NAVELEX 0967-LP-613-5010

TECHNICAL MANUAL

OPERATION AND MAINTENANCE INSTRUCTIONS
WITH PARTS LIST

# TELETYPEWRITER SET
# COMPACT PAGE PRINTER
# KEYBOARD SEND-RECEIVE AND
# RECEIVE ONLY MODEL 28

Manufactured by
Teletype Corporation

Manual Prepared by
Western Technical Associates
N00039-76-C-0153

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# INSTRUCTION SHEET

Change 1 to Technical Manual Operation and Maintenance Instructions with Parts List for Teletypewriter Set Compact Page Printer Keyboard Send-Receive and Receive Only Model 28 NAVELEX 0967-LP-613-5010.

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DATED: 24 July 1980

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# VALIDATION PERFORMANCE

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Contractor: Western Technical Associates
5730 Arbor Vitae Street
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Contract No: N00039-76-C-0153

| Chapter | Section | Paragraph | Date Validation Completed | Check here if not validated |
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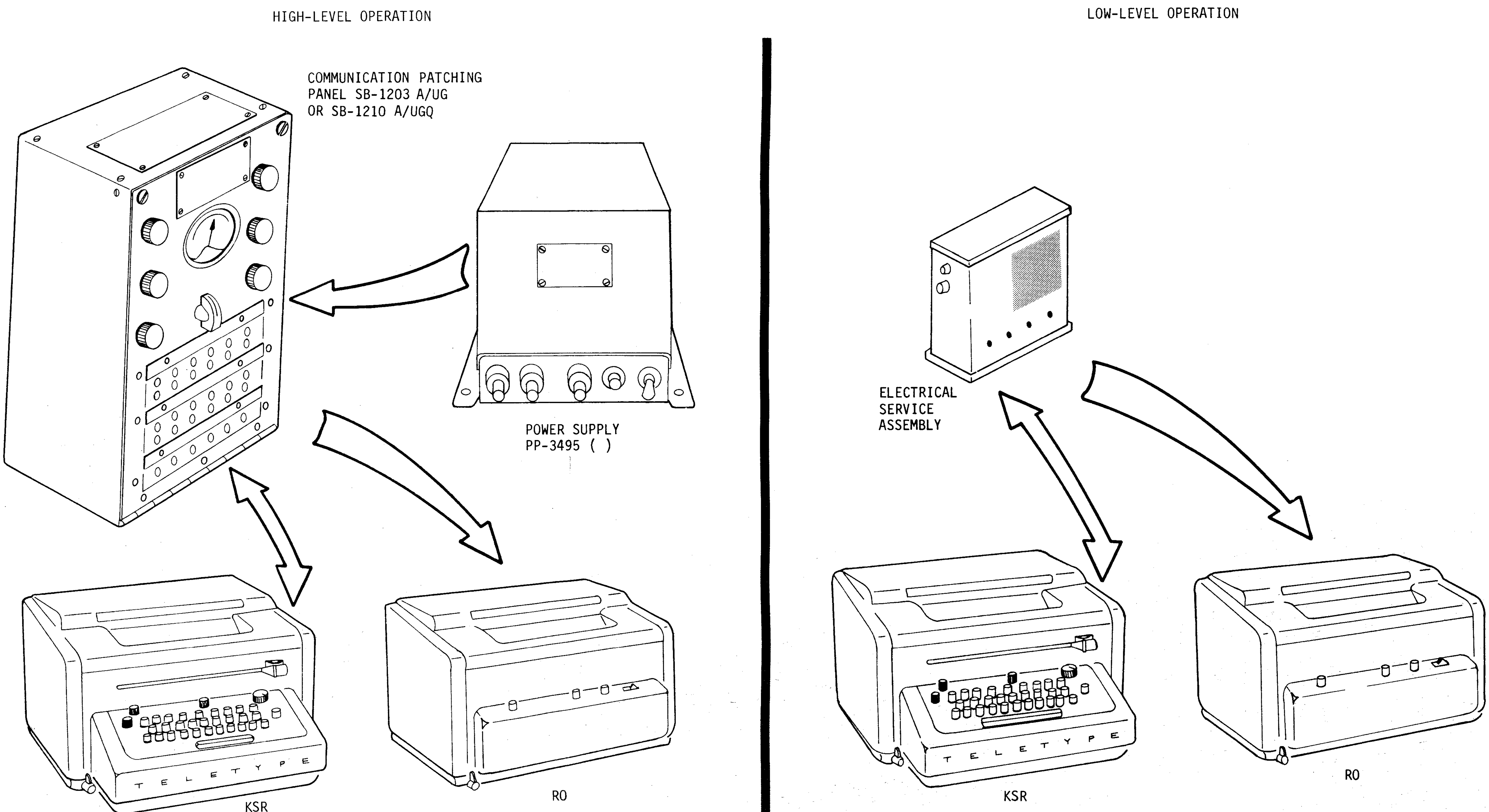


Figure 1-1. Model 28 Compact Page Printers KSR and RO

# CHAPTER 1
# GENERAL INFORMATION AND SAFETY PRECAUTIONS

1-1. SAFETY PRECAUTIONS. To stress the importance of employing proper safety techniques while performing maintenance procedures on the equipment involved, the user of this manual is directed to thoroughly familiarize himself with the safety precautions described in Chapter 4, paragraph 4-4. Specific CAUTIONS concerning possible damage to equipment and WARNINGS concerning danger to personnel are referenced below (by paragraph) and should be strictly observed.

CAUTIONS

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4-8b(1)(e)
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1-2. INTRODUCTION. This manual provides information and instructions for installation, operation, and maintenance of Model 28 Compact Page Printer (CPP) Keyboard Send-Receive (KSR) and Receive-Only (RO) Teletypewriter Sets (figure 1-1). Maintenance information includes instructions for testing, performing preventive maintenance and adjustments, troubleshooting, and repairing. A parts list is also included. CPP configurations covered by this manual are described in matrices referenced in paragraph 1-6.

1-3. EQUIPMENT DESCRIPTION. The Model 28 Compact Page Printer (CPP) KSR and RO Sets are designed to provide normal teletypewriter service in mobile and fixed stations where minimum equipment size is desired. Interfacing equipment is shown in figure 1-1 for information only and is not a part of CPP teletypewriter equipment. Refer to paragraph 1-4. Equipment size has been reduced by using a modified 32 keyboard and a 28 typing unit.

a. General. The CPP KSR and RO teletypewriter sets originate and monitor messages in a telegraphic network. The characters or functions which form a message are originated by depressing individual keys on a KSR set. The resulting message is monitored by the local and selected typing units in the network. A RO set primarily monitors the telegraphic network to print the characters or interpret the functions.

(1) The KSR and RO sets are similar in appearance but differ in the number of mechanisms. The KSR is equipped with a keyboard transmitter mechanism and a distributor mechanism to originate and distribute coded information on the signal line. The RO has a control hood with power switch, local function keys, and break switch.

(2) Intelligence for the CPP teletypewriter sets is transmitted and received serially by means of a five level, binary permutation code. In addition to the five code bits, there is a start bit and a stop bit, always spacing and marking, respectively. The start bit precedes the code bits to initiate operation of the typing unit, and a stop bit follows the code bits to secure the typing unit. Variations of the KSR generate 7.00 and 7.42 units per character. The first bit (1 unit) is always spacing; the next five bits (5 units total) are either marking or spacing code levels, and the final bit (1 or 1.42 units) is always marking. The signal line remains energized by a remote dc power source during marking intervals, and becomes deenergized by local electrical contacts during spacing intervals.

b. High- and Low-Level. This manual covers both high-level and low-level configurations of CPP teletypewriter sets. High-level teletypewriter sets are used in applications wherein radio frequency interference (rfi) does not present a problem. Low-level teletypewriter sets have rfi suppression features incorporated. One of the rfi suppression features is the use of a low-level signaling code from which the term low-level is derived. The low-level signaling code is the +6-volt (mark) and -6-volt (space) polar code levels versus that of the 0.060 amperes (mark) and 0 amperes (space) neutral code levels used in the high-level sets. High-level teletypewriter equipment is described in paragraph 1-3.1 and low-level equipment is described in paragraph 1-3.2.

1-3.1 EQUIPMENT DESCRIPTION (HIGH-LEVEL). The KSR set (figure 1-2) consists of a keyboard unit, typing unit, motor unit, and cover. The RO set (figure 1-3) consists of a base unit, typing unit, motor unit, and cover.

a. Keyboard Unit (KSR). The keyboard unit provides transmission facilities for originating coded characters, and a base for mounting the motor unit, typing unit, and cover. The keyboard unit (figure 1-4) consists of a mounting base, keyboard transmitter, distributor, 3-speed gear shift assembly, local function mechanisms, margin indicator switch, and electrical cable assemblies. The margin indicator switch (not visible in the photo) is attached to the mounting base behind the keyboard transmitter, and is operated by the typing unit. When operated, it illuminates a neon indicator lamp on the cover. The local function mechanisms respond to the deflection of their keys on the keyboard transmitter. The keys mechanically control line feed and carriage return on the typing unit.

(1) Mounting Base. The mounting base includes the inner base and outer base pan. The inner base is isolated from

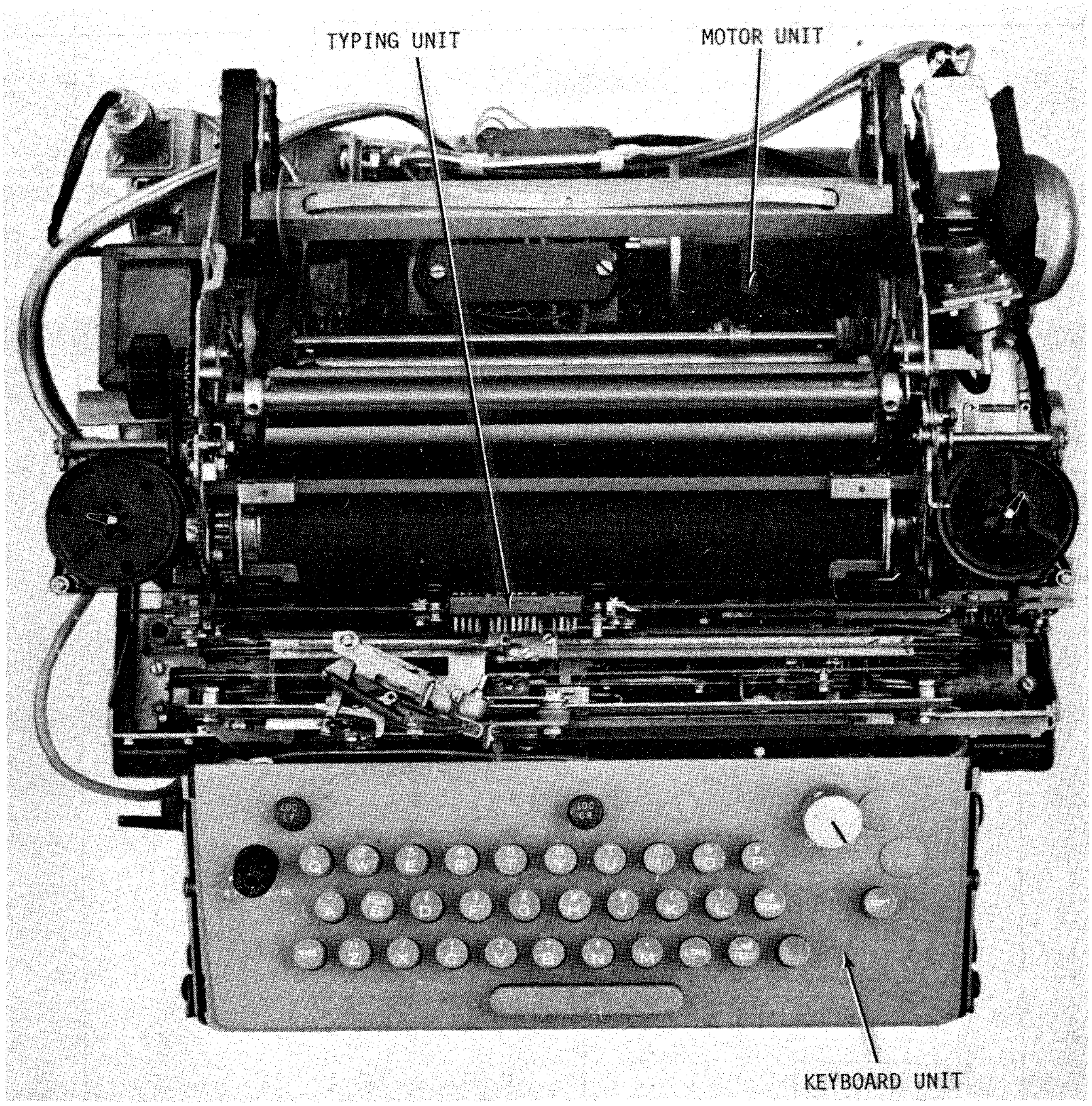


Figure 1-2. Model 28 Compact Page Printer (KSR)
(Cover Removed)

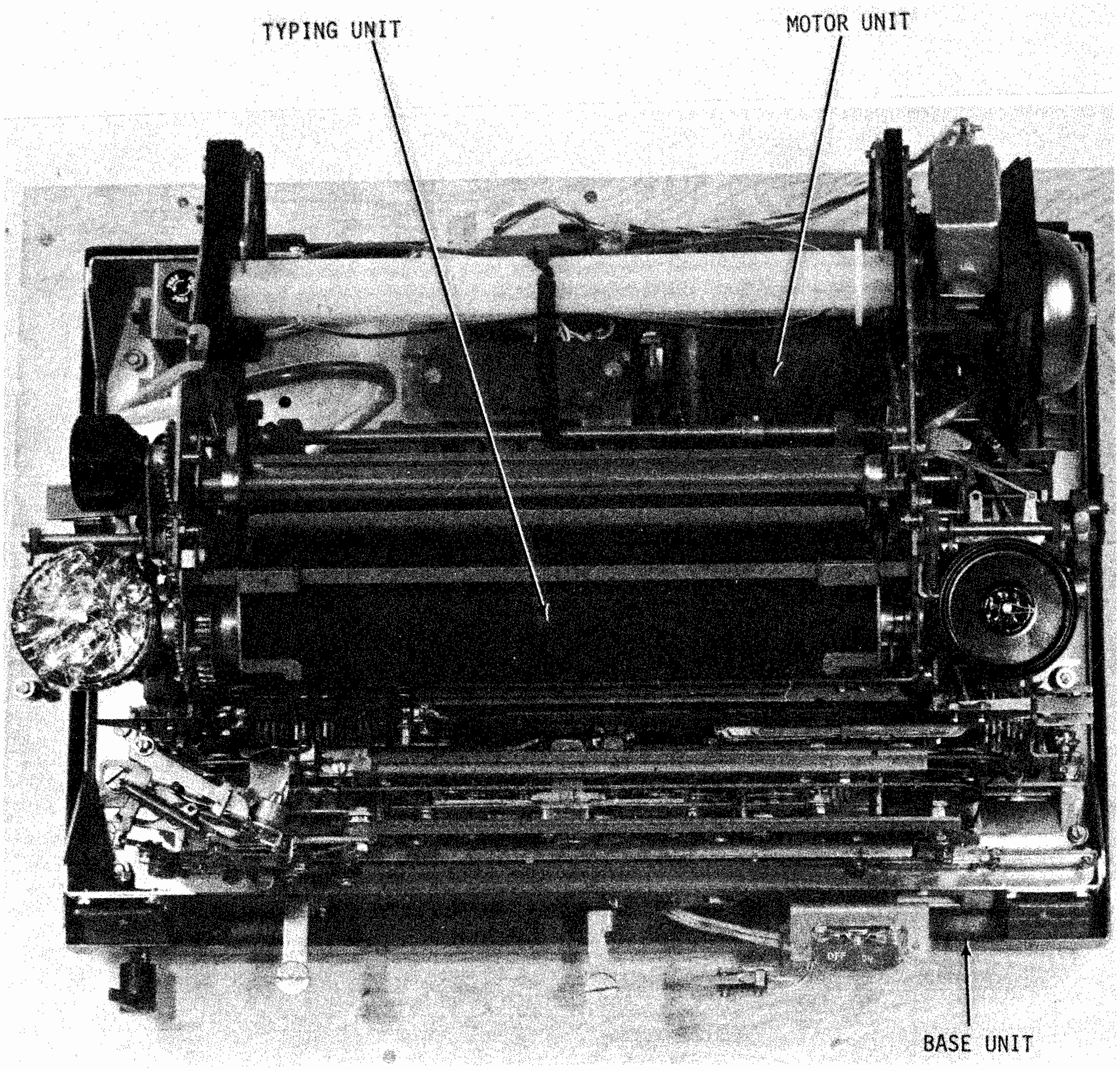


Figure 1-3. Model 28 Compact Page Printer (RO)
(Cover Removed)

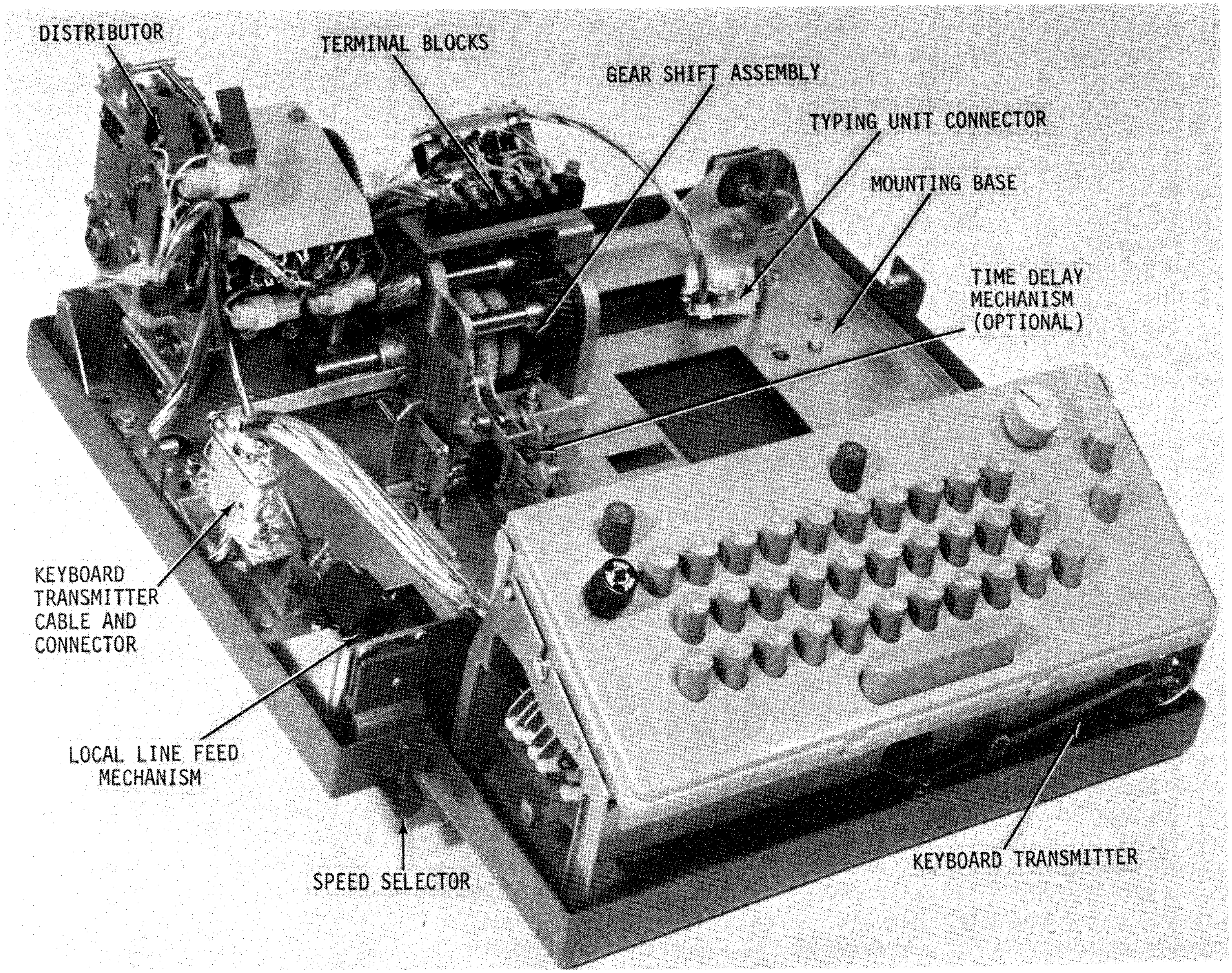


Figure 1-4. Keyboard Unit

the outer base pan by four, vertically positioned, vibration mounts. The outer base pan provides mounting facilities for the keyboard transmitter and cover unit.

(2) Keyboard Transmitter. The keys on the keyboard transmitter (figure 1-5) are arranged in a conventional manner with numerals, punctuation marks, and special symbols in upper case positions. Standard keys for local line feed and local carriage return are located above the character keytops. Line break and repeat keys are located to the right of the character keys. Power to the electrical components in the set is initially routed through the switch in the upper right corner and through the fuse in the upper left corner. When a character key is depressed, the wire contacts on the right side of the keyboard transmitter are simultaneously positioned in marking and/or spacing conditions, and the universal lever is released. The universal lever is reset by a solenoid reset mechanism. The solenoid is attached to the rear of the keyboard transmitter. With the exception of local function mechanisms, all functional connections between the keyboard transmitter and the rest of the set are made through the cable and connector. The repeat key when depressed operates a miniaturized switch to maintain current in the distributor magnet and open the solenoid reset circuit.

NOTE

To prevent loss of characters during repeat operation, the repeat key should be depressed in conjunction with the character key. However, if the keyboard transmitter is inadvertently reset while the repeat key is depressed, a series of blanks will be transmitted.

The break key simply opens the signal line circuit by pushing the break contact wire away from the terminal strip.

(3) Distributor. The distributor (figure 1-6) is located in the left rear corner of the keyboard unit. The distributor consists of a trip magnet assembly, cam-clutch assembly, contact block, and mounting frame. The electrical cable from the keyboard transmitter merges with the distributor wiring harness through a 24-point connector.

(4) Gear Shift Assembly. The 3-speed gear shift assembly is located in the rear center of the keyboard unit (figure 1-7). The speed selector is located in the front left corner of the base pan. The speed selector and gear shift assembly are mechanically linked between the front and rear of the base. Each position of the selector will engage one of three gears with the variable speed shaft of the gear assembly. The operating speed may be changed with the motor unit in the running or idle condition.

b. Base Unit (RO). The receive-only base provides mounting facilities for the motor unit, typing unit, and cover. The base consists of a mounting base, 3-speed gear shift assembly, local function mechanisms, and signal line break key. The mounting base includes an inner base and outer base pan. The inner and outer

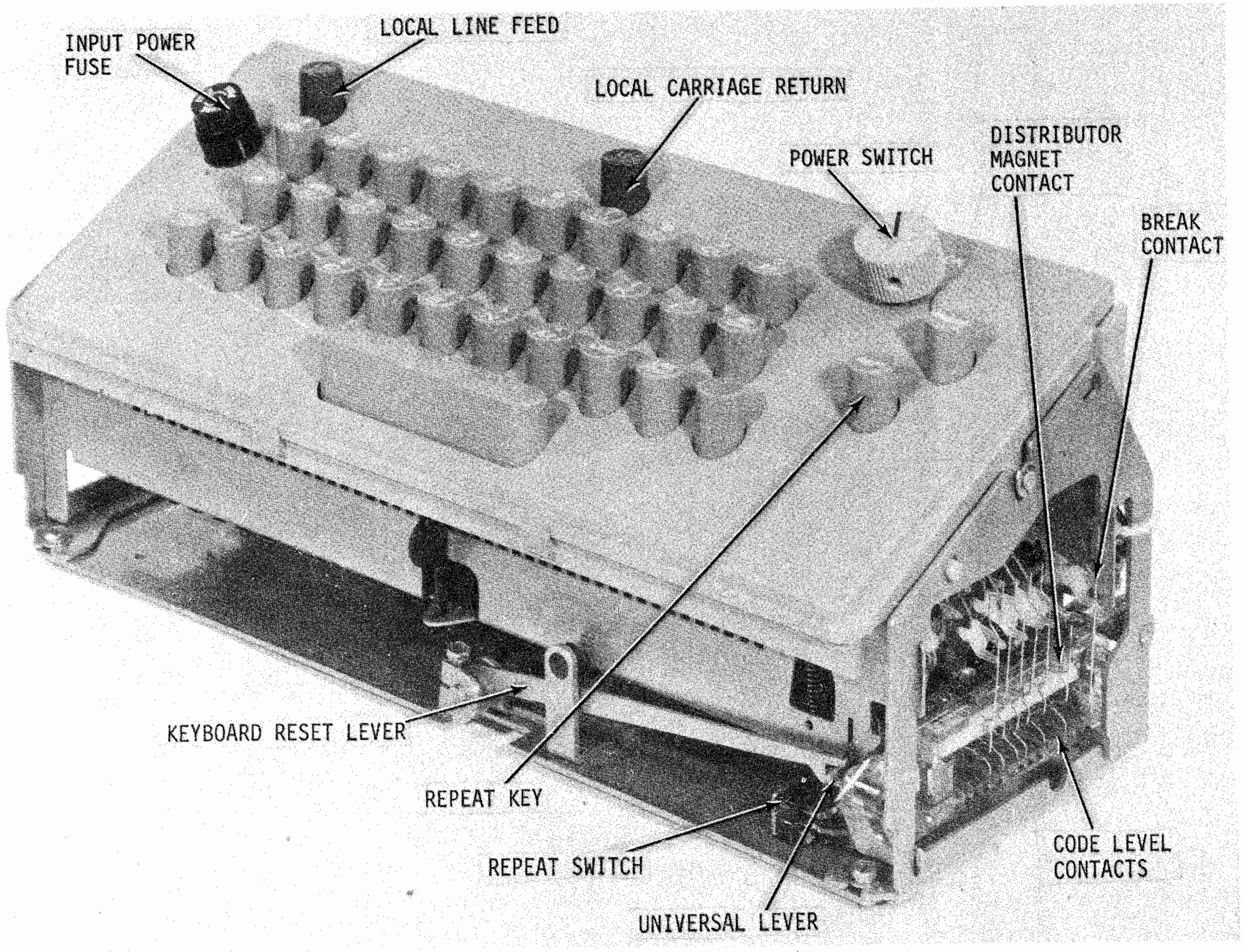


**Figure 1-5. Keyboard Transmitter**

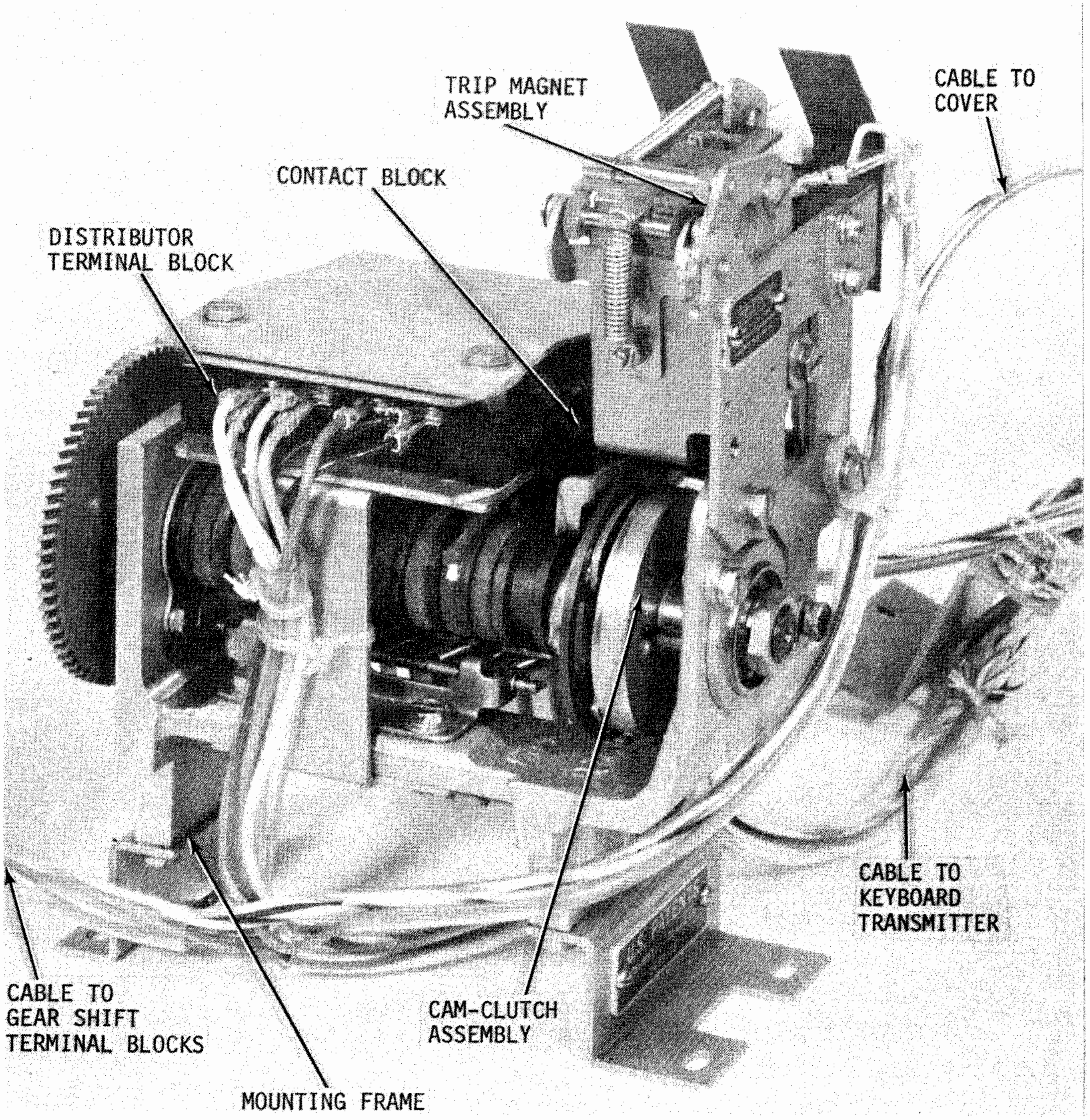


Figure 1-6. Distributor (Rear View)

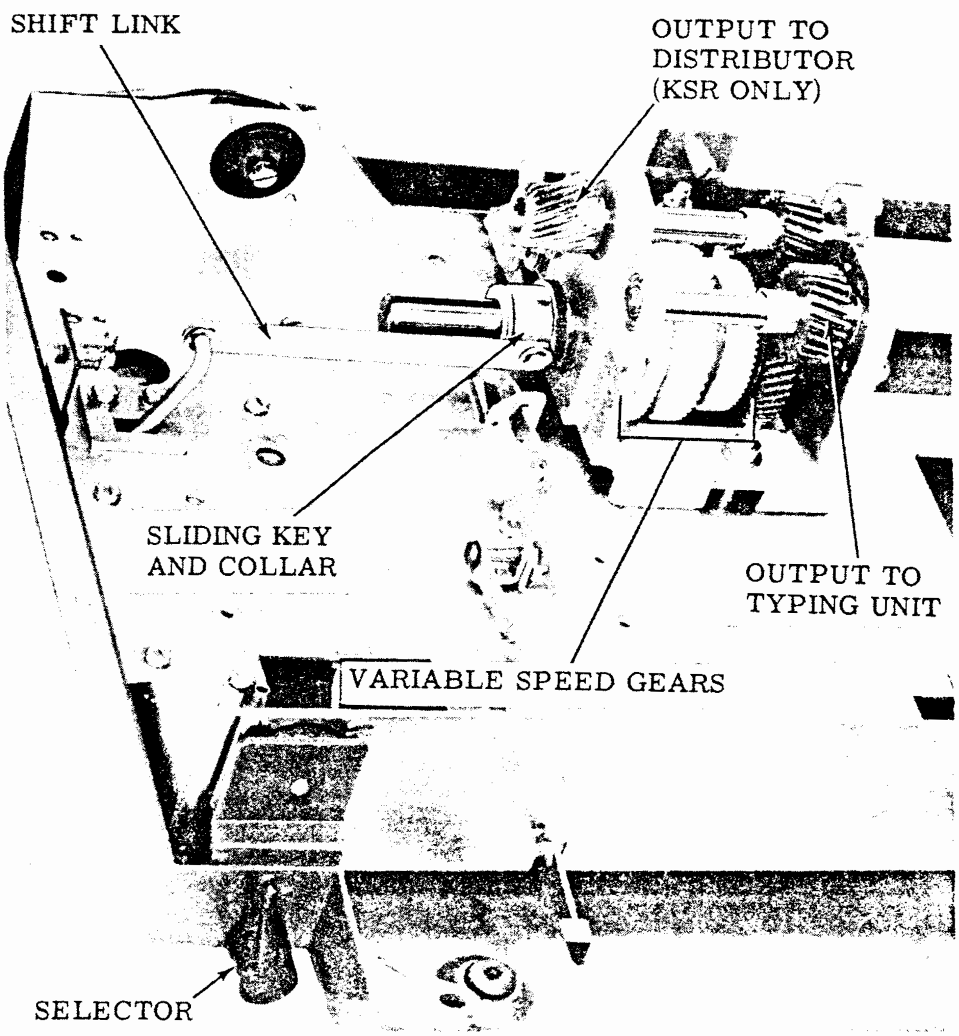


Figure 1-7. 3-Speed Gear Shift Assembly

base elements are isolated from each other by four vertically mounted vibration mounts. The local line feed, local carriage return, signal line break, and ON-OFF power switch are attached to the base unit, and extend through the control hood on the cover (figure 1-8). When turned ON, the power switch illuminates an indicator lamp on the cover. Power to the electrical components in the set is initially routed thorugh the switch and through a fuse in the left rear corner of the base.

c. Typing Unit (KSR and RO). The typing unit (figures 1-9 and 1-10) is composed of mechanisms interconnected to perform a function or to type a character. The major mechanisms are the selector mechanism, code bar mechanism, function mechanism, and printing and spacing mechanism. A main shaft accepts rotational motion and, through a series of cams, clutches, and gears, distributes the motion to operate the typing unit mechanisms. The motion is extended to each mechanism as the typing unit proceeds through its operating cycle. The typing unit is mounted on a keyboard base (KSR) or a base (RO). Rotary mechanical motion for its operation and information in the form of a signaling code come from an external source. A front plate and side plates provide mounting facilities for the various assemblies and

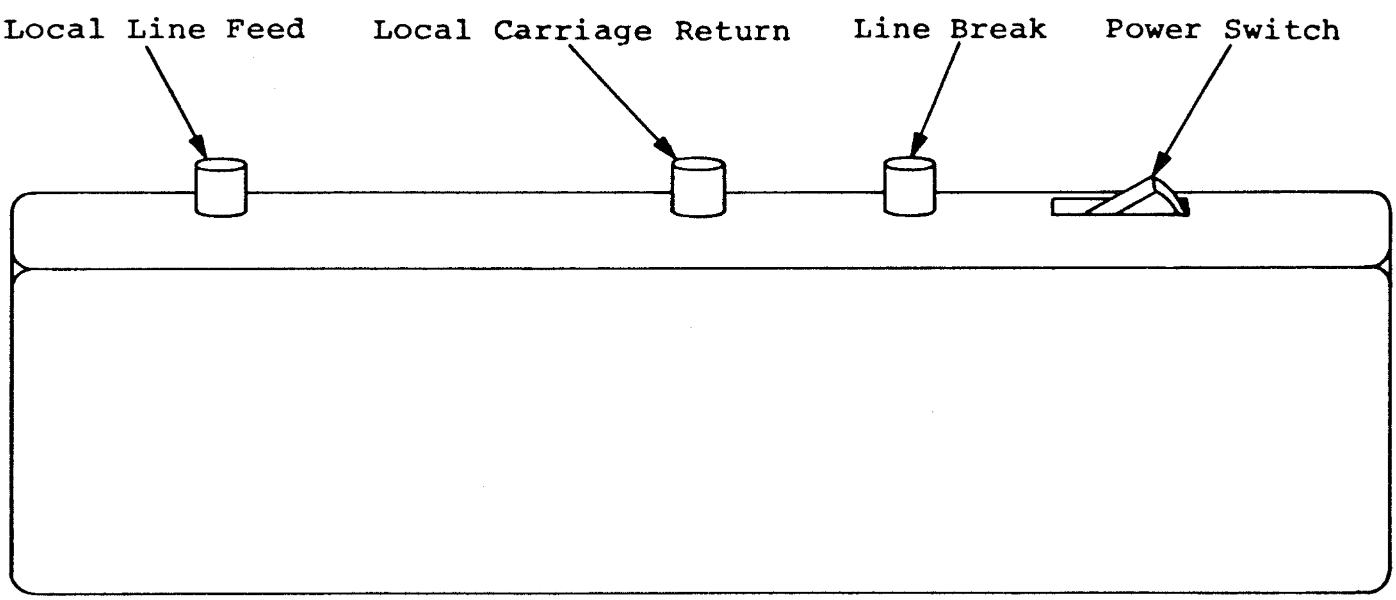


Figure 1-8. Control Hood (RO)

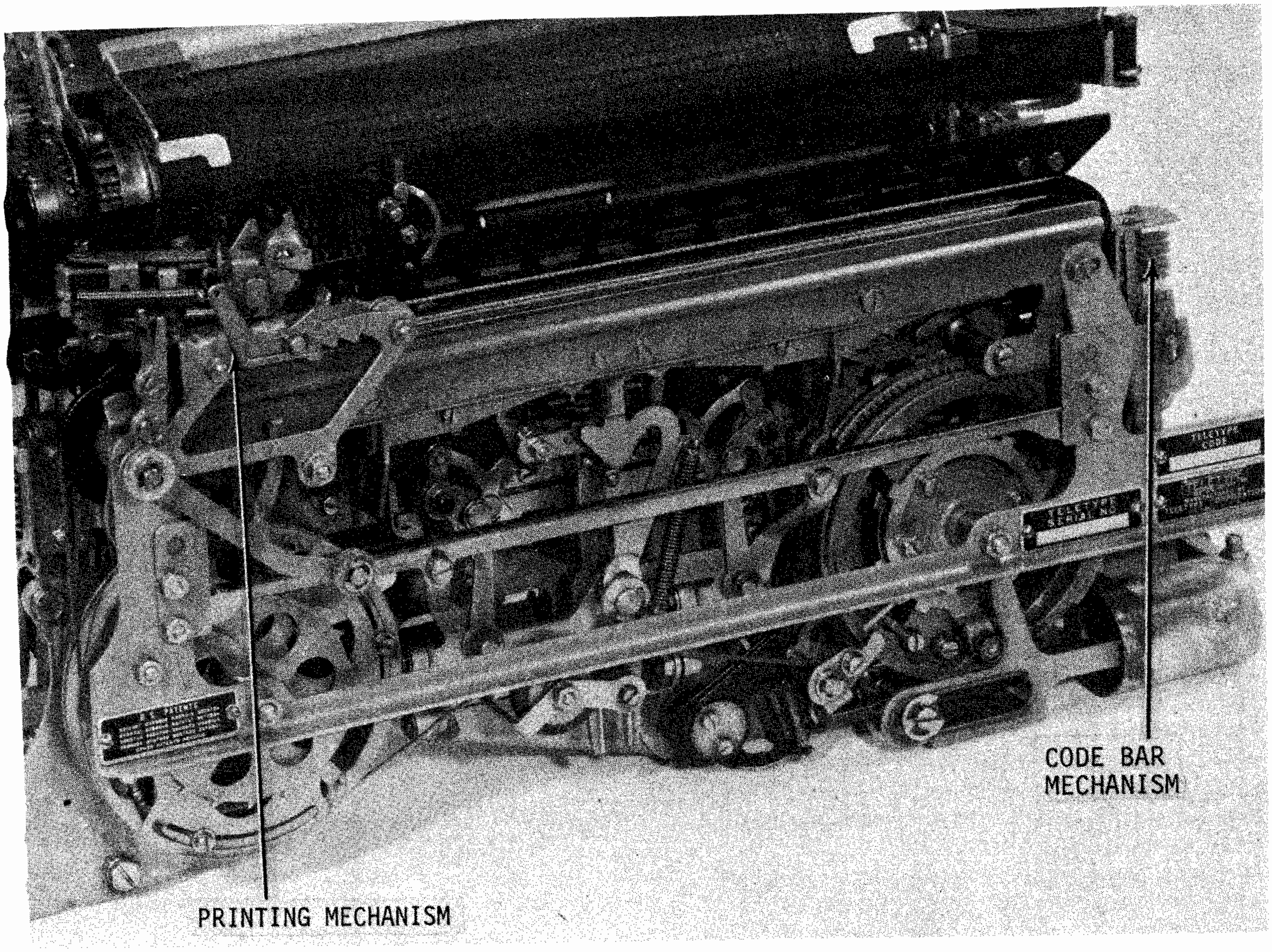


Figure 1-9. Typing Unit (Front View)

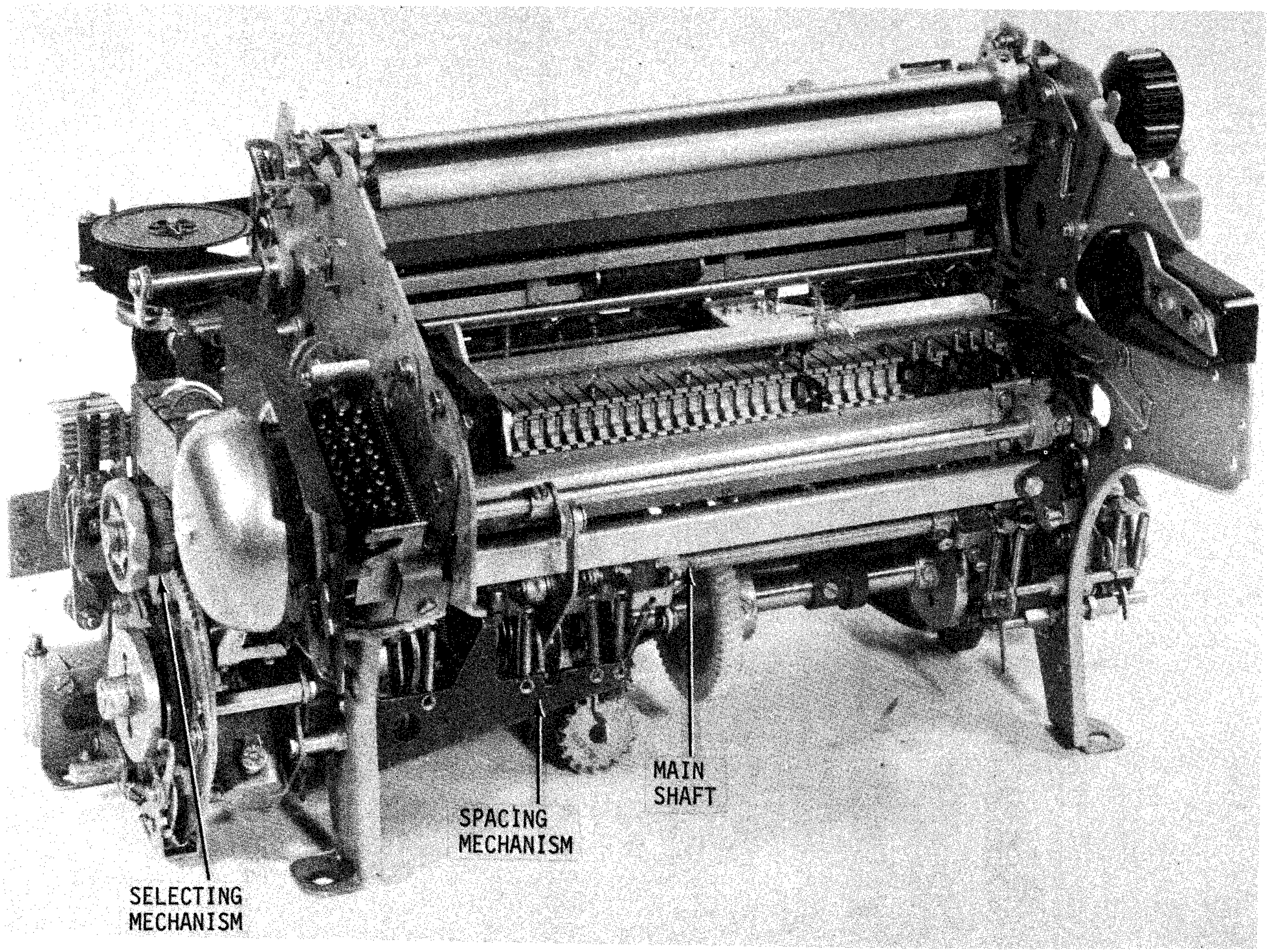


Figure 1-10. Typing Unit (Rear View)

mechanisms that make up the unit.

d. Motor Unit (KSR and RO). Mechanical motion for driving the distributor (KSR only) and typing unit is provided by a 1/20 horsepower, two pole, single phase, synchronous motor unit. The motor unit (figure 1-11) operates from a 115 ±10% VAC source. Both 50 ±0.75% Hertz, 3000 rpm or 60 ±0.75% Hertz, 3600 rpm motors are available. The motor rests in the cradle of a mounting bracket and is held in place by a strap at each end. The cradle is isolated from the motor by resilient mounts to reduce vibration. A small fan is mounted at each end of the rotor within the motor housing, and a combination handwheel and fan is mounted on the rear of the shaft. A start relay and start capacitor are mounted in front of the motor. A thermal cutout switch is located in the rear of the motor. The thermal cutout switch provides protection against overload.

CAUTION

If motor becomes blocked for several seconds, the thermal cutout switch will break circuit. Allow motor to cool at least 5 minutes before depressing red reset button.

e. Cover Unit (KSR and RO). The cover provides a protective enclosure for the KSR (figure 1-12) and RO (figure 1-13) teletypewriter

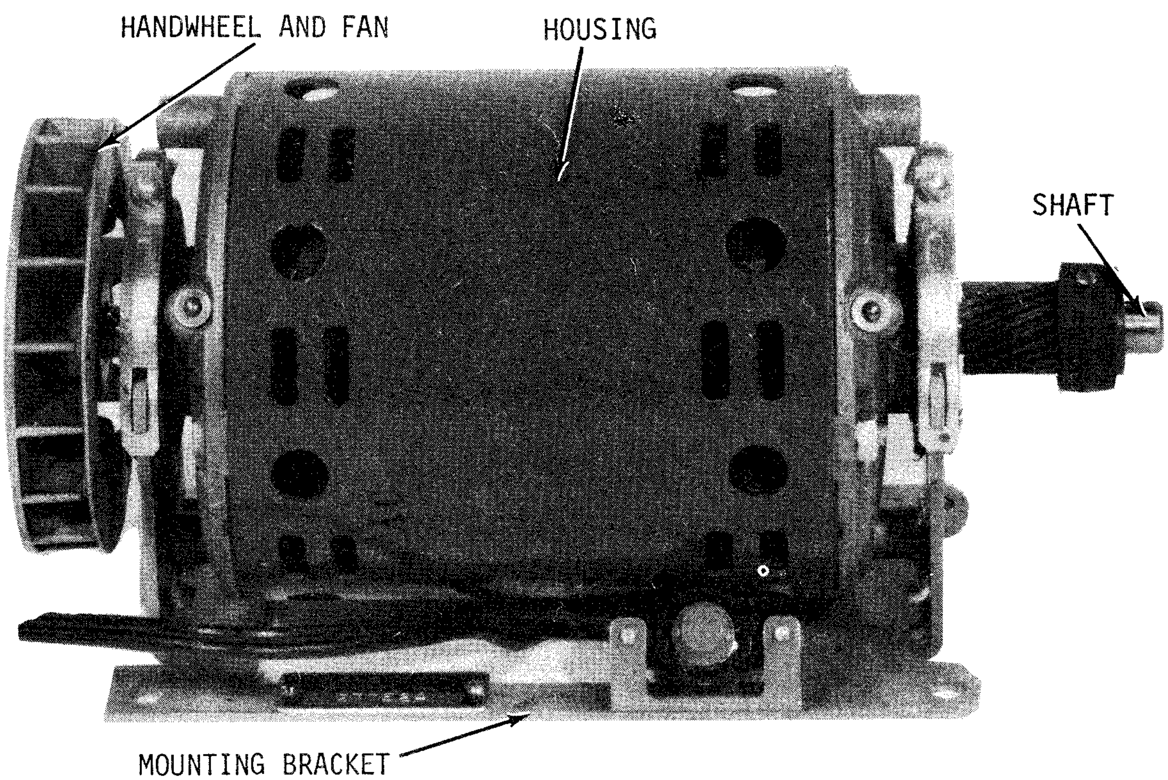


Figure 1-11. Motor Unit (Rear View)

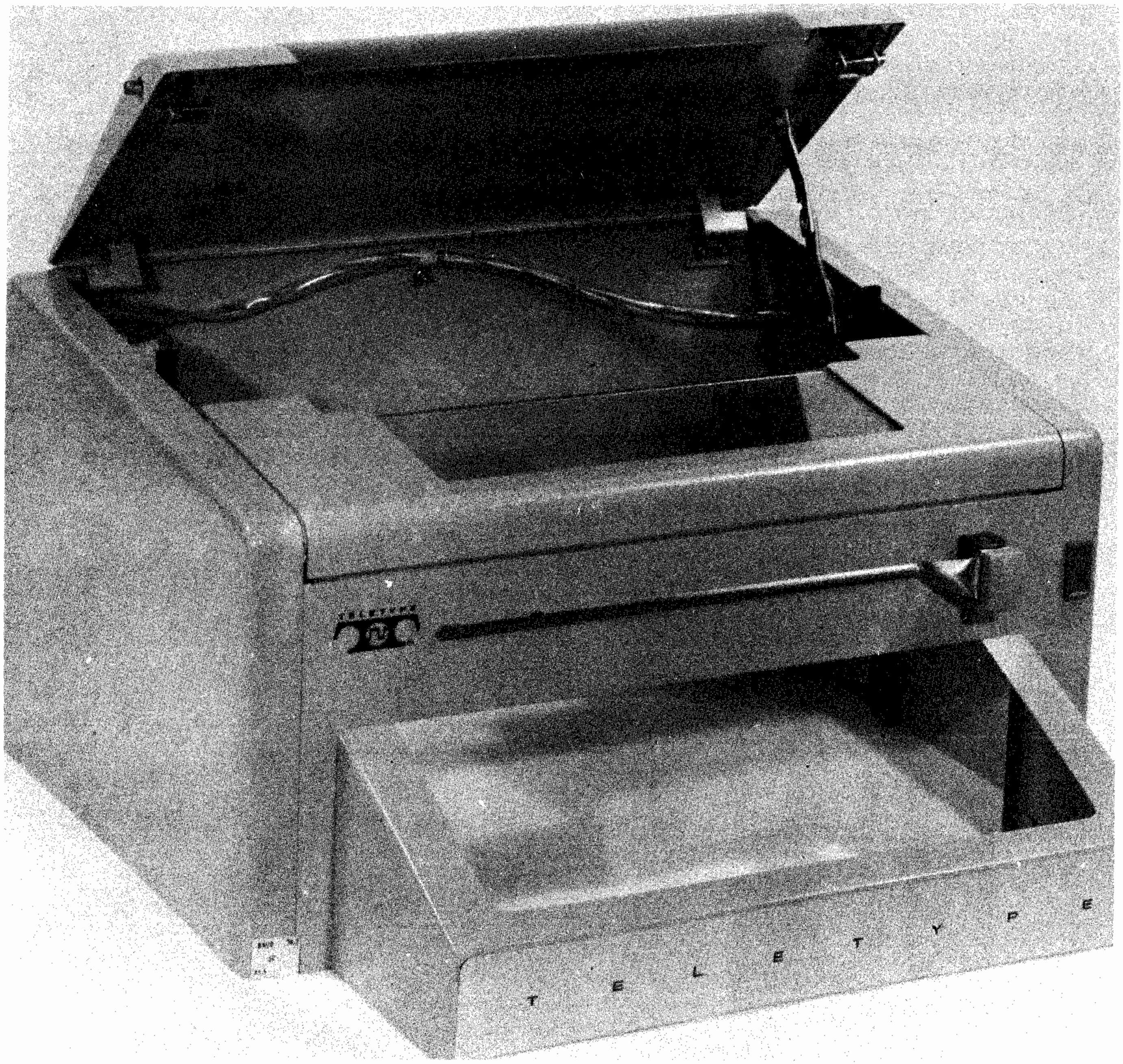


Figure 1-12. Cover Unit (KSR)

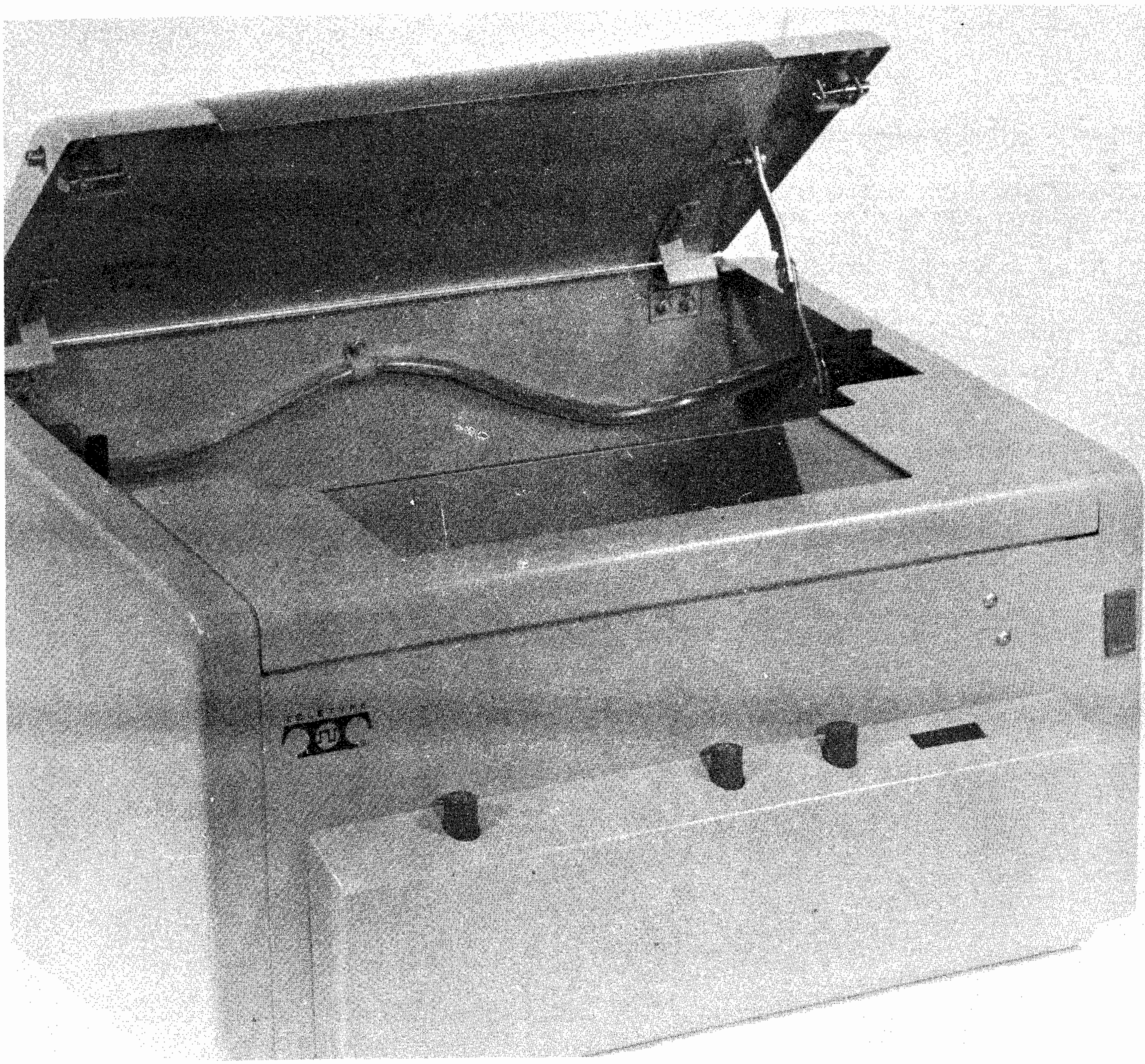

Figure 1-13. Cover Unit (RO)

sets. The cover is positioned on the base by three retainers and is locked to the base by two spring loaded latches. The latches are attached to the inside surfaces of the cover and are accessible through the dome. The dome is released by depressing the plungers on the left and right sides. When raised, the dome is supported in an open position by the stop arm. Power circuits are extended to the cover through a six point connector. A step down transformer is attached to the inside surface of the cover. Line voltage is reduced for the copylights in the cover. The power indicator lamp for the RO set is located on the cover unit. The lamp is illuminated when power is applied. The margin indicator lamp for the KSR set is illuminated when the switch on the keyboard unit is tripped by the typing unit. The margin indicator contains a neon bulb which is illuminated from line voltage. The lamp circuit is routed through the six point connector. The window at the top of the cover permits visual observation of the printed copy. A copy holder and line guide is provided on KSR sets.

f. Variable Features. A motor stop time delay mechanism (figure 1-4) is available as an optional feature and is used in conjunction with a separate electrical service unit. The motor stop time delay mechanism consists of a time delay mechanism and a stop magnet assembly. The stop magnet assembly, located in a separate service unit, requires an electrical pulse to open the power circuit to the set. The pulse originates from a time delay mechanism on the keyboard or base unit. Upon receipt of a pulse, the motor is stopped and the signal line is shunted. The pulse occurs after the signal line has remained continuously energized from 756 to 1512 revolutions of the typing unit main shaft. A cam on the typing unit main shaft drives a ratchet mechanism on the base. The motor is restored to its running condition when the signal line current is interrupted by a start pulse or line break.

1-3.2 EQUIPMENT DESCRIPTION (LOW-LEVEL). Low-level KSR and RO CPP teletypewriter equipment differs from high-level equipment in that radio frequency interference (rfi) suppression features have been incorporated in several of the low-level components. The following paragraphs describe the rfi suppression features and point out the areas of difference between high and low-level equipment.

a. RFI Suppression. RFI suppression as applied to teletypewriter equipment is accomplished by means of shielding and wave shaping a low level electrical telegraph signal throughout the equipment. The installations vary with each set, but produce the same results of ensuring signal line privacy.

(1) Signaling. The code is transmitted by means of a ±6-volt polar signal through a network of shielded cables to the shielded container of an electrical service assembly (ESA). A +6-volt signal is mark; a -6-volt signal is space.

(2) Electrical Service Assembly (ESA). The ESA is an electrically shielded container in which shielded cables terminate. It also serves as a housing for certain components such as plug-in selector magnet driver circuit

cards, clutch magnet driver circuit cards, keyer circuit cards, power supply circuit cards, and relays. Electrical service assemblies which house low level keyers (LLK) and selector magnet drivers (SMD) have double shielded containers and double shielded cables with appropriate connectors for LLK and SMD connections to external equipment.

(3) Cabling. The shielded cabling varies with each set according to need. Each component unit of a set is equipped with sufficient shielding, in the form of metallic enclosures and shielded cables, to suppress signal radiation. All signal generators and magnet assemblies in the signal circuitry are shielded by means of metal containers attached to their respective cables. Interconnecting cables join the component units to the electrical service assembly by means of metal connectors which screw together for a tight shielded connection.

b. Keyboard Unit (KSR). The rfi application for low-level keyboard units consists of shielded line signal cable and photoelectric signal generating devices instead of contact mechanisms in the keyboard transmitter and the distributor.

(1) Mounting Base. The high-level mounting base description in paragraph 1-3.2a(1) is also applicable to the low-level mounting base.

(2) Photoelectric Keyboard Transmitter. A lamp assembly in the keyboard transmitter photoelectric assembly (figure 1-14) provides the necessary light source to activate the photocells. A mechanical shutter assembly, linked with the keyboard transmitter code bar mechanism and located between the photocells and lamp assembly, provides windows to either allow light from the lamp assembly to pass and activate the photocells (mark) or to block the light and not activate the photocells (space). The photocells generate a parallel electrical signal of approximately 300 microamperes. The generated signal travels along a shielded cable to the photoelectric distributor.

(3) Photoelectric Distributor. The photoelectric distributor (figure 1-15) serializes the signal, and by means of a shielded cable, routes it to the input of a polar line keyer.

(4) Gear Shift Assembly. The gear shift assembly in low-level equipment is identical to that used in high-level equipment. Refer to paragraph 1-3.1a(4).

(5) Synchronous Pulse. Synchronous pulsed transmission is accomplished by the keyboard reset mechanism and pulsed operation of the photoelectric distributor clutch magnet.

c. Base Unit (RO). The high-level base unit description in paragraph 1-3.1b is also applicable to the low-level base unit.

d. Typing Unit (KSR and RO). RFI suppression of the typing unit is achieved by means of an rfi selector mechanism. The rfi selector mechanism (figure 1-16) mounts on the upper right side frame of the typing unit. The selector

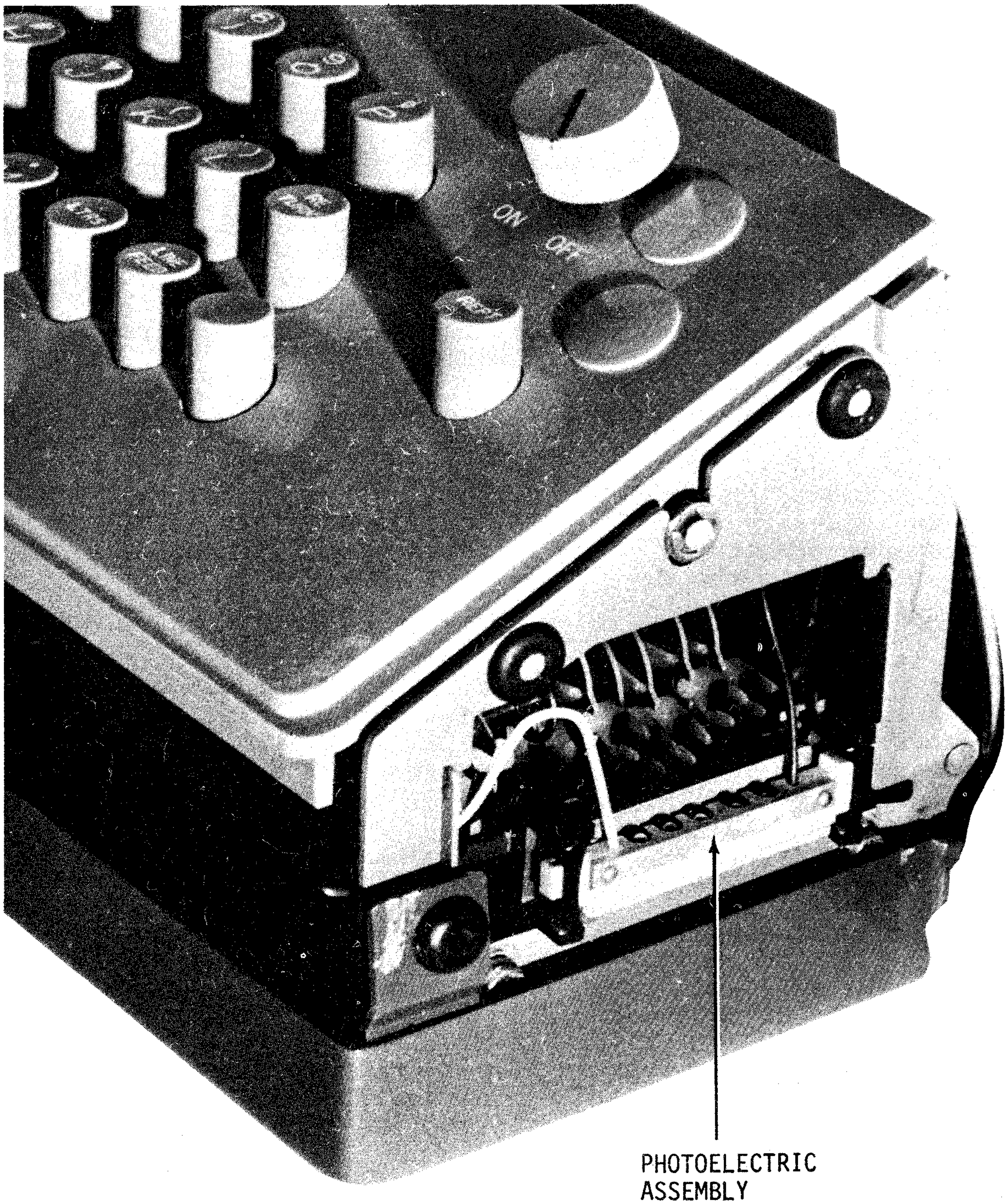


Figure 1-14. Keyboard Transmitter Photoelectric Assembly

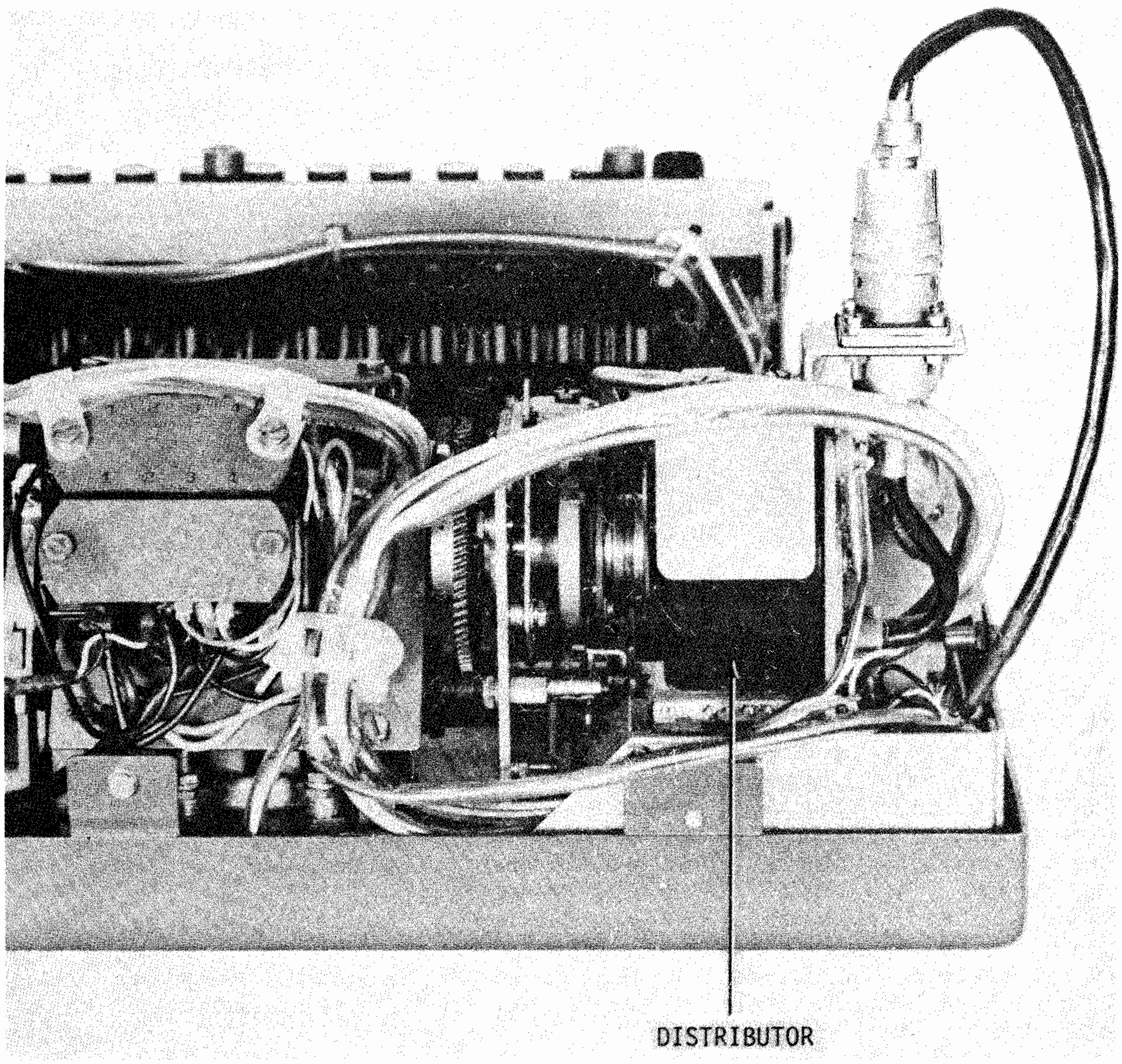


Figure 1-15. Photoelectric Distributor

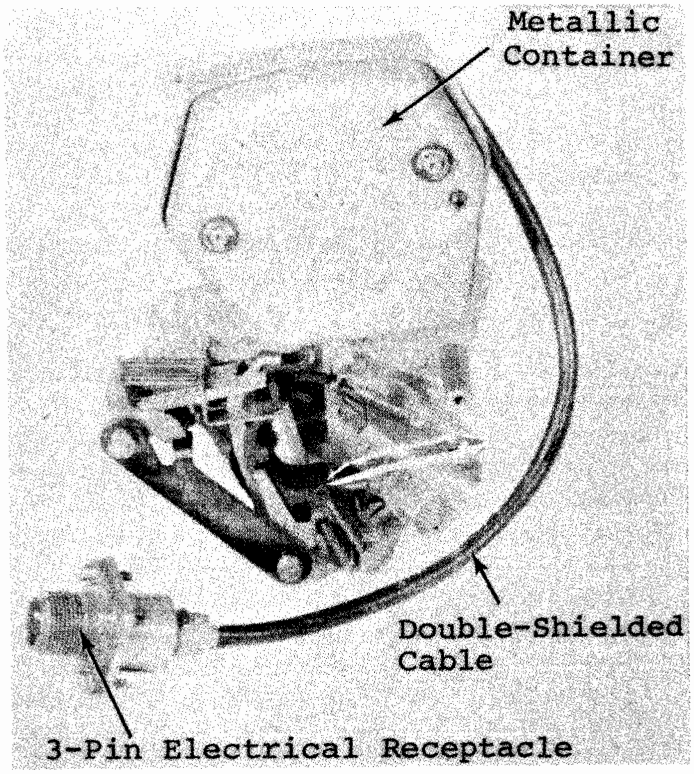


Figure 1-16. RFI Selector Mechanism

consists of a special three-pin electrical receptacle, double shielded cable, and metallic container. The three-pin electrical receptacle ensures a secure and shielded electrical connection to other associated apparatus. The double shielded cable electrically connects the three-pin electrical receptacle to the selector magnets. The shielded cable is composed of three electrical conductors encircled by braided inner and outer shields. The inner and outer braided shields are electrically separated from each other and the three electrical conductors by flexible solid dielectric. The metallic container functions as a shielded enclosure for the selector magnet assembly. Enclosed within the metallic container are the selector magnet coils, coil mounting bracket, and selector armature. Each selector magnet coil contains an electrostatic shield which surrounds the coil windings. The selector coil mounting bracket provides mounting facilities for the coils, armature, and biasing spring. The receptacle, shielded cable, metallic container, and selector coils provide rfi suppression when used with associated rfi equipment.

e. Motor Unit (KSR and RO). The motor unit used in low-level equipment is identical to that used in high-level equipment. Refer to paragraph 1-3.1d.

f. Cover Unit (KSR and RO). The high-level cover unit descriptions in paragraph 1-3.1e also apply to the low-level cover units with one exception; the step-down transformer for the copy lights is mounted in the cover in high-level equipment, and mounted on the typing unit in low-level equipment.

g. Electrical Service Assemblies. Electrical service assemblies (ESAs) are metal shielded containers which vary for different applications. A typical ESA is shown in figure 1-17. ESAs house electronic components which serve to suppress radio frequency interference (rfi) and provide low-level transmission of telegraph signals. The three types of ESAs used with low-level CPP teletypewriter sets are listed in table 1-1 along with the number of connectors provided for associated LLK, SMD, and CMD circuit cards (figure 1-18). All three of the ESAs are table mounted. ESAs which house LLK and/or SMD circuit cards require double-shielding. An inner aluminum box functions as an electrostatic shield and is electrically isolated from an outer box which serves as a magnetic shield. CMD circuit cards do not require double box construction. Single box construction is adequate for the CMD and serves as a combined electrostatic-magnetic shield. The inner box contains a mounting plate with printed circuit board connectors to accommodate a power supply with printed circuit board assembly and the required number of CMD, SMD, and LLK circuit cards. A screw terminal strip is provided for connecting the signal line. The inner box also contains the power supply rectifier filter capacitor. The outer box contains the inner box, power supply transformer, power line filter, and screw terminal block for ac power connections. A power switch and fuse are located on one side of the outer box. The power supply transformer and rectifier filter capacitor form an assembly which, when used with an ESA Power supply card, will meet power supply requirements.

1-4. RELATIONSHIP OF UNITS. Figure 1-1 shows the relationship between a CPP teletypewriter set and external interfacing equipment. The communication patching panel (SB-1203A/UG or SB-1210A/UGQ) is for shipboard use to facilitate interconnection of teletypewriter sets and various types of terminal equipments. Refer to NAVSHIPS 0967-LP-874-1010. The power supply (PP-3495()) is used as a dc loop current supply for high-level operation of teletypewriter sets. (Refer to NAVSHIPS 0967-LP-425-1010.) For low-level CPP operation, the electrical service assembly (ESA) is required.

1-5. REFERENCE DATA. Reference data pertinent to Model 28 CPPs, both high and low level, are provided in table 1-2. Data for the ESA 0.5-Ampere Power Supply applies only to low-level equipment.

1-6. EQUIPMENT SUPPLIED. The matrices in tables 1-3 and 1-4 list the family of Model 28 CPP Teletypewriter equipment by official NAVY nomenclature versus Teletype Corporation code numbers for major assemblies comprising each configuration.

1-7. EQUIPMENT REQUIRED BUT NOT SUPPLIED. Table 1-5 lists tools and test equipment not supplied but required for maintenance and troubleshooting procedures.

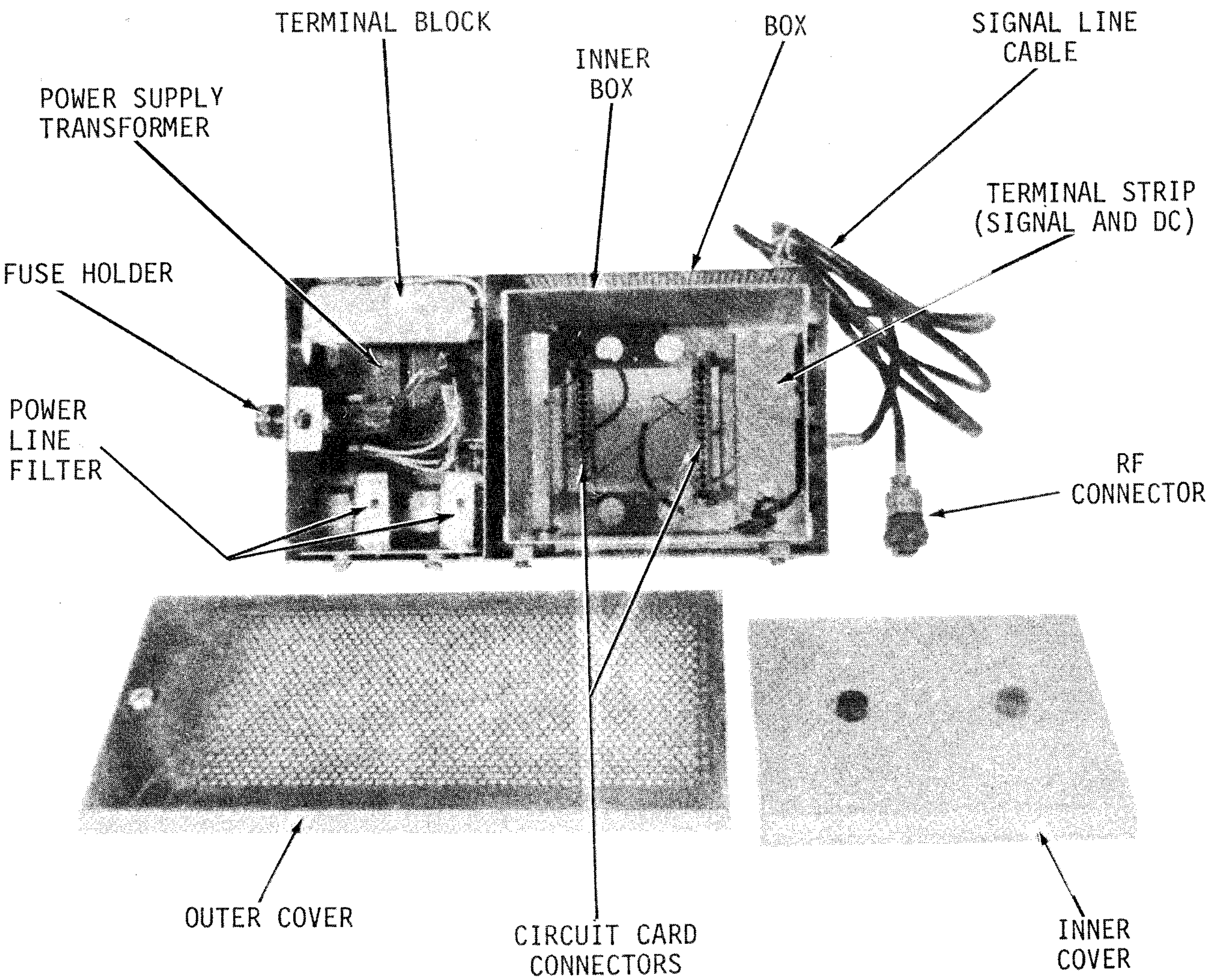


Figure 1-17. Typical ESA (Top View)

Table 1-1. Electrical Service Assemblies Used in Low-Level CPP Teletypewriter Sets

| Electrical Service Assembly | Circuit Card Connectors 0.5A Power Supply | LLK | SMD | CMD |
|---|---|---|---|---|
| TP321231 | 1 | | 1 | |
| TP323120 | 1 | | | 1 |
| TP323121 | 1 | 1 | 1 | |

LLK = Low Level Keyer
SMD = Selector Magnet Driver
CMD = Clutch Magnet Driver

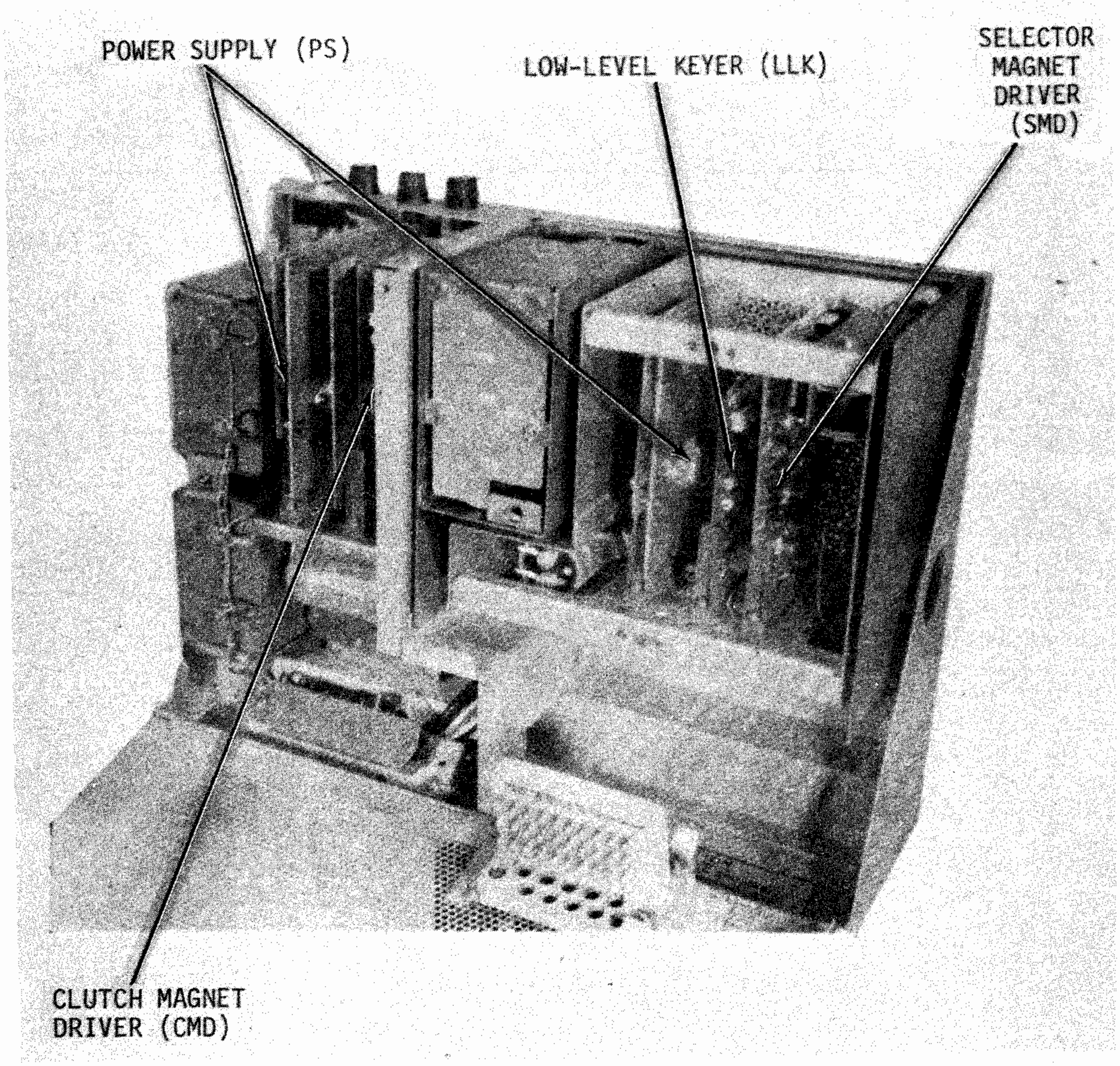


Figure 1-18. ESA - Circuit Cards Installed

Table 1-2. Reference Data

| Description: | |
|---|---|
| Nameplate data: | Model 28 CPP (KSR and RO) Teletypewriter Sets |
| Manufacturer: | Teletype Corporation |
| Weight: | |
| KSR: | 59 lbs. |
| RO: | 50 lbs. |
| Depth: | |
| KSR: | 16 inches |
| RO: | 12 inches |
| Width: (KSR and RO) | 16-1/2 inches |
| Height: (KSR and RO) | 10 inches |
| Functional Characteristics: | |
| Power requirements: | |
| 50-Hertz Synchronous Motor | |
| Input Voltage | 115 VAC; Single-Phase |
| Input Current - | |
| Starting | 9 amps |
| Running | 2.4 amps |
| Power Output | 1/20 HP @ 3000 RPM |
| Power Consumption | 107 Watts |
| Heat Dissipation | 70 Watts |
| Protection | Thermal Cutout |
| 60-Hertz Synchronous Motor | |
| Input Voltage | 115 VAC; Single-Phase |
| Input Current - | |
| Starting | 9 amps |
| Running | 1.9 amps |
| Power Output | 1/20 HP @ 3600 RPM |
| Power Consumption | 65 Watts |
| Heat Dissipation | 50 Watts |
| Protection | Thermal Cutout |

Table 1-2. Reference Data - Continued

| | |
|---|---|
| **Operating Speeds:** | |
| Unit Code; | 7.00 |
| Baud (bits per second); | 45.5, 50.0, 75.0 |
| Words per minute (wpm) | 65.0, 71.4, 107 |
| Unit Code; | 7.42 (60 Hz motor) |
| Baud (bits per second); | 45.5 50.0 74.2 |
| Words per minute (wpm); | 61.3 67.4 100 |
| Unit Code; | 7.42 (50 Hz motor) |
| Baud (bits per second); | 45.5, 50.0, 74.2 |
| Words per minute (wpm) | 61.3 67.4 100 |
| **Signal line requirements:** | 0.020 - 0.060 amps |
| **ESA 0.5 Amp Power Supply** | |
| Input | 100 to 130 VAC, 45 to 66 Hz. Nominal Power: 55 watts at 115 VAC for 25 watts output. |
| Output | (a) +47 to +53 VDC at 0.5 amp max<br>(b) +6.6 to +7.8 VDC at 0.018 amp max<br>(c) -6.6 to -7.8 VDC at 0.018 amp max |
| Operating Temperature | +40° to +100°F with cooling fan in cabinet |
| Fusing | (a) ac-0.8 amp slow-blowing (TP162360)<br>(b) dc-0.5 amp fast-blowing (TP131807) |

Table 1-3. Equipment Matrix - Model 28 Compact Page Printer (CPP) Teletypewriter Sets - High-Level

| | | COVER | | KBD/BASE | | | TYPING UNIT | | | | MOTOR | | GEARS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NAVY DESIGNATION | | | | | | | | | | | | | | | | | | |
| | MANUFACTURERS DESIGNATION | LPC400BR (KSR) | LPC401BR (RO) | LLK2CRL (KBD) | LLK2CRM (KBD) | LLB (RO) | LP111RE/ AJF | LP111RN/ AJG | LP111RN/ AY | LP111WY/ AJG | LMU37 (60 Hz) | LMU51 (50 Hz) | 145365 (60 Hz MTR) | 145366 (60 Hz MTR) | 304668 (50 Hz MTR) | 304669 (50 Hz MTR) | 198576 (DISTRIBUTOR) | 198580 (DISTRIBUTOR) | |
| | WIRING AND SCHEMATIC DIAGRAMS / EQUIPMENT | FIG. 5-3 | FIG. 5-3 | FIG. 5-4 | FIG. 5-4 | | FIG. 5-6 | FIG. 5-6 | FIG. 5-6 | FIG. 5-6 | FIG. 5-7 | FIG. 5-7 | | | | | | | (CONFIGURATION IDENTIFICATION) |
| KSR | AN/UGC-20 | X | | X | | | | | X | | X | | X | X | | | X | X | (VSL500BR) |
| KSR | AN/UGC-20A | X | | X | | | | X | | | X | | X | X | | | X | X | (VSL529BR) |
| KSR | AN/UGC-20X | X | | X | | | | | X | | | X | | | X | X | X | X | (BSL510BR) |
| KSR | AN/UGC-43(WX) | X | | | X | | X | | | | X | | X | X | | | X | X | |
| RO | AN/UGC-25 | | X | | | X | | | X | | X | | X | X | | | | | (VSL501BR) |
| RO | AN/UGC-25A | | X | | | X | | | | X | X | | X | X | | | | | (VSL530BR) |
| RO | AN/UGC-25AX | | X | | | X | | | | X | | X | | | X | X | | | (VSL509BR) |
| RO | AN/UGC-25X | | X | | | X | | | X | | | X | | | X | X | | | |
| RO | AN/UGR-4(WX) | | X | | | X | X | | | | X | | X | X | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |

Table 1-4. Equipment Matrix - Model 28 Compact Page Printer (CPP) Teletypewriter Sets - Low-Level

| | NAVY DESIGNATION | | COVER | | ESA/CIRCUIT CARD | | | | | | | KBD/BASE | | | TYPING UNIT | | | | MOTOR | | GEARS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MANUFACTURERS DESIGNATION | WDP | LPC403BR (KSR) | LPC402BR (RO) | 323120 (KSR) | 323121 (KSR) | 321231 (RO) | 321290 (PS) | 323810 (SMD) | 333069 (CMD) | 323130 (LLK) | LLK4 (CRM) (KBD) | LLK4(CRS) (KBD) | LLB5(BR) (RO) | LP139RE/ AJF | LP139WY/ AJG | LP156RE/ AJG | LP156WY/ AJG | LMU 37 (60 Hz) | LMU 51 (50 Hz) | 145365 60 Hz MTR | 145366 60 Hz MTR | 304668 50 Hz MTR | 304669 (50 Hz MTR) | 198576 (DISTRIBUTOR) | 198580 (DISTRIBUTOR) | |
| | WIRING AND SCHEMATIC DIAGRAMS / EQUIPMENT | | FIG. 5-12 | FIG. 5-11 | FIG. 5-19 5-20 | FIG. 5-23 5-24 | FIG. 5-13 5-14 | FIG. 5-15 5-16 | FIG. 5-17 5-18 | FIG. 5-21 5-22 | FIG. 5-25 | | | FIG. 5-26 | FIG. 5-27 | FIG. 5-27 | FIG. 5-29 | FIG. 5-29 | FIG. 5-7 | FIG. 5-7 | | | | | | | (CONFIGURATION IDENTIFICATION) |
| KSR | AN/UGC-77 | 0123 | X | | X | X | | X | X | X | X | | X | | | | | X | X | | X | X | | | X | X | (28RFH8001A/003/AAA/BR) 8728WD-A(4), 8719WD-S(a) |
| KSR | AN/UGC-91(WX) | 0123 | X | | X | X | | X | X | X | X | X | | | | | X | | X | | X | X | | | X | X | (28RFH8001A/001/AAA/BR) 8728WD-A(4), 8719WD-S(a) |
| RO | AN/UGR-9 | 0029 | | X | | | X | X | X | | | | | X | | X | | | X | | X | X | | | | | (28RFH8000B/003/AAA/BR) |
| RO | AN/UGR-9X | 0029 | | X | | | X | X | X | | | | | X | | X | | | | X | | | X | X | | | (28RFH8000B/003/AAA/BR) |
| RO | AN-UGR-16(WX) | 0029 | | X | | | X | X | X | | | | | X | X | | | | X | | X | X | | | | | (28RFH8001B/001/AAA/BR) |

Table 1-5. Equipment Required But Not Supplied

| Category | Recommended Equipment | Alternate | Equipment Test Parameters | Application |
|---|---|---|---|---|
| Telegraph Signal Generator | Test Set, Telegraph AN/UGM-8B(V). | Equivalent | Provides controlled signals, both distorted and undistorted, at all commonly used transmission speeds and code formats. Refer to NAVSHIPS 0967-378-4010 | Maintenance, Trouble-shooting |
| Telegraph Signal Analyzer | Test Set, Telegraph TS-2616/UGC | Equivalent | Measures timing distortion in start/stop and synchronous data telegraph signals. Refer to NAVSHIPS 0969-125-8010. | Maintenance, Trouble-shooting |
| Volt-ohm-millia-meter | Multimeter AN/USM-311 | Equivalent | AC voltage - 115, 5.6<br>DC voltages - 120, 6.0<br>Direct Current - 60 mA<br>Resistance - Continuity measurements | Maintenance, Trouble-shooting |
| Tools | Teletype Repair Kit TK-188/U | Equivalent | | Maintenance, Repair |

# CHAPTER 2
# OPERATION

2-1. INTRODUCTION. This chapter describes the operation of Model 28 CPP KSR and RO teletypewriter sets from a maintenance standpoint. Operation of a CPP teletypewriter set when installed as part of a system is covered in the appropriate system manual.

2-2. CONTROLS AND INDICATORS. CPP KSR and RO teletypewriter set controls and indicators are shown in figure 2-1 and briefly described in table 2-1. Controls applicable to both KSR and RO are indicated. All others apply to KSR only.

2-3. OPERATING PROCEDURES. Procedures for operating the CPP KSR and RO sets are provided in table 2-2. If abnormal indications are encountered, refer to Chapter 5 for troubleshooting information.

NOTE

If set is a low-level configuration, the proper switch on the associated electrical service assembly (ESA) must be operated to the appropriate position for turn-on and turn-off.

2-4. OPERATOR MAINTENANCE. Operator maintenance is limited to replacing paper and installing a new ribbon.

a. Installing Paper. To insert paper, proceed as follows:

(1) Insert spindle (supplied with typing unit) in a roll of paper.

(2) Mount spindle in spindle retainers so that paper unwinds from underneath.

(3) Route paper over straightener shaft, under platen, between paper fingers, and through opening between window door and dome.

b. Installing Ribbon. To thread ribbon, proceed as follows:

(1) Refer to figure 2-2.

(2) Remove both spools from ribbon spool shafts.

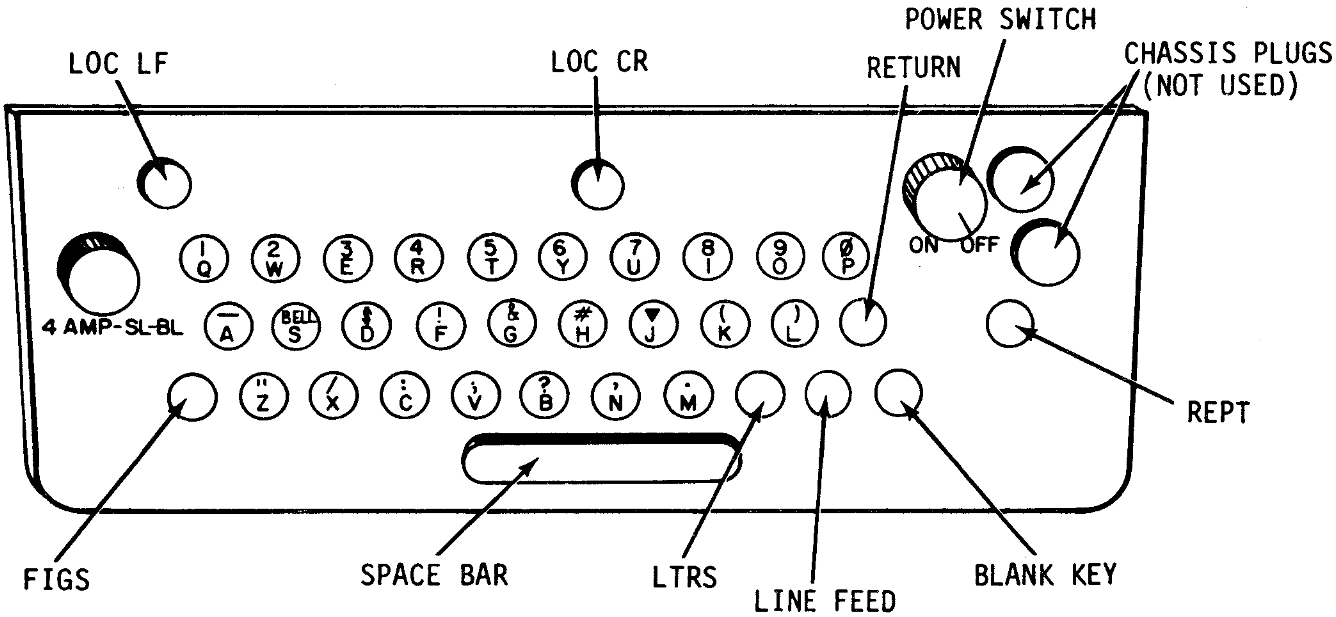
(3) Engage hook, on end of new ribbon, in hub of new spool.

(4) Wind a few turns of ribbon onto empty spool in same direction it comes off full spool.

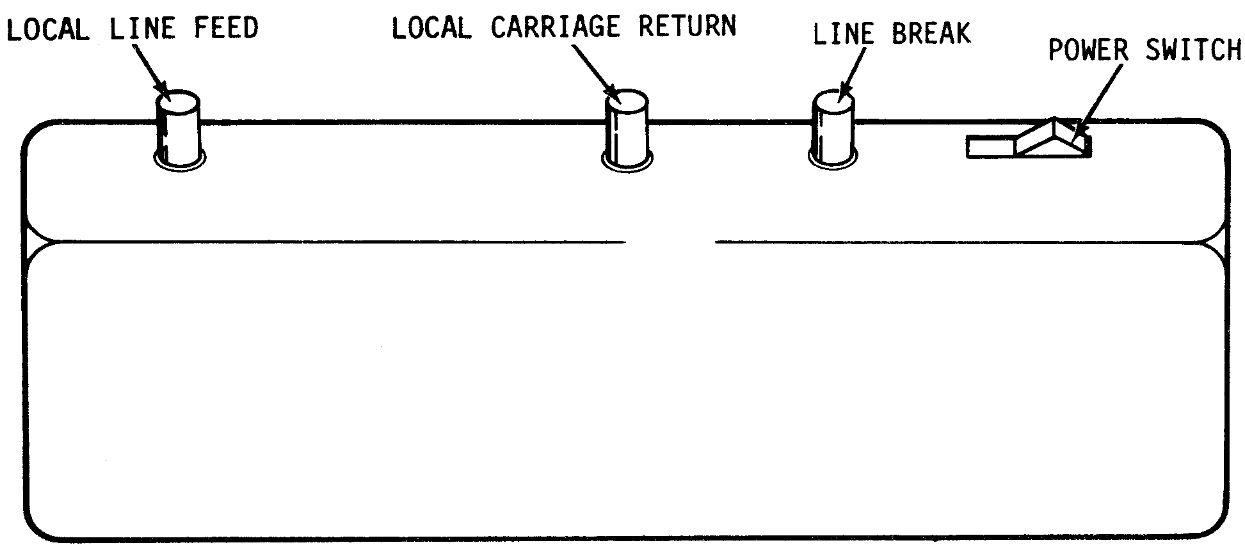
(5) Ensure that reversing eyelet has been wound up on empty spool.

(6) Place spools on spool shafts so that ribbon on right spool unwinds from right side and ribbon on left spool unwinds from left side without twisting.

(7) Thread ribbon around and through reverse lever slots.




KSR KEYBOARD




RO CONTROL HOOD

Figure 2-1. CPP (KSR and RO) Controls and Indicators

Table 2-1. Control and Indicator Functions

| Control/Indicator | Function |
|---|---|
| 4AMP-SL-BL fuse | Provides electrical circuit overload protection. |
| ON/OFF Switch (KSR and RO) | Applies primary ac power to motor unit and margin indicator circuit. Refer to paragraph 3-4 for additional power distribution information. |
| Function keys | When pressed, manually sets code bar mechanism to signal code combination for function selected. Signal code combination is photoelectrically distributed to signal line. Signal code is transmitted to local typing unit, for monitoring, and to remote typing unit. Signal code combination, received by typing units, activates mechanism corresponding to function selected. |
| FIGS key | Selects figures signal code combination. Figures shift function initiated at typing units. Results in positioning of type box, through related mechanisms, for printing of figures. |
| LTRS key | Selects letters signal code combination. Letters shift function initiated at typing units. Results in positioning of type box, through related mechanisms, for printing of letters. |
| RETURN key | Selects carriage return signal code combination. Carriage return function initiated at typing units. Results in returning printing type box carriage, through related mechanisms, toward left side of typing unit. |
| LINE FEED key | Selects line feed signal code combination. Line feed function initiated at typing units. Results in advancing platen, through related mechanisms, either one line or two lines depending on position of single-double line feed lever. |
| Local function keys (KSR and RO) | Linked directly to typing unit. Mechanically initiates functions normally initiated by signal code combination. |

Table 2-1. Control and Indicator Functions - Continued

| Control/Indicator | Function |
|---|---|
| LOC LF key | When pressed, operates line feed mechanism with same results as described for LINE FEED key. |
| LOC CR key | When pressed, operates carriage return mechanism with same results as described for RETURN key. |
| Character keys | When pressed, manually sets code bar mechanism to code combination for character selected. Signal code combination is photoelectrically distributed to signal line. Signal code is transmitted to local typing unit, for monitoring, and to remote typing unit. Signal code combination, received by typing units, activates printing mechanism to print letter or figure character selected, depending on which shift function has been previously selected. |
| REPT key | When pressed, together with any other key (except local function keys), causes repeated transmission of function or character selected. |
| Space Bar | Manually sets code bar mechanism to space signal code combination. Signal code combination received by typing unit activates spacing mechanism. |
| Margin indicator | Illuminates when typing unit carriage reaches preset end of line and activates margin indicator switch on base. |
| BAUD-45.5-50-74.2 selector switch | Selects operating speed of teletypewriter set. Manually operates gear shift assembly. |
| Break (blank) key (KSR and RO) | When pressed, interrupts signal line causing typing units to run "open." |

Table 2-2. KSR Operating Procedures

| Step | Action | Normal Indication |
|---|---|---|
| | 1. Turn-On. To turn on teletypewriter set, proceed as follows: | |
| *a. | Ensure primary power cord is plugged in to ac outlet. | Copy light photoelectric lamps are illuminated. |
| *b. | Rotate ON/OFF switch to ON position. | Motor starts running. |
| | 2. Operating Tests. Check for proper operation of teletypewriter set as follows: | |
| *a. | Press LOC CR key. | Type box carriage returns to left margin. |
| | NOTE<br>In following step, paper should advance approximately three times faster than when LINE FEED key is pressed repeatedly. | |
| *b. | Press LOC LF key. | Paper advances and continues to advance as long as LOC LF key is held pressed. |
| c. | Press LTRS key and type several lines of test sentence "The quick brown fox jumps over the lazy dog." | Printing is accurate; spaced equally horizontally; vertically positioned evenly. Margin indicator operates properly. |
| d. | Press FIGS key and type. | Figures characters are printed. |
| e. | Press BELL(S) key repeatedly. | Bell rings clearly on single or repeated operations of BELL key. |

*Applies to both KSR and RO.

Table 2-2. KSR Operating Procedures - Continued

| Step | Action | Normal Indication |
|---|---|---|
| f. | Press LTRS key and type test sentence again. | Letters characters are printed. |
| g. | Press REPT key along with any other key (except local function keys). | Character prints or function occurs, repetitively. |
| h. | Press RETURN function key. | Type box carriage returns to left margin. |
| i. | Press LINE FEED key. | Paper advances one or two lines depending on position of single-double line feed lever (located inside). |
| | 3. Turn off the teletypewriter set, proceed as follows: | |
| *a. | Press LOC CR and LOC LF keys. | |
| *b. | Rotate ON/OFF switch to OFF. | Motor stops running. |
| | NOTE<br>If set is to be secured for any length of time, unplug power cord or set primary power circuit breaker to off position. | |

*Applies to both KSR and RO.

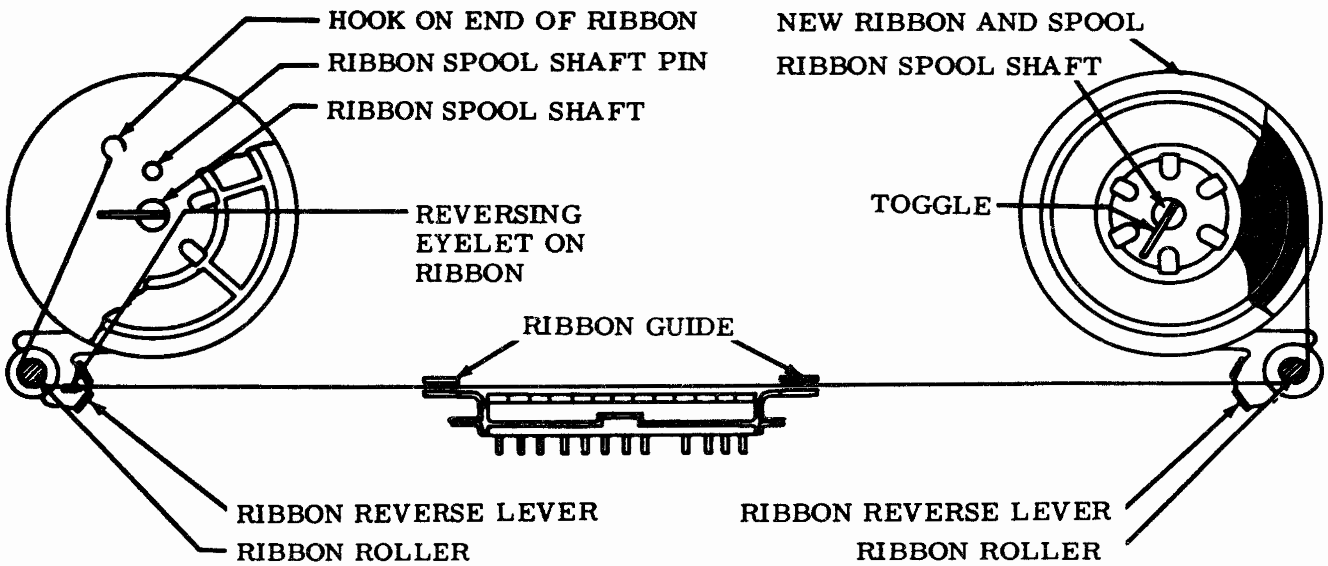



Figure 2-2. Path of Ribbon

# CHAPTER 3
# FUNCTIONAL DESCRIPTION

3-1. INTRODUCTION. This chapter provides a functional description of Model 28 Compact Page Printer (CPP) KSR and RO Teletypewriter Sets presented in a three-level format. The first level discussion is a brief overall functional description based on a simplified block diagram. The second-level discussion is a detailed functional description supported by a pictorial functional diagram. The third-level discussion provides detailed descriptions of the operation of mechanical assemblies.

3-2. OVERALL FUNCTIONAL DESCRIPTION. High-level CPPs are discussed in paragraph 3-2.1, and low-level CPPs are discussed in paragraph 3-2.2.

3-2.1 OVERALL FUNCTIONAL DESCRIPTION (HIGH-LEVEL). Figure 3-1 shows significant electrical signal and mechanical energy paths between units of high-level CPP teletypewriter sets. Units common to both KSR and RO and units peculiar to KSR only or RO only are indicated. Keyboard unit functions are not applicable to the RO. Primary power (115 VAC, 60 Hz) is supplied directly to the primary of a step-down transformer mounted in the cover unit and is also supplied, through the power switch, to the motor unit. The 5.6-volt ac output of the transformer is used to supply power to the copy lights. The motor unit drives mechanisms in the typing unit and the distributor (KSR only) through the gear shift assembly which determines the speed of a main shaft. Speed of operation is controlled by the speed selector switch, mechanically linked to the gear shift assembly. Local line feed (LOC LF) and local carriage return (LOC CR) function keys on the keyboard (KSR) or control hood (RO) are mechanically linked to the typing unit and initiate their respective functions when pressed. Character or function keys on the keyboard are mechanically linked to a code bar mechanism in the keyboard transmitter. The mechanical signal code on the codebar mechanism is converted to a parallel, 5-bit electrical signal code by code-level contacts in the keyboard transmitter. The distributor serializes the 5-bit signal code which is used to key an external dc loop current power supply to generate mark/space signals. The mark/space signal code (0.060 amperes mark and 0 amperes space) is applied to selector magnets in the local typing unit and sent out on the signal line to a remote typing unit. The typing units print the character or perform the function previously selected at the keyboard (KSR) or determined by the received signal code (RO).

3-2.2 OVERALL FUNCTIONAL DESCRIPTION (LOW-LEVEL). Figure 3-2 shows significant electrical signal and mechanical energy paths between units of low-level CPP teletypewriter sets. Units common to both KSR and RO and units peculiar to KSR only or RO only are indicated. Keyboard unit functions are not applicable to the RO. Primary power (115 VAC, 60 Hz) is supplied directly to the primary of a step-down transformer mounted in the cover unit (RO

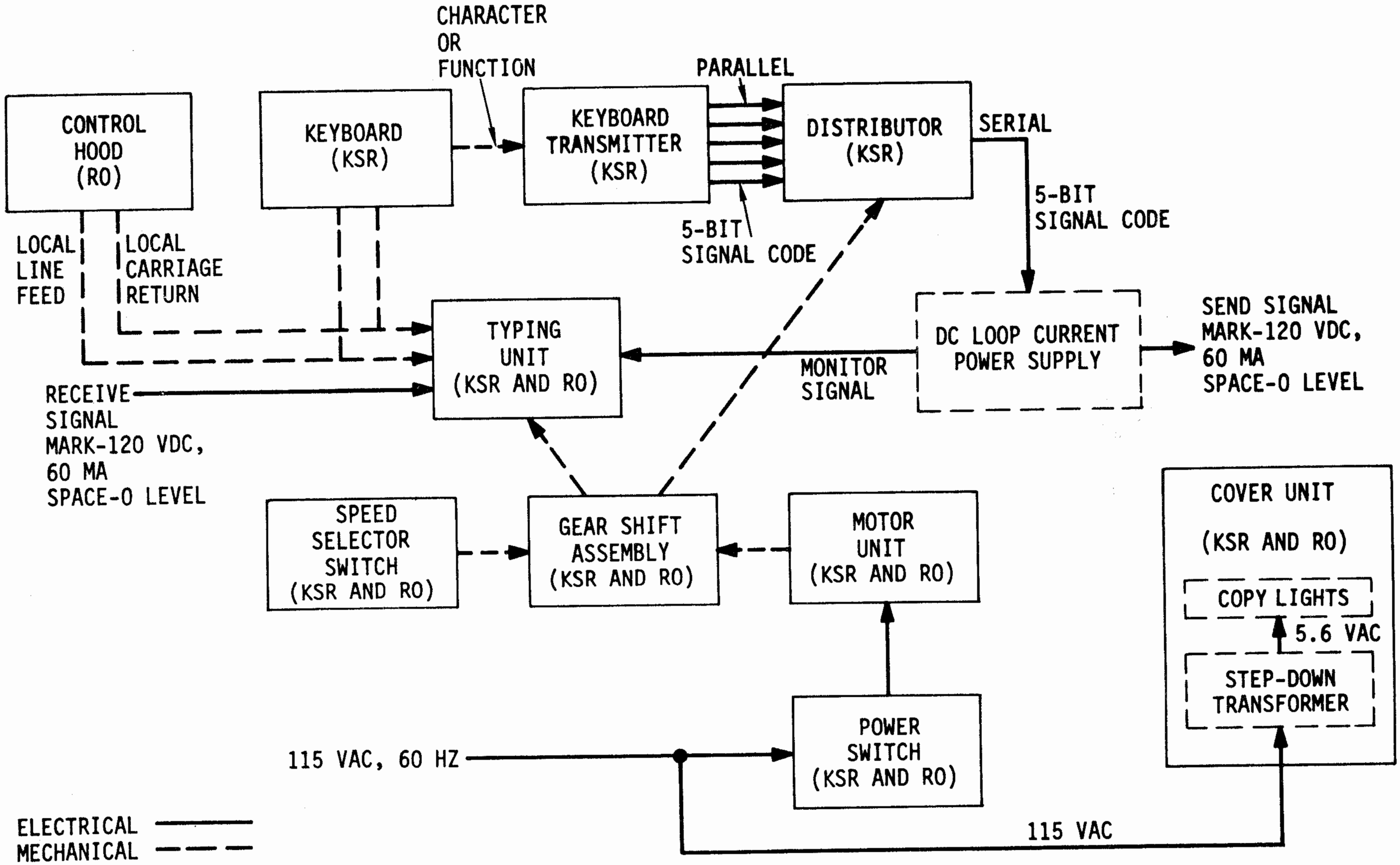



Figure 3-1. CPP (KSR and RO) Overall Functional Block Diagram (High-Level)

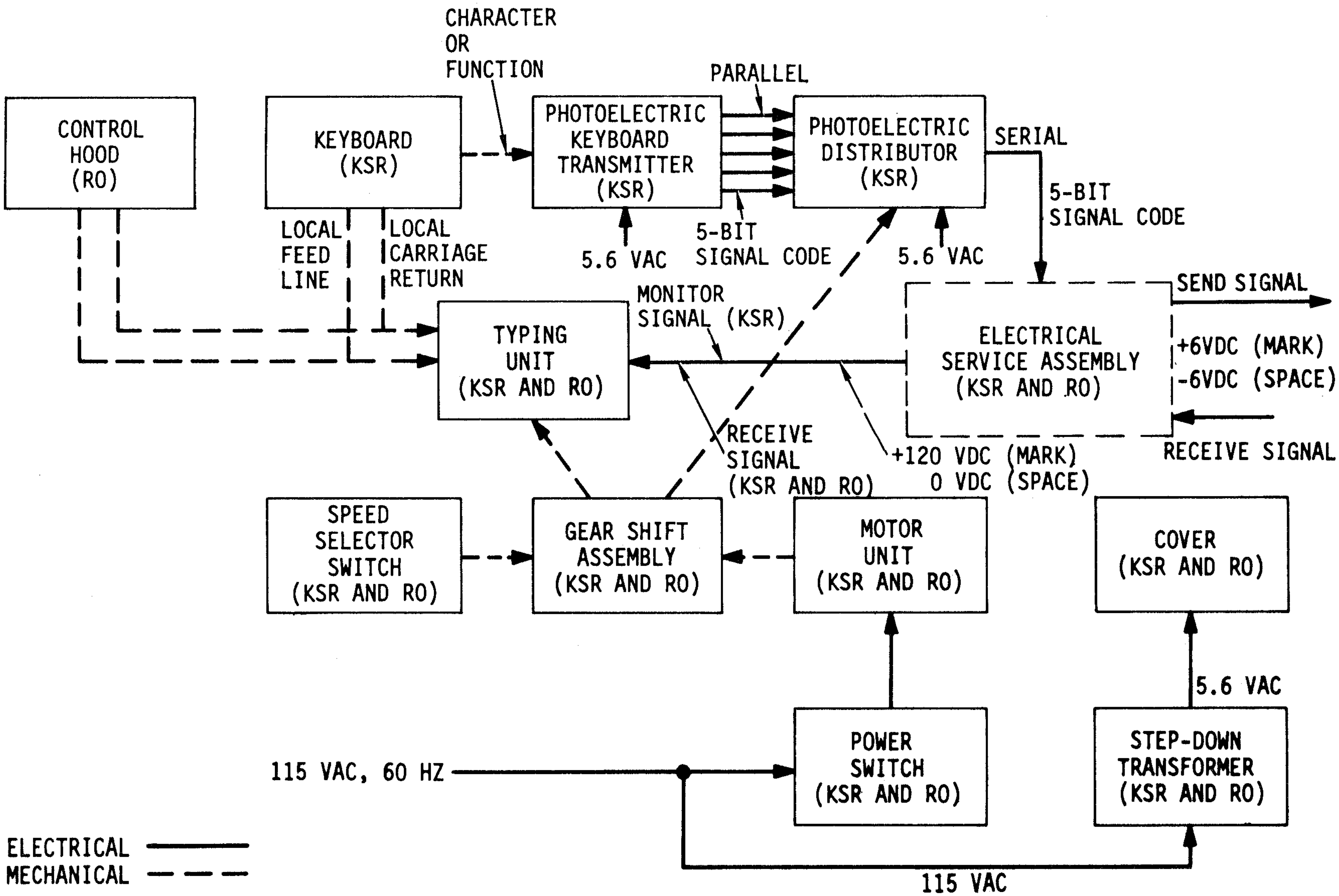



Figure 3-2. CPP (KSR and RO) Overall Functional Block Diagram (Low-Level)

only) and is also supplied, through the power switch, to the motor unit. In the low-level KSR set, the step-down transformer is mounted on the typing unit. The 5.6-volt ac output of the transformer is routed to the cover to supply power to the copy lights. The 5.6-volt ac is also used to supply the lamp assemblies in the photoelectric keyboard transmitter and distributor. The motor unit drives mechanisms in the typing unit and the photoelectric distributor (KSR only) through the gear shift assembly which determines the speed of a main shaft. Speed of operation is controlled by the speed selector switch, mechanically linked to the gear shift assembly. Local line feed (LOC LF) and local carriage return (LOC CR) function keys on the keyboard (KSR) and control hood (RO) are mechanically linked to the typing unit and initiate their respective functions when pressed. Character or function keys on the keyboard are mechanically linked to a code bar mechanism in the photoelectric keyboard transmitter. The mechanical signal code on the code bar mechanism is converted to a parallel, 5-bit electrical signal code by the photoelectric assembly in the keyboard transmitter. The photoelectric distributor serializes the 5-bit signal code which is applied to the input of the electrical service assembly (ESA). Circuit cards in the ESA develop the ±6-vdc send signal and the 0.060/0.0 ampere monitor signal applied to the selector magnets in the typing unit. The ±6-volt receive signal is converted in the ESA to the 0.060/0.0 ampere receive signal required to drive the selector magnet. The typing units print the character or perform the function previously selected at the keyboard (KSR) or determined by the received signal code (RO).

3-3. DETAILED FUNCTIONAL DESCRIPTION. As shown in figure 3-3, basic functions of the CPP telegraphic communications network, are the transmission (KSR only) and reception of telegraphic coded signals and printing of messages represented by the coded signals. The power distribution function supports both electrical and mechanical functions. Unless otherwise noted the following discussions apply to both high-level and low-level equipment.

a. Power Distribution. Distribution of electrical power is shown in the schematic diagrams provided in Chapter 5 Distribution of mechanical power is discussed in the following paragraphs.

(1) Motor Unit. Mechanical motion for driving the typing unit and distributor through the gear shift assembly is provided by a 1/20 horsepower, two-pole, single-phase, synchronous motor unit.

(2) Gear Shift Assembly. The three-speed gear shift assembly transfers rotational motion from the motor distributor mechanism and to the main shaft in the typing unit. The output speed of the gear shift assembly can be manually selected, by the speed selector switch, while the motor unit is in the idle or running condition.

(3) Main Shaft. Motive power for the main shaft is applied to the driven gear centrally located on the shaft. The main shaft rotates at the output speed of the gear shift

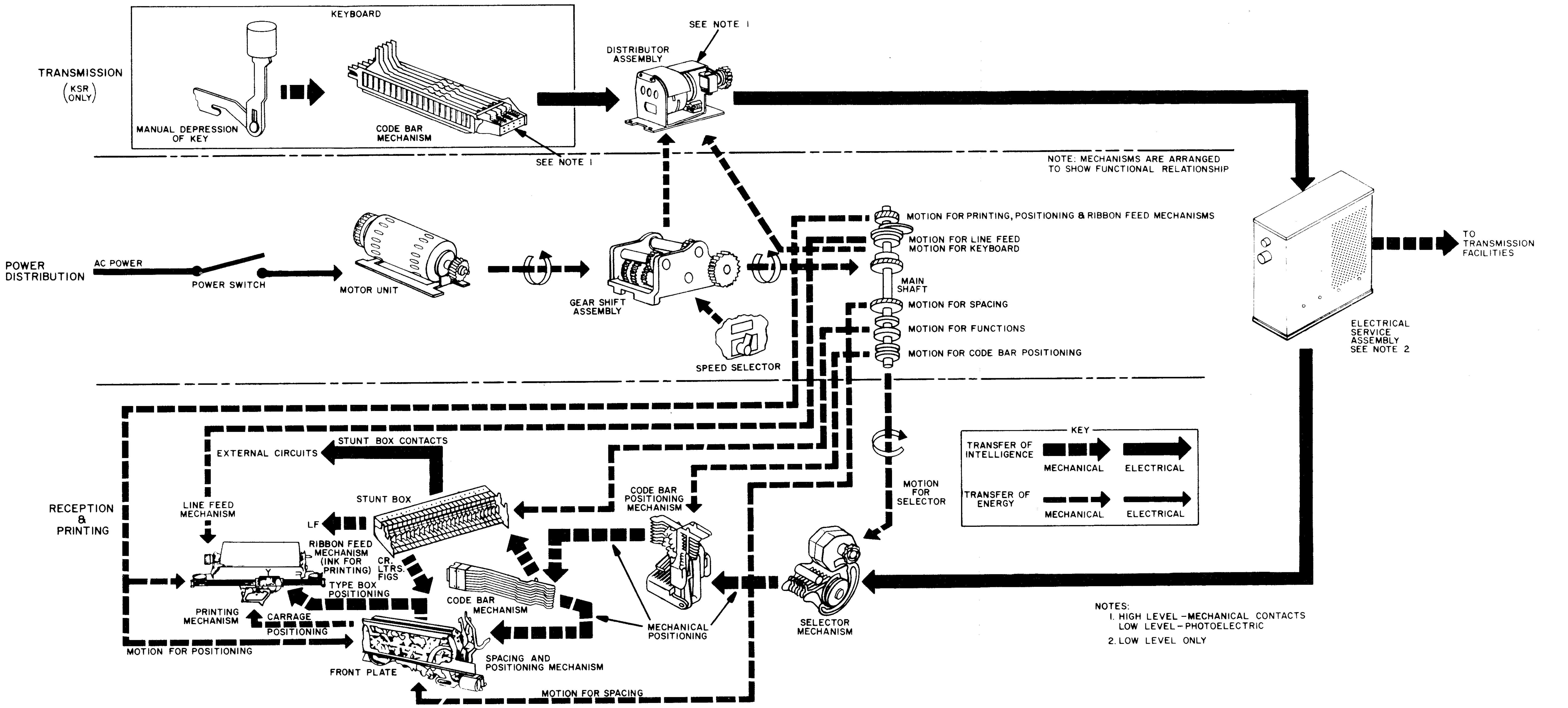



Figure 3-3. CPP Detailed Functional Diagram

assembly. Six all-steel internal expansion clutches convert the rotary motion of the main shaft to the linear mechanical requirements for operation of the teletypewriter set. The clutches rotate with the main shaft when engaged and do not rotate when disengaged (latched). From left to right in their installed position on the main shaft, the clutches control the type box, line feed, spacing, function, code bar, and selecting mechanism.

b. Transmission (KSR Only). The transmission function is accomplished by the keyboard unit.

(1) Keyboard Unit (High-Level). The keyboard unit consists of the keyboard transmitter and the distributor assembly. The keyboard transmitter provides a means for selecting a character or function, presetting local contacts, and initiating transmission. The selected character is then sequentially distributed on the signal line by the distributor assembly. A second character cannot be selected until the first character has been distributed. When a character or function key is pressed, a code combination is mechanically set up on the code bar mechanism. The code bar mechanism is mechanically linked to wire contacts. The wire contacts at the keyboard transmitter are electrically connected to their respective distributor contacts through parallel wires. When the wire contacts are positioned by depressing a keytop, the distributor magnet wire contact is also closed to energize the distributor clutch magnet. When the distributor clutch magnet is energized, the distributor clutch is tripped to engage its cam sleeve with the distributor main shaft. The rotating cam sleeve sequentially operates the code level contacts to extend signal line current to existing marking or spacing wire contacts at the keyboard transmitter. Additional cams on the distributor sleeve operate (1) a timing contact which opens the clutch magnet circuit and (2) a reset contact which operates a solenoid to reset the keyboard transmitter.

NOTE

The following discussion is applicable to low-level CPP sets with photoelectric keyboard units. Some low-level CPP equipments have contact assemblies with goldplated wire contacts, mounted in rfi enclosures, which function in the same manner as described above for high-level equipment.

(2) Keyboard Unit (Low-Level). The low-level keyboard unit consists of a photoelectric keyboard transmitter and a photoelectric distributor assembly. The keyboard transmitter provides a means for selecting a character or function, presetting photoelectric shutter window assemblies, and initiating transmission. The selected character is then sequentially distributed to an electrical service assembly by the distributor assembly. A second character cannot be selected until the first character has been distributed. When a character or function key is pressed, a code combination is mechanically set up on the code bar mechanism. The code bar mechanism is mechanically linked to shutter windows in the keyboard transmitter

photoelectric assembly. The photoelectric assembly forms the code combination into a parallel, 5-bit electrical signal which is photoelectrically converted in the distributor assembly to a serial, 5-bit electrical signal. The serial output of the distributor assembly is applied to the input of the electrical service assembly.

c. Reception and Printing. Reception and printing functions are accomplished by mechanisms in the typing unit. The basic function of the typing unit (figures 3-4 and 3-5) is to record in page printed form information received from a signal line in the form of a signaling code combination which represents characters or functions. Character representations, or graphics, are the alphabetic, numeral, or symbol intelligence equivalent of the input code combinations. Function representations are the coded equivalent of non-typing operations auxiliary to reception of the graphics, such as line feed, carriage return, or signal bell. The typing unit translates these electrical code combinations into mechanical motions which imprint the message or initiate the indicated function, such as line feed, carriage return, or signal bell. Printing is accomplished through an inked ribbon upon paper rolled around a horizontally stationary platen while the type and printing mechanism move from left to right across the page. All operations of the typing unit are performed automatically in response to input signal code combinations. A few local off-line functions such as line feed or carriage return may be initiated independently of the signal line from the local keyboard or base mechanism. The speed of operation of the equipment is usually given in operations per minute. Speed in words per minute is roughly one-sixth of the operations per minute. The typing unit is designed to operate at 60, 75, or 100 words per minute, depending on the gear ratio used on associated equipment. Rotary mechanical motion for its operation, and information in the form of the signaling code, come from external sources. A front plate and side plates provide mounting facilities for the various assemblies and mechanisms that make up the unit. Rotary motion from the gear shift assembly is applied to the main shaft, which turns constantly as long as the associated unit is under power. A signal applied to the selector magnets initiates operating sequences. The application of voltage to the stunt box and to various switches and controls is dependent upon external circuitry and associated equipment. With the main shaft under power (associated equipment main power supply on), the typing unit is described as running closed when a steady current (marking) condition is maintained in the signal line and no signal intelligence is received. It is described as running open when a no current (spacing) condition is maintained through an interruption in signal line current.

(1) Selecting Mechanism. A selecting mechanism translates the signaling code combinations into corresponding mechanical arrangements which control code bars in a code bar mechanism. It includes a two-coil magnet that connects in series with the

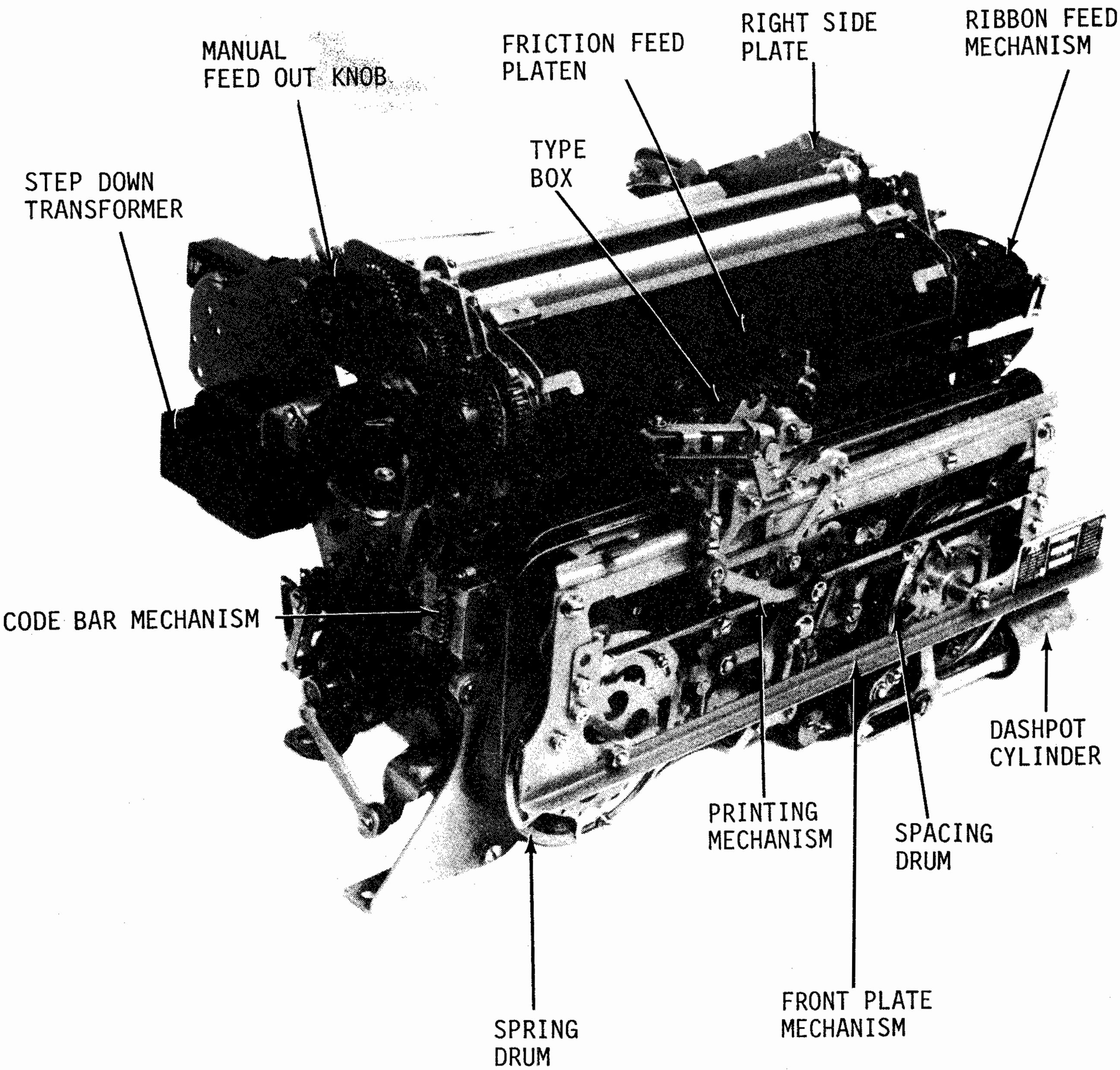



Figure 3-4. Typing Unit (Friction Feed) (Front View)

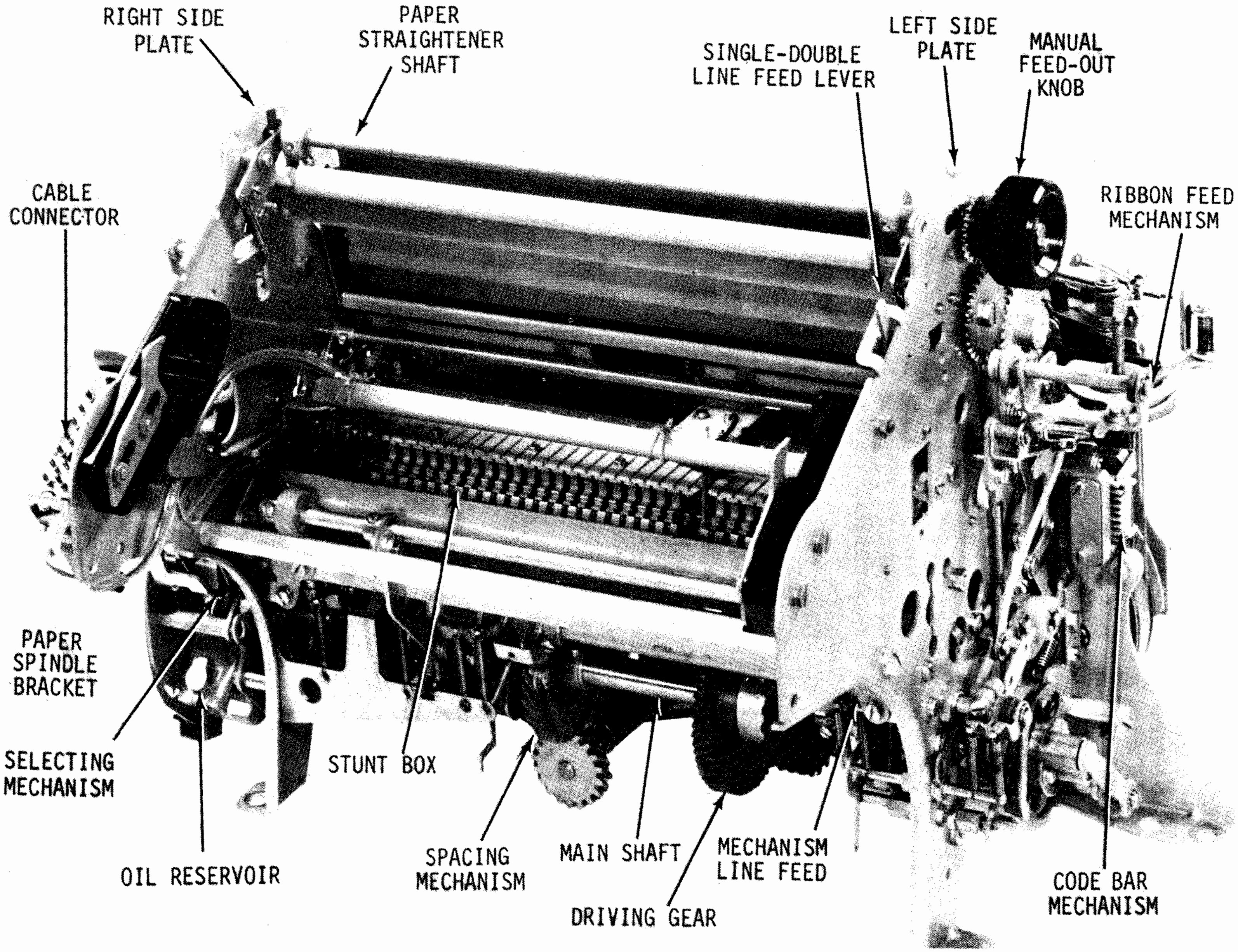



**Figure 3-5. Typing Unit (Left Rear View)**

external signal line. The coils may be wired in either series or parallel to accommodate 0.020 ampere or 0.060 ampere line currents. A range finder is used to refine the mechanical orientation of the selector to the signaling code. The signaling code combinations are applied to the selecting mechanism through a cable connector located just above the selector magnets. The start pulse (spacing) of each code combination permits the start lever to fall to the rear behind the magnet armature, and rotate to trip the selector cam clutch. The range finder mechanism permits adjustment of the angular relationship of the trip-off point to the optimum quality incoming line signal. The selector cam clutch, driven by the main shaft, converts the incoming signal into mechanical marking or spacing equivalents of each pulse in the signal code. A cam on the selector cam clutch engages the code bar clutch when a signal code combination has been translated and locked in a mechanical arrangement in the selecting mechanism.

(2) Code Bar Mechanism. The code bar mechanism, when positioned by the selecting mechanism to correspond to the input code intelligence, sets up mechanical requirements for type box positioning, printing, and stunt box operation. The code bar clutch initiates mechanical actions which position the code bars in patterns determined by the selecting mechanism (marking-left, spacing-right), and condition the typing unit for type box positioning, function selection, and printing. A cam operated by the code bar clutch operates the function clutch and type box clutch trip mechanisms.

(3) Printing Mechanism. When mechanically conditioned by the code bar mechanism, the printing mechanism prints the selected character, and spaces to the next printing area on the paper, or spaces without printing, or on units so equipped, tabulates horizontally, or returns the type box to the left hand printing margin. The mechanism includes the horizontal positioning mechanism operated by the code bars, spacing mechanisms and carriage return, and the print hammer mechanism. The code bar mechanism and the code bar clutch operate in combination to trip the type box clutch. When the type box clutch is tripped, it initiates mechanisms involved in vertical and horizontal positioning of the type box, ribbon feed, and printing. The main rocker shaft provides power from the type box clutch (and main shaft), and the code bars determine the specific application of that power required for each input signal code combination representing a graphic. A cam plate on the main rocker shaft trips the spacing clutch stop mechanism to engage the spacing clutch, except when spacing is suppressed. The type box, positioned by the printing and spacing mechanisms in accordance with intelligence set up in the code bars, presents a single graphic in printing position for each operating cycle. To prevent printing during a function selection, the type box is positioned to present a vacant type-pallet position. At the proper moment, with the type box locked in printing position, a spring loaded print hammer is released to tap the selected type pallet sharply against the

inked ribbon and the paper. A cleanly imprinted graphic character corresponding to the input signal code combination results, and the printing mechanism trips the spacing clutch to move both the type box and the print hammer to the next horizontal printing position to the right. The type box is capable of vertical and horizontal positioning in response to the permutations set up by the code bar mechanism. When positioned to correspond to the input code intelligence, the type box presents a single type pallet with the embossed graphic equivalent of the selected code for printing. Printing is accomplished when this pallet is struck by the print hammer to press an inked ribbon against the paper, which is supported by the typing unit platen.

(4) Spacing Mechanism. The spacing mechanism moves the type box and printing mechanism one character space to the right each time a graphic character is received and imprinted. A suppression mechanism prevents spacing on receipt of certain non-typing functions. The spacing clutch, when tripped by the cam plate on the printing mechanism main rocker shaft, advances the type box and printing hammer one character space to the right across the paper. Spacing suppression may be initiated by the function mechanism to permit execution of a non-typing function without interference with the page printed message by the carriage return mechanism or by the printing mechanism when the type box reaches the end of a printed line.

(5) Line Feed Mechanism. The line feed mechanism permits single or double line advance of paper in the platen mechanism when the code combination for this function is received. The function may also be initiated locally through mechanical linkage with the base or keyboard base. The line feed clutch operates mechanical linkages which advance the paper one or two spaces by rotating the platen. The function clutch controls the function bail and the stripper bail. The function reset bail permits transfer of intelligence from the code bars to the function mechanism and, upon receipt of a function code, operates the function linkage or switch or contact corresponding to the input signal code. The stripper bail resets selected function mechanisms. When the input signal calls for carriage return function, direct mechanical linkage between the stunt box and the spacing mechanism initiates this function. When the input signal calls for line feed, the function mechanism trips the line feed mechanism, engaging the line feed clutch.

(6) Stunt Box. A typical stunt box (figure 3-6) is a compact, self-contained device with memory storage capabilities that provide the typing unit with the facilities of a built-in sequence selector. In effect, it allows the 32 available letters and figures-character combinations to be used again for special, non-printing operations, without the sacrifice of printed characters. It operates in response to combinations set up in the code bar mechanism, with a single character or several characters in sequential combination used to initiate a single function. In general, the stunt box may be programmed to perform three basic types of operation: mechanical initiation of

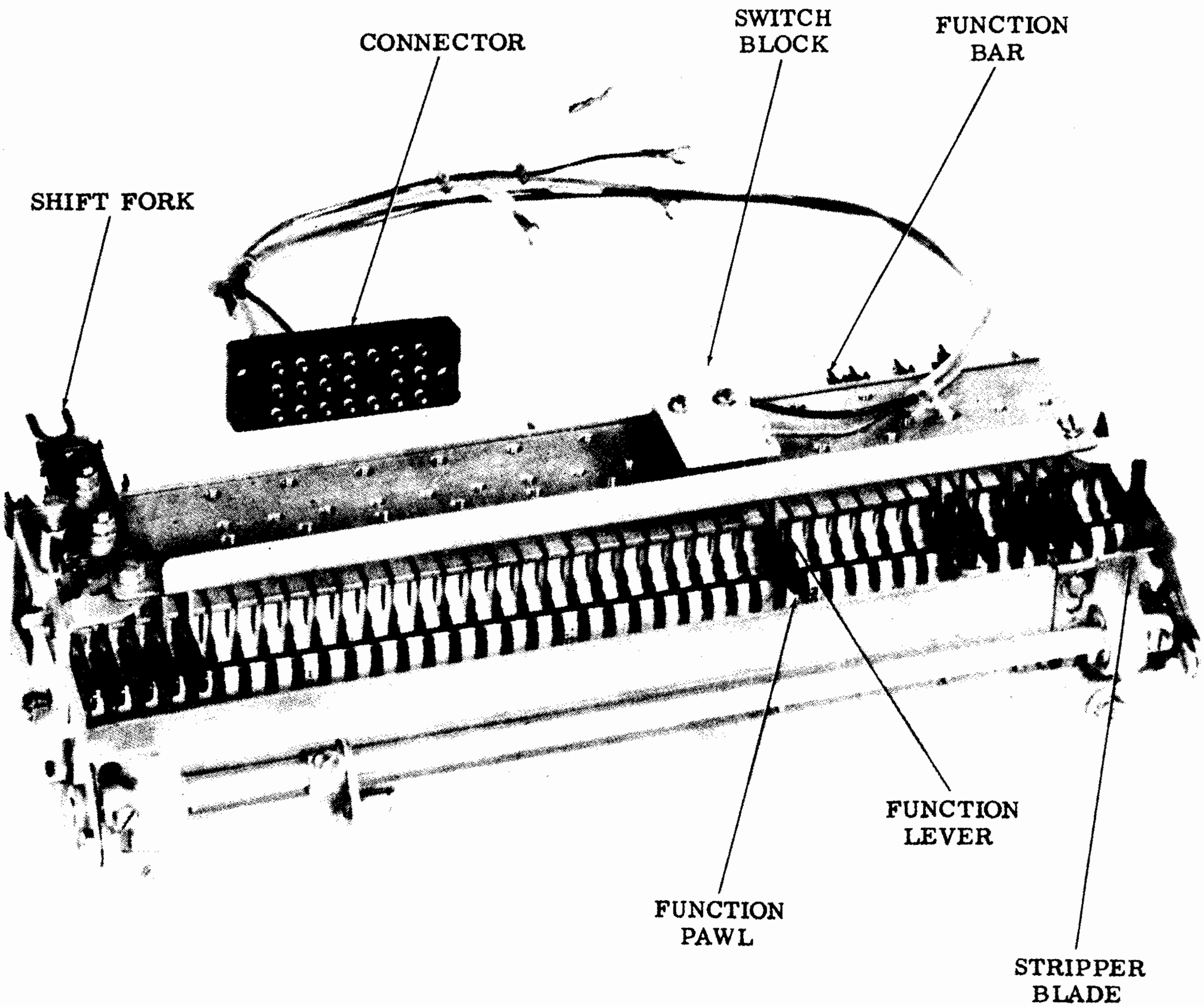


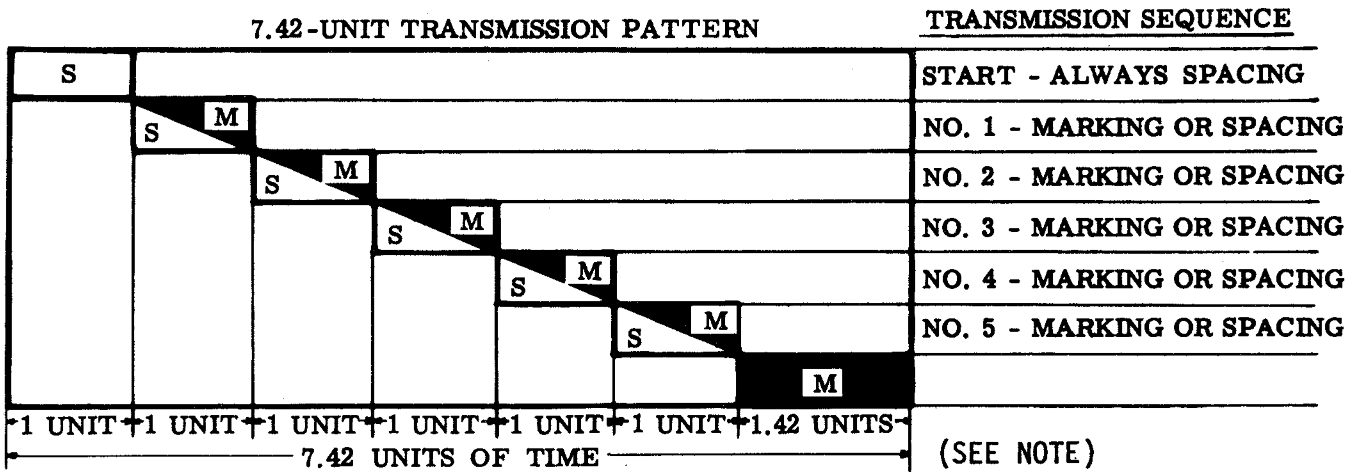

Figure 3-6. Typical Stunt Box

internal functions within the typing unit; electrical control of functions within the teletypewriter set; and electrical control of external equipment.

(7) <u>Ribbon Feed Mechanism</u>. A ribbon feed mechanism passes an inked fabric ribbon between the type box and the paper. The mechanism advances the ribbon horizontally when each character has been printed, and automatically reverses the direction of ribbon feed when one of the two ribbon spools has been emptied.

(8) <u>Paper Feed Mechanism</u>. The platen and paper feed mechanisms are located at the top of the printer, between the two side plates. A manual paper or form feed-out knob is located at the top of the left side plate. Paper is fed from a supply at the rear of the printer by friction feed.

(9) <u>Signaling Code</u>. Information is received by the typing unit in the form of a 7.0 or 7.42 unit start-stop signaling code (figure 3-7) in which each character (graphic) or function is represented by a sequential combination of current and no-current time intervals. Intervals during which current flows in the signal circuit are referred to as marking, and those in which no current flows are spacing. Every combination includes five pulses(also referred to as levels) that carry the intelligence, each of which may be either marking or spacing. To ensure synchronization between the transmitting and receiving equipment, a start pulse which is always spacing is added at the beginning of each combination of intelligence pulses, and a stop pulse which is always marking is added at the end. The code representation for the graphics R and Y are shown in figure 3-8. In these combinations, alternate marking and spacing conditions for the intelligence pulses are required. In different signaling codes used with 28 teletypewriter equipment, the length of the stop pulse may vary. For example, in the code shown in figure 3-7, the length of the stop pulse is 1.42 times the other pulses. Thus, the transmission of a graphic requires 7.42 units of time. It is therefore said to have a 7.42 unit transmission pattern. The stop pulse may be equal in duration to the other pulses in some applications, in which case the transmission code would have a 7.0 unit transmission pattern. The total number of permutations of a five-level (5 intelligence pulses) code is two to the fifth power, or 32. To accommodate more than 32 graphics, a letters-figures shift is designed into the typing unit. This is similar to the lower and upper case of a typewriter and permits each code combination, excluding the two used to shift the equipment, to represent two characters. A typical character arrangement is shown in figure 3-7. The black circles represent marking pulses, the blank squares spacing pulses. When the letters code combination (12345) is transmitted, it conditions all typing units connected to the circuit to print, at the receipt of all following code combinations, the characters in the letters (lower case) line on the chart. Similarly, when the figures code combination (12-45) is transmitted, it conditions the typing units to print the character or perform functions in the figure (upper case) line on the chart.




a.

| FIGURES | – | ? | : | $ | 3 | ! | & | # | 8 | ' | ( | ) | . | , | 9 | Ø | 1 | 4 | Δ | 5 | 7 | ; | 2 | / | 6 | " | ≀ | < | ≡ | ■ | ∨ | ∧ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LETTERS | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z | BLANK | C.R. | L.F. | SPACE | LTR. | FIG. |
| 1 | ● | ● | | ● | ● | ● | | | | ● | ● | | | | | | ● | | ● | | ● | | ● | ● | ● | ● | | | | | ● | ● |
| 2 | ● | | ● | | | | ● | | ● | ● | ● | ● | | | | ● | ● | ● | | | ● | ● | ● | | | | | | ● | | ● | ● |
| FEED HOLES | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| 3 | | | ● | | | ● | | ● | ● | | ● | | ● | ● | | ● | ● | | ● | | ● | ● | | ● | ● | | | | | ● | ● | |
| 4 | | ● | ● | ● | | ● | ● | | | ● | ● | | ● | ● | ● | | | ● | | | | ● | | ● | | | | ● | | | ● | ● |
| 5 | | ● | | | | | ● | ● | | | | ● | ● | | ● | ● | ● | | | ● | | ● | ● | ● | ● | ● | | | | | ● | ● |

(TYPICAL CHARACTER ARRANGEMENT) b.

NOTE: FOR 7.0 UNIT CODE, ALL UNITS OF TIME ARE EQUAL

Figure 3-7. Signaling Code

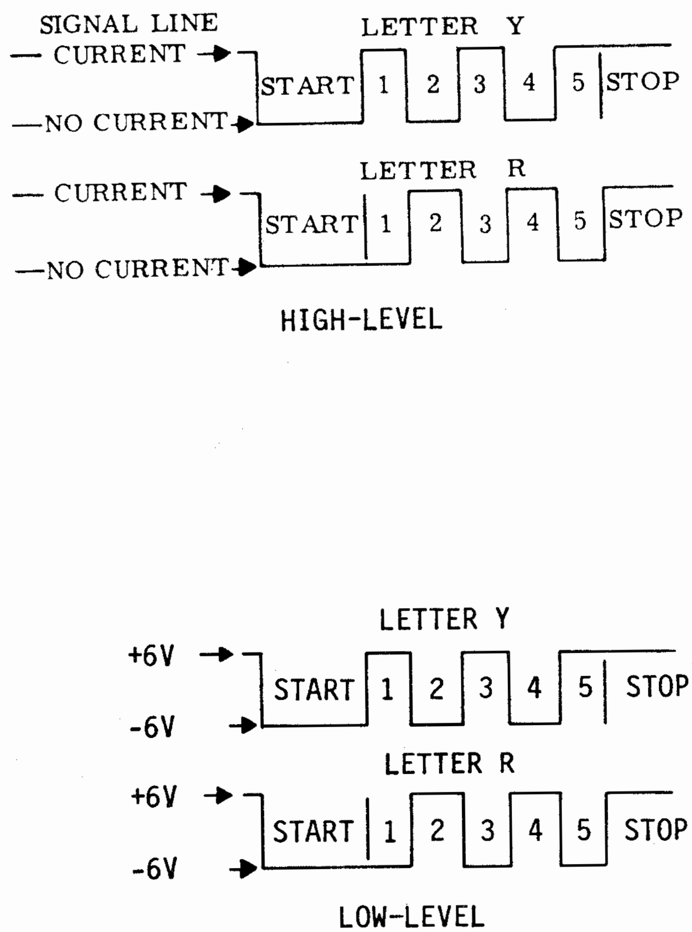



Figure 3-8. Code Representation of Letters R and Y

3-4. ELECTRICAL CIRCUITS. Electrical circuit information is provided for high-level and low-level CPP equipment in paragraphs 3-4.1 and 3-4.2, respectively.

3-4.1 ELECTRICAL CIRCUITS (HIGH-LEVEL). High-level CPP schematics and wiring diagrams are provided in figures 5-1 through 5-7.

3-4.2 ELECTRICAL CIRCUITS (LOW-LEVEL). Low-level CPP schematics and wiring diagrams are provided in figures 5-8 through 5-29. Electrical Service Assemblies (ESAs) used in conjunction with low-level CPP equipment are discussed in paragraph 3-4.3.

3-4.3. ELECTRICAL SERVICE ASSEMBLIES. The following paragraphs present technical descriptions and theory of operation for ESAs used with CPP low-level teletypewriter equipment. As noted in Chapter 1, the ESAs are metal shielded containers which vary in configuration for different applications. They are used as a housing for electronic components which serve to suppress radio frequency interference and provide low-level transmission of telegraph signals. Figure 3-9 shows a typical CPP ESA. The ESA low-level radio-frequency components are used in conjunction with shielded cabling to form a complete shielded electrical system for rfi suppression. CPP electrical service assemblies differ from one another primarily because of the number of circuit board connectors provided for the associated keyers and drivers. Table 1-1 of Chapter 1 lists the three ESAs used with low-level CPP sets and identifies the circuit cards contained in each. As noted in the table, the following circuit cards are used:

PS - Power Supply
CMD - Clutch Magnet Driver
LLK - Low-Level Keyer
SMD - Selector Magnet Driver

ESAs 323120 and 323121 are used in CPP KSR sets. Figures 5-19 and 5-20 in Chapter 5 are the wiring and schematic diagrams, respectively, of ESA 323120, which houses the KSR CMD circuit cards and is single shielded. Figures 5-23 and 5-24 of Chapter 5 are the wiring and schematic diagrams, respectively, of ESA 323121, which houses the KSR SMD and LLK circuit cards and is double shielded. ESA 321231 (figure 3-9) is used in CPP RO sets to house the SMD circiut card and is double shielded. Wiring and schematic diagrams for ESA 321231 are shown in figures 5-13 and 5-14, respectively, of Chapter 5. Figures 3-10 and 3-11, respectively, show typical parts of single and double-shielded ESAs. ESA single and double shielding is discussed in paragraph 1-3.2g of Chapter 1. All CPP ESA's contain the same 321290 power supply circuit board assembly with the 321130 power supply circuit card. A typical ESA, showing circuit card connectors, is shown in figure 3-12.

a. <u>ESA Power Supply Circuits</u>. CPP ESA power supply circuits utilize the TP321290 0.5 ampere power supply shown in figure 3-13. When installed in a shielded ESA containing the proper transformer and filter assembly, this power supply is intended as the radio frequency interference suppression power source in CPP systems requiring low-level rfi.

(1) <u>Technical Description</u>. An assembly

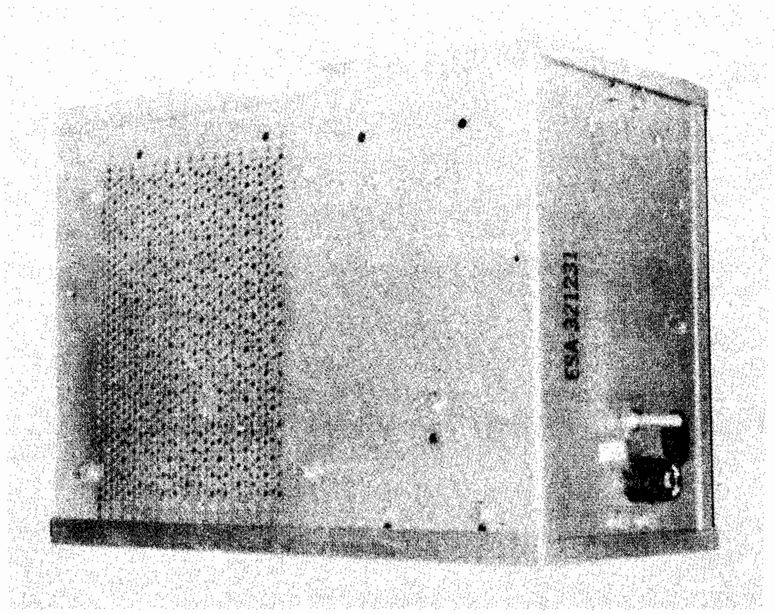



Figure 3-9. ESA for Table Mounting - Double Box Construction

drawing of the TP321290 power supply assembly and a schematic diagram of its associated 321130 circuit board assembly, respectively, are shown in figures 5-15 and 5-16 of Chapter 5.

(a) The power supply is plugged into the 15-pin TP148458 connector in the ESA that has a TP198650 polarizing key between pins M and N. Refer to table 1-1 of Chapter 1 for information regarding the applicable power supply card to be used with the particular set and to the wiring diagram package for the applicable wiring diagrams. See also the applicable ESA wiring and schematic diagrams (figures 5-13, 5-14, 5-19, 5-20, 5-23, 5-24) in Chapter 5.

(b) The transformer and filter circuits for the power supplies are located in part of their associated ESAs. The power transistor and heat sink are included as part of the TP321290 circuit card assembly.

(c) The ESAs are normally wired so that one 250 ohms (25 watts) resistor is connected across the collector-emitter of transistor Q1 when each associated SMD or CMD is inserted in its connector to reduce power dissipation in Q1. (This is equivalent to paralleling Q1 with 250 ohms for each 0.150 ampere, approximately, of load current.)

(d) Fuse F102 limits the output current to a total of 0.5 ampere.

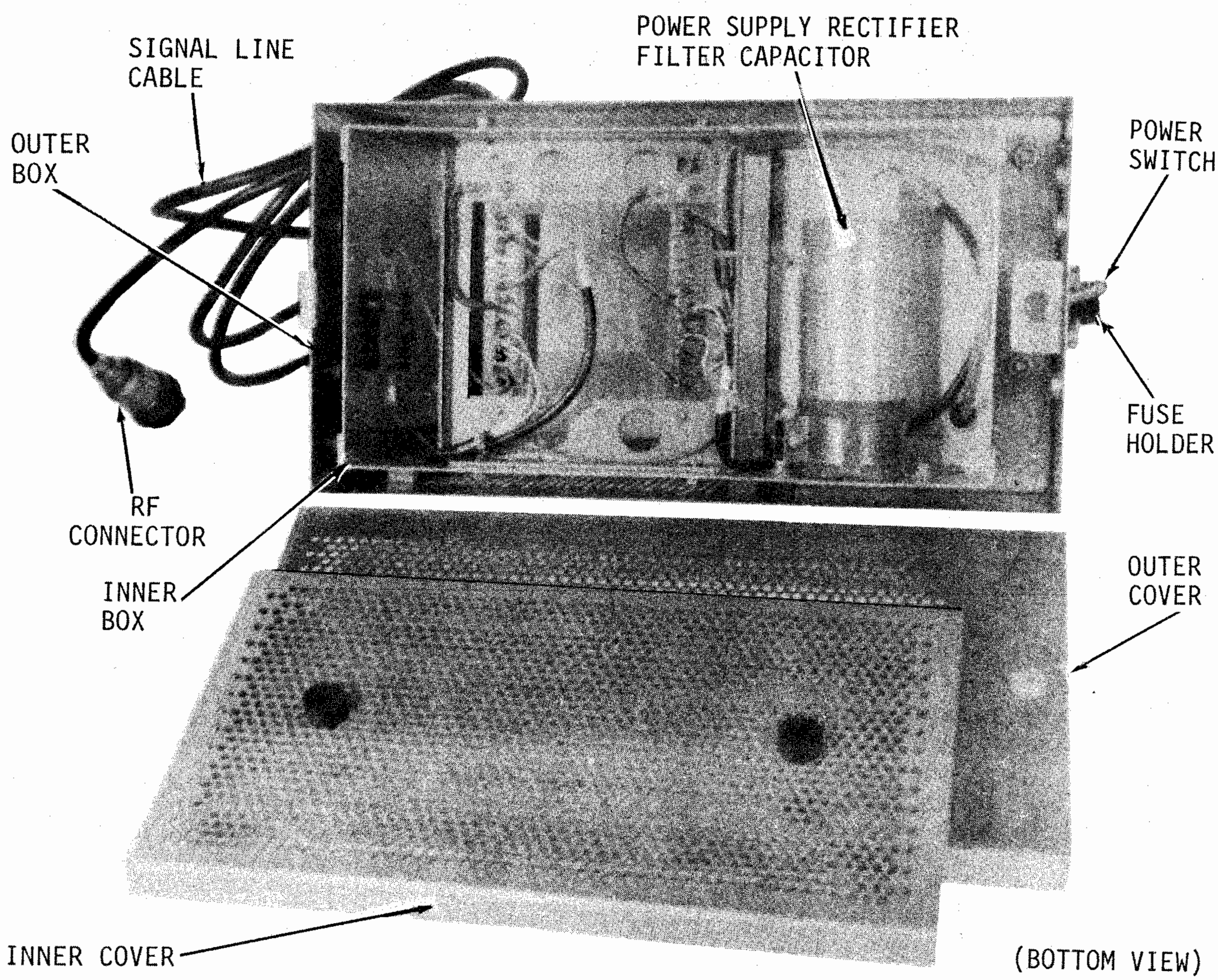



**Figure 3-10. Typical Parts of an ESA - Double Box Construction (Bottom View)**

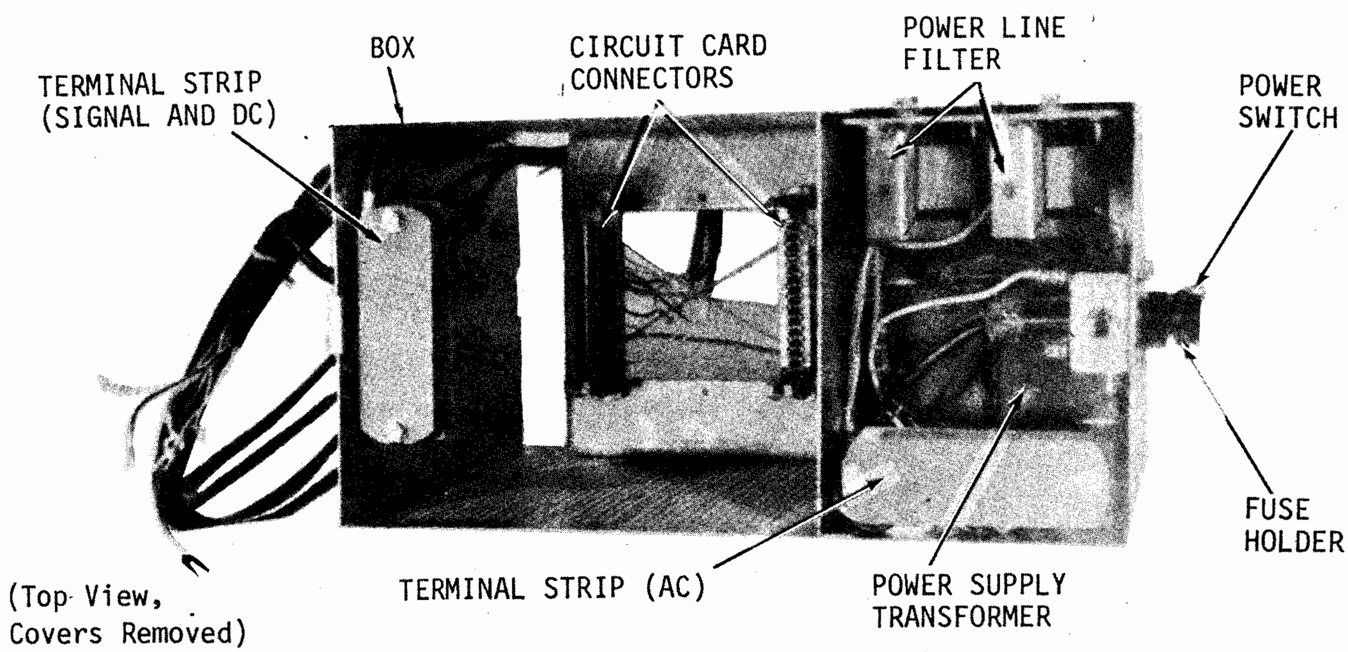



**Figure 10 - Typical Parts of an ESA — Single Box Construction**

Figure 3-11. Typical Parts of an ESA - Single Box Construction (Top View, Covers Removed)

(2) <u>Technical Data</u>. In the following paragraphs, the technical data refers to the complete power supply, including transformer and filter components in the associated electricl service assembly. The data applies to 0.5 ampere power supplies when installed in an electrical service assembly that accomodates from one to three selector magnet drivers (SMD) or clutch magnet drivers (CMD). (See also Table 1-2, Reference Data, in Chapter 1.)

(a) Input: 100 VAC to 130 VAC, 45 to 66 Hertz.

(b) Output:

1. +47 VDC to +53 VDC at 0.5 ampere maximum.

2. +6.6 VDC to +7.8 VDC at 0.018 ampere maximum.

3. $\pm$6.6 VDC to -7.8 VDC at 0.018 ampere maximum.

(c) Fusing

1. AC: 0.8 ampere, slow-blowing (TP162360).

2. DC: 0.5 ampere, fast-blowing (TP131807).

(d) Operating Ambient Temperature: +40 F to +120 F.

(3) <u>Theory of Operation</u>. The following paragraphs explain the general

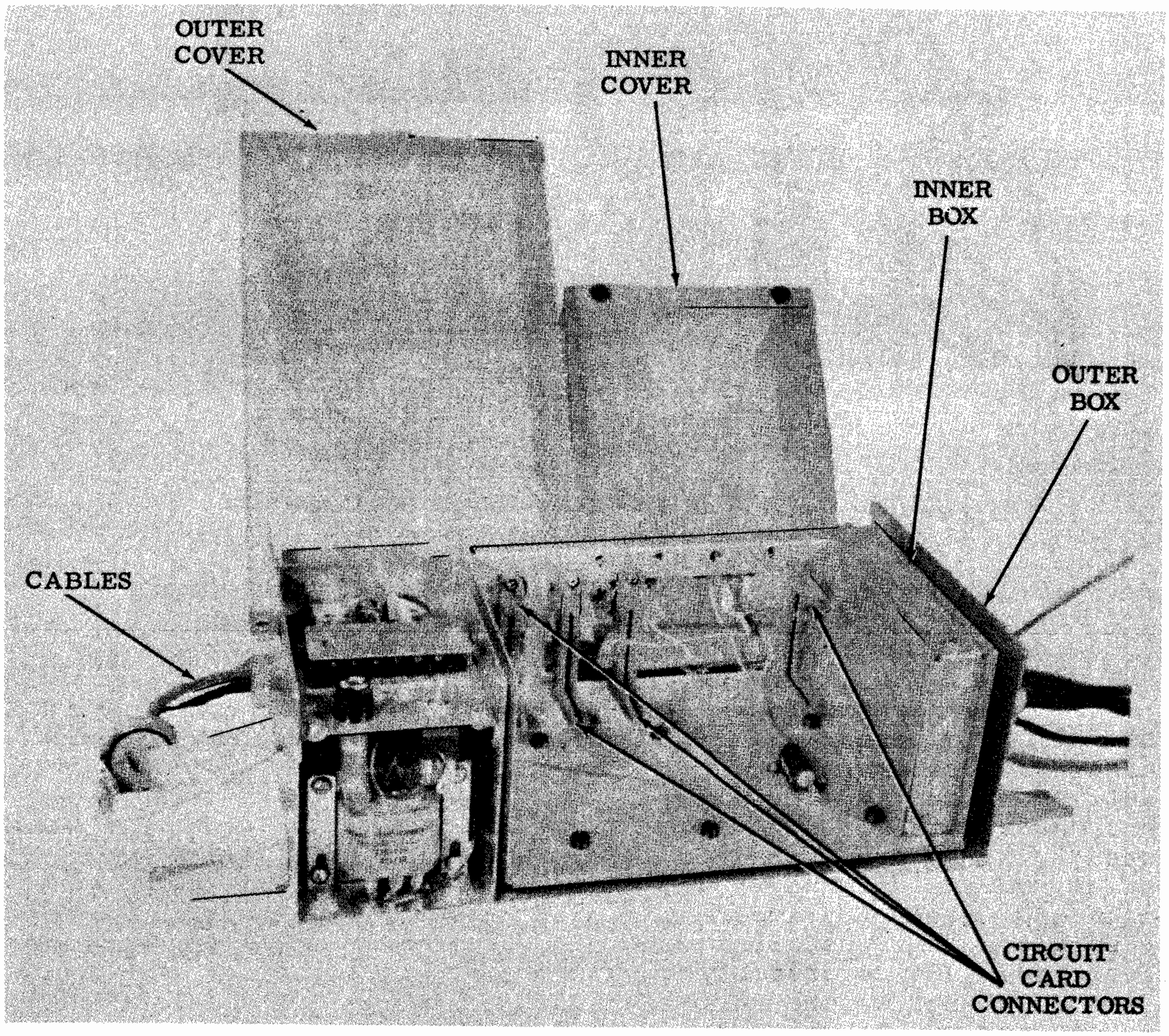



Figure 3-12. Typical ESA Showing Circuit Card Connectors

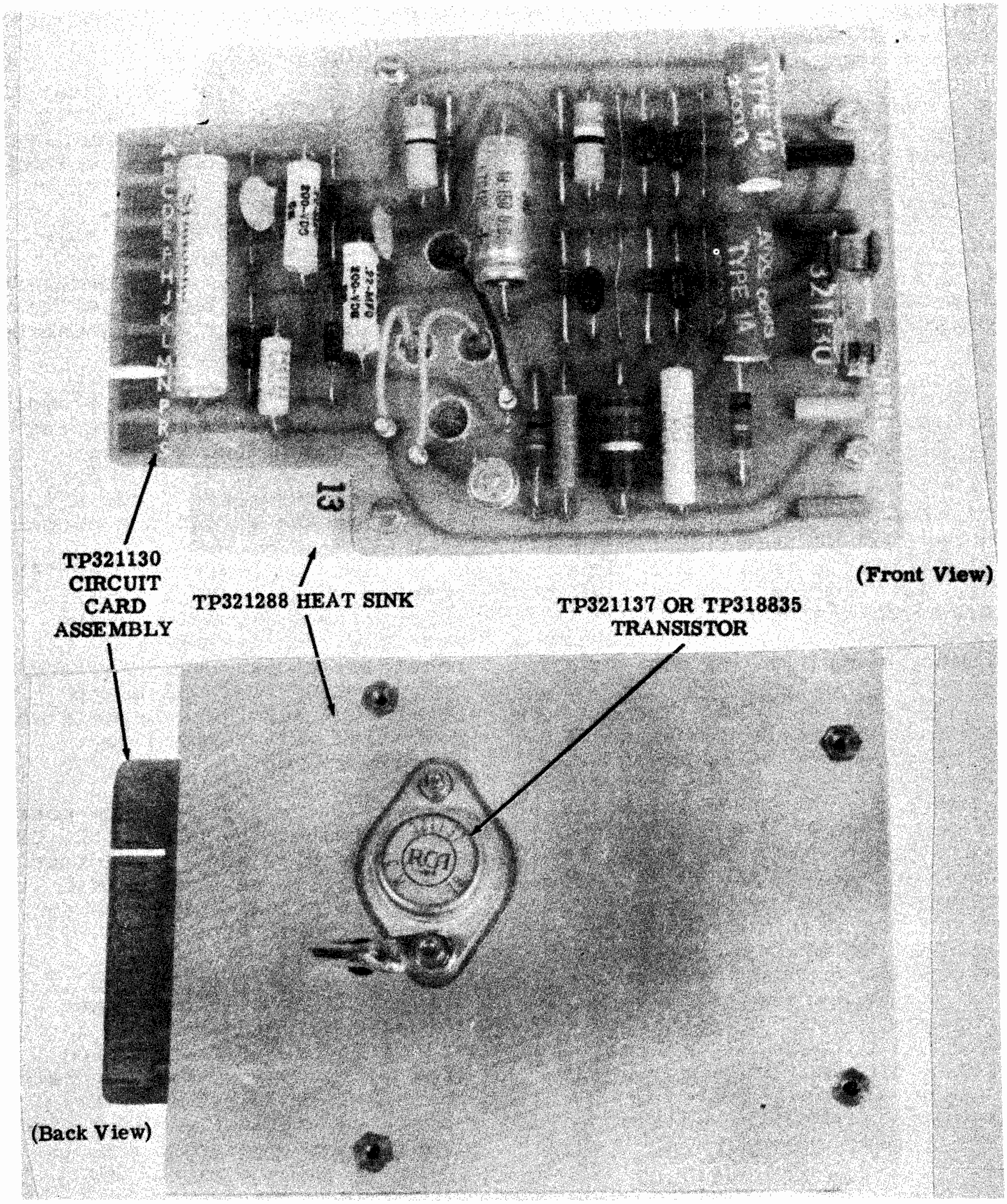



Figure 3-13. One-Half Ampere Power Supply (TP321290)

operation of the power supply circuit card assembly when it is installed in an ESA. The transformer and filter are included as part of the ESA. See figures 5-15 and 5-16 in Chapter 5 for power supply circuitry. For additional information refer to the ESA diagrams in Chapter 5 for the specific set that is used.

(a) Transformer T1, capacitor C8 or C102, filter component L1, L2, C9, C10, C11, and C12 are all located in the ESA, not on the circuit card assembly. (Refer to figure 3-13 and ESA wiring diagrams in Chapter 5).

(b) Transformer T1, diodes CR1, CR3, and capacitor C8 form a full-wave rectifier to obtain a minimum 58 volts unregulated dc. In ESAs containing CMD circuit cards, capacitor C102 performs a function similar to that of C3.

(c) Transistors Q1 and Q2 form a two stage series voltage regulating element. Both transistors are always conducting with the base emitter drop of each transistor at approximately 0.7 volt. The drop across R2 (used in conjunction with capacitor C5 for rfi noise suppression) is negligible. In effect, the emitter of Q1 (dc output) is clamped to the same potential as the reference diode combination CR7 and CR12 (nominally +47 volts). The difference between the dc output and unregulated dc appears across the collector-emitter junction of Q1.

(d) Resistor R1 limits the current that divides between the CR7-CR12 reference diodes and the base of Q2, which is a gain stage for Q1. The base current of Q1 (Q2 collector current) is the base current of Q2 multiplied by the dc current gain ($H_{FE}$) of Q2.

(e) Resistor R7 acts as a bleeder and assures that Q1 and Q2 will conduct even when no load is conected across the output terminals. Without R7 and no load connected, the output would rise to the same value as the unregulated dc. However, a minimum load of 0.150 ampere must also be applied to maintain the +53 volt regulation limit.

(f) The +7 volt output is obtained by dropping the unregulated dc voltage through resistor R4 to supply the Zener reference diode CR6, which appears across the output.

(g) R5 and CR5 provide -7 volts in a similar manner; however, a full-wave rectifier consisting of rectifier diodes CR2, CR4, and capacitor C4 is required to obtain the negative unregulated potential with respect to circuit common.

(h) A low-pass filter consisting of L1, L2, C9, C10, C11, C12, and transformer shielding are used to obtain noise isolation between power line and power supply.

b. <u>Selector Magnet Driver</u>. The selector magnet driver (SMD) provides two inputs and makes possible reception from either one of two separate transmitters (single input operation) while the input line from the other transmitter is open. A spacing signal at either input will provide a spacing output. In order to function properly, the SMD is installed in a double-shielded enclosure and used in conjunction with the appropriate

ESAs where extreme rfi suppression is required. It is not intended for general use.

(1) Technical Description. The TP323810 SMD is a 15-pin circuit card assembly designed to plug into an associated ESA as an integral part of its components. When used in conjunction with proper power supply and filter assemblies, it is intended for radio frequency interference suppression of receiving selector noise in systems requiring this suppression. Figure 3-14 shows the SMD circuit card. Refer to figures 5-17 and 5-18 in Chapter 5, respectively, for the SMD circuit board assembly drawing and schematic diagram.

(2) Technical Data. The following technical data is applicable to the TP323810 SMD circuit card.

(a) The input current to the TP323810 SMD is a low-level +6 volts for a marking state, and a -6 volt for a spacing state.

(b) The output current of the SMD is 60 milliamperes ±10% during the marking state. The output is zero during the spacing state.

(c) The SMD assumes the marking state with positive input voltages not greater than 0.5 volt and the spacing state with negative voltages not greater than 0.5 volt. The marking and spacing switching levels are

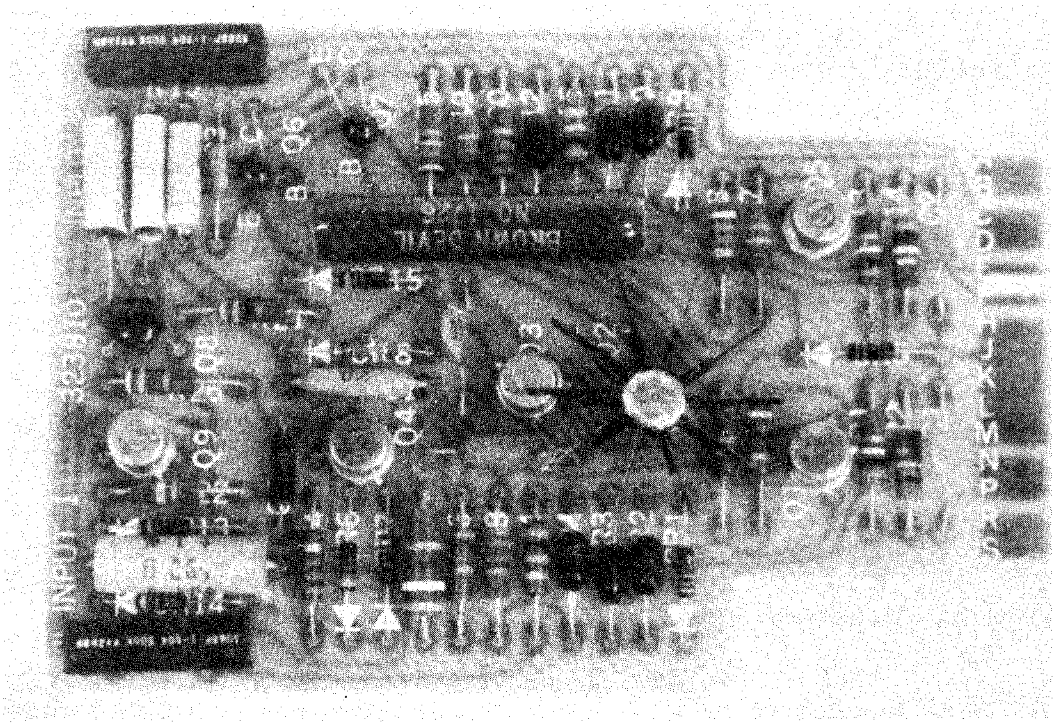


Figure 3-14. Selector Magnet Driver (SMD) (TP323810)

adjustable within 10% of each other. This requirement applies to either input.

(d) Each input of the SMD has a minimum input resistance of 50,000 ohms.

(e) The maximum input capacitance of either input is 2500 picofarads.

(f) Overall receiving margins of properly adjusted Model 28 type selectors driven by this SMD (polar rectangular wave input) should exceed 70 points at either input.

(g) The SMD provides a marking output when both inputs are open.

(h) Both inputs cannot be in the marking condition simultaneously without producing a garbled output.

(i) The SMD operates at bit rates up to 75 baud.

(j) It operates in a free-air ambient temperature of 70°C (158°F). Storage temperature should not exceed 85°C (185°F).

(k) The SMD operates from a power supply delivering 47 to 53 VDC.

(l) The power consumption under any combination of power source, environmental, and component conditions is 8.5 watts maximum.

(m) The TP323810 SMD, together with associated ESA and power supply, is intended for use with equipment requiring low-level rfi (polar-EMC) operation.

(3) <u>Principles of Operation</u>. The following electrical theory requires reference to figure 3-14. Refer also to figures 5-17 and 5-18 in Chapter 5.

(a) The TP323810 SMD is basically a direct coupled amplifier providing a current gain of approximately 80 db The first two stages (Q1, Q6, or Q5, Q7) provide the necessary gain to drive a Schmitt trigger (Q8 and Q9). Q2, Q3, and Q4 comprise a power regulator stage which provides the power supply with a constant load.

(b) In the marking state with a positive voltage with respect to common applied to each input (or a positive voltage on one input, the other open), Q1 and Q5 conduct, which in turn saturate Q6 and Q7. In this marking state the voltage drop from the emitter of Q6 to the collector of Q7 is less than the voltage drop from the CR15 anode to the Q8 emitter. Under this condition, the base-emitter junction of Q8 is reverse biased, thus turning Q8 off. With Q8 off, the Q9 base will conduct through R26 and thus energize the external selector magnet in the collector circuit. Transistor Q9 base current is sufficient to saturate the collector. In this condition, selector magnet current is determined primarily by the value of the limiting resistor R23 and the power regulator output voltage.

(c) In the spacing state, with a negative voltage on input 1, input 2, or both inputs, the respective input transistor or transistors (Q1, Q5) are off. In this condition Q6-Q7 collector current is cutoff and the base of Q8 conducts. Transistor Q8 base current is sufficient to saturate the collector. The Q8 emitter-collector saturation voltage is less than the forward drop across CR13 thus reverse biasing the base emitter junction of Q9. With this junction reverse biased, Q9 collector current is cutoff and the selector magnet is de-energized.

(d) Because of the difference in magnitude of Q8 and Q9 load currents, the drop across R21 will be greater in the marking state than in spacing. This means that the input voltage to the third stage (Q6 VCE + Q7 VCE) necessary to change the state of Q8 will be different depending on the previous state. Specifically, a larger combined Q6 and Q7 collector-emitter voltage is required to turn on Q8 than to turn off Q8. This hysteresis, peculiar to Schmitt triggers, enables positive driver input signals to energize the selector coil and negative going input signals to de-energize the coil.

(e) Resistors R4, R16, and potentiometers R3 and R15 serve to bias Q1 and Q5 and set the center of the switching interval. Emitter resistors R7 and R18 assist in gain stabilization. Resistors R6, R8 and R19, and R20 form voltage dividers to bias CR2, CR3, CR4 and CR10, CR11, CR12. These diodes exhibit temperature characteristics such that together with R7 and R18, effective temperature compensation is obtained to stabilize the switching level of the SMD. Diode CR5 establishes a voltage reference for the first stages to insure switching level stability.

(f) When low resistance transmitters (about 100 ohms) are used to key the driver, R1 and R13 have no significant effect on the operation of the circuit. However, when the line resistance is high (open line), R1 and R13 apply sufficient bias to driver Q1 and Q5 into conduction. This operation will maintain the terminal equipment in the idle state when input lines are open, or allow single line operation by simulating a marking signal on the other input.

(g) In the power regulator, CR8 and the base-emitter junction of Q4 establish a voltage reference for R11 which determines the current drain of the unit. Diodes CR6, CR7 and the base-emitter junction of Q3 serve to clamp the Q4 collector at a low voltage so as to minimize power dissipation in Q4. As the power requirement of the circuitry following the regulator decreases, the ouput voltage of the regulator will begin to rise. This rise corresponds to a decrease in Q4 collector-base voltage. The effect is to increase the forward bias on the base-emitter junction of Q3 and cause increased collector conduction. This collector current increases the conduction of Q2 whereby Q2 and R10 absorb the excess power. Q2 functions as a variable resistance so as to maintain a constant resistance across the output of the regulator regardless of the state of the driver circuitry. As a consequence of this, the power supply sees a constant load, regardless of driver state.

(h) Capacitors C4 and C5 provide negative feedback to reduce transient generation in the driver. Capacitors C3, C7 and C8 are radio frequency bypass capacitors to eliminate any parasitic oscillations that may occur as a result of switching.

c. Low-Level Keyer. The following paragraphs provide technical description, technical data, and principles of operation for the low level keyer (LLK) circuit card used in CPP KSR ESAs.

(1) Technical Description. Refer to figure 5-25 in Chapter 5 for a schematic diagram of the TP323130 LLK.

(a) The TP323030 LLK is a circuit card assembly approximately 2-1/4 by 4-1/2 inches. It is designed to plug into a 15-pin connector that is wired into the ESA where it becomes an integral component for the suppression of radio frequency interference (rfi).

(b) The TP323130 LLK is for use in photoelectric systems (such as Model 28/32 keyboard) requiring a low-level interface and extreme rfi suppression. It is used in conjunction with a TP333069 CMD.

(c) Each keyer is designed to operate into a high resistance load such as the TP323810 SMD.

(d) An external power source, mounted in the associated ESA, is required to operate the keyers.

(2) Technical Data. The following technical data is applicable to the LLK circuit card. All low-level keyer features for the TP323130 circuit card given in the following paragraphs assume the use of the TP321268 filter card assembly.

(a) Maximum unloaded power consumption of each keyer is less than 50 milliwatts.

(b) The output of the TP323130 keyer is +6.0 volts ±1.0 Volt corresponding to the marking state and -6.0 volts ±1.0 volt corresponding to the spacing state.

(c) The marking and spacing output voltages should be balanced to within 10 percent of each other.

(d) The outputs from two TP321268 filter card assemblies may be paralleled for parallel operation of either of two transmitters.

(e) The nominal output impedance is 100 ohms.

(f) The keyers operate at bit rates up to 75 baud.

(g) Maximum short circuit output current is 60 milliamperes.

(h) The TP323130 keyer operates into a load resistance of 500 ohms minimum.

(i) The keyer and TP321268 filter card assembly operate in a maximum free-air ambient temperature of 70°C (158°F). Storage temperature should not exceed 85°C (185°F).

(j) The TP323130 keyer operates from a power source delivering ±7.2 VDC ±0.6 volt. Maximum unloaded power consumption is less than 50 milliwatts.

(k) The mark and space symmetry at zero volt (output waveform) may be adjusted within 10 percent of each other by the 5 megohm potentiometer on the keyer card for the TP323130 keyer.

(l) The keyer is intended for use on signal lines less than 1000 feet in length. However, operation is possible with line lengths up to 5000 feet.

(3) Principles of Operation. All references in the following paragraphs are made with respect to the LLK schematic diagram, figure 5-25 of Chapter 5.

(a) The TP323130 keyer takes a 250 uA (min) photocell signal from the distributor and by means of passive and active filtering, shapes the output.

(b) In the marking state (photocell illuminated), Q5 is turned off causing the bases of Q1 and Q2 to go positive through the passive shaping network made up of R2, C1 and R4. With the bases of Q1 and Q2 positive, Q1 will turn on turning Q4 off and Q2 will turn off turning Q3 on. Capacitor C2, resistors R6, R9, and capacitor C3 further shape the wave by providing feedback and phase shift thereby controlling the rate at which the active filter Q1, Q2, Q3, and Q4 will switch.

(c) In the spacing state (photocell dark), Q5 is turned on providing a negative signal to the bases of Q1 and Q2. The switching occurs as in figure 5-25 except, transistors that are off turn on and those that are on turn off.

(d) During the transition from on to off and off to on, one of the output transistors of the active filter is always conducting. This will provide a smooth transition from plus volts through zero volt to minus volts and back again. The rate of switching being controlled by the feedback and phase shift of C2, R6, R9 and C3.

(e) Diode CR1 compensates for the nonsymmetry of the first stage. Resistors R10 and R5 and capacitors C6 and C7 provide for the proper output impedance and some additional shaping.

d. Clutch Magnet Driver (CMD). The following paragraphs describe the TP333069 CMD circuit card and outline the electrical theory that applies when the card is installed (plugged) into a shielded ESA containing the proper power supply and filter assemblies.

(1) Technical Description. Refer to figures 5-21 and 5-22, respectively, in Chapter 5 for the assembly drawing and the schematic diagram of the CMD circuit card.

(a) The CMD is a solid state, direct coupled amplifier built as a plug-in circuit card assembly approximately 2-1/2 by 4-1/4 inches. It requires an external power source. All connections are made through a 15-pin circuit card connector.

(b) The CMD output drives a Model 28 type transmitting clutch upon receipt of a low-level input pulse. It is to be used with the proper associated equipment and is not for general use.

(c) CMDs are adaptable to various Model 28 type equipment sets through the use of associated modification kits. Each CMD (one or more) is part of, or associated with some electrical service assembly (ESA). The number of CMDs used depends on the number of clutch magnets used in the set.

(2) Technical Data. The following technical data is applicable to the TP333069 CMD.

(a) The CMD receives low-level signals (+6 volts clutch coil energized, -6 volt coil de-energized, nominal) and operates a Model 28 type clutch.

(b) The TP333069 must be used with 278 magnet coils. The output current during the energized state for the CMD is 35 to 56 ma (single 278M coil for photoelectric distributor clutch).

(c) Operation is considered satisfactory when the incoming synchronous pluse complies with the following requirements:

1. Minimum sync pulse duration = 20 ms.

2. Maximum sync pulse duration = 40 ms or 2 bit lengths, whichever is longer.

3. Minimum sync pulse period = 110 percent of transmitted character length.

NOTE

When operating a keyboard the maximum pulsing rate (minimum period), the machine may not respond to each synchronous pulse when in repeat mode.

4. Under condition (c)3, start pulse delay should be between 15 and 35 mS. (Delay is measured from zero volt of the positive going input synchronous pulse signal to the beginning of the start pulse at the signal generator contacts.)

(d) The TP333069 CMD assumes the energized state with positive input voltages not greater than +0.5 volt and the de-energized state with negative voltages not greater than -0.5 volt.

(e) The energized and de-energized switching levels as defined in (d) are adjustable to within 10 percent of each other.

(f) The TP333069 CMD should have a minimum input resistance of 50,000 ohms.

(g) The maximum input capacitance is 2500 picofarads.

(h) The CMD provides a spacing (de-energized) output when the input line is open.

(i) The CMD operates in a free air ambient temperature range of 0°C (32°F) to 65°C (150°F).

(j) The TP333069 CMD operates from a power supply delivering +47 to +53 VDC.

(k) Power consumption under any combination of power source, environmental, and component conditions is 13 watts maximum.

(l) The TP333069 CMD is intended for use on clock lines less than 1000 feet in length. However, operation is possible with line lengths up to 5000 feet.

(m) The TP333069 CMD, when used with associated power supplies, is intended for use with interfaces conforming to the following requirements:

1. FED STD. 222 Section 3102 b.

2. MIL STD. 188B.

(3) Principles of Operation. All circuit references in the following paragraphs are made with respect to the circuit board assembly drawing, and schematic wiring diagram of the CMD. Refer to figures 5-21 and 5-22 in Chapter 5.

(a) The TP333069 CMD is basically a direct coupled amplifier providing a current gain of approximately 60 db. The first two stages (Q1 and Q2) provide the necessary gain to drive a Schmitt trigger (Q3 and Q4). Q5 and CR2 comprise a power regulator stage which provides the power supply with a constant load.

(b) In the marking state, with a positive voltage with respect to common applied to the input side of the Q1 base resistor R5, Q1 conducts, which in turn saturates Q2. In this condition, the sum of the voltage drops around the loop R14, Q2 collector-emitter and Q3 base-emitter is in a condition to reverse bias the base-emitter junction of Q3 and thus cutoff Q3 collector current. The Q4 base current increases the voltage drop across R15 in order to satisfy loop conditions established by the power regulator voltage, R14, CR8, and Q4 base-emitter voltage. The Q4 base current is sufficient to saturate the collector. In this condition, load current is determined primarily by the load resistance, R17, and the power regulator output voltage.

(c) In the spacing state, with a negative input voltage, Q1 is cutoff with reverse base-emitter bias established by the reverse transient protection diode CR3. With Q1 off, Q2 does not conduct. Consequently, to satisfy loop conditions established by R13, Q3 base-emitter, R14, and the regulator voltage, Q3 conducts to raise the voltage across R13. Base current is sufficient to saturate the Q3 collector. The Q3 collector-emitter voltage is less than CR8 voltage, which in turn reverse biases the base-emitter junction of Q4. With the latter junction reverse biased, the Q4 collector is cut-off.

(d) The collector circuit at Q2 has been interrupted and brought out to the connector contacts at the bottom of the card. This circuit must be completed externally or Q3 cannot be turned off and the magnet coils are held de-energized. The circuit thus affords a degree of local magnet control.

(e) Because of the difference in magnitude of Q3 and Q4 load currents, the drop across R14 will be greater in the marking state than in spacing state. This means that input voltage to the third state (Q3 VCE) necessary to change the state of Q3 will be different depending on the previous state. Specifically, a larger Q2 collector-emitter voltage is required to turn on Q3 than to turn off Q3. This hysteresis, peculiar to Schmitt triggers, enables positive driver input signals to energize the load coil and negative going input signals to de-energize the load coil.

(f) Resistor R6 and potentiometer R7 serve to bias Q1 and set the center of the switching interval. Emitter resistor R8 assists in gain stabilization. R11 and R9 form a voltage divider to bias CR4, CR5, and CR6. These diodes exhibit temperature characteristics such that together with R8, effective temperature compensation is obtained to stabilize the switching level of the driver. CR7 establishes a voltage reference for the first stage to insure switching level stability.

(g) When a low resistance transmitter (about 100 ohms) is used to key the driver, R4 has little significance on the operation of the circuit. However, when the input resistance is extremely high, R4 applies sufficient bias to Q1 to cutoff. This operation will maintain the terminal equipment in the idle state when the input line is open circuited.

(h) In the power regulator, CR1 and the base-emitter junction of Q5 establish a voltage reference for R1 and R2 which determines the current drain of the unit. As the driver demands less power from the regulator, such as being in the de-energized state, the excess current (excess over energized current) is shunted through Zener diode CR2. This operation maintains a relatively constant load for the external power supply. R2 is adjusted to set minimum CR2 current for voltage regulation.

(i) Coil L1 and capacitor C1 serve to reduce noise generated by Zener diode CR2.

(j) Capacitors C3 and C6 provide negative feedback to reduce transient generation in the driver. C5 and C7 are radio frequency bypass capacitors to eliminate any parasitic oscillations that may occur during high speed switching.

(k) Diode CR9, C4 and R16 form a transient limiting network to protect Q4 from excessive reverse transient present when switching inductive loads.

3-5. TYPING UNIT MECHANICAL MOTION DESCRIPTIONS. The following paragraphs provide a detailed functional description of the mechanical assemblies used to perform the various functions of the typing unit. The typing unit discussions are applicable to both high-level and low-level configurations of KSR and RO CPP teletypewriter sets.

a. <u>Distribution of Motion</u>. Refer to figure 3-15.

NOTE

In the following discussions, unless otherwise stated, references to "left" or

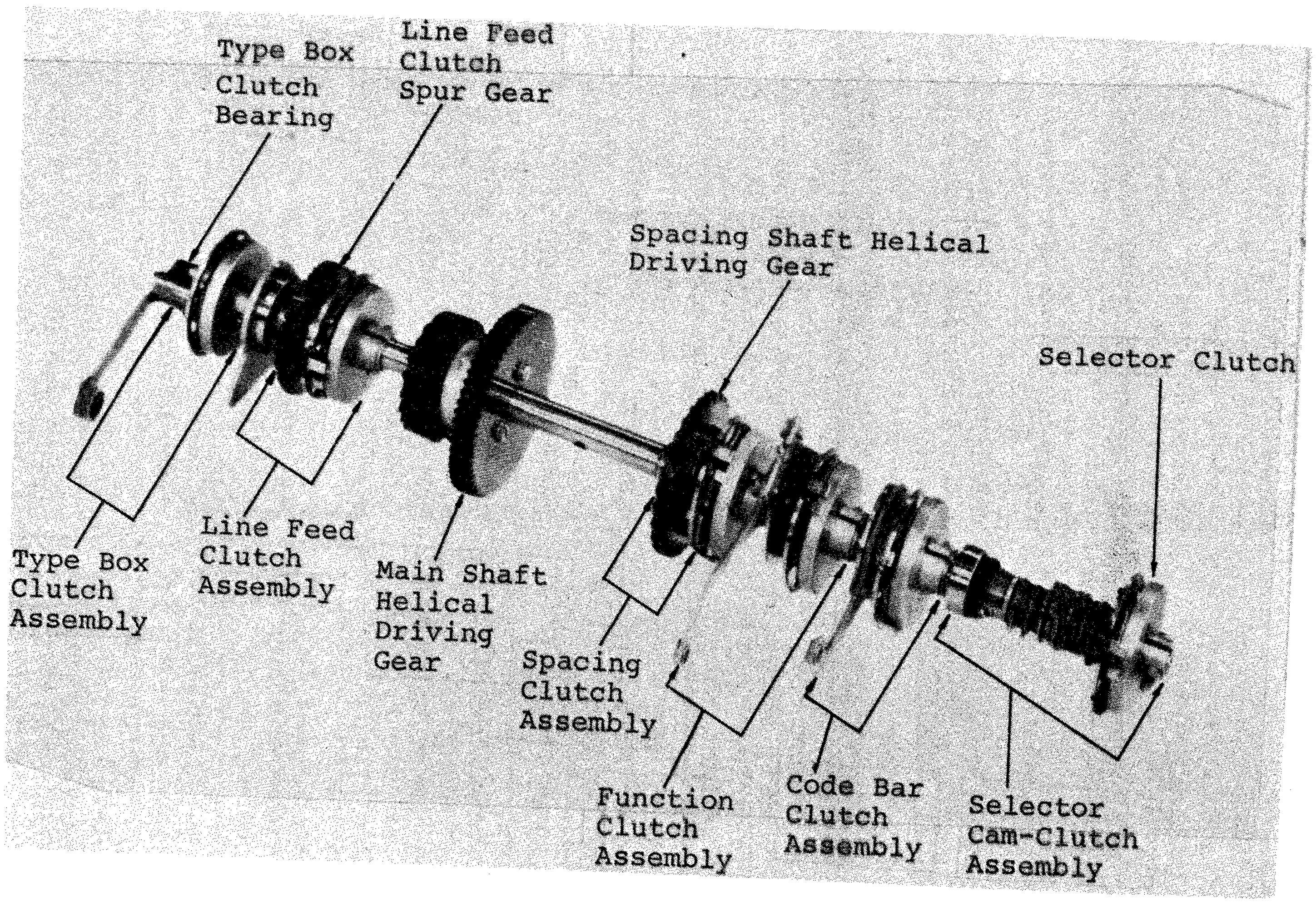



Figure 3-15. Main Shaft (Right Front View)

"right" and "rear" or "forward" assume that the technician is facing the front of unit with selector mechanism at the right and type box at the front.

(1) General. The main shaft is located in the lower rear portion of the typing unit, supported between the two side frames by ball bearings. It extends the full width of the unit. Centrally located on the shaft are two driving gears. The larger gear meshes with the gear mechanism of the gear shift assembly to transmit power from the motor to the typing unit. The smaller gear is not used in CPP applications. Power take-off from the constantly rotating main shaft is controlled by six clutches, each of which, when tripped (engaged, or unlatched), drives its associated mechanism. From the right end of the shaft, these clutches may be identified as the selector clutch (with cam sleeve), the code bar clutch, the function clutch, the spacing clutch, the line feed clutch, and the type box clutch. The sequence in which these clutches are tripped is: selector, code bar, function, type box, spacing, and line feed. However, the type box and spacing clutch engagement may be suppressed under certain operating conditions, and the line feed clutch is operative only upon a specific set of input signal code combinations. The spacing and line feed clutches are three-stop clutches (figure 3-16), each permitting their associated mechanisms to operate through one-third of a revolution of the main shaft. All other clutches are one-stop clutches (figures 3-17 and 3-18), operating through an entire revolution of the main shaft.

(2) One-Stop Clutches. The clutch drums are attached to and rotate with the main shaft (figure 3-15). In the disengaged position, as shown in figure 3-17, the clutch shoes do not contact the drum, and the shoes and cam disk are held stationary. Engagement is accomplished by moving the stop arm (figure 3-18) toward the rear of the typing unit, away from the clutch, thus releasing stop lug A and the lower end of shoe lever B. (figure 3-18). The upper end of lever B pivots around its ear C, which bears against the upper end of the secondary shoe and moves its ear D and the upper end of the primary shoe toward the left until the shoe makes contact with the notched inner surface of the rotating drum at point E. As the drum turns counterclockwise, it drives the primary shoe downward so that it again makes contact with the drum at point F. There, the combined forces acting on the primary shoe cause it to push against the secondary shoe at point G. The lower end of the secondary shoe then bears against the drum at point I. The forces involved are multiplied at each of the preceding steps. The aggregate force is applied through the shoes to the lug J on the clutch cam disk, and the disk and attached cam turn in unison with the drum. Disengagement is effected when the lower end of shoe lever B strikes the stop arm. Lug A and the lower end of the shoe lever are brought together (figure 3-17), and the upper end of lever B pivots about its ear C and allows its other ear D to move toward the right. The upper spring then pulls the two shoes together and away from the drum. The latch lever seats in the indent in the cam disk, and the cam is held in

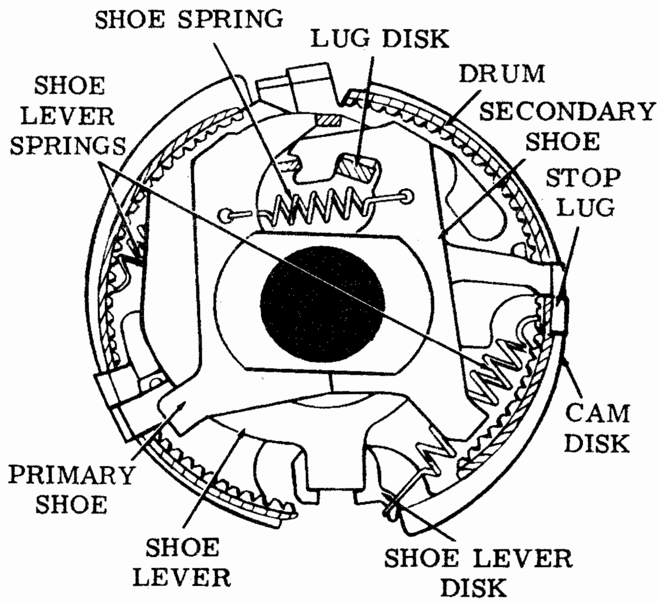



**Figure 3-16. Three-Stop Clutch**

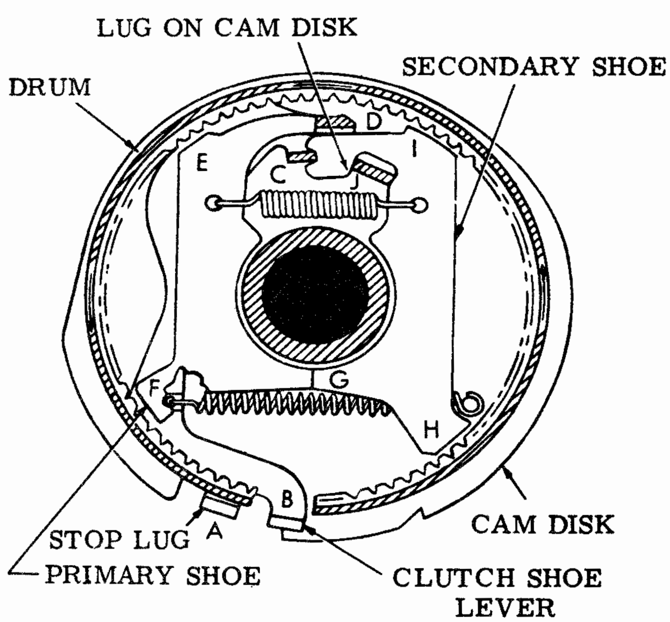



**Figure 3-17. One-Stop Clutch (Disengaged)**

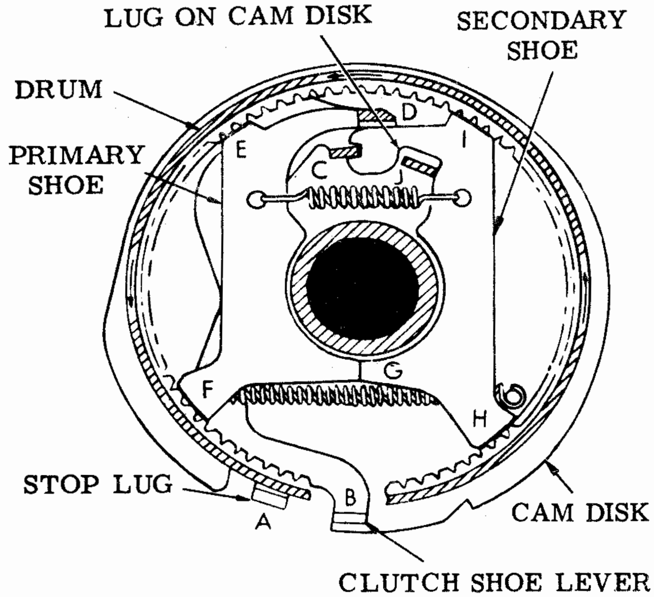



Figure 3-18. One-Stop Clutch (Engaged)

its stop position until the clutch is again engaged.

(3) Three-Stop Clutches. Two of the clutches, spacing and line feed (figure 3-16), have three sets of lugs equally spaced about their periphery. The action is as described in paragraph (2) above, but the clutch is permitted to rotate through only one-third revolution before the stop lever and latch lever halt its motion.

b. Selection. The selection function of the typing unit is discussed in the following paragraphs.

(1) General. The selecting mechanism consists of two magnet coils, an armature, a selector cam clutch, and the associated levers, arms, bails, and slides necessary to convert the electrical pulses of the start-stop code to the mechanical arrangements which govern the character to be printed and the function to be performed.

(2) Selector Mechanism. Refer to figures 3-19 and 3-20. The selector cam clutch comprises, from right to left (figure 3-15), the clutch, the stop arm bail cam, the fifth, fourth, and third selector lever cams, the cam for spacing and marking lock levers, the second and first selector lever cams, the push lever reset bail cam, and the code bar clutch trip cam. During the time in which a closed line circuit (marking) condition exists, the selector

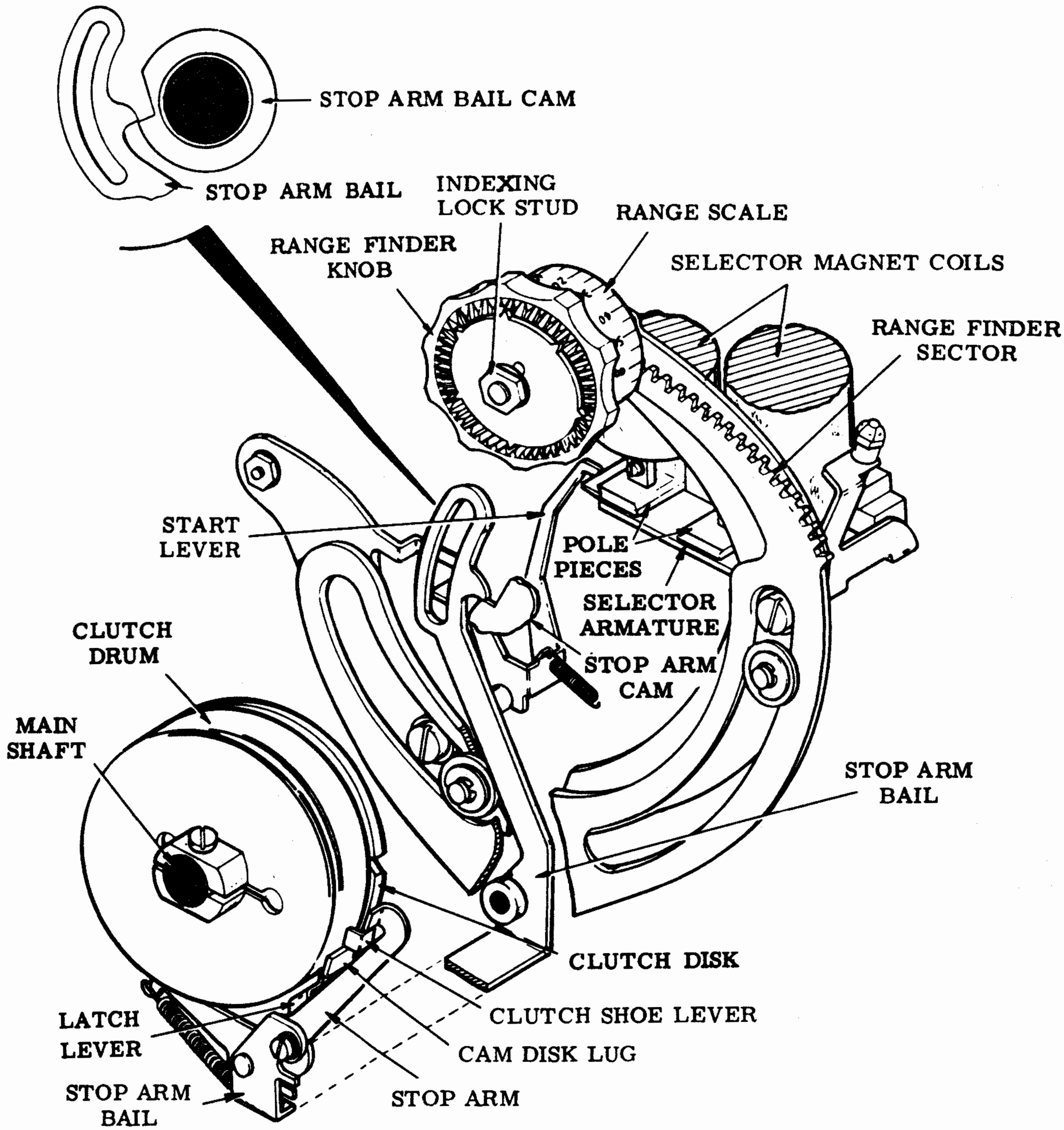



Figure 3-19. Selector Clutch and Range Finder (Right Front View)

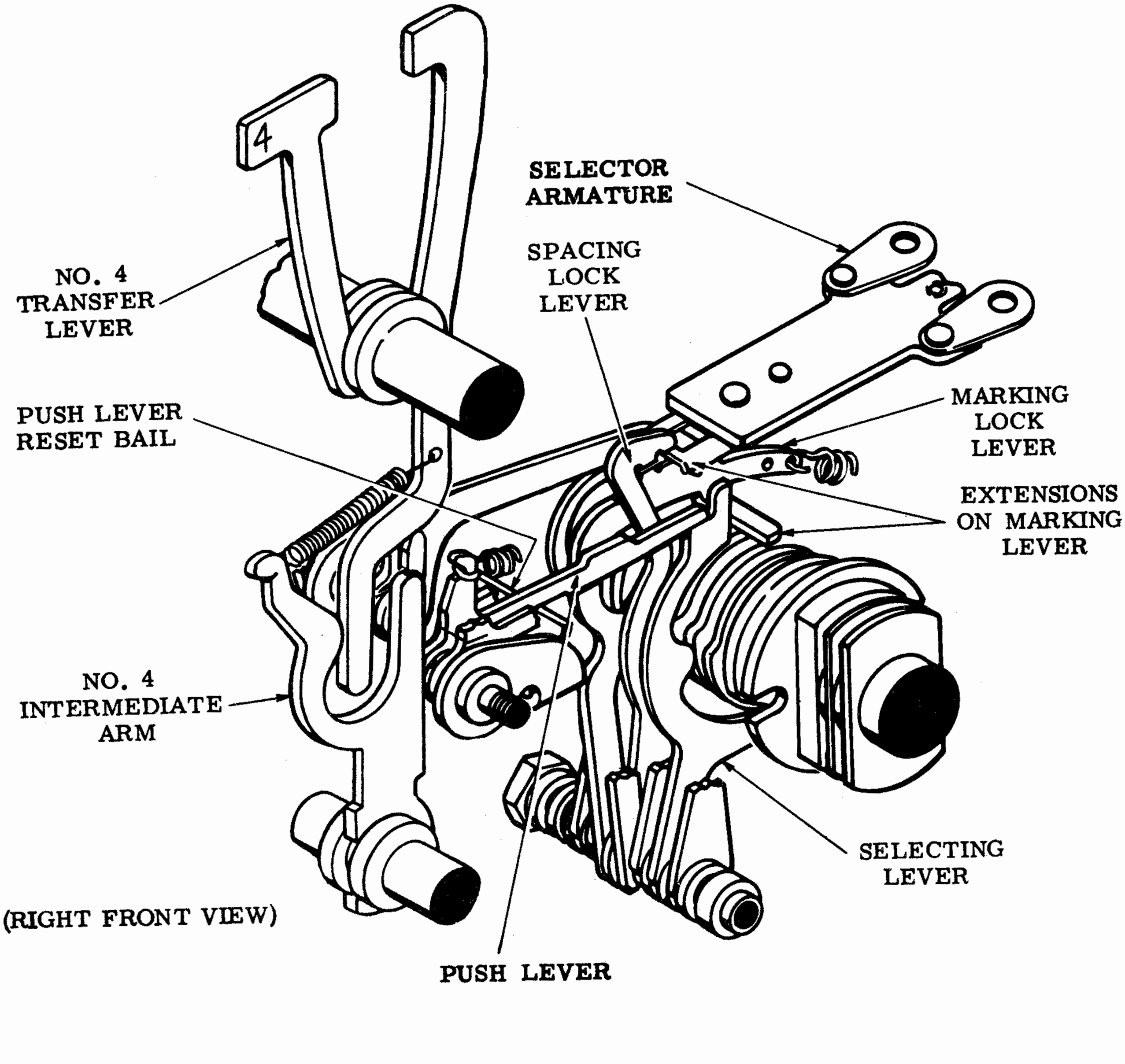



Figure 3-20. Selecting Mechanism and Transfer Mechanism

magnet coils are energized and hold the selector armature against the selector magnet pole pieces. In this stop position, the selector armature blocks the start lever (figure 3-19). While the signal for any character or function is being received, the start (spacing) pulse releases the selector armature which, under the tension of its spring, moves away from the magnet cores, and thus unlatches the start lever. The start lever rotates clockwise (as viewed from the right) under tension of its spring, moving the stop arm bail into the indent of the first cam. As the stop arm bail rotates about its pivot point, the attached stop arm is moved out of engagement with the clutch shoe lever. The selector cam clutch engages and begins to rotate. The stop arm bail immediately rides to the high part of its cam, where it remains to hold the start lever away from the selector armature during the reception of the signal code combination. When the stop pulse at the end of the signal code combination is received, the selector armature is pulled up to block the start lever. Thus, the stop arm bail is prevented from dropping into the indent of its cam, and the attached stop arm is held so as to stop the clutch shoe lever. The clutch cam disk upon which the latch lever rides has an indent as its stop position. When the clutch shoe lever strikes the stop arm, the inertia of the cam disk assembly causes it to continue to turn until its lug makes contact with the lug on the clutch shoe lever. At this point, the latch lever drops into the indent in the cam disk, and the clutch is held disengaged until the next start bit is received. The series of five selecting levers and a marking lock lever ride their respective cams on the selector cam clutch. As the marking or spacing signal pulses are applied to the selector magnets, the selector cam clutch rotates and actuates the selector levers. When a spacing pulse is received, the marking lock lever is blocked by the end of the armature, and the spacing lock lever swings toward the rear, above the armature, and locks it in the spacing position until the next signal pulse is received. Extensions on the marking lock lever prevent the selector levers from following their cams (figure 3-20). When a marking pulse is received, the spacing lock lever is blocked by the end of the armature, and the marking lock lever swings to the rear, below the armature, to lock it in the marking position until the next signal pulse is received. During this marking condition, the selector levers are not blocked by the marking lock lever and are permitted to move against their respective cams. The selecting lever that is opposite the indent in its cam while the armature is locked in marking condition swings to the rear, or selected, position momentarily. Each selecting lever has an associated push lever which drops into a notch on the top of the selecting lever when the selecting lever falls into the indent in its cam. As the selector cam clutch rotates, each selecting lever is moved forward as it rides to the high part of its cam. Selected (dropped) push levers are also moved forward. Unselected push levers remain in the rear position, on top of the notch of the selecting lever. When all five code pulses have been received, push levers are held in their selected or unselected position until the next start bit is received. When the subsequent start pulse is received, the cam clutch is again engaged. The push lever reset bail, following its cam, unlatches the selected push levers. The push levers then return to their unselected (rear) position under their spring tension.

(3) Orientation. For optimum performance, the selecting mechanism should sample the code elements at the most favorable time. Manual operation of the range finder varies the time of sampling between the operating margins. Adjusting the range finder is called orientation. When the range finder knob (figure 3-9) is pushed inward and rotated, its attached range finder gear moves the range finder sector (which mounts the stop arm, bail, stop arm, and latch lever) either clockwise or counterclockwise about the selector cam clutch. This changes the angular position at which the selector cam clutch stops with respect to the selecting levers. When an optimum setting is obtained, the range finder knob is released. Its inner teeth engage the teeth of the indexing lock stud to lock the range finder mechanism in position. The setting may be read on the range finder scale opposite the fixed index mark.

c. Positioning the Code Bars. The code bars in the typing unit are positioned as described in the following paragraphs.

(1) Code Bar Mechanism. Refer to figure 3-21. The character printed or the function performed by the typing unit is basically determined by the code bar mechanism, to which the input signal intelligence, translated into mechanical form, is transmitted from the selecting mechanism push levers The code bars are positioned by code bar shift bars which move to the left for marking and to the right for spacing. The shift bars, positioned to the rear for marking and forward for spacing, are pushed into marking position by selected push levers through a mechanical linkage, intermediate arms, and transfer levers. Power to position the selected code bar shift bar, and through them the code bars, is supplied by the code bar clutch. The code bar clutch is engaged by its cam on the selector cam clutch.

(2) Code Bar Operation. Refer to figures 3-21, 3-22, and 3-23. Each selector push lever has an associated intermediate arm, transfer lever, and code bar shift bar (figure 3-21). In addition, there is a common transfer lever with its code bar shift bar. When a push lever is toward the rear (spacing) its associated intermediate arm and transfer lever are pulled toward each other by a spring. The upper end of the transfer lever is held forward (spacing), holding the code bar shift bar in spacing position. When a push lever is moved forward (marking), it rotates the intermediate arm counterclockwise, positioning the transfer lever to the rear (marking) and holding the code bar shift bar in marking position. The common transfer lever (third from left, operating the common code bar, third from bottom) has an extension which passes behind the number 1 and 2 transfer levers. There is no connection between the common transfer lever and the selecting mechanism, but when either the

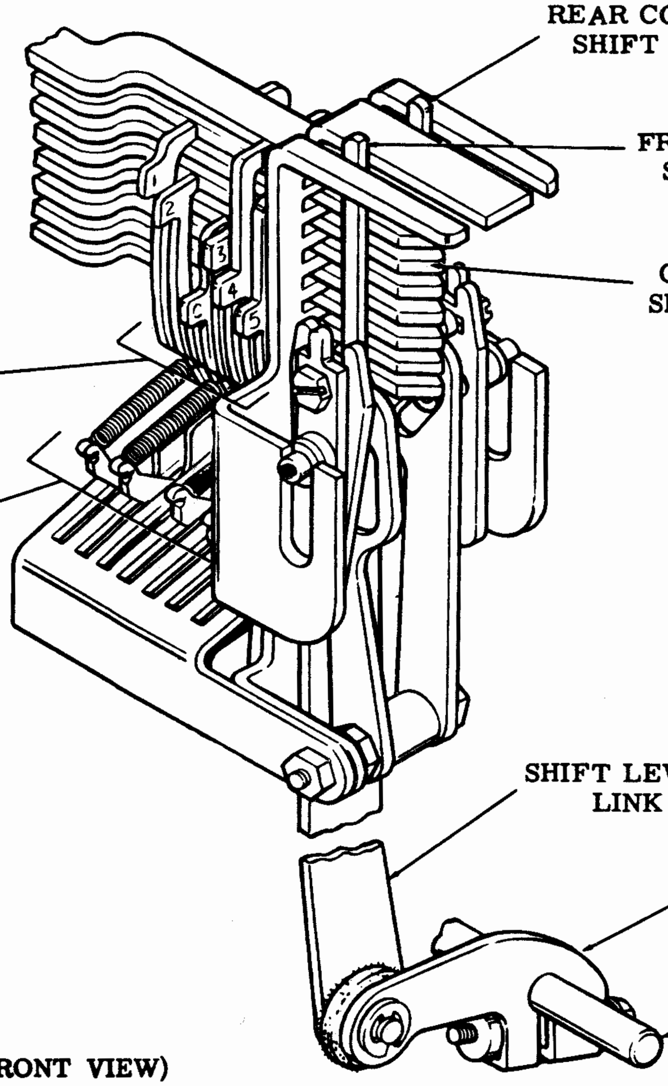



Figure 3-21. Code Bar Mechanism

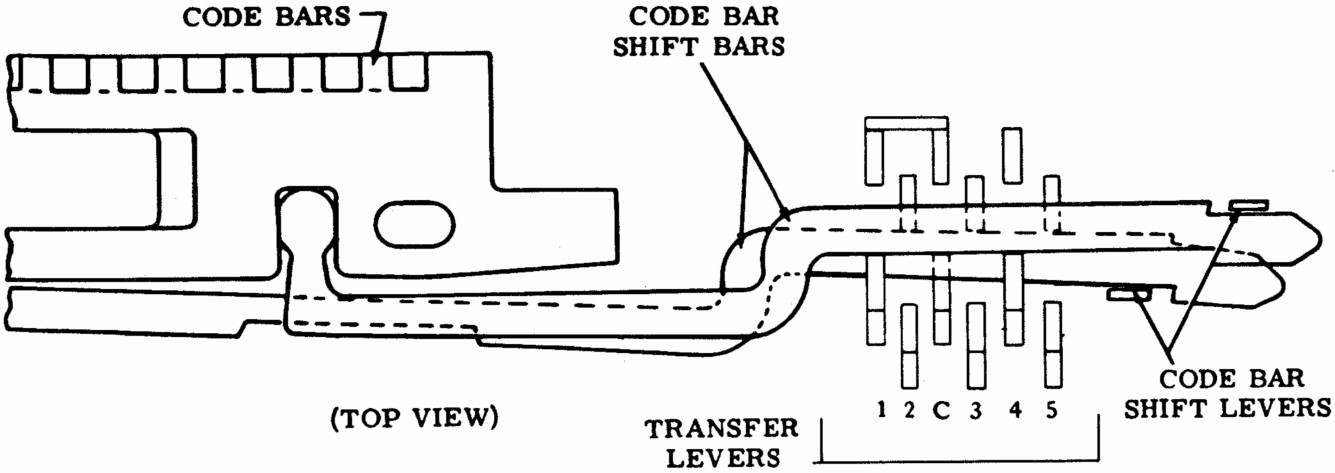



Figure 3-22. Code Bar Shift Bar Positioning

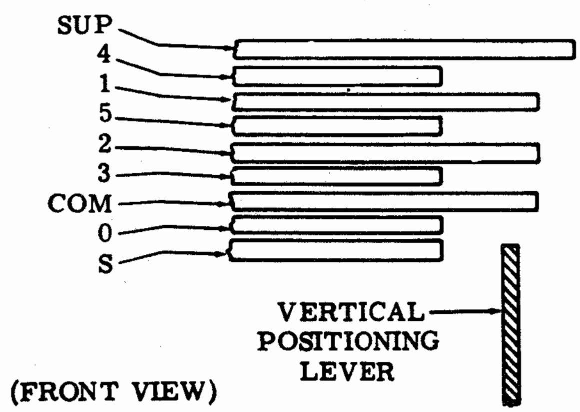



Figure 3-23. Vertical Arrangement of Code Bars

number 1 or number 2 push bar is selected, the associated transfer levers position the common code bar shift bar to the rear (marking). Both ends of these code bars determine vertical positioning of the type box (figure 3-24). As the selector cam clutch completes its revolution, the trip shaft operating lever rides to the peak of the code bar clutch trip cam (figure 3-15). This causes the shaft to turn slightly (counterclockwise, viewed from the right) to move the code bar clutch trip lever away from the clutch stop lug and engage the clutch. Rotation of the clutch operates an eccentric and the shift lever drive shaft, shift lever drive arm, and shift lever drive link. The drive link moves two code bar shift levers in a scissors-like action, the front lever moving to the right, the rear lever moving to the left. Any code bar shift bar in marking position (left) during the previous operating cycle is moved to spacing position (right) by the forward shift lever, unless the transfer lever is once again holding that bar to the rear (marking). The rear shift lever, as it moves to the left (figure 3-22), carries with it any code bar shift bar held in the marking position, completing the transfer of intelligence from the selecting mechanism to the code bars. At the end of one revolution, the code bar clutch trip lever strikes the clutch shoe lever. Inertia of the cam disk assembly causes it to continue to turn to permit the latch lever to drop into the indent in the cam disk, and the clutch is held disengaged. The code bars, code bar shift bars, and shift levers are held in the selected position, but the transfer levers and intermediate arms are free to position the shift bars forward or to the rear in response to new input signal intelligence from the selector.

(3) Code Bar Arrangement. Refer to figure 3-17. A total of nine code bars in marking (left) or spacing (right) position convey mechanically translated signal intelligence to the typing and function mechanisms. The code bars are arranged from top to bottom as follows: suppression, number 4, number 1, number 5, number 2, number 3, common, zero (0), and letters-figures shift (S).

d. Positioning the Type Box. The type box is positioned as described in the following paragraphs.

(1) General. All of the characters (graphics) that may be printed by the typing unit are formed by type pallets which are arranged in a type box. The type box is mounted in a carriage from which it may be removed for cleaning or replacement. In order to print any selected character, the type box carriage is so positioned that the character on the pallet is directly over the desired location on the paper. Since the pallets are arranged in four horizontal rows and sixteen vertical rows, it is necessary to position the type box carriage both horizontally and vertically. See figure 3-24 for arrangement of graphics which are represented on the type box pallets. See figure 3-7 for input signal code permutations equivalent to each graphic representation. The type box carriage rides on rollers over a track which is moved vertically for positioning in that particular plane. The carriage is positioned horizontally on its track by the oscillating

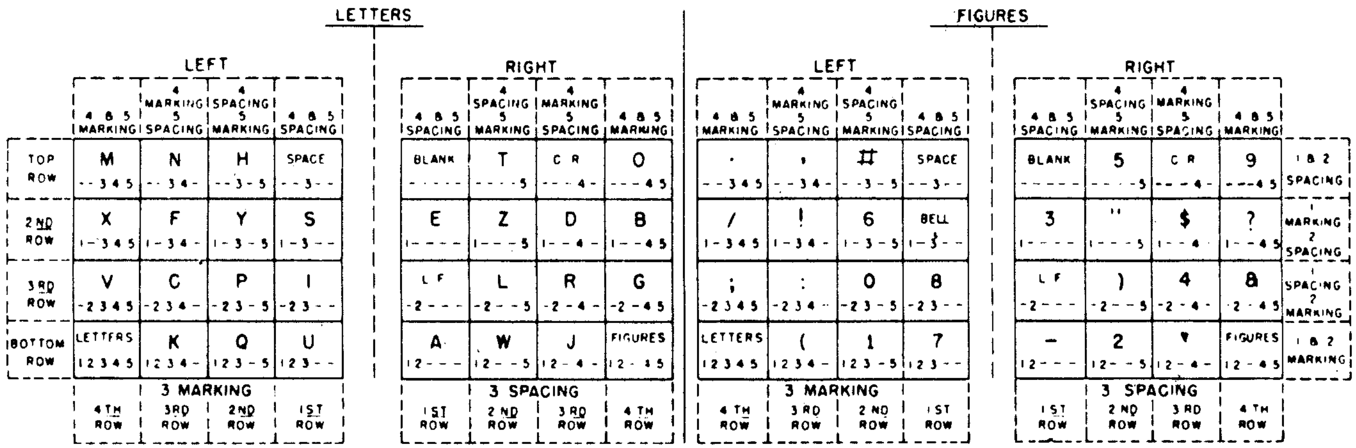



Figure 3-24. Typical Type Box Pallet Arrangement

rail slide and type box carriage link. The slide rides the oscillating rail and is clamped to the rear section of the upper draw wire rope. The link provides a flexible connection to permit the type box carriage to follow both the vertical movement of the type box carriage track and the horizontal movement of the oscillating rail slide. The lower right rear end of the upper draw wire rope is fastened to the spacing drum. From this point, it passes partway around the spacing drum, upward and around the right rail pulley, over to the left rail pulley and downward to the spring drum. After passing partway around the spring drum, the upper draw wire rope is doubled backward around it and passes upward to the left printing carriage rail pulley over to the right printing carriage rail pulley, and downward to the spacing drum to which it is again fastened. The lower draw wire rope is fastened at its left end to the spring drum and, at its right end, to the spacing drum. It acts in opposition to the upper draw wire rope and holds the two drums in phase (figure 3-25). A tensioning pulley rides the under side of the lower draw wire rope, to take up any slack which may occur due to stretching of the upper and lower draw wire ropes. The oscillating rail is supported by pivoted arms at each end. These arms which extend downward are pivoted on the typing unit frame at their lower ends. Thus, the oscillating rail and draw wire rope that it carries with it may be shifted to the left or right with no change in position relative to each other. The oscillating rail shift slide and two oscillating rail shift links are used to accomplish the horizontal positioning of the oscillating rail and also connect it with the oscillating rail shift slide. The links are pivoted and are of such a length that only one at a time may be fully extended.

(2) Letters-Figures Shift. Refer to figure 3-26. Mechanical limitations restrict the selection from the type box pallets to four horizontal rows and eight vertical rows. With a total of sixteen vertical rows in the type box, it is necessary to determine which of two fields, letters (left half of type box) or figures (right half of type box) will be presented for printing. To accomplish this, a special non-printing signal combination is used for each shift operation. Upon receipt of the letters or figures shift signal, mechanisms provided in the stunt box initiate the shifting operation. This, as are other non-printing operations, is described under Functions. The operation of the mechanisms that perform the actual shifting of the type box, however, are as follows: the lowermost code bar, designated S, contains a pin near its right end that projects upward to permit engagement with the stunt box. The code bar is positioned to the left (the figures position) or to the right (the letters position). A slotted extension of the S code bar engages a tongue from the right end of the letters-figures shift slide and causes it to follow the S code bar movements. Pins at the end of the shift slide serve as lower guides for the right and left shift link breaker slides. Pins which project from the front plate serve as upper guides and pivot points. The main bail has left and right breaker slide bails mounted on its ends. Upon receipt of the signal code for the letters shift operation, the

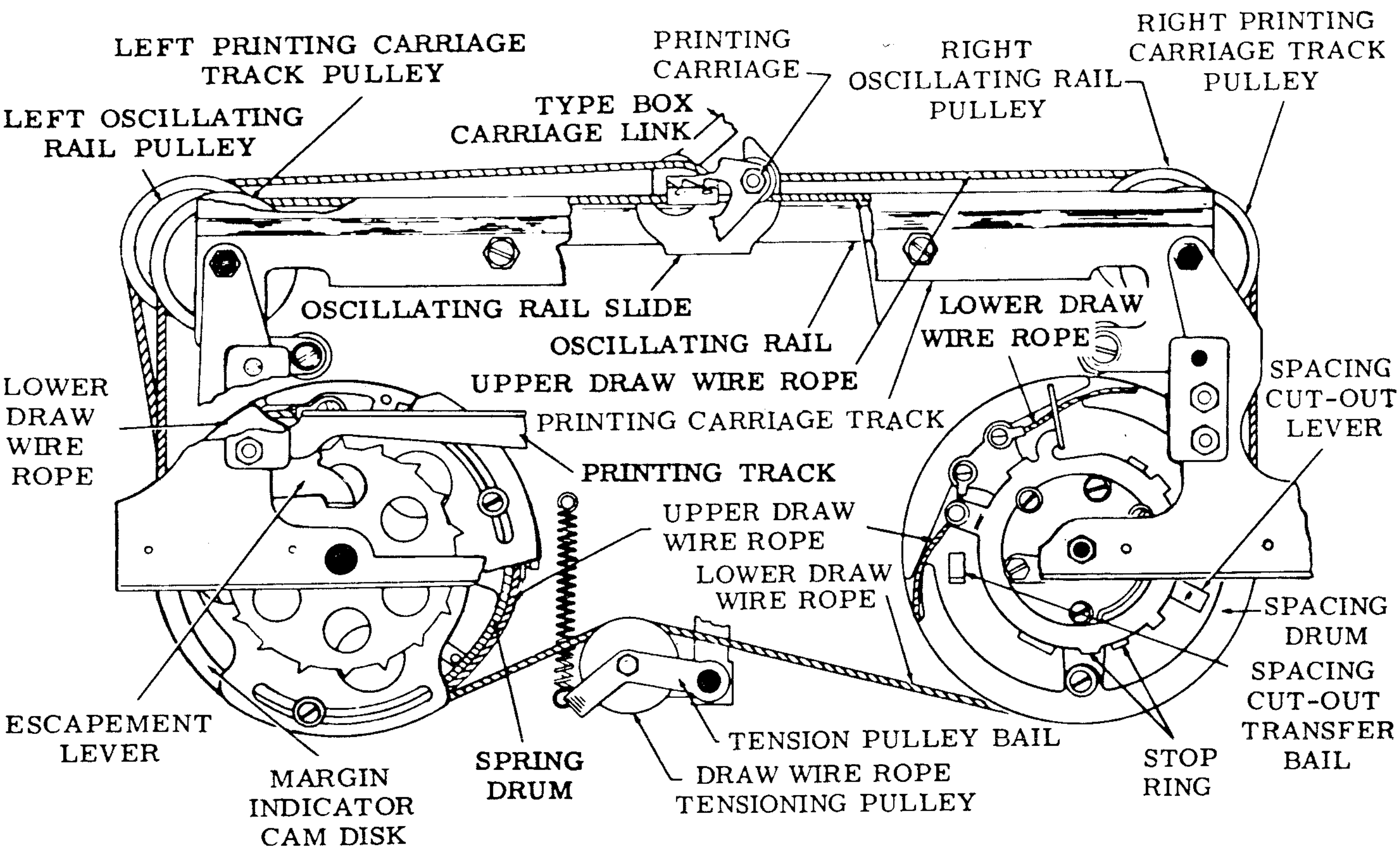



Figure 3-25. Draw-Wire Rope and Drums (Front View)

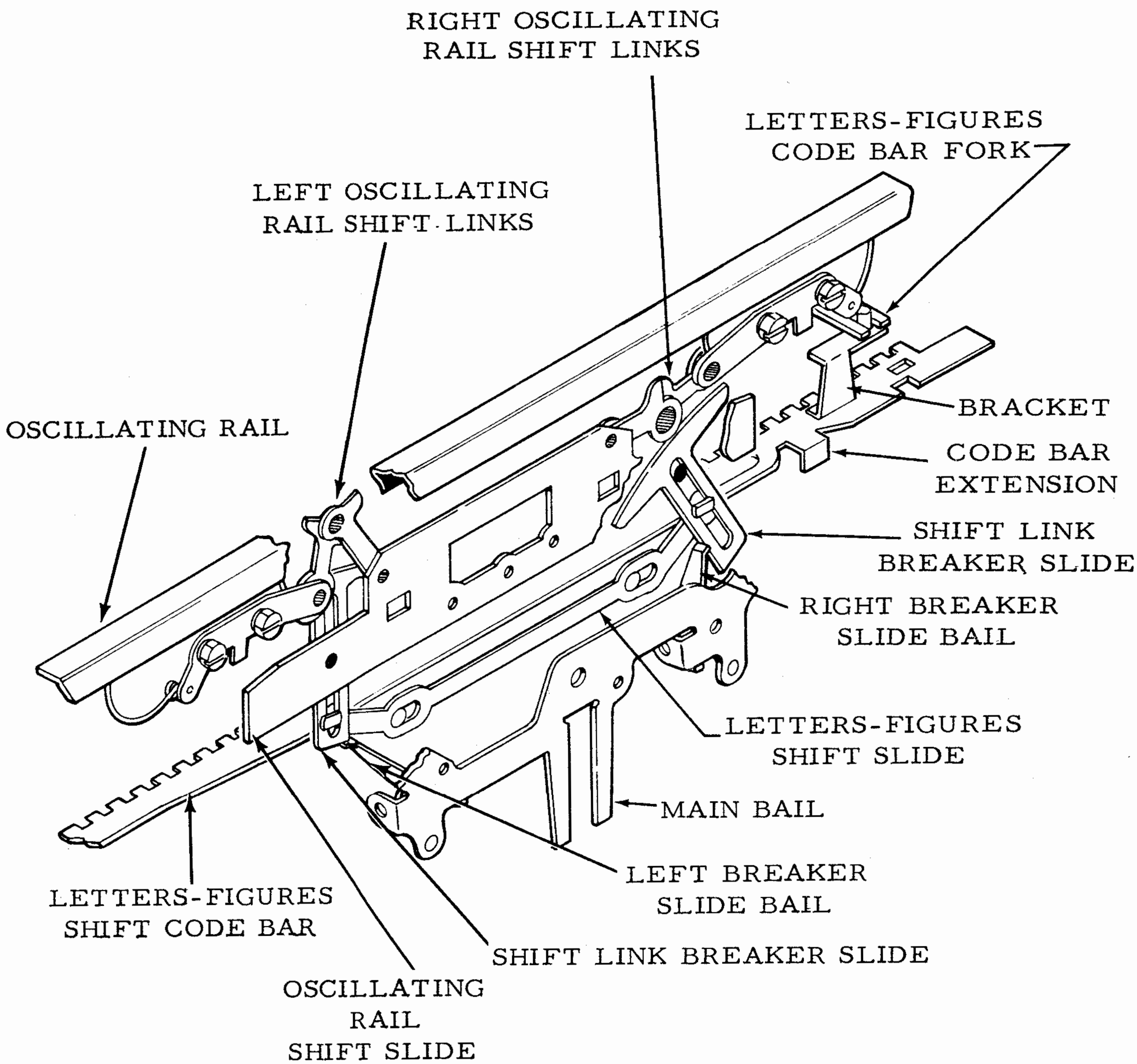



Figure 3-26. Letters-Figures Shift Mechanism
(Left Front View)

shift slide is moved to the right. This positions the left shift link vertically with its lower end over the left breaker slide bail. The right breaker slide is positioned so that its lower end is to the right of the right breaker slide bail. As the main bail moves upward, the right breaker slide bail clears the right breaker slide, but the left breaker slide bail engages the left breaker slide and moves it upward. As a result of this action, the left oscillating rail shift links open and the oscillating rail is permitted to be moved to the right. This action presents the letters field in line for printing. In a similar manner, when the signal code for the figures shift is received, the right oscillating rail shift links are opened, the oscillating rail shifts left, and the figures field of the type box is in line for printing.

(3) Vertical Positioning. Refer to figure 3-27. The selection of the various characters from the four horizontal rows and eight vertical rows in either field (figures or letters) and the printing of those characters take place as follows: the number 1 and number 2 code bars determine selection of the horizontal row. The number 3 code bar determines if the selection is to be made from the left four vertical rows or the right four vertical rows (in either the figures or the letters field). The number 4 and number 5 code bars determine the selection of one row from the four vertical rows predetermined by the number 3 code bar. Four code bars (longer than the others) extend through the right code bar bracket and serve as stops for the right vertical positioning levers. They are (from top to bottom) the suppression, number 1, number 2, and common code bars. Notches are arranged in the left ends of these code bars so that the left side vertical positioning levers are stopped, in each case, by the same bar that blocks the right side levers. After all code bars have been positioned by the code bar positioning mechanism, the code bar clutch cam follower arm and its roller, in traversing the sloping indent on the code bar clutch cam, rotate the clutch trip lever shaft. As the shaft turns, it first causes the function clutch lever to release the function clutch (figure 3-28) and then causes the type box clutch trip arm to engage its trip lever and release the type box clutch. When the type box clutch completes its revolution, it is disengaged by its trip lever and latch lever in the same manner as was the code bar clutch. During its rotation, the type box clutch operates a drive link and a bracket to cause the main rocker shaft to oscillate. This, in turn, through its left and right brackets and the main side drive links, extends the motion to the vertical positioning levers (figure 3-27). These levers are driven upward until they strike a projecting code bar, which causes them to buckle. The type box carriage track is mounted between the vertical positioning levers, and its vertical motion is controlled by them. When the number 1 and number 2 code bars are toward the right (spacing), the common code bar is also toward the right, where it blocks the vertical positioning levers. The top row of pallets in the type box are then in line for printing. When the number 1 code bar is toward the left (marking), the common code bar

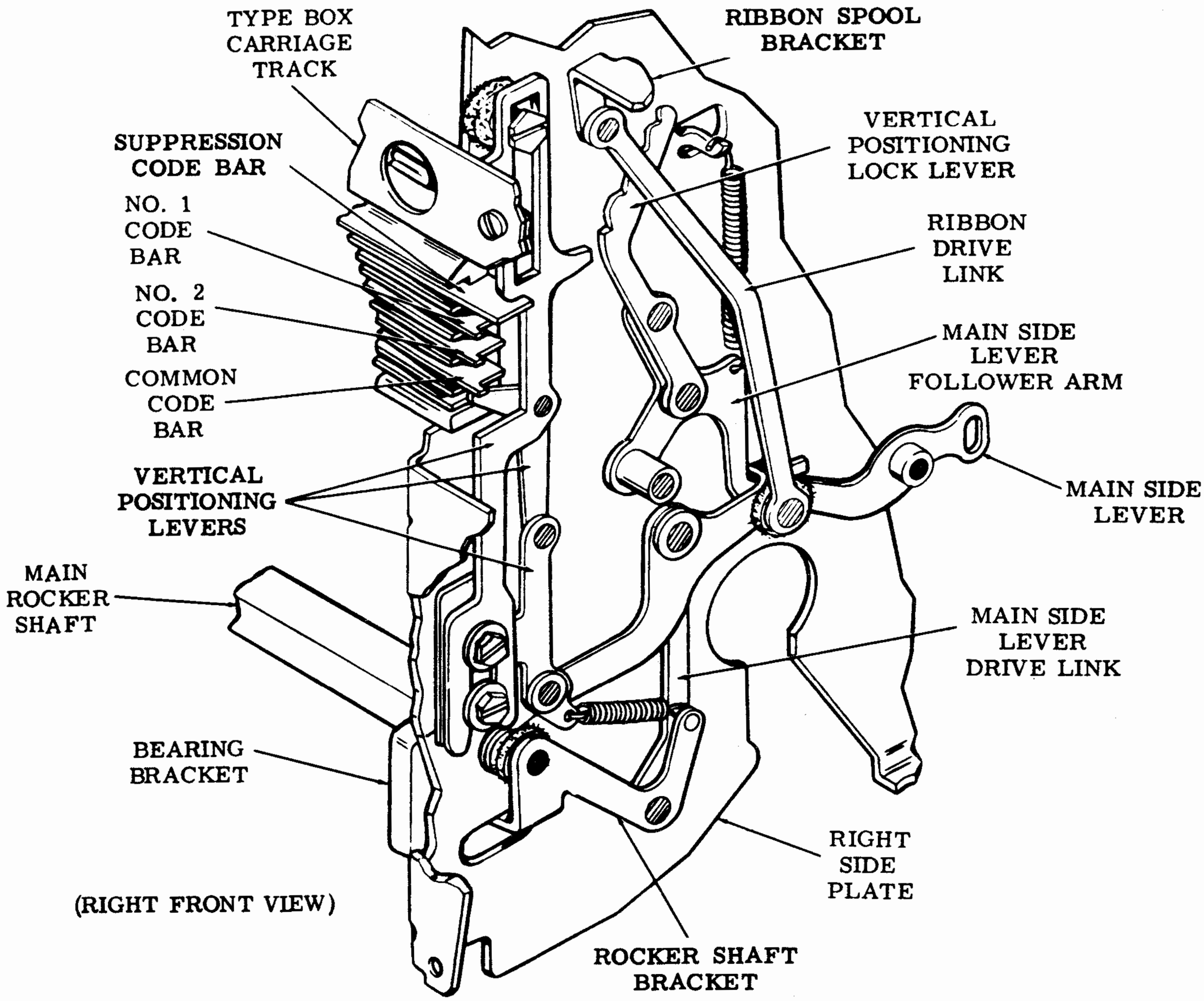



Figure 3-27. Vertical Positioning Mechanism

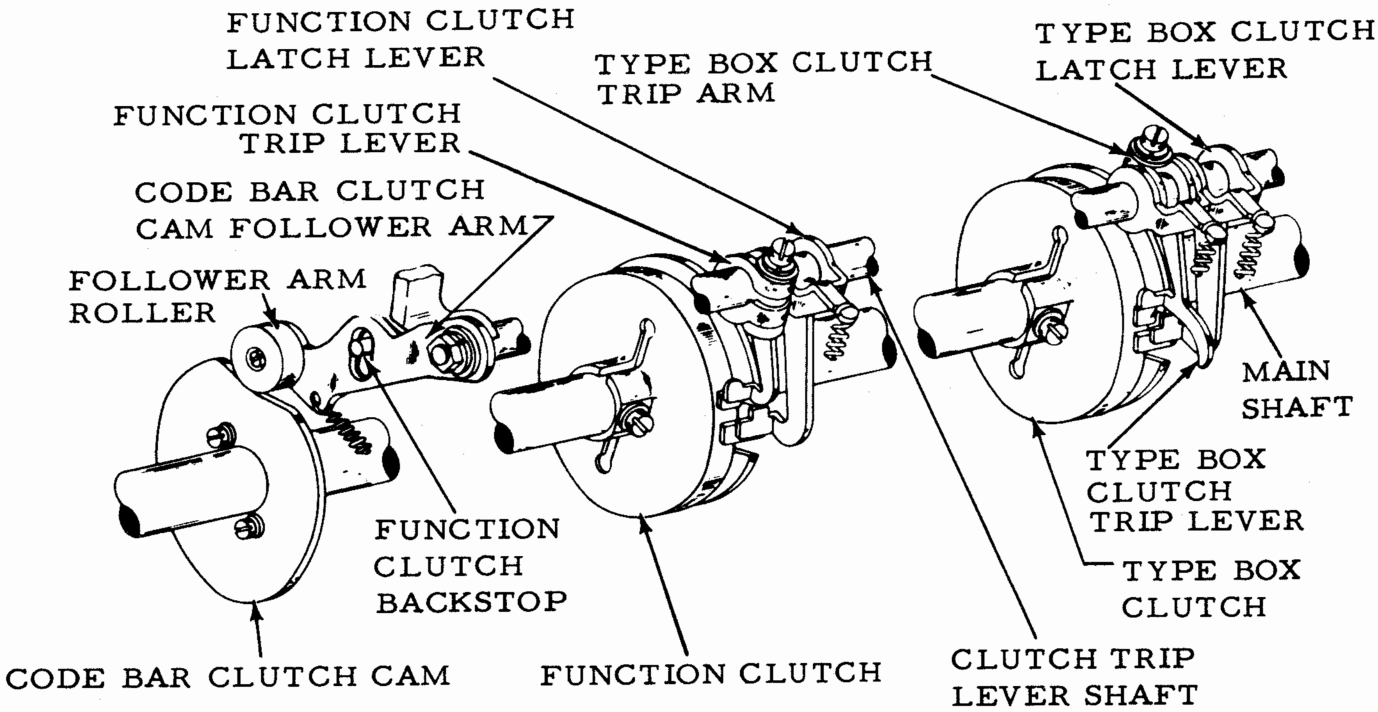



Figure 3-28. Clutch Trip Mechanism (Right Rear View)

is toward the left. If the number 2 code bar is toward the right (spacing), it blocks the vertical positioning levers, and the second row of pallets (from the top) is then in line for printing. When the number 1 code bar is toward the right (spacing), and the number 2 code bar is toward the left (marking), the common code bar is toward the left. The number 1 code bar blocks the vertical positioning levers and the third row of pallets is in line for printing. When both the number 1 and number 2 code bars are to the left (marking), the common code bar is also to the left. The suppression code bar blocks the vertical positioning levers, and the fourth (bottom) row of pallets in the type box is then in line for printing. At each of the four levels at which the vertical positioning levers may be stopped, they are locked momentarily by lock levers controlled by the main side lever follower arms.

(4) <u>Horizontal Positioning</u>. Refer to figures 3-29 and 3-30. A bracket attached to the main rocker shaft applies vertical motion to the main bail by means of two main bail links (figure 3-29). Attached to each end of the oscillating rail shift slide are pivoted, buckling-type drive links which extend downward to each end of the main bail. As the main bail moves downward under impetus of the type box clutch, the left shift slide links, if not buckled, will try to shift the oscillating rail shift slide links to the left. When the

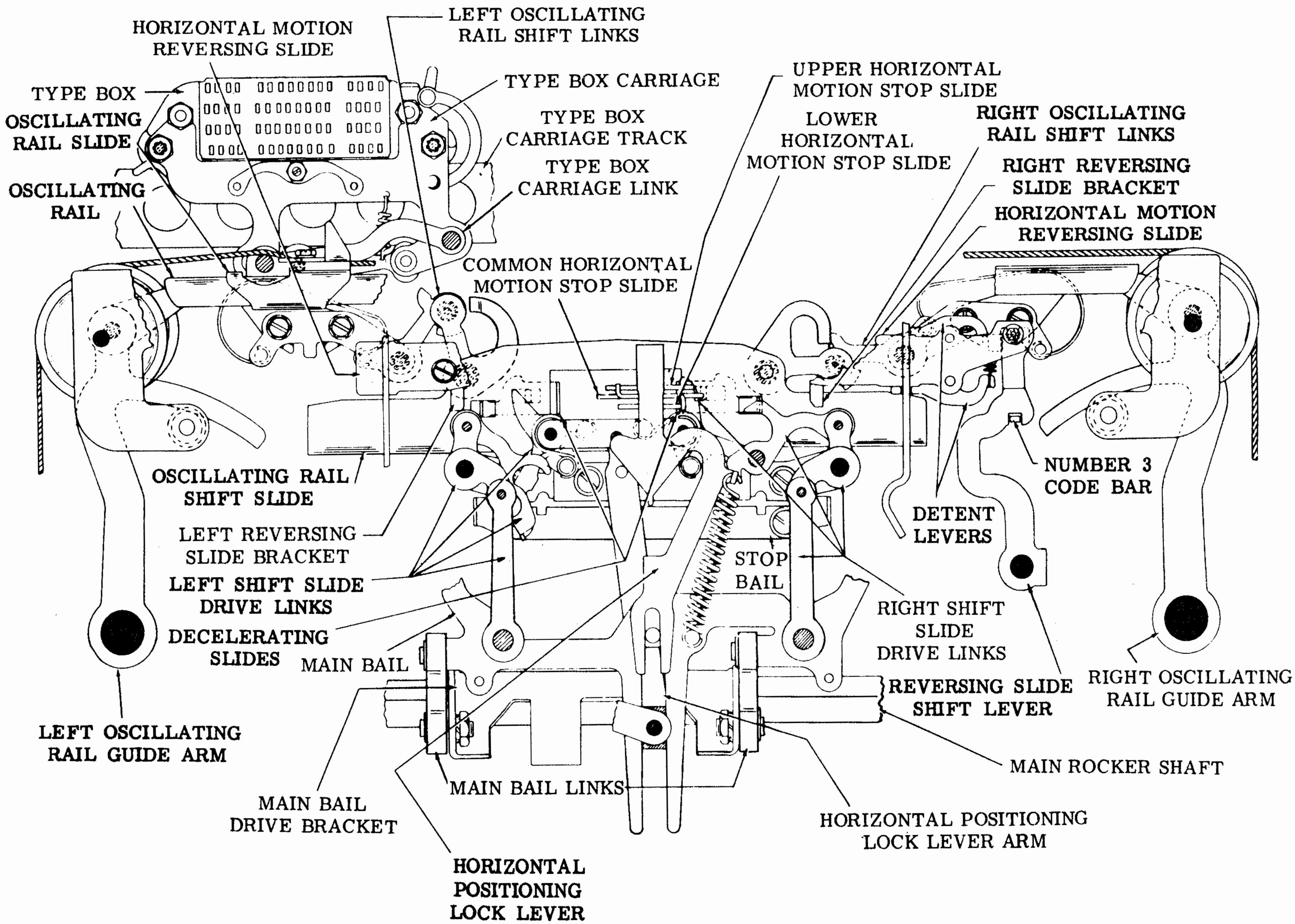



Figure 3-29. Horizontal Positioning Mechanism (Front View)

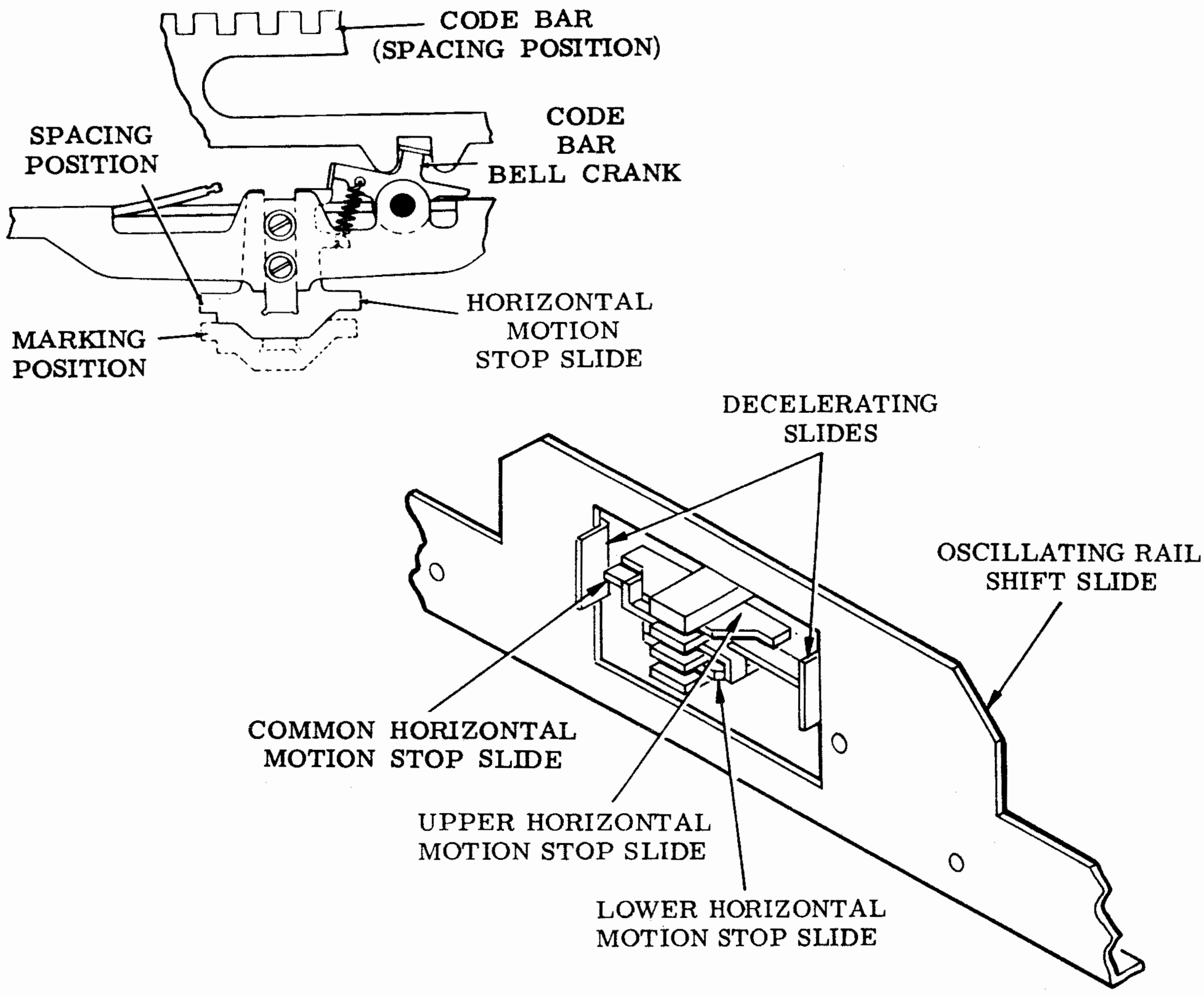



Figure 3-30. Horizontal Motion Stop Slides
(Right Front View)

number 3 code bar is shifted toward the left (marking), the horizontal motion reversing slide is shifted toward the left by the reversing slide shift lever, and is held there by detent levers. A bracket near the right end of the reversing slide will then make contact with the right shift slide drive links and cause them to buckle. As the main bail is driven downward, the unbuckled left shift slide drive links will start to shift the oscillating rail shift slide toward the right. This positions the type box so that the characters to be printed will be located in the left half of the figures or the letters field. In a similar manner, when the number 3 code bar is shifted toward the right (spacing), the horizontal motion reversing slide is also shifted toward the right by the shift lever and is held there by the detent levers. A bracket near the left end of the horizontal motion reversing slide then makes contact with the left shift slide drive links and causes them to buckle. As the main bail is driven downward, the unbuckled right shift slide drive links will start to shift the oscillating rail shift slide toward the left. This positions the type box so that the characters to be printed will be located in the right half of the figures or the letters field. After determination of the field (figures or letters) and the group of vertical rows in which the character to be printed are located, the number 4 and number 5 code bars operate three horizontal motion stop slides to determine the row in that group in which the character is to be found (figure 3-30). A wedge shaped horizontal positioning lock lever which is pulled downward by the main bail through a yield spring bears against the horizontal positioning lock lever arm. This arm drives the oscillating rail shift slide in the direction in which it was started (by the number 3 code bar selection) until one of two decelerating slides which are mounted on the oscillating rail shift slide strikes an unselected horizontal motion stop slide. A camming surface on the unbuckled shift slide drives the decelerating slide and causes the drive links to buckle. The oscillating rail shift slide finally comes to rest when it strikes the blocked decelerating slide. This, in turn, ends the downward excursion of the lock lever, and the yield spring extends until the main bail reaches the lowest point of its oscillation. As the main bail returns upward, it centers the oscillating rail shift slide. It is during this time that the horizontal motion stop slides are positioned for the selection of the next character. The number 4 and number 5 code bars each operate a code bar bell crank. Each, in turn, moves a horizontal motion stop slide toward the front (marking) or toward the rear (spacing) (figure 3-30). A third (common) stop slide (spring tensioned toward the rear) is located between the upper and lower stop slides, and has projections which pass across the front edges of these slides (figure 3-29). Each stop slide is of a different length. The common stop slide, which is the longest stop, has an additional stop on its shank, so that it serves as the shortest stop when all the slides are moved forward. The upper slide (operated from the number 4 code bar) is the second longest stop, and the lower slide (operated from the number 5 code bar) is the third longest stop. When both the number 4 and number 5 code bars are moved toward the right (spacing), their respective horizontal motion stop slides are toward the rear. The oscillating rail shift slide is moved to the right or left of its central position (determined by the number 3 code bar) until it is stopped by one end of the common horizontal motion stop slide. This positions the first vertical row (right or left of the center of the figures field or the letters field) in line for printing. When the number 4 code bar is toward the right (spacing), and the number 5 code bar is toward the left (marking), the lower and the common stop slides are toward the front, and the upper stop slide is toward the rear. The oscillating rail shift slide is moved to the right or left of its central position until it is stopped by one end of the upper stop slide. This positions the second vertical row (right or left of the center of the figures field or the letters field) in line for printing. When the number 4 code bar is toward the left (marking) and the number 5 code bar is toward the right (spacing), the upper and the common stop slides are toward the rear. The oscillating rail shift slide is moved toward the right or left of its central position until it is stopped by one end of the lower stop slide. This positions the third vertical row (right or left of the center of the figures field or the letters field) in line for printing. When both the number 4 and the number 5 code bars are toward the left (marking), their respective horizontal motion stop slides and the common stop slide are toward the front. The oscillating rail shift slide is moved toward the right or left of its central position until it is stopped by one side of the shank of the common stop slide. This positions the fourth vertical row (right or left of the center of the figures field or the letters field) in line for printing.

e. Printing. After the type box has been moved so that the selected type pallet is in its proper position, it must be struck by a print hammer in order to print. This is accomplished by the action of the printing carriage located on the printing carriage track at the top of the front plate mechanism.

(1) Positioning. Refer to figures 3-29 and 3-31. The printing carriage rides on rollers on the printing carriage track, which is rigidly attached to the typing unit front plate. The carriage is clamped to the forward section of the upper draw wire rope. This moves the carriage along its track in such a manner that the hammer advances to the next printing position after each character (graphic) is imprinted.

(2) Operation. The printing track which is located on the front of the typing unit (figure 3-31) is fastened to an extension at each end of the main bail. As the main bail reciprocates vertically, it extends the motion through the printing track, which travels in guides located at each end of the track. The printing arm, which extends downward from the printing carriage, rides the printing track. As the arm follows the reciprocating motion of the track, its upper end moves first toward the left and then toward the right. When the upper end of the arm moves toward the left, it rotates the print hammer operating bail

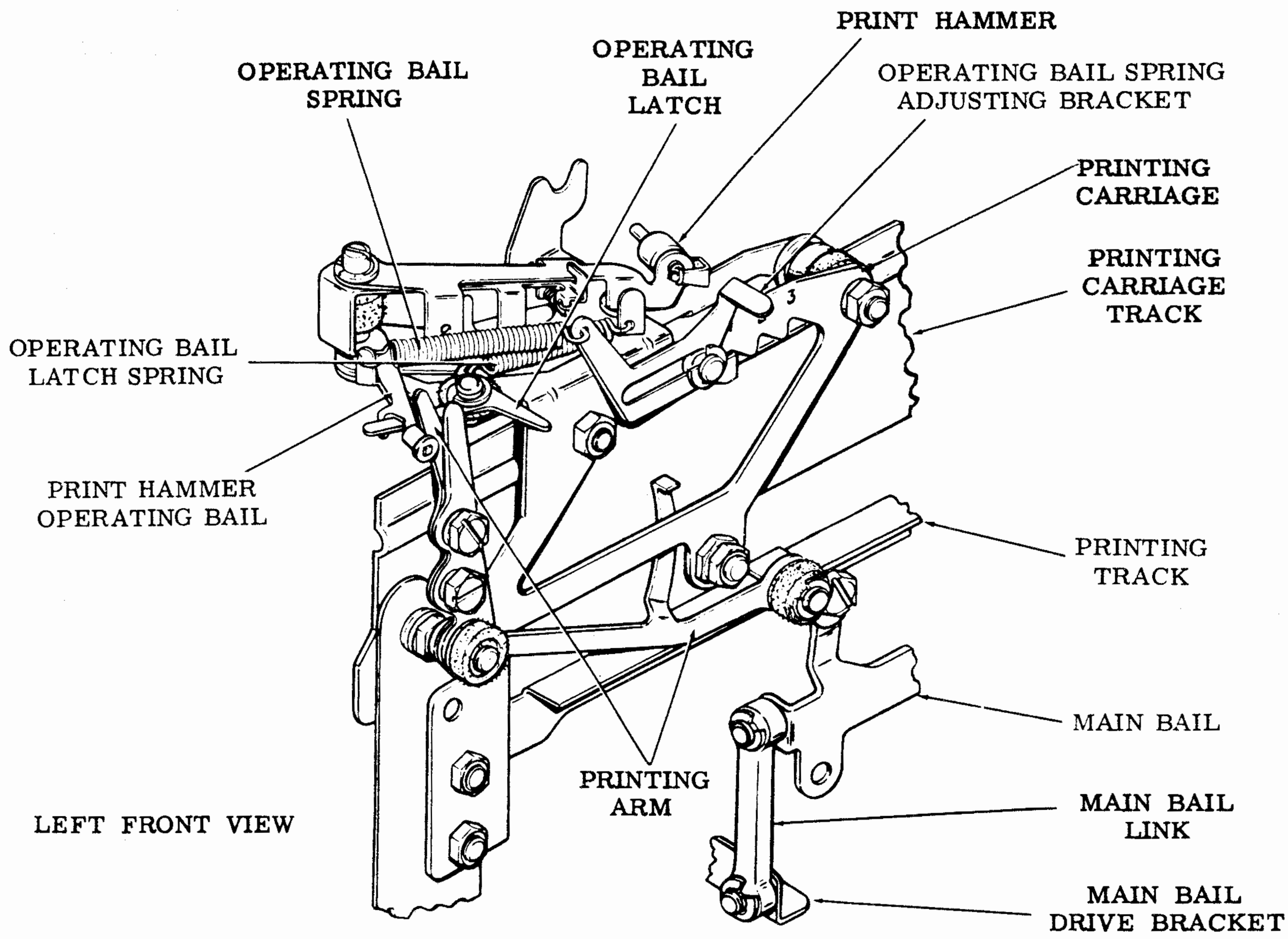



Figure 3-31. Print Hammer and Carriage

clockwise against its spring tension until it becomes latched by the operating bail latch. The print hammer operating bail draws the print hammer away from the type box by means of the print hammer bail spring. When the upper end of the printing arm moves to its extreme right position, it makes contact with the latch and causes it to release the print hammer operating bail. The operating bail is swung in a counterclockwise direction by the operating bail spring until it strikes its stop. The print hammer bail, in being driven by the operating bail, is swung toward the type box. When the operating bail is stopped, momentum causes the print hammer bail to continue its travel against the tension of the print hammer bail spring until the printing hammer strikes the selected type pallet. The force with which the hammer strikes is adjustable to three positions marked on the carriage.

f. Spacing. The spacing function is accomplished as described in the following paragraphs.

(1) General. Refer to figures 3-31 and 3-32. To space the printed characters properly, the type box and printing carriages must be advanced with each character printed. The spacing must also be accomplished when the input signal code combination represents a letter space. As shown in figure 3-25, the carriages are connected to a draw wire rope which, in turn, is fastened to the spring drum and the spacing drum. The purpose of the spring drum, which contains a torsion spring, is to tension the draw wire rope and pull the carriages to the left. The spacing drum has ratchet teeth about its perimeter which are engaged by the eccentric driven spacing drum feed pawls (figure 3-32). The spacing shaft which mounts the spacing eccentrics is driven through its helical gear attached to the three stop spacing clutch on the main shaft. The gear ratio of 1-1/2 to 1 causes the spacing shaft to turn one-half of a revolution each time the spacing clutch is tripped. This allows the feed pawls to advance the spacing drum by one ratchet tooth. The same trip shaft which, through a cam on the code bar clutch trips the function clutch, also rotates the type box clutch trip lever counterclockwise (viewed from the left). Unless movement of this lever is blocked by the print suppression mechanism, the type box clutch is engaged, oscillating the main rocker shaft, which drives the printing mechanism. A cam plate (figure 3-32) fastened to the bottom of the rocker shaft is moved upward by the shaft as it begins its movement. The cam plate operates the spacing trip lever bail. As this bail is rotated, it raises the spacing trip lever until it latches onto the spacing clutch trip lever arm. As the rocker shaft reverses its direction of rotation, the spacing trip lever bail and the trip lever move downward under spring tension, causing the latched-up spacing clutch trip lever arm to operate the spacing clutch trip lever and engage the spacing clutch. Before the spacing clutch completes one-third of a revolution, its restoring cam moves the spacing trip lever about its pivot point until it releases the spacing clutch trip lever, which returns to its normal position in time to stop the spacing clutch after one-third of a revolution. The

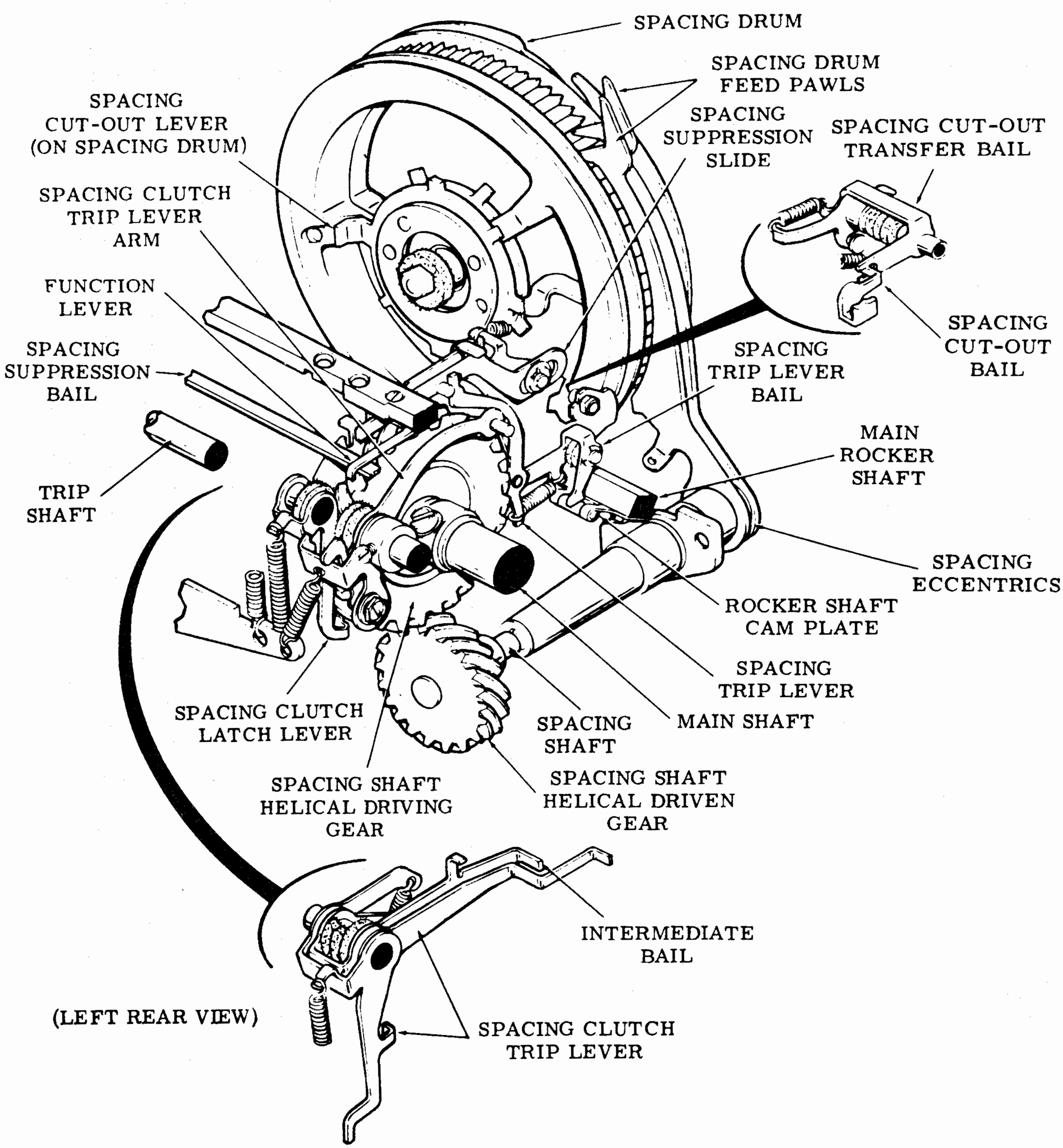



Figure 3-32. Spacing Mechanism

spacing clutch three-stop cam disk upon which the latch lever rides has an indent at each stop position. When one of the three lugs on the clutch shoe lever disk strikes the spacing clutch trip lever, the inertia of the cam disk assembly causes it to turn until its lugs make contact with the lugs on the clutch shoe lever disk. The latch lever drops into an indent in the cam disk, and the clutch is held disengaged until the trip lever is again operated.

(2) Space Function. The non-typing function, by which spacing between words or any spacing other than that which accompanies printing is accomplished, is initiated when the code bars are set in a combination equivalent to the spacing code combination (all spacing except third pulse marking). The function is executed through the code bar clutch tripping the printing clutch and the spacing clutch. For this function, the type box is positioned so that a vacant pallet (top horizontal row, first right row in the figures field) is presented beneath the type hammer. No printing occurs when the type hammer is tripped in its normal fashion. The stunt box is not involved in the execution of this function.

(3) Space Suppression. Refer to figure 3-32. When certain non-typing functions are selected or when the carriages reach their extreme right position, it is necessary to suppress spacing to avoid interference with the page-printed message or damage to the equipment. This is accomplished by moving the spacing suppression slide forward to a point at which it will hold the upper end of the spacing trip lever forward and prevent it from engaging the spacing clutch trip lever. In the case of spacing suppression on selection of a function code combination, the spacing suppression slide is shifted forward by the spacing suppression bail, mounted beneath the function box. When space suppressing function levers are selected, they engage the bail and, when the function mechanism is operated, move the bail forward. Moved forward with the bail, the suppression slide prevents engagement of the spacing clutch. When the carriages are near their extreme right position, a cut-out ring on the spacing drum engages the spacing cut-out transfer bail, which in turn operates the spacing cut-out bail. The ring and the end of the spacing cut-out transfer bail are shown in figure 3-25. The spacing cut-out bail shifts the spacing suppression slide forward and prevents engagement of the spacing clutch until the carriages are returned. The maximum number of characters which the typing unit may print is eighty-five, including spacing function spaces. In order to prevent spacing beyond this point, and subsequent damage to the equipment, several teeth are omitted from the spacing drum ratchet wheel.

(4) Margin Indicator. Refer to figure 3-25. When used in conjunction with a keyboard base, the typing unit actuates a margin indicator switch (base mounted). Before the type box carriage reaches the end of its travel, an actuator mounted on the face of the spring drum operates the switch contact. The angular position of the cam disk with respect to the spring drum may be altered to change

the point at which the indicator contact will be closed.

g. Ribbon Feeding. The ribbon feeding function of the typing unit is discussed in the following paragraphs.

(1) General. Refer to figure 3-33. The left and right ribbon feed mechanisms oscillate in a vertical plane with each revolution of the type box clutch. They are driven by ribbon drive links attached to the main side levers (figure 3-27). At their uppermost position, the ribbon mechanisms position the ribbon relative to the horizontal type box row being printed. After each character is printed, the ribbon mechanisms are dropped downward together with and behind the type box, to permit viewing of the last printed character. The ribbon is held in place at the point of printing by a ribbon guide fastened to the rear of the type box carriage. Each of the ribbon mechanisms consists of a bracket which is hinged at its rear end, and upon which is mounted a ribbon spool shaft. A ribbon tension bracket is keyed to the lower end of the ribbon spool shaft. A ribbon ratchet wheel is mounted freely on the ribbon spool shaft just below the ribbon spool bracket, from which it is separated by a friction washer. This applies a constant drag to the ratchet wheel.

(2) Operation. A ribbon tension plate which is keyed to the hub of the ribbon ratchet wheel has two projecting lugs (A and B, figure 3-33) which straddle the lug on the ribbon tension bracket. A ribbon tension spring tends to maintain the ribbon tension bracket against lug A of the ribbon tension plate. In operation, the ribbon spool bracket, driven by the ribbon drive link, pivots about point C. The ratchet feed and ratchet detent levers pivot about points D and E respectively and are held against the teeth on the ribbon wheel by their springs. As the ribbon spool bracket is moved upward, the ratchet wheel feed lever skips over one tooth, while the ratchet detent lever holds the ribbon ratchet wheel from turning backward. When the ribbon spool bracket is moved downward, the ratchet feed lever engages a ratchet tooth and pushes the ratchet wheel. A tooth on the ribbon ratchet wheel then skips over the ratchet detent lever. The teeth on the left and right ribbon ratchet wheels face in opposite directions so that when their feed levers are engaged, the left ribbon ratchet wheel turns counterclockwise (viewed from the top). In order for the ribbon to be pulled from one ribbon spool to the other, only one of the ribbon mechanisms can have its ratchet feed and ratchet detent levers engaged with its ribbon ratchet wheel at a time. As the ribbon ratchet wheel turns, the ribbon tension plate also turns, and extends the ribbon tension spring. When the lug B of the ribbon tension plate makes contact with the ribbon tension bracket, the ribbon spool shaft is made to turn, and the ribbon is wound on the ribbon spool.

(3) Ribbon Reversing. When the ribbon has been completely unwound from one spool, it is necessary to reverse necessary to reverse its direction so it can rewind. This is accomplished automatically by disengaging one set of ratchet feed and ratchet detent levers and engaging the

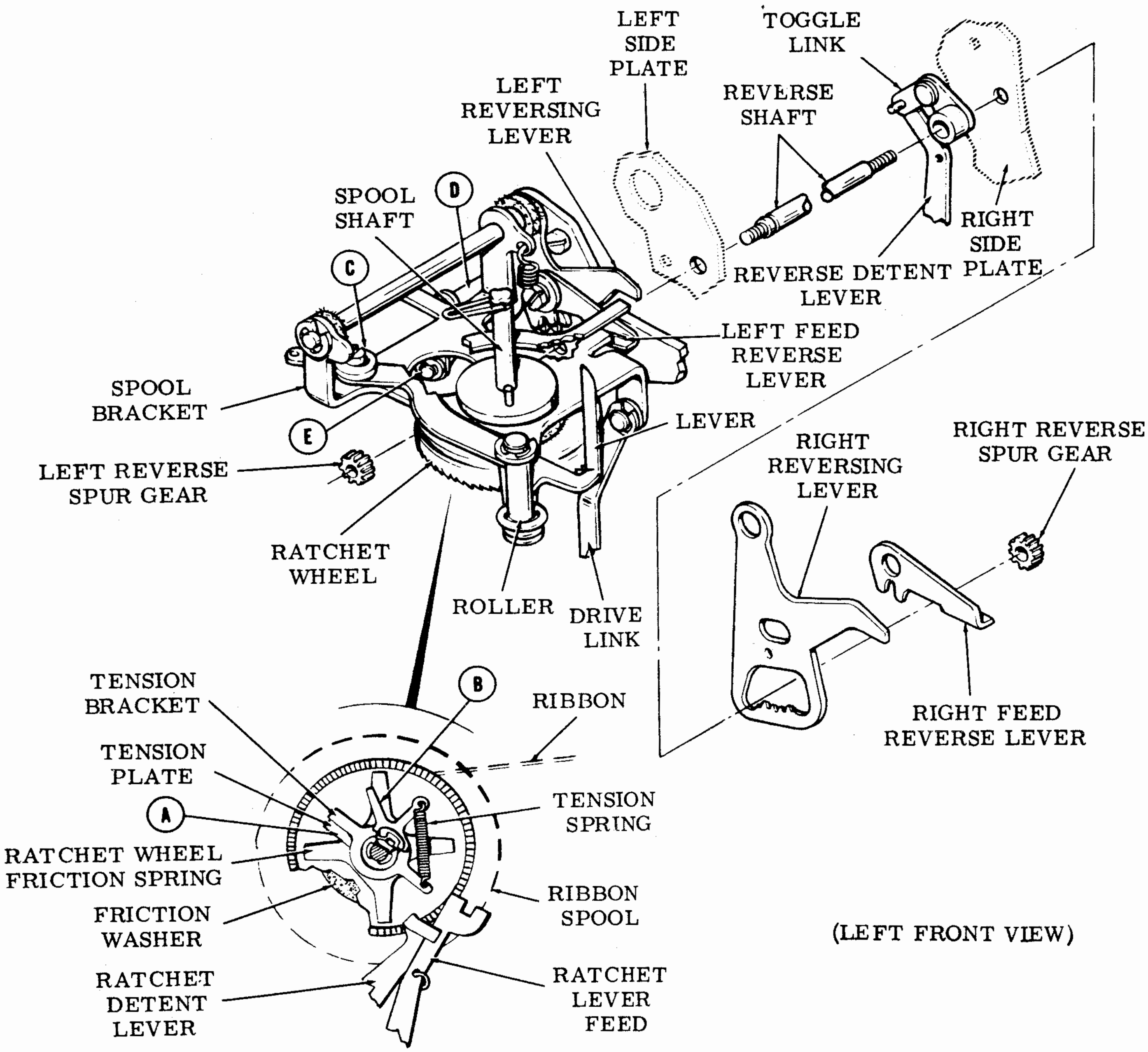



Figure 3-33. Ribbon Feeding Mechanism

other set. While the ribbon is passing from the left spool to the right spool, the right set of levers is engaged. The left set is held disengaged against the tension of the springs by the left ribbon feed reverse lever, which is in its downward position (figure 3-33). The lever is held in this position by means of the ribbon reverse detent lever through the intervening ribbon reverse detent cam, ribbon reverse shaft, and ribbon reverse spur gear. As the ribbon unwinds from the ribbon spool, it passes around the ribbon roller and through the slot in the end of the ribbon lever. When the ribbon nears its end of the ribbon spool, an eyelet which is fastened to the ribbon catches in the ribbon lever slot and pulls the lever toward the right. The next time the ribbon mechanism is moved upward, the displaced ribbon lever engages the end of the left ribbon reversing lever and causes it to move to the position shown in phantom in figure 3-33. As the lever moves, its teeth rotate the left spur gear which, through the ribbon reverse shaft, turns the detent cam and the right spur gear. As the right spur gear moves the right ribbon reversing lever downward, a pin on the lever drives the right ribbon feed lever downward to disengage the ratchet feed and wheel. At the same time a pin on the left ribbon reversing lever moves the left ribbon feed reversing lever upward to permit the left ratchet feed and detent levers to engage the left ribbon ratchet wheel. Thus, the ribbon mechanisms are positioned to rewind the ribbon on the left ribbon spool. When it nears its end on the right ribbon spool, the ribbon is again reversed in a manner similar to that just described. During the reversing cycle, the ribbon is held taut by the previously extended ribbon tension spring.

h. Paper Feeding (Friction Feed). Paper for the page printed message is stored on a roll 8-1/2 inches wide, mounted on a paper spindle suspended between two side plates at the rear of the typing unit. From the roll, the paper passes over a paper straightener shaft, downward behind the platen (figure 3-34) and between the platen and the pressure rollers. A paper pressure bail at the front of the platen equalizes pressure brought to bear on the paper by the pressure rollers. The pressure bail can be released by rotating the paper release lever at the top of the right side plate to the rear (clockwise, viewed from the right) when it is necessary to straighten the paper or to remove paper from the platen. Two paper fingers operated on a spring tensioned shaft across the front of the platen hold copy paper firmly against the plate, in position for printing.

i. Stunt Box Operation. Operation of the stunt box is described in the following paragraphs.

(1) Functions. Refer to figure 3-35. There are two types of operation which can be performed by the typing unit. The first embodies those mechanical actions which are directly necessary to the actual printing of a character (or space function). The second embodies mechanical action which alters the positions of the various mechanisms, or activates external devices or circuits through switching contacts. The latter are known as functions. Spacing may technically be considered a function, but it is

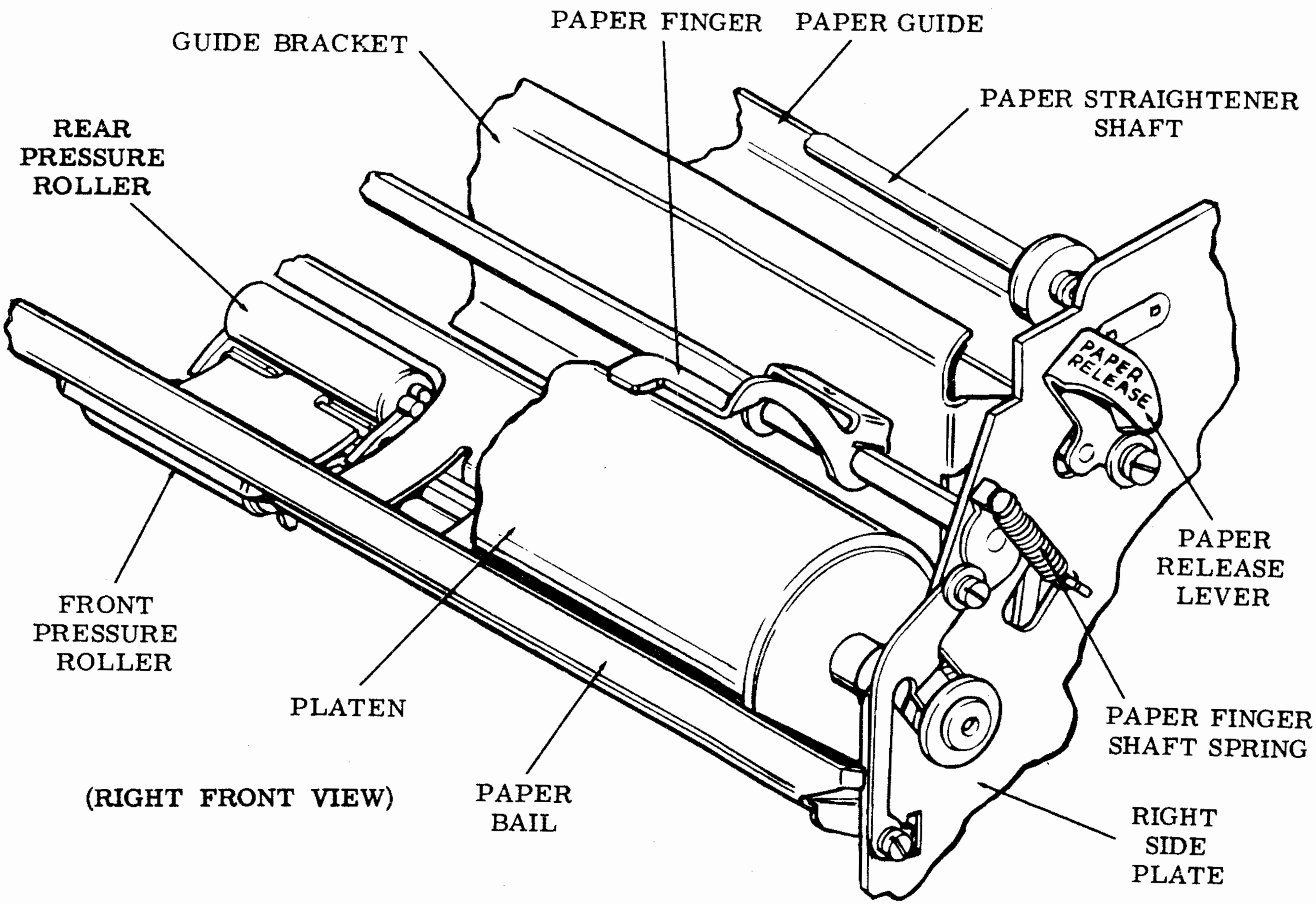



Figure 3-34. Friction Feed Platen Mechanism

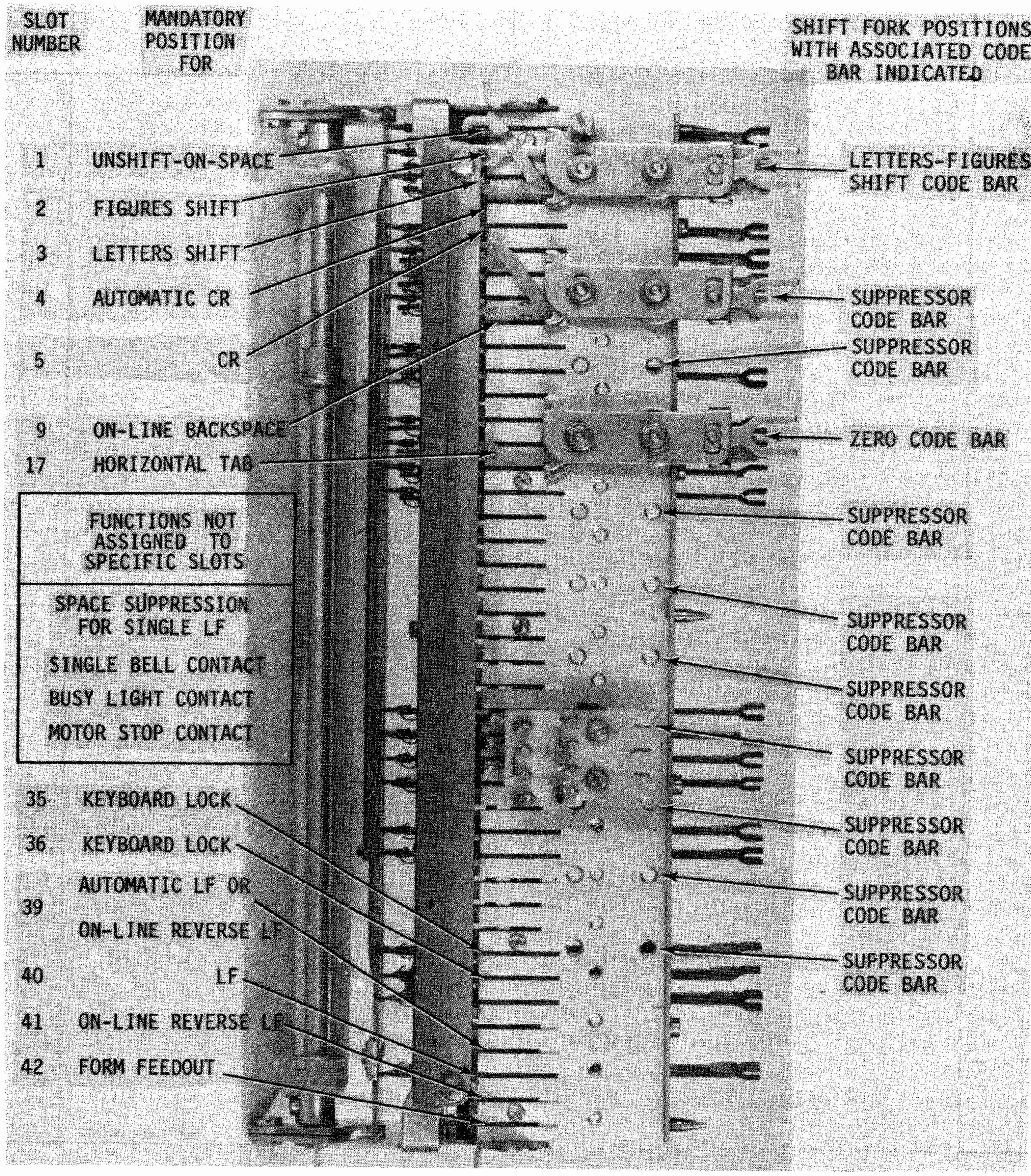



Figure 3-35. Stunt Box (Top View)

mechanically associated with the printing operation, except when suppressed by function mechanisms. As in printing, the reception of function codes results in the positioning of the code bars. The back edges of the code bars are notches (figure 3-36). Positioned directly behind the code bars is a stunt box, which contains the function bars for the various functions (figure 3-35 and 3-36). Each function bar has a series of tines on its end, offset to one side or the other to correspond with the marking and spacing elements of the particular input signal code combination to which it is to respond. Tines positioned to the right are spacing; those to the left are marking. When the function clutch is engaged (figure 3-28), it rotates and extends motion to the function bar reset bail (through the intervening cam and follower arm and function rocker shaft) to cause the function bar reset bail with its attached reset bail blade to release the function bars momentarily (figure 3-37). As the spring-tensioned function bars are released, they move forward to bear against the code bars. If the code bars are positioned for a function, each tine on the function bar for that function will be opposite a notch in the code bar. This will permit the selected function bar to continue to move forward into the code bars, while the other function bars are blocked by one or more code bars (figure 3-38). Associated with each function bar in the stunt box is a function pawl and a function lever. In the unselected position, the function bar is not latched with its function pawl (figure 3-39). When the function bar reset bail blade releases the function bars, any selected bar will move sufficiently forward (to the left, in figure 3-39) to permit it to engage its function pawl. Then, as the reset bail blade returns the function bar to its initial position, the function bar carries the function pawl to the rear (to the right, figure 3-40). The function pawl, in turn, moves the function lever clockwise about its pivot point. A projection at the lower end of most function levers operates the spacing suppression bail, and the selected levers move the bail forward. Either the upper or the lower end operates the indicated function. Near the end of the function cycle, a stripper blade (figure 3-36) operated by a cam on the function clutch assembly rises to engage any selected function pawl and strip it from its function bar. Springs return the released function pawl and the function lever to their original position. The function clutch is disengaged upon completion of one revolution when its latch lever falls into the indent of the clutch cam, in the same manner as described in connection with the code bar clutch.

(2) Carriage Return Function. Refer to figures 3-41 and 3-36. The carriage return function mechanism is located in the right end of the typing unit. Reception of the input signal code combination for the function causes the function bar, pawl, and lever to operate (figure 3-41). The lower end of the function lever engages the carriage return slide arm and pushes it forward. The slide arm, in turn, moves the carriage return bail and its lever about their pivot point. As the front portion of the lever moves downward, it takes with it the

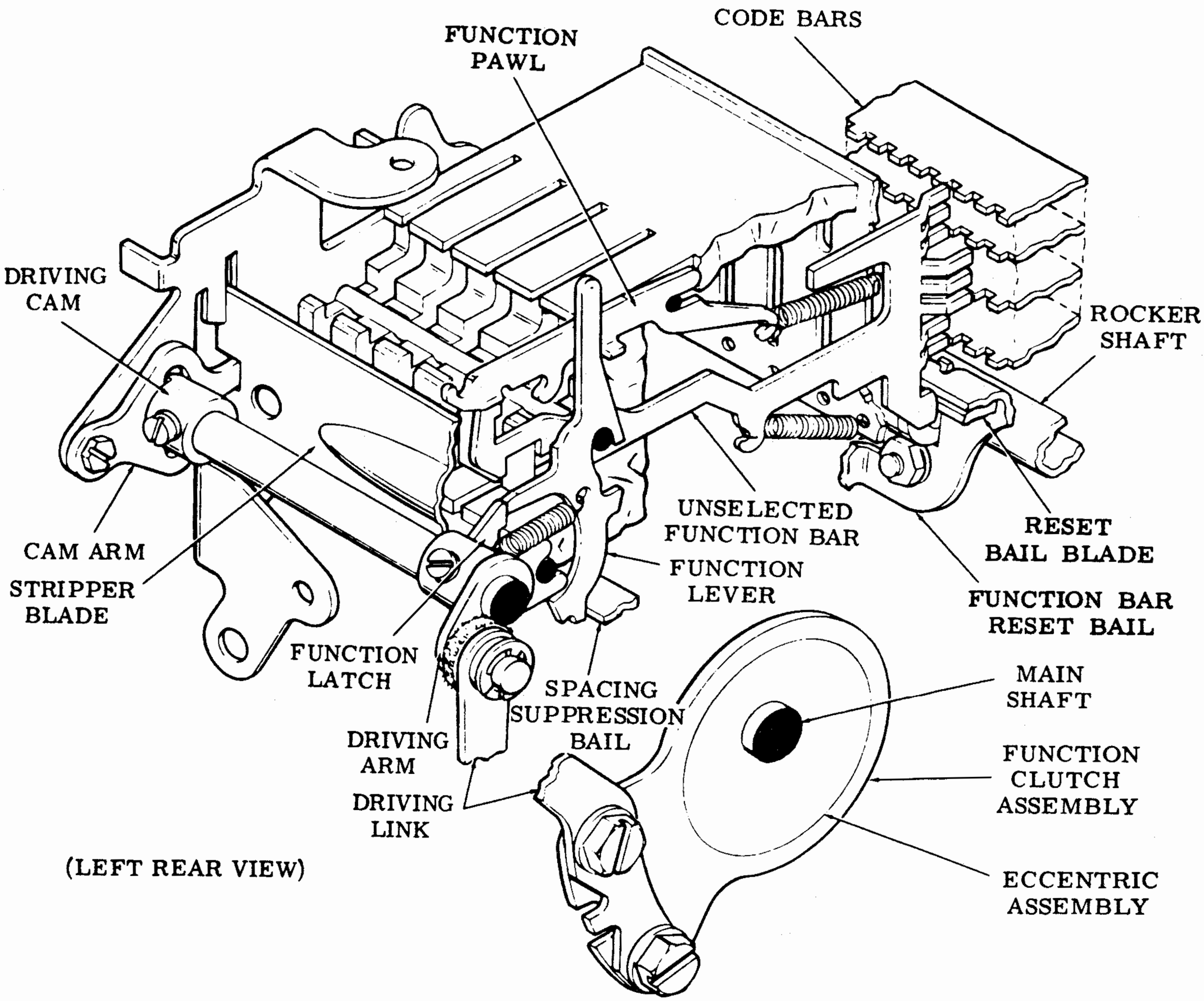



Figure 3-36. Stunt Box (Function Linkage Unselected)

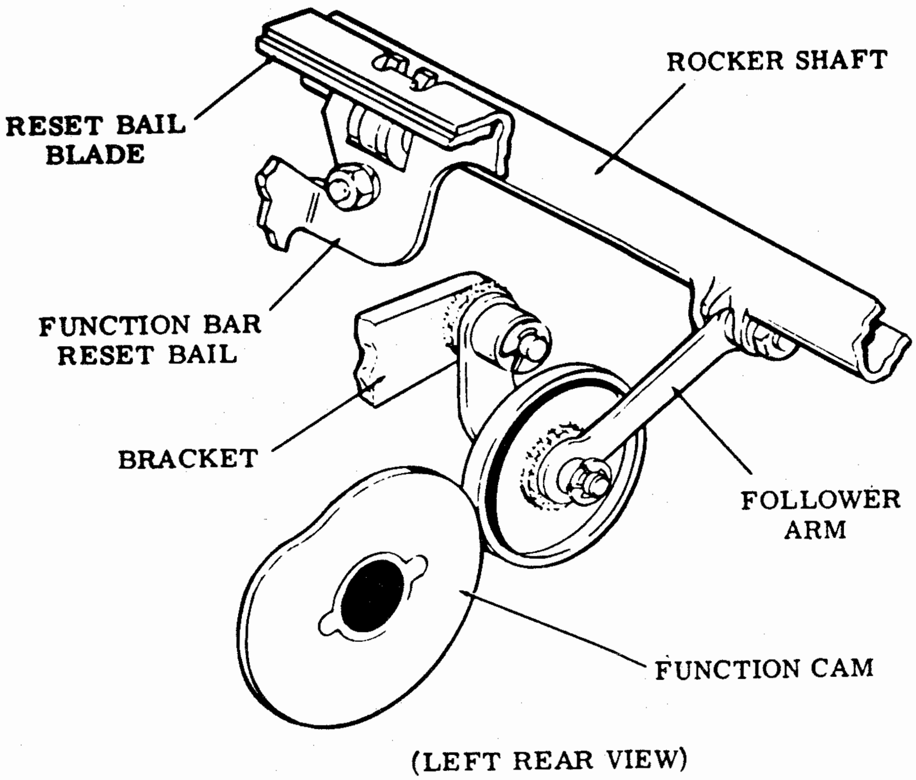



Figure 3-37. Reset Bail Mecahnism

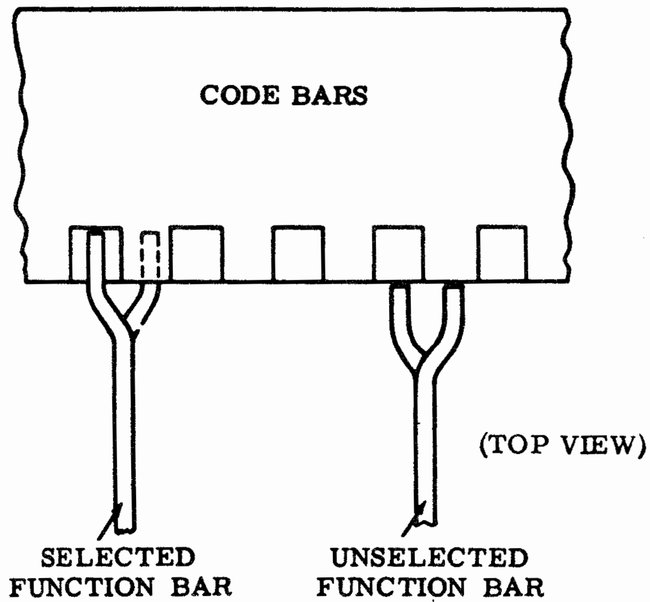



Figure 3-38. Function Bar Selection

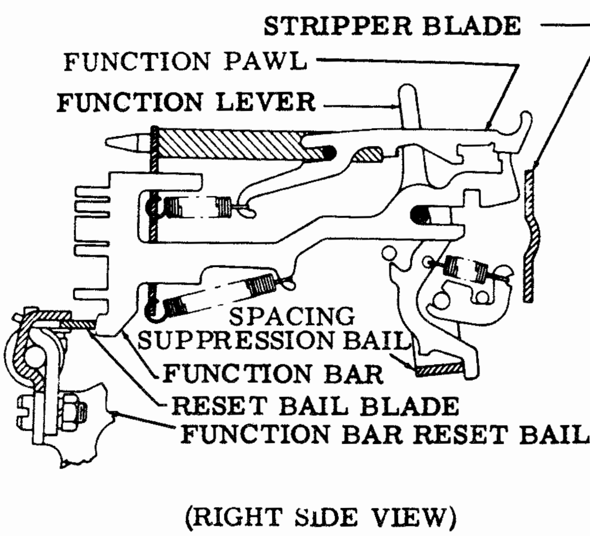



Figure 3-39. Typical Function Linkage (Unselected)

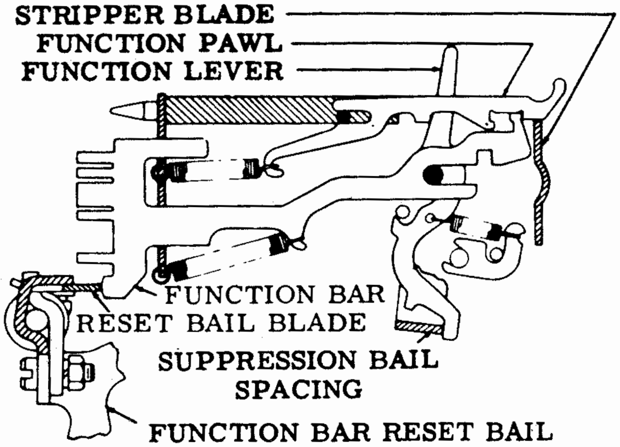



Figure 3-40. Typical Function Linkage (Selected)

lower section of the spacing drum feed pawl release link. This causes the upper portion of the link to turn and disengage the spacing drum feed pawls from the spacing drum (figure 3-42). When the carriage return lever reaches the lowest point, the carriage return latch bail locks it there. The disengagement of the spacing drum feed pawls from the spacing drum permits the spring drum to return the printing and type box carriages toward the left side of the typing unit. As the spacing drum nears the end of its counterclockwise rotation, the roller on the stop arm contacts the transfer slide which, in turn, drives the dashpot piston into the dashpot cylinder. A small passageway with an inlet from the inside of the cylinder and three outlets to the outside is incorporated in the end of the cylinder. Two of the openings to the outside are closed by a steel ball, which is held in its seat by means of a compression spring. A set screw which may be locked in place with a nut is used to regulate the spring pressure on the ball. The rate of deceleration provided by the cushioning effect of the trapped air is automatically regulated for various lengths of line by means of the ball valve. This, together with the direct opening to the outside, determines the rate at which the air may escape from the cylinder. When the spacing drum reaches its extreme counterclockwise position, an extension on the stop arm trips the carriage return latch bail plate, which is fastened to the carriage return latch bail. The

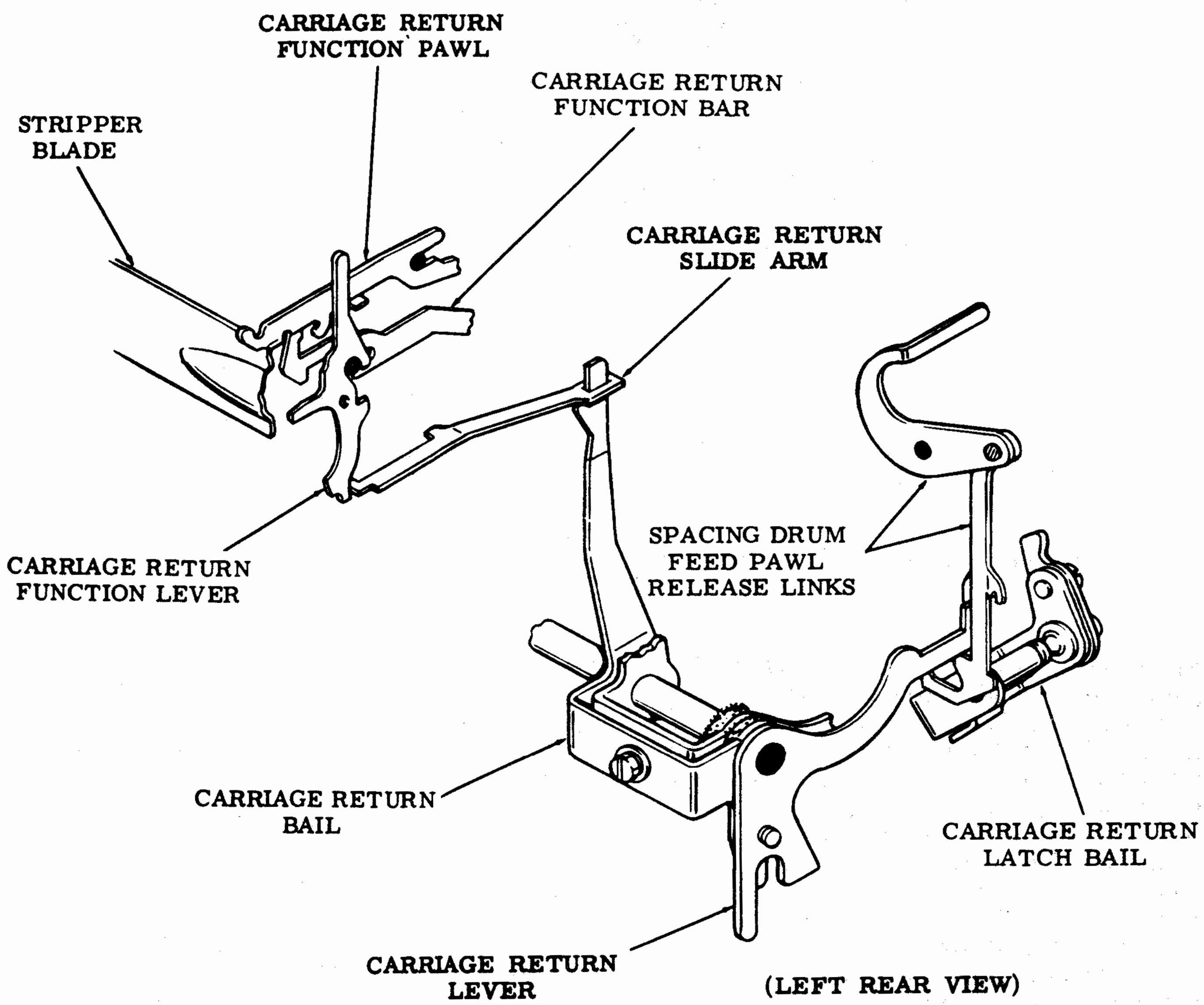



Figure 3-41. Carriage Return Function Mechanism

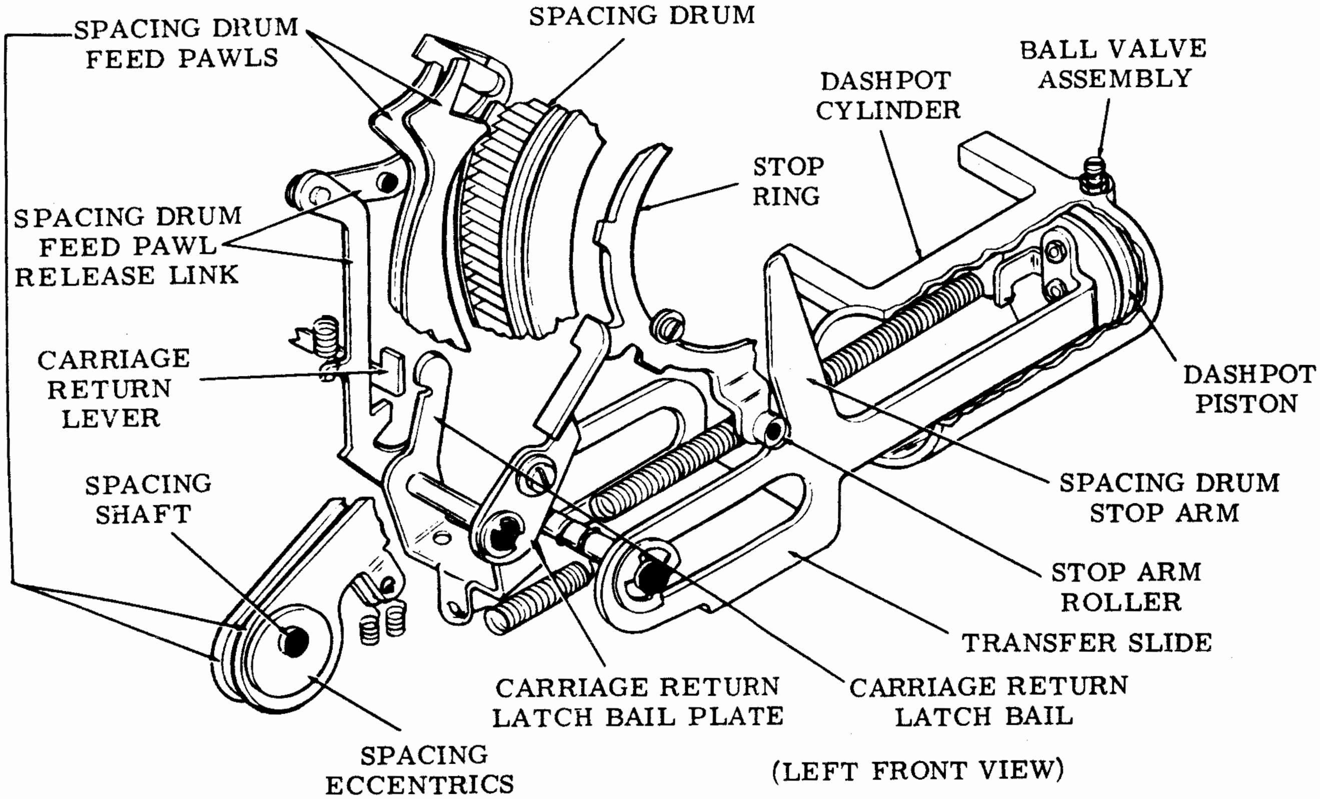



Figure 3-42. Carriage Return Mechanism

latch bail disengages the carriage return lever, and the feed pawls are again permitted to engage the spacing drum. Local (off-line) operation of the carriage return mechanism may be obtained from the keyboard base or base on which the typing unit is mounted. A projection beneath the carriage return lever (figure 3-41) when rotated to the rear (counterclockwise, viewed from the right), operates the carriage return mechanism in the same way as when this lever is operated by the stunt box.

(3) <u>Line Feed Function</u>. Refer to figures 3-43 and 3-44. The line feed function mechanism is located in the left end of the typing unit. The code bar mechanism, set to correspond to an input signal code combination for line feed, permits two line feed function bars, pawls, and levers to operate. The function linkage at the far left of the stunt box (figure 3-43) operates the line feed mechanism. The lower end of the line feed function lever engages the line feed slide arm and pushes it forward. The slide arm, in turn, moves the line feed clutch trip arm and the trip lever above their pivot until the trip lever releases the three-stop line feed clutch. The line feed gearing is such that each one-third revolution of the clutch will advance the platen by one line. Therefore, the length of time that the line feed clutch trip lever is held away from the clutch will determine the number of line feeds that occur. The timing relationship between the stripper blade cycle and the main shaft rotation is such that the function pawl is not stripped from a function bar until after more than one-third of a revolution of the clutch has occurred. Thus, the line feed clutch trip lever will stop the clutch after two-thirds of a revoluation, or double line feed, has occurred. When single line feed is desired, it is necessary to strip the function pawl from the line feed function bar before the line feed clutch completes one-third of a revolution. This is accomplished by the use of an auxiliary function pawl stripper which is attached to the left end of the stripper bail. The cam disk on the three-stop line feed clutch provides the motive force to operate the stripper bail once each one-third revolution of the line feed clutch. The stripper bail on which the slotted line feed function pawl stripper rides may be shifted toward the right (double) or to the left (single) by action of the single or double line feed lever (figure 3-43). The upper end of the pivoted single or double line feed lever protrudes from the upper left of the left side plate of the typing unit, where it rides in the two position side frame detent extension. When the lever is in position 1, the stripper bail engages the line feed function stripper to raise it into contact with the function pawl before the stripper blade would strike it When the lever is moved to the rear (position 2), the bail is disengaged from the blade, and the stripper blade strikes the function pawl in the normal cycling of the function box stripper blade. When single line feed is being used, the line feed function lever is released too soon (by the line feed function pawl stripper) to prevent spacing. Therefore, an additional line feed function bar, pawl, and lever are installed in a slot of the stunt box for the purpose of

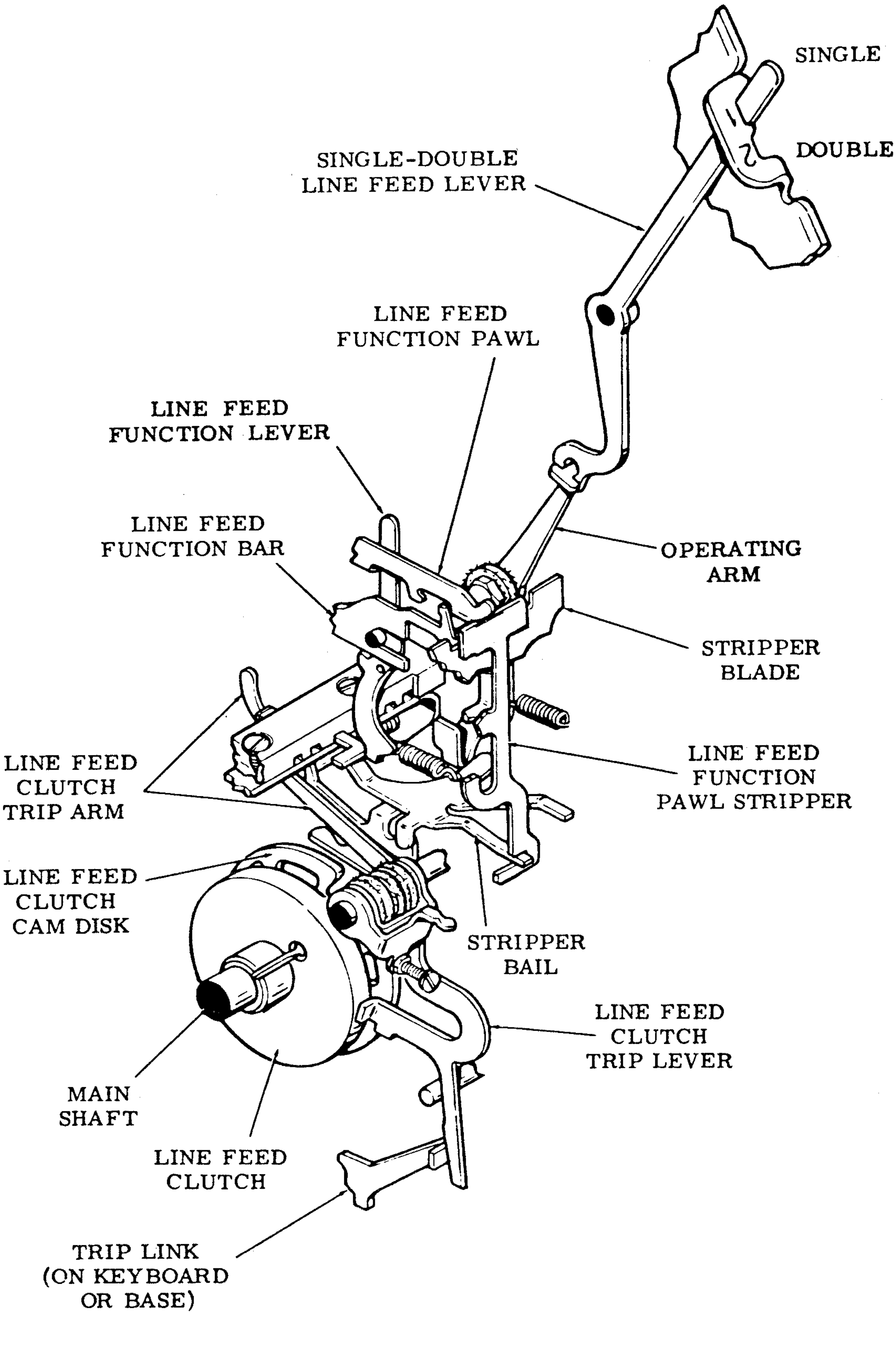



Figure 3-43. Line Feed Mechanism (Left Rear View)

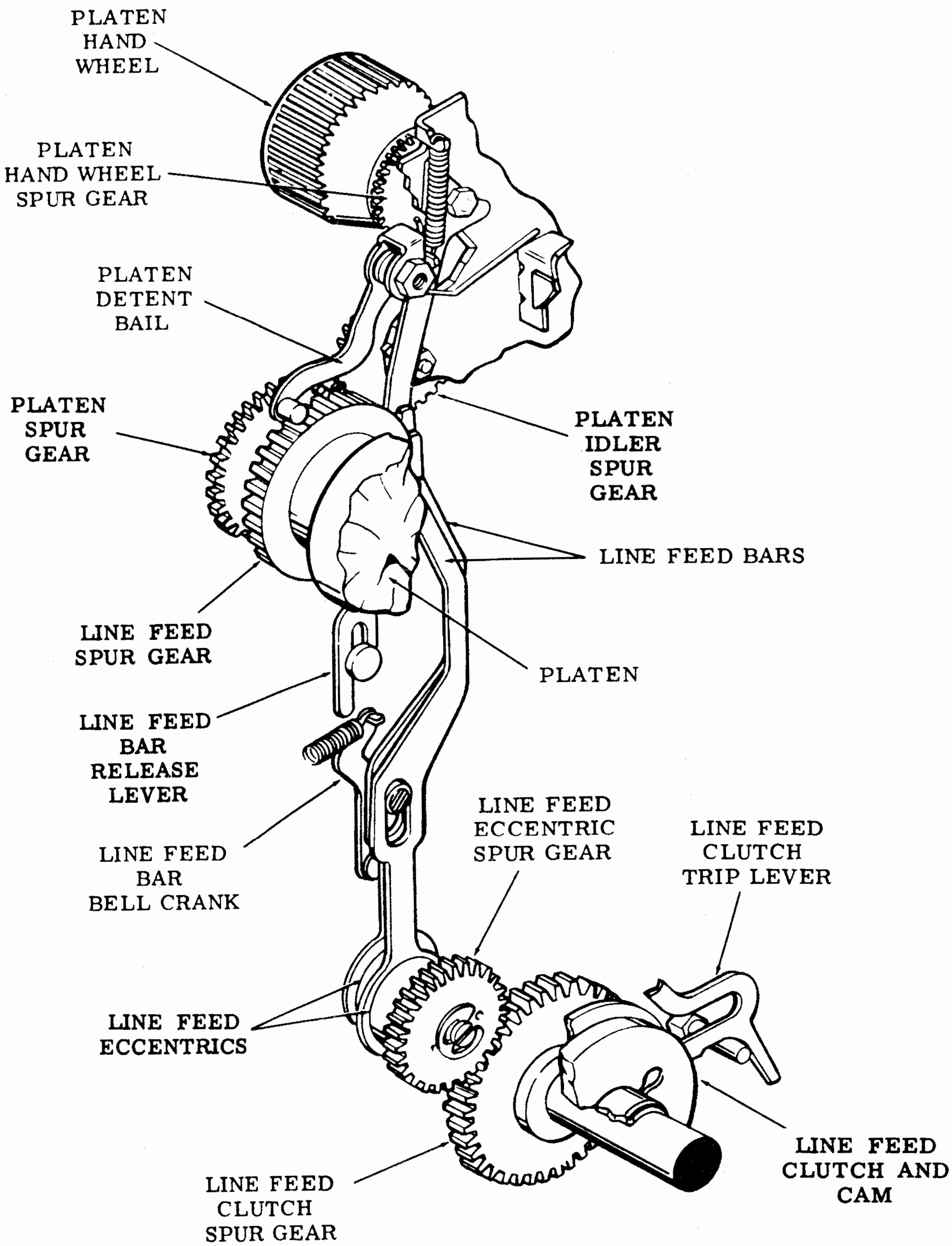



Figure 3-44. Line Feed Mechanism (Right Front View)

suppressing spacing on single line feed function. This mechanism, which always operates on the line feed function code bar arrangement, is released only by the stunt box stripper blade and, therefore, holds the spacing suppression bail operated (forward) until the spacing cycle is completed. After the line feed clutch is stopped by its trip lever, it is disengaged when the latch lever drops into the indent in the clutch cam, in the same manner as described in connection with the code bar clutch. Each one-third revolution of the line feed clutch causes its attached spur gear (figure 3-44) to rotate the line feed eccentric spur gear and its attached eccentrics one-half of a revolution. The eccentrics, which are offset in opposite directions, each carry a line feed bar. These bars are guided by the line feed bar bell crank and alternately engage the line feed spur gear on the platen, advancing the platen one line for each one-half turn of the eccentrics. A platen detent bail engages the line feed spur gear to retain the platen at each setting. When it is desired to position the platen manually, this may be accomplished by bearing down on and rotating the platen handwheel at the top of the right side plate. This causes the platen handwheel spur gear to engage the platen idler gear, which in turn is engaged with the platen spur gear on the platen shaft. At the same time, the line feed bar release lever (figure 3-43) bears on the line feed bar bell crank and causes it to disengage the line feed bars from the line feed spur gear. Local (off-line) operation of the line feed mechanism may be obtained from the keyboard base or base on which the typing unit is mounted. A projection beneath the line feed clutch trip lever (figure 3-43), when rotated to the rear (counterclockwise, veiwed from the right), operates the line feed mechanism in the same way as when this lever is operated by the function box. Since the clutch is manually engaged, line feed is continuous until released at the keyboard or base.

(4) <u>Letters-Figures Shift Function</u>. Refer to figure 3-26. Upon reception of the letters or figures signal code, the letters and figures function bars, pawls, and levers initiate the letters or figures shift. The upper ends of the function levers engage the letters and figures function slides. The front ends of these function slides have camming surfaces which, when a slide is shifted to the rear by its function lever, move the letters-figures code bar fork to the right (letters position) or to the left (figures position). The fork engages a pin on the bracket which is fastened to the letters-figures shift code bar, and positions the code bar to the right or left. Movement of the letters-figures code bar results in the positioning of the type box, through related mechanisms, for printing of letters or figures.

(5) <u>Stunt Box Contacts</u>. Refer to figures 3-45 and 3-40. For external circuit control and switching functions, the function levers may be positioned to operate normally open, normally closed, or SPDT switches mounted on the top of the stunt box. In general, the function contacts are similar except for electrical connections, which are determined by external

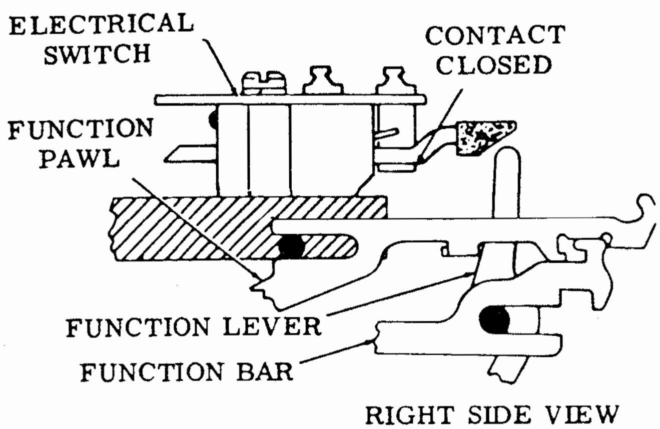



Figure 3-45. Typical Stunt Box Contact (Unoperated)

requirements. The contact arm configuration is changed as required to either make or break the contact when the associated function lever is in selected (rear) position. All contacts are wired through the cable connector located on the right side plate. A typical contact (NO) is illustrated in unselected (figure 3-45) and selected (figure 3-46) condition.

3-6. KEYBOARD UNIT MECHANICAL MOTION DESCRIPTIONS. Keyboard units used in high-level CPP equipment are discussed in paragraph 3-6.1, and keyboard units used in low-level CPP equipment are discussed in paragraph 3-6.2.

3-6.1 KEYBOARD UNIT MECHANICAL MOTION DESCRIPTIONS (HIGH-LEVEL). The following paragraphs provide a detailed description of the mechanical assemblies used to perform the various functions of the high-level keyboard units.

a. General. The primary functions of the keyboard unit are to send binary code information on the signal line. The receive-only base unit, having no sending facilities, receives binary code information only. To perform the sending function the keyboard unit is equipped with a keyboard transmitter mechanism for manually setting a code combination, and a distributor mechanism for automatically distributing the code combination on the signal line.

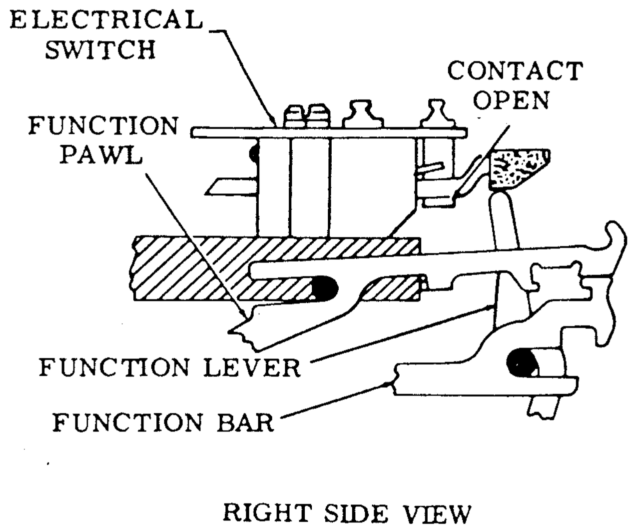



Figure 3-46. Typical Stunt Box Contact (Operated)

b. Keyboard Transmitter. To initiate transmission of a character or function a key is pressed, moving a keylever down. The keylever moving down initially contacts the code bar mechanism to start the code bar T-levers rotating clockwise and/or counterclockwise. As the keylever descends, it engages the universal code bar which, through a tie link, releases the universal lever. As the universal lever rises, the code bar T-levers are locked, and the contact bail is rotated to release the contact wires. When the contact bail is released, a power contact wire touches its terminal to initiate transmission through the distributor. At the end of the distributor cycle, the reset mechanism drives the universal lever downward to the latched position. As the universal lever descends, the contact bail is returned to its unoperated position, and the code bar T-levers become unblocked. Another character can then be selected. The operation of the keyboard transmitter is discussed in the order in which the mechanisms respond. The active mechanisms are:

Code bar mechanism
Universal mechanism
Contact mechanism
Reset mechanism

The support mechanisms are:

Repeat mechanism
Line break mechanism
Local function keys

(1) Code Bar Mechanism. For each code level,

there is a corresponding code bar submechanism consisting of a front bar, rear bar, tie link, and two T-levers (figure 3-47). Collectively, the code bar submechanisms make up the code bar mechanism. The submechanisms, numbering one through five from the rear to the front, correspond to the five code levels. The single bar nearest the front is the universal code bar and is related to the universal mechanism. The front and rear bars in each code bar submechanism have slots in their top edges and are complimentary coded; i.e., for each keylever location, one bar is slotted where the other bar is solid. Each submechanism has a marking and a spacing position. A slot in the rear bar permits the front bar to descend under pressure of a keylever, establishing a marking condition for that code level in a selected character. A slot in the front bar permits the rear bar to descend for a spacing condition. Therefore, in the marking condition, the front bar is down; the rear bar is up, and the right T-lever is clockwise. The spacing condition is the opposite: front bar up, rear bar down, and right T-lever in the counterclockwise position. When the T-levers are rotated to either clockwise (marking) or counterclockwise (spacing) positions, their associated contact wires are against (marking) or held away from (spacing) the signal terminal strip in the contact mechanism. The extensions on the right T-levers are held to either the left or right by the released universal lever. This prevents another key being depressed until the universal lever is reset. After a key is depressed, it is returned immediately to its original up position by a leaf spring attached to the frame. However, the code combination, representing the key's character, remains in the code bar mechanism. When a new key is depressed, only the submechanisms whose code levels differ from the preceding combination, are operated. As a keylever is driven towards the bottom of its travel, it engages the universal code bar to trip the universal mechanism.

(2) <u>Universal Mechanism</u>. The universal mechanism releases the contact bail on the contact mechanism, and locks the code bar submechanisms. The universal code bar, when depressed by a keylever, causes its associated T-lever and tie link to rotate clockwise (figure 3-48). The tie link extension in contact with the tab on the nonrepeat lever, causes the latchlever to pivot towards the left to unblock the universal lever. The universal lever is released and moves up, under spring tension, to lift the nonrepeat lever tab. The spring force raising the universal lever causes the universal lever to drive the tab above the tie link extension. When the tab rises above the tie link extension, the nonrepeat lever and latchlever return to the right. With the universal lever up, the nonrepeat lever is up, and the latch lever leans against the universal lever. In the released position, the universal lever locks the code bar submechanisms, and permits the contact bail (on the contact mechanism) to pivot clockwise. The code level contact wires and power contact wire are released. When the power contact wire touches the ac terminal strip, a current path to the distributor clutch magnet is established. The distributor clutch magnet is

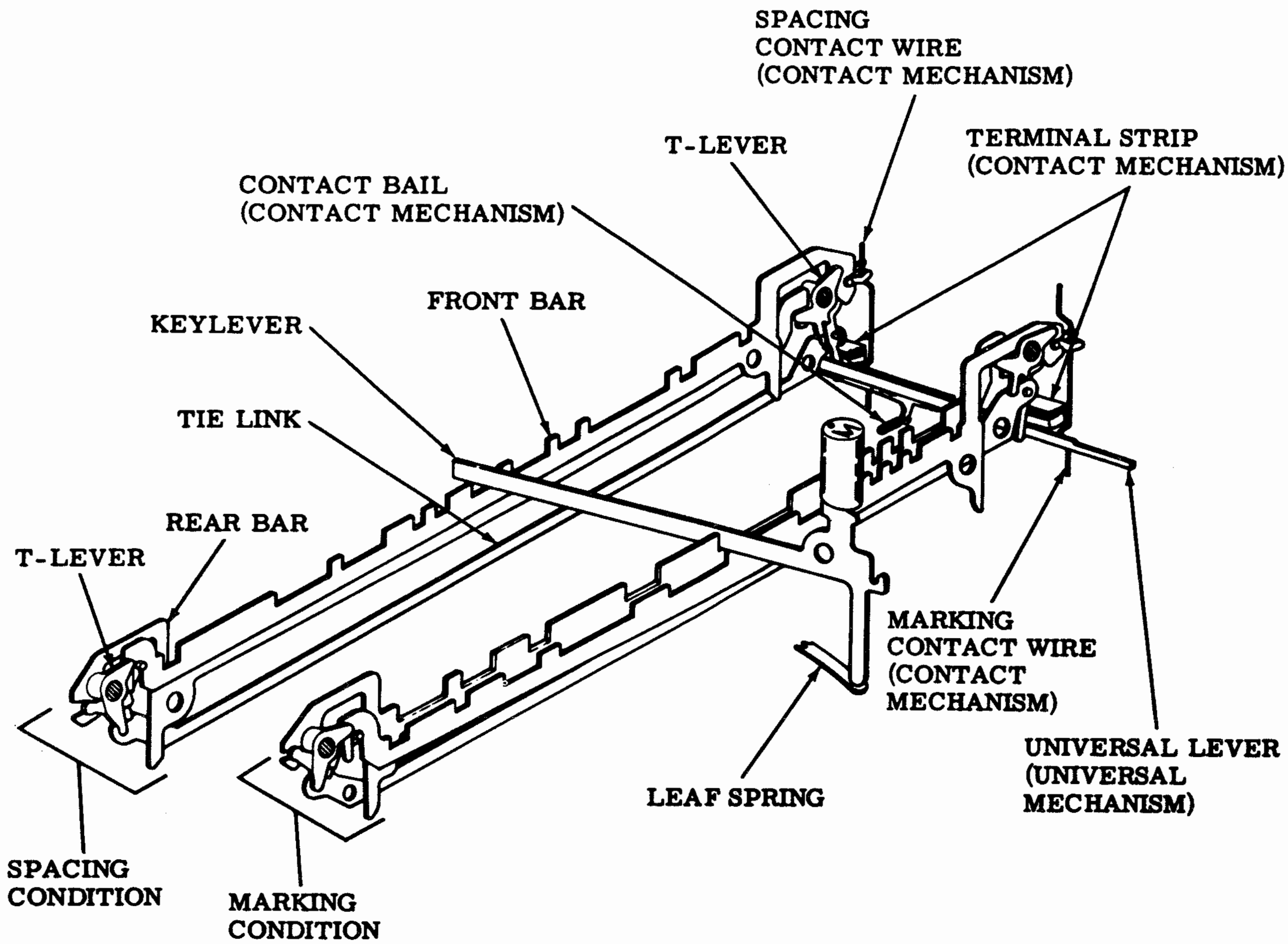



Figure 3-47. Code Bar Mechanism

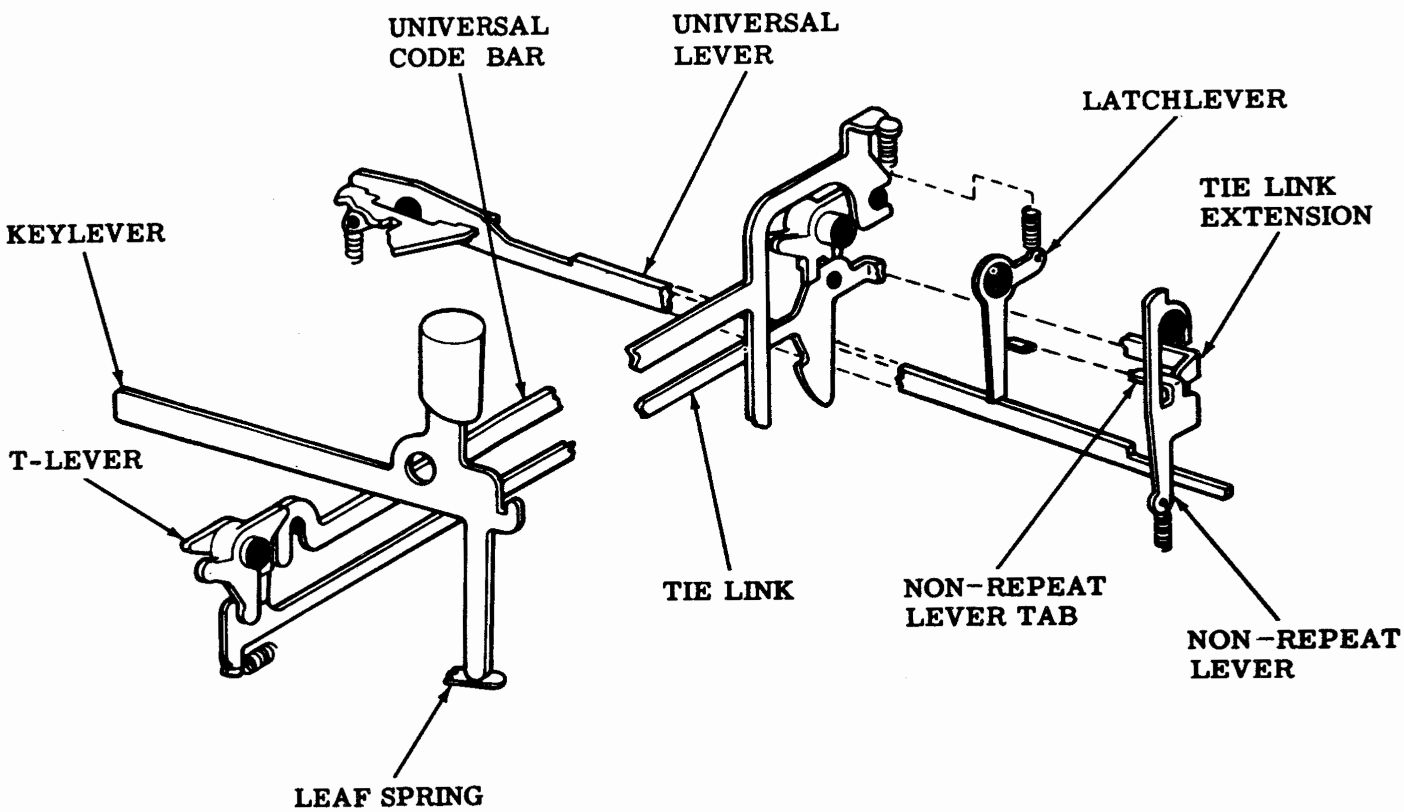



Figure 3-48. Universal Mechanism

subsequently deenergized when a set of timing contacts at the distributor is opened. As the distributor cycle ends, an additional set of contacts at the distributor is closed to energize the reset solenoid on the keyboard transmitter. The universal lever is driven back to its down position where it is latched by the latchlever. Should a keylever remain depressed beyond the end of the distributor cycle, the tie link extension prevents the non-repeat lever from returning to its reset condition. The non-repeat lever tab hangs on top of the tie link extension as the unaffected latchlever holds the universal lever down. When the keylever is released, the tie link extension moves back to the right, and the non-repeat lever shifts downward allowing the tab to fall between the latchlever and the tie link extension.

(d) Contact Mechanism. The contact mechanism (figure 3-49) responds to inputs from the code bar universal, and reset mechanisms. The code bar mechanism operates a set of T-levers into marking and/or spacing positions, and the universal mechanism releases the contact wires in the contact mechanism. A contact wire is associated with each code bar submechanism. Subsequent to code selection, the universal mechanism is tripped to release the contact bail and lock the code selection. The contact bail releases the five code level contact wires and one power contact wire. In the reset condition of the keyboard transmitter, the contact bail holds the contact wires away from their respective T-levers. When the universal lever is released, the contact bail rotates clockwise to release all contact wires against either the terminal strip for marking conditions, or individual T-levers for spacing conditions. When the contact bail rotates, the power contact wire is always marking against the ac terminal strip. The contact bail is returned to its reset position when the universal lever is returned by the reset mechanism.

(4) Reset Mechanism. A solenoid mounted on the rear of the keyboard transmitter, is used to reset the universal lever. The reset mechanism (figure 3-50) includes a solenoid, reset shaft, and reset arm, and is operated by an electrical pulse received from the distributor. The pulse originates from a set of contacts that are closed during the final segment of the distributor cycle. When energized, the solenoid plunger rotates the reset shaft and reset arm to drive the universal lever down.

(5) Repeat Mechanism. The repeat mechanism (figure 3-51) consists of a repeat keylever and a miniature switch. When operated, the repeat keylever depresses the switch to (1) close the distributor clutch magnet circuit and (2) open the reset solenoid circuit. The distributor continues to operate and permits repeated transmission of the character as long as the REPT key is depressed. To avoid loss of the character, the character keylever and repeat keylever should be held down simultaneously.

(6) Line Break Mechanism. The line break mechanism consists of a break keylever, T-lever, and contact wire. The signal line current is interrupted when the BREAK

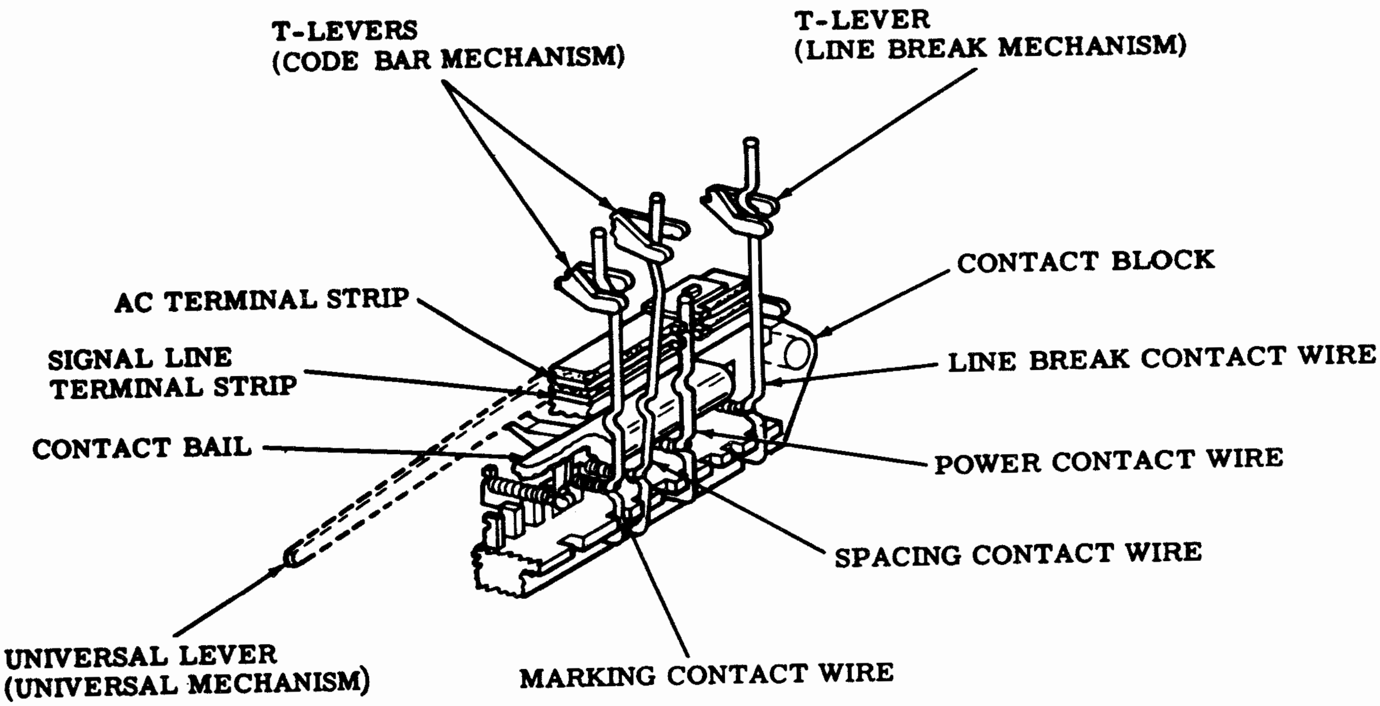



Figure 3-49. Contact Mechanism

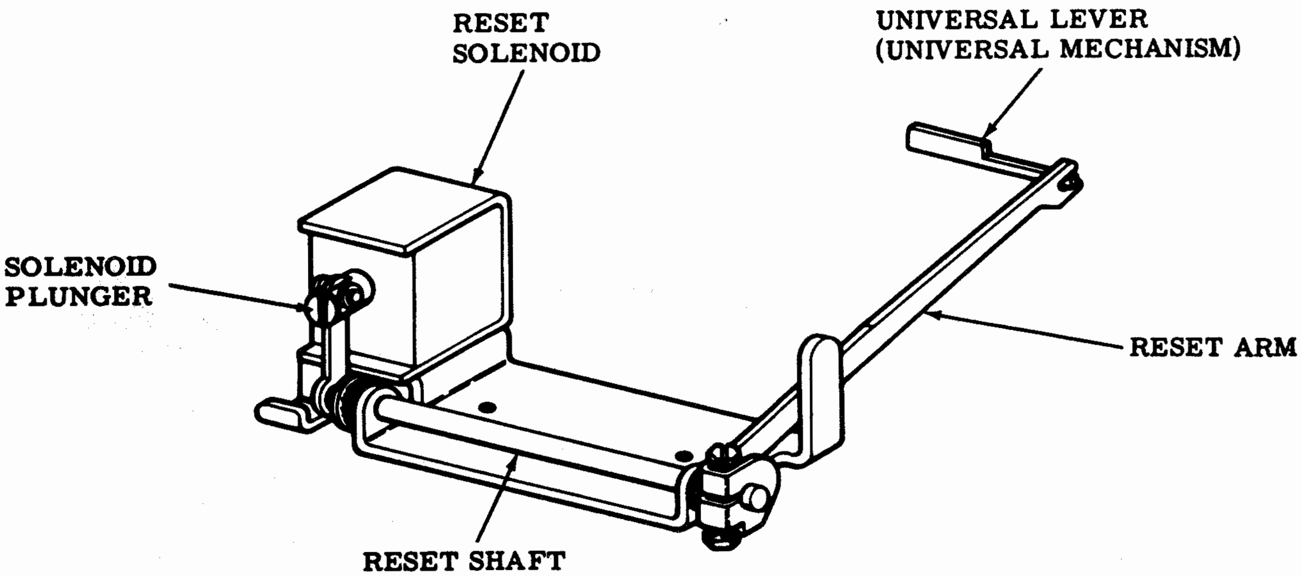



Figure 3-50. Reset Mechanism

key is depressed. The signal line remains open until the key is released. The contact wire is a serial link in the signal line.

(7) Local Function Keys. In addition to the normal signal line keys, the keyboard transmitter is equipped with a local line feed key and a local carriage return key. The local function keytops are red to readily distinguish them from the signal line function keys.

c. Distributor. The distributor mechanism (figure 3-52) sequentially applies signal line current to the keyboard transmitter mechanism, and controls the electrical power circuits which operate the distributor clutch magnet and keyboard transmitter reset solenoid. The timing functions are initiated when a keytop at the keyboard transmitter is depressed. The keytop presets the code level contact wires and closes a power contact wire to allow current to flow to the distributor clutch magnet. When energized, the distributor clutch magnet attracts an armature to release the clutch trip lever. When the clutch shoe lever is released, the clutch shoes engage the cam sleeve with the main shaft. A cam on the rotating cam sleeve opens a set of timing contacts to deenergize the distributor clutch magnet. (The pulse for the distributor clutch magnet is initiated by the keyboard transmitter and terminated by the distributor.) The clutch magnet armature is mechanically reset as the high part of the

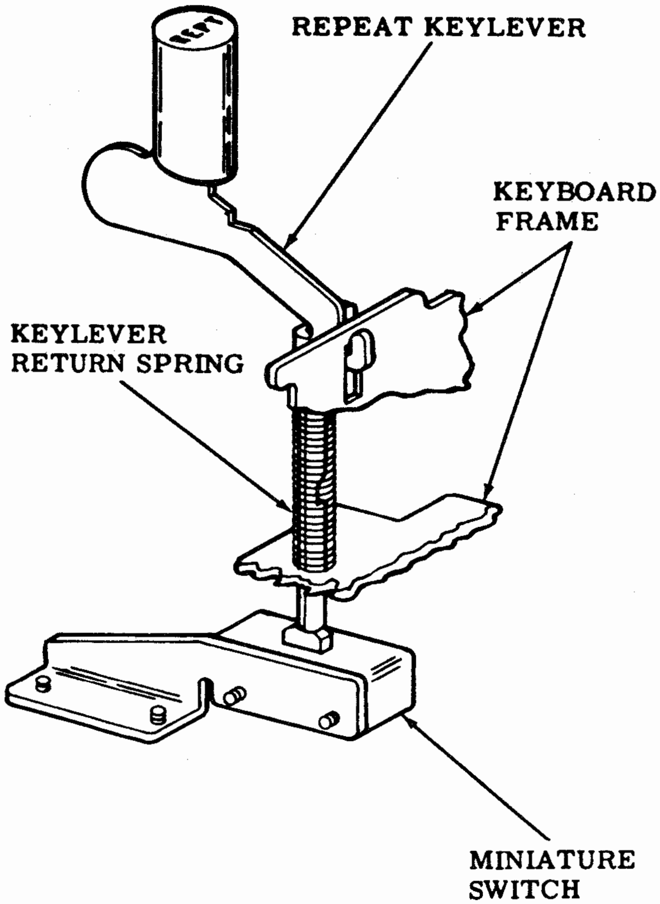



Figure 3-51. Repeat Mechanism

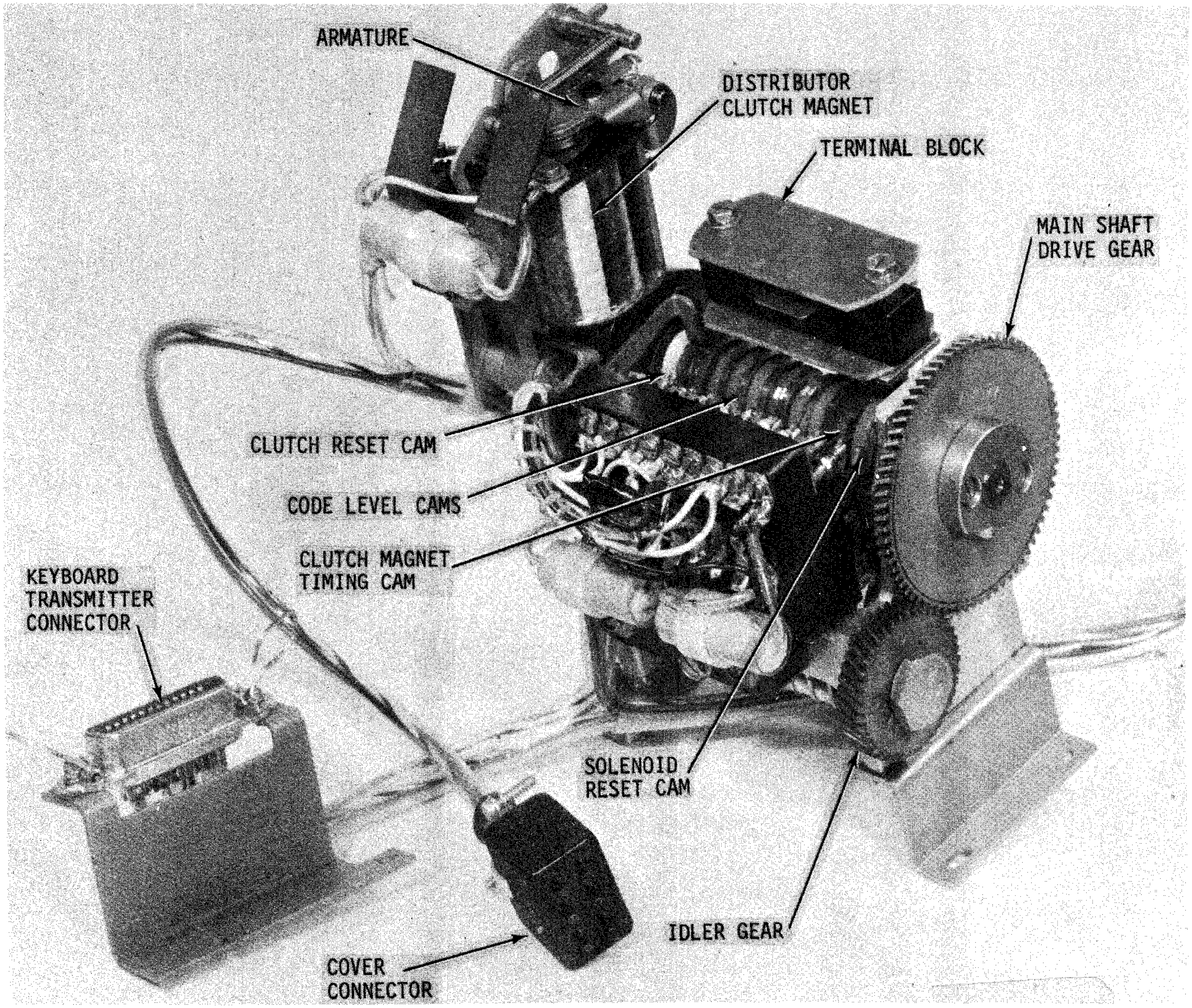



Figure 3-52. Distributor Mechanism

clutch reset cam rotates the reset lever away from the armature. The armature, under spring tension, rises to lock the trip lever. The signal line, before and during the brief start interval (for the distributor) remains closed by the stop cam and contacts at the distributor. The keyboard transmitter contacts are linked in parallel with the distributor contacts, and are sensed as current is applied sequentially. There are six cams on the distributor cam sleeve to actuate the five code level and stop contacts in the distributor contact block. A flat on each cam causes the follower to close the contacts. Initially, before current is admitted to the code level contacts, the stop contact is opened for one unit of time. Then, in succession while the stop contact remains opened, signal line current is directed through each set of code level contacts as their respective follower arms are operated. After the fifth set of code level contacts is opened, the stop contact is closed to reestablish constant current on the signal line. The duration of each code pulse is controlled by the dwell period of the cams. For a 7.42 unit code, the dimensionless time length for the start and each code level pulse is one unit, and for the stop pulse is 1.42 units. For a 7.00 unit code, the start, code level and stop pulses are all one unit in length. During transmission of the fifth code pulse, the solenoid reset contacts are closed to reset the keyboard transmitter mechanism. The pulse terminates or the reset contacts are opened before the distributor completes its rotational cycle.

d. <u>3-Speed Gear Shift Assembly</u>. The gear shift assembly (figure 3-53) transfers rotational motion from the motor unit to the distributor mechanism (KSR only) and the typing unit. The output speed of the gear assembly can be manually selected while the motor unit is in the idle or running condition. The assembly drive shaft, driven by the motor pinion, rotates at a constant speed. Three variable sized gears are attached to the assembly drive shaft, with pins. The gears mesh with three free wheeling gears on the variable speed shaft. A sliding key attached to the shift linkage engages one of three gear ratios with the variable speed shaft. A spur gear on the variable speed shaft transfers rotational motion to an idler shaft which drives the gear on the main shaft of the typing unit. A second output is taken from the spur gear on the variable speed shaft to turn another idler shaft. The output from this idler shaft is transferred to the distributor idler gear which conveys rotational motion to the gear on the distributor main shaft. Neither the typing unit nor the distributor will operated unless their respective clutches engage associated cam sleeves with their main shafts. The selector on the front edge of the set operates a shift link in the rear to select one of three Bauds. The shift link positions the collar and sliding key to engage a single gear ratio with the variable speed shaft.

e. <u>Mounting Base</u>. The mounting base provides facilities for securing the mechanisms to the keyboard or base units. There are two locating studs on the base to properly align the typing unit when securing it to the base.

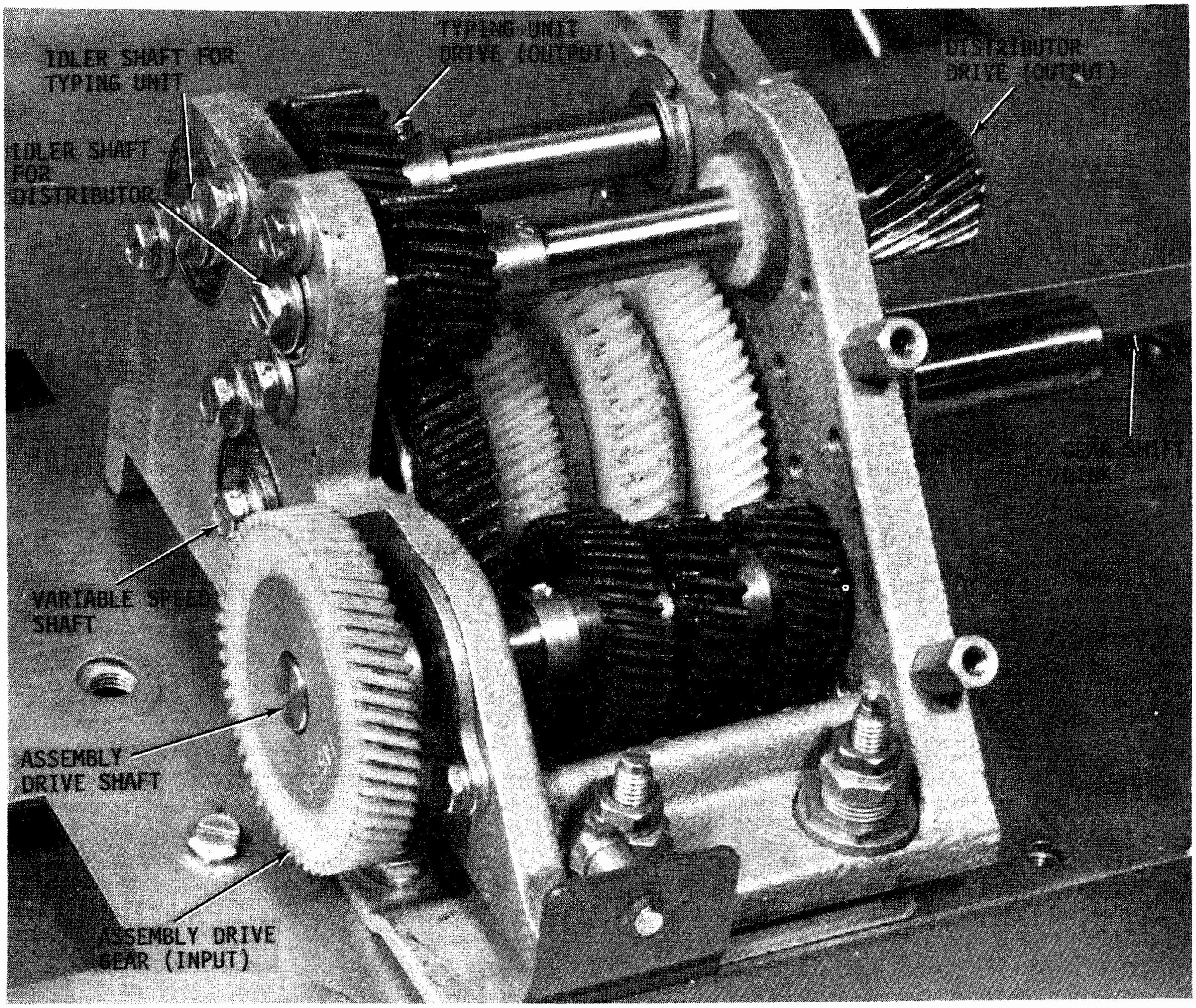



Figure 3-53. 3-Speed Gear Shift Assembly

(1) Margin Indicator Switch. The margin indicator switch is mounted on the keyboard unit and is opened by the carriage pulley on the typing unit. The switch lever is held against the switch button by a spring. When the switch is closed, a neon bulb on the cover is illuminated. Electrical connections exist between the indicator switch, terminal blocks, cover connector, and neon bulb.

(2) Local Functions. The local functions are intended to provide local control of certain functions without disturbing the signal loop. The local function keytops are red to distinguish them from the signal line function keytops.

(3) Local Carriage Return. The local carriage return mechanism trips the carriage return function to return the type box and printing hammer to the left margin of the typing unit. Since the function is performed mechanically, the signal line is uninterrupted, and other typing units on the signal line are undisturbed. When the local carriage return (LOC CR) keylever is depressed, the associated bail is rotated toward the rear of the base (figure 3-54). The trip link, pinned to the local carriage return bail, slides under the guide bracket to trip the carriage return lever on the typing unit. The same carriage return lever is tripped internally when the coded function for carriage return is received by the typing unit.

(4) Local Line Feed. The local line feed mechanism performs the function of advancing the platen without disturbing other typing units on the signal line. The mechanism trips the line feed clutch trip lever on the typing unit. When the local line feed keylever (LOC LF) is depressed, the rear of the local line feed bail is raised against the line feed lever (figure 3-55). The lever is rotated toward the rear to cause the line feed trip link to slide to the rear. The line feed clutch trip lever releases the clutch shoe lever on the typing unit. The line feed mechanism on the typing unit advances the platen.

f. Variable Features. Variable features of CPP teletypewriter equipment are discussed in the following paragraphs.

(1) Time Delay Mechanism. A time delay mechanism (figure 3-56) is available to close a set of contacts after a number of idle revolutions of the typing unit main shaft. The mechanism provides an electrical pulse to operate a stop magnet assembly (in a separate service unit) which opens the power circuit and shunts the signal line.

NOTE

The stop magnet assembly is not installed in the Model 28 Compact Teletypewriter Set, but is available for installation in a separate electrical service unit.

When combined with the time delay mechanism, the stop magnet assembly completes the requirements for developing the time delay motor stop circuits. A break in the signal line current is necessary to reactivate an RO or KSR set after a time delay motor stop mechanism has interrupted

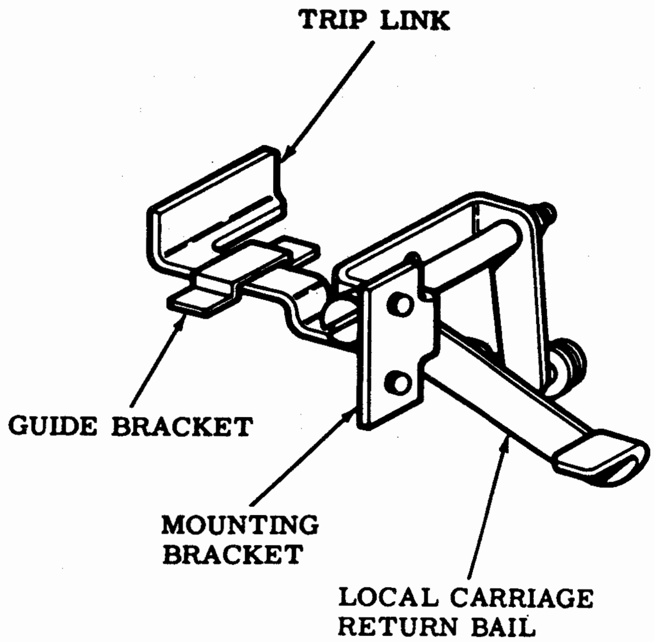



Figure 3-54. Local Carriage Return Mechanism

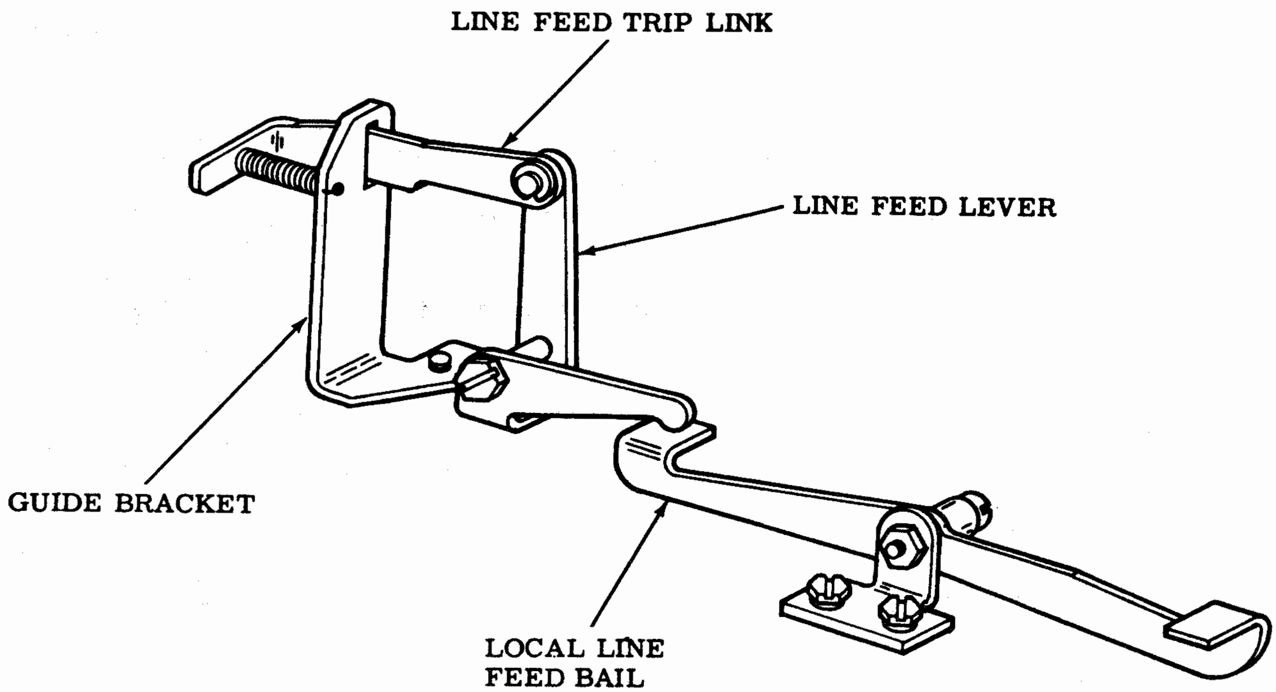



Figure 3-55. Local Line Feed Mechanism

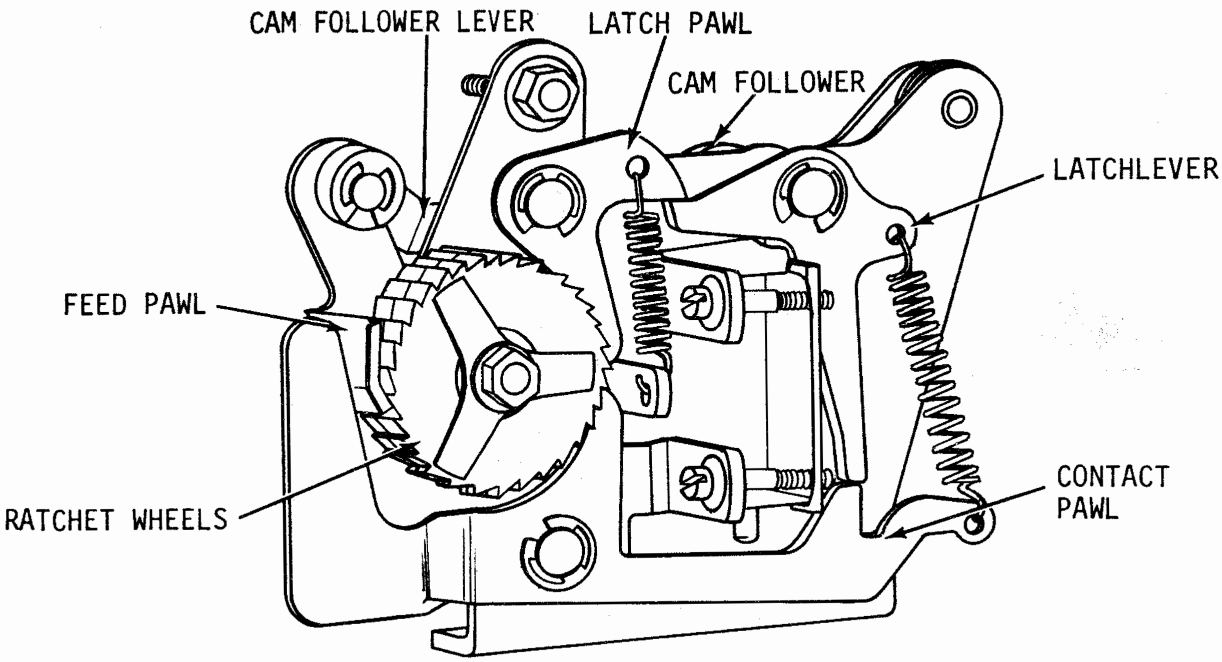



Figure 3-56. Time Delay Mechanism

continuous-but-idle-operation. The time delay mechanism is mounted on the base and is located under the typing unit main shaft. A cam on the typing unit main shaft provides motion to operate the cam follower lever on the time delay mechanism. The motion imparted to the feed pawl advances a pair of ratchet wheels. One ratchet wheel has 27 teeth, and the other has 28 teeth. A single feed pawl, attached to the cam follower lever, advances the pair of ratchet wheels one notch with each revolution of the typing unit main shaft. As the pair advances, one wheel turns a little faster than the other. The ratchet wheel with the 27 teeth advances 1/756th revolution more than the wheel with 28 teeth. It requires 756 ratchet advances to align adjacent points on the two wheels. The latch pawl rides on the inside flanges of the ratchet wheels. Each flange has a semi-circular hole in its camming surface. Both holes must be aligned to permit the latch pawl to snap into the indentation. After 756 revolutions of the typing unit main shaft, the holes on the ratchet wheel flanges are adjacent for nearly one revolution of the ratchet wheels. When the adjacent holes pass under the latch pawl, the latch pawl, under spring tension, snaps into the indentation, briefly. When deflected, the latch pawl rotates the latchlever out of engagement with the contact pawl. The contact pawl is released to bear against the inside flanges of the ratchet wheels. One of two conditions may exist on the signal line during the next 756 revolutions of the typing unit main shaft. Should a line break occur - character transmission or physical break - to activate the typing unit mechanisms, the rocker shaft bail on the typing unit will engage the end of the contact pawl and cause the pawl to be relatched by the latchlever. If no line break occurs, the typing unit mechanisms, other than the main shaft, remain idle; the holes in the flanges reach alignment, and the contact pawl snaps into the indentation. The contact pawl, upon snapping into the indentation, depresses the plunger on the time delay switch. In operation, the delay will vary within a given time range for each Baud. The approximate values for the time delay ranges are given in table 3-1.

3-6.2 KEYBOARD UNIT MECHANICAL MOTION DESCRIPTIONS (LOW-LEVEL).

NOTE

The following discussion is applicable to low-level CPP sets with photoelectric keyboard units. Some low-level CPP equipments have contact assemblies with gold-plated wire contacts, mounted in rfi enclosures, which function in the same manner as described above for high-level equipment.

The following paragraphs provide a detailed description of the mechanical and photoelectrical assemblies used to perform the various functions of the low-level keyboard unit. Discussions in paragraphs 3-6.1d, e, and for the 3-speed gear shift assembly, mounting base, and variable features are also applicable to low-level CPP equipment. The keyboard unit consists of the keyboard transmitter and the distributor.

a. Keyboard Transmitter. The operation of the keyboard transmitter is discussed in the order in which the mechanisms operate.

(1) Code Bar Mechanism. Refer to figures 3-57 and 3-58. The purpose of the code bar mechanism (figure 3-57) is to preset the necessary code level shutter windows (figure 3-58) for transmission of each character or function. For each code level there is a corresponding code bar submechanism. They are numbered one through five, rear to front, to correspond to the five-level code. The code bar submechanism consists of a front bar, rear bar, tie link, and two T-levers

(a) Positioning for a Mark. To initiate transmission of a mark, a key is pressed moving the keylever down. The keylever moving down strikes the code bar submechanism moving the front bar down to a marking condition. The front bar, when moving down, moves the T-levers in a clockwise direction. The right T-lever moves the shutter down allowing light to pass through the shutter window to a photoelectric cell. The T-levers when rotating clockwise move the tie-link to the left. When the key is released, the leaf spring moves the keylever up, moving the key up to the normal stop position.

(b) Positioning for a Space. To initiate transmission of a space, a key is pressed moving the keylever

Table 3-1. Time Delay Range

| Baud | Time Delay<br>Minimum (Minutes) | Maximum (Minutes) |
|---|---|---|
| 45.5 | 1.8 | 3.6 |
| 50.0 | 1.6 | 3.3 |
| 74.2 | 1.1 | 2.2 |
| 75.0 | 1.1 | 2.2 |

down. The keylever moving down strikes the code bar submechanism moving the rear bar down for a space. The rear bar, when moving down, moves the T-levers in a counterclockwise direction. The right T-lever moves the shutter up, which blocks the light from going to the photocell. The T-levers when rotating counterclockwise move the tie link to the right. When the key is released, the leaf spring moves the keylever up, moving the key up to the normal stop position.

NOTE

The tie-link serves to hold the T-levers in the proper relationship to each other and facilitates the up and down movement of the front and rear bars.

(2) Universal Mechanism. Refer to figures 3-59 and 3-60. The purpose of the universal mechanism is to lock the T-levers in the selected position during transmission of a character or function. When a key or the spacebar is pressed, it moves the keylever down. Near the bottom of the keylever travel it comes into contact with the universal code bar and moves it down. When the universal code bar moves down, it causes the right universal T-lever to rotate clockwise. When the right universal T-lever is rotated clockwise, the tie link moves to the left. The tie link extension comes into contact with the non-repeat lever tab and rotates it clockwise. The non-repeat lever tab, in moving to the left, rotates the latch lever clockwise out of the path of the universal lever. With the latchlever out of the way, the universal lever rotates counterclockwise, or the front end will move up, to lift up on the non-repeat lever. When the

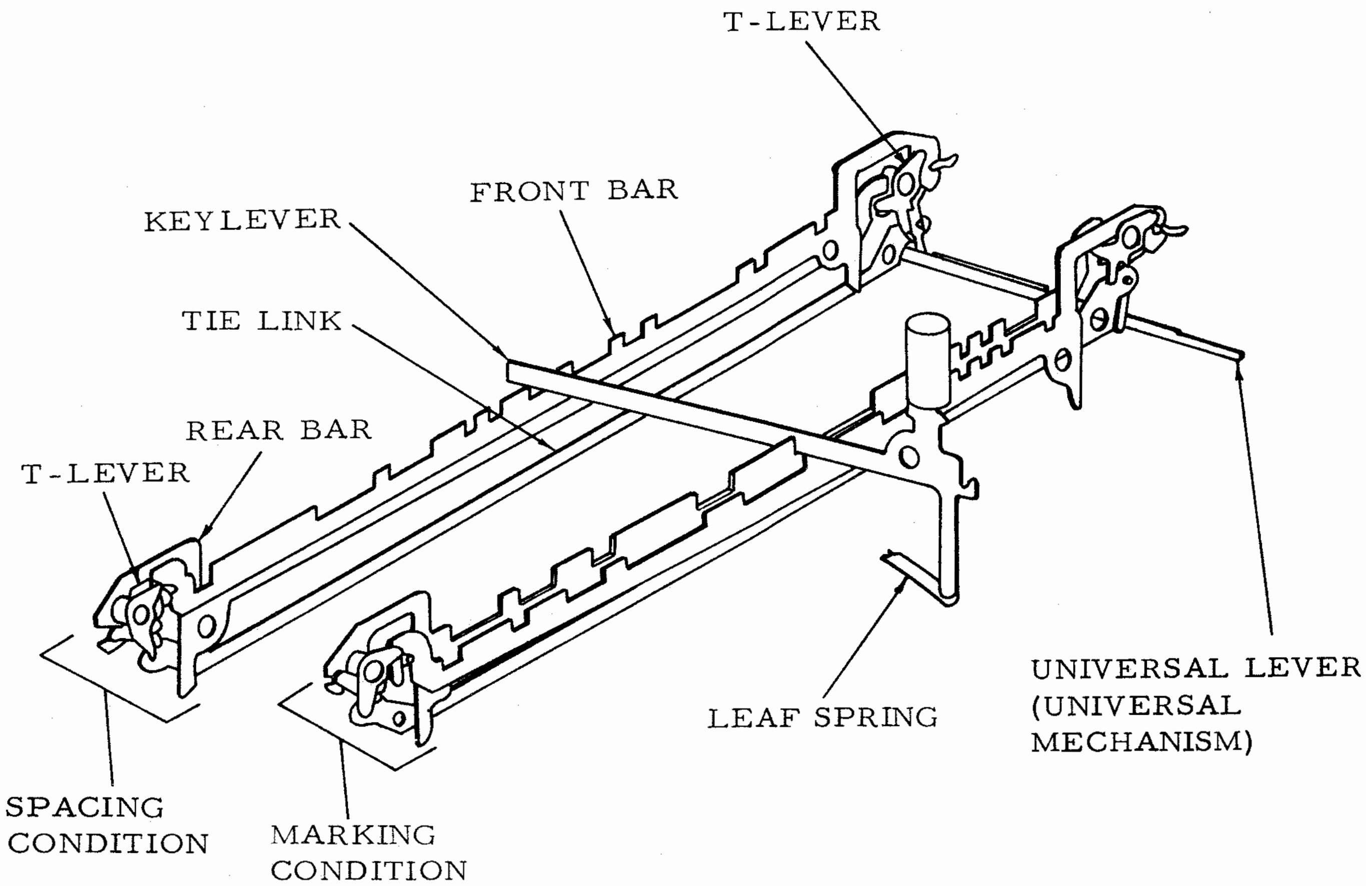



Figure 3-57. Code Bar Mechanism

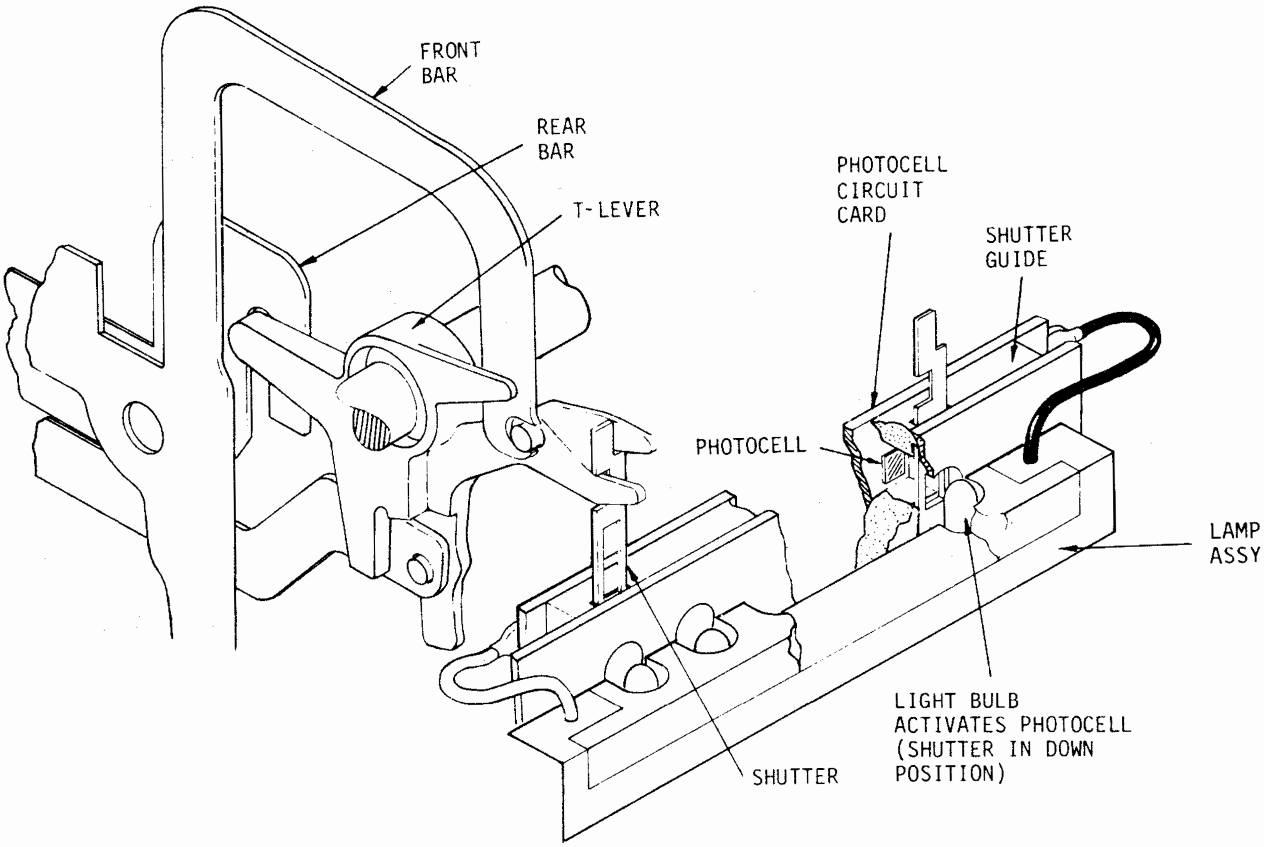



Figure 3-58. Shutter Window Mechanism

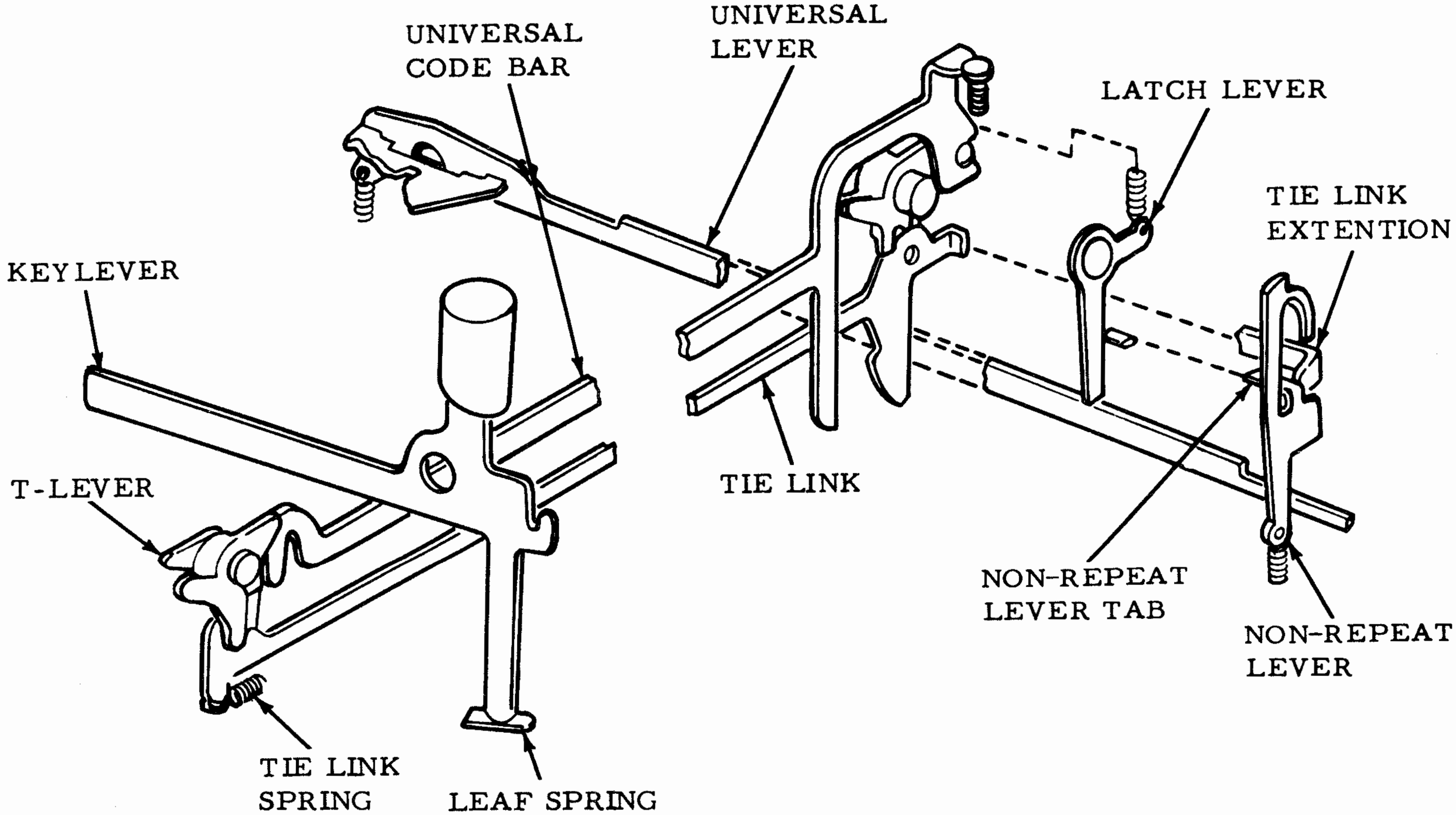



Figure 3-59. Universal Mechanism (Left Front View)

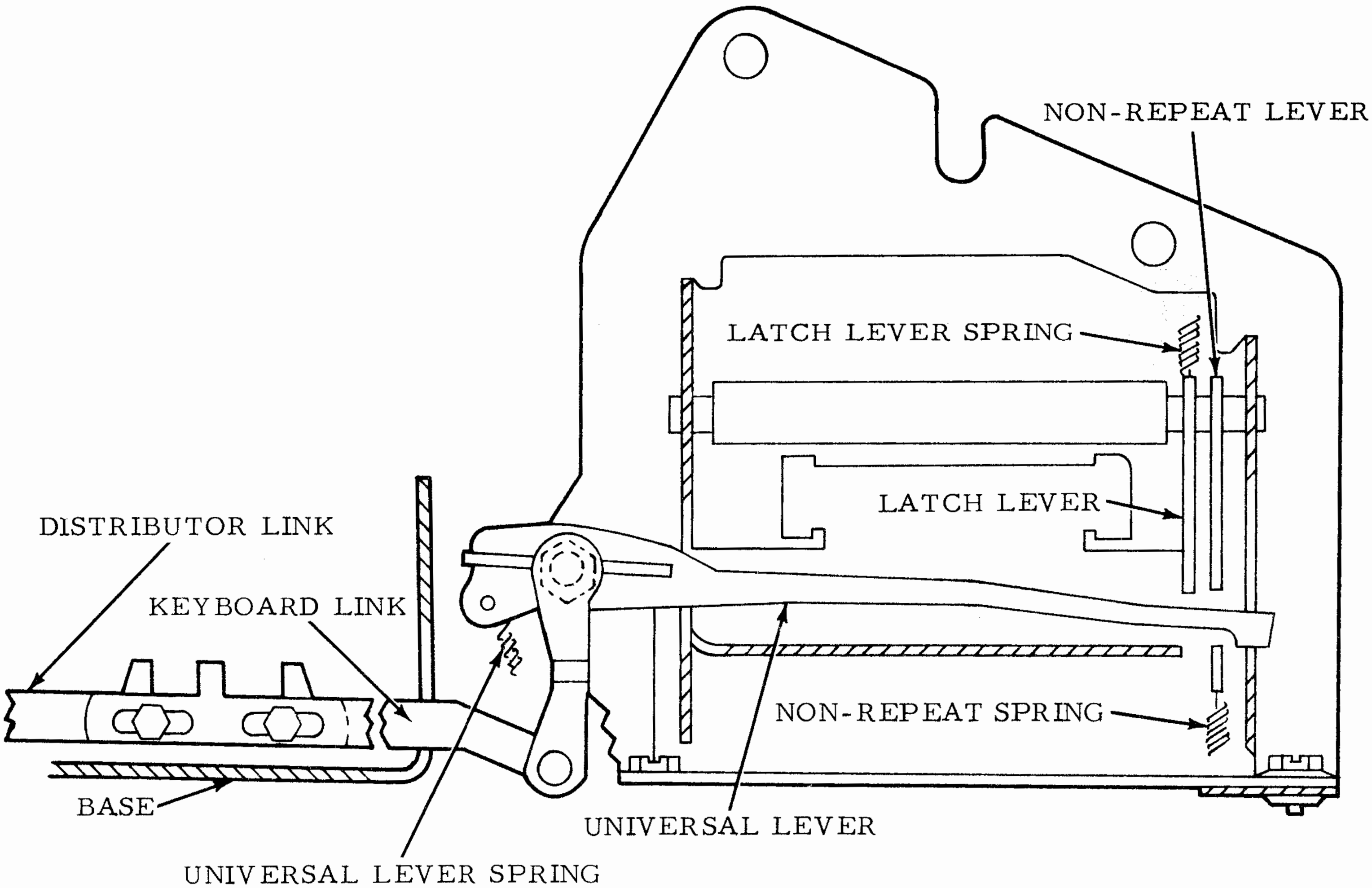



Figure 3-60. Universal Mechanism (Left Side View)

non-repeat lever moves up, it takes the non-repeat lever tab up and moves away from the tie link extension allowing the non-repeat lever to rotate counterclockwise. This allows the latchlever to rotate counterclockwise against the universal lever. In the operated condition, the universal lever holds the T-lever extensions (code bar submechanism) either left or right thus preventing another key from being pressed until the universal lever is reset.

(a) Keyboard Reset. The purpose of the keyobard reset is to reset the universal mechanism in preparation for the next character or function. Near the end of the fifth code-level pulse the clutch cam disk roller moves the distributor link to the rear, which rotates the reset shaft clockwise (figure 3-60). As the reset shaft rotates clockwise it will move the universal lever down in front. As the universal lever moves down in front it allows the latchlever spring to move the latchlever clockwise, over the top of the universal lever. As the universal lever moves down in front it also moves away from the non-repeat lever allowing the non-repeat lever spring to move the non-repeat lever down, moving the non-repeat lever tab down between the universal tie link extension and the latchlever.

(b) Non-Repeat Mechanism. Should a keylever remain pressed beyond the end of the distributor cycle, the tie link extension prevents the non-repeat lever from returning to its reset condition. The non-repeat lever tab hangs on top of the tie link extension. The latchlever, unaffected by the tie link or non-repeat lever, moves to the right, over the top of the universal lever when it moves down, and blocks it, not allowing the universal lever to move up until the keylever is released. At this time, the tie link extension moves back to the right, and the non-repeat lever shifts downward allowing the non-repeat lever tab to fall between the latchlever and the tie link extension (the normal stop position).

b. Photoelectric Distributor Mechanism. The operation of the distributor mechanism is discussed in the following paragraphs. Refer to figure 3-61.

(1) General. Mounted on the distributor clutch is a drive arm, which engages with a drum that has slots cut into it. The slots are arranged in a predetermined interval around the drum. Mounted below the drum are six lamps and mounted in the drum are photoelectric cells which correspond to the five character or function code-level pulses and the stop pulse. As the distributor clutch engages and rotates the drum, a slot corresponding to the stop pulse moves past the lamp that produces the start pulse. Approximately 13.5 milliseconds after the start pulse, as the drum continues to rotate, another slot presents itself to the next lamp. If the shutter is down in the keyboard transmitter, current flows through photoelectric cells in both the keyboard transmitter and the distributor, causing the first code-level pulse to be a mark. If the shutter is up, no current flows and the pulse is a

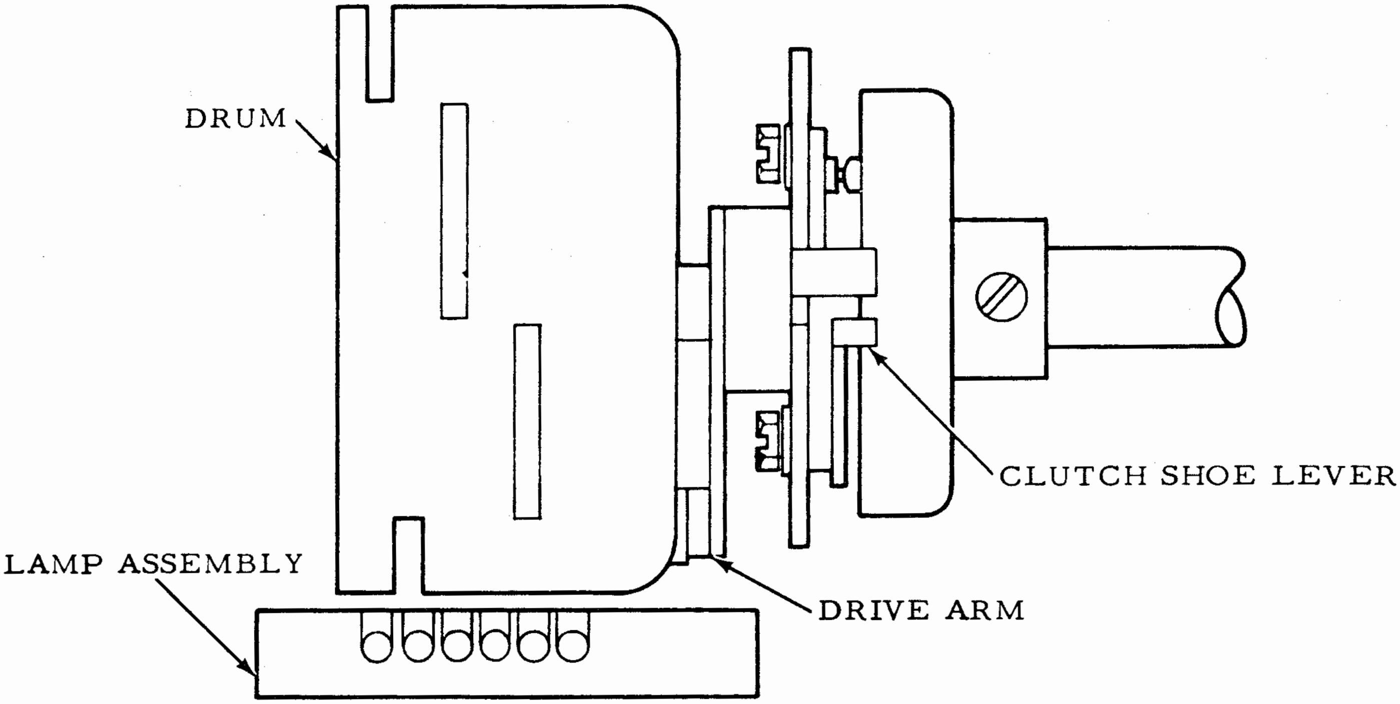



Figure 3-61. Photoelectric Distributor Mechanism

space. The same thing happens for the next four code-level pulses. Then, the slot in the drum corresponding to the stop pulse presents itself causing current to flow, producing the stop pulse as the distributor disengages and the drum is approaching the end of its rotation.

(2) Engaging and Disengaging Distributor Clutch. The distributor clutch is engaged and disengaged as described in the following paragraphs.

(a) Engaging. As the universal lever moves up in front, the rear moves the reset shaft ccounterclockwise, which pulls the keyboard link to the front, causing the reset bail to rotate counterclockwise, moving away from the adjusting plate on the latch bail. At this time, the latch bail spring moves the latch bail counterclockwise. A tab on the latch bail moves against the trip lever, moving it away from the distributor clutch, engaging the clutch.

(b) Disengaging. As the clutch cam disk roller moves the reset bail clockwise, the reset bail moves against the adjusting plate on the latch bail and moves the latch bail clockwise, moving the tab away from the trip lever, allowing the trip lever spring to move the trip lever back into the path of the clutch shoe lever, disengaging the distributor clutch.

# CHAPTER 4
# SCHEDULED MAINTENANCE

4-1. INTRODUCTION. This chapter contains preventive maintenance and performance test procedures, for Model 28 Compact Page Printer (CPP) KSR and RO teletypewriter sets, to be accomplished on a scheduled basis. The purpose of scheduled maintenance is to anticipate and eliminate potential trouble sources in an effort to minimize interruptions to service. Recommended preventive maintenance actions are tabulated in a scheduled maintenance action index along with suggested intervals of performance and references to paragraphs containing specific instructions for performing maintenance actions. The scheduled maintenance actions in this manual are cancelled when the Planned Maintenance System (PMS) is implemented for this equipment aboard your ship or station.

4-2. SCHEDULED MAINTENANCE ACTION INDEX. Table 4-1 lists scheduled maintenance actions to be performed on CPP teletypewriter sets. The Periodicity column indicates the interval and sequence of maintenance action performance. D denotes daily, W denotes weekly, M denotes monthly, Q denotes quarterly, and R denotes as required. The Maintenance Action column briefly describes the maintenance action to be performed. The Reference column lists the paragraph describing the maintenance action in further detail.

4-3. EQUIPMENT AND MATERIALS REQUIRED. The following equipment and materials are required to accomplish preventive maintenance and performance test procedures included in this chapter.

Clean, lint-free cloths.

Cleaning solvent:
Trichloroethane O-T-620

Lubricants: Oil, MIL-L-17672
Grease, MIL-G-23827

Test equipment and tools listed in table 1-5.

4-4. SAFETY PRECAUTIONS. The following are general safety precautions that are not related to any specific procedures and therefore do not appear elsewhere in this publication. These are recommended precautions that personnel must understand and apply during many phases of operation and maintenance.

a. Keep Away From Live Circuits. Operating personnel must at all times observe all safety regulations. Do not replace components or make adjustments inside the equipment with the primary power applied. Under certain conditions, dangerous potentials may exist when the power control is in the off position due to charges retained by capacitors. To avoid casualties, always remove power and discharge and ground a circuit before touching it.

b. Do Not Service Or Adjust Alone. Under no circumstances should any person reach into or enter the enclosure for the purpose of servicing or adjusting the equipment except in the presence of someone who is capable of rendering aid.

c. Resuscitation. Personnel working with or near high voltage should be familiar with modern methods of resuscitation. Such information may be obtained from the Bureau of Medicine and Surgery.

4-5. PREVENTIVE MAINTENANCE PROCEDURES. The following paragraphs contain scheduled preventive maintenance procedures referenced in table 4-1.

a. Daily Inspection and Cleaning. Daily inspection and cleaning of the teletype machine is performed as follows:

CAUTION

Never increase tension on print hammer for darker print; replace the ribbon. When replacing type box, ensure that it is properly positioned and securely fastened. Ensure that ribbon is correctly installed.

(1) Inspect ribbon for wear and frayed edges; replace if required.

(2) Inspect wire rope for frayed ends, cuts, and broken strands; replace if required.

(3) Inspect type and type box for excessive wear on pallets; clean with stiff brush if smudging is evident.

(4) Inspect machine for loose, broken, or worn parts.

CAUTION

While cleaning teletype machine, ensure that springs and adjustable parts are not disturbed.

(5) Inspect machine for dust, lint, and paper shavings.

(6) Wipe inside and outside of machine with soft, lint-free cloth.

(7) Check paper supply: ensure paper roll is correctly installed; ensure that sufficient paper is provided on roll.

b. Weekly Inspection and Cleaning. Weekly inspection and cleaning of the teletype machine is performed as follows:

NOTE

When a signal test set is not available, the orientation range can be determined while receiving the characters RY from the keyboard or a distant station.

(1) Check orientation range as follows:

(a) Set POWER switch to ON.

(b) Supply loop current and test signal.

(c) Rotate range finder knob in one direction until errors appear in copy.

(d) Retract range finder setting slowly until errors disappear. Note number of points indicated.

(e) Rotate range finder knob in opposite direction and determine points

Table 4-1. Scheduled Maintenance Action Index

| Periodicity | Maintenance Action | Reference |
|---|---|---|
| D | Inspect and clean as necessary. | 4-5a |
| D | Check paper supply. | 4-5a(7) |
| D | Inspect and lubricate if necessary. | 4-6,4-7 |
| W | Check points of range. | 4-5b(1) |
| W | Clean selector magnet pole faces. | 4-5b(2) |
| W | Check keyboard contact wires. | 4-5b(3) |
| W | Check distributor code level contacts. | 4-5b(4) |
| W | Check distributor solenoid contacts gap. | 4-5b(5) |
| W | Lubricate. | 4-6,4-7 |
| W | Check operation of keyboard. | 2-3 |
| M | Disassemble and inspect. | 4-5c |
| M | Inspect main shaft. | 4-5c(2) |
| M | Inspect function box. | 4-5c(3) |
| M | Inspect keyboard. | 4-5c(4) |
| M | Inspect selector mechanism. | 4-5c(5) |
| M | Reassemble. | 4-5c(6) |
| M | Check left margin. | 4-5c(7) |
| M | Check right margin. | 4-5c(8) |
| Q | Disassemble and clean in cleaning solvent. | 4-5d |
| Q | Lubricate. | 4-6,4-7 |
| Q | Check adjustments. | 4-5d(6) |
| Q | Inspect selector mechanism. | 4-5c(5) |
| Q or R | Conduct performance tests. | 4-8 |

indicated as described in steps (c) and (d) above. Note number of points indicated.

(f) Difference between number of points indicated in steps (d) and (e) above should be 72 points (minimum).

(2) Clean selector magnet pole faces by running a clean piece of bond paper between them. Do not use teletype paper.

(3) Check keyboard contact wire clearances (use feeler gauge). With keyboard in reset condition and T-levers in marking positions, clearances between contact wires and terminals should be from 0.010 inch (minimum) to 0.025 inch (maximum). With keyboard in reset condition and T-levers in spacing condition, clearances between contact wires and terminals should be from 0.020 inch (minimum) to 0.040 inch (maximum).

(4) Check distributor code level contact gaps (use feeler gauge). Place cam follower lever on high part of cam by tripping clutch manually and rotating distributor shaft. Clearance between first six contact gaps from clutch end of shaft should be from 0.020 inch (minimum) to 0.030 inch (maximum).

(5) Check distributor solenoid contact gap. With distributor clutch in latched or stop position, solenoid contact gap should be from 0.025 inch (minimum) to 0.030 inch (maximum).

c. Monthly Inspection and Cleaning. Monthly inspection and cleaning of the teletype machine is performed as follows:

(1) Disassemble major units from machine; remove cover, typing unit, keyboard, and motor unit from keyboard base. (Refer to disassembly procedures in paragraph 6-12a through 6-12l.)

(2) Inspect main shaft. Check all clutches and wicks, paying particular attention to evidence of wear on clutches.

(3) Inspect function box. Check alignment of function pawls and spring tensions. Check adjustment of stripper blade. Check rear of function box for bits of paper or accumulations of dirt. Clean as required.

(4) Inspect keyboard. Inspect gear shift assembly for worn or cracked teeth on gears. Check for accumulations of dirt or grease, and clean as required. Pay particular attention to evidence of loose parts from automatic typer. Check local off-line functions for proper operation.

(5) Inspect selector mechanism for missing springs.

(6) Reassemble machine. (Refer to reassembly procedures in paragraphs 6-12m through 6-12x.) Prior to reassembly, replace all worn, broken, or missing parts as required. Ensure that typing unit seats properly on keyboard base. Set gears by turning fan on rear of motor in a counterclockwise direction, as viewed from the fan end.

(7) Check left margin. With type box clutch disengaged, spacing drum in its

return position, and type box shifted to letters position, the clearance between the left edge of platen and letters print indicator should be between 15/16 inch and 1-1/6 inches.

(8) Check right margin. Observe that carriage return and line feed occur after 74th character, with a slight overprint.

d. Quarterly Inspection and Cleaning. Quarterly inspection and cleaning of the teletype machine is performed as follows:

(1) Set power switch to OFF; disconnect power cord from primary ac power source; remove loop current.

(2) Disassemble components as described in paragraph 4-c(1); remove platen, type box, and selector assembly.

CAUTION

Ensure that springs are not disengaged, or other parts disturbed in cleaning. Avoid getting dust or dirt into bearings or other moving parts. Cleaning with air hose should be avoided.

(3) Clean machine thoroughly using approved cleaning solvent and clean, soft, lint-free cloths.

(4) Relubricate machine. Refer to lubrication procedures in paragraphs 4-6 and 4-7.

(5) Reassemble machine.

(6) Check following adjustments and readjust if necessary:

(a) Left margin (Friction feed - paragraph 6-3.1h(2)) (Sprocket feed - paragraph 6-3.1c(1)) (earlier design - paragraph 6-7.1j(2)).

(b) Right margin (Friction feed - paragraph 6-3.1h(15), 3.6h(17)) (Sprocket feed - paragraph 6-3.1c(3)) (earlier design 6-7.1h(7)), (Variable feature - 6-5f(17) (earlier design variable feature - 6-9.1a(12)).

(c) Dash-pot vent screw (paragraph 6-3.1h(10)).

(d) Carriage draw-wire rope (paragraph 6-3.1h(3)).

NOTE

Adjust clutches to the high side for 100-wpm operation.

(e) All clutches.

4-6. TYPING UNIT LUBRICATION. The following paragraphs provide typing unit lubrication instructions and specify lubrication intervals (table 4-2) which depend on the amount of daily operation and the speed of operation. Lubrication methods for the typing unit are presented in lubrication charts located at the end of this chapter and indexed in table 4-3. The lubrication charts consist of photographs and line drawings. Photographs show the general area to be lubricated. Callouts on the photographs refer to line drawings indicating each specific mechanism to be lubricated and method of lubrication.

Table 4-2. Lubrication Interval

(Based on 5-Day Week)*

| | Daily Operation of Keyboard | | |
|---|---|---|---|
| Speed (wpm) | 0-8 hrs | 8-16 hrs | 16-24 hrs |
| 60 | 52 wks | 39 wks | 26 wks |
| 66 | 52 wks | 39 wks | 26 wks |
| 75 | 52 wks | 39 wks | 26 wks |
| 100 | 39 wks | 26 wks | 13 wks |
| Newly Installed Equipments (All Speeds) | 3 wks | 2 wks | 1 wk |

*For a 6-day week operation, reduce lubrication intervals 15 percent. For a 7-day week operation, reduce lubrication intervals 30 percent.

Table 4-3. Typing Unit Lubrication Chart Index

| Figure | Title | Page No. |
|---|---|---|
| 4-3 | Printing Area (Front View) | 4-49 |
| 4-4 | Printing Mechanism | 4-50 |
| 4-5 | Type Box Carriage Mechanism | 4-51 |
| 4-6 | Paper Feed Area | 4-52 |
| 4-7 | Paper Feed Mechanism | 4-53 |
| 4-8 | Code Bar Area | 4-54 |
| 4-9 | Code Bar Detents | 4-54 |
| 4-10 | Code Bar Mechanism (A) | 4-55 |
| 4-11 | Ribbon Area (A) | 4-56 |
| 4-12 | Ribbon Feed Mechanism (A) | 4-57 |
| 4-13 | Ribbon Feed Mechanism (B) | 4-58 |
| 4-14 | Vertical Positioning Mechanism | 4-59 |
| 4-15 | Ribbon Area (B) | 4-60 |
| 4-16 | Ribbon Feed Mechanism (C) | 4-61 |
| 4-17 | Vertical Positioning Mechanism | 4-62 |
| 4-18 | Selector Area | 4-63 |
| 4-19 | Code Bar Mechanism (B) | 4-64 |
| 4-20 | Selector Mechanism | 4-65 |
| 4-21 | Function Area (A) | 4-66 |
| 4-22 | Stunt Box Mechanism | 4-67 |
| 4-23 | Stipper Blade Mechanism | 4-68 |
| 4-24 | Function Area (B) | 4-69 |
| 4-25 | Ribbon Reverse Mechanism | 4-70 |
| 4-26 | Shift Mechanism | 4-71 |
| 4-27 | Function Rocker Shaft Mechanism | 4-72 |
| 4-28 | Spacing Area | 4-73 |

Table 4-3. Typing Unit Lubrication Chart Index - Continued

Table 4-3. Typing Unit Lubrication Chart Index - Continued

Table 4-3. Typing Unit Lubrication Chart Index - Continued

a. References to front, rear, left, right, etc., in the lubrication charts, apply to the typing unit as viewed by the operator facing the unit.

b. Lubricate the typing unit just prior to placing it in service. After 300 to 500 operating hours, relubricate the typing unit. Recheck all clutch gaps; reset if necessary. Thereafter, use the lubrication intervals specified in table 4-2.

WARNING

Disconnect power before applying any lubricant.

c. Apply a thick film of grease to all gears and the spacing clutch trip cam plate. Apply oil to all cams, including the camming surfaces of each clutch disc. The following symbols apply to the specific lubrication instructions indicated in the line drawings.

| Symbol | | Meaning |
|---|---|---|
| O | - | Apply MIL-L-17672 |
| G | - | Apply MIL-G-23827 |
| SAT | - | Saturate with MIL-L-17672 oil |

d. Apply MIL-L-17672 oil wherever the use of oil is indicated. Apply MIL-G-23827 grease on all surfaces wherever indicated. Whenever clutches are disassembled, apply a thin coat of grease to the shoe lever spring loops, and oil to the internal mechanisms. Fill lubricator reservoir at indicated intervals.

e. Lubricate the typing unit thoroughly. Saturate all felt washers and oilers, and apply oil to each end of all springs. Apply oil to points where it will adhere and not run off. Avoid over-lubrication. Keep electrical contacts and wire insulations free of lubricants. In general, apply oil to all bearings, wicks, and locations where parts rub, slide, or move with respect to each other. Apply grease to gear teeth and points of heavy pressure.

4-7. KEYBOARD UNIT LUBRICATION. The following paragraphs provide keyboard unit lubrication instructions and specifiy lubrication intervals which depend on the amount of daily operation and the speed of operation. Lubrication methods for the keyboard unit are presented in lubrication charts located at the end of this chapter and indexed in table 4-4. The lubrication charts consist of photographs and line drawings. Photographs show the general area to be lubricated. Callouts on the photographs refer to line drawings indicating each specific mechanism to be lubricated and method of lubrication.

a. References in the lubrication charts made to left or right, top or bottom, and front or rear, apply to the mechanism in its normal operating position as viewed by the operator facing the unit.

b. All felt lubricating washers and all moving surfaces should be thoroughly lubricated. However, over-lubrication which would allow oil to drip, or grease to be thrown, on other parts should be avoided. Exercise special care to avoid

Table 4-4. Keyboard Unit Lubrication Chart Index getting oil or grease on electrical contact surfaces.

c. Lubricate the keyboard unit before putting the set into service or before placing it in storage. After a short period of service, relubricate the set to make certain that no areas have been missed. Thereafter, lubricate the mechanisms and units according to the schedule in table 4-2.

d. The following list of symbols applies to the specific lubrication instructions indicated in the line drawings.

D Keep dry - no lubricant permitted.

G Apply thin coat of grease.

O Apply 1 drop of oil.

02 Apply 2 drops of oil.

03 Apply 3 drops of oil, etc.

OS Oil sparingly (1 or 2 drops only).

OSD Oil sparingly or leave dry. (See NOTE below.)

OSL Oil sparingly or liberally.

SAT Saturate with oil.

NOTE

Applies to all areas not contacted by other parts.

<u>CAUTION</u>

Do not allow oil or grease to obstruct the light path between lamp assemblies and photoelectric cells in the keyboard transmitter and distributor.

e. Use MIL-L-17672 oil at all locations where the use of oil is indicated. Use MIL-G-23827 grease on all surfaces where grease is indicated.

4-8. SCHEDULED PERFORMANCE TESTS. Performance tests consist of mechanical adjustment checks, described in paragraphs 4-8b and 4-8c, and operational tests described in paragraph 4-8d.

a. <u>Preliminary Instructions</u>. Prior to performing mechanical adjustment checks, disassemble machine as follows:

<u>WARNING</u>

Disconnect power from unit. Failure to comply can cause serious injury.

(1) Remove cover:

(a) Depress plungers on sides of dome.

(b) Open window door by lifting from rear.

(c) Disconnect copy light plug.

(d) Push cover latches toward rear and lift cover.

(2) Remove typing unit:

(a) Disconnect P103 from J103.

(b) Remove B plug by pushing clips together at bottom.

(c) Remove four screws which mount typing unit on base.

(d) With left hand under rear frame and right hand on side of front plate above dash pot, lift typing unit from base.

b. Keyboard Unit Adjustment Checks. The following paragraphs describe procedures for checking keyboard unit adjustments.

(1) Check keyboard shutter window gap as follows:

(a) Refer to figure 6-152.

(b) Depress LTRS key to move all T-levers to their lowest position.

(c) Lift first and last shutter with approximately one ounce of force.

(d) Measure clearance between upper edge of shutter window and shutter plate.

(e) Clearance should be between 0.065 inch and 0.075 inch. If clearance is not within specified limits, perform adjustment procedures described in paragraph 6-4.2a(1).

CAUTION

Exercise care to ensure no wires are broken when removing keyboard transmitter.

(2) Remove keyboard transmitter as follows:

(a) Disengage reset linkage from reset lever.

(b) Remove four mounting screws.

(c) Lift keyboard transmitter from base.

(3) Check keyboard universal link clearance as follows:

(a) Refer to figure 6-100 (low-level - figure 6-153).

(b) Push universal lever down until latched by latch lever.

(c) Measure clearance between universal link and frame.

(d) Clearance should be between 0.089 inch and 0.103 inch. If clearance is not within the specified limits, perform adjustment procedures described in paragraph 6-4.1a(1) (high level) or paragraph 6-4.2a(2) (low-level).

(4) Replace and position keyboard transmitter as follows:

(a) Position keyboard transmitter on base so that slot ends in left and right brackets are against rear mounting screws.

(b) Secure transmitter with four mounting screws.

(c) Engage reset linkage with reset lever.

(5) Check distributor clutch drum (low-level only) as follows:

(a) Refer to figure 6-155.

(b) With clutch manually disengaged and pressed against clutch drum, measure gap between ring and hub protrusion.

CAUTION

Do not distort ring while measuring gap.

(c) Gap should be betwen 0.005 inch and 0.010 inch. If gap is not within specified limits, perform adjustment procedure described in paragraph 6-4.2(1).

(d) Visually inspect distributor clutch drum to determine drive arm is parallel to surface of drum assembly. If they are not parallel, manually bend drive arm until they become parallel as gauged by eye.

(6) Check distributor clutch shoe lever gap as follows:

(a) Refer to figure 6-119 (low-level-figure 6-156).

(b) Disengage clutch.

(c) Measure gap between clutch shoe lever and stop lug. Record the value.

(d) Engage clutch.

(e) Repeat step (c).

(f) Subtract the value obtained in step (c) from that obtained in step (e).

(g) The measurement in step (e) should be 0.055 to 0.085 inch greater than the measurement in step (c). If the difference is not within the specified limits, perform adjustment procedure described in paragraph 6-4.1b(5) (high-level) or paragraph 6-4.2a(2) (low-level.

(7) Check distributor clutch trip lever engagement as follows:

(a) Refer to figure 6-116 (low-level-figure 6-157).

(b) Ensure that clutch trip lever engages clutch shoe lever by full thickness of clutch shoe lever.

(c) If full engagement does not exist, perform the adjustment procedure described in paragraph 6-4.1b(2) (high-level) or paragraph 6-4.2b(3) (low-level).

(8) Check distributor clutch magnet plate (low level only) as follows:

(a) Refer to figure 6-158.

(b) Disengage clutch.

(c) Set the control lever to REMOTE position.

(d) Ensure latch bail is against armature.

(e) Measure gap between latch bail and trip lever.

(f) Gap should be between 0.020 inch and 0.040 inch. If gap is not within specified limits, perform adjustment procedure described in paragraph 6-4.2b(4).

(g) Set control lever to LOCAL position.

(9) Check distributor gear backlash as follows:

(a) Refer to figure 6-136 (low-level - figure 6-150).

(b) Hold pinion gear stationary.

(c) Rotate driven gear back and forth while observing amount of backlash between pinion gear and driven gear at point in travel where clearance is minimum. As gauged by eye and feel, backlash should be barely perceptible (0.002 to 0.005).

(d) If backlash adjustment is necessary, perform procedure described in paragraph 6-4.1c(5) (low-level - paragraph 6-4.2c(5)).

(10) Check distributor reset lever clearances (low-level only) as follows:

(a) Refer to figure 6-160.

(b) Engage distributor clutch and rotate until reset lever is at lowest point.

(c) Measure clearance between latchlever and reset lever, and between the base and the distributor and keyboard links.
this is page 4-16

(c) Clearance between latchlever and reset lever should not be less than 0.030 inch nor more than 0.045 inch. Clearance between the base and the distributor and keyboard links should not be less than 0.050 inch nor more than 0.090 inch. If either clearance exceeds specified limits, perform adjustment procedure described in paragraph 6-4.2b(6).

(11) Check distributor latch bail clearance (low-level only) as follows:

(a) Refer to figure 6-161.

(b) Disengage clutch.

(c) Ensure keyboard is reset.

(d) Set control lever to REMOTE position.

(e) Insert a 0.025-inch gauge between bottom of armature and latch bail.

(f) Measure clearance between front of tab on armature and rear of tab on latch bail.

(g) Clearance should be between 0.010 inch and 0.018 inch. If clearance is not within specified limits, perform adjustment procedure described in paragraph 6-4.2b(7).

(h) Return control lever to LOCAL position.

(12) Check distributor clutch trip armature aire gap as follows:

(a) Refer to figure 6-115.

(b) Hold armature flush against magnet core.

(c) Measure clearance between armature and magnet assembly bracket.

(d) Clearance should be between 0.004 inch and 0.008 inch. If clearance is not within specified limits, perform adjustment procedure described in paragraph 6-4.1b(1).

(13) Check keyboard contact wire clearances as follows:

(a) Refer to figure 6-101.

(b) Place keyboard in reset condition.

(c) Set T-levers in marking position.

(d) Using feeler gauge, check clearance between contact wires and terminal is from 0.010 inch (minimum) to 0.025 inch maximum.

(e) Set T-levers in spacing condition.

(f) Check clearance between contact wires and terminal is from 0.020 inch (minimum) to 0.040 inch (maximum). If not, perform adjustment procedure described in paragraph 6-4.1a(2).

(14) Check distributor code level contacts as follows:

(a) Refer to figure 6-123.

(b) Place cam follower lever on high part of cam by tripping clutch manually and rotating distributor shaft.

(c) Using feeler gauge, check first six contact gaps from clutch end of shaft. Gaps should be from 0.020 inch (minimum) to 0.030 inch (maximum). If not, perform adjustment procedure described in paragraph 6-4.1b(9).

(15) Check distributor solenoid contact gap as follows:

(a) Refer to figure 6-125.

(b) Place distributor clutch in latched or stop position.

(c) Using feeler gauge, check solenoid contact gap is from 0.025 inch (minimum) to 0.030 inch (maximum). If not, perform adjustment procedure described in paragraph 6-4.1b(11).

c. <u>Typing Unit Mechanical Adjustment Checks</u>. The following paragraphs describe procedures for checking typing unit adjustments.

(1) Check range finder knob phasing as follows:

(a) Refer to figure 6-71.

(b) Rotate range finder knob either clockwise or counterclockwise to the stop.

(c) Zero on range scale should be within three points of index mark. If zero is more than three points away from index, perform adjustment procedure described in paragraph 6-3.1g(6).

(d) Rotate knob to set 60 on range scale at index.

(2) Check selector clutch stop arm as follows:

(a) Refer to figure 6-71.

(b) Set range scale at 60.

(c) With selector clutch disengaged and armature in marking position, clutch stop arm should engage clutch shoe lever by approximately the full thickness of shoe lever. If not, perform adjustment procedure described in paragraph 6-3.1g(7).

(3) Check selector clutch drum end play as follows:

(a) Refer to figure 6-80.

(b) With clutch latched in stop position, measure cam-clutch assembly end play.

(c) Cam-clutch assembly should have some end play, but not to exceed 0.010 inch. If end play adjustment is necessary, perform procedure described paragraph 6-3.1g(17).

(4) Check code bar clutch trip lever end play as follows:

(a) Refer to figure 6-34.

(b) Disengage selector clutch and code bar clutch.

(c) Code bar clutch trip lever should engage clutch shoe lever by full thickness of clutch shoe lever, and trip shaft should have some end play, but not to exceed 0.006 inch.

(d) If either engagement or end play adjustment is necessary, perform procedure described in paragraph 6-3.1d(5).

(5) Check function clutch trip lever end play as follows:

(a) Refer to figure 6-41.

(b) Disengage code bar clutch and function clutch.

(c) Function clutch trip lever should engage clutch shoe lever by full thickness of clutch shoe lever. (Check at lug with least bite on three stop clutches). Trip lever shaft should have some end play, but not to exceed 0.006 inch.

(d) If either engagement or end play adjustment is necessary, perform procedure described in paragraph 6-3.1d(13).

(6) Check clutch trip shaft set collars as follows:

(a) Refer to figure 6-39 (earlier design - figure 6-239).

(b) Measure spacing cutout lever end play.

(c) Lever should have some end play, not to exceed 0.008 inch.

(d) Measure line feed clutch latch lever side play.

(e) Lever should have some side play, not to exceed 0.008 inch.

(f) If side play adjustment is required, perform procedure described in paragraph 6-3.1d(11) (earlier design - paragraph 6-7.1d(2)).

(7) Check type box clutch trip lever eccentric post as follows:

(a) Refer to figure 6-42.

(b) Disengage type box clutch.

(c) Ensure that trip lever engages clutch shoe lever by full thickness of shoe lever.

(d) If full engagement does not exist, perform adjustment procedure described in paragraph 6-3.1d(14).

(8) Check spacing clutch trip lever as follows:

(a) Refer to figure 6-38 (earlier design - figure 6-241).

(b) Disengage clutch.

(c) Trip clutch trip lever and rotate main shaft until trip lever is over shoe lever. Take up play of shoe lever inward by snapping trip lever over shoe lever.

(d) Check clearance between shoe lever and drum at each of three stop positions to determine which stop yields greatest clearance.

(e) With trip lever at stop position which yields greatest clearance, rotate main shaft slowly until trip lever just falls off stop lug. Check clearance between trip lever and drum. Clearance should be from 0.018 to 0.035 inch less than clearance between shoe lever and drum.

(f) If clearance adjustment is necessary, perform procedure described in paragraph 6-3.1d(10) (earlier design - paragraph 6-7.1d(4).

(9) Check line feed clutch trip lever eccentric post as follows:

(a) Refer to figure 6-43.

(b) Disengage clutch.

(c) Trip clutch trip lever and rotate main shaft until trip lever is over shoe lever. Take up play of shoe lever inward by snapping trip lever over shoe lever.

(d) Check clearance between shoe lever and drum of each of three stop positions to determine which stop yields greatest clearance.

(e) With trip lever at stop position which yields greatest clearance, rotate main shaft slowly until trip lever just falls off stop lug. Check clearance between trip lever and drum. Clearance should be from 0.018 to 0.035 inch less than clearance between shoe lever and drum.

(f) If clearance adjustment is necessary, perform procedure described in paragraph 6-3.1d(15).

(10) Check line feed clutch trip lever adjusting screw as follows:

(a) Refer to figure 6-43.

(b) Set line feed function slide arm in rear position and clutch trip lever against its eccentric post.

(c) Hold trip arm against the function slide arm and measure clearance between end of trip lever adjusting screw and trip arm. Clearance should not exceed 0.006 inch.

(d) If clearance adjustment is necessary, perform procedure described in paragraph 6-3.1d(16).

(11) Check line feed spur gear detent eccentric as follows:

(a) Refer to figure 6-20.

(b) Disengage line feed clutch.

(c) Rotate platen until detent stud is seated between two teeth on line feed spur gear.

(d) When hand wheel is released, manually set the teeth on the feed bars into engagement with the teeth on the line feed spur gear.

(e) The detent stud should contact one gear tooth and be not more than 0.010 inch from other tooth. If adjustment is necessary, perform procedure described in paragraph 6-3.1c(6).

(12) Check line feed clutch phasing as follows:

(a) Refer to figure 6-21.

(b) Disengage line feed clutch.

(c) Both line feed bars should engage teeth of line feed spur gear and be flush with each other.

(d) If adjustment is necessary, perform procedure described in paragraph 6-3.1c(8).

(13) Check spacing gear clearance as follows:

(a) Refer to figure 6-94.

(b) With carriage fully returned, hold spacing driving gear stationary and gently rotate driven gear back and forth.

(c) Ensure backlash between gears is barely perceptible, without bind, at closest point in travel. If backlash adjustment is necessary, perform procedure described in paragraph 6-3.1h(18).

(14) Check spacing gear phasing as follows:

(a) Refer to figure 6-94.

(b) Engage spacing clutch.

(c) Observe index line on spacing pawl is midway between the two lines on pawl retaining washer. If adjustment is necessary, perform procedure in paragraph 6-3.1j(18).

(15) Check rocker shaft bracket eccentric stud as follows:

(a) Refer to figure 6-45.

(b) Disengage type box clutch and take up play toward front.

(c) Measure gap between lower side of lock lever roller and top edge of shoulder on horizontal positioning lock lever. Gap should be between 0.055 inch and 0.090 inch. If not, perform adjustment procedure described in paragraph 6-3.1e(3).

(16) Check clutch shoe levers as follows:

(a) Refer to figure 6-35.

(b) Disengage clutch and measure gap between clutch shoe lever and its stop lug. Record measurement.

(c) Engage and rotate clutch until clutch shoe lever is towards bottom of unit.

(d) With clutch engaged, again measure gap between clutch shoe lever and its stop lug. Measurement should be 0.055 inch to 0.085 inch greater than measurement obtained in step (b) above. If adjustment is necessary, perform procedure described in paragraph 6-3.1d(7).

(e) Repeat steps (a) through (d) for each clutch.

(17) Check code bar shift lever drive arm as follows:

(a) Refer to figure 6-5 (earlier design - figure 6-229).

(b) Engage and rotate code bar clutch until code bar shift lever link is in uppermost position.

(c) There should be some clearance, but not to exceed 0.025 inch, between top of code bar shift lever link roller and top of cam slots in top of code bar shift levers. If adjustment is necessary, perform procedure described in paragraph 6-4q.

(d) Code bar shift lever link shaft should have some end play but not to exceed 0.006 inch. If adjustment is necessary, perform procedure described in paragraph 6-3.1a(5), earlier design - paragraph 6-7.1a(1).

(18) Check transfer lever eccentric as follows:

(a) Refer to figure 6-7.

(b) Set up a letters (12345) code combination.

(c) Disengage selector clutch.

(d) Engage and rotate code bar clutch until code bar shift lever link is in uppermost position.

(e) With play of shift bar taken up for maximum clearance, measure clearance between rear code bar shift lever and code bar shift bar farthest from shift lever.

(f) Clearance should be 0.010 to 0.025. If not, perform adjustment procedure described in paragraph 6-3.1a(8).

(19) Check intermediate arm back stop bracket as follows:

(a) Refer to figure 6-8.

(b) Set up a blank (-----) code combination.

(c) Disengage selector and code bar clutches.

(d) Take up play to obtain maximum clearance between front code bar shift lever and inner step of code bar shift bar farthest from shift lever, then measure clearance.

(e) Clearance should be from 0.010 inch to 0.025 inch. If not, perform adjustment procedure described in paragraph 6-3.1a(9).

(20) Check code bar shift lever link brackets as follows:

(a) Refer to figure 6-4 (earlier design link guide bracket - figure 6-230).

(b) Set up a letters (12345) code combination.

(c) Engage and rotate code bar clutch until code bar shift lever link is in uppermost position.

(d) Ensure code bars are detented.

(e) With play taken up for maximum clearance, measure clearance between right side of front code bar shift lever and shoulder of closest code bar shift bar. Clearance should be between 0.002 inch and 0.025 inch.

(f) Set up a blank (-----) code combination.

(g) Repeat steps (c) and (d).

(h) With play taken up for maximum clearance, measure clearance between left side of rear code bar shift lever and shoulder of closest code bar shift bar. Clearance should be between 0.002 inch and 0.025 inch.

(i) If clearance in either step (e) or (h) above is not within specified limits, perform adjustment procedure described in paragraph 6-3.1a(4) (earlier design link guide bracket - paragraph 6-7.1a(2)).

(21) Check type box clutch trip lever as follows:

(a) Refer to figure 6-36 (variable feature - figure 6-170).

(b) Engage and rotate code bar clutch until trip shaft cam follower roller is on lowest surface of code bar clutch cam.

(c) Align type box clutch disc stop lug with trip lever.

(d) Measure clearance between trip lever and stop lug. Clearance should be from 0.025 inch to 0.045 inch.

(e) Measure type box clutch latchlever side play. There should be some side play but it should not exceed 0.008 inch.

(f) If clearance measured in step (d) or side play measured in step (e) exceed specified limits, perform adjustment procedure described in paragraph 6-3.1d(8) (variable features - paragraphs 6-5c(4), 6-5m(3)).

(22) Check carriage draw-wire rope as follows:

(a) Refer to figure 6-85.

(b) Engage and rotate type box clutch 180 degrees.

(c) As gauged by feel, rear upper cable should have slightly greater tension than front cable.

(d) Measure clearance between lower draw-wire rope and carriage return latch bail post. Clearance should be 0.006 inch minimum.

(e) Measure clearance between lower draw-wire rope and left horizontal positioning drive linkage. Clearance should be 0.030 inch minimum.

(f) If either clearance is insufficient, perform adjustment procedure described in paragraph 6-3.1h(3).

(23) Check oscillating rail slide position as follows:

(a) Refer to figure 6-91 (earlier design - figure 6-257).

(b) Move type box carriage to right until feed pawl farthest advanced engages tooth immediately above cut-away section on spacing drum ratchet.

(c) Measure clearance between oscillating rail slide and right rear draw-wire pulley at point on pulley where clearance is minimal.

(d) Clearance should be between 0.025 inch and 0.050 inch. If clearance is not within the specified limits, perform adjustment procedure described in paragraph 6-3.1h(13) (earlier design - paragraph 6-7.1h(9)).

(24) Check printing carriage lower roller as follows:

(a) Refer to figure 6-58.

(b) Move printing carriage to right.

(c) Operate manual carriage return while holding printing carriage to right. Allow carriage to slowly return.

(d) Observe play of carriage on track is minimal over full length of track.

(e) If adjustment of eccentric bushing or sliding screw is necessary, perform procedure described in paragraph 6-3.1f(4).

(25) Check printing carriage position as follows:

(a) Refer to figure 6-60.

(b) Set up M (--345) code combination.

(c) Position printing carriage at approximate midpoint of platen.

(d) Engage and rotate type box clutch 180 degrees.

(e) From top view, as gauged by eye, ensure that M type pallet is centered on printing hammer when hammer is touching pallet.

(f) If adjustment is necessary, perform procedure described in paragraph 6-3.1f(6).

(26) Check printing hammer bearing stud as follows:

(a) Refer to figure 6-61.

(b) Set up a period (--345) code combination in upper case.

(c) Position printing carriage at approximate midpoint of platen.

(d) Engage and rotate type box clutch 180 degrees.

(e) From right view, as gauged by eye, ensure that period type pallet fully engages printing hammer when hammer is touching pallet.

(f) If adjustment is necessary, perform procedure described in paragraph 6-3.1f(7).

(27) Check spacing trip lever bail cam plate as follows:

(a) Refer to figure 6-96.

(b) With spacing trip lever arm in upward position, engage and rotate type box clutch 180 degrees.

(c) Disengage all function pawls from function bars.

(d) Measure clearance between top surface of trip lever arm extension and spacing trip lever shoulder.

(e) Clearance should be between 0.010 inch and 0.040 inch. If clearance exceeds specified limits, perform adjustment procedure described in paragraph 6-3.1h(21).

(28) Check printing track as follows:

(a) Refer to figure 6-62.

(b) Set up blank (-----) code combination in figures.

(c) Position printing arm slide alternately over each printing track mounting screw.

(d) Position printing hammer operating bail latching extension in line with left face of latch shoulder.

(e) Measure clearance between latching extension and latch shoulder.

(f) Clearance should be between 0.015 inch and 0.040 inch. If clearance exceeds specified limits, perform adjustment procedure described in paragraph 6-3.1f(12). Hold clearance to maximum.

NOTE

Cycle unit between each check.

(29) Check printing hammer stop bracket as follows:

(a) Refer to figure 6-57 (earlier design - figure 6-246).

(b) Set up M (--345) code combination.

(c) Engage and rotate type box clutch 180 degrees.

(d) Hold printing hammer stop bracket towards type pallet with eight ounces of force.

(e) Measure clearance between printing hammer and M type pallet across entire length of pallet.

(f) Clearance should be between 0.005 inch and 0.035 inch. If clearance is not within specified limits, perform adjustment procedure described in paragraph 6-3.1f(2) (earlier design - paragraph 6-7.1f(2)).

(30) Check printing arm as follows:

(a) Refer to figure 6-57 (earlier design - figure 6-246).

(b) Position printing track in its extreme downward position.

(c) Set printing hammer operating bail against its stop.

(d) Take up play for maximum by lightly pressing down on printing arm slide and measure clearance between secondary printing arm and forward extension of printing hammer operating bail.

(e) There should be some clearance, not to exceed 0.015 inch.

(f) Position printing track in its extreme upward position.

(g) Disengage type box clutch.

(h) Measure clearance between right face of operating bail latching extension and left face of latch surface. Check right and left positions.

(i) Clearance should be 0.006 inch minimum.

(j) If clearance measured in steps (d) or (i) is not within specified limits, perform adjustment procedure described in figure 6-3.1f(1) (earlier design - paragraph 6-7.1f(3).

(31) Check function reset bail blade as follows:

(a) Refer to figure 6-12 (earlier design - figure 6-234).

(b) Engage and rotate code bar clutch until shoe lever just touches trip lever.

(c) Disengage all function pawls from function bars.

(d) Unlatch all function lever latches from function levers.

(e) Using spring puller, pull each function bar to rear and measure clearance between each function bar and function reset bail blade.

(f) Clearance should be between 0.018 inch and 0.035 inch. If clearance is not within specified limits, perform adjustment procedure described in paragraph 6-3.1b(6) (earlier design - paragraph 6-7.1b(4).

(32) Check carriage return latch bail as follows:

(a) Refer to figure 6-86.

(b) Manually return carriage.

(c) Take up play in carriage return bail to right by holding right side against retainer.

(d) Measure clearance between carriage return lever and carriage return latch bail.

(e) Clearance should be between 0.004 inch and 0.040 inch. If clearance is not within specified limits, perform adjustment procedure described in paragraph 6-3.1h(5).

(33) Check carriage return lever as follows:

(a) Refer to figure 6-87.

(b) Set up carriage return (---4-) code combination.

(c) Engage and rotate function clutch until stop lug is toward bottom of unit.

(d) Rotate spacing drum clockwise until carriage return latch bail over-travels carriage return lever.

(e) Measure clearance between latching surface of carriage return latch bail and top of carriage return lever.

(f) Clearance should be between 0.006 inch and 0.035 inch. If clearance is not within specified limits, perform adjustment procedure described in paragraph 6-3.1h(7) (variable feature - paragraph 6-5b(1).

(34) Check left margin as follows:

(a) Refer to figure 6-18 'sprocket feed) or 6-84 (line feed). (For earlier design line feed, refer to figure 6-252.)

(b) Manually return carriage.

(c) Shift type box to letters condition.

(d) Ensure front feed pawl is farthest advanced.

(e) Measure clearance between left edge of platen and letters print indicator.

(f) Clearance should be between 15/16 inch and 1-1/16 inch. If clearance is not within the specified limits, perform adjustment procedure described in paragraph 6-4am, steps (1) through (7).

(g) Take up play in spacing shaft by rotating driven gear clockwise from a front view.

(h) Measure clearance between feed pawl and shoulder of ratchet tooth immediately above pawl. There should be some clearance, not to exceed 0.008 inch.

(i) Engage and rotate spacing clutch until rear feed pawl is farthest advanced and clutch is disengaged.

(j) Manually return carriage.

(k) Observe rear feed pawl drops into indentation between ratchet wheel teeth, and bottoms firmly in notch. If adjustment is necessary, perform procedure described in paragraph 6-3.1c(1) (sprocket feed) or 6-3.1h(2) (line feed). (For earlier design line feed, refer to paragraph 6-7.1h(2)).

(35) Check shift linkage as follows:

(a) Refer to figure 6-54.

(b) Position carriage near midpoint at platen.

(c) Set up O (not zero) (---45) code combination.

(d) Engage and rotate type box clutch 180 degrees.

(e) Note position of printing hammer in relation to O (not zero) type pallet when hammer is pushed in to touch pallet.

(f) Manually buckle right shift linkage.

(g) Position of printing hammer in relation to 9 type pallet should be same as it was in relation to O (not zero) type pallet in step (e).

(h) Repeat steps (b) through (g) using W and 2 type pallets and (12--5) code combination.

(i) If adjustment is necessary, perform procedure described in paragraph 6-3.h(5).

(36) Check stripper blade drive cam position as follows:

(a) Refer to figure 6-15.

(b) Note amount of over-travel between upper peak of stripper blade drive cam and stripper blade drive arm.

(c) Engage and rotate function clutch 180 degrees.

(d) Note amount of over-travel between lower peak of stripper blade drive cam and stripper blade drive arm.

(e) Amount of over-travel in steps (b) and (d) should be equal as gauged by eye. If adjustment is necessary perform procedure described in paragraph 6-3.1b(9).

d. Operational Tests. Operational tests for high-level CPP equipment are discussed below in paragraph 4-8d(1) and for low-level CPP equipment in paragraph 4-8d(2).

(1) Operational Tests (High-Level). Figure 4-1 shows test setup required to perform high-level CPP test procedures described in table 4-5. If abnormal indications are encountered during a test, refer to Troubleshooting Index, table 5-1, in Chapter 5. Prior to conducting the tests, perform the following initial control setting on the AN-UGM8B(V) and TS-2616/UGM test sets shown in figure 4-1.

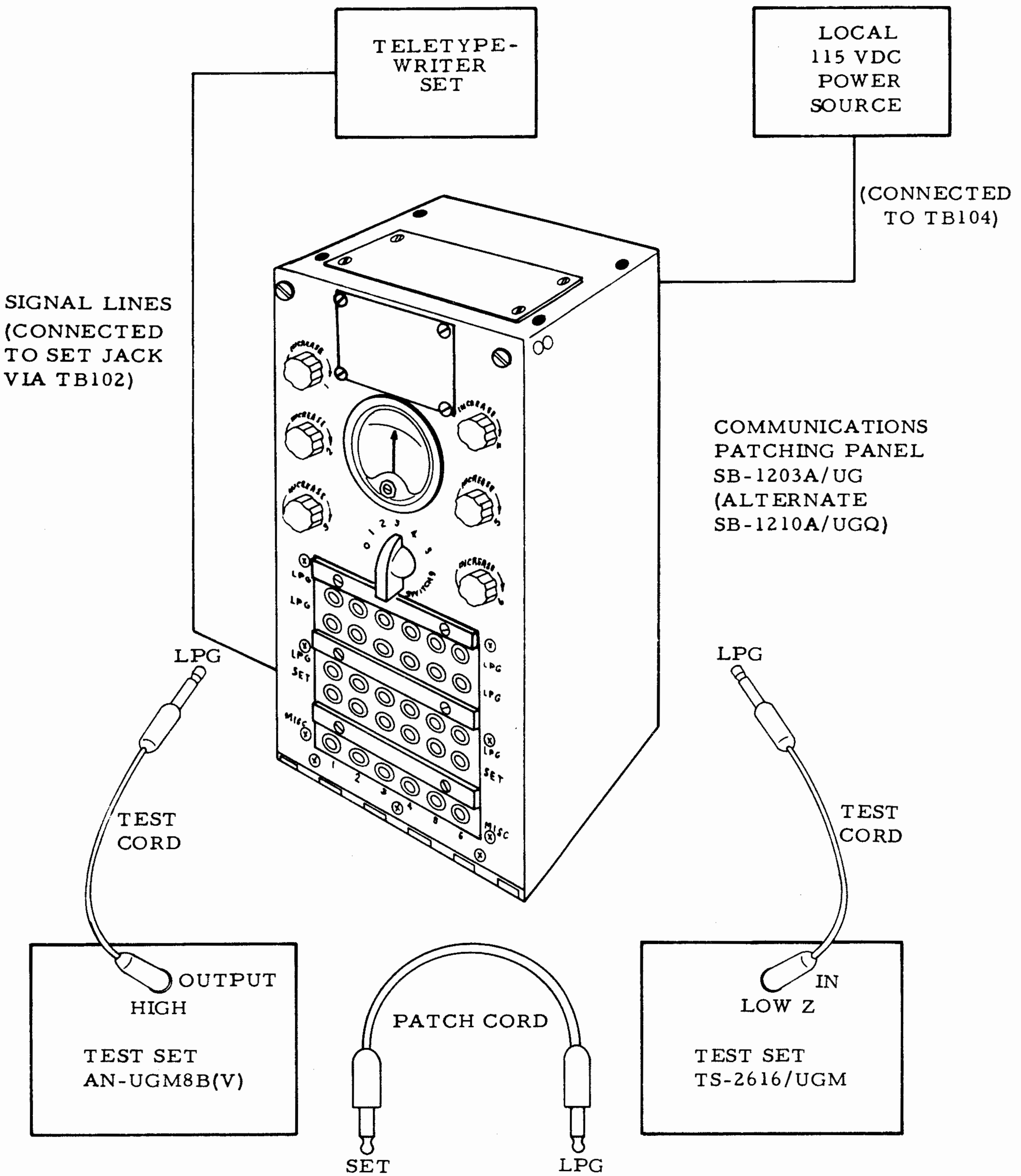



Figure 4-1. CPP Test Setup (High-Level)

Table 4-5. Operational Test Procedures (High-Level)

| Step | Action | Normal Indication | Peference Table 5-1 |
|---|---|---|---|
| 1. | Preliminary | | |
| a. | Ensure test set controls are set as indicated in paragraph 4-8d (1). | | |
| b. | Ensure power switch on CPP is set to OFF. | | |
| c. | Refer to figure 4-1. | | |
| d. | Ensure CPP and local 115 VDC power source are correctly connected to patching panel (See NAVSHIPS 0967-874-1010, formerly NAVSHIPS 95718.) | | |
| e. | Plug test cords into OUTPUT HIGH jack on AN/UGM-8B(V) and IN LOW Z jack on TS-2616/UGM. | | |
| f. | Plug test set power cords into 115-VAC power outlets. | | |
| g. | Plug test cord from AN/UGM-8B(V) into LPG jack (top row) in same channel as SET jack for CPP is located. | | |

Table 4-5. Operational Test Procedures (High-Level) - Continued

| Step | Action | Normal Indication | Reference Table 5-1 |
|---|---|---|---|
| h. | On patching panel, set current meter SWITCH to CPP channel. Rotate current ADJUSTMENT control fully counterclockwise. | | |
| 2. | <u>Typing Unit Range Check</u>. | | |
| a. | Set POWER ON/OFF switch on AN/UGM-8B(V) to ON. | | |
| b. | Set power switch on CPP to ON. | | |
| c. | On patching panel, rotate channel current ADJUSTMENT control for reading of 60 on current meter. | | |
| d. | Press LOC LF and LOC CR keys on AN/UGC-20B keyboard. | | |
| e. | Set SIGNAL PATTERN switch on AN/UGM-8B(V) to FOX. | (1) Typing unit types test message. | |
| | | (2) Letters-figures shift and figures-letters shift operate properly. | Items 9 and 10. |
| | | (3) Normal carriage return and line feed operate properly. | Items 11 and 13. |

Table 4-5. Operational Test Procedures (High-Level) - Continued

| Step | Action | Normal Indication | Reference Table 5-1 |
|---|---|---|---|
| f. | Adjust range finder knob on selector assembly to determine minimum and maximum settings at which message is typed without error. | | |
| g. | Note difference between minimum and maximum settings obtained in step f. | 72 (minimum difference) | Item 1 |
| h. | Place range finder on optimum setting as follows: | | |
| | (1) Add low and high readings obtained in step f. | | |
| | (2) Divide by 2. | | |
| | (3) Resulting number is optimum setting. | | |
| 3. | <u>Typing Unit Quality of Print Check</u>. | | |
| a. | While typing unit is receiving test message, observe quality of printed copy. | (1) Characters are positioned on straight vertical line. | Item 2 |
| | | (2) Uniform spacing between characters. | Item 3 |
| | | (3) Clear type. | Item 4 |

Table 4-5. Operational Test Procedures (High-Level) - Continued

| Step | Action | Normal Indication | Reference Table 5-1 |
|---|---|---|---|
| | | (4) Proper, error-free test pattern typed. | Item 5 |
| | | (5) Proper ribbon feed. | Item 6 |
| b. | Manually operate ribbon lever inward, on side where ribbon is being unwound. | Ribbon reverses. | Item 7 |
| c. | Repeat step b, using other ribbon lever. | Ribbon reverses. | Item 7 |
| d. | Set SIG PATTERN switch on AN/UGM-8B(V) to STDY MK. | | |
| 4. | <u>Typing Unit Distorted Signal Check</u>. | | |
| | NOTE<br>This test checks the ability of the typing unit to copy a distorted signal. | | |
| a. | Ensure DISTORTION SELECT switch on AN/UGM-8(V) is set to MARK BIAS. | | |

Table 4-5. Operational Test Procedures (High-Level) - Continued

| Step | Action | Normal Indication | Reference Table 5-1 |
|---|---|---|---|
| b. | Set PERCENT DISTORTION switches as follows:<br>(1) TENS: 40<br>(2) UNITS: 0 | | |
| c. | Set SIGNAL PATTERN switch on AN/UGM-8B(V) to FOX. | Must copy one line with not more than one error. | Item 8 |
| d. | Set DISTORTION SELECT switch to SPACE BIAS. | Same as step e. | Item 8 |
| e. | Set DISTORTION SELECT switch to MARK END. | Same as step e. | Item 8 |
| f. | Set PERCENT DISTORTION switches as follows:<br>(1) TENS: 30<br>(2) UNITS: 5 | | Item 8 |
| g. | Set DISTORTION SELECT switch to SPACE END. | Same as step e. | Item 8 |
| h. | Set DISTORTION SELECT switch to SWITCH BIAS. | Same as step e. | Item 8 |
| i. | Set POWER ON OFF switch on AN/UGM-8B(V) to OFF. | | |
| j. | Set power switch on CPP to OFF. | | |

Table 4-5. Operational Test Procedures (High-Level) - Continued

| Step | Action | Normal Indication | Reference Table 5-1 |
|---|---|---|---|
| 5. | Typing Unit Proper Function Operation Check. | | |
| a. | Unplug AN/UGM-8B(V) test cord from patching panel. | | |
| b. | Remove patch cord connected between SET and LPG jacks. | | |
| c. | Set power switch on CPP to ON. | | |
| d. | Adjust channel current ADJUSTMENT control for reading of 60 on current meter. | | |
| e. | Press FIGS key. | | |
| f. | Press S key. | Signal bell rings. | Item 12 |
| g. | Set single/double line feed lever (inside) to number 1 position. | | |
| h. | Press LINE FEED key. | Typing unit single line feeds. | Item 14 |
| i. | Set single/double line feed lever to number 2 position. | | |
| j. | Repeat step h. | Typing unit double line feeds. | Item 14 |

Table 4-5. Operational Test Procedures (High-Level) — Continued

| Step | Action | Normal Indication | Reference Table 5-1 |
|---|---|---|---|
| k. | Press LOC CR key to return carriage. | | |
| l. | Press M and REPT keys simultaneously until full line of Ms has been printed, carriage has returned, and printing has started on next line. Count characters. | (1) There shall be 72 clear characters. | Items 15 and 16 |
| | | (2) The 74th character shall strike over the 73rd character. | Items 15 and 16 |
| | | (3) The 75th character shall print approximately in center of page, beneath 32nd through 42nd character. | Items 15 and 16 |
| | | (4) The 76th character shall print exactly under 1st character. | Items 15 and 16 |
| | | (5) The 77th character shall print exactly under 2nd character. | Items 15 and 16 |
| m. | Press RETURN key. | Carriage returns and line feeds. | Items 17 and 20 |
| n. | Press LINE FEED key. | No line feed occurs. | Items 17 and 20 |
| o. | Repeat step n. | No line feed occurs. | Items 17 and 20 |

Table 4-5. Operational Test Procedures (High-Level) - Continued

| Step | Action | Normal Indication | Reference Table 5-1 |
|---|---|---|---|
| p. | Repeat step n. | Line feed occurs. | Items 17 and 20 |
| 6. | Local Functions Check. | | |
| a. | Press LOC CR key. | Carriage returns. | Item 18 |
| b. | Press and hold LOC LF key. | Line feed occurs continuously until key is released. | Item 19 |
| 7. | Keyboard Proper Operation Check. | | |
| a. | Press each character and function key. | Selected character prints or selected function operates. (Keys operate easily.) | Item 22 |
| b. | Set power switch on CPP to OFF. | | |
| 8. | Keyboard Distortion Check. | | |
| a. | Refer to figure 4-1. | | |
| b. | On patching panel, connect patch cord between CPP channel SET jack and LPG (top row) jack. | | |
| c. | Plug TS-2616/UGM test cord into CPP channel LPG (2nd row) jack. | | |

Table 4-5. Operational Test Procedures (High-Level) - Continued

| Step | Action | Normal Indication | Reference Table 5-1 |
|---|---|---|---|
| d. | Set POWER switch on TS-2616/UGM to ON. | | |
| e. | Set power switch on CPP to ON. | | |
| f. | Observe reading on PERCENT DISTORTION meter on TS-2616/UGM while pressing the following keys:<br>(1) REPT and E<br>(2) REPT and LF<br>(3) REPT and Space<br>(4) REPT and CR<br>(5) REPT and T<br>(6) REPT and R<br>(7) REPT and Y<br>(8) REPT and A<br>(9) REPT and M<br>(10) REPT and LTRS | 5-percent (maximum). | Item 21 |

Table 4-5. Operational Test Procedures (High-Level) - Continued

| Step | Action | Normal Indication | Reference Table 5-1 |
|---|---|---|---|
| g. | Set DISTORTION SELECT switch on TS-2616/UGM to BIAS. | | |
| h. | Repeat step f. | 5-percent (maximum). | Item 21 |

| AN/UGM-8B(V) | TS-2616/UGM |
|---|---|
| POWER ON OFF switch to OFF. | AC power switch to off (down) position. |
| DISTORTION SELECT switch to MARK BIAS. | PEAK RESET switch to AUTO. |
| PERCENT DISTORTION switch to 0. | RATE-BAUDS switch to 74.2. |
| STOP LENGTH SYNC-START/STOP switch to S/S 1.42. | CODE LEVEL switch to 5. |
| CHARACTER RELEASE switch to FREE RUN. | DISTORTION SELECT switch to PEAK-TOTAL. |
| SIGNAL PATTERN switch to STDY MK. | TRANSITION SELECT switch to ALL. |
| RATE switch to 74.2. | INPUT POLARITY switch to either + or - to cause meter to deflect to right. |
| LOOP POLARITY switch to either + or - to cause meter to deflect to right. | INPUT SELECT switch to NEUTRAL 60. |
| LOOP ADJ control fully counterclockwise. | INPUT FILTER switch to IN. |
| HIGH-LEVEL OUTPUT MODE switch to EXT NEUT. | |
| MARK SPACE switches to any position. | |

(2) Operational Tests (Low-Level). Figure 4-2 shows test setup required to perform low-level CPP procedures described in table 4-6. If abnormal indications are encountered during a test, refer to Troubleshooting Index, table 5-1, Chapter 5. Prior to conducting the tests, perform the initial control settings on the AN/UGM-8B(V) and TS-2616/UGM test sets as described in paragraph 4-8d(1).

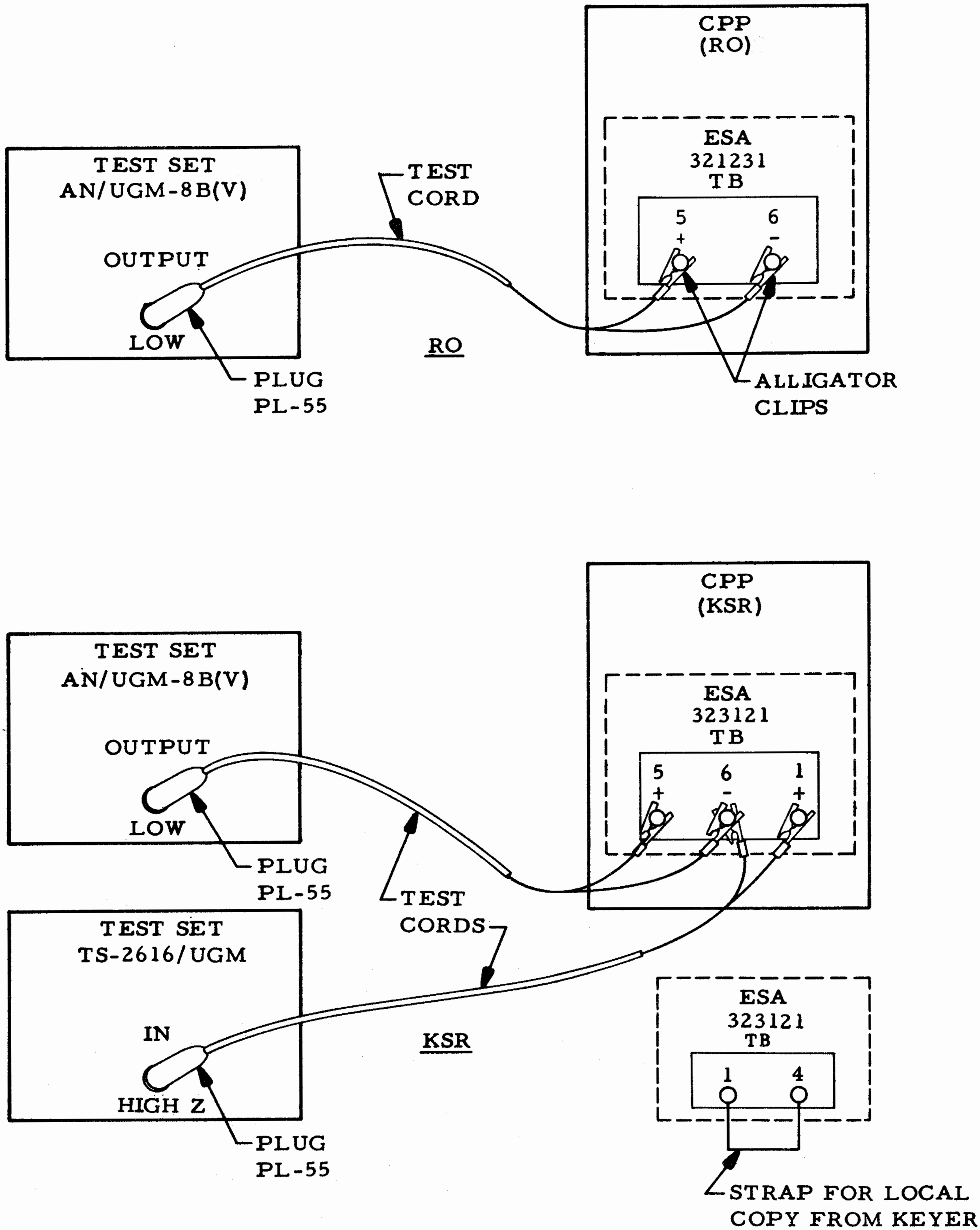



Figure 4-2. CPP Test Setup (Low-Level)

Table 4-6. Operational Test Procedures (Low-Level)

| Step | Action | Normal Indication | Reference Table 5-1 |
|---|---|---|---|
| 1. | <u>Preliminary</u> | | |
| a. | Ensure test set controls are set as indicated in paragraph 4-8d. | | |
| b. | Ensure power switches on CPP and ESA are set to OFF. | | |
| c. | Connect AN/UGM-8B(V) test set to ESA 321231 (RO) or ESA 323121 (KSR) as shown in figure 4-2. | | |
| d. | Connect TS-2616/UGM test set to ESA 323121 (KSR) as shown in figure 4-2. | | |
| e. | Plug test cords into OUTPUT LOW jack on AN/UGM-8B(V) and IN HIGH Z jack on TS-2616/UGM. | | |
| f. | Plug test set power cords into 115-vac power outlets. | | |
| 2. | <u>Typing Unit Range Check</u>. | | |
| a. | Set POWER ON/OFF switch on AN/UGM-8B(V) to ON. | | |

Table 4-6. Operational Test Procedures (Low-Level) - Continued

| Step | Action | Normal Indication | Reference Table 5-1 |
|---|---|---|---|
| b. | Set power switch on CPP and ESA to ON. | | |
| c. | Set SIGNAL PATTERN switch on AN/UGM-8B(V) to FOX. | (1) Typing unit types test message. | |
| | | (2) Letters-figures shift and figures-letters shift operate properly. | Items 9 and 10. |
| | | (3) Normal carriage return and line feed operate properly. | Items 11 and 13. |
| d. | Adjust range finder knob on selector assembly to determine minimum and maximum settings at which message is typed without error. | | |
| e. | Note difference between minimum and maximum settings obtained in step d. | 72 (minimum difference) | Item 1 |
| f. | Place range finder on optimum setting as follows:<br>(1) Add low and high readings obtained in step d.<br>(2) Divide by 2.<br>(3) Resulting number is optimum setting. | | |

Table 4-6. Operational Test Procedures (Low-Level) – Continued

| Step | Action | Normal Indication | Reference Table 5-1 |
| --- | --- | --- | --- |
| 3. | <u>Typing Unit Quality of Print Check</u>. | | |
| a. | While typing unit is receiving test message, observe quality of printed copy. | (1) Characters are positioned on straight vertical line. | Item 2 |
| | | (2) Uniform spacing between characters. | Item 3 |
| | | (3) Clear type. | Item 4 |
| | | (4) Proper, error-free test pattern typed. | Item 5 |
| | | (5) Proper ribbon feed. | Item 6 |
| b. | Manually operate ribbon lever inward, on side where ribbon is being unwound. | Ribbon reverses. | Item 7 |
| c. | Repeat step b, using other ribbon lever. | Ribbon reverses. | Item 7 |
| d. | Set SIG PATTERN switch on AN/UGM-8B(V) to STDY MK. | | |
| 4. | <u>Typing Unit Distorted Signal Check</u>. | | |

Table 4-6. Operational Test Procedures (Low-Level) - Continued

| Step | Action | Normal Indication | Reference Table 5-1 |
|---|---|---|---|
| | NOTE<br>This test checks the ability of the typing unit to copy a distorted signal. | | |
| a. | Ensure DISTORTION SELECT switch on AN/UGM-8B(V) is set to MARK BIAS. | | |
| b. | Set PERCENT DISTORTION switches as follows:<br>(1) TENS: 40<br>(2) UNITS: 0 | | |
| c. | Set SIGNAL PATTERN switch on AN/UGM-8B(V) to FOX. | Must copy one line with not more than one error. | Item 8 |
| d. | Set DISTORTION SELECT switch to SPACE BIAS. | Same as step c. | Item 8 |
| e. | Set DISTORTION SELECT switch to MARK END. | Same as step c | Item 8 |
| f. | Set PERCENT DISTORTION switches as follows:<br>(1) TENS: 30<br>(2) UNITS: 5 | | Item 8 |

Table 4-6. Operational Test Procedures-(Low Level) - Continued

| Step | Action | Normal Indication | Reference Table 5-1 |
|---|---|---|---|
| g. | Set DISTORTION SELECT switch to SPACE END. | Same as step c. | Item 8 |
| h. | Set DISTORTION SELECT switch to SWITCH BIAS. | Same as step c. | Item 8 |
| i. | Set POWER ON OFF switch on AN/UGM-8B(V) to OFF. | | |
| j. | Set power switches on CPP and ESA to OFF. | | |
| k. | Disconnect AN/UGM-8B(V) test cord from ESA. | | |
| 5. | <u>Typing Unit Proper Function Operation Check (KSR Only)</u>. | | |
| a. | Install strap between TB1 and TB4 of ESA 323121 an shown in figure 4-2. | | |
| b. | Set power switches on CPP and ESA to ON. | | |
| c. | Press FIGS key. | | |
| d. | Press S key. | Signal bell rings. | Item 12 |
| e. | Set single/double line feed lever (inside) to number 1 position. | | |

Table 4-6. Operational Test Procedures (Low-Level) - Continued

| Step | Action | Normal Indication | Reference Table 5-1 |
|---|---|---|---|
| f. | Press LINE FEED key. | Typing unit single line feeds. | Item 14 |
| g. | Set single/double line feed lever to number 2 position. | | |
| h. | Repeat step f. | Typing unit double line feeds. | Item 14 |
| i. | Press LOC CR key to return carriage. | | |
| j. | Press M and REPT keys simultaneously until full line of Ms has been printed, carriage has returned, and printing has started on next line. Count characters. | (1) There shall be 72 clear characters. | Items 15 and 16 |
| | | (2) The 74th character shall strike over the 73rd character. | Items 15 and 16 |
| | | (3) The 75th character shall print approximately in center of page, beneath 32nd through 42nd character. | Items 15 and 16 |
| | | (4) The 76th character shall print exactly under 1st character. | Items 15 and 16 |
| | | (5) The 77th character shall print exactly under 2nd character. | Items 15 and 16 |

Table 4-6. Operational Test Procedures (Low-Level) - Continued

| Step | Action | Normal Indication | Reference Table 5-1 |
|---|---|---|---|
| k. | Press RETURN key. | Carriage returns and line feeds. | Items 17 and 20 |
| l. | Press LINE FEED key. | No line feed occurs. | Items 17 and 20 |
| m. | Repeat step l. | No line feed occurs. | Items 17 and 20 |
| n. | Repeat step l. | Line feed occurs. | Items 17 and 20 |
| 6. | Local Functions Check (KSR Only). | | |
| a. | Press LOC CR key. | Carriage returns. | Item 18 |
| b. | Press and hold LOC LF key. | Line feed occurs continuously until key is released. | Item 19 |
| 7. | Keyboard Proper Operation Check (KSR Only). Press each character and function key. | Selected character prints or selected function operates. (Keys operate easily.) | Item 22 |
| 8. | Keyboard Distortion Check (KSR Only). | | |
| a. | Set POWER switch on TS-2616/UGM to ON. | | |

Table 4-6. Operational Test Procedures (Low-Level) - Continued

| Step | Action | Normal Indication | Reference Table 5-1 |
|---|---|---|---|
| b. | Observe reading on PERCENT DISTORTION meter on TS-2616/UGM while pressing the following keys:<br>(1) REPT and E<br>(2) REPT and LF<br>(3) REPT and Space<br>(4) REPT and CR<br>(5) REPT and T<br>(6) REPT and R<br>(7) REPT and Y<br>(8) REPT and A<br>(9) REPT and M<br>(10) REPT and LTRS | 5-percent (maximum). | Item 21 |
| c. | Set DISTORTION SELECT switch on TS-2616/UGM to BIAS. | | |
| d. | Repeat step b. | 5-percent (maximum). | Item 21 |

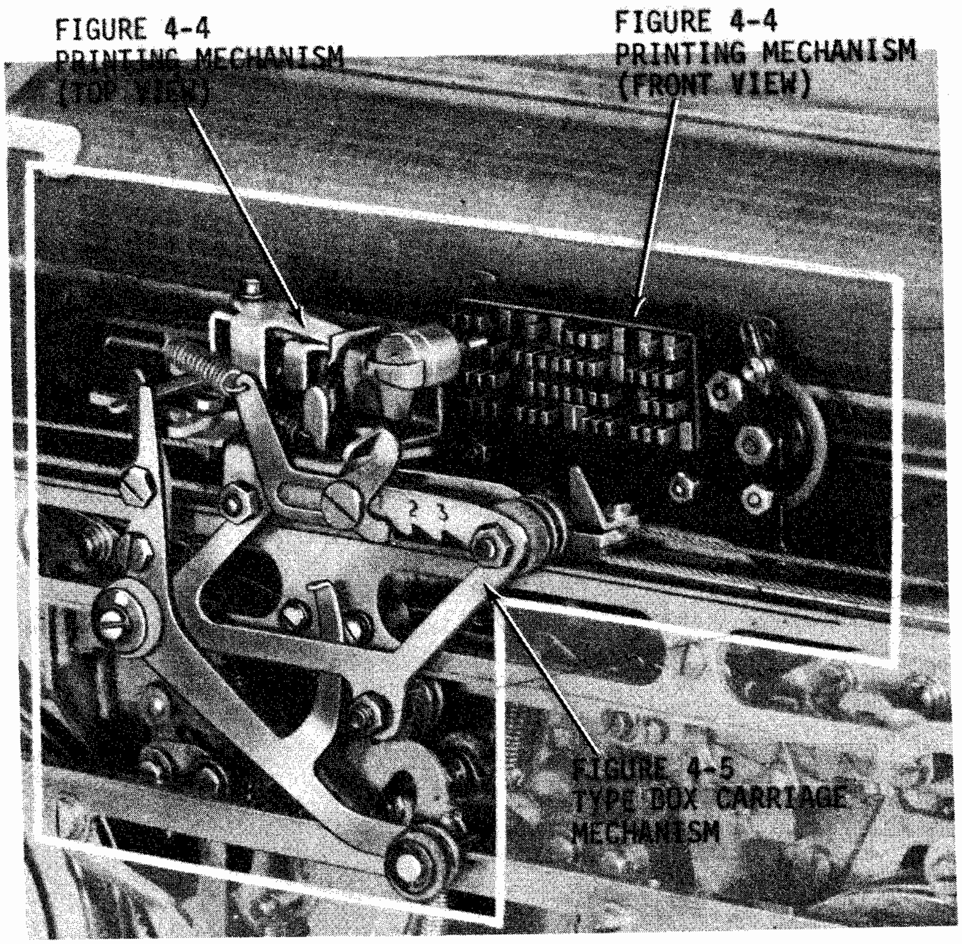
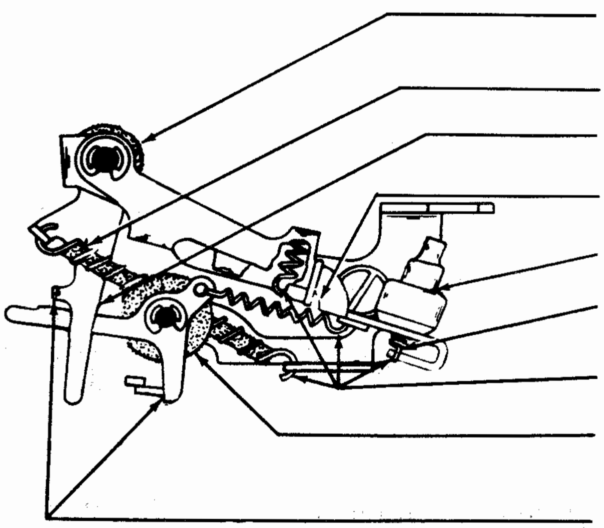
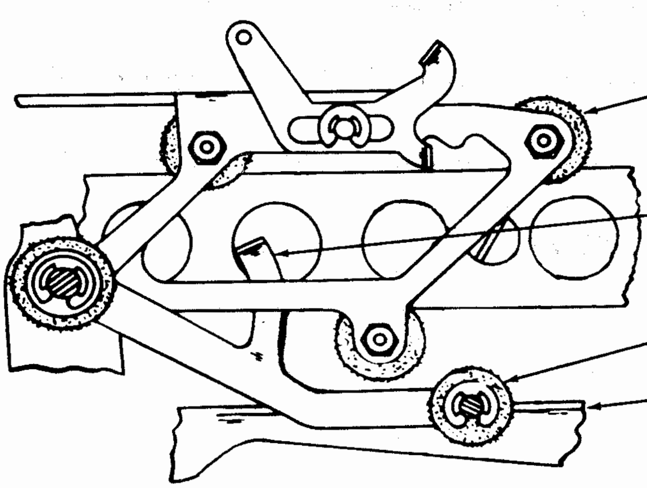



Figure 4-3. Printing Area (Front View)



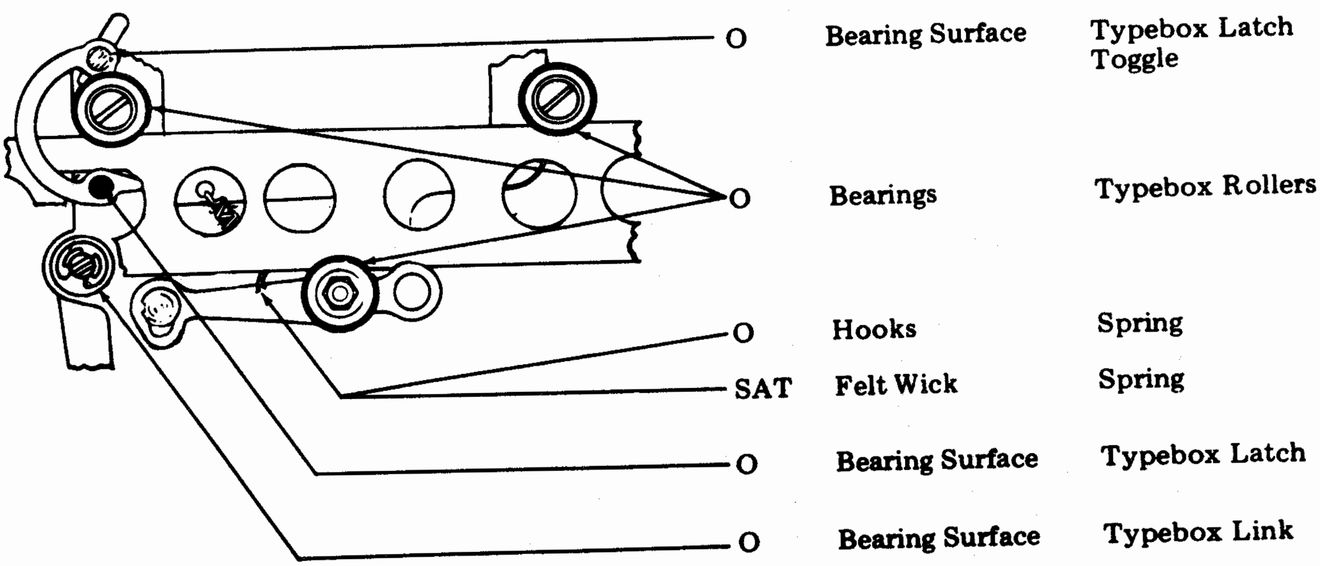

(TOP VIEW)




(FRONT VIEW)

(F

Figure 4-4. Printing Mechanism




(REAR VIEW)

Figure 4-5. Type Box Carriage Mechanism

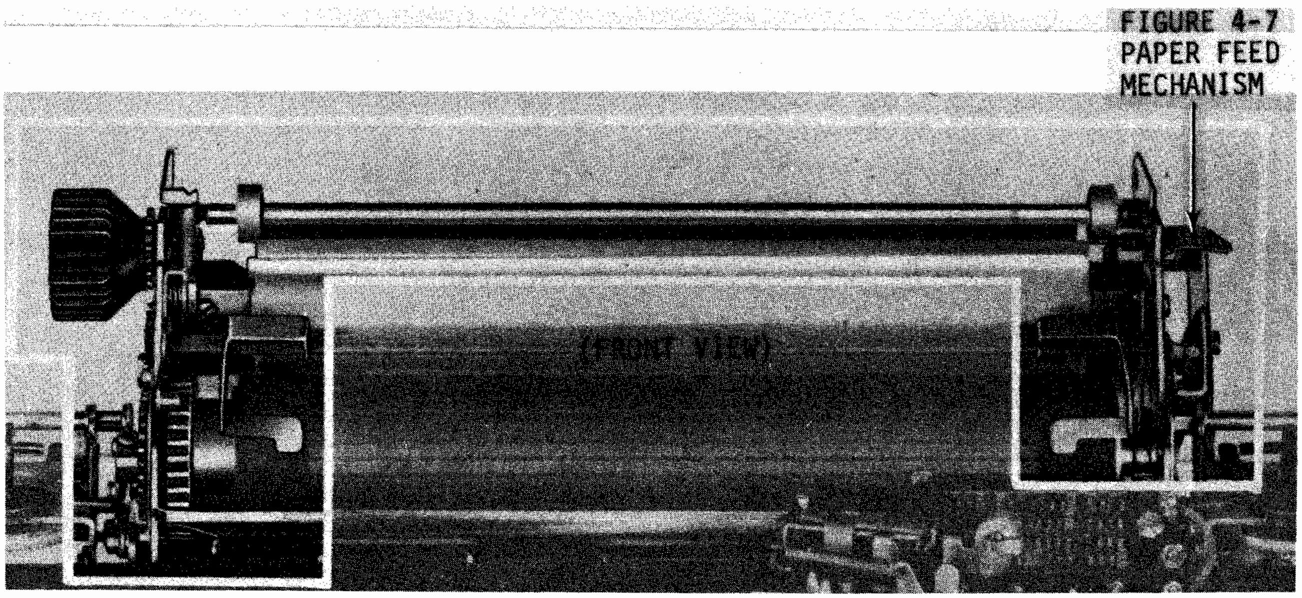
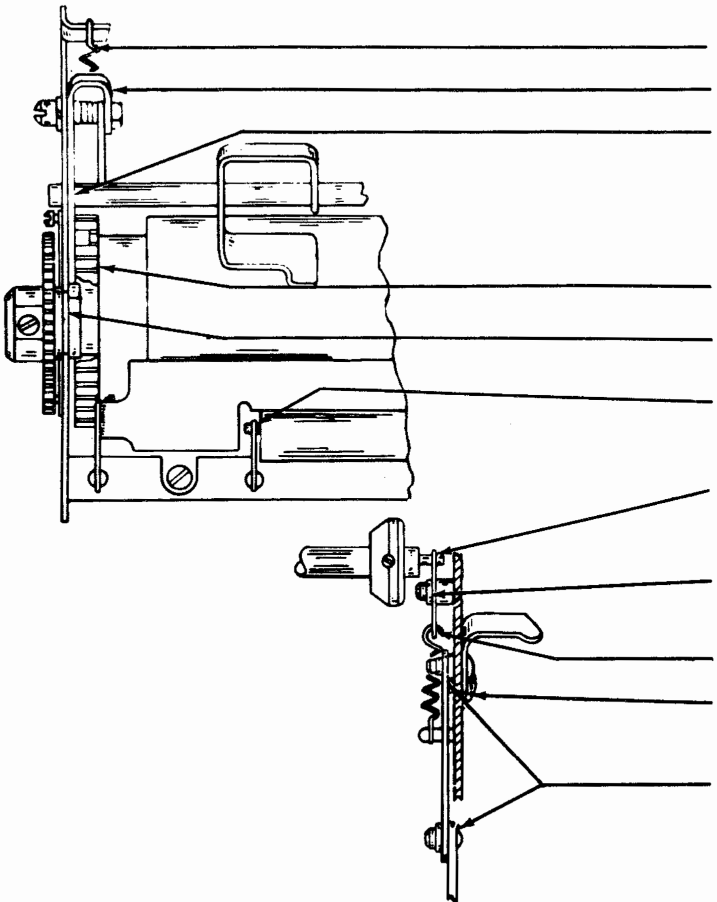



Figure 4-6. Paper Feed Area




| | | |
|---|---|---|
| O | Hooks | Spring |
| O | Bearing Surface | Platen Detent Bail |
| O | Bearing Surface | Paper Finger Shaft |
| G | Teeth (2 Gears) | Platen Gears |
| O | Bearings | Platen Shaft |
| O | Bearing Surfaces | Paper Pressure Roller Shafts |
| O | Bearing Surfaces | Paper Straightener Shaft |
| O | Bearing Surfaces | Paper Straightener Levers |
| O | Hooks | Spring |
| O | Bearing Surface | Release Lever |
| O | Bearing Surfaces | Release Lever Link |

Figure 4-7. Paper Feed Mechanism

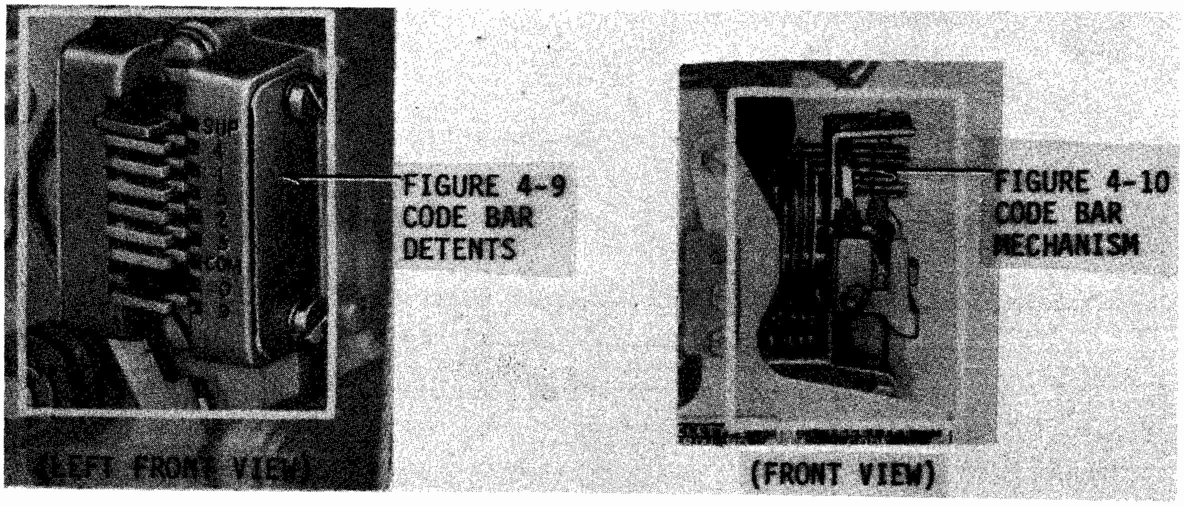



Figure 4-8. Code Bar Area

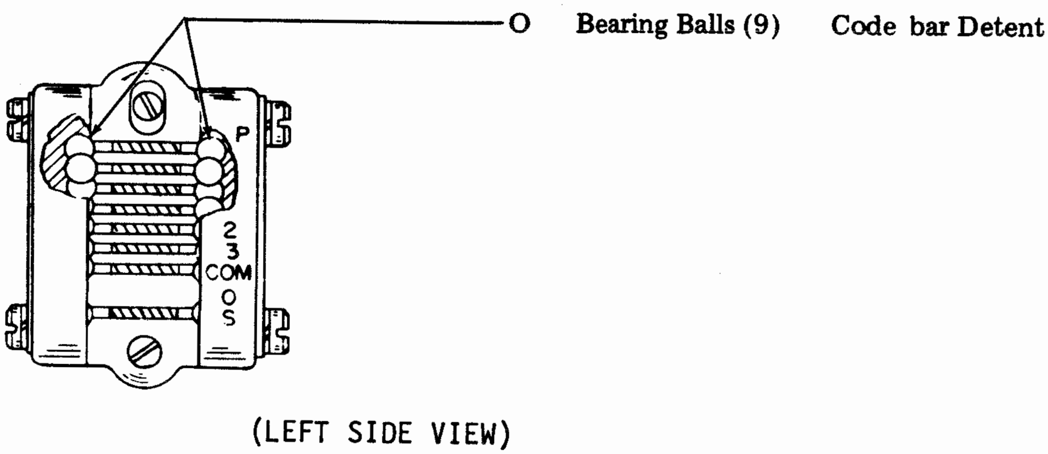



Figure 4-9. Code Bar Detents

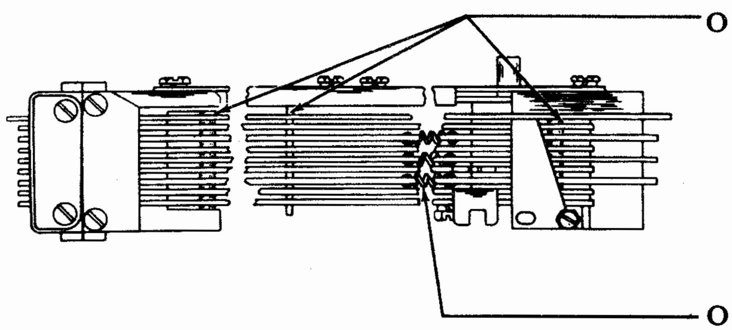



Figure 4-10. Code Bar Mechanism (A)

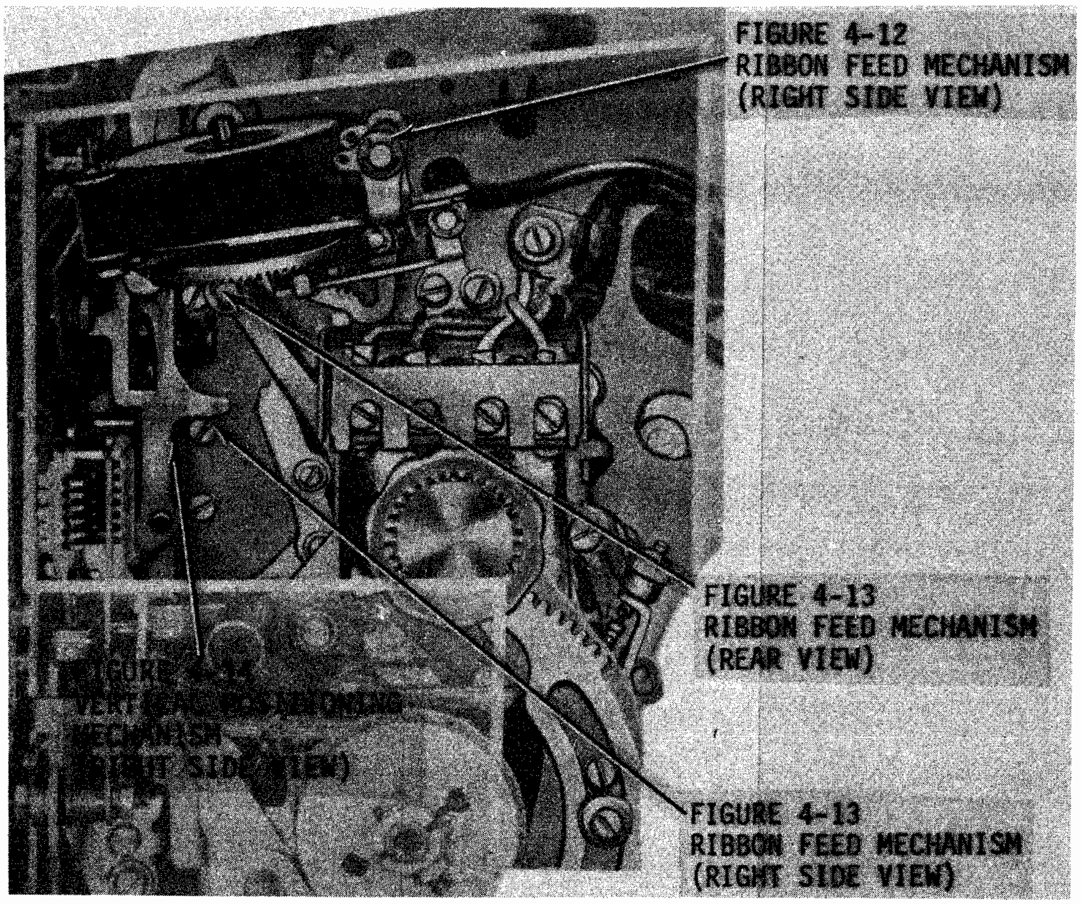
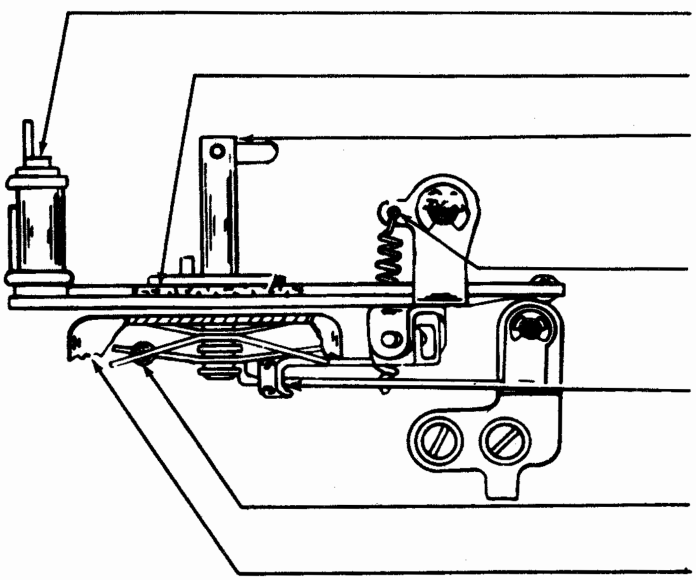


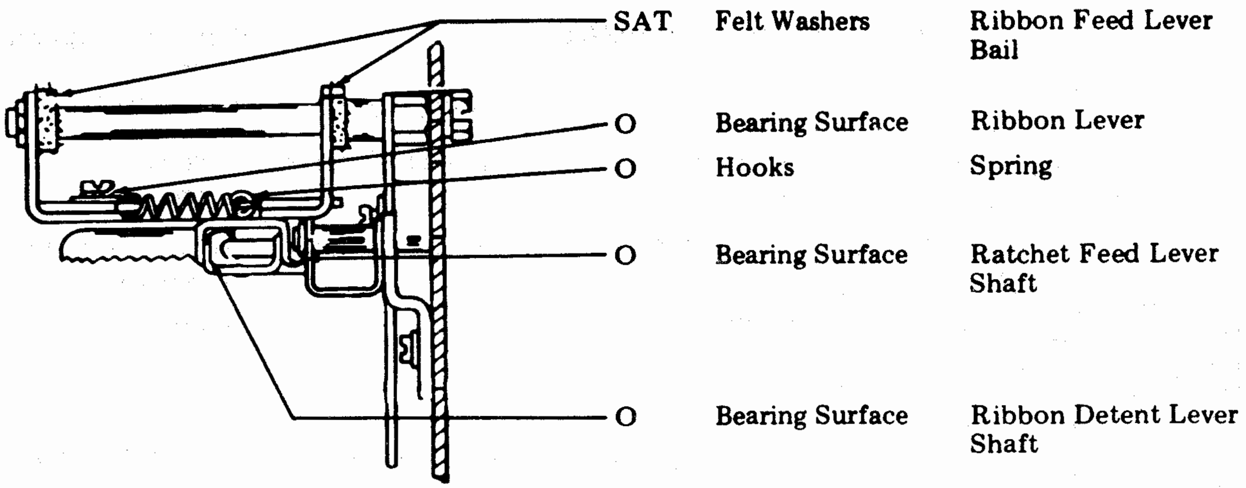

Figure 4-11. Ribbon Area (A)



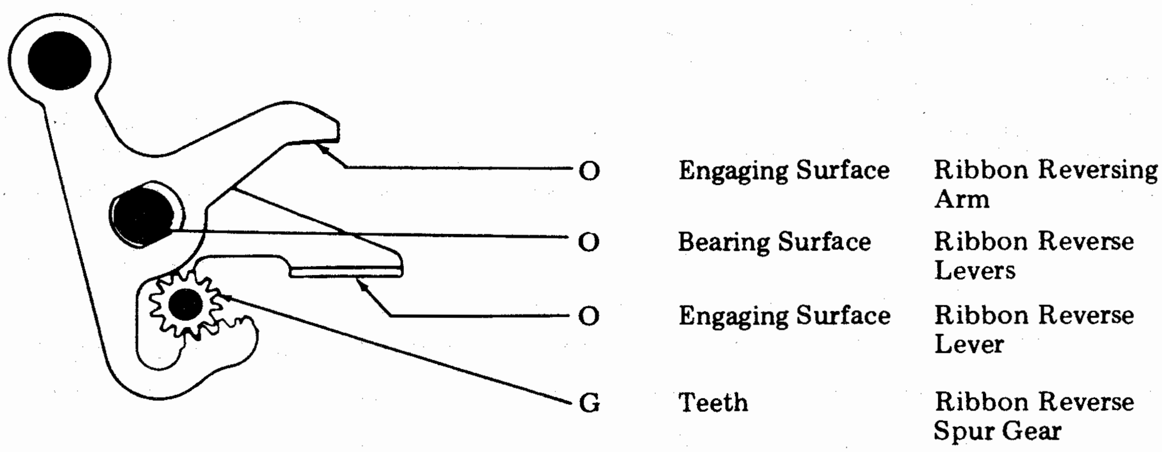
| | | |
|---|---|---|
| O | Bearing Surface | Ribbon Roller Shaft |
| SAT | Felt Washer | Ribbon Spool Shaft |
| O | Bearing Surface | Ribbon Spool Toggle |
| O | Hooks | Ribbon Feed Lever Spring |
| O | Engaging Surface | Ribbon Detent Lever |
| O | Hooks | Ribbon Ratchet Wheel Spring |
| G | Teeth | Ribbon Ratchet Wheel |

(RIGHT SIDE VIEW)

Figure 4-12. Ribbon Feed Mechanism (A)

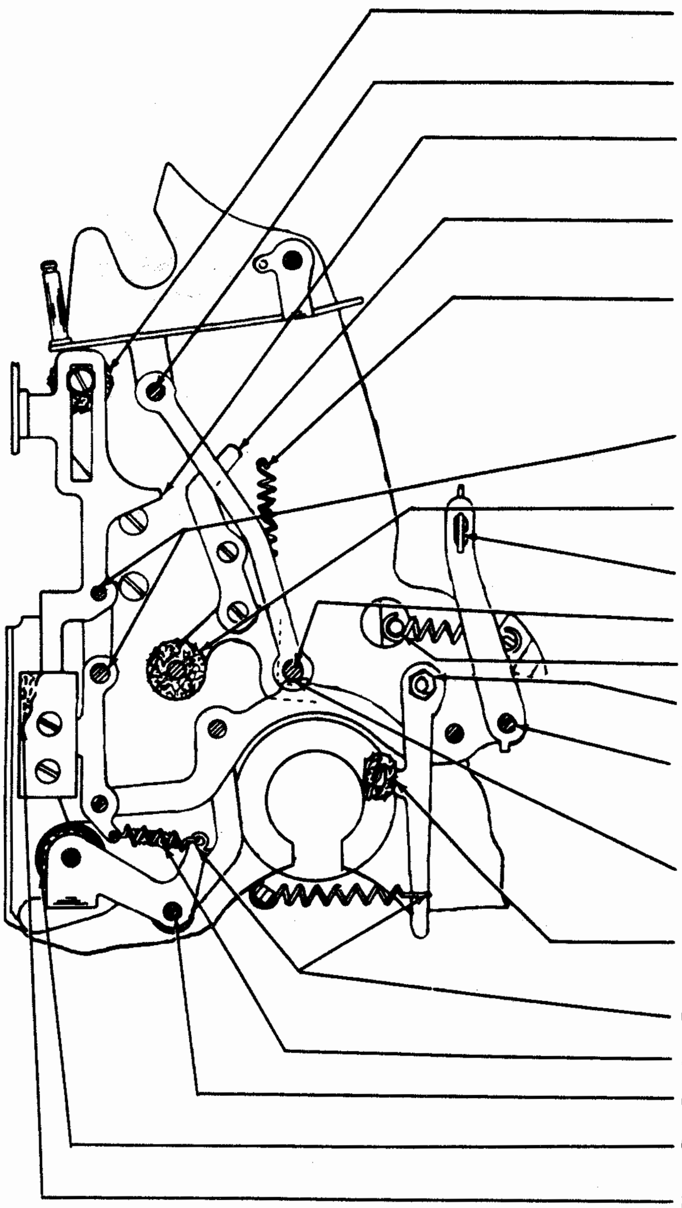



(REAR VIEW)




(RIGHT SIDE VIEW)

Figure 4-13. Ribbon Feed Mechanism (B)



| | | |
|---|---|---|
| SAT | Felt Washer | Vertical Positioning Lever |
| O | Bearing Surface | Ribbon Drive Link |
| O | Engaging Surface | Vertical Positioning Lever |
| O | Engaging Surfaces | Vertical Positioning Locklever |
| O | Hooks | Spring |
| O | Bearing Surfaces | Vertical Positioning Lever |
| SAT | Felt Washers (2) | Main Side Lever Follower Arm |
| O | Guiding Surface | Stripper Blade |
| O | Bearing Surface | Ribbon Drive Link |
| O | Hooks | Spring |
| O | Bearing Surface | Operating Lever |
| O | Bearing Surface | Stripper Blade Arm |
| O | Engaging Surface | Main Side Lever Follower Arm |
| SAT | Felt Washer | Operating Lever Extension |
| O | Hooks | Spring |
| SAT | Spring Felt Wick | Rocker Shaft Bracket |
| O | Bearing Surface | Rocker Shaft Bracket |
| O | Ball Bearing | Main Rocker Shaft |
| SAT | Felt Oiler | Vertical Positioning Lever |

(RIGHT SIDE VIEW)

Figure 4-14. Vertical Positioning Mechanism

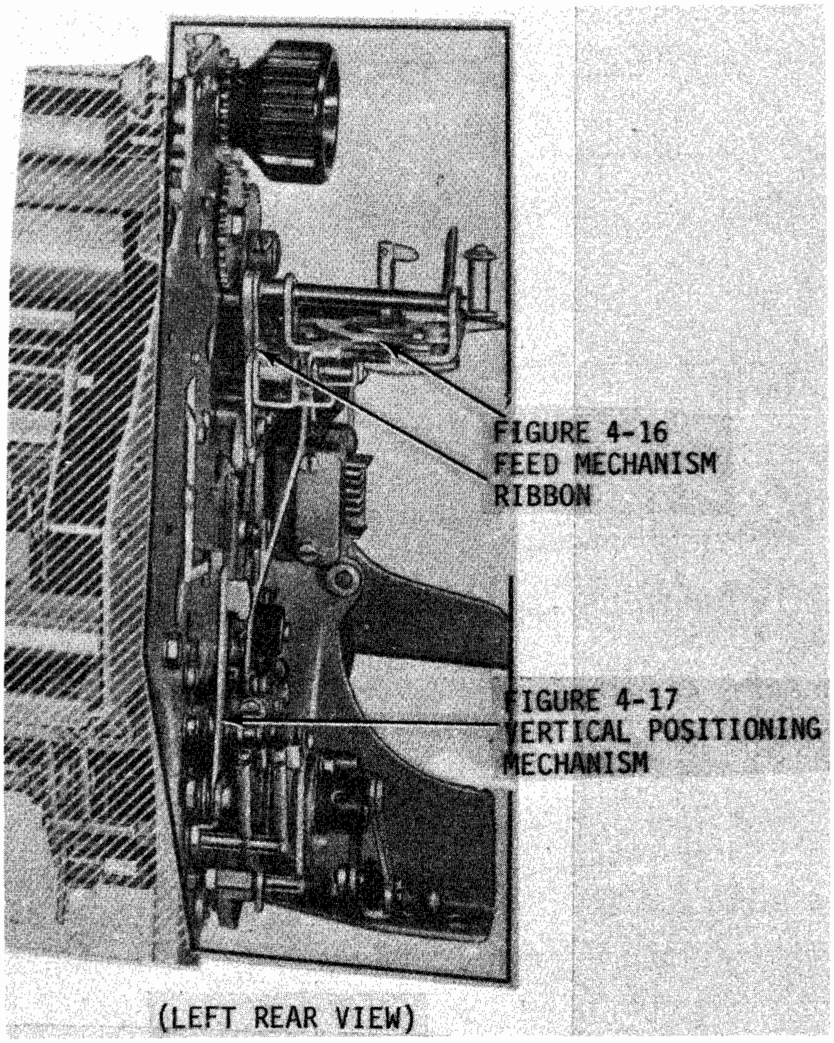
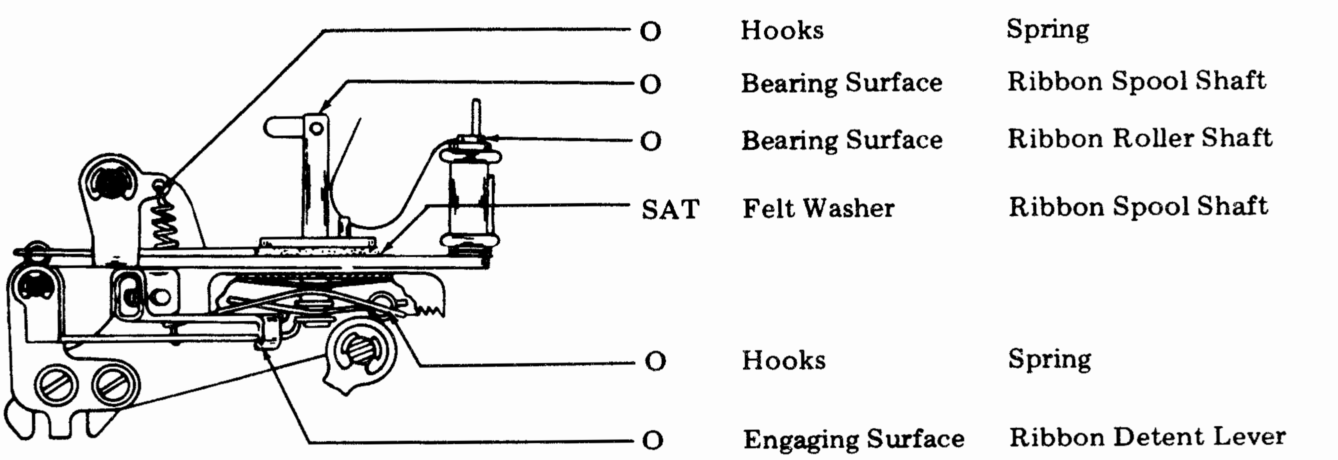
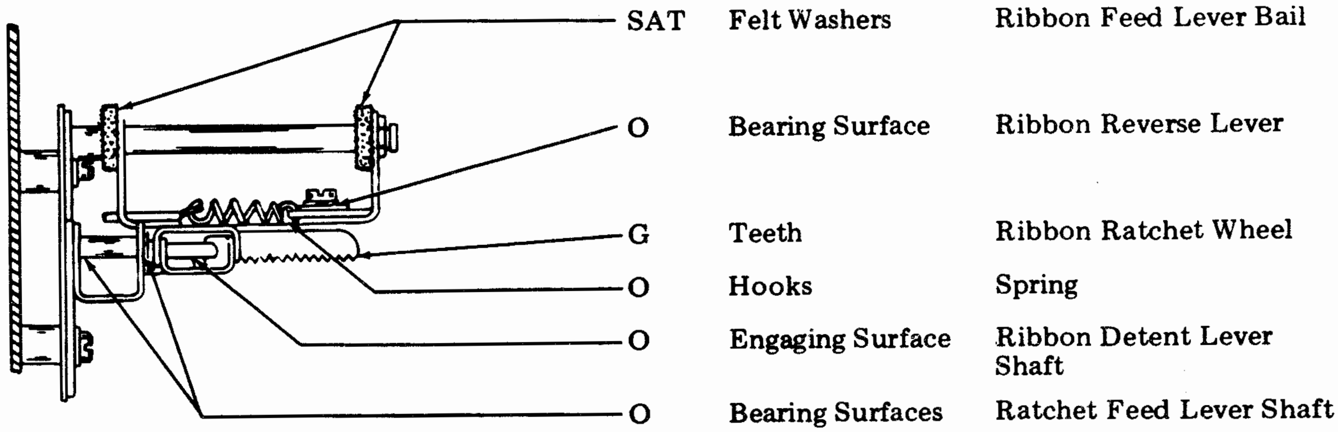


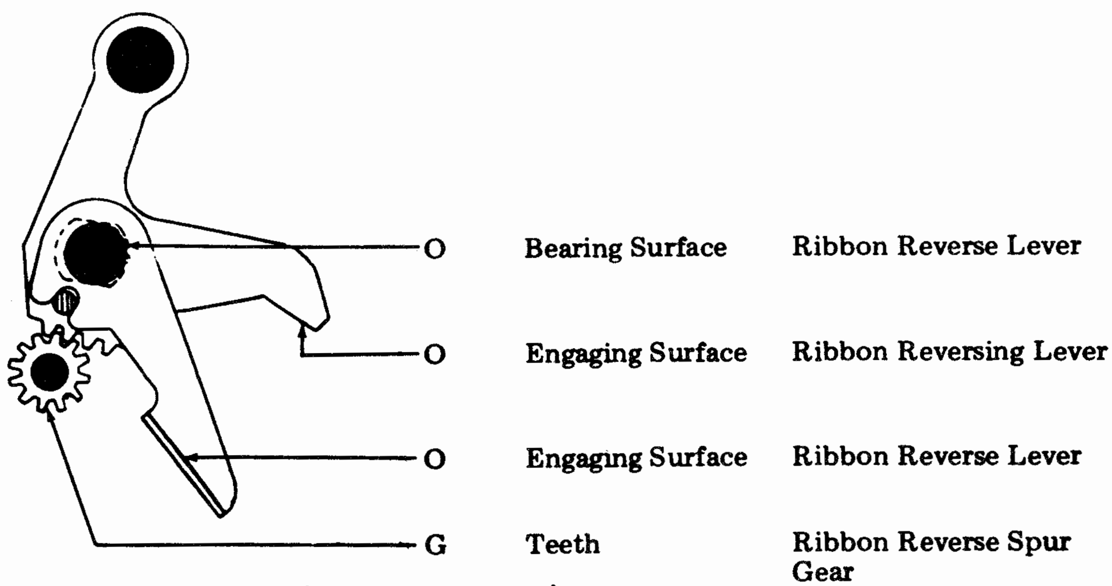

Figure 4-15. Ribbon Area (B)




(LEFT SIDE VIEW)

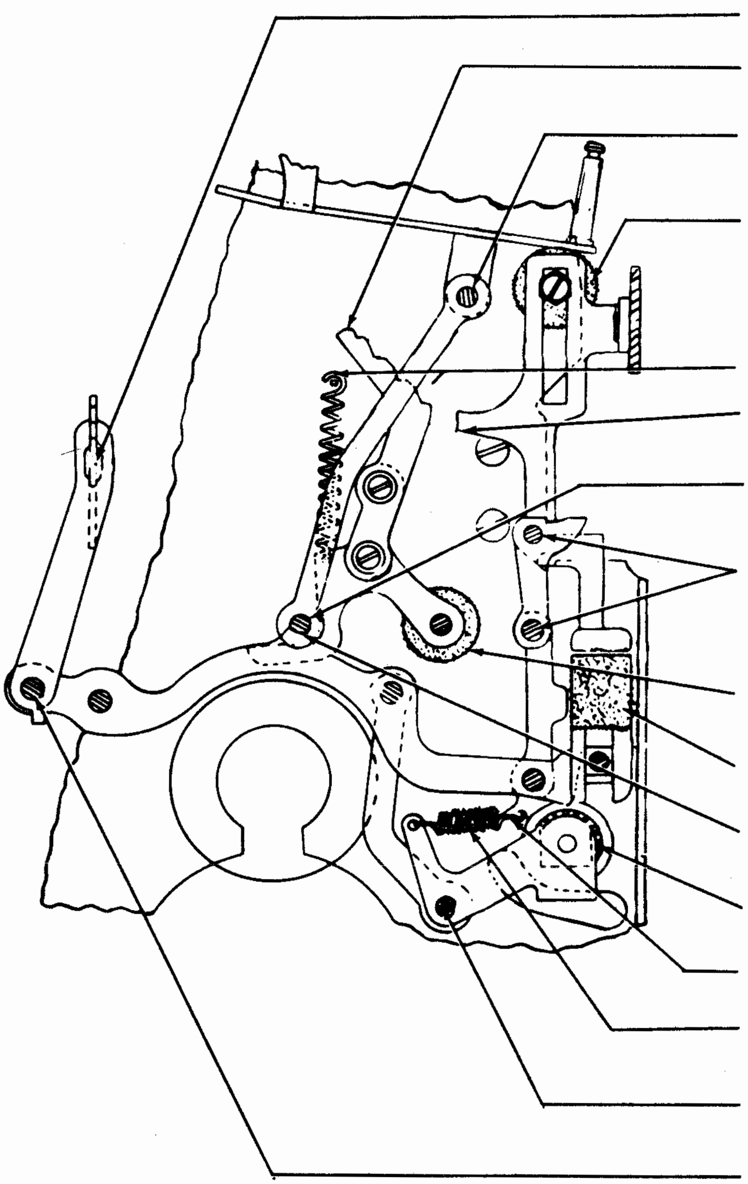



(REAR VIEW)




(LEFT SIDE VIEW)

Figure 4-16. Ribbon Feed Mechanism (C)



| | | |
|---|---|---|
| O | Guiding Surface | Stripper Blade |
| O | Engaging Surfaces | Vertical Positioning Locklever |
| O | Bearing Surface | Ribbon Drive Link |
| SAT | Felt Washer | Vertical Positioning Link |
| O | Hooks | Spring |
| O | Engaging Surface | Vertical Positioning Lever |
| O | Bearing Surface | Ribbon Drive Link |
| O | Bearing Surfaces | Vertical Positioning Lever |
| SAT | Felt Washers (2) | Main Side Lever Follower Arm |
| SAT | Felt Oiler | Vertical Positioning Lever |
| O | Camming Surface | Main Side Lever Follower Arm |
| O | Ball Bearing | Main Rocker Shaft |
| O | Hooks | Spring |
| SAT | Spring Felt Wick | Rocker Shaft Bracket |
| O | Bearing Surface | Rocker Shaft Bracket |
| O | Bearing Surface | Stripper Blade Arm |

(LEFT SIDE VIEW)

**Figure 4-17. Vertical Positioning Mechanism**

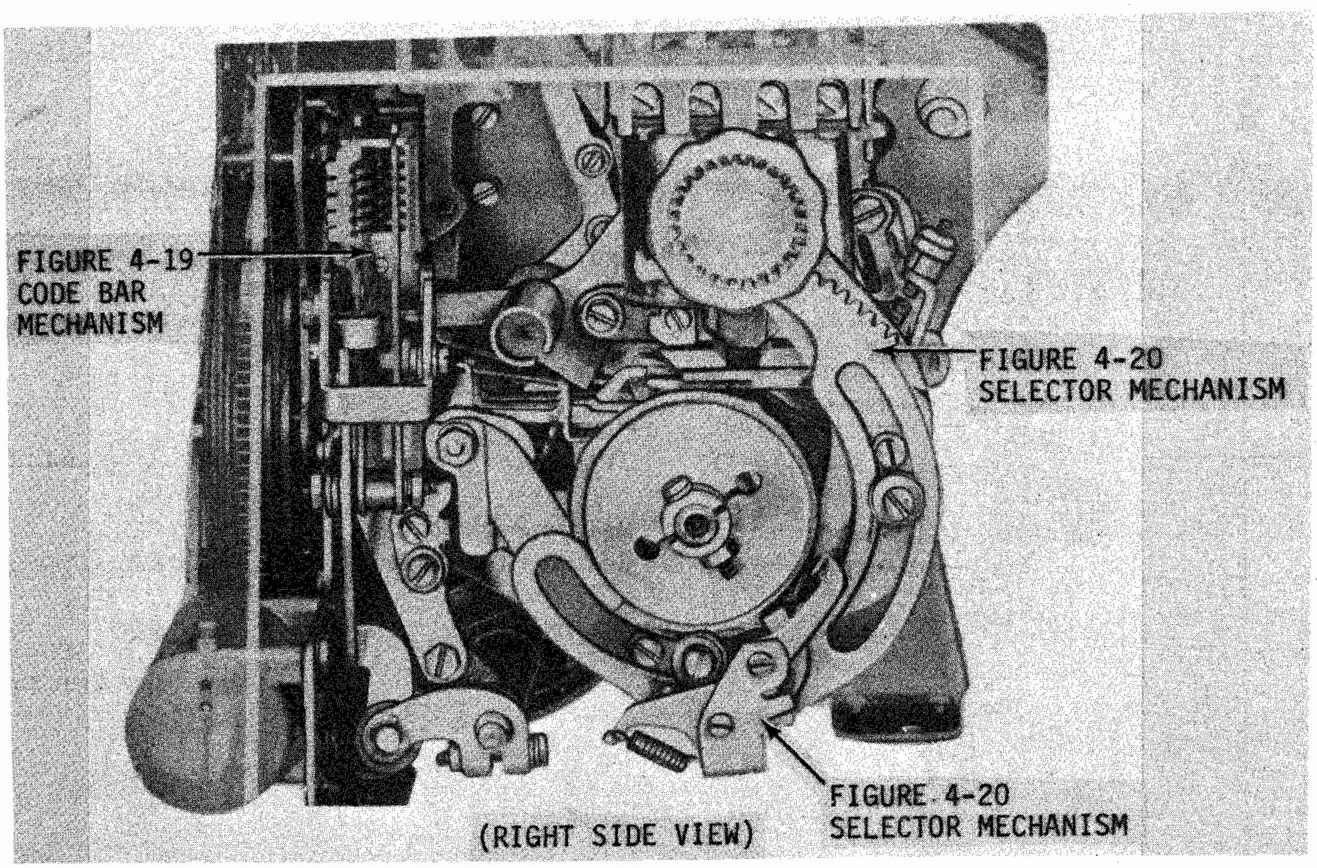
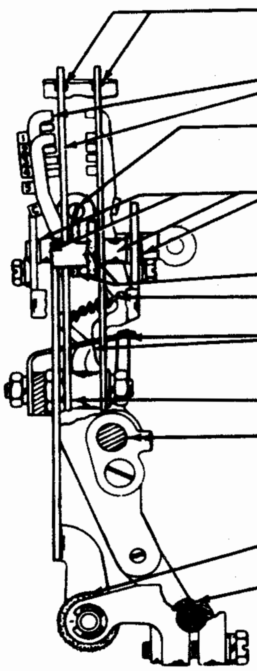


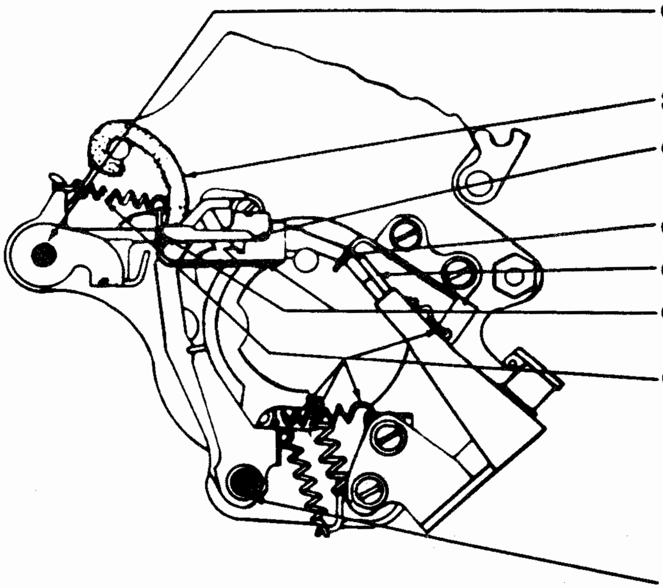

Figure 4-18. Selector Area



| | | |
|---|---|---|
| O | Guide Slots | Shift Levers |
| O | Engaging Surface | Shift and Transfer Levers |
| O | Bearing Guide Slots | Transfer Lever Guide Bearing |
| O | Roller Bearings | Shift Lever Link Rollers |
| SAT | Felt Washers | Shift Lever Link Shaft |
| O | Hooks | Springs |
| O | Guide Slots | Intermediate Arms and Transfer Levers |
| O | Bearing Surfaces | Shift Levers |
| O | Bearing Guide Slots | Intermediate Arm Guide Bearing |
| SAT | Felt Washer | Shift Lever Link |
| O | Oil Hole | Shift Lever Drive Arm Shaft |

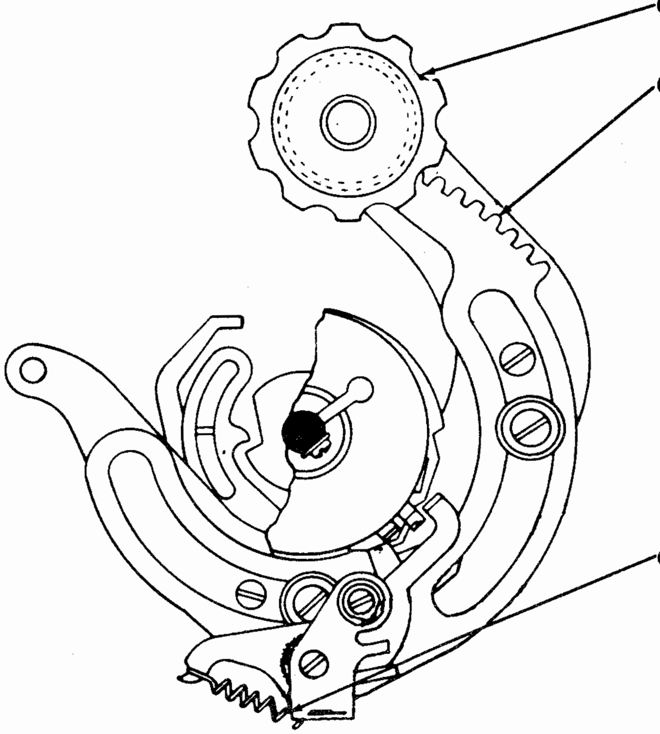
(RIGHT SIDE VIEW)

Figure 4-19. Code Bar Mechanism (B)



| | | |
|---|---|---|
| O | Bearing Guide Slots | Push Lever Guide Bearing |
| SAT | Felt Wick | Selector Wick |
| O | Engaging Surfaces | Push Levers |
| O | Guide Slot | Marking Locklever |
| O | Wick | Lubricator Wick |
| O | Guide Slots | Selector and Push Levers |
| O | Hooks | Springs |
| O | Bearing Guide Slots | Selector Lever Guide Bearing |

(RIGHT SIDE VIEW)



| | | |
|---|---|---|
| G | Teeth | Knob |
| G | Teeth | Gear |
| O | Hooks | Spring |

(RIGHT SIDE VIEW)

Figure 4-20. Selector Mechanism

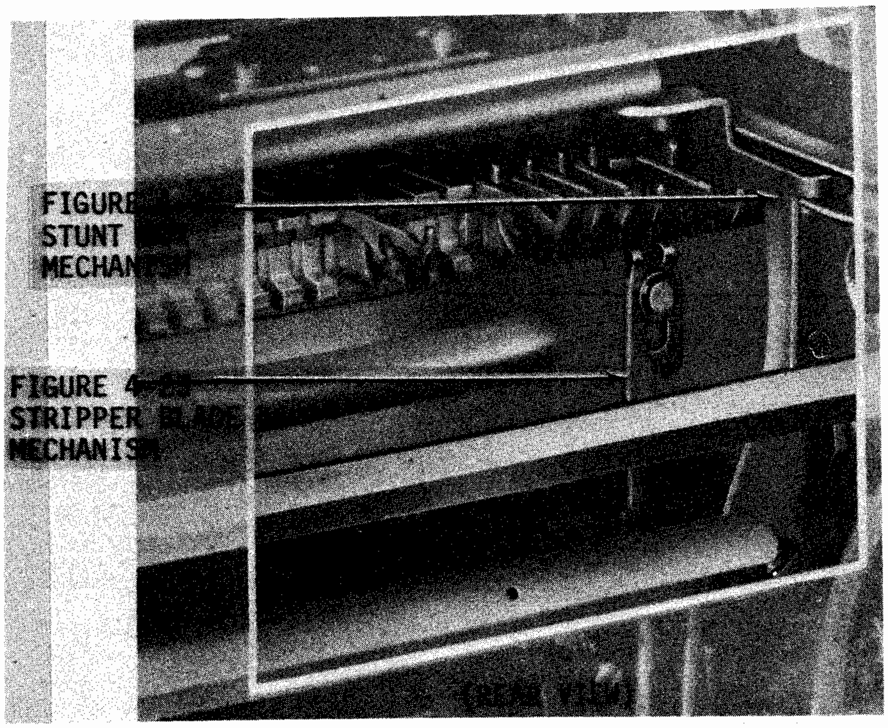
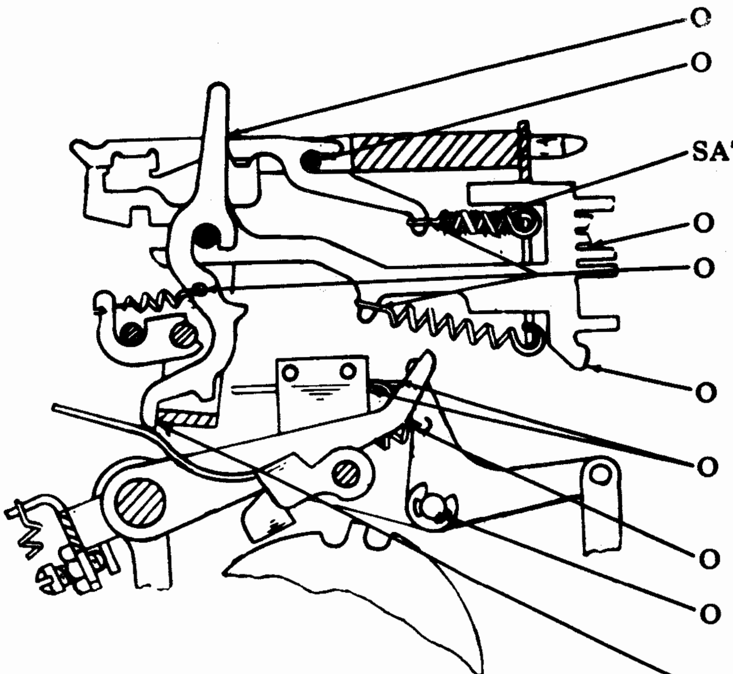



Figure 4-21. Function Area (A)

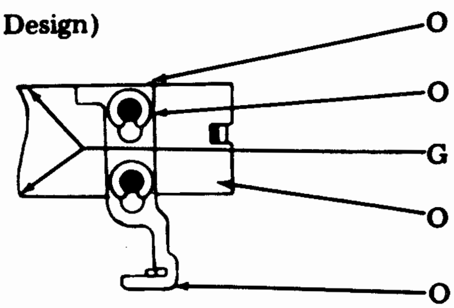


| | | |
|---|---|---|
| O | Guide Slots | Function Levers |
| O | Guide Slots | Function Pawls |
| SAT | Each Felt Wick | Function Pawl Springs |
| O | Guide Slots | Function Bars |
| O | Hooks | Springs |
| O | Engaging Surfaces | Function Bars (Front and Rear) |
| O | Guide Surfaces | Line Feed Slide Arm |
| O | Hooks | Spring |
| O | Bearing Surface | Keyboard Locklever |
| O | Engaging Surfaces | Function Levers |

(RIGHT SIDE VIEW)

Figure 4-22. Stunt Box Mechanism

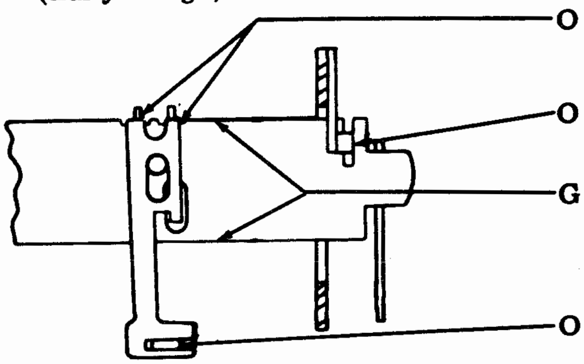
(Late Design)



| | | |
|---|---|---|
| O | Engaging Surface | Line Feed Stripper Slide |
| O | Guide Surfaces | Stripper Slide |
| G | Engaging Surfaces | Stripper Blade |
| O | Guide Surfaces | Stripper Blade |
| O | Engaging Surface | Stripper Blade |

(REAR VIEW)

(Early Design)



| | | |
|---|---|---|
| O | Engaging Surfaces | Line Feed Function Pawl Stripper |
| O | Guiding Surface | Stripper Blade |
| G | Upper and Lower Surface | Stripper Blade |
| O | Guiding Surface | Stripper Bail |

(REAR VIEW)

Figure 4-23. Stripper Blade Mechanism

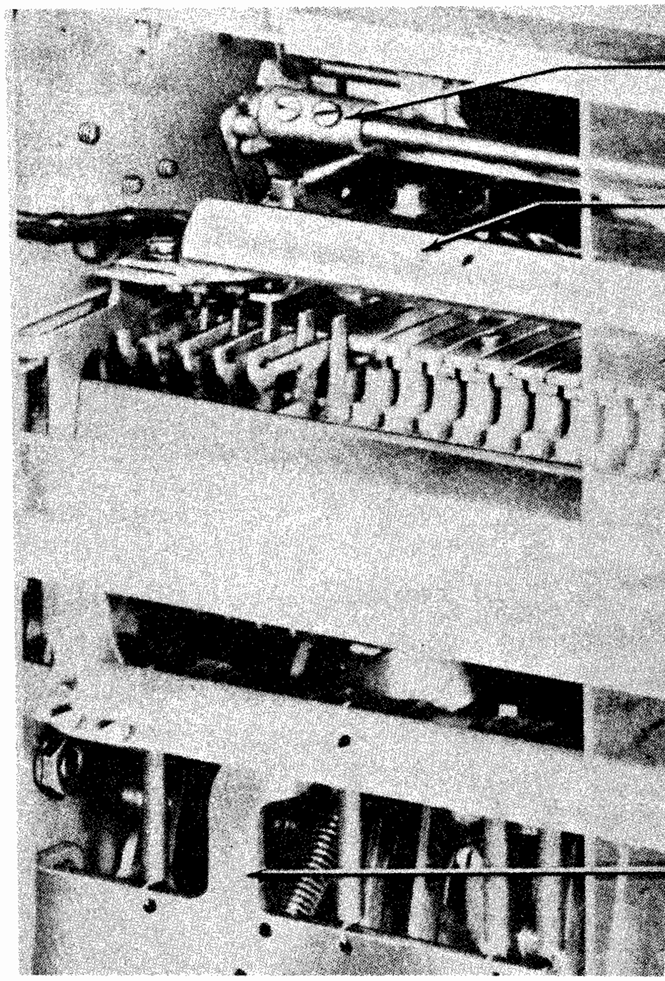



Figure 4-24. Function Area (B)

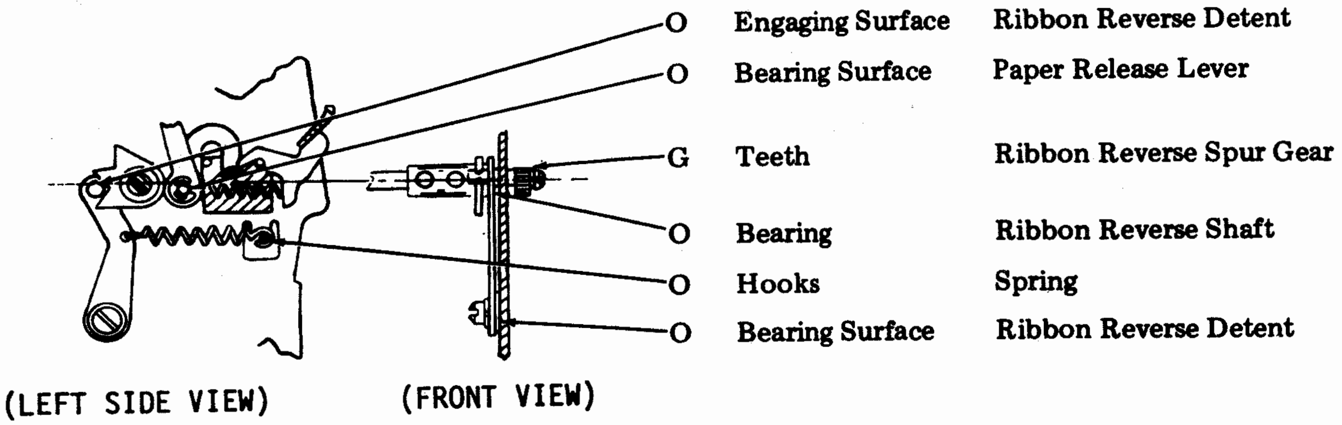
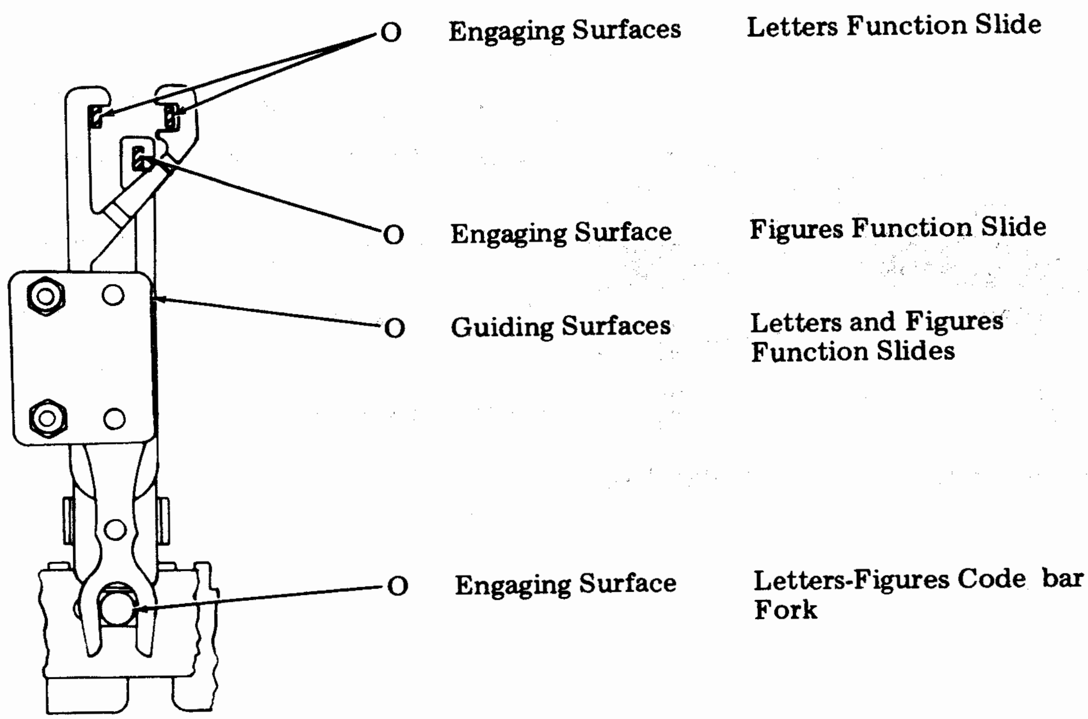



Figure 4-25. Ribbon Reverse Mechanism




(TOP VIEW)

Figure 4-26. Shift Mechanism

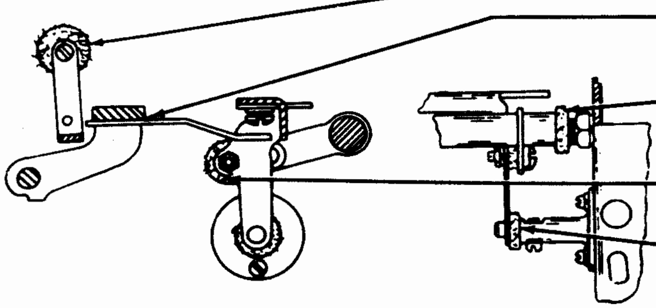



Figure 4-27. Function Rocker Shaft Mechanism

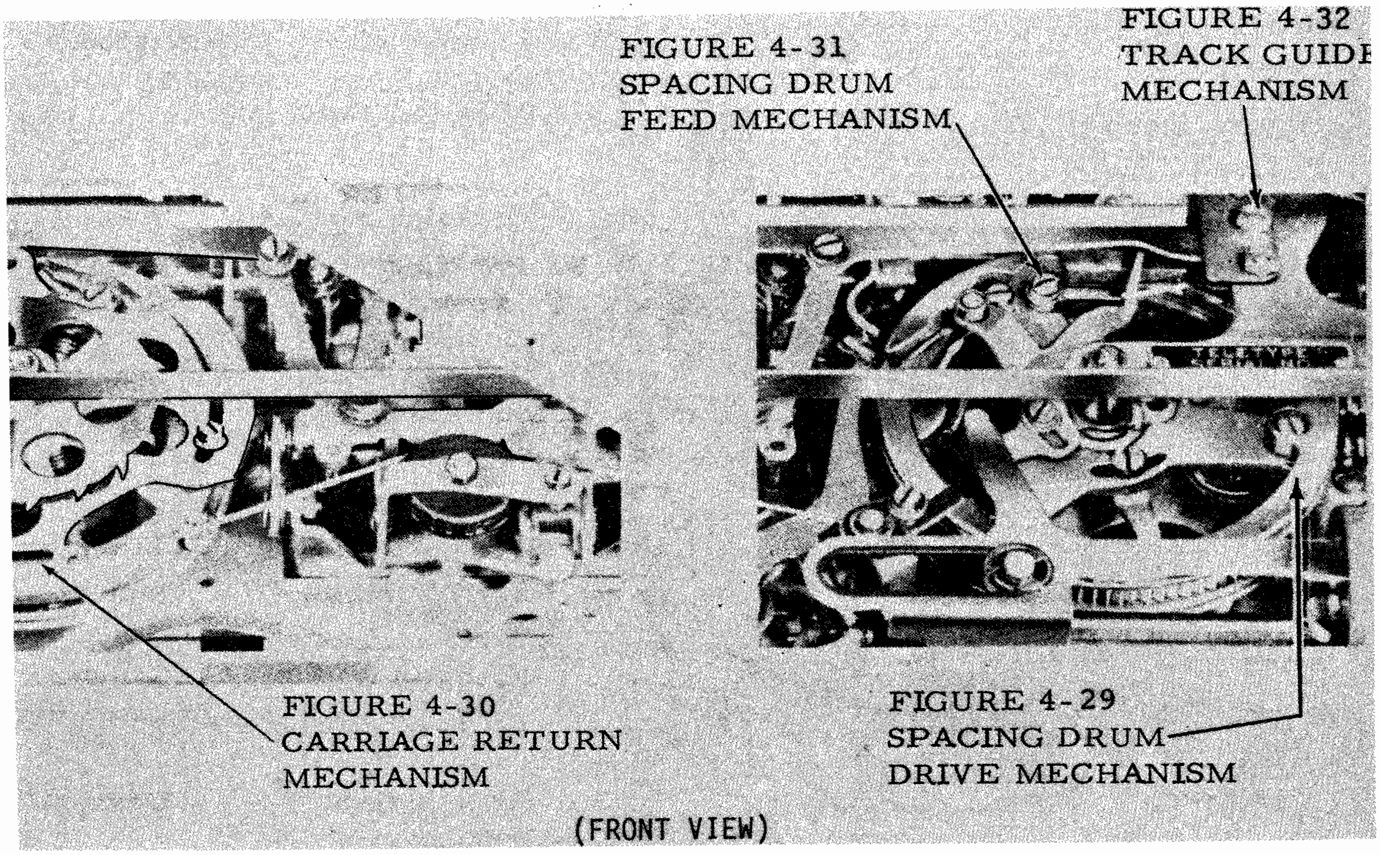
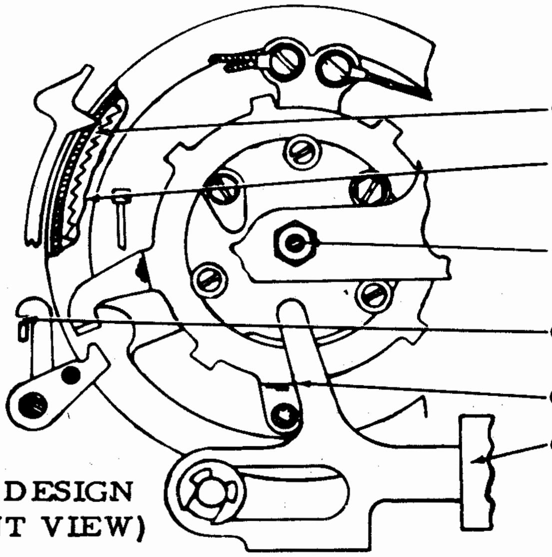


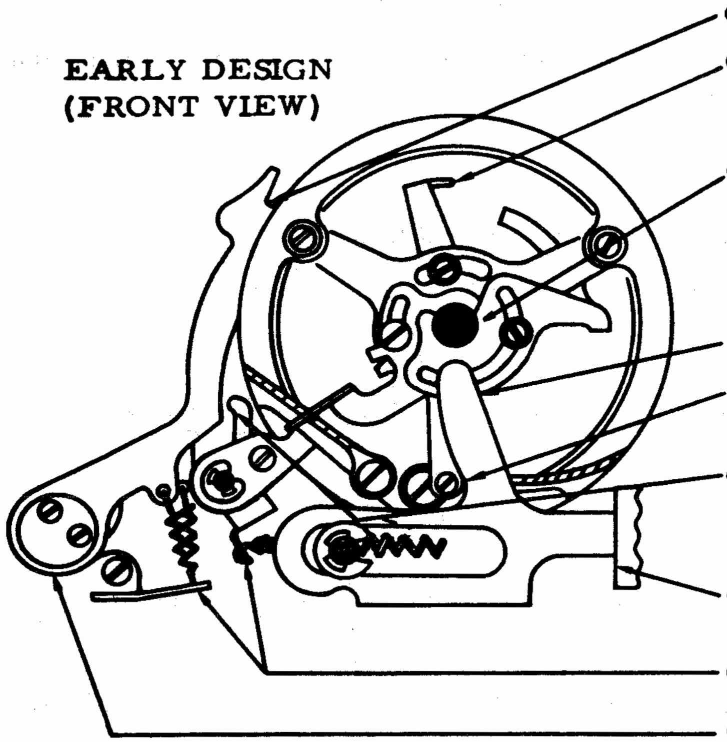

Figure 4-28. Spacing Area

LATE DESIGN
(FRONT VIEW)



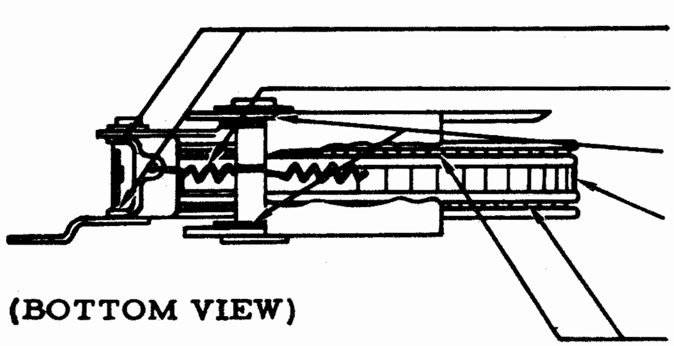
| | | |
|---|---|---|
| O | Cable Grooves | Spacing Drum |
| G | Teeth | Spacing Drum Ratchet |
| SAT | Oilers | Spacing Drum Shaft |
| O | Engaging Surfaces | Carriage Return Latch Bail |
| O | Engaging Surface | Transfer Slide |
| O | Apply Around Periphery of Cup | Dashpot |

EARLY DESIGN
(FRONT VIEW)



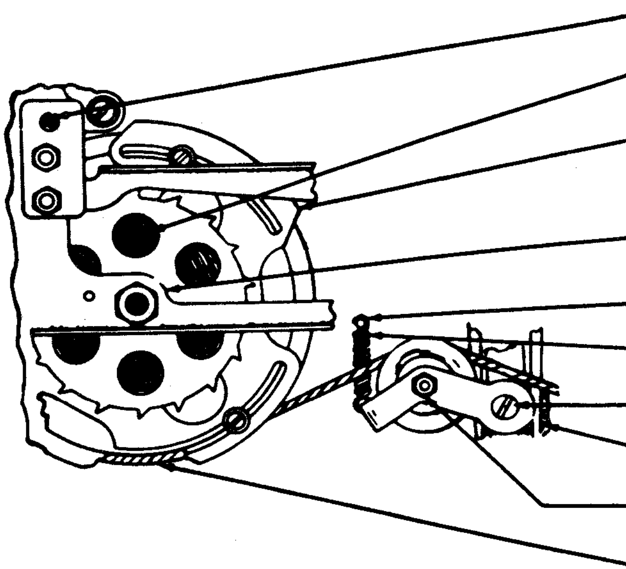
| | | |
|---|---|---|
| O | Engaging Surface | Space Pawls (2) |
| O | Engaging Surface | Spacing Cutout Lever |
| O | Bearing (Outer and Inner End) | Spacing Drum Shaft |
| O | Engaging Surface | Transfer Slide |
| | Roller Bearing | Stop Arm Roller |
| O | Engaging Surfaces | Carriage Return Latch Bail |
| O | Apply Around Periphery of Cup | Dashpot |
| O | Hooks | Springs |
| O | Bearing Surfaces | Spacing Pawls Eccentrics |

(BOTTOM VIEW)



| | | |
|---|---|---|
| O | Bearing Surfaces | Carriage Return Latch Bail |
| SAT | Felt Wick | Spring Wick |
| O | Roller Bearings | Transfer Slide Rollers |
| O | Teeth | Spacing Drum Ratchet Wheel |
| O | Cable Grooves | Spacing Drum |

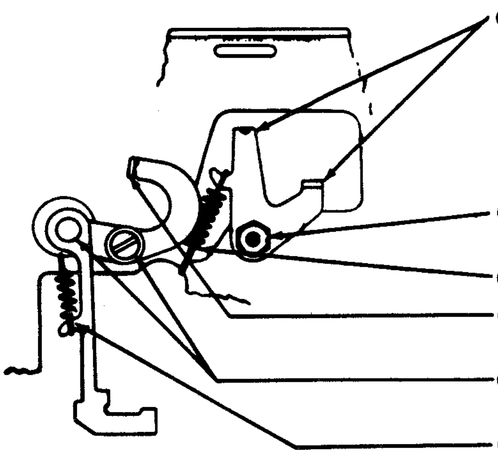
Figure 4-29. Spacing Drum Drive Mechanism



| | | |
|---|---|---|
| SAT | Felt Oiler | Printing Track Guide |
| O | Between Layers | Carriage Return Spring |
| G | Cam Disc Surface | Margin Indicator Cam Disc |
| O | Bearing (Outer and Inner End) | Carriage Return Spring Drum Shaft |
| O | Hooks | Spring |
| SAT | Spring Felt Wick | Tension Pulley Bail |
| O | Bearing Surface | Tension Pulley Bail |
| SAT | Felt Oiler | Main Bail |
| O | Bearing Surface | Pulley |
| O | Cable Grooves | Carriage Return Spring Drum |

(FRONT VIEW)

Figure 4-30. Carriage Return Mechanism



| | | |
|---|---|---|
| O | Engaging Surfaces | Automatic Carriage Return Bellcrank |
| O | Bearing Surface | Automatic Carriage Return Bellcrank |
| O | Hooks | Spring |
| O | Engaging Surface | Spacing Drum Feed Pawl Release Link |
| O | Bearing Surfaces | Spacing Drum Feed Pawl Release Link |
| O | Hooks | Spring |

(FRONT VIEW)

Figure 4-31. Spacing Drum Feed Mechanism

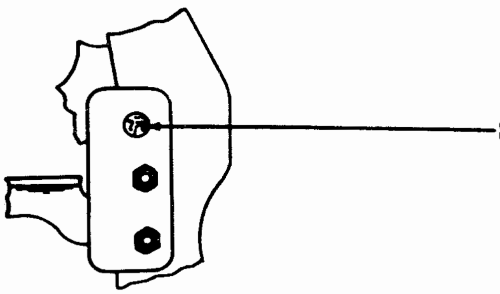



Figure 4-32. Track Guide Mechanism

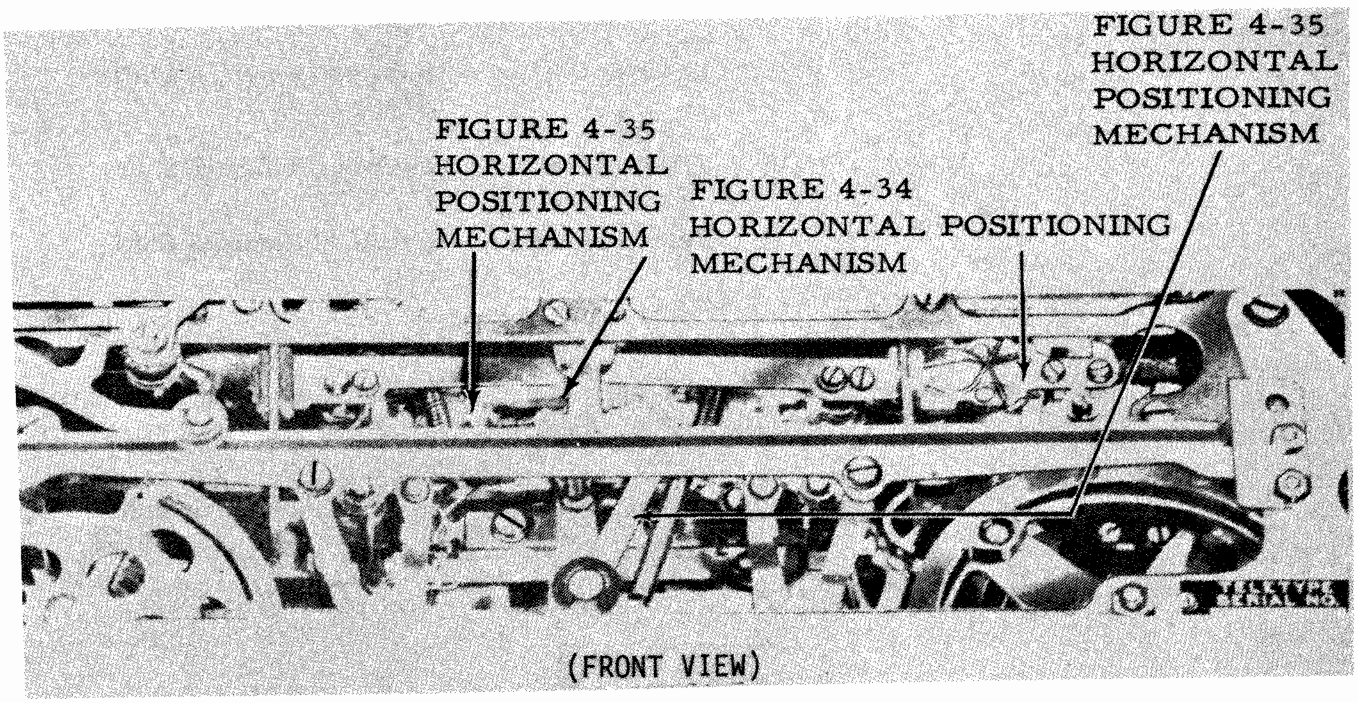
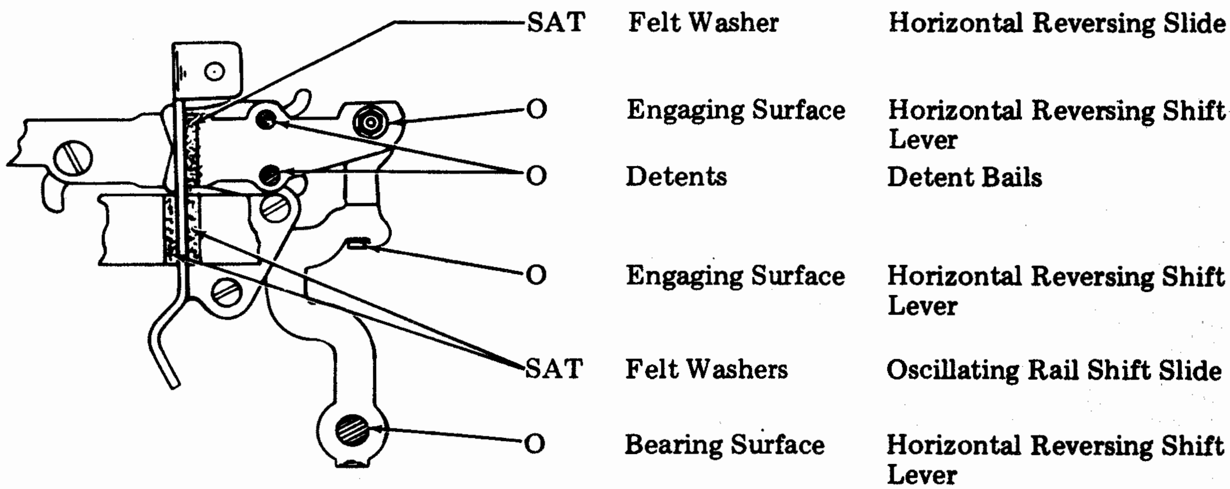
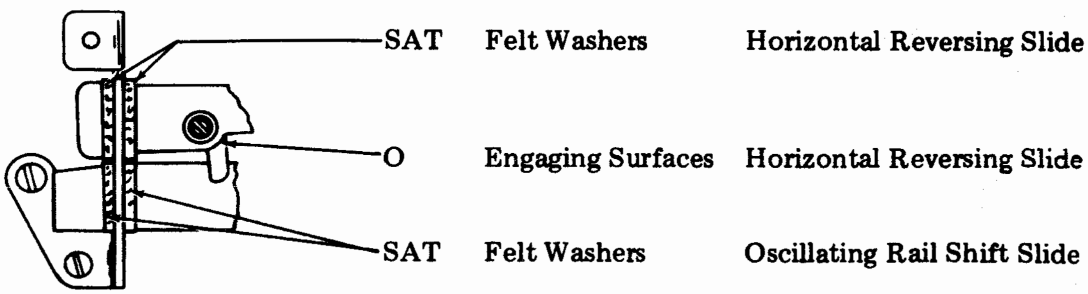



Figure 4-33. Horizontal Positioning Area

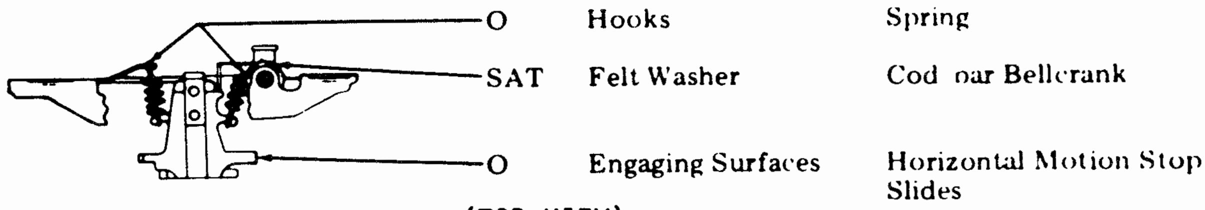



(FRONT VIEW)

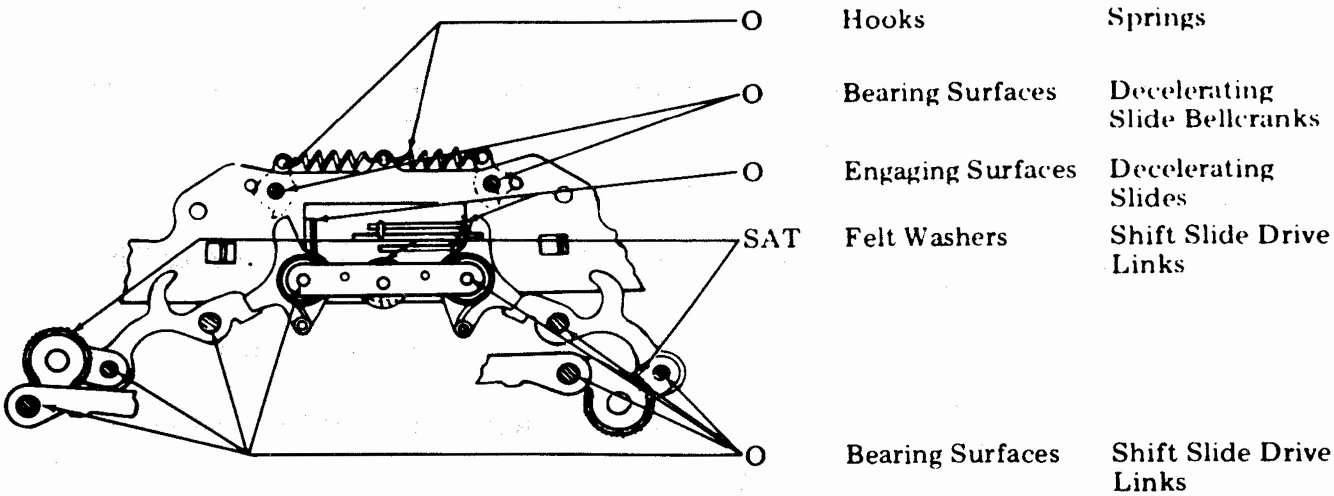



(FRONT VIEW)

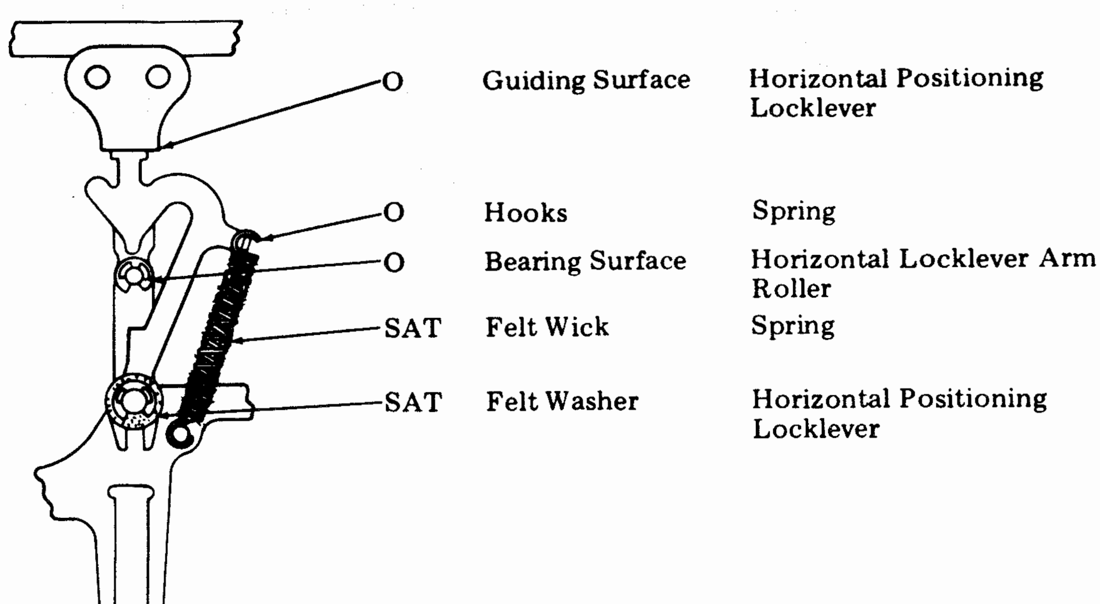
Figure 4-34. Horizontal Positioning Mechanism (A)




(TOP VIEW)




(FRONT VIEW)




(FRONT VIEW)

Figure 4-35. Horizontal Positioning Mechanism (B)

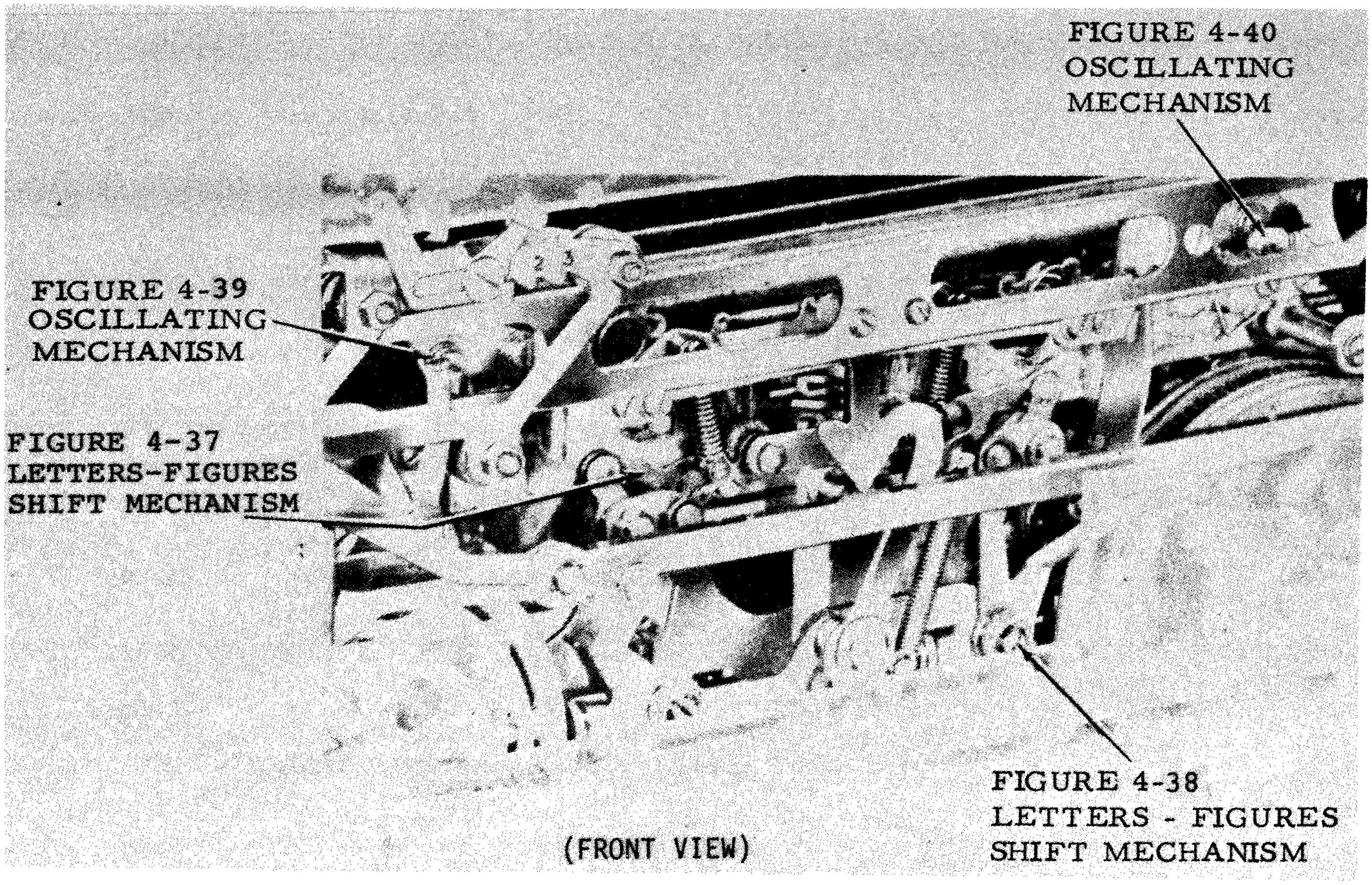



Figure 4-36. Letters-Figures Shift Area

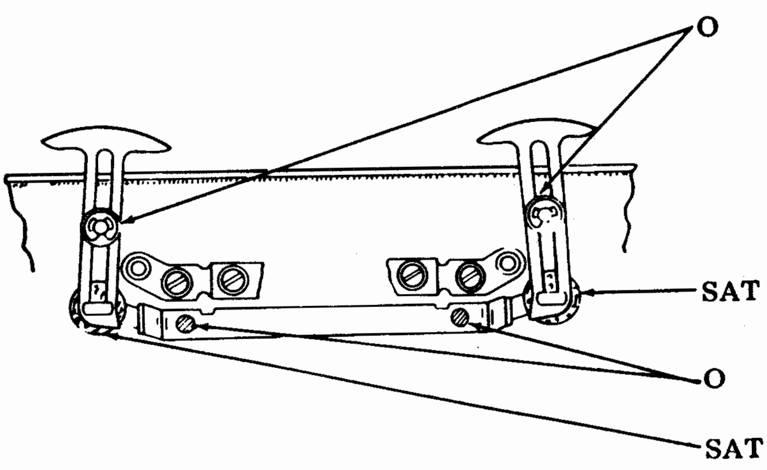
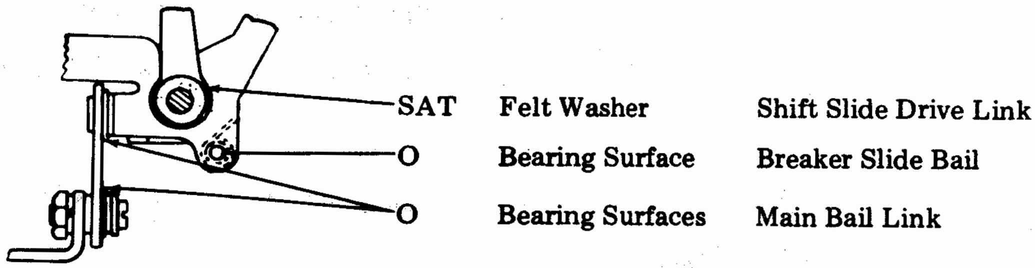
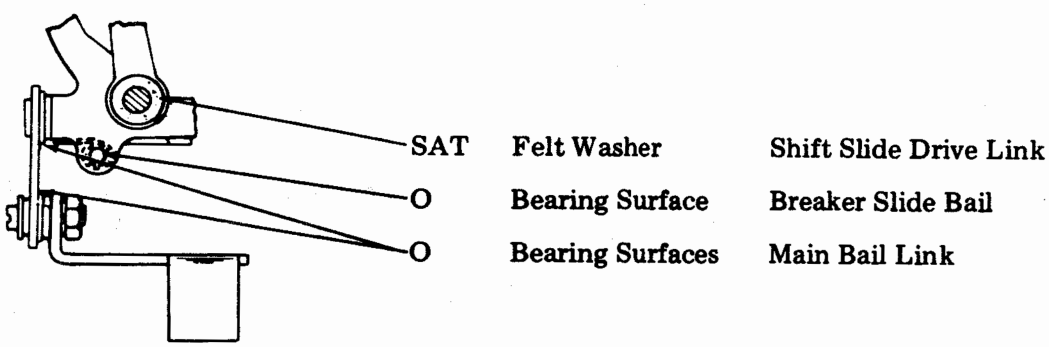



Figure 4-37. Letters-Figures Shift Mechanism (A)




(FRONT VIEW)




(FRONT VIEW)

Figure 4-38. Letters-Figures Shift Mechanism (B)

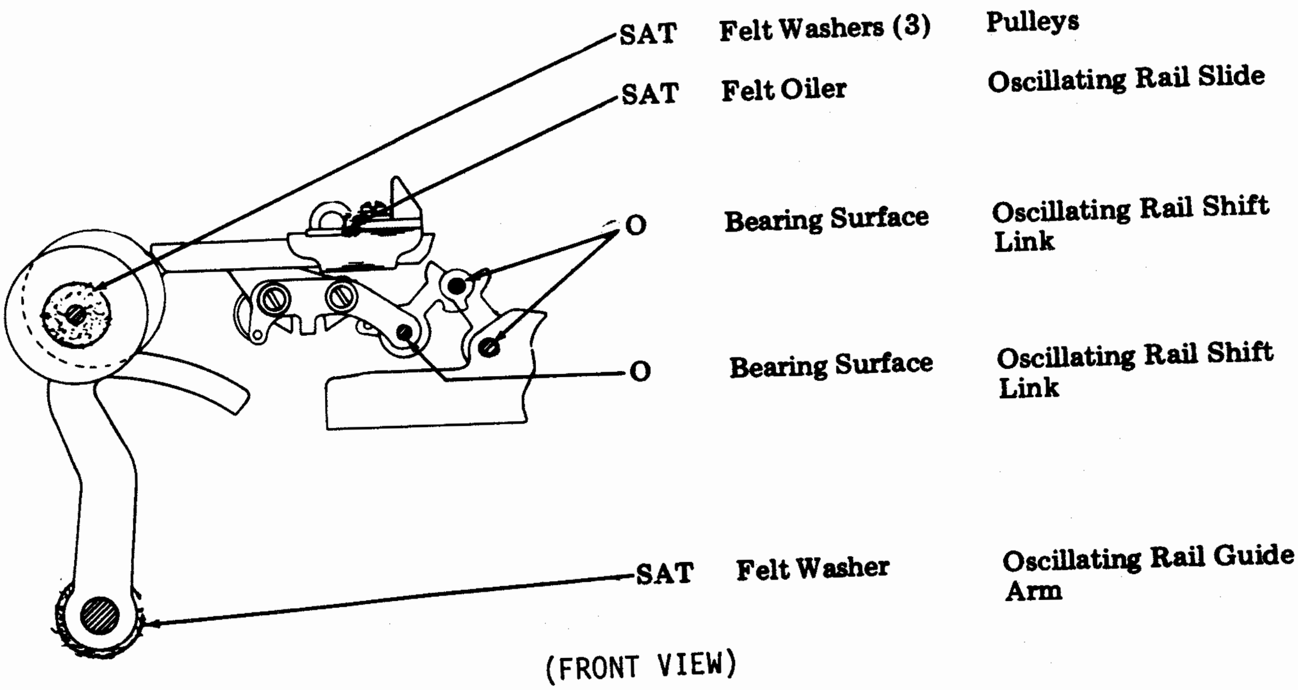



Figure 4-39. Oscillating Mechanism (A)

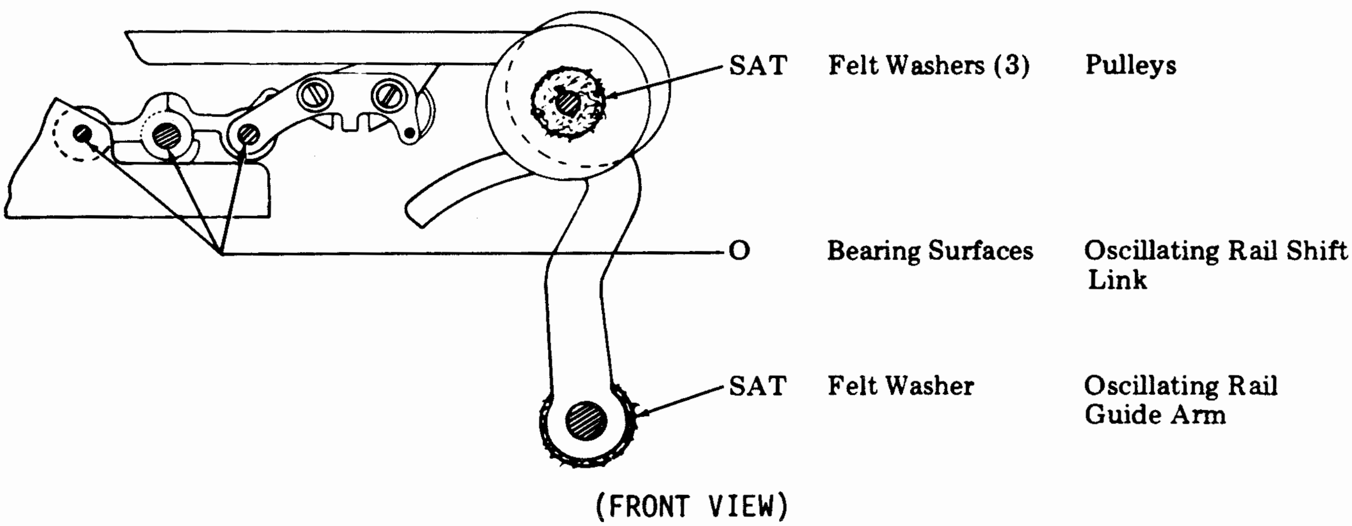



Figure 4-40. Oscillating Mechanism (B)

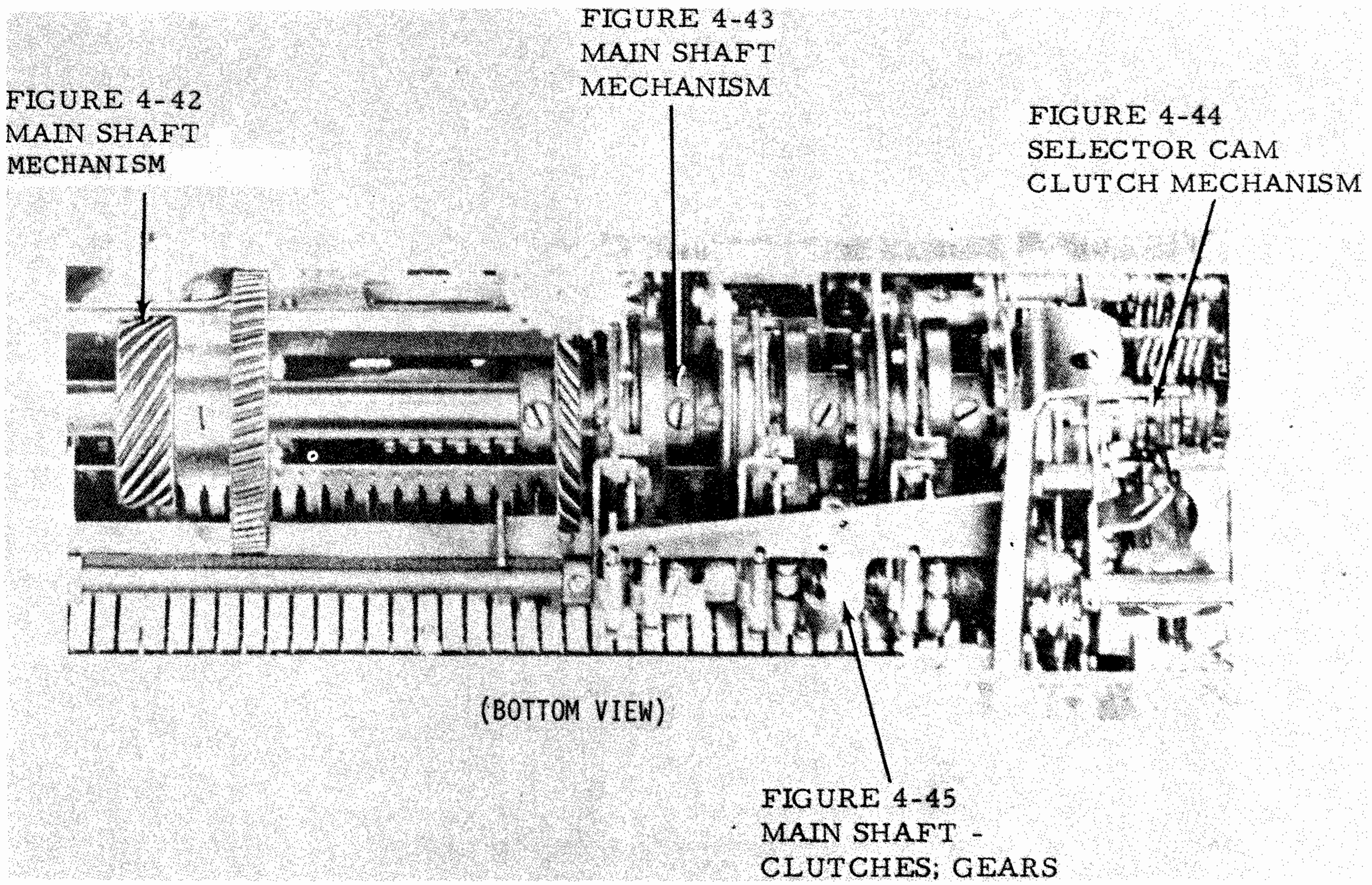



Figure 4-41. Main Shaft Area

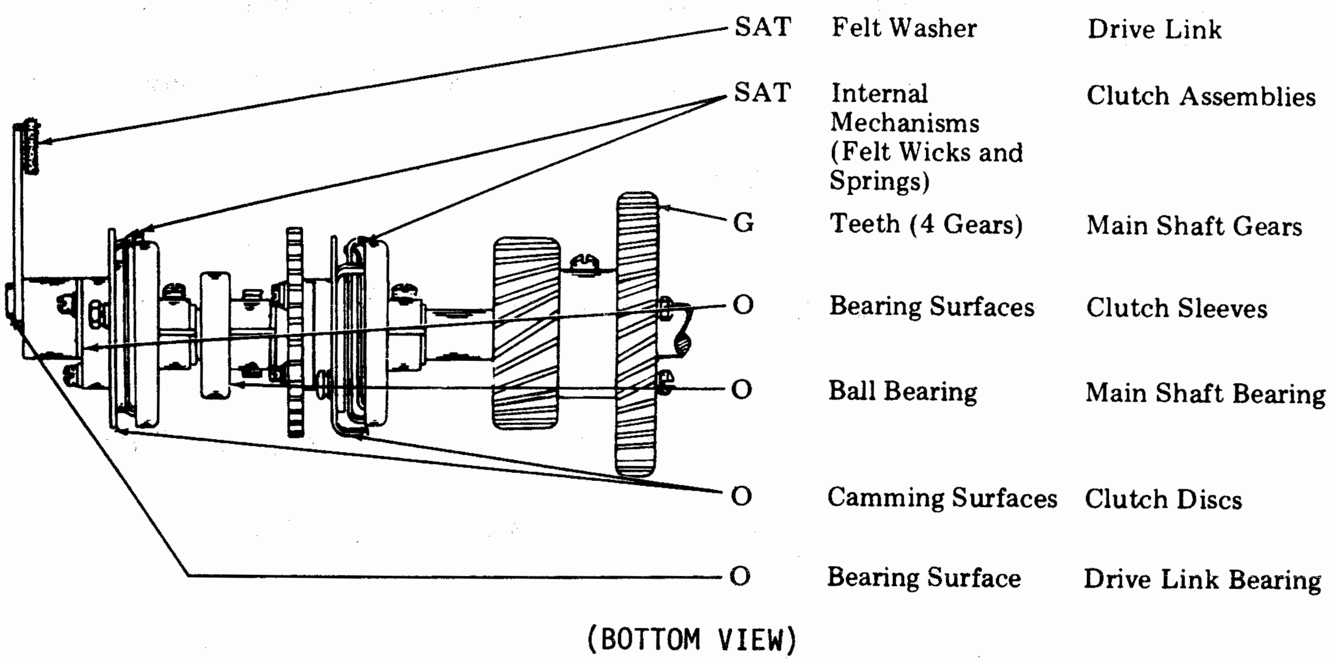
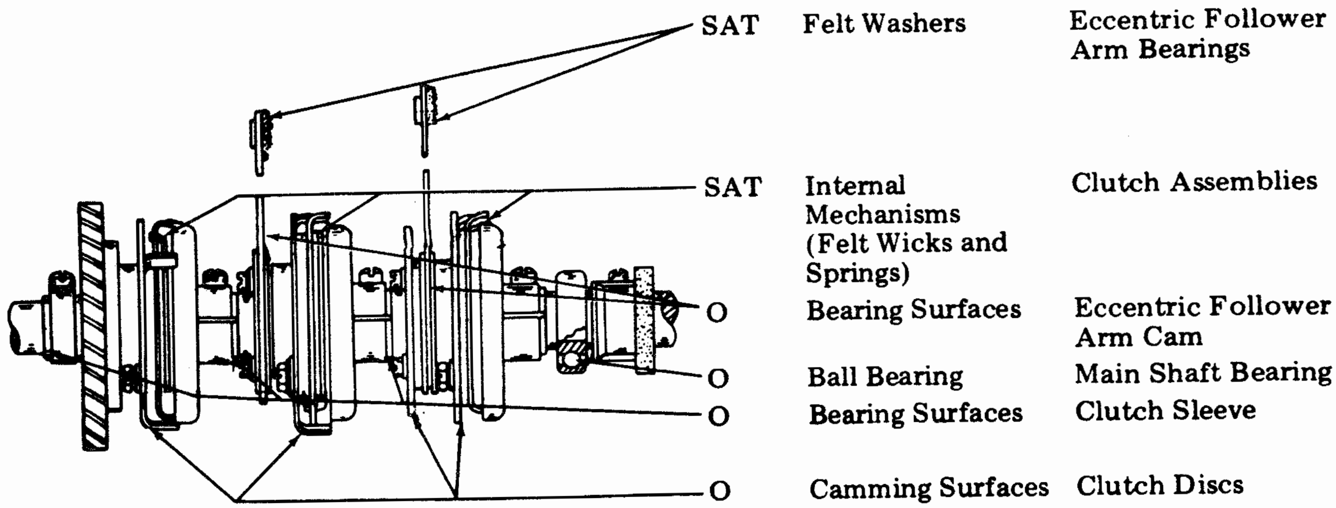
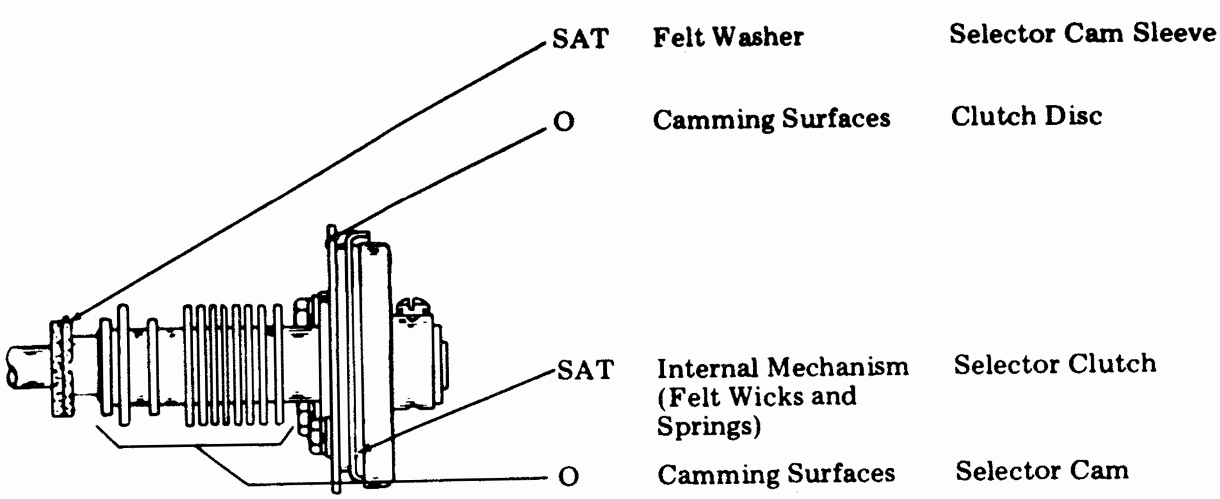



Figure 4-42. Main Shaft Mechanism (A)




(BOTTOM VIEW)

Figure 4-43. Main Shaft Mechanism (B)




(FRONT VIEW)

Figure 4-44. Selector Cam Clutch Assembly

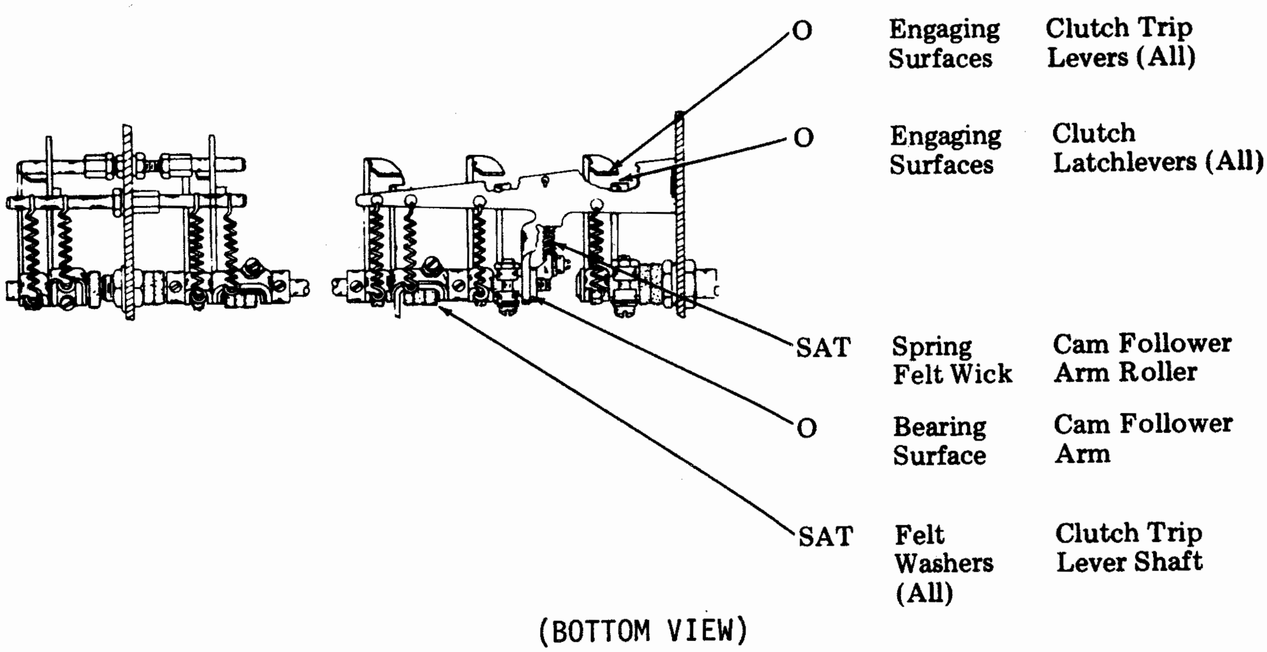
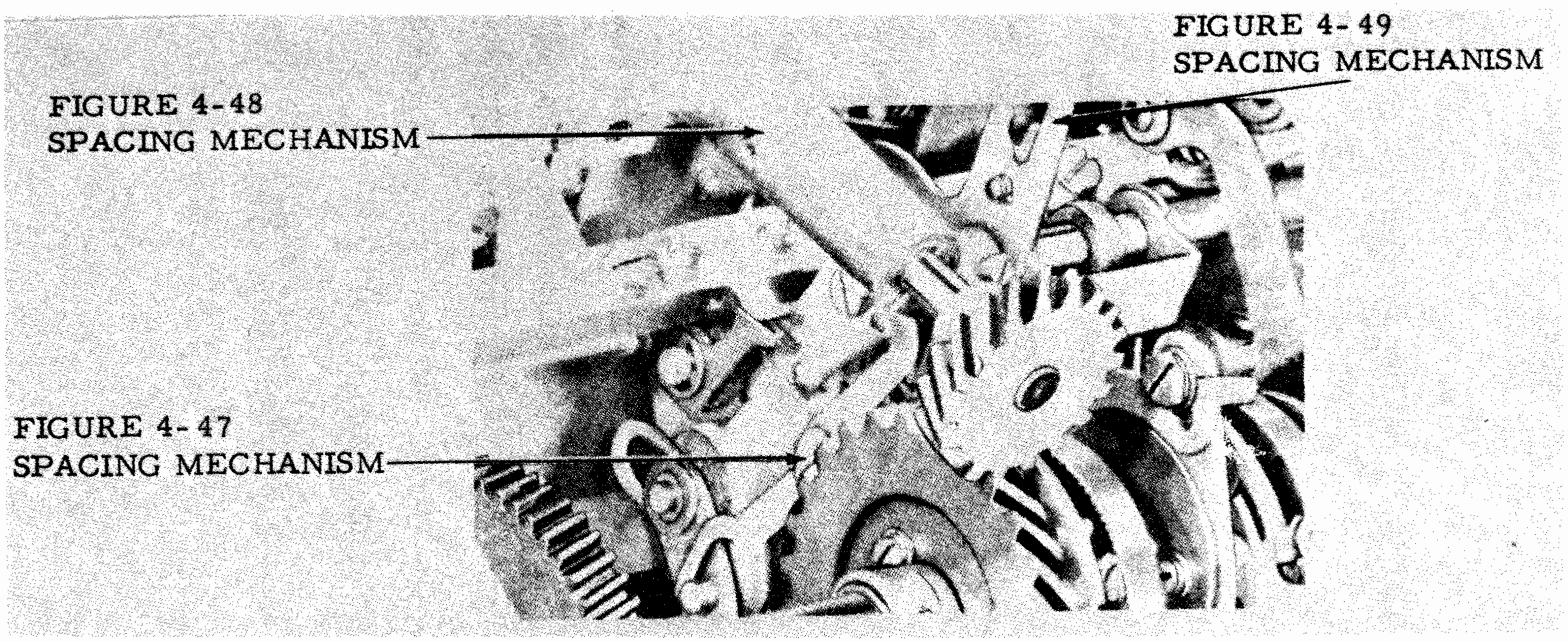
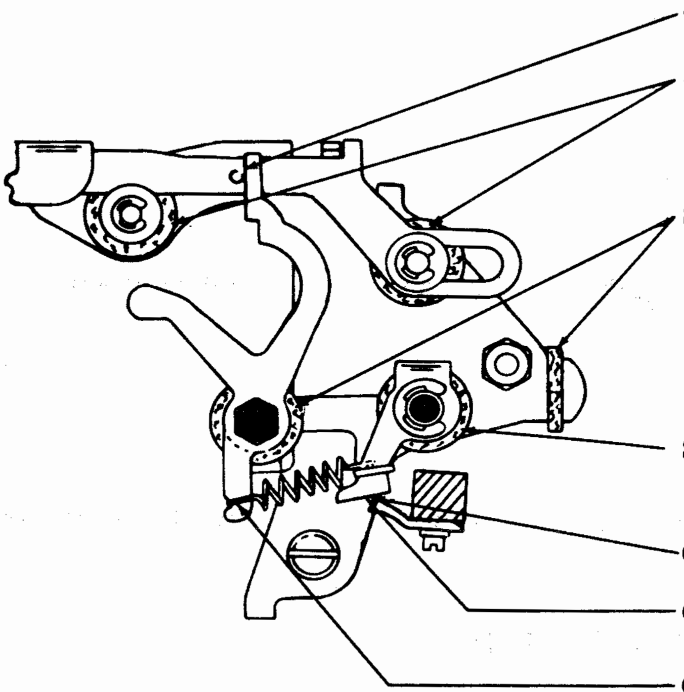



Figure 4-45. Main Shaft-Clutches; Gears




(BOTTOM VIEW)

Figure 4-46. Spacing Area



| | | |
|---|---|---|
| O | Engaging Surfaces | Spacing Trip Lever |
| SAT | Felt Washers | Spacing Suppression Slide |
| SAT | Felt Washers | Spacing Trip Lever |
| SAT | Felt Washer | Spacing Trip Lever Bail Shaft |
| O | Engaging Surface | Spacing Trip Lever Bail |
| G | Engaging Surface | Trip Reset Cam |
| O | Hooks | Springs |

(LEFT SIDE VIEW)

Figure 4-47. Spacing Mechanism (A)

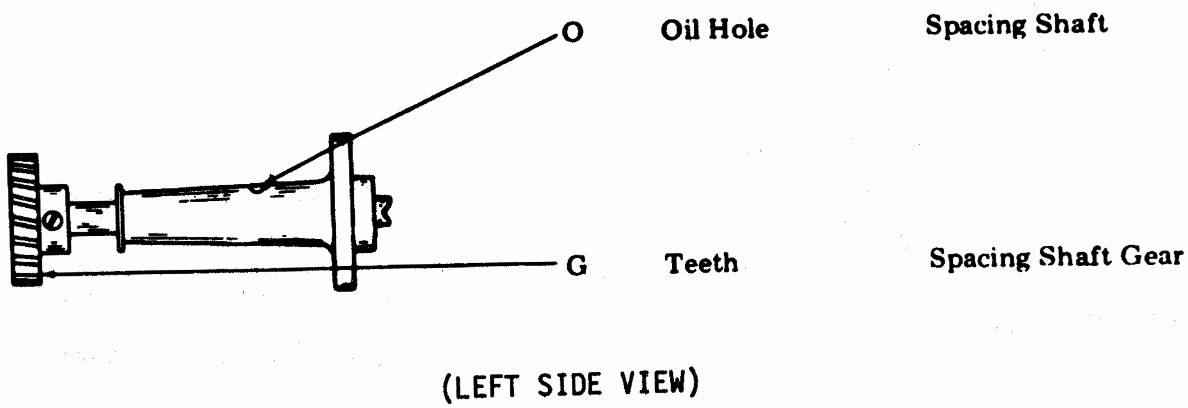



Figure 4-48. Spacing Mechanism (B)

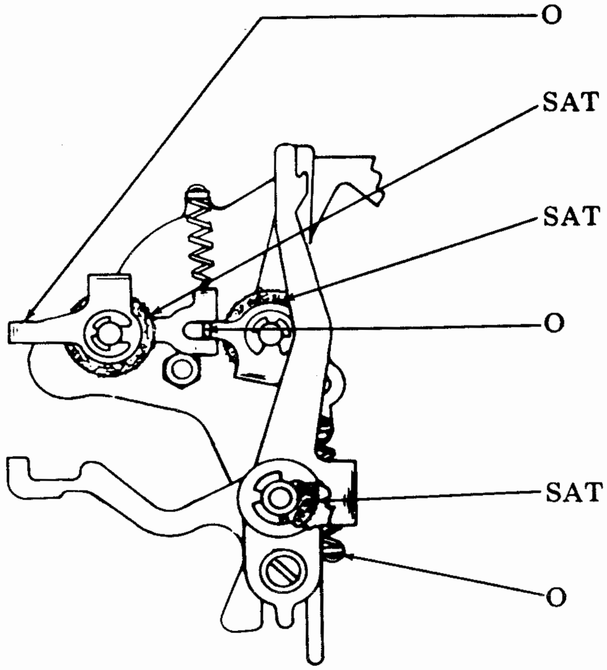



Figure 4-49. Spacing Mechanism (C)

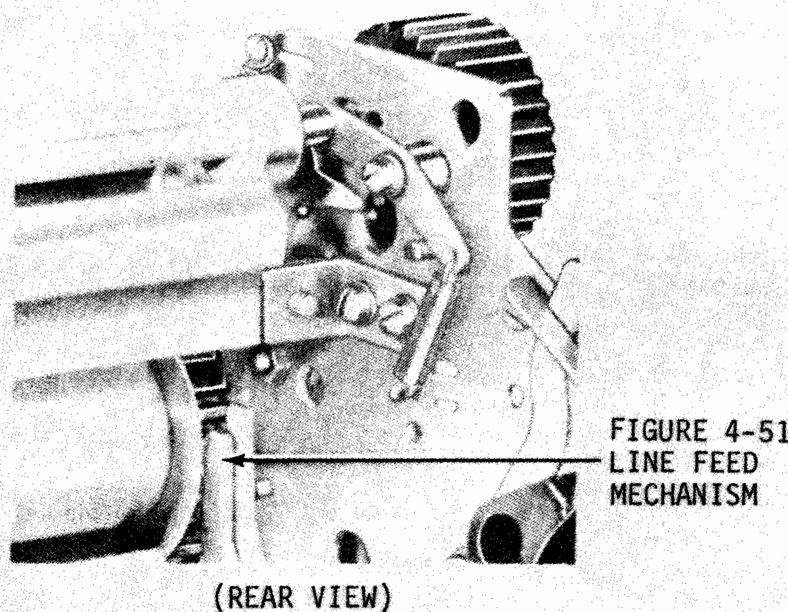



Figure 4-50. Line Feed Area (A)

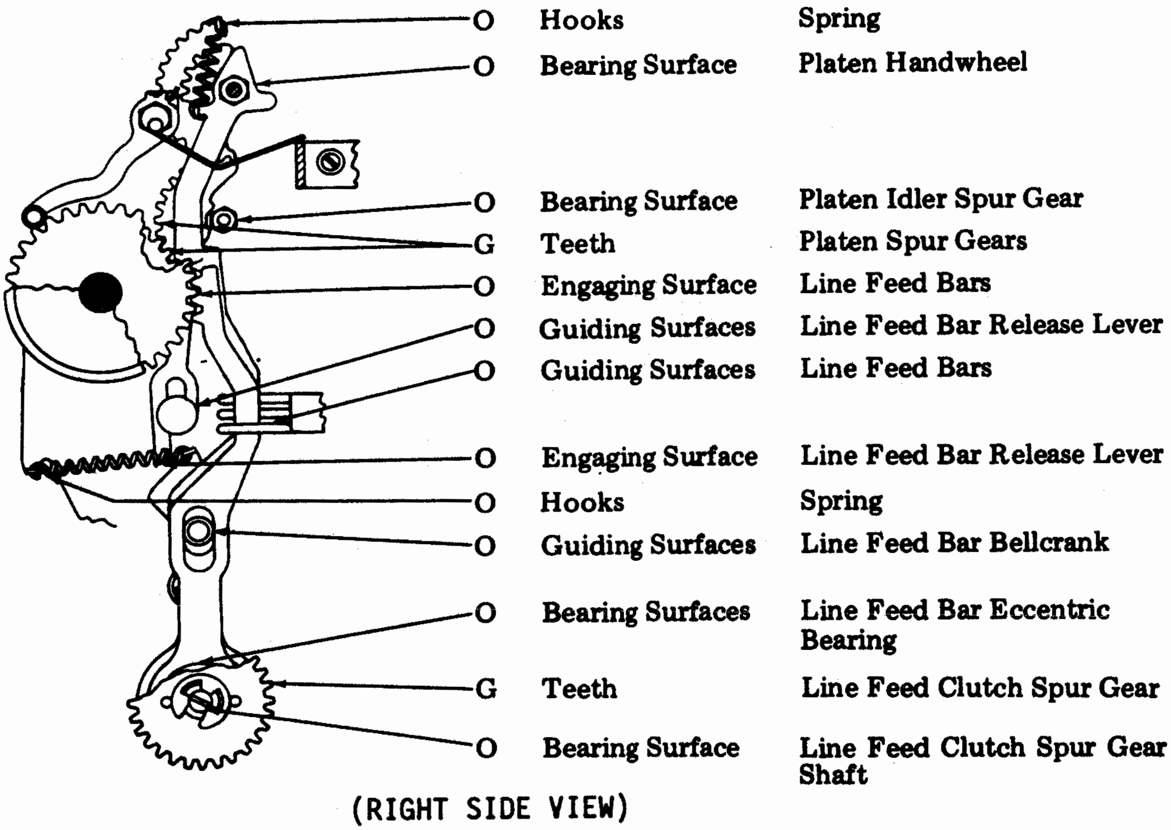



Figure 4-51. Line Feed Mechanism (A)

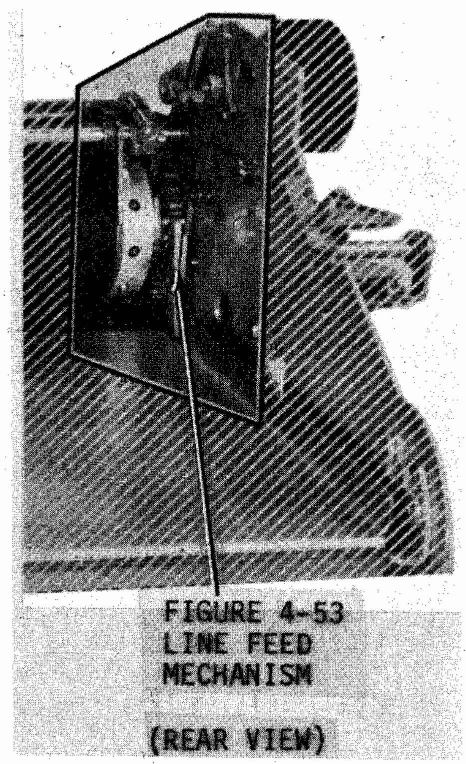
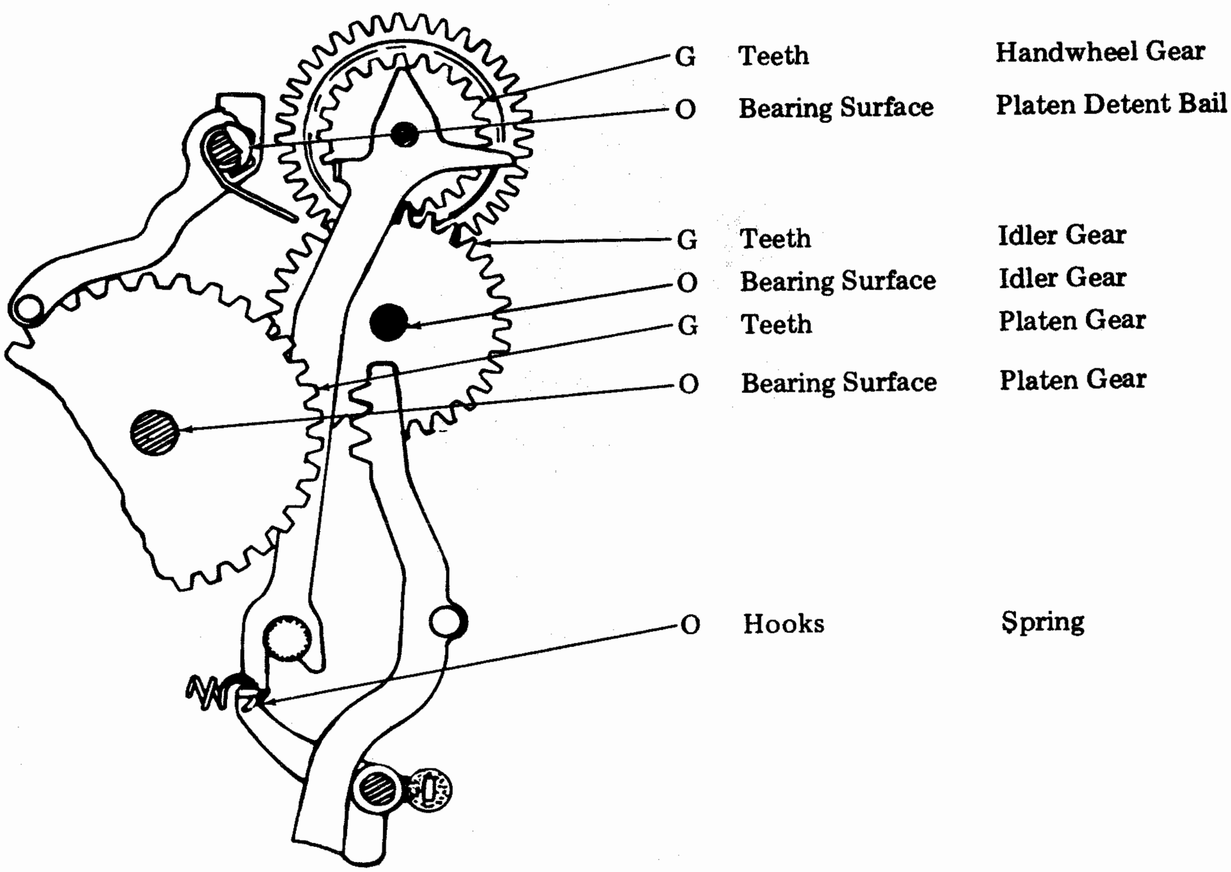



Figure 4-52. Line Feed Area (B)




(RIGHT SIDE VIEW)

Figure 4-53. Line Feed Mechanism (B)

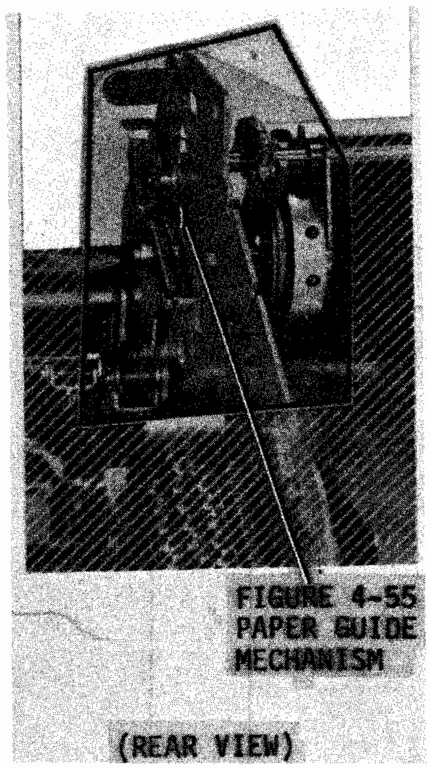



Figure 4-54. Paper Guide Area

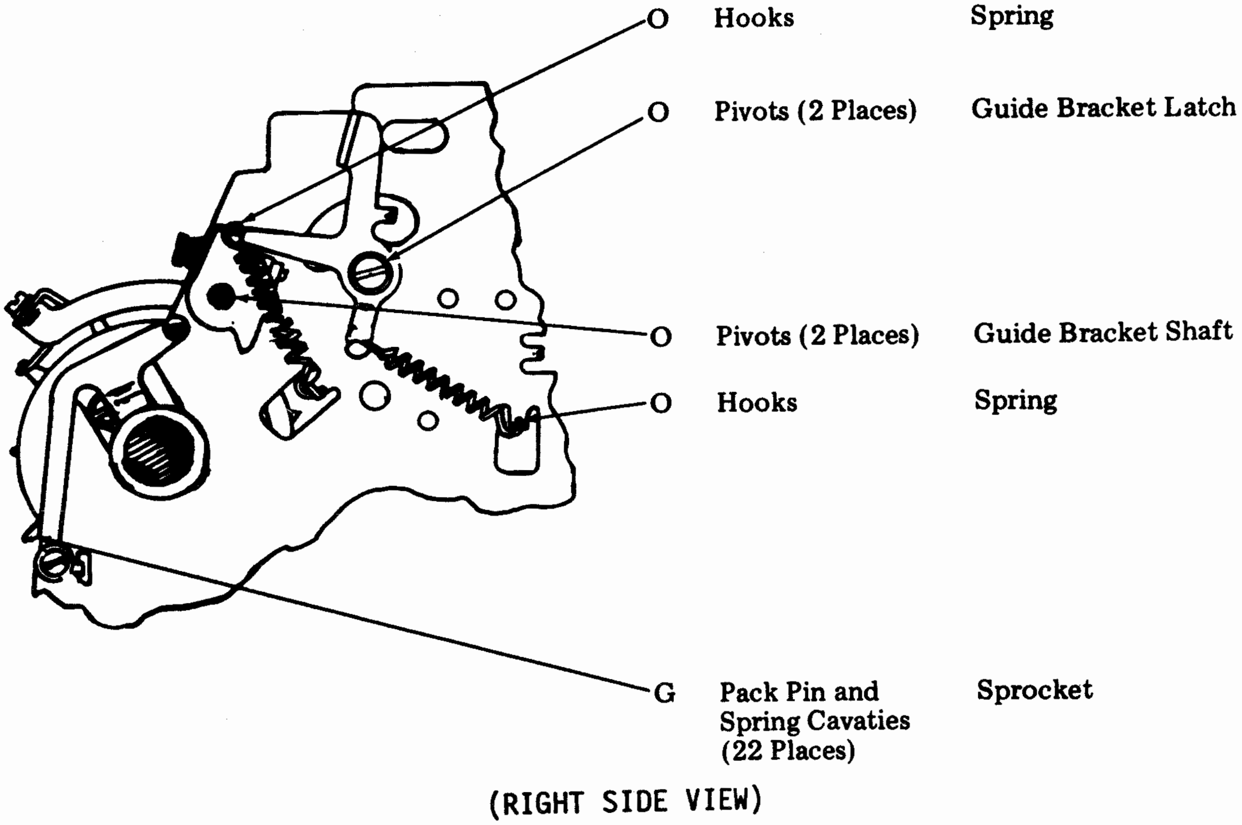



Figure 4-55. Paper Guide Mechanism

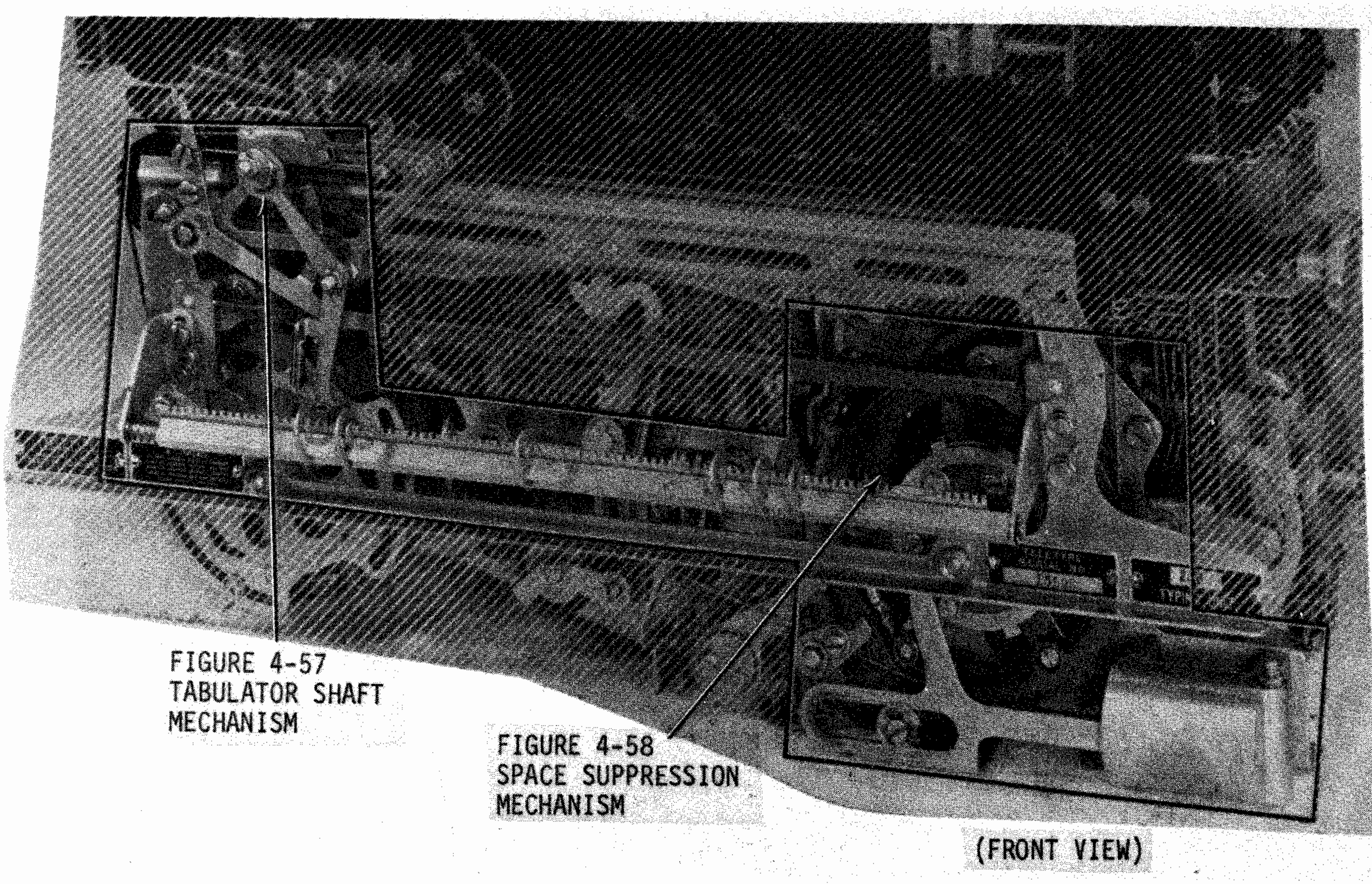
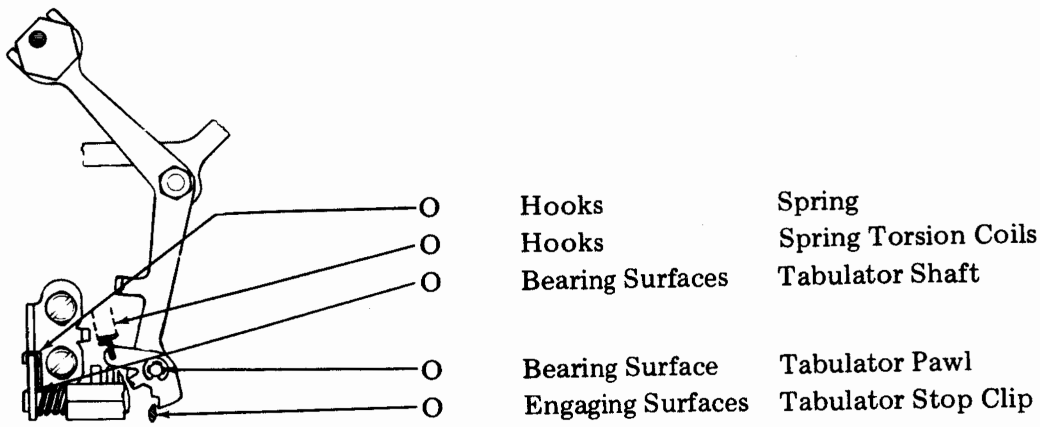
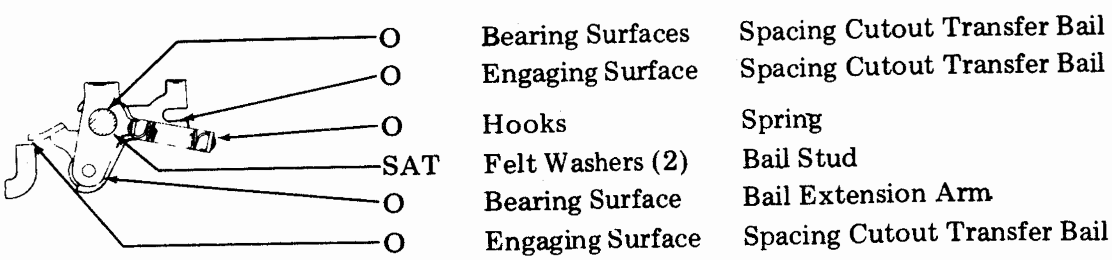



**Figure 4-56. Horizontal Tabulator Mechanism (Early Design)**




(FRONT VIEW)

Figure 4-57. Tabulator Shaft Mechanism




(RIGHT SIDE VIEW)

Figure 4-58. Space Suppression Mechanism

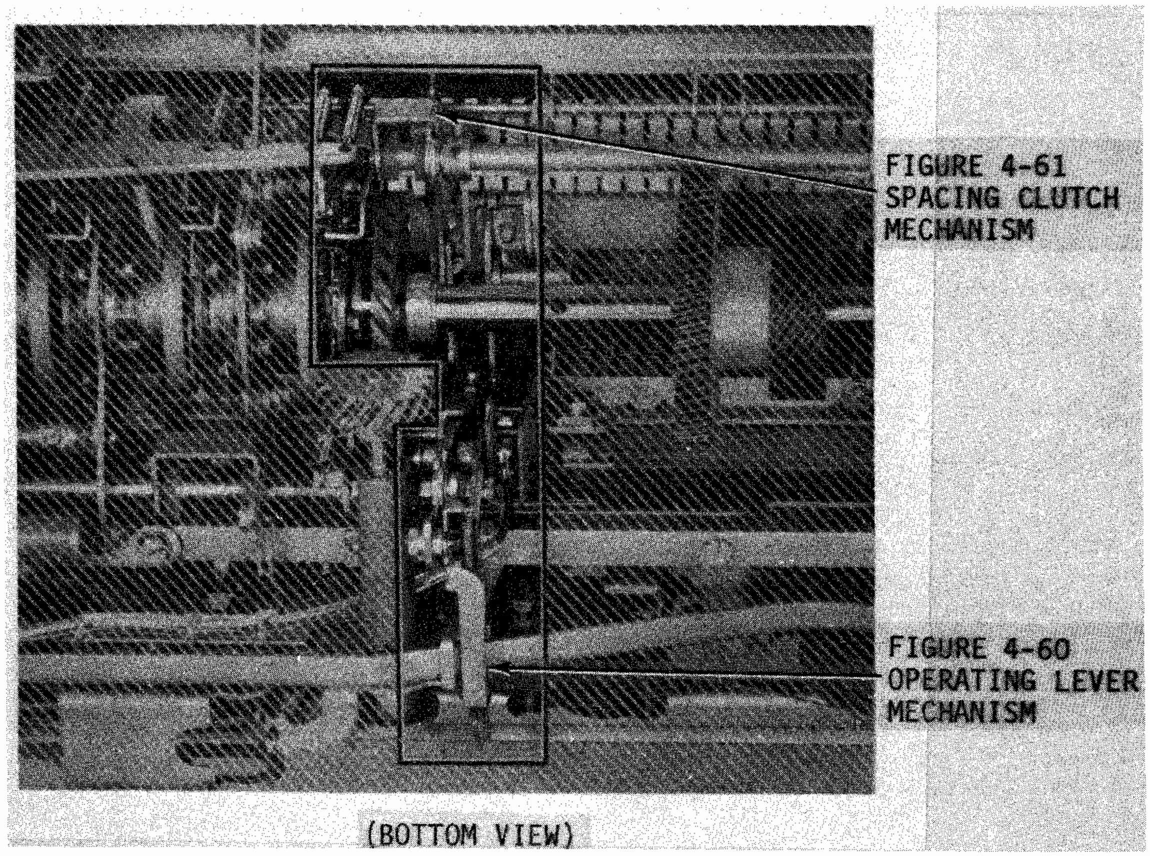



Figure 4-59. Horizontal Tabulator Mechanism (Early Design)

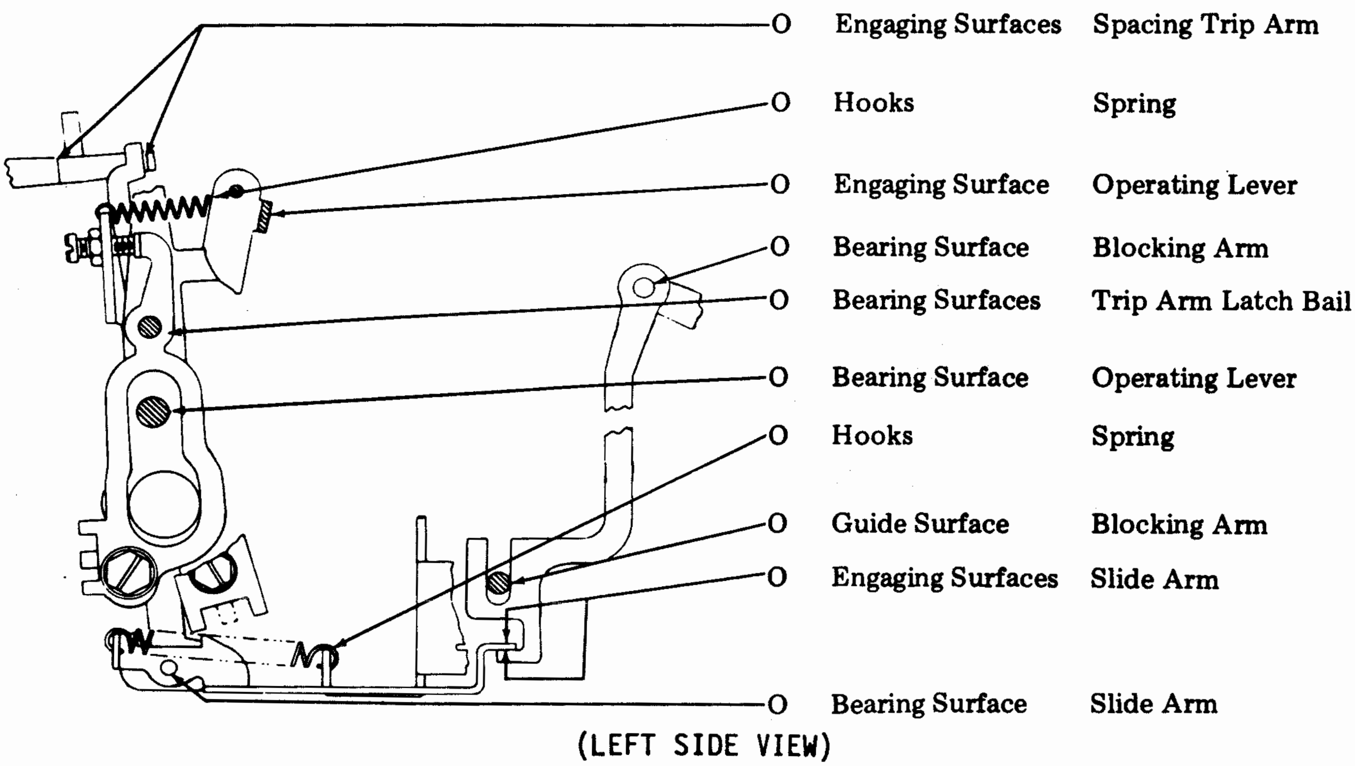
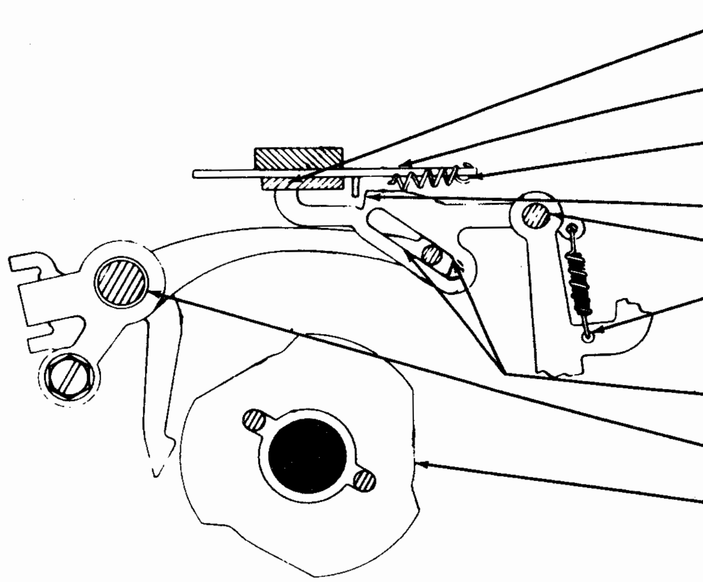



Figure 4-60. Operating Lever Mechanism



| | | |
|---|---|---|
| O | Guide Surface | Cam Arm |
| O | Guide Surface | Tabulator Slide Arm |
| O | Hooks | Spring |
| O | Engaging Surface | Cam Arm |
| O | Bearing Surfaces | Cam Arm |
| O | Hooks | Spring |
| O | Camming Surface | Cam Arm |
| SAT | Felt Washers (5) | Clutch Trip Shaft |
| G | Camming Surface | Spacing Clutch Restoring Cam |

(RIGHT SIDE VIEW)

Figure 4-61. Spacing Clutch Mechanism

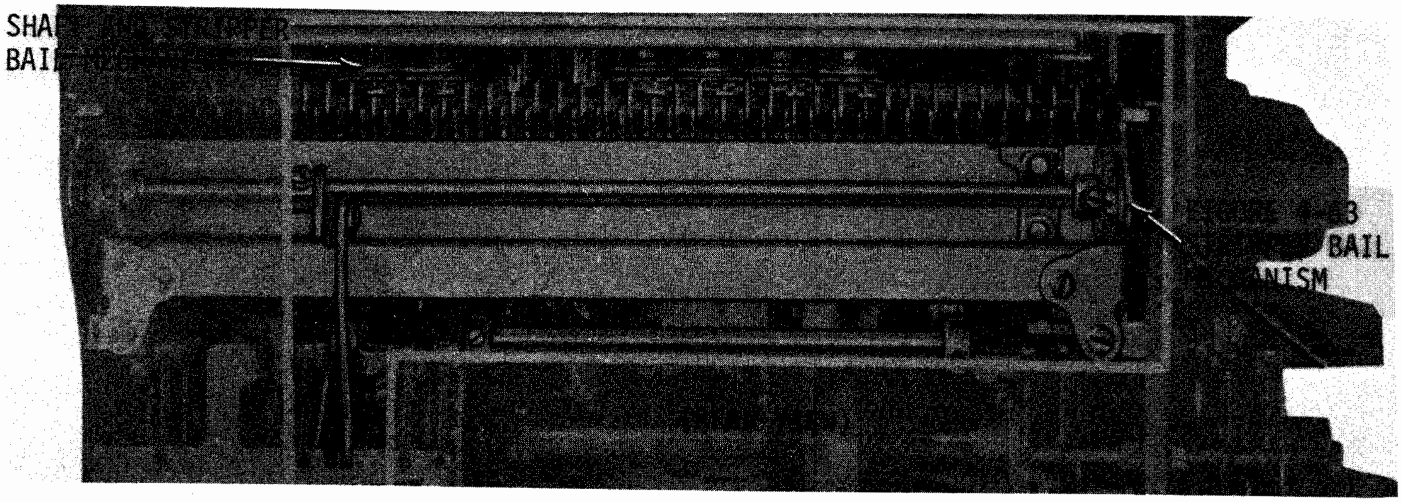



Figure 4-62. Selective Calling Mechanism

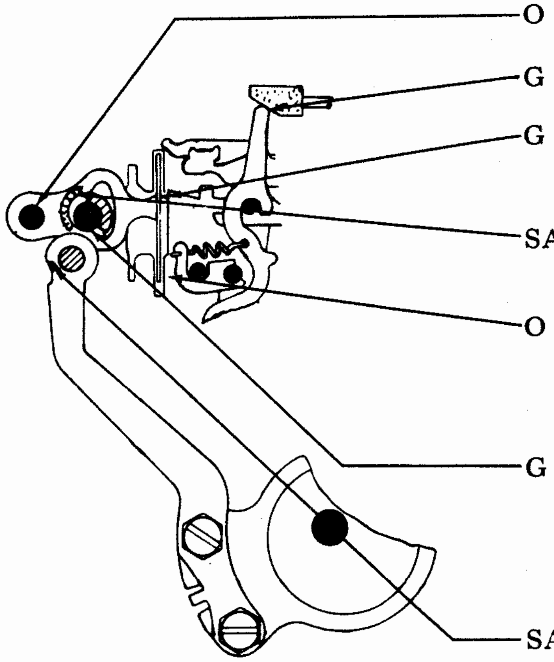



Figure 4-63. Stripper Bail Mechanism

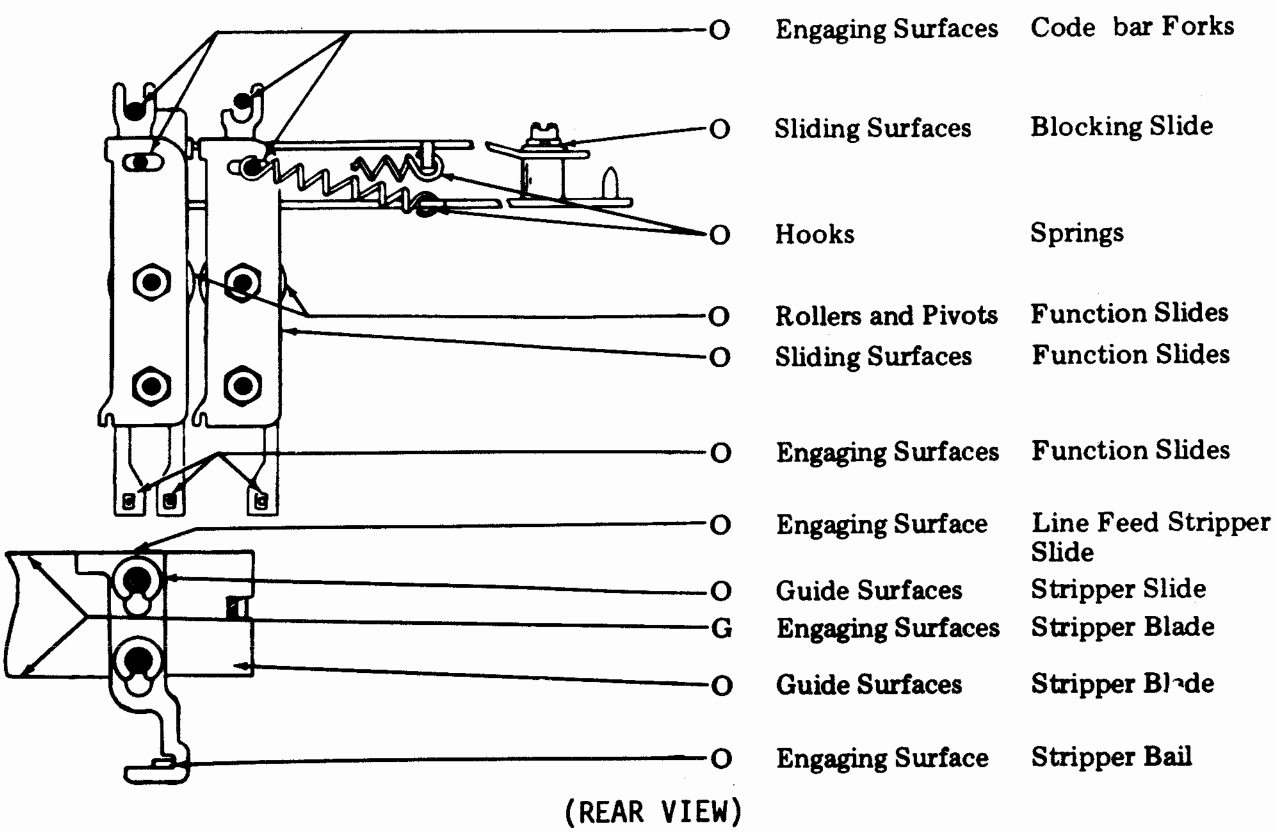
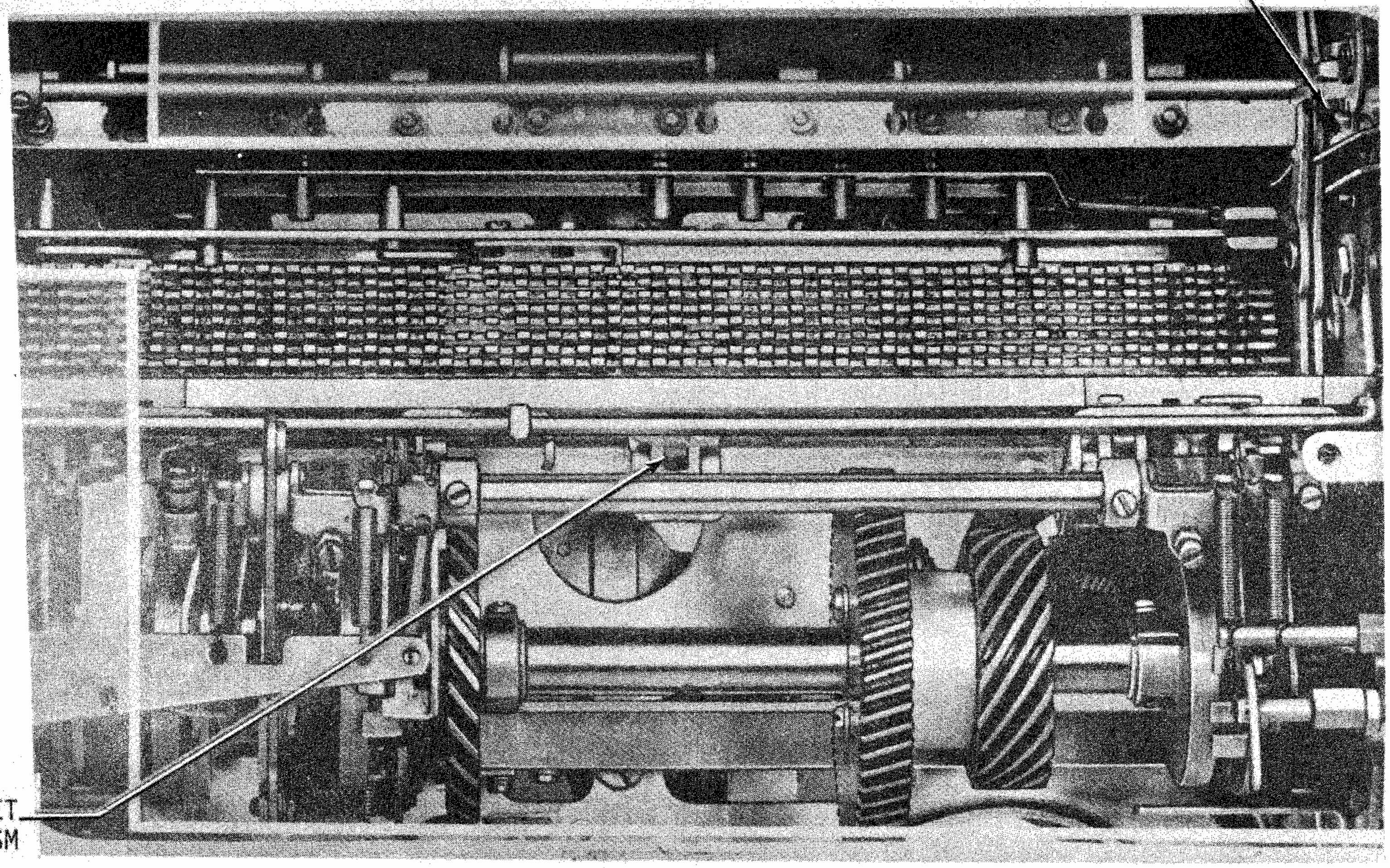
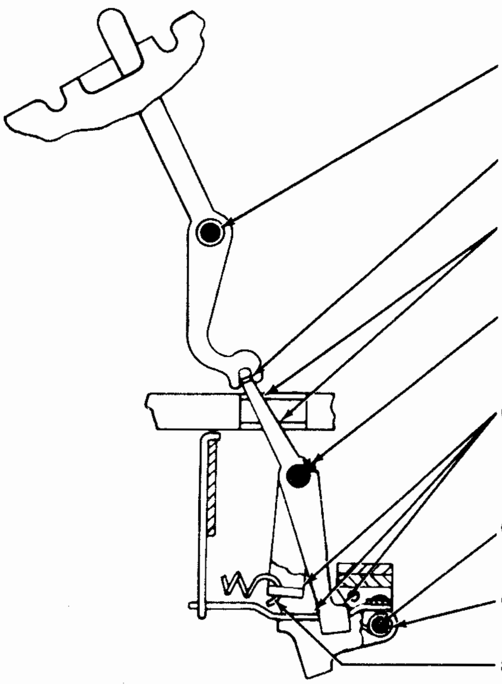



Figure 4-64. Shift and Stripper Bail Mechanism




(REAR VIEW)

Figure 4-65. Selective Calling Mechanism



| | | |
|---|---|---|
| O | Pivot | Single-Double Line Feed Lever |
| O | Engaging Surface | Operating Arm |
| O | Guide Surfaces | Operating Arm |
| SAT | Felt Washer | Operating Arm |
| O | Engaging Surfaces | Stripper Bail |
| O | Coils | Torsion Spring |
| O | Hooks | Spring |
| O | Hooks | Spring |

(RIGHT SIDE VIEW)

Figure 4-66. Single-Double Line Feed Mechanism

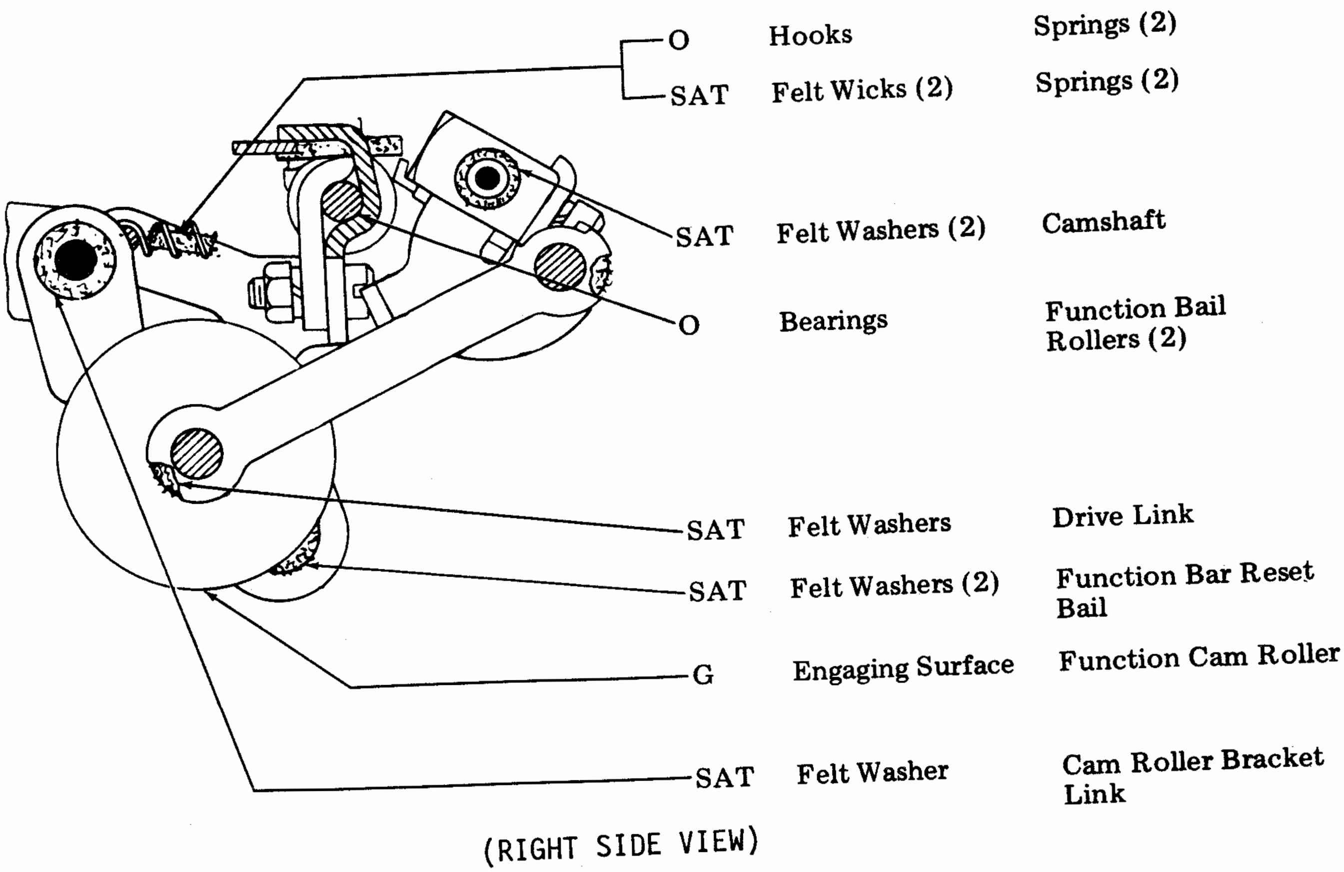



Figure 4-67. Function Reset Bail Mechanism

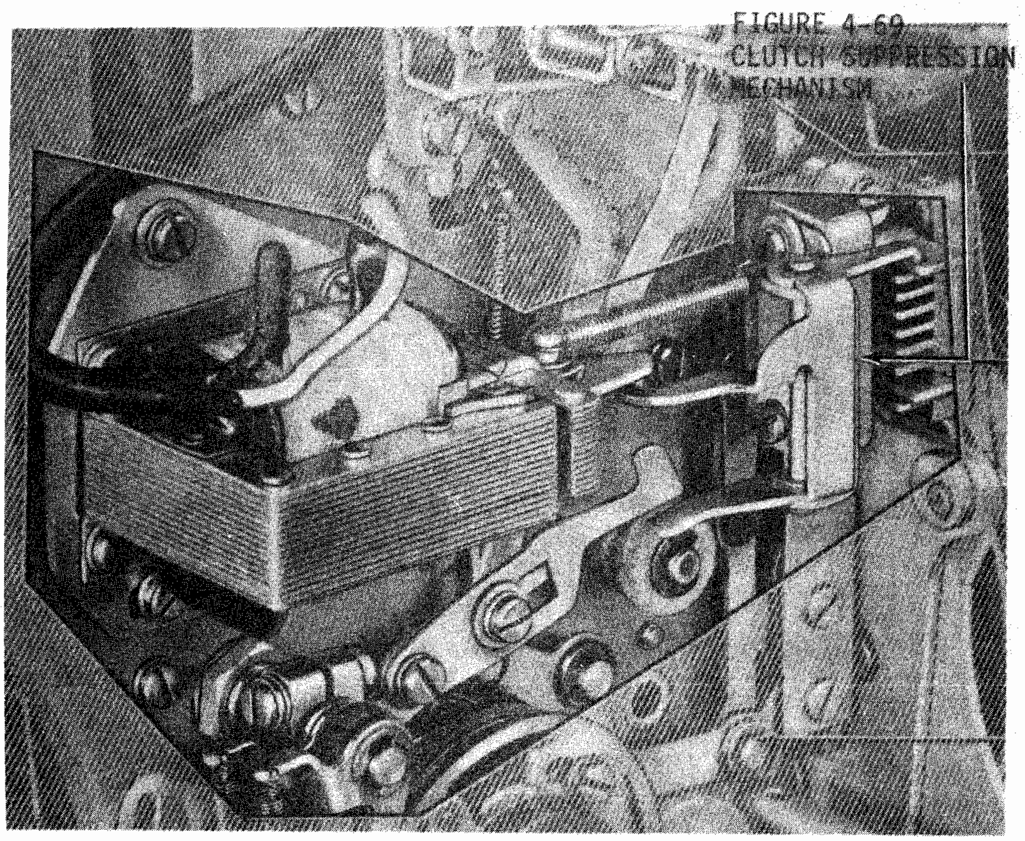



Figure 4-68. Selective Calling Mechanism

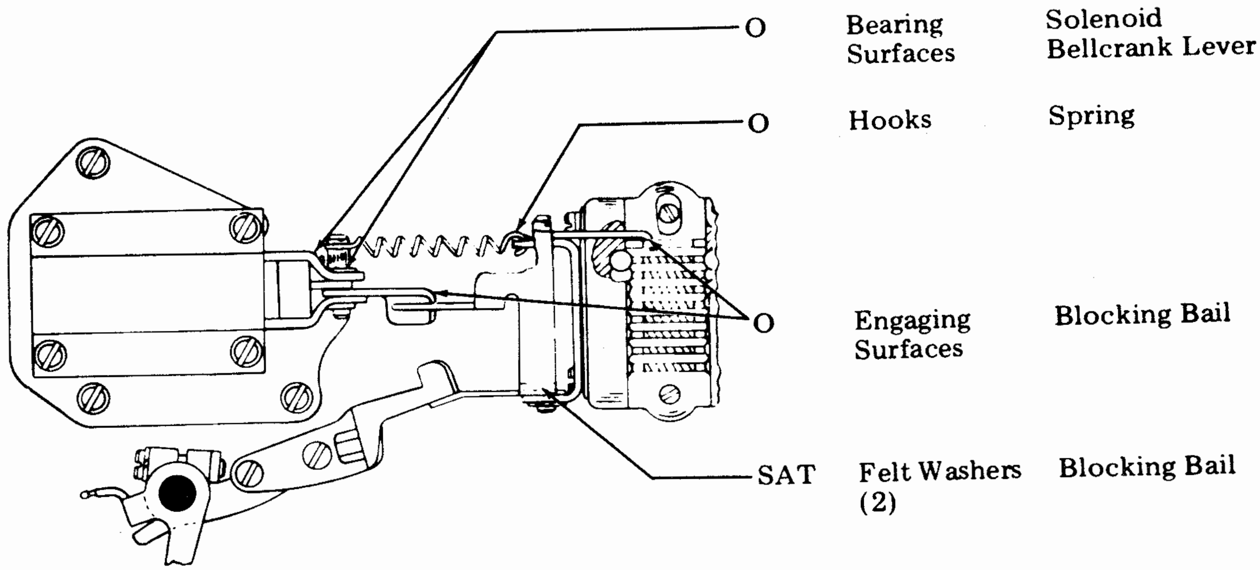



Figure 4-69. Clutch Suppression Mechanism

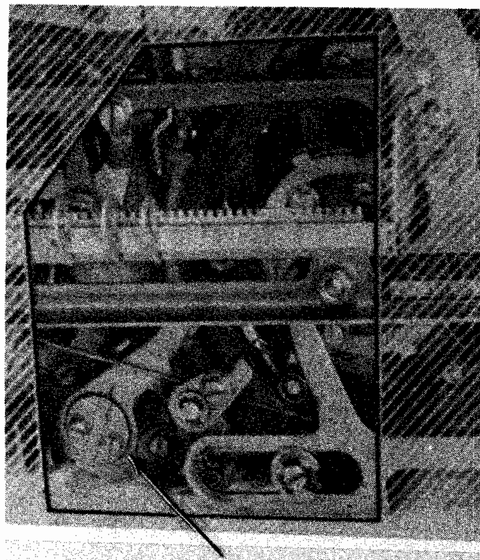


FIGURE 4-71
PAWL MECHANISM

(FRONT VIEW)

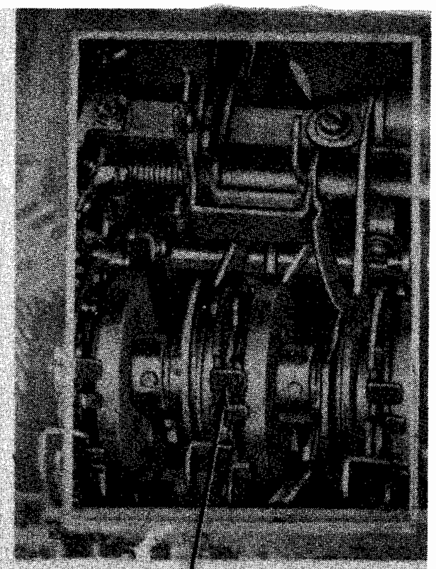


FIGURE 4-72
TRIP MECHANISM

(BOTTOM VIEW)

Figure 4-70. Local Backspace Mechanism

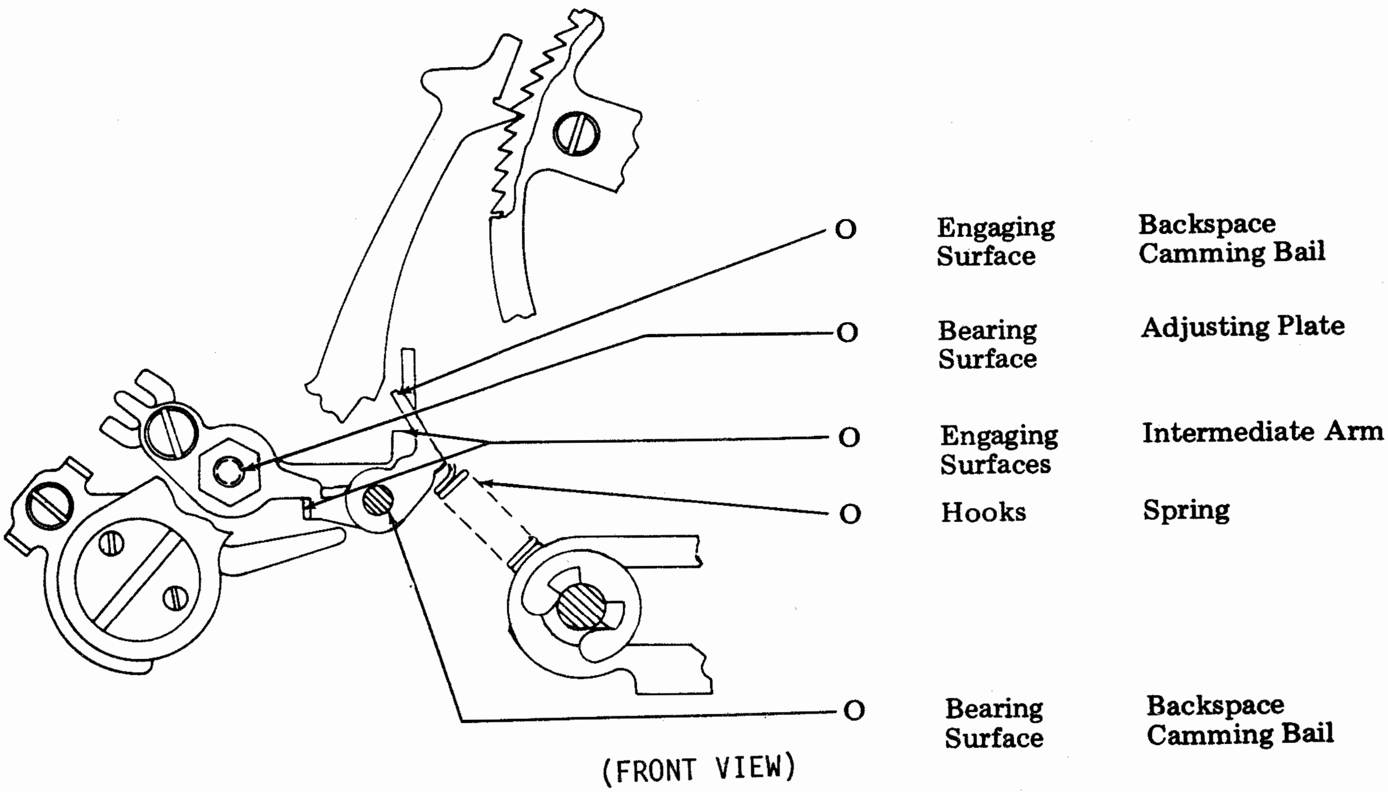
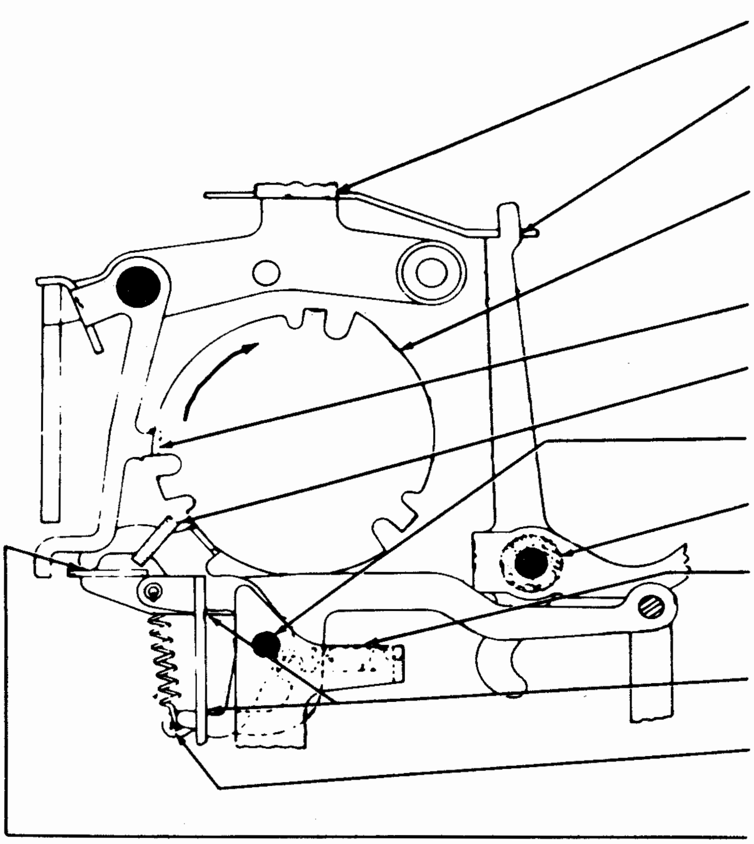


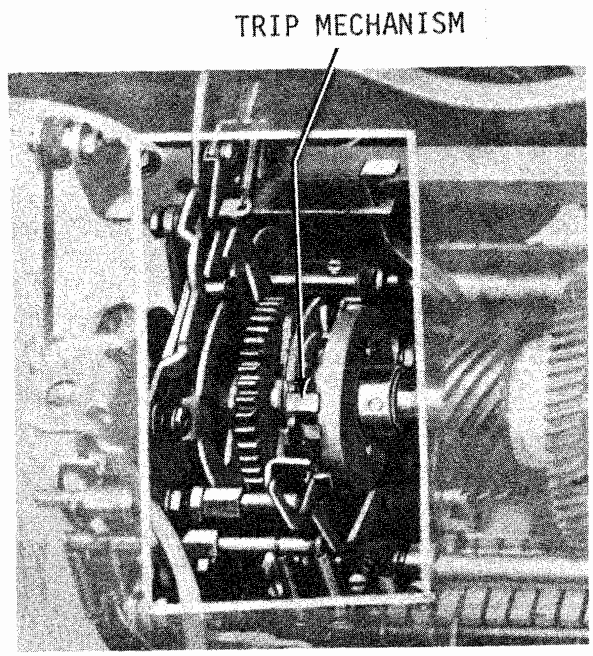

Figure 4-71. Pawl Mechanism



| | | |
|---|---|---|
| O | Guide Surfaces | Backspace Slide Arm |
| O | Engaging Surface | Backspace Bail |
| G | Camming Surface | Spacing Clutch Cam Disc |
| O | Engaging Surface | Spacing Clutch Cam Disc |
| SAT | Felt Oiler | Trip Link Stripper Lever |
| O | Bearing Surface | Trip Link Stripper Lever |
| SAT | Felt Washers (2) | Backspace Bail |
| O | Hooks | Spring |
| O | Guide Slots | Trip Link Stripper Lever |
| O | Hooks | Spring |
| O | Engaging Surface | Trip Link Stripper Lever |

(RIGHT SIDE VIEW)

Figure 4-72. Trip Mechanism



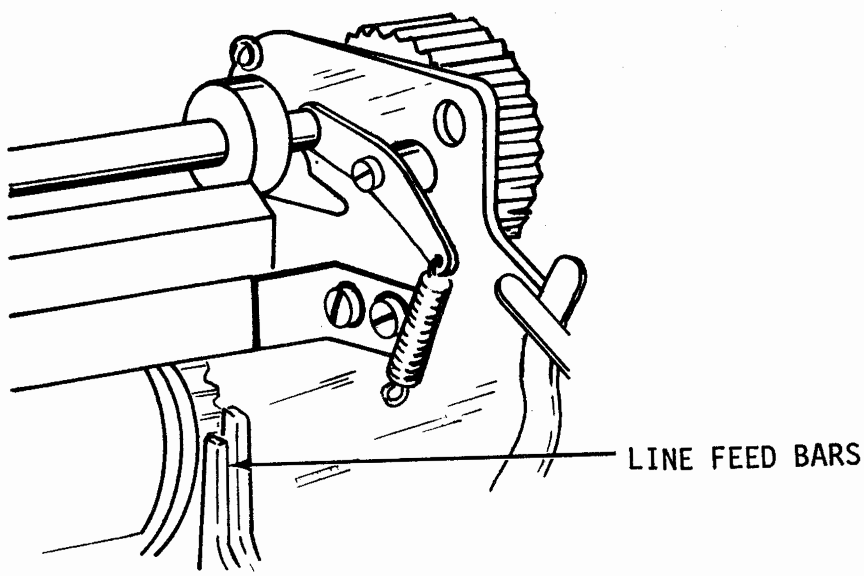
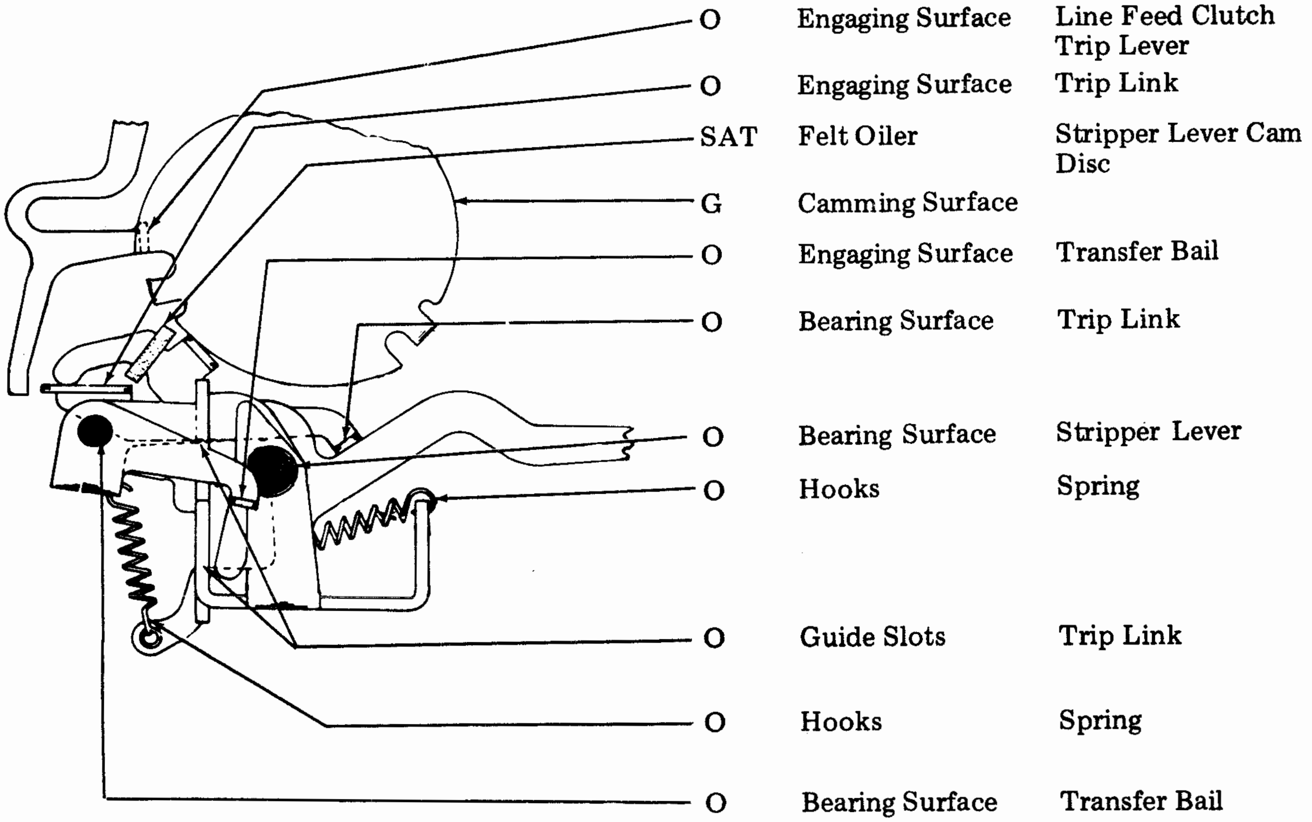
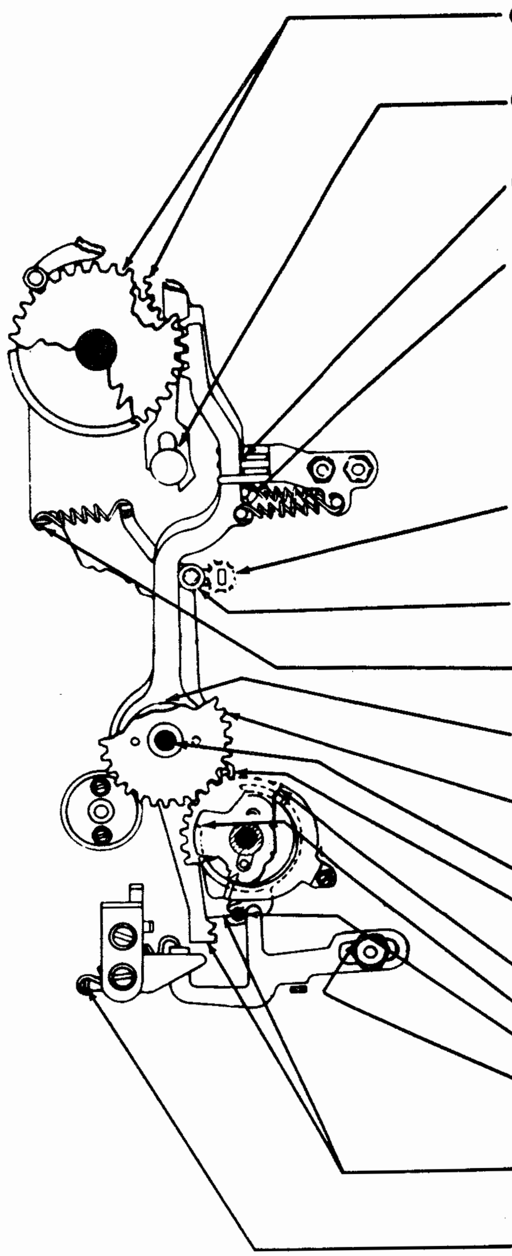




Figure 4-73. Reverse Line Feed Mechanism




(LEFT SIDE VIEW)

Figure 4-74. Trip Mechanism



| | | |
|---|---|---|
| G | Teeth (2 Gears) | Platen Spur Gears |
| O | Guide Surface | Line Feed Bar Release Lever |
| O | Guide Surfaces | Line Feed Bars (2) |
| O | Hooks | Springs (2) |
| SAT | Felt Oiler | Line Feed Bar Bellcrank |
| O | Bearing Surface | Line Feed Bar Bellcrank |
| O | Hooks | Spring |
| O | Bearing Surfaces | Line Feed Bar Eccentric |
| G | Teeth | Line Feed Clutch Spur Gear |
| O | Bearing Surface | Spur Gear |
| O | Bearing Surface | Line Feed Bar Bellcrank |
| G | Teeth | Platen Spur Gear |
| O | Bearing Surfaces | Intermediate Lever |
| O | Bearing Surface | Roller |
| O | Bearing Surface | Reverse Line Feed Slide Link |
| O | Engaging Surfaces | Line Feed Bars (2) |
| O | Hooks | Spring |

(RIGHT SIDE VIEW)

Figure 4-75. Line Feed Mechanism (C)

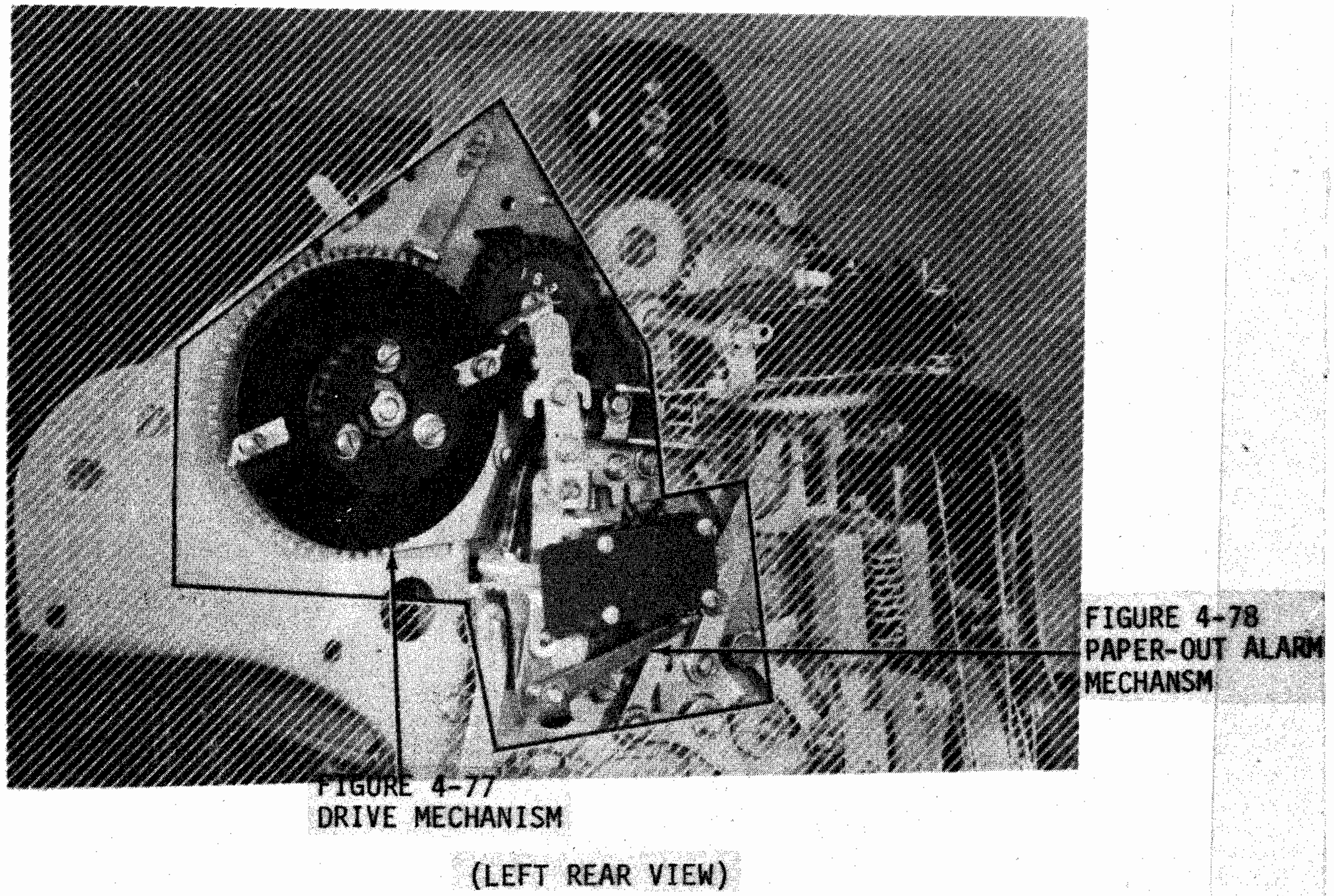



Figure 4-76. Page Feed-Out Mechanism

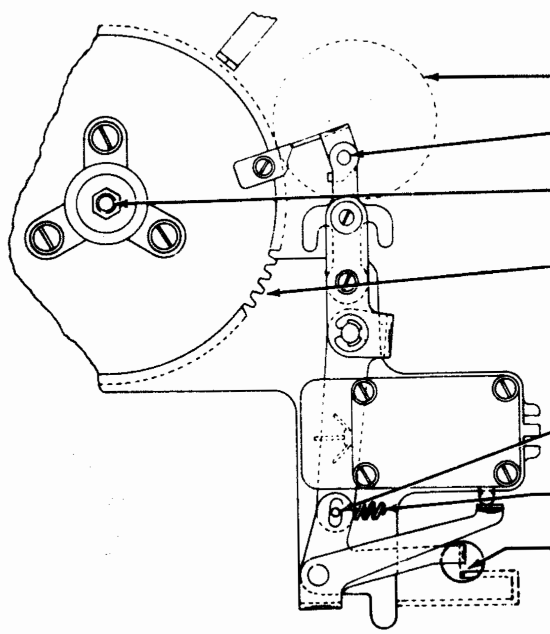



Figure 4-77. Drive Mechanism

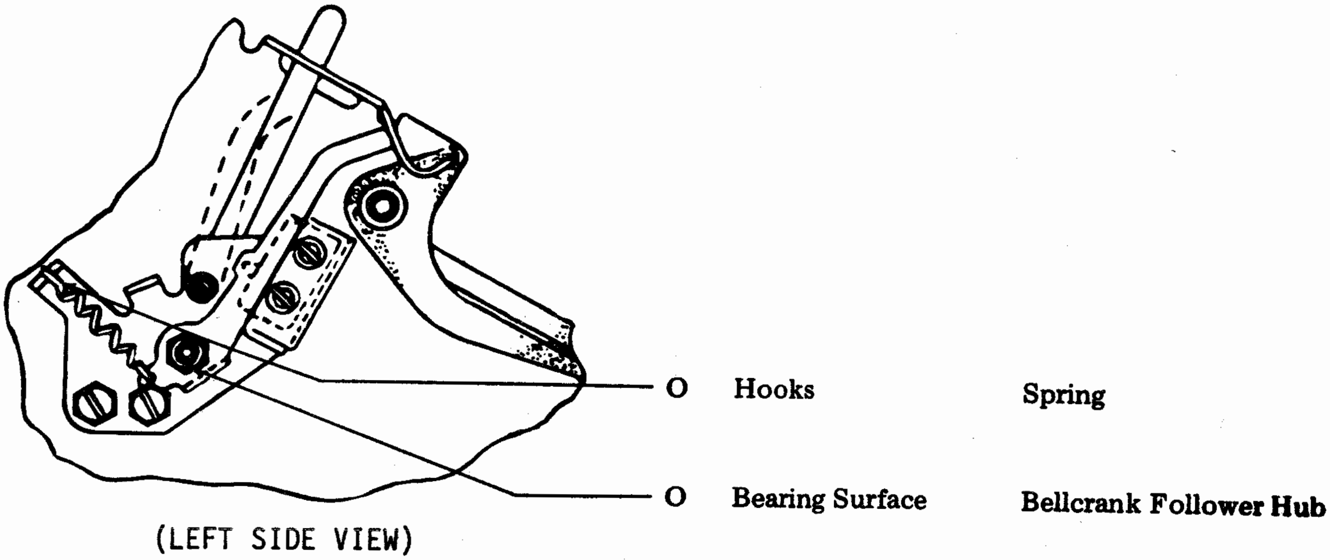



Figure 4-78. Paper-Out Alarm Mechanism

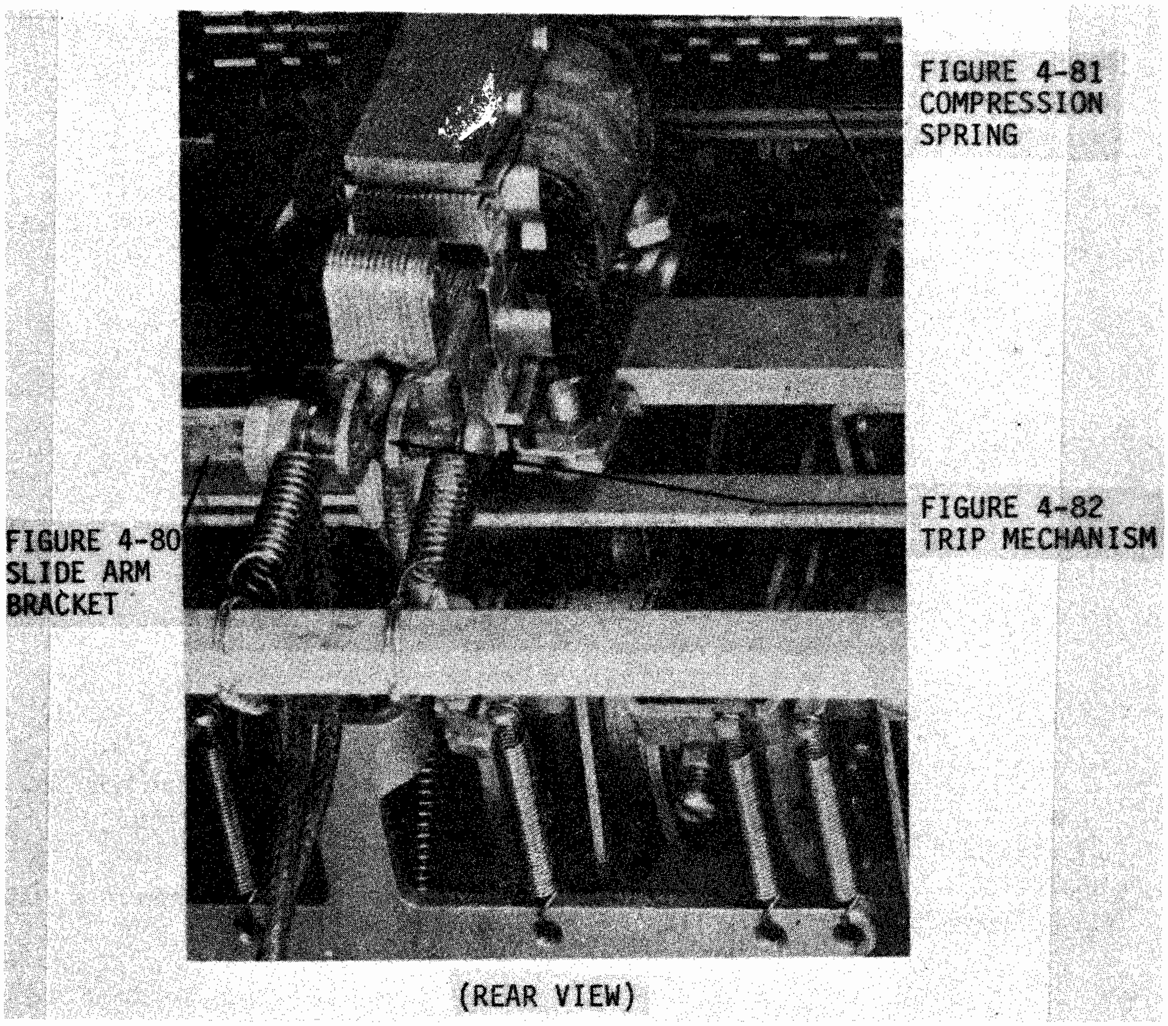



Figure 4-79. Continuous Spacing Mechanism

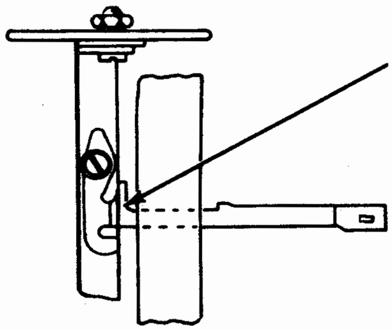



**Figure 4-80. Slide Arm Bracket**

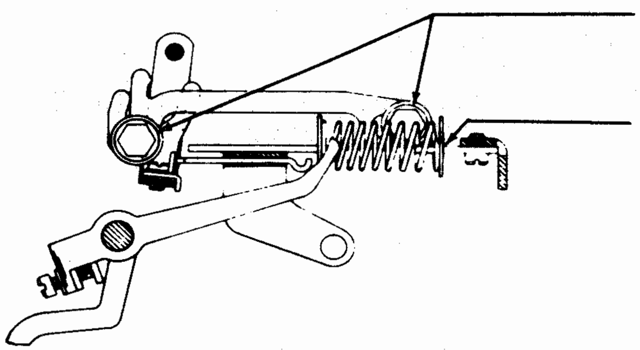



**Figure 4-81. Compression Spring**

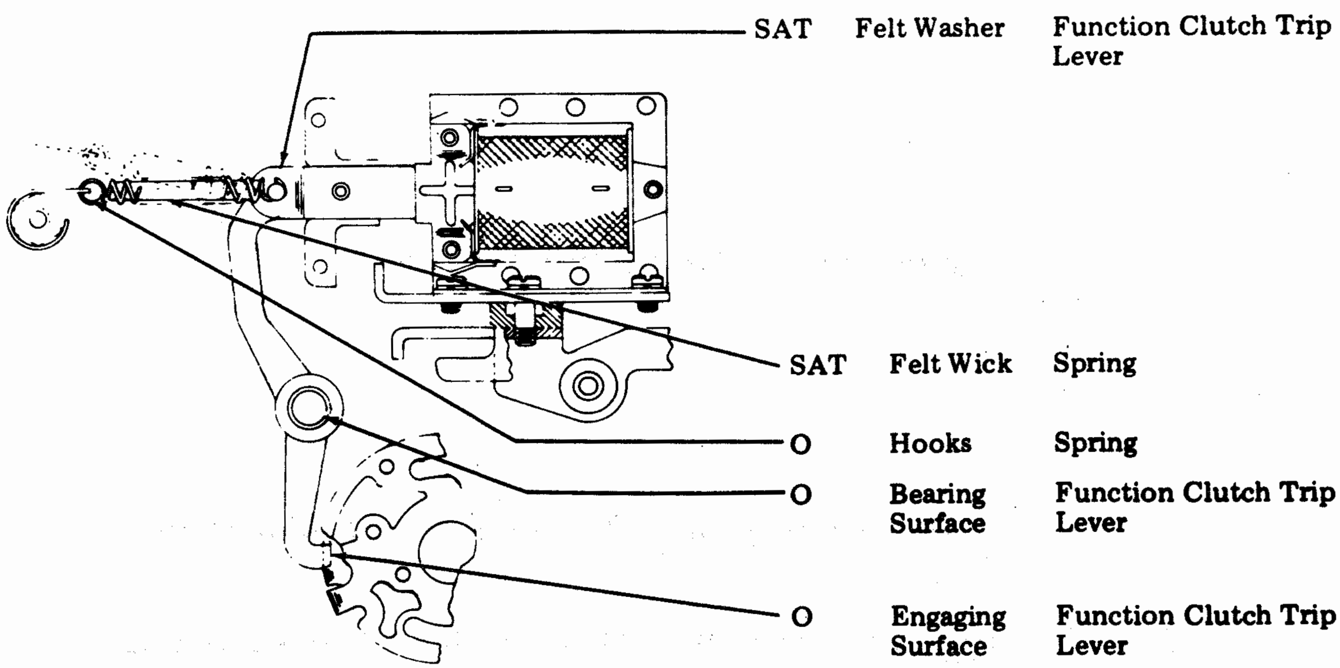
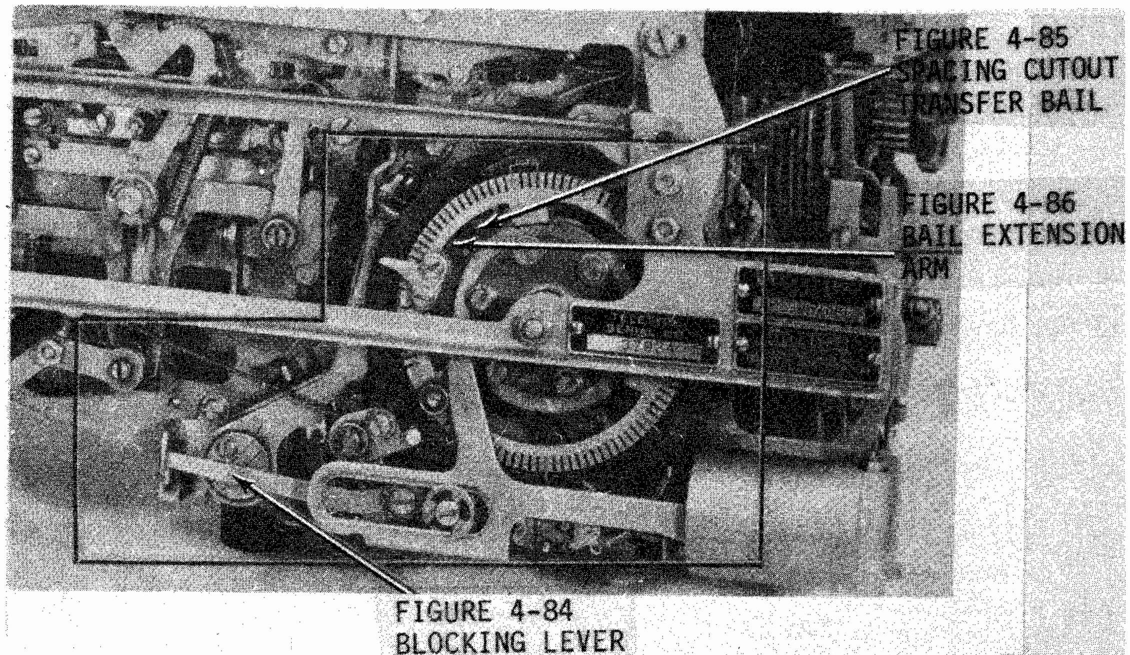
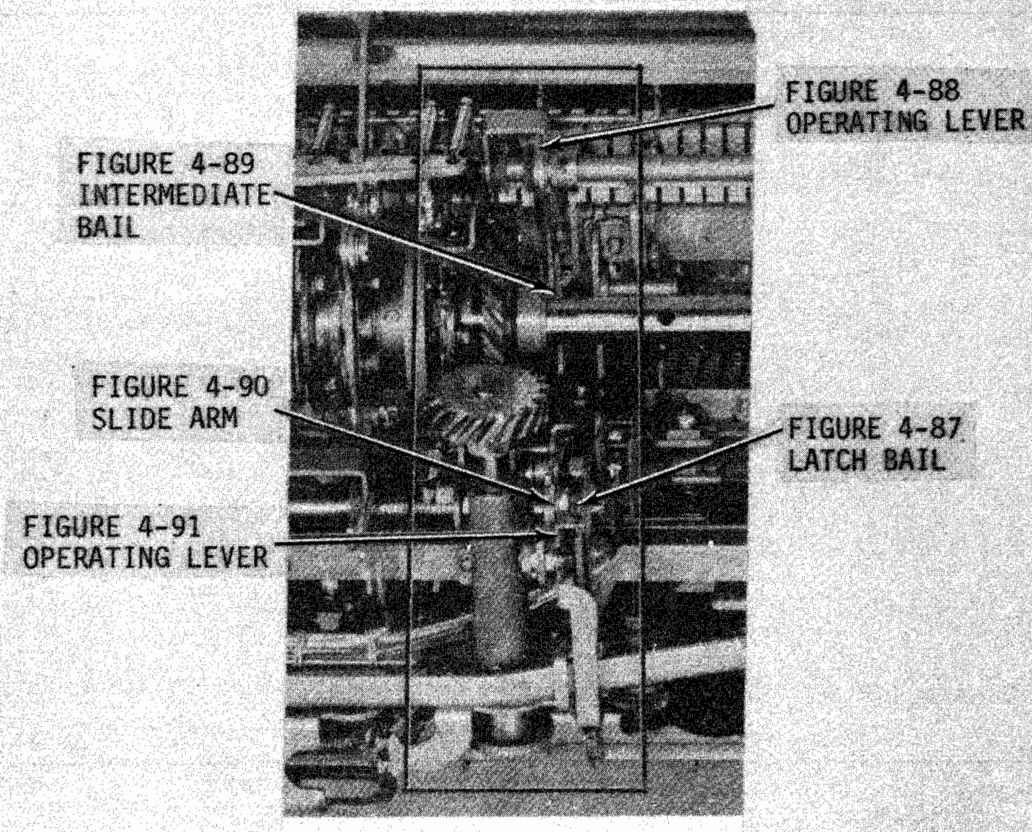



Figure 4-82. Trip Mechanism




(FRONT VIEW)




(BOTTOM VIEW)

Figure 4-83. Horizontal Tabulator Mechanism (Late Design)

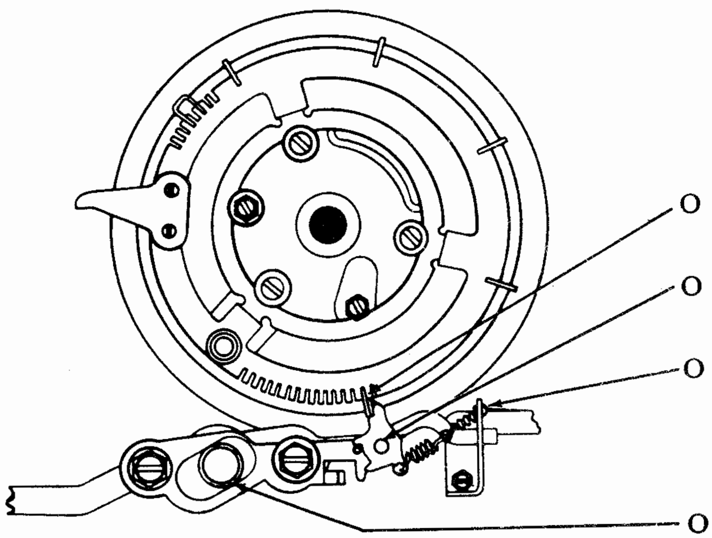
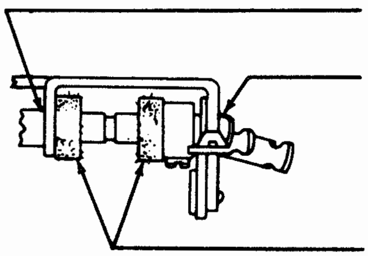


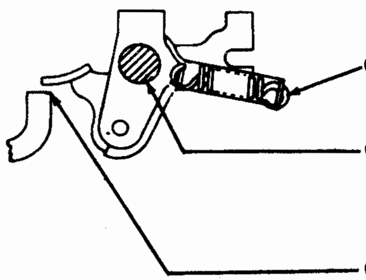

Figure 4-84. Blocking Lever



| | | |
|---|---|---|
| O | Bearing Surface | Spacing Cutout Transfer Bail |
| O | Bail Contacting Surface | Spacing Cutout Transfer Bail |
| SAT | Felt Washers | Transfer Bail Stud |

(FRONT VIEW)

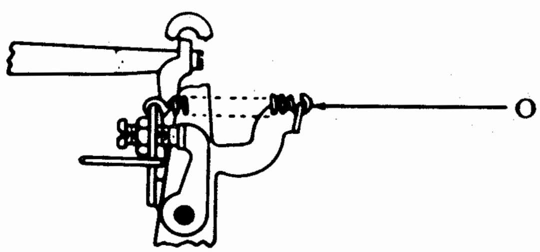
Figure 4-85. Spacing Cutout Transfer Bail



| | | |
|---|---|---|
| O | Hooks | Space Suppression Bypass Spring |
| O | Bearing Surface | Bail Extension Arm |
| O | Contact Surface With Spacing Cutout Lever | Bail Extension Arm |

(RIGHT SIDE VIEW)

Figure 4-86. Bail Extension Arm

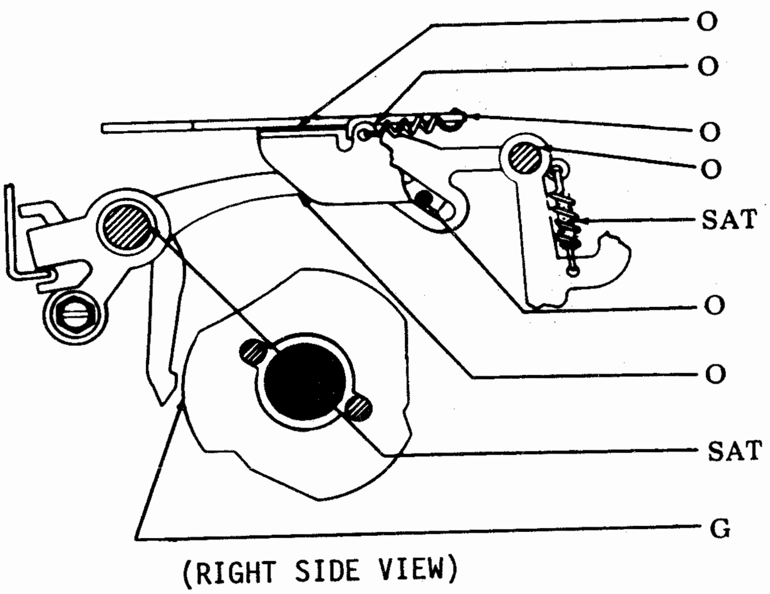


Hooks

Latch Bail Spring

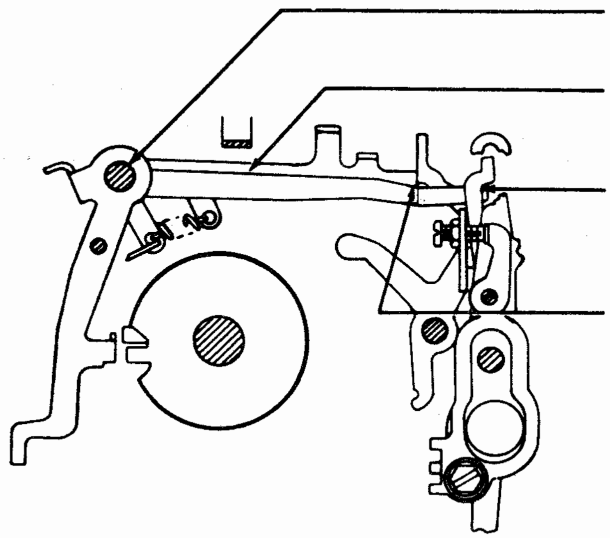
(RIGHT SIDE VIEW)

Figure 4-87. Latch Bail




| | | |
|---|---|---|
| O | Guide Surfaces | Operating Lever |
| O | Contact With Slide Arm | Operating Lever |
| O | Hooks | Slide Arm Spring |
| O | Bearing Surface | Operating Lever |
| SAT | Felt Wick | Spring |
| O | Slot Camming Surface | Operating Lever |
| O | Bracket Contact Surface | Operating Lever |
| SAT | Felt Washers | Stripper Bail Shaft |
| G | Camming Surface | Spacing Clutch Restoring Cam |

Figure 4-88. Operating Lever



| | | |
|---|---|---|
| SAT | Felt Washer | Trip Lever Arm Shaft |
| O | Contact Surface Spacing Trip Lever | Intermediate Bail |
| O | Contacting Surface | Spacing Trip Lever Arm |
| O | Contact Surface Trip Lever Arm | Intermediate Bail |

(RIGHT SIDE VIEW)

Figure 4-89. Intermediate Bail

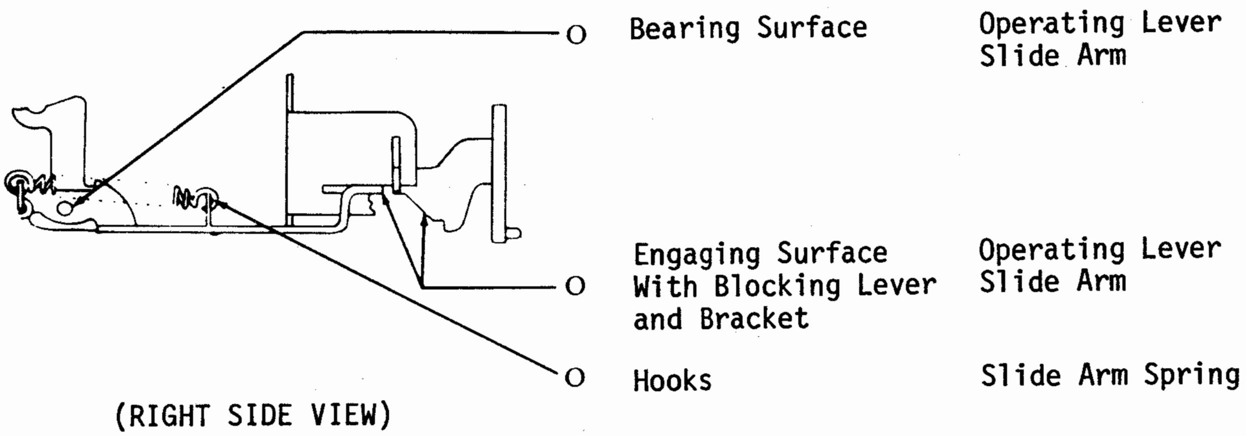



**Figure 4-90. Slide Arm**

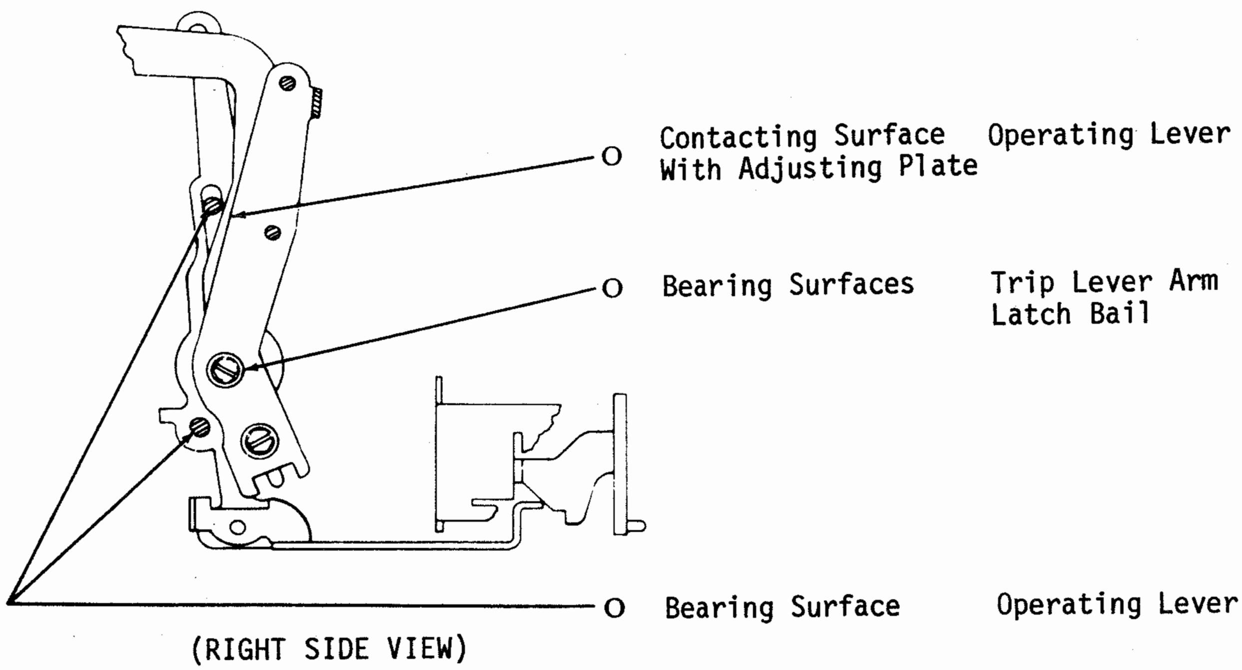
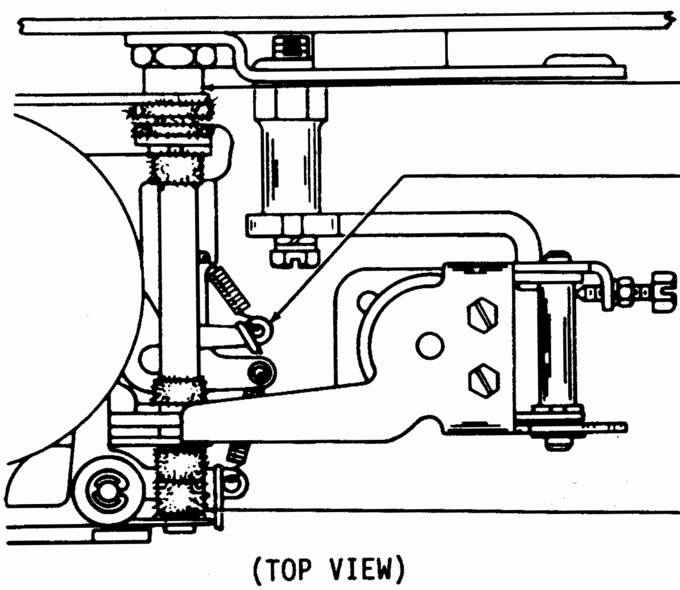
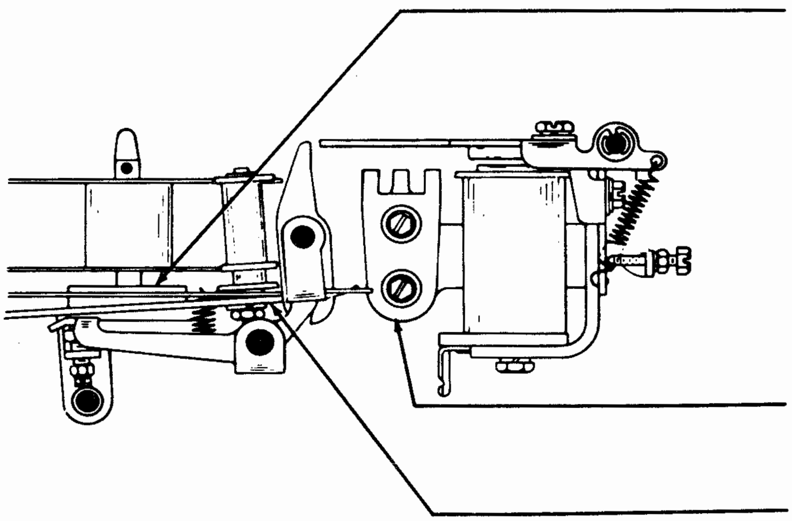



**Figure 4-91. Operating Lever**




| | | |
|---|---|---|
| G | Shaft Mounting Surface | Oscillating Lever and Roller Bail |
| O | Engaging Surfaces | Ribbon Reversing Levers |
| SAT | Felt Washers | Ribbon Spool Bracket Shaft |

Figure 4-92. Two-Color Ribbon Mechanism Oscillating Lever




(RIGHT SIDE VIEW)

Figure 4-93. Two-Color Ribbon Mechanism Ribbon Operating Mechanism

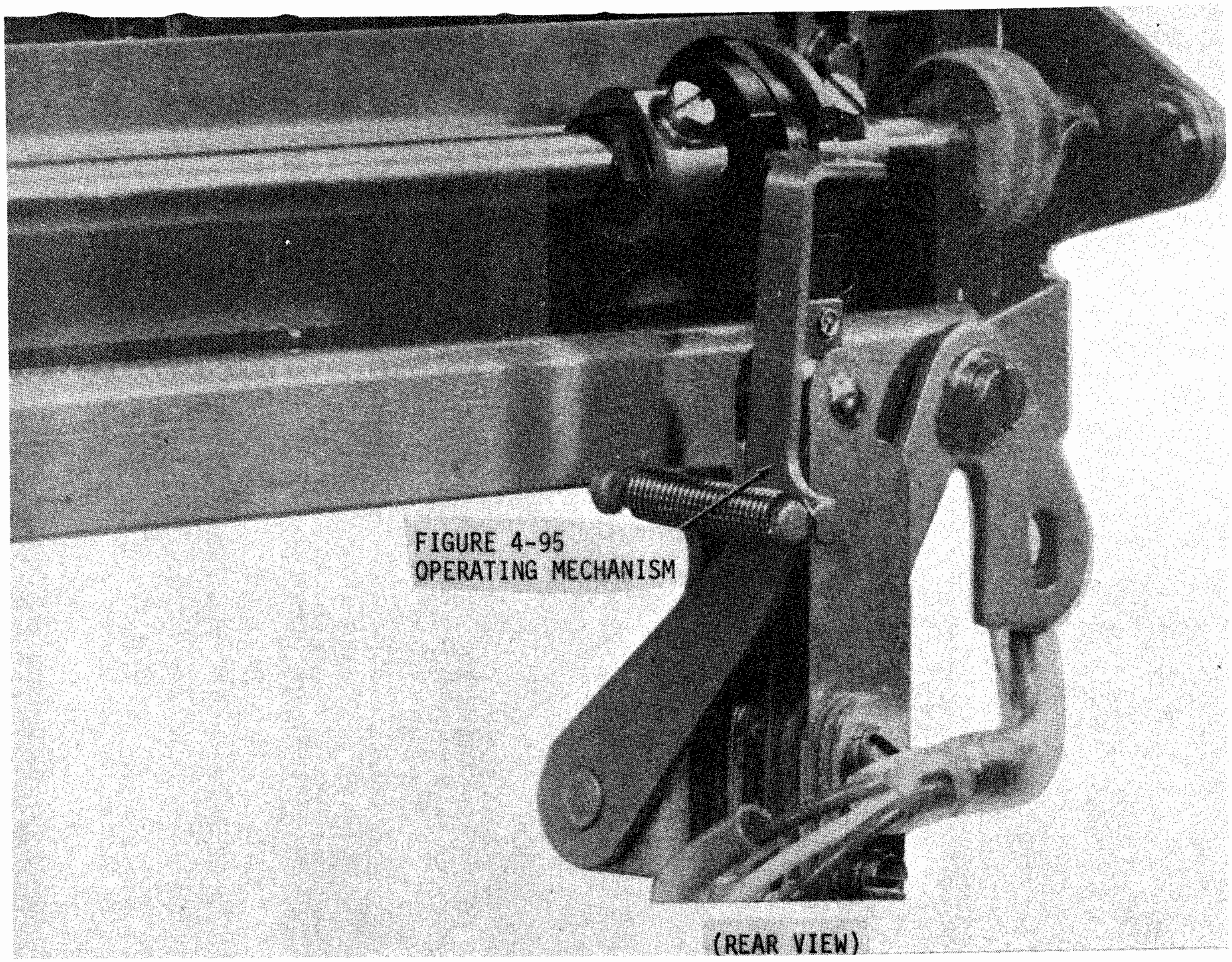



Figure 4-94. Universal Contact Stunt Box Mechanism

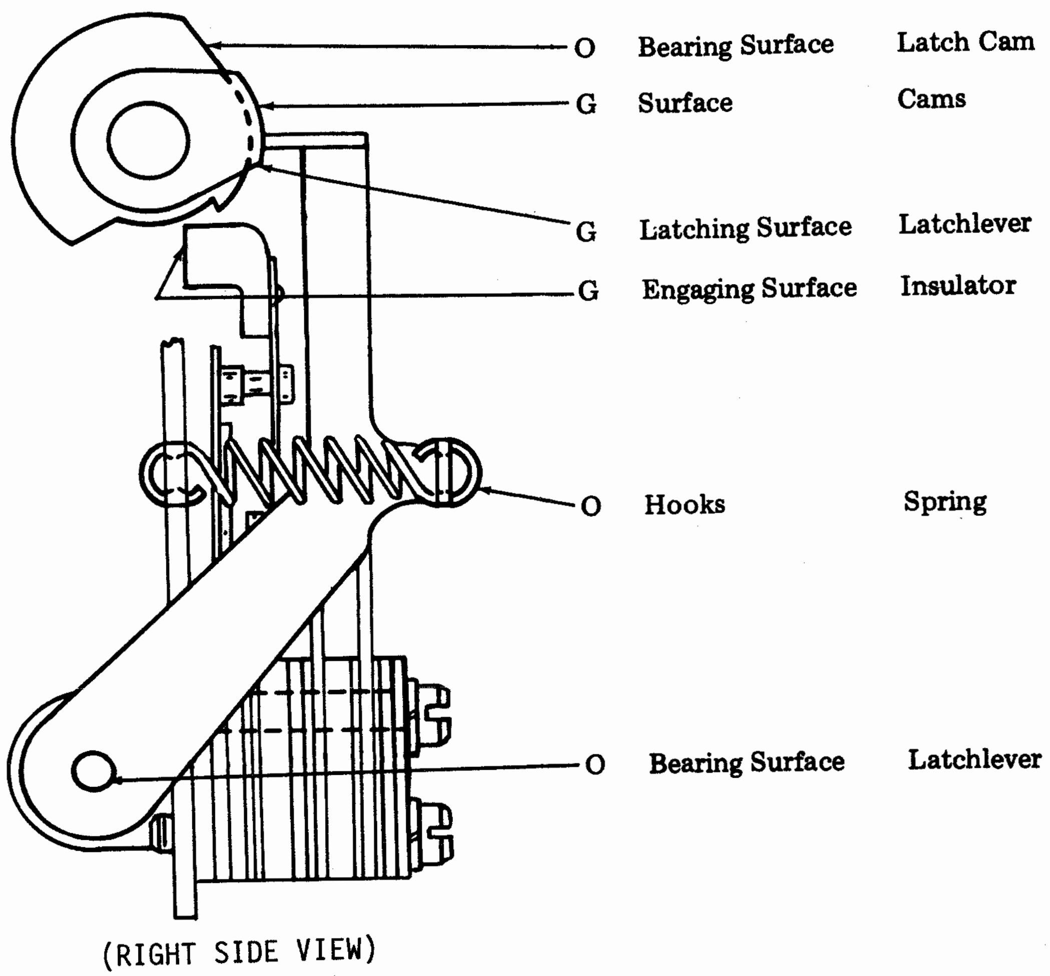



Figure 4-95. Operating Mechanism

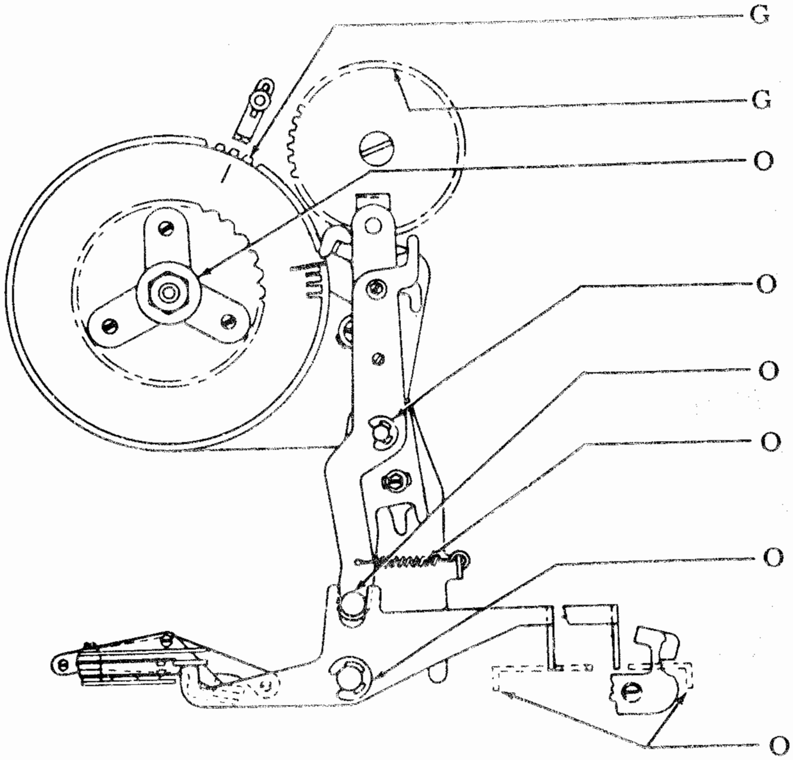
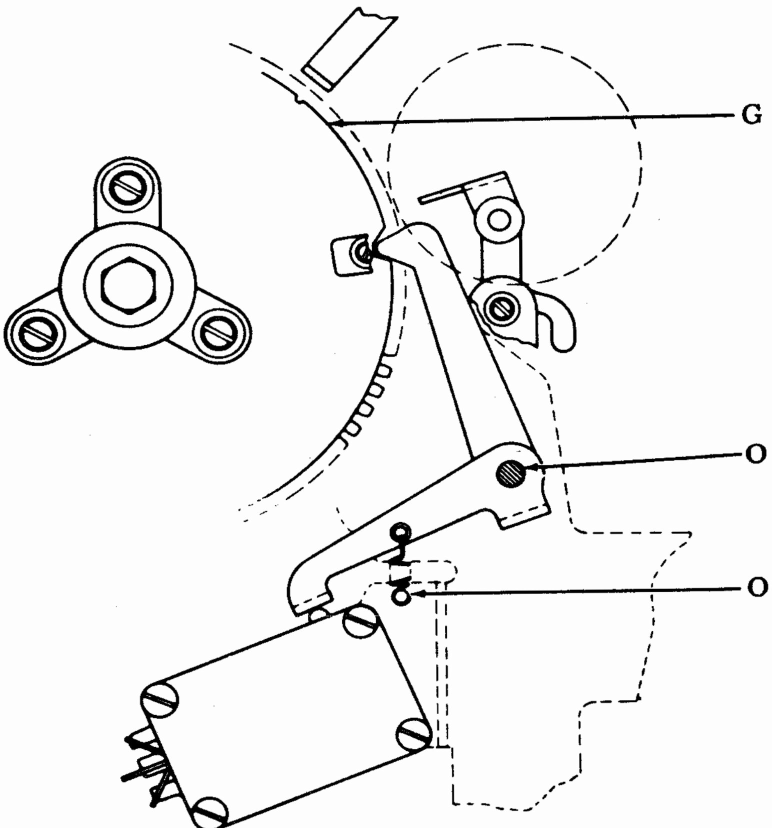



Figure 4-96. Vertical Tabulation and Transmitter Distributor Control Mechanism




| | |
|---|---|
| Periphery | Disc |
| Pivot Point | Form Alignment Lever |
| Hooks | Spring |

**Figure 4-97. Form Alignment Switch Mechanism**

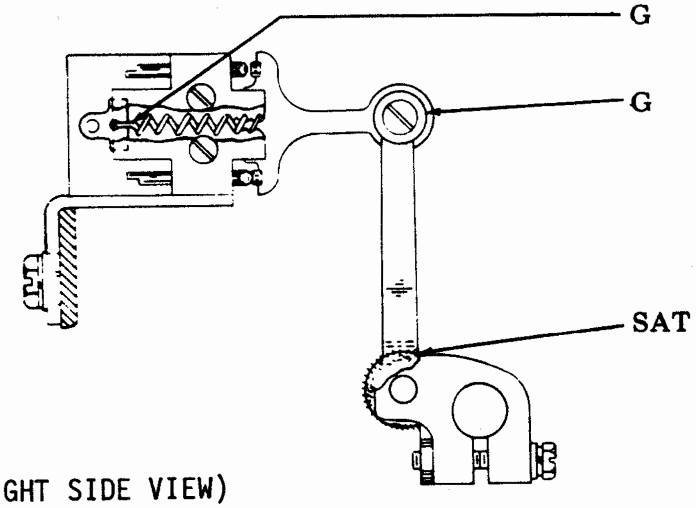



Figure 4-98. Universal Contact Selector Mechanism

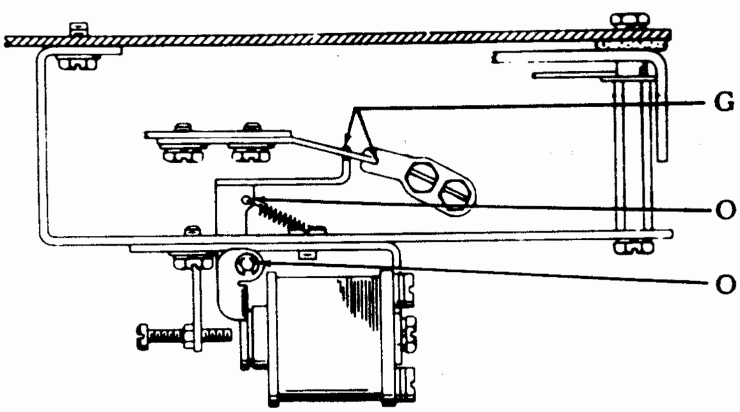



Figure 4-99. DC Magnet-Operated Print Suppression Mechanism

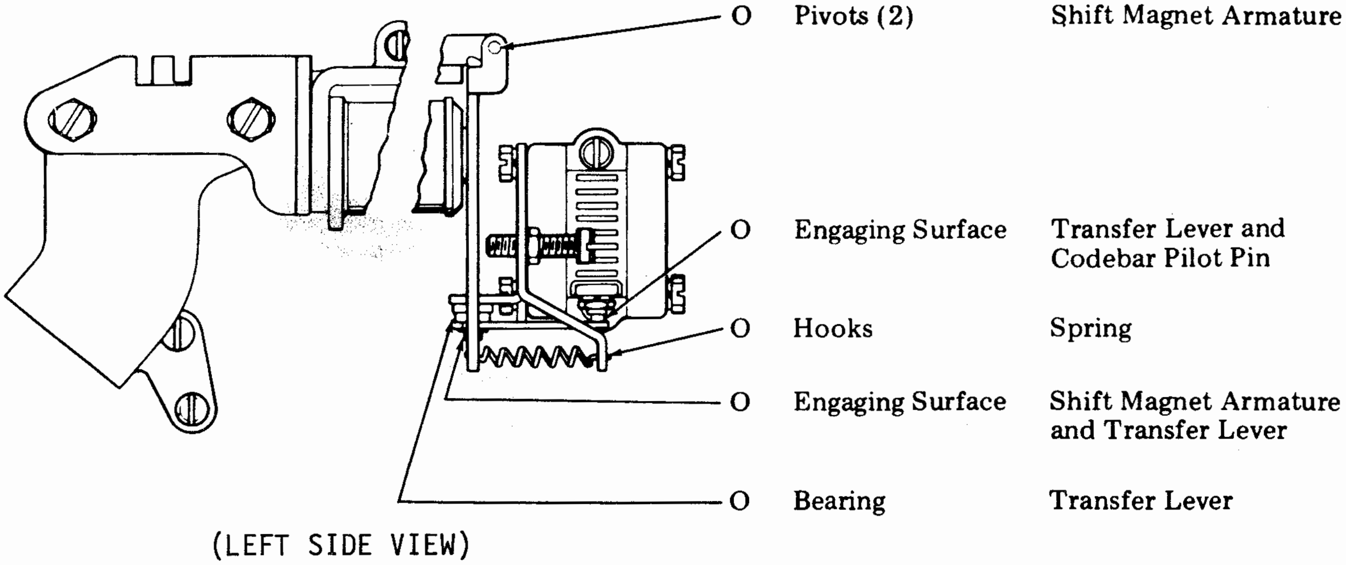



Figure 4-100. Letters-Figures Code Bar Shift Magnet Mechanism

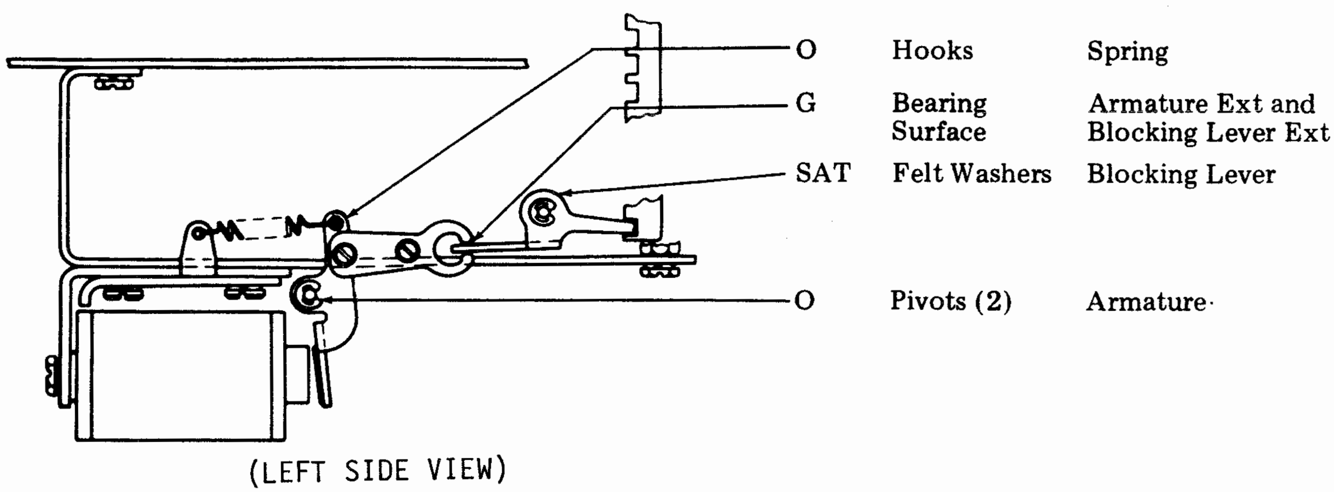



Figure 4-101. Print Suppression and Off-Line Stunt Shift Control Mechanism

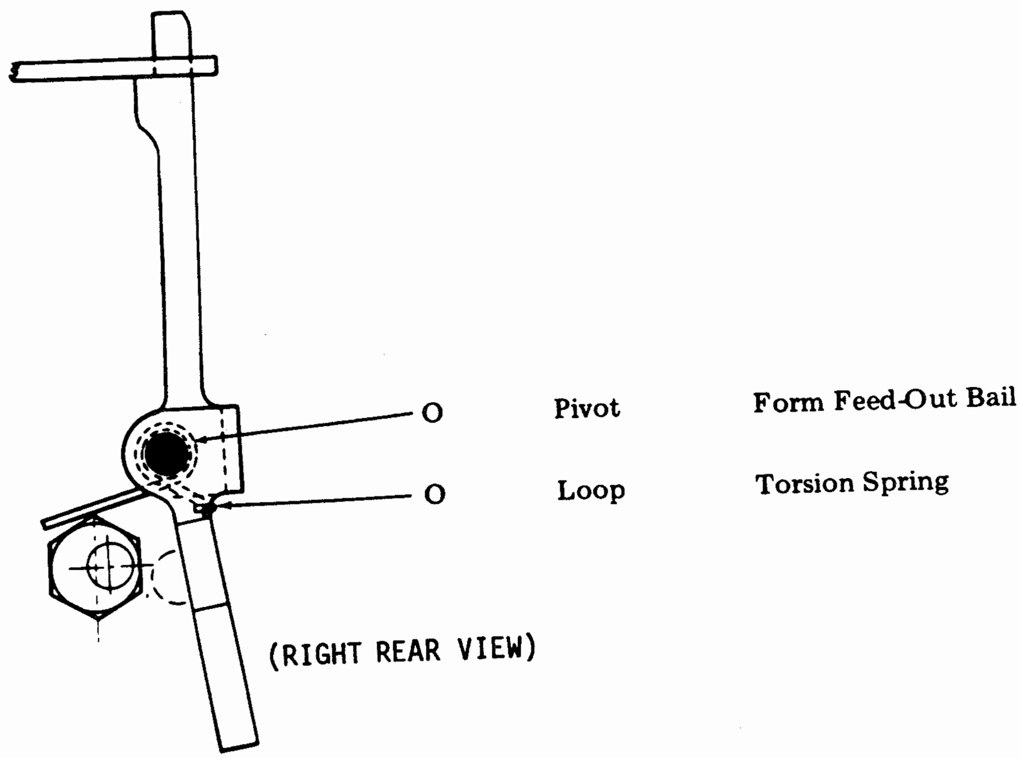



Figure 4-102. Form Feed-Out Mechanism

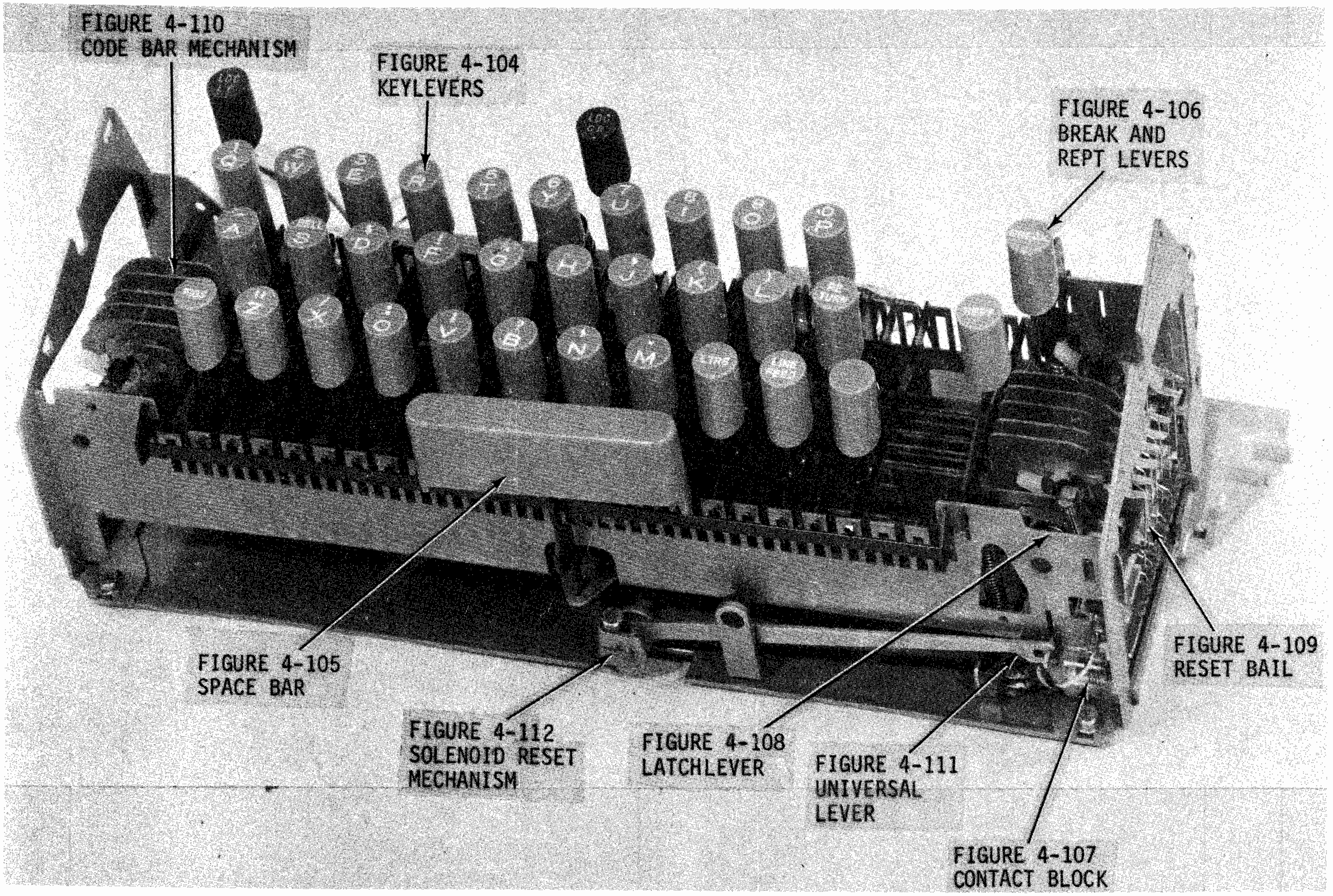
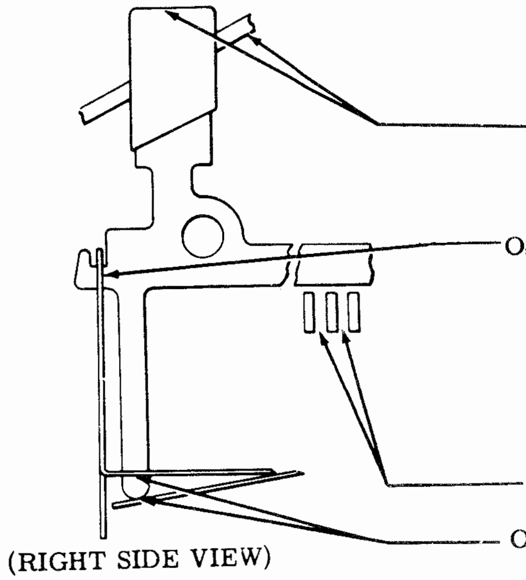
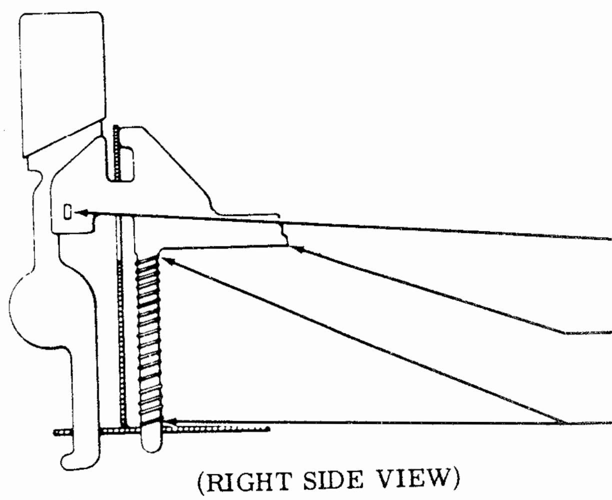



Figure 4-103. Keyboard Transmitter Mechanism




| | | |
|---|---|---|
| D | Top Surface | Keytops and Keytop Guide Plate |
| OSD | Guide Slots | Frame |
| D | Between Bars | Codebars |
| OSL | Contact Surface | Keylever Springs |

Figure 4-104. Keylevers




| | | |
|---|---|---|
| OSL | Contact Surfaces (5) | Space Lever |
| OSD | Surface Engaging Codebars | Keylevers |
| OSL | Seat (Each End) | Springs (2) |

Figure 4-105. Spacebar

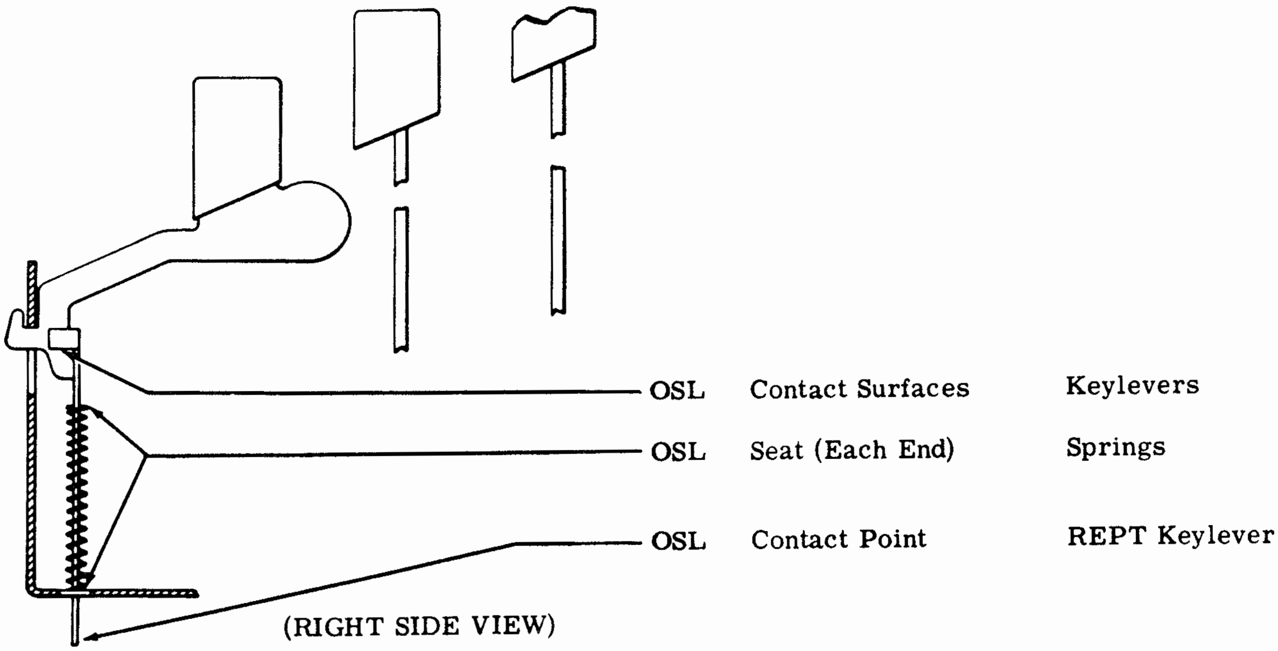



Figure 4-106. Break and REPT Levers

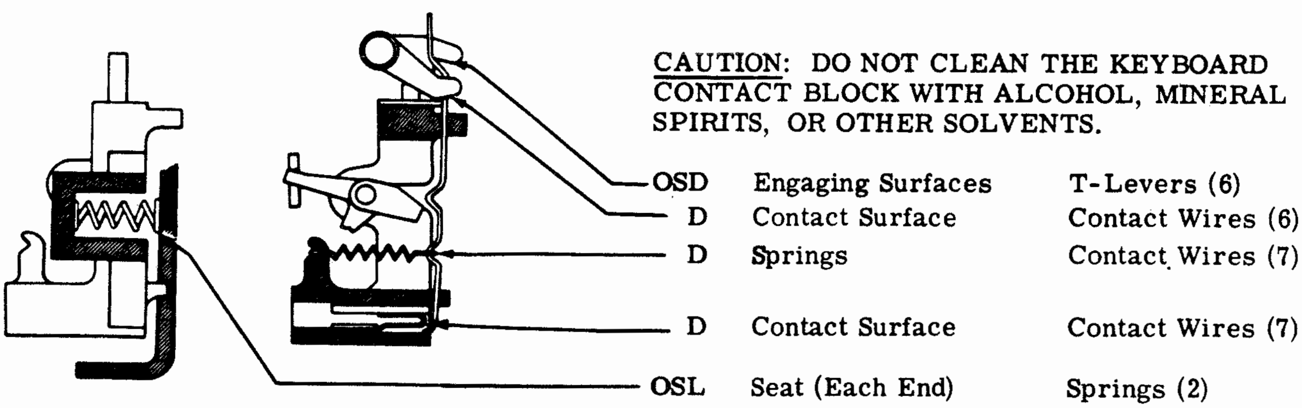
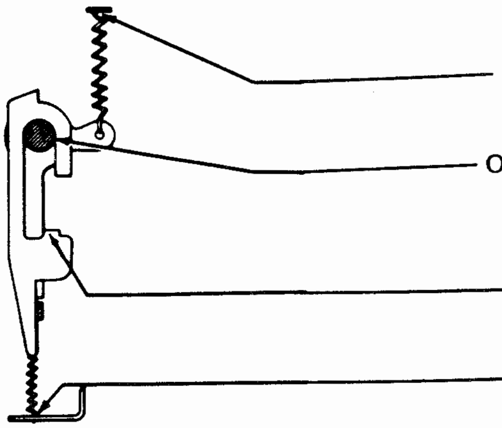
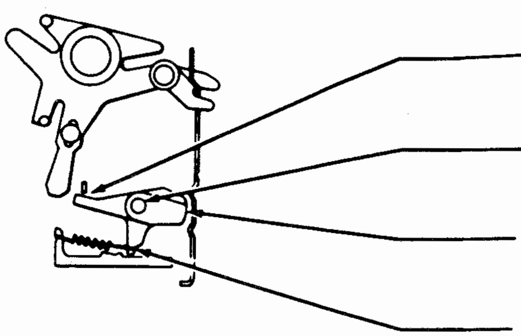



Figure 4-107. Contact Block



| | | |
|---|---|---|
| G | Holes (Each End) | Latchlever Spring |
| OSL | Pivot | Latchlever and Nonrepeat Lever |
| G | Camming Surface | Nonrepeat Lever |
| G | Hooks (Each End) | Nonrepeat Spring |

Figure 4-108. Latchlever



| | | |
|---|---|---|
| G | Contact Surface | Universal Lever |
| OS | Pivots (2) | Reset Bail |
| OSD | Camming Surface | Reset Bail |
| OSL | Hooks (Each End) | Link Spring |

Figure 4-109. Reset Bail

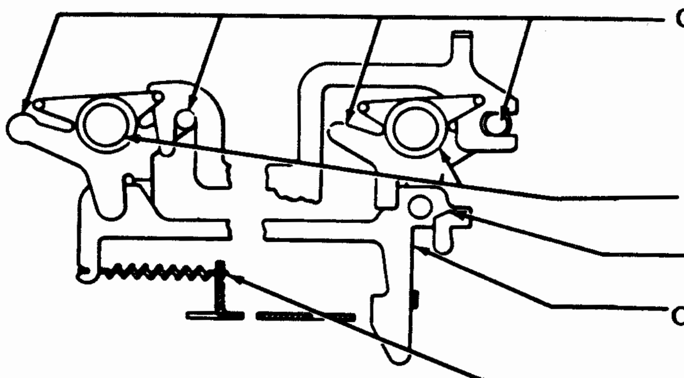



Figure 4-110. Code Bar Mechanism

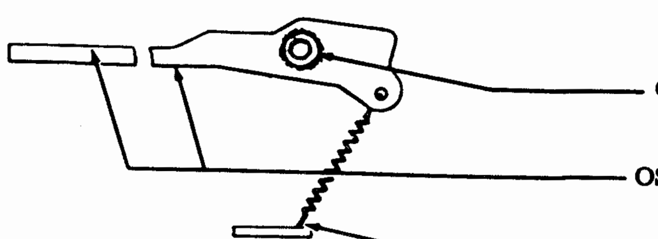



Figure 4-111. Universal Lever

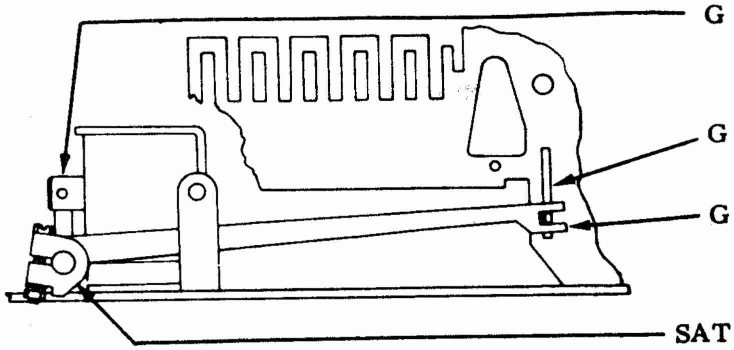



Figure 4-112. Solenoid Reset Mechanism

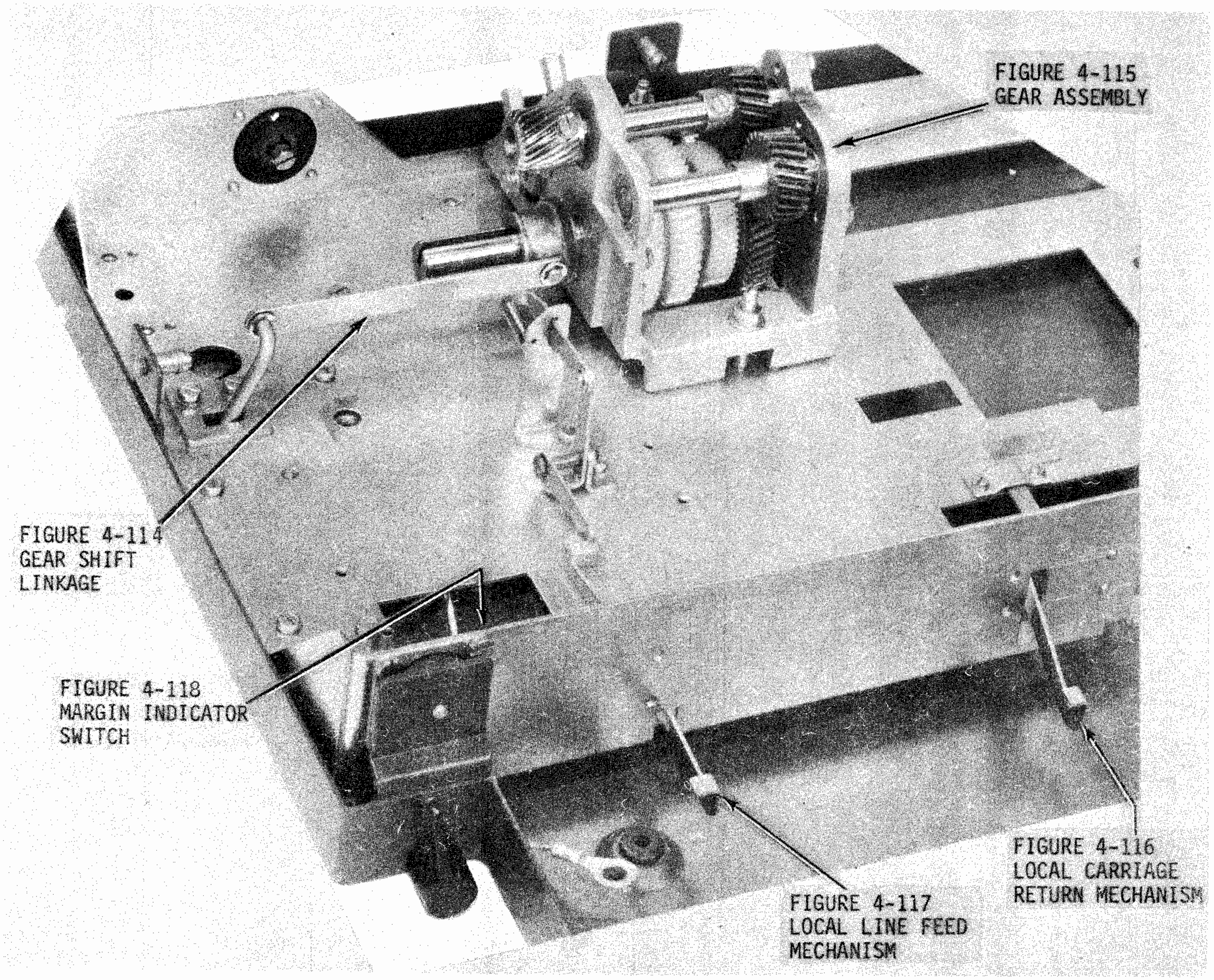



Figure 4-113. Gear Shift Assembly

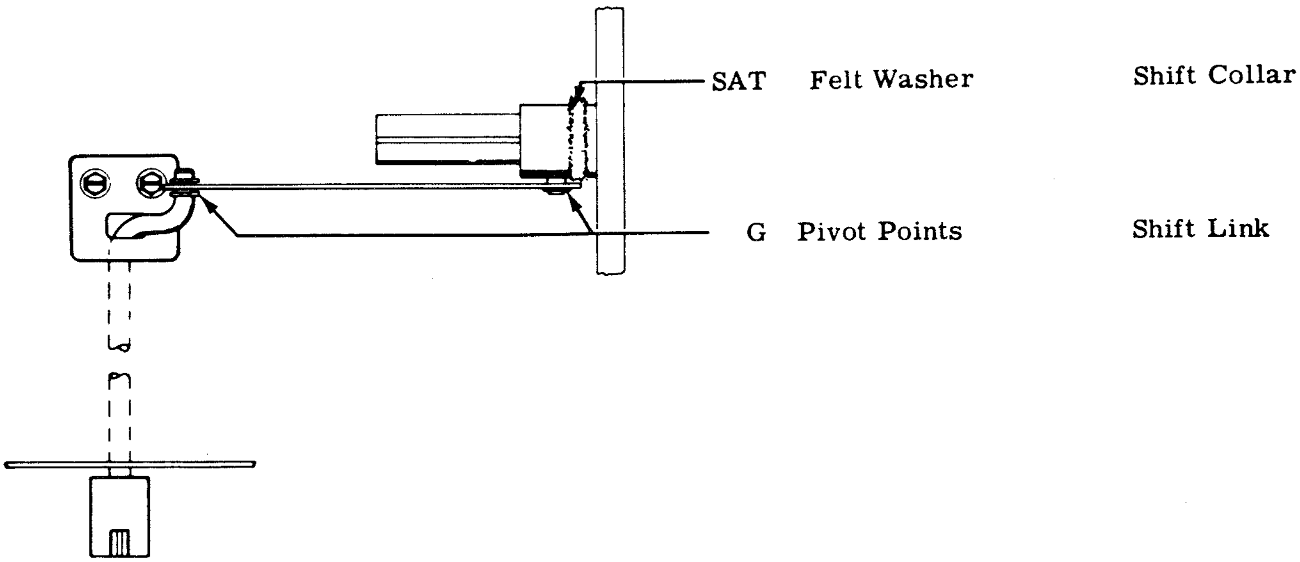



Figure 4-114. Gear Shift Linkage

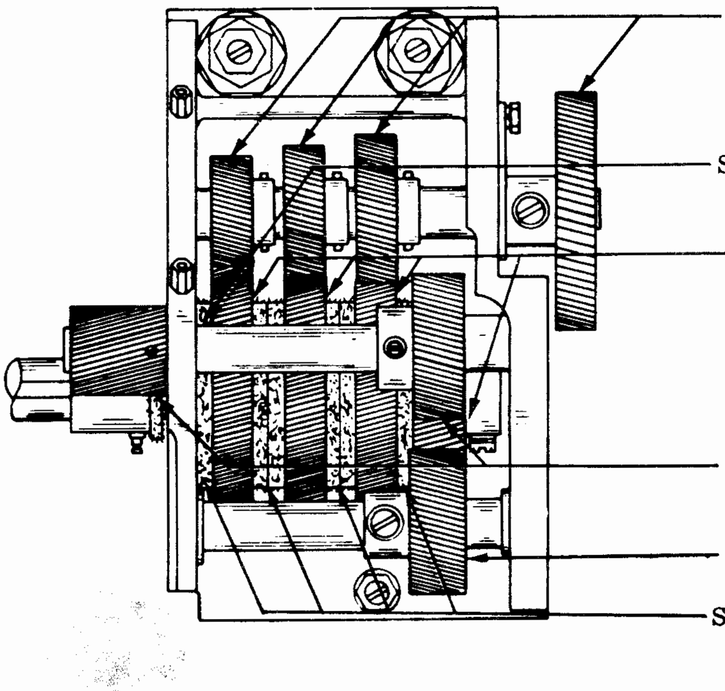



Figure 4-115. Gear Assembly

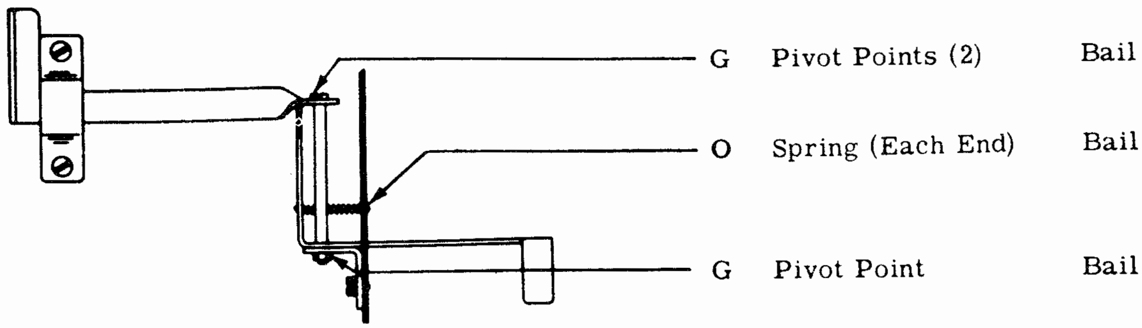



Figure 4-116. Local Carriage Return Mechanism

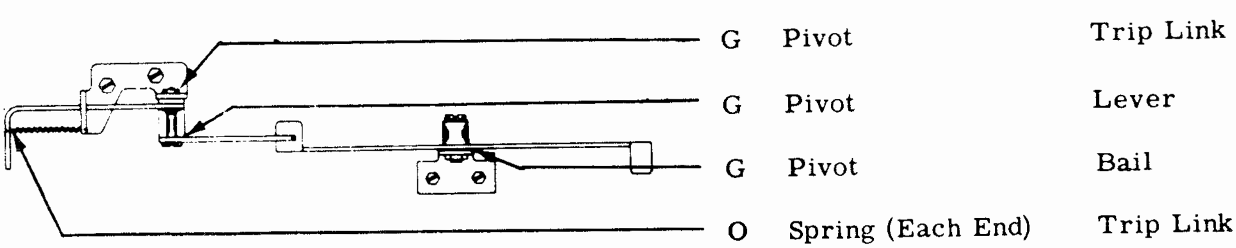
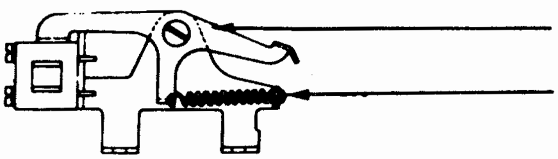



Figure 4-117. Local Line Feed Mechanism



| | | |
|---|---|---|
| G | Pivot | Lever |
| O | Spring (Each End) | Lever |

Figure 4-118. Margin Indicator Switch

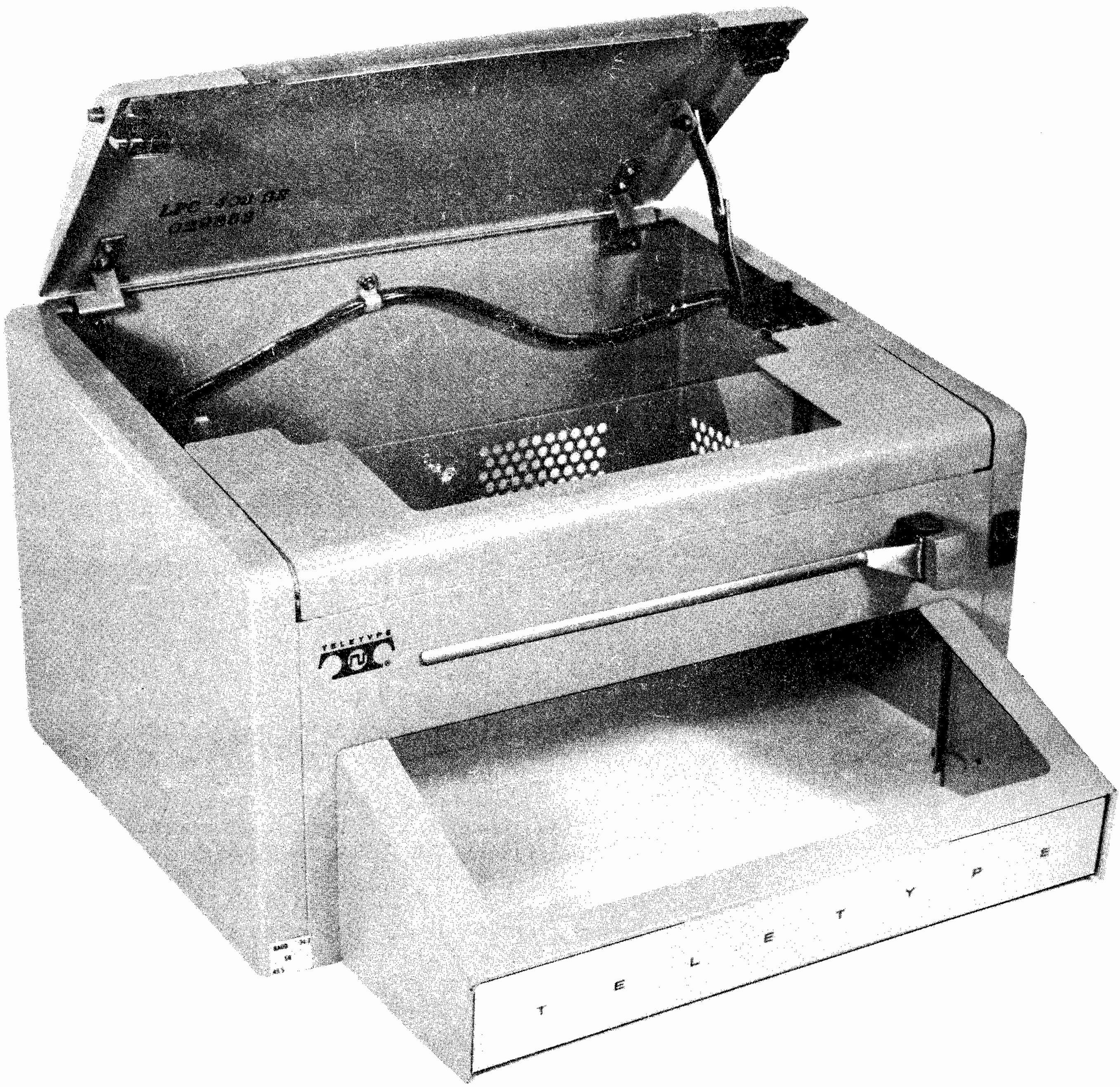



Figure 4-119. Cover Unit

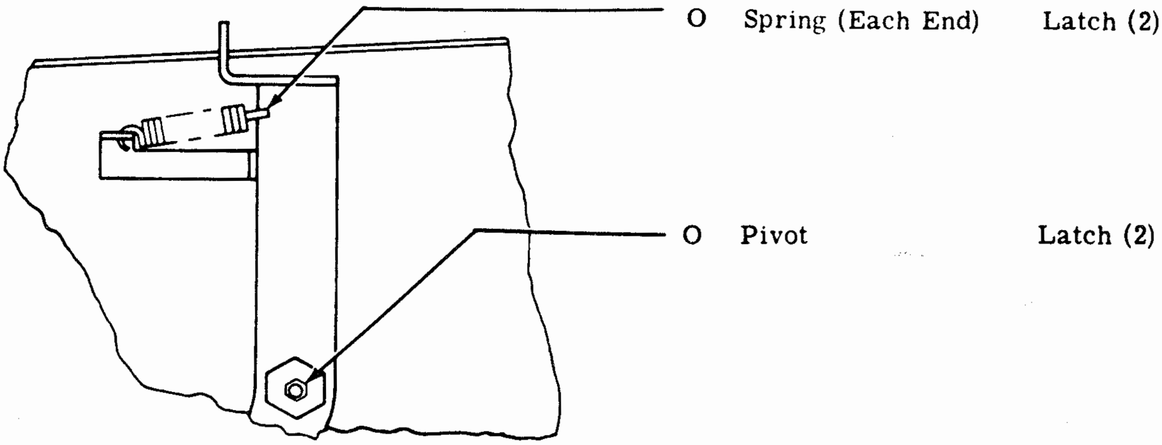



Figure 4-120. Cover Latch Mechanism

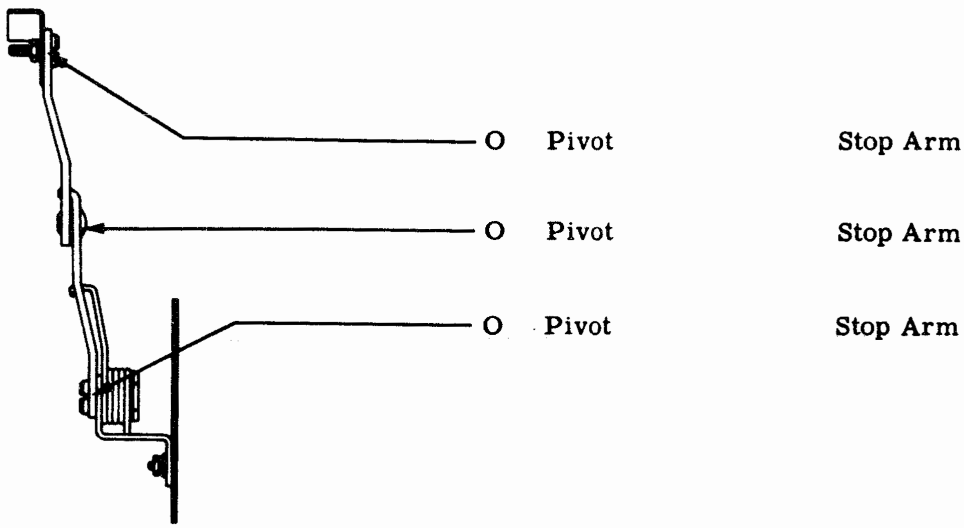



Figure 4-121. Dome Stop Arm

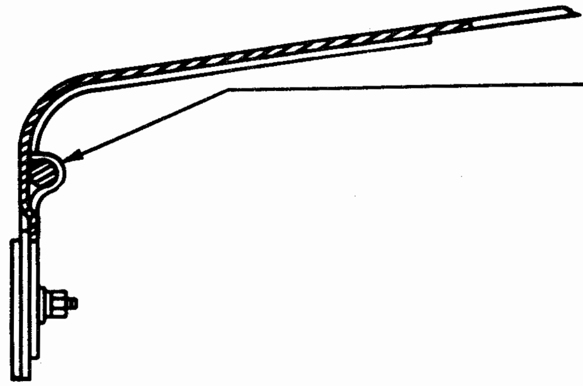



Figure 4-122. Window Door Hinge

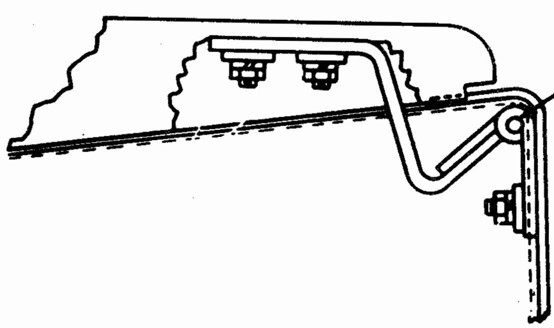



Figure 4-123. Dome Hinge

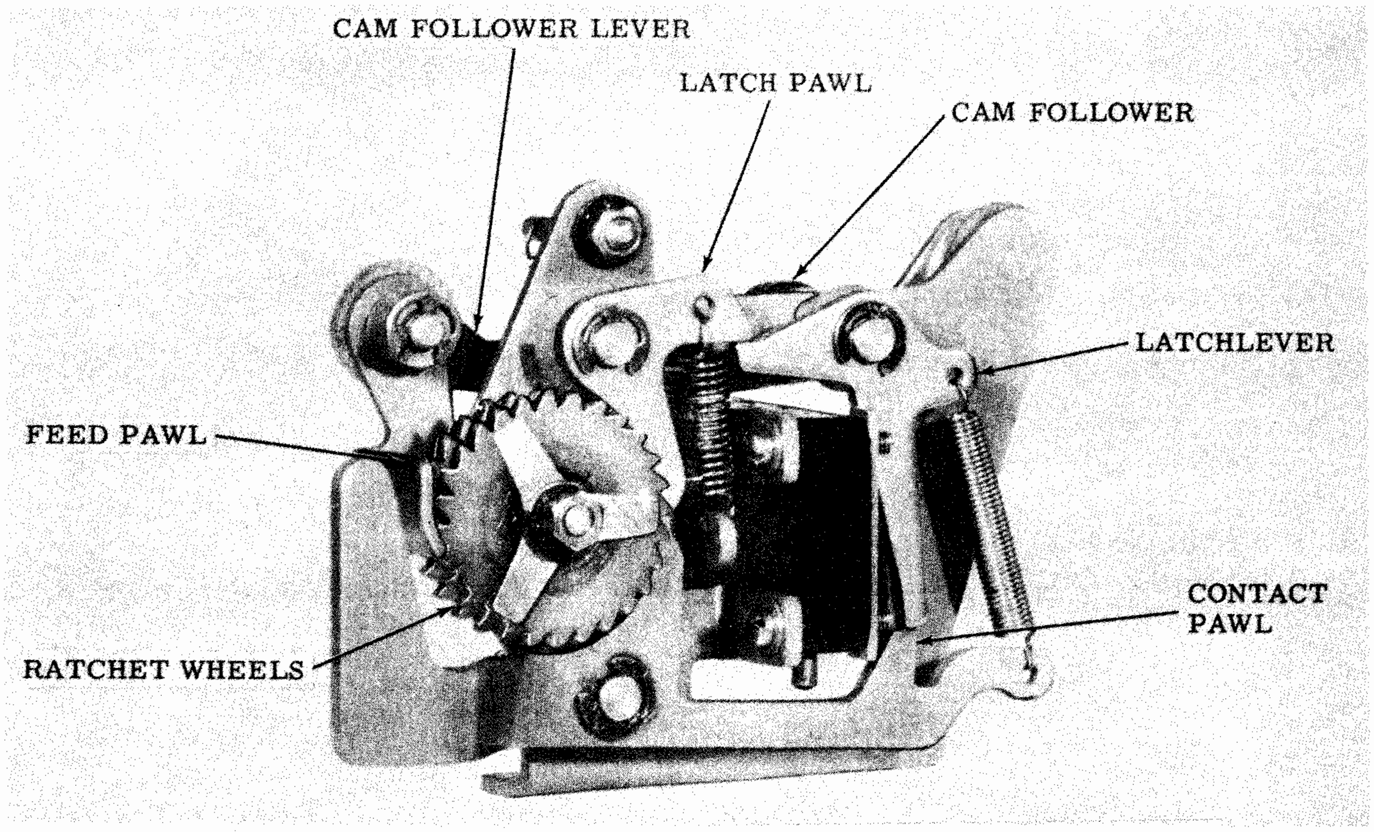



Figure 4-124. Time Delay Mechanism

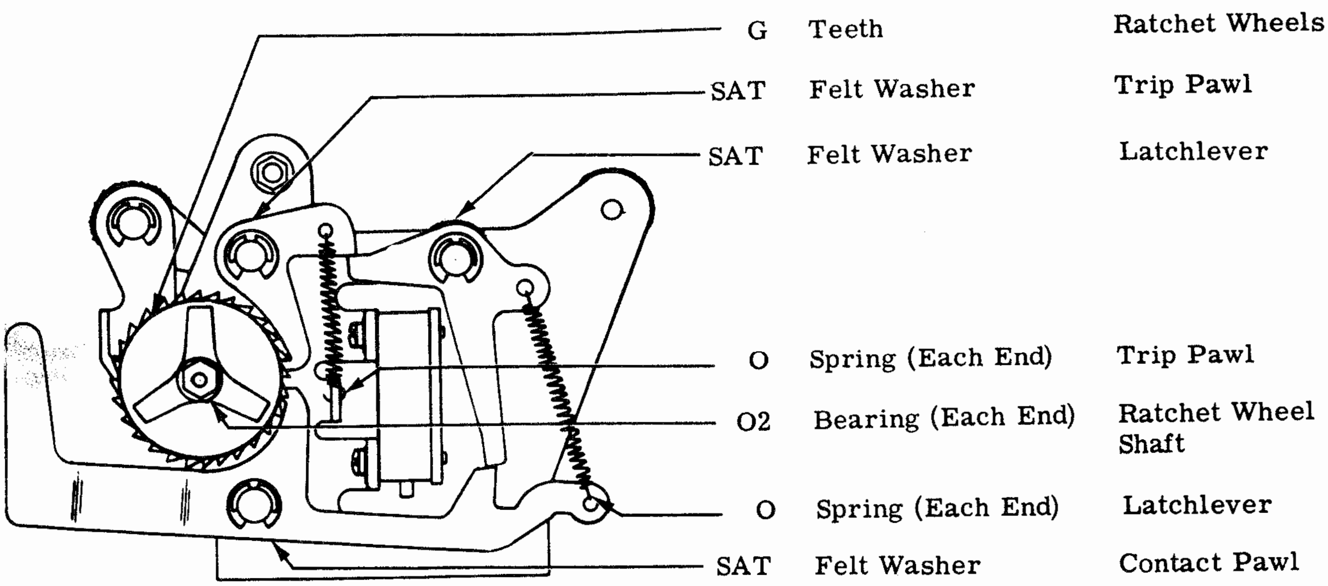



Figure 4-125. Trip and Reset Mechansim

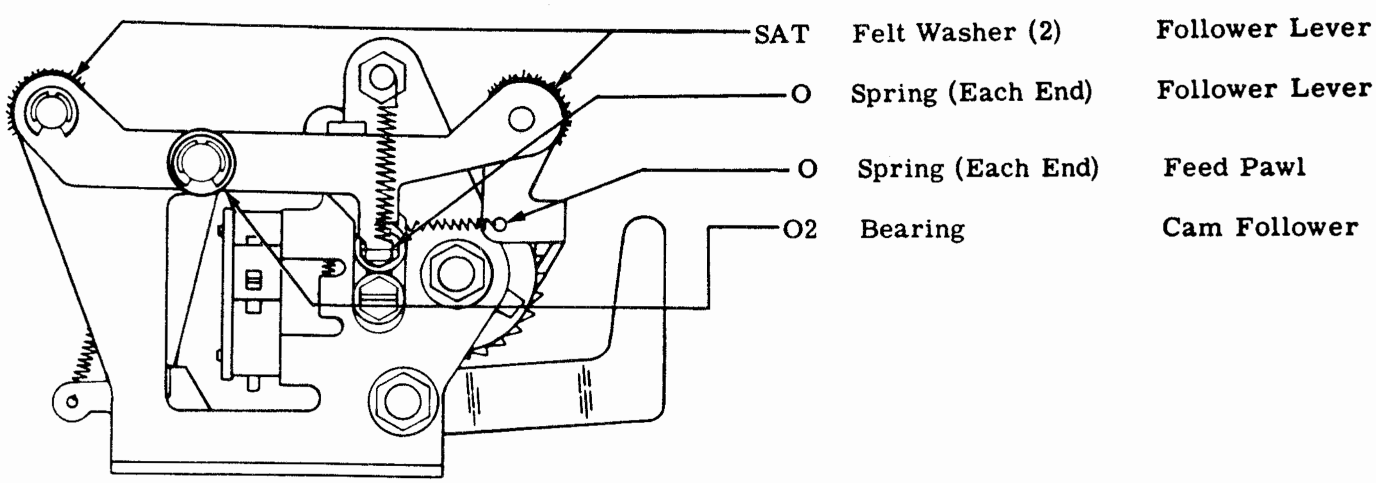



Figure 4-126. Cam Follower and Feed Mechanism

# CHAPTER 5
# TROUBLESHOOTING

5-1. INTRODUCTION. This chapter provides information required to isolate a malfunction in compact page printer (CPP) teletypewriter sets to a misadjusted mechanism or a defective component. Troubleshooting is based on the results of operational tests described in paragraph 4-8d of Chapter 4. Wiring and schematic diagrams are presented at the end of this chapter for use in troubleshooting.

5-2. TROUBLESHOOTING PROCEDURES. Troubleshooting procedures for high and low-level CPP teletypewriter equipment are provided in paragraphs 5-2.1 and 5-2.2. The high-level procedures contained in paragraph 5-2.1, are also applicable to low-level equipment. The procedures contained in paragraph 5-2.2 are applicable to low-level equipment only.

5-2.1 HIGH-LEVEL TROUBLESHOOTING PROCEDURES. The following paragraphs provide procedures for use in troubleshooting high-level CPP teletypewriter equipment.

a. <u>Troubleshooting Index</u>. The troubleshooting index, table 5-1, contains the items referenced in tables 4-5 and 4-6, operational test procedures. If an abnormal indication is encountered, the technician is directed to a fault isolation paragraph describing remedies for symptoms related to the abnormal test results.

b. <u>Lamp and Fuse Index</u>. Table 5-2 provides a list of lamps and fuses used in the high level CPP teletypewriter sets. The above active components constitute the most probable cause of failure.

c. <u>Fault Isolation Procedures</u>. The following paragraphs provide fault isolation procedures referenced in table 5-1.

(1) If unequal spacing between characters is observed, proceed as follows:

(a) Check horizontal positioning drive linkage adjustment (paragraph 6-3.1e(5)) (earlier designs - paragraphs 6-7.1e(1), 6-7.1e(3).

(b) Check reversing slide brackets adjustment (paragraph 6-3.1e(12)).

(c) If adjustments are required in both steps (1) and (2), check rocker shaft bracket eccentric stud adjustment (paragraph 6-3.1e(3)).

(2) If type is not clear, proceed as follows:

(a) Check ribbon.

(b) Check type box.

(c) Check printing track adjustment (paragraph 6-3.1f(12)).

(d) Check printing hammer stop bracket adjustment (paragraph 6-3.1f(2)) (earlier design - 6-7.1f(2)).

Table 5-1. Troubleshooting Index

| Item | Test/Step | Symptom | Fault Isolation Paragraph |
|---|---|---|---|
| 1 | 2/g | Low range span. | 5-2.1c(20) |
| 2 | 3/a(1) | Printing unequal vertically. | 5-2.1c(3) |
| 3 | 3/a(2) | Unequal spacing between characters. | 5-2.1c(1) |
| 4 | 3/a(3) | Unclear type. | 5-2.1c(2) |
| 5 | 3/a(4) | Garbled test pattern. | 5-2.1c(4) |
| 6 | 3/a(5) | Improper ribbon feed. | 5-2.1c(5) |
| 7 | 3/b,c | Improper ribbon reverse. | 5-2.1c(6) |
| 8 | 4/c thru h | Machine does not meet requirements for copying a distorted signal. | 5-2.1c(20) |
| 9 | *2/e(2) **2/c(2) | Figures-letters shift inoperative. | 5-2.1c(7) |
| 10 | *2/e(2) **2/c(2) | Letters-figures shift inoperative. | 5-2.1c(8) |
| 11 | *2/e(3) **2/c(3) | Normal carriage return inoperative. | 5-2.1c(17) |
| 12 | 5/f | Signal bell inoperative. | 5-2.1c(12) |
| 13 | *2/e(3) **2/c(3) | Normal line feed inoperative. | 5-2.1c(13) |
| 14 | *5/h,j **5/f,h | Single/double line feed improper operation. | 5-2.1c(14) |
| 15 | *5/l(1) thru (5) **5/j(1) thru (5) | Automatic carriage return-line feed inoperative. | 5-2.1c(15) |
| 16 | *5/l(1) thru (5) **5/j(1) thru (5) | Automatic carriage return-line feed improper operation. | 5-2.1c(16) |

Table 5-1. Troubleshooting Index - Continued

| Item | Test/Step | Symptom | Fault Isolation Paragraph |
|---|---|---|---|
| 17 | *5/m thru p<br>**5/k thru n | Automatic line feed on selected carriage return inoperative. | 5-2.1c(18) |
| 18 | 6/a | Local carriage return function inoperative. | 5-2.1c(8) |
| 19 | 6/b | Local line feed function inoperative. | 5-2.1c(9) |
| 20 | *5/m thru p<br>**5/k thru n | Line feed blocking after carriage return inoperative. | 5-2.1c(19) |
| 21 | *8/f,h<br>**8/b,d | High percentage of distortion. | 5-2.1c(21) |
| 22 | 7 | One or more keys hard to press. | 5-2.1c(22) |
| | | *Table 4-5<br>**Table 4-6 | |

Table 5-2. Lamp and Fuse Index

| Qty | Name, Type, Part Number | Function, Location | Energizing Voltage |
|---|---|---|---|
| 2 | Lamps, Indandescent, 151982. | Copylight, cover. | 5.5 VAC |
| 1 | Fuse, 4 Amp, Slo-Blo, 129919. | Electrical circuit protection, Keyboard motor circuit. | -- |
| 1 | Fuse, 1 Amp, 115358. | Electrical circuit protection, Keyboard function and reset circuits. | -- |

(e) Check printing arm adjustment (paragraph 6-3.1f(1)) (earlier design - 6-7.1f(3)).

(3) If printing is unequal vertically, proceed as follows:

(a) Check left and right vertical positioning lever eccentric stud adjustments (paragraphs 6-3.1e(8) and 6-3.1e(13)).

(b) Check right and left vertical positioning lock lever adjustment (paragraph 6-3.1e(19)).

(c) If adjustments are required in step (1), check rocker bracket eccentric stud adjustment.

(4) If a garbled test message is typed, proceed as follows:

(a) Check range setting.

(b) Check selector magnet bracket adjustment (paragraph 6-3.1g(14)).

(c) Check selector armature spring adjustment (paragraphs 6-3.1g(13), 6-3.1g(15)) (low - level - 6-3.2a(2)).

(5) If ribbon does not feed properly, proceed as follows:

(a) Check ribbon feed lever bracket adjustment (paragraph 6-3.1f(13)).

(b) Check ribbon feed lever spring.

(6) If ribbon does not reverse properly, proceed as follows:

(a) Check ribbon reverse spur gear adjustment (paragraph 6-3.1f(20)) (earlier design - paragraph 6-7.1f(5)).

(b) Check ribbon reverse detent adjustment (paragraph 6-3.1f(18)) (earlier design - paragraph 6-7.1f(6)).

(7) If repeating characters are observed, proceed as follows:

(a) Check code bar clutch trip lever adjustment (paragraph 6-3.1d(5)).

(b) Check type box clutch trip lever adjustment (paragraph 6-3.1d(8)).

(8) If local carriage return function is inoperative, proceed as follows:

(a) Press LOC CR key; verify local carriage return function bail moves top to rear; if not, check train of parts (located on keyboard) from key to bail.

(b) Ensure bail is operating carriage return lever; if not, remount typing unit.

(9) If local line feed function is inoperative, proceed as follows:

(a) Press LOC LF key; verify local line feed trip key moves to rear; if not, check train of parts (located on keyboard) from key to trip link.

(b) Ensure trip link is operating clutch trip lever; if not, remount typing unit.

(10) If figures-letters shift function is inoperative, proceed as follows:

(a) Set up code combination for letters (12345).

(b) Engage and rotate function clutch 180 degrees; observe the following:

1. Letters function lever should be top to rear; if not, check function bar through lever.

2. Right shift link breaker slide should be rotated clockwise over breaker slide bail; if not, check parts from function lever to breaker slide bail.

(c) Rotate main shaft 180 degrees while observing the following:

1. Right breaker slide bail moves shift link breaker slide up.

2. Breaker slide buckles right oscillating rail shift link.

3. Oscillating rail moves left until left oscillating rail shift link completely straightens.

(11) If letters-figures shift function is inoperative, proceed as follows:

(a) Set up code combination for figures (12-45).

(b) Engage and rotate function clutch 180 degrees; observe the following:

1. Figures function lever should be top to rear; if not, check function bar through lever.

2. Left shift link breaker slide should be rotated counterclockwise over breaker slide bail; if not, check parts from function lever to slide bail.

(c) Rotate main shaft 180 degrees while observing the following:

1. Left breaker slide bail moves shift link breaker slide up.

2. Breaker slid buckles left oscillating rail shift link.

3. Oscillating rail moves right until right oscillating rail shift link completely straightens.

(12) If signal bell is inoperative, proceed as follows:

(a) Place typing unit in figures.

(b) Set up code combination for S (1-3--).

(c) Engage and rotate function clutch 180 degrees; signal bell function lever should be top to rear; if not, check function bar through lever.

(d) If signal bell function lever is properly positioned, trouble is electrical. Refer to schematics and wiring diagrams at end of this chapter.

(13) If normal line feed function is inoperative, proceed as follows:

(a) Set up code combination for line feed (-2---).

(b) Engage and rotate function clutch 180 degrees.

(c) Rotate main shaft 180 degrees; observe the following:

1. Line feed function lever should be top to rear; if not, check function bar through lever.

2. Check that line feed function pawl stripper is down and in proper engagement with stripper bail.

3. Check that clutch trip lever is out of path of shoe lever; if not, check bottom of function lever through trip lever.

4. Line feed bars should be in engagement with spur gear; if not, check line feed bar bell crank spring.

5. Rotate main shaft while observing that one line feed bar moves to rear and up while other line feed bar is moving down and rotating spur gear.

(14) If single/double line feed operates improperly, proceed as follows:

(a) Set single/double line feed lever in position 1.

(b) Observe that stripper bail is rotated counterclockwise (top view) in engagement with slot in line feed function pawl stripper; if not, check parts between lever and bail and stripper bail spring.

(c) Set single/double line feed lever in position 2.

(d) Observe that stripper bail is rotated clockwise (top view) out of engagement with slot in line feed function pawl stripper; if not, check parts between lever and bail.

(15) If automatic carriage return line feed is inoperative, proceed as follows:

(a) Rotate spacing drum clockwise while observing the following:

1. Lug on spacing drum rear stop spring should strike and rotate automatic carriage return-line feed bell crank clockwise; if not, check for broken or bent lug or bell crank; check right margin adjustment (paragraph 6-3.1c(3), 6-3.1h(15), 6-3.1h(17)) (earlier design - paragraph 6-7.1h(7)).

2. The 0 (zero) code bar should move right; if not, check engagement of bell crank with code bar.

(b) Engage and rotate function clutch 180 degrees; observe the following:

1. Automatic carriage return and automatic line feed function levers should be top to rear; if not, check function bar through levers.

2. Normal line feed function lever should be top to rear; if not, check

tab on automatic line feed function pawl.

(c) Check engagement of bottom of automatic carriage return and normal line feed function levers with respective slide arms.

(16) If automatic carriage return-line feed function operates improperly, proceed as follows:

(a) If carriage does not return when 74th character is printed, check right margin adjustment (paragraphs 6-3.1c(3), 6-3.1h(15), 6-3.1h(17)) (earlier design - paragraph 6-7.1h(7)).

(b) If 75th character is not printed in center of page, increase tension on carriage return spring to move it to left, or decrease tension to move it to right.

(c) If carriage return spring tension was adjusted in step (2) above, readjust dash-pot vent screw (paragraph 6-3.1h(10)).

(d) If 76th and 77th characters are not positioned under 1st and 2nd, respectively, proceed as follows:

1. Check dash-pot vent screw adjustment (paragraph 6-3.1h(10)).

2. Check left margin adjustment (paragraphs 6-3.1c(1), 6-3.1h(2)) (earlier design - paragraph 6-7.1h(2)).

(17) If normal carriage return is inoperative, proceed as follows:

(a) Set up code combination for carriage return (---4-).

(b) Engage and rotate function clutch 180 degrees, observe the following:

1. Carriage return function lever should be top to rear; if not, check function bar through lever.

2. Carriage return feed pawl release link should be rotated counterclockwise holding feed pawls out of engagement with spacing drum, if not, check bottom of function lever through release link including carriage return lever adjustment (paragraph 6-3.1h(7)).

3. Carriage should be to left; if not, check for bind in spacing drum, draw-wire rope, carriage return spring drum, and printing and type-box carriages. Check tension on carriage return spring.

(18) If automatic line feed on selected carriage return function is inoperative, proceed as follows:

(a) Set up code combination for carriage return (---4-).

(b) Engage and rotate function clutch 180 degrees; observe the following:

1. Line feed on carriage return function lever should be top to rear; if not, check function bar through lever.

2. Check engagement of bottom of function lever with slide arm.

(19) If line feed blocking after carriage return function is inoperative, proceed as follows:

(a) Set up code combination for carriage return (---4-).

(b) Engage and rotate function clutch 180 degrees; observe the following:

1. Line feed on carriage return blocking function lever should be top to rear; if not, check function bar through lever.

2. Blocking slide should be to right with extensions in front of function bars in slots 39 and 40; if not, check top of function lever through blocking slide.

(c) Disengage function clutch.

(d) Set up code combination for line feed (-2---).

(e) Engage and rotate function clutch 180 degrees; observe the following:

1. Blocking function lever should be top to rear; if not, check blocking function lever latch.

2. Universal number 1 function lever should be top to rear; if not, check function bar through lever.

(f) Repeat steps (3) through (5); observe the following:

1. Universal number 1 and 2 function levers should be top to rear; if number 2 is not to rear, check function bar through lever.

2. Blocking slide should be to left; if not, check blocking function lever latch through blocking slide and shift plate post spring.

(20) If difference between range settings (range span) is too low or machine does not meet requirements for copying a distorted signal, proceed as follows:

(a) Check selector armature adjustment (paragraph 6-3.1g(10)) (low level - paragraph 6-3.2a(1)) (earlier design - paragraph 6-7.1g(4)).

(b) Check selector magnet bracket adjustment (paragraph 6-3.1g(14)).

(c) Check selector magnet bracket vertical adjustment (paragraph 6-3.1g(14)).

(d) Check for wear on armature extension, marking and spacing lock lever, and spring tensions.

(e) Check that range spans are centered on scale; if not, increase or decrease tension on selector armature spring to raise or lower range span.

(21) If percentage of distortion is too high, check keyboard shutter window gap

adjustment (low-level - paragraph 6-4.2a(1)).

(22) If one or more keys are hard to press, proceed as follows:

(a) Remove keyboard transmitter top plate.

(b) Check that keylevers are in proper slots.

(c) Check that keylevers are properly seated in slots.

d. Maintenance Schematic and Wiring Diagrams. Schematic and wiring diagrams are provided at the end of this chapter as aids to troubleshooting and maintenance of the teletypewriter sets. Figures 5-1 and 5-2 are schematic diagrams for high-level ac and dc circuits. Wiring diagrams for the high-level basic component assemblies are shown in figures 5-3 through 5-7. An index of the schematic and wiring diagrams for high-level equipment is provided in table 5-3.

5-2.2 LOW-LEVEL TROUBLESHOOTING PROCEDURES. The following paragraphs provide troubleshooting procedures for checking some of the difficulties that may be encountered in the operation of electrical service assemblies (ESAs) and their associated components. For troubleshooting mechanical failures refer to the high-level equipment troubleshooting procedures in paragraph 5-2.1, which are also applicable to low-level equipment.

a. Wiring and Schematic Diagrams. Wiring and schematic diagrams for use in troubleshooting low-level equipment are shown in figures 5-8 through 5-29 at the end of this chapter. An index of these diagrams is provided in table 5-4.

b. Lamp, Photocell, Fuse, and Semiconductor Indexes. Refer to table 5-2 for a list of lamps and fuses used in both high-level and low-level teletypewriter sets. Table 5-5 lists additional lamps, photocells, fuses, and semiconductors found in low-level assemblies. These active components are identified because they constitute the most probable cause of failure.

c. ESA General Troubleshooting Instructions. The following paragraphs provide general instructions for use when troubleshooting CPP ESAs.

(1) Since the ESA encloses and is dependent on other component circuits for its operation, the field troubleshooting and repair for these components also are included in the procedures. Refer to the applicable wiring diagrams at the end of this chapter which are referenced in table 5-4, for circuit tracing and identification of components. The diagrams are identified with their associated assemblies in the equipment matrix provided in table 1-4 of Chapter 1, which also indicates the figure number.

(2) Before attempting to repair a power supply fault, the technician should familiarize himself with the power supply card and ESA wiring. Refer to the circuit description in Chapter 3. Refer also to the wiring diagrams for each teletypewriter set as identified in table 1-4 of Chapter 1. The wiring diagrams

Table 5-3. Index of High-Level Schematic and Wiring Diagrams for Troubleshooting

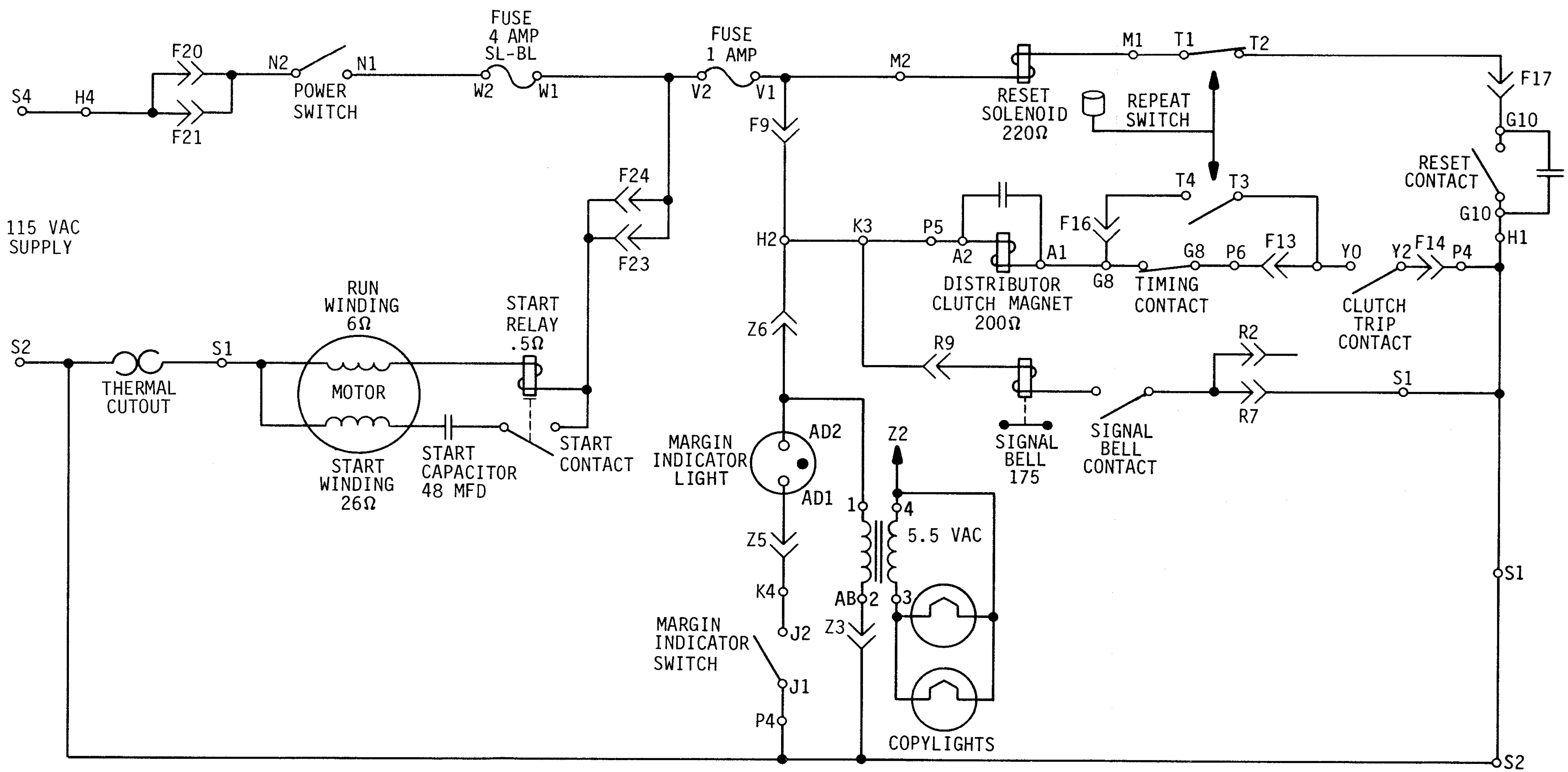



Figure 5-1. AC Power and Control Circuits

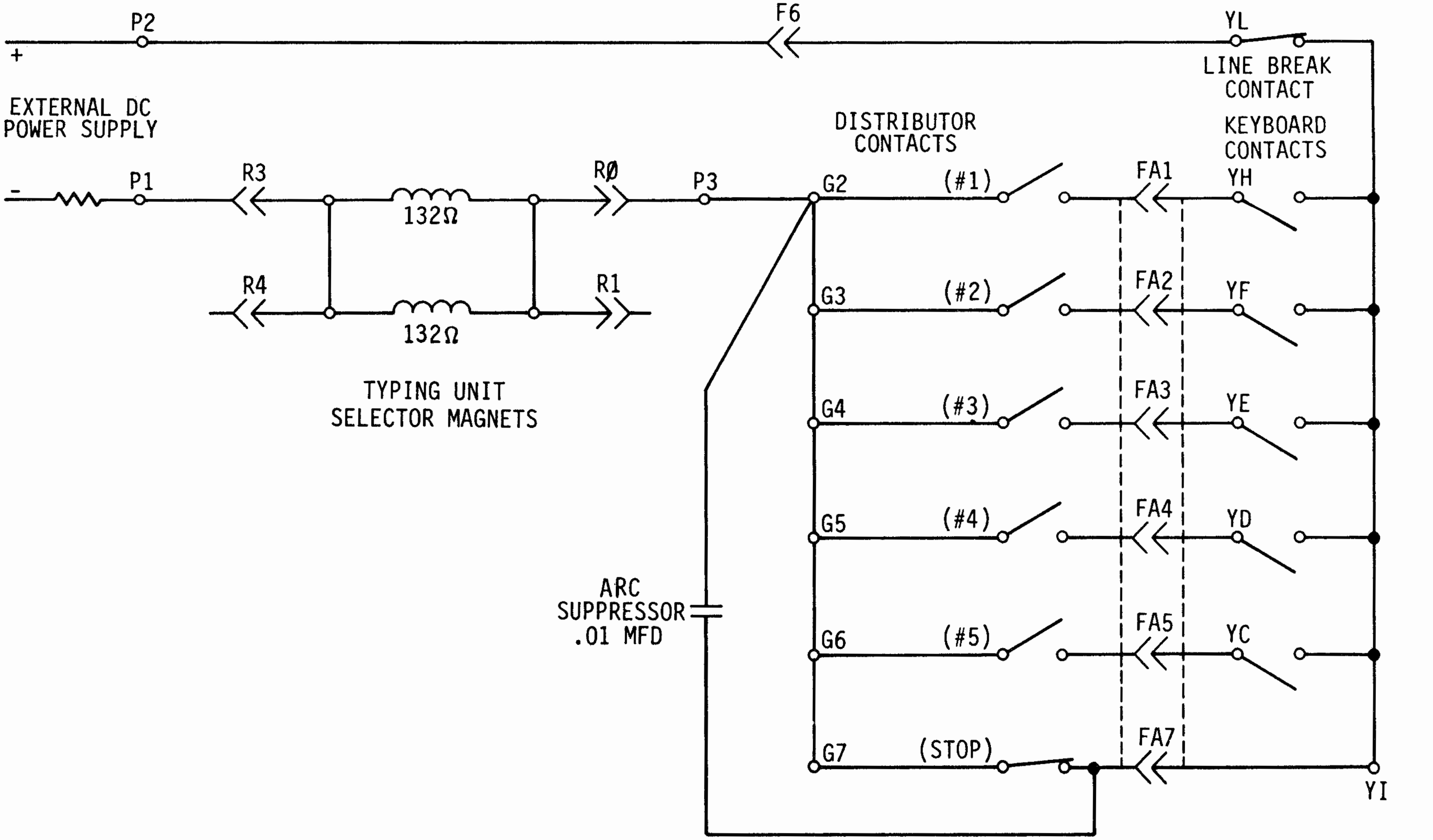



Figure 5-2. DC (Signal) Circuits

Table 5-4. Index of Low-Level Schematic and Wiring Diagrams for Troubleshooting

Table 5-4. Index of Low-Level Schematic and Wiring Diagrams for for Troubleshooting - Continued

| Figure | Diagram No. | Title | Page |
|---|---|---|---|
| 5-17 | 323810 | Circuit Board Assembly; Model 28 CPP KSR and RO ESA SMD with Signal Combiner | 5-63 |
| 5-18 | 8143 WD | Schematic Diagram; Model 28 CPP KSR and RO ESA SMD with Signal Combiner, 323810 | 5-65 |
| 5-19 | 8724 WD (Sheet 1 of 4) | Wiring Diagram; Model 28 CPP KSR ESA 323120 (CMD) (Sheet 1 of 4) | 5-67 |
| | 8724 WD (Sheet 2 of 4) | Wiring Diagram; Model 28 CPP KSR ESA 323120 (CMD) (Sheet 2 of 4) | 5-69 |
| | 8724 WD (Sheet 3 of 4) | Wiring Diagram; Model 28 CPP KSR ESA 323120 (CMD) (Sheet 3 of 4) | 5-71 |
| | 8724 WD (Sheet 4 of 4) | Wiring Diagram; Model 28 CPP KSR ESA 323120 (CMD) (Sheet 4 of 4) | 5-73 |
| 5-20 | 8725 WD | Schematic Diagram; Model 28 CPP KSR ESA 323120 (CMD) | 5-75 |
| 5-21 | 333069 | Assembly Drawing; Model 28 CPP KSR ESA CMD Circuit Board Assembly with Heat Sink | 5-77 |
| 5-22 | 333142 | Schematic Diagram; Model 28 CPP KSR ESA CMD Circuit Board Assembly | 5-79 |
| 5-23 | 8726 WD (Sheet 1 of 3) | Wiring Diagram; Model 28 CPP KSR ESA 323121 (SMD and LLK) (Sheet 1 of 3) | 5-81 |
| | 8726 WD (Sheet 2 of 3) | Wiring Diagram; Model 28 CPP KSR ESA 323121 (SMD and LLK) (Sheet 2 of 3) | 5-83 |
| | 8726 WD (Sheet 3 of 3) | Wiring Diagram; Model 28 CPP KSR ESA 323121 (SMD and LLK) (Sheet 3 of 3) | 5-85 |
| 5-24 | 8727 WD | Schematic Diagram; Model 28 CPP KSR ESA 323121 (SMD and LLK) | 5-87 |

Table 5-4. Index of Low-Level Schematic and Wiring Diagrams for for Troubleshooting - Continued

| NO. | NOTES |
|---|---|
| 1. | WIRING LEGEND:<br>DISTANT TERMINATING AREA<br>DISTANT TERMINATING DESIGNATION<br>AB-4-BR<br>WIRE COLOR CODE |
| 2. | COLOR CODE:<br>BK-BLACK R-RED<br>BL-BLUE Y-YELLOW<br>BR-BROWN G-GREEN<br>O-ORANGE W-WHITE<br>S-SLATE P-PURPLE |
| 3. | ASSOCIATED WIRING DIAGRAM<br>5976W9 ACTUAL WIRING DIAGRAM<br>LLK1 & LLK2 (FIGURE 5-4) |
| 4. | INDICATES SPLICE SOLDER AND TAPE |
| 5. | CONNECTOR VIEWED FROM SOLDER END. |
| 6. | USE 155755 INSULATING SLEEVE ON THE CONNECTOR TERMINALS AFTER SOLDERING. |
| 7. | THE 184856 NEON INDICATOR IS USED AS A MARGIN INDICATOR ON THE LPC 400 ONLY, ON THE LPC401 THIS LIGHT IS USED AS A POWER "ON" INDICATOR. BOTH COVER UNITS USE THE 198562 CABLE ASSEMBLY. |
| 8. | SPLICE LEADS AB-3, AC-1 & AC-4 TAPE & TUCK & TIE AT THE "Z" CONN. |
| 9. | EARLY VERSION COVERS UTILIZE ONE OF THE TRANSFORMER MOUNTING SCREWS FOR TERMINATING THE GROUND STRAP. |

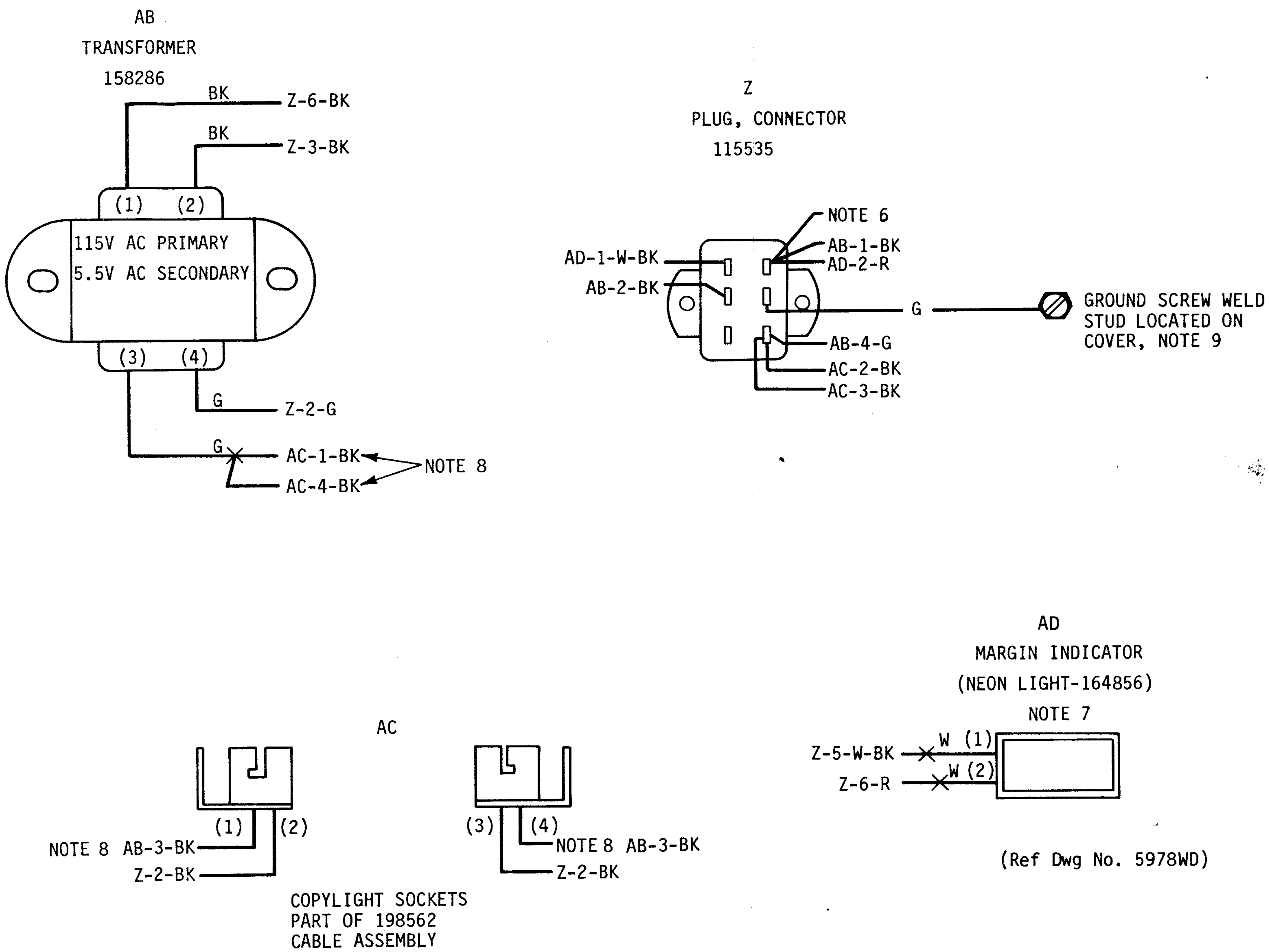



Figure 5-3. Wiring Diagram; Model 28 CPP Covers LPC400 (KSR) and LPC401 (RO)

| NO | NOTES |
|---|---|
| 1. | WIRING LEGEND<br>DISTANT TERMINATING AREA<br>DISTANT TERMINATING DESIGNATION<br>G-9-W-P<br>WIRE COLOR CODE |
| 2. | COLOR CODE<br>W - WHITE BL - BLUE<br>BK - BLACK Y - YELLOW<br>R - RED BR - BROWN<br>G - GREEN P - PURPLE<br>O - ORANGE S - SLATE<br>W-BK - WHITE-BLACK<br>W-R - WHITE-RED<br>W-G - WHITE-GREEN<br>W-O - WHITE-ORANGE<br>W-BL - WHITE-BLUE<br>W-Y - WHITE-YELLOW<br>W-BR - WHITE-BROWN<br>W-P - WHITE-PURPLE<br>W-S - WHITE-SLATE<br>R-BL - RED-BLUE<br>W-P-BK - WHITE-PURPLE-BLACK<br>W-BK-O - WHITE-BLACK-ORANGE |
| 3. | CONNECTORS VIEWED FROM SOLDER END. |
| 4. | 84551 TERMINAL STRAP |
| 5. | * INDICATES 18 GA WIRE. |
| 6. | WHEN TIME DELAY MOTOR STOP OPTION IS USED, CONNECT TO K TERMINAL BLOCK AS INDICATED ON SCHEMATIC WIRING DIAGRAM 5977WD. |
| 7. | THIS UNIT IS WIRED FOR 115V AC OPERATION OF THE DISTRIBUTOR CLUTCH MAGNET.<br>FOR SYNCHRONOUS PULSE OPERATION, REMOVE STRAPS P-4 TO S-2 AND P-6 TO K-3. EXTERNAL POWER (100 MILLI-AMPERES) TO BE FURNISHED BY CUSTOMER. |
| 8. | GROUND SCREW LOCATED ON TERMINAL BLOCK MOUNTING BRACKET FOR CUSTOMERS TERMINAL GROUND CONNECTION. |
| 9. | 103160 GROUND STRAP CONNECTED BETWEEN INNER AND OUTER PAN NEAR MOTOR; THIS APPLIES TO SETS WHOSE BASE SERIAL NO. IS ABOVE 447 |
| 10 | 151827 TERMINAL STRAP. |
| 11 | NUMERALS IN PARENTHESIS ARE NOT MARKED ON THE COMPONENTS BUT ARE SHOWN FOR PROPER TERMINAL ORIENTATION. |
| 12 | SPARE TERMINAL BLOCK PROVIDED FOR CUSTOMER CONVENIENCE. |
| 13 | FOR FULL DUPLEX OPERATION REMOVE G2 LEAD FROM P3 AND PLACE ON KS1. TERMINAL. CONNECT INCOMING SIGNAL LINE TO P1 AND P3. CONNECT OUTGOING SIGNAL LINE TO P2 AND KS1. |
| 14. | INPUT POWER LEADS SHOULD BE SECURED IN CLAMP MOUNTED ALONGSIDE TERMINAL BLOCKS |
| 15 | THIS ISSUE OF THE WIRING DIAGRAM APPLIES TO SETS WHOSE BASE SERIAL NUMBER IS ABOVE 600 |
| 16 | USE RADIO INTERFERENCE SUPPRESSOR FOR INSTALLATIONS REQUIRING A DECREASED RF INTERFERENCE. FOR OTHER INSTALLATION OMIT SUPPRESSOR AND CONNECT INPUTS DIRECTLY TO TERMINALS AS SHOWN. |
| 17. | 151368 RADIO INTERFERENCE SUPPRESSOR IS OPTIONAL EQUIPMENT. IT IS TO BE MOUNTED OUTSIDE OF UNIT AT A LOCATION CONVENIENT TO THE CUSTOMER. |
| 18 | SET GROUND AND RADIO INTERFERENCE SUPPRESSOR GROUND MUST BE CONNECTED TO THE SAME GROUND SCREW. SEE NOTE 8 |
| 19 | 178535 SPARK SUPPRESSOR ASSEM. (153631 NETWORK) |

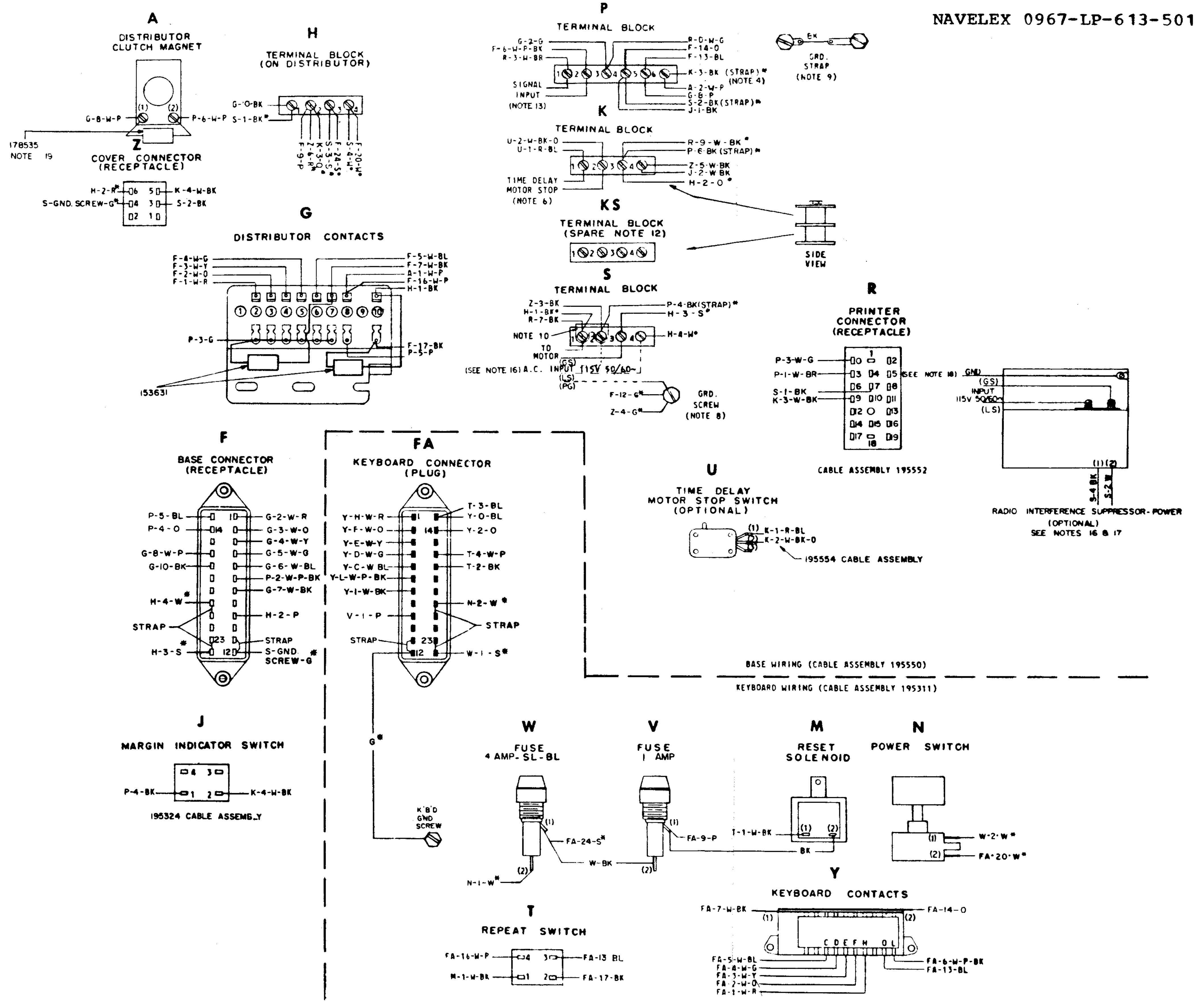



Figure 5-4. Wiring Diagram; Model 28 CPP KSR Keyboard Base LLK 2

1. WIRING LEGEND

   DISTANT TERMINATING AREA
   DISTANT TERMINATING DESIGNATION
   WIRE COLOR CODE
   G-9-W-P

2. COLOR CODE:

| | |
|---|---|
| W-WHITE | W-BK--WHITE-BLACK |
| R-RED | W-G -- WHITE-GREEN |
| BL-BLUE | W-P -- WHITE-PURPLE |
| BR-BROWN | W-Y -- WHITE-YELLOW |
| Y--YELLOW | W-R---WHITE-RED |
| G--GREEN | W-O---WHITE-ORANGE |
| S--SLATE | W-S---WHITE-SLATE |
| BK--BLACK | R-BL--RED-BLUE |
| O--ORANGE | W-P-BK--WHITE-PURPLE-BLACK |
| P--PURPLE | W-Y-BK--WHITE-YELLOW-BLACK |
| W-BL--WHITE-BLUE | |
| W-BR--WHITE-BROWN | |

3. CONNECTORS VIEWED FROM SOLDER END
4. 151827 TERMINAL STRAP
5. SPARE TERMINAL BLOCK PROVIDED FOR CUSTOMER CONVENIENCE
6. ALL WIRES TO BE 24 GAGE EXCEPT AS NOTED NO. 18 GAGE WIRE TO BE USED
7. 103160 GROUND STRAP CONNECTED BETWEEN INNER AND OUTER PAN NEAR MOTOR
8. NUMERALS IN PARENTHESIS ARE NOT MARKED ON THE COMPONENTS BUT ARE SHOWN FOR PROPER ORIENTATION
9. GROUND SCREW LOCATED ON TERMINAL BLOCK MOUNTING BRACKET FOR CUSTOMERS TERMINAL GROUND CONNECTION

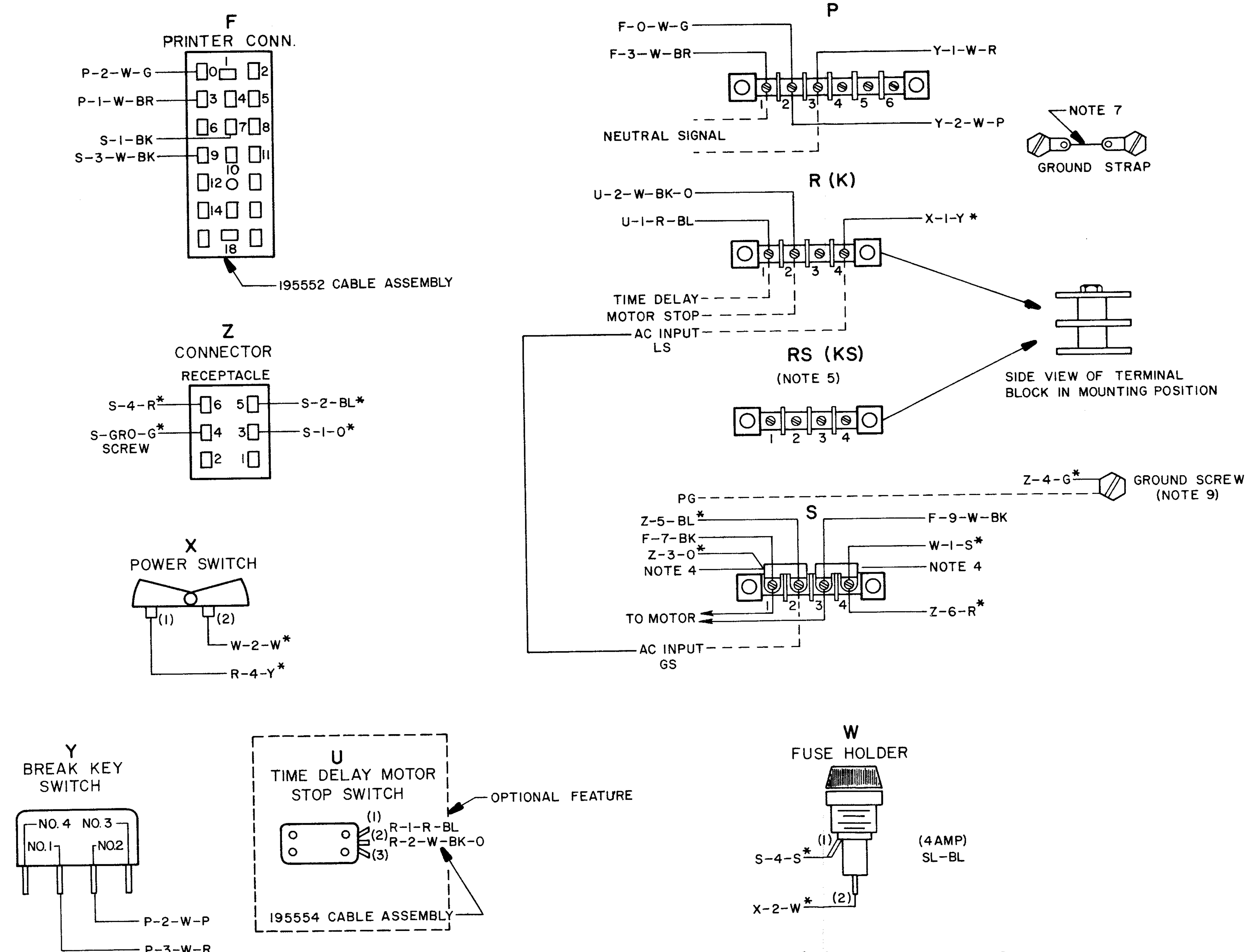



Figure 5-5. Wiring Diagram; Model 28 CPP RO Base LLB

| NO | NOTES |
|---|---|
| 1 | WIRING CHANNEL DESIGNATED BY "R" DOES NOT REPRESENT CABLES, BUT ASSISTS IN TRACING CONNECTIONS |
| 2 | COLOR CODE: BK-BLACK, W-WHITE, Y-YELLOW, P-PURPLE, S-SLATE, BL-BLUE, R-RED, BR-BROWN, O-ORANGE, G-GREEN |
| 3 | COLOR LEGEND: R- (CHANNEL IDENTIFICATION) 8- (CHANNEL WIRE NUMBER) W (WIRE COLOR CODE) |
| 4 | |
| 5 | CONNECTOR VIEWED FROM SOLDERED TERMINAL ENDS. |
| 6 | |
| 7 | THESE LEADS FURNISHED WITH FUNCTION BOX. |
| 8 | NORMALLY OPEN CONTACTS; NORMALLY CLOSED CONTACTS |
| 9 | A COMPLETE LP UNIT USES ONLY ONE STUNT BOX. MAKE APPROXIMATE (____) CONNECTIONS TO COMPLETE CIRCUIT. |
| 10 | TRANSFER CONTACTS: REAR CONTACTS NORMALLY OPEN; REAR CONTACTS NORMALLY CLOSED |
| 11 | THE FOLLOWING STUNT BOXES ARE WITHOUT SWITCH ASSEMBLIES: AX, ADL. |
| 12 | THESE TWO TERMINALS ARE USED WHEN LP IS EQUIPPED WITH XD CONT. PAGE FEED OUT OR XD CONT. HORIZ. TAB. IF BOTH FEATURES ARE USED, THEY ARE WIRED IN SERIES TO THESE TERMINALS. |
| 13 | USE 39522RM STRAP FOR LP 95,96,97,102,122 |
| 14 | THE 159611 SIGNAL BELL AND THE 195353 CABLE ASSEMBLY ARE CONTAINED ON THE LP111 ONLY. |
| 15 | A THE LP111 IS FACTORY WIRED FOR 60MA OPER. B THE LP111 MAY BE CONVERTED FOR 20-30MA. OPERATION BY THE CUSTOMER. |
| 16 | FOR AFY STUNT BOX, CONTACT IS OVER SLOT 30. |
| 17 | 195269 STRAP CONNECTED FROM TERMINAL 6 TO CONNECTOR BRACKET MOUNTING SCREW FOR 179613 AND 179644 R.F. SUPPRESSION MODIFICATION KITS. |

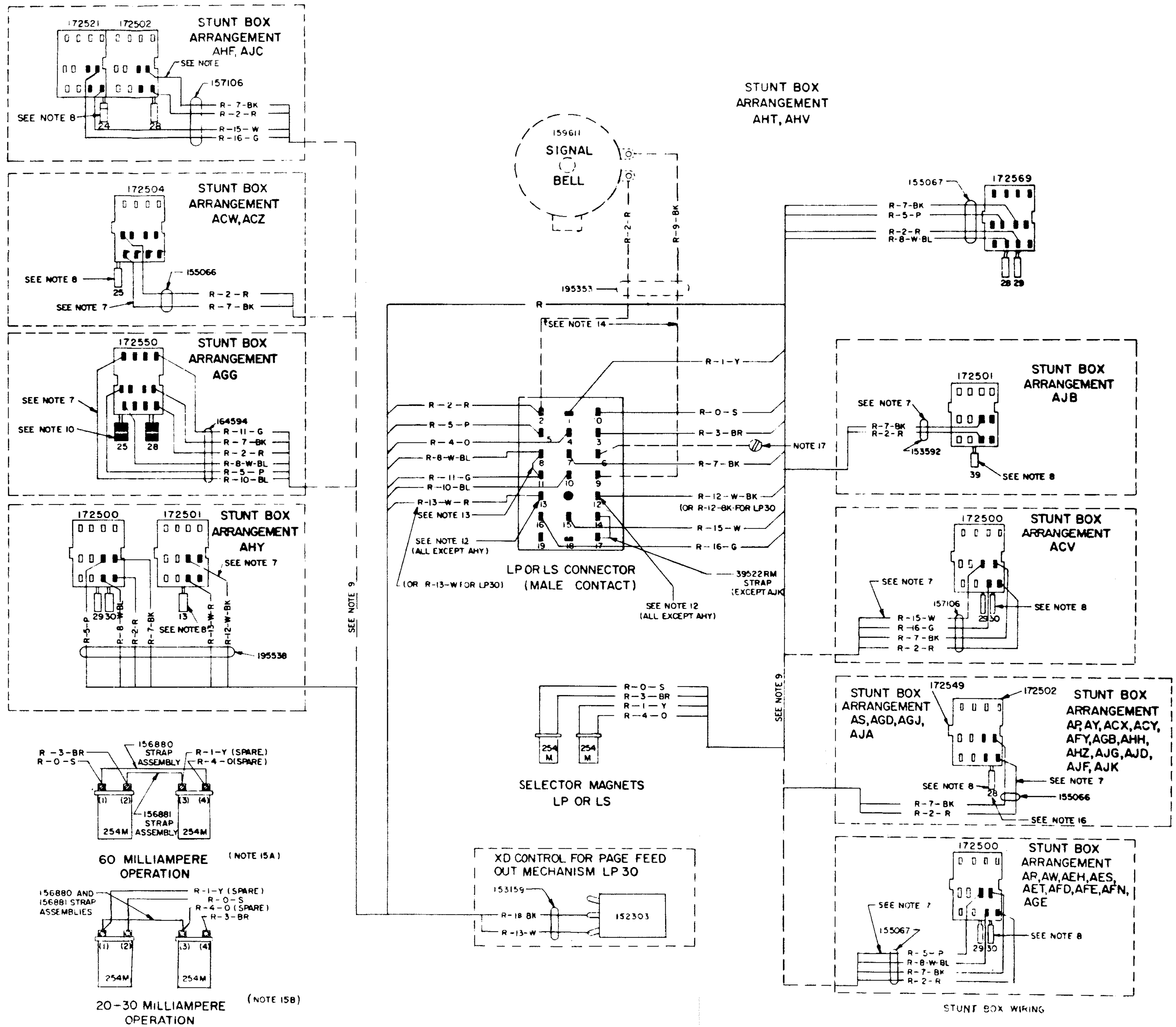
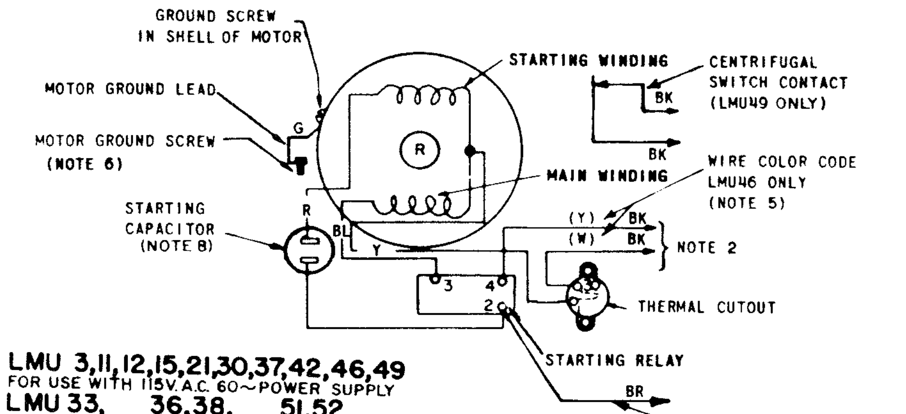



Figure 5-6. Wiring Diagram; Model 28 CPP KSR and RO Typing Unit LP111

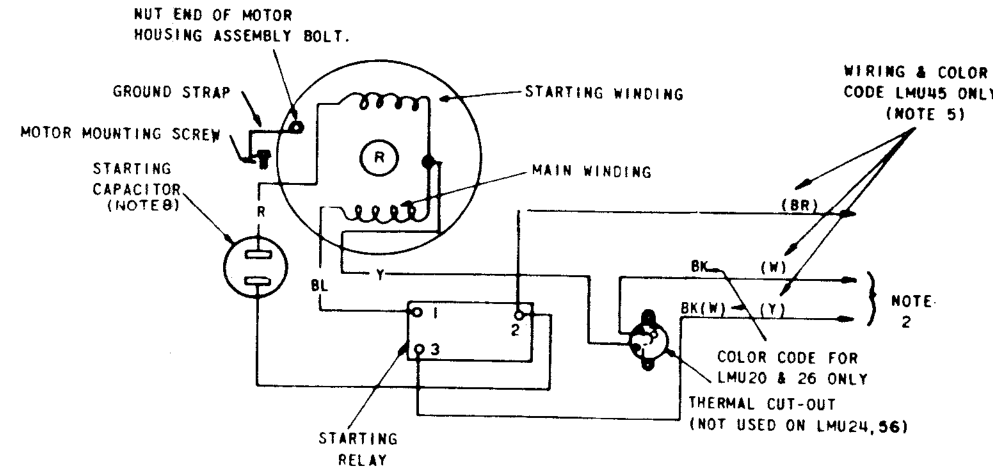
# SYNCHRONOUS MOTOR UNITS

| NO. | NOTES |
|---|---|
| 1. | SYNCHRONOUS MOTOR OPERATES ON REGULATED FREQUENCY (± 0.75%) MAXIMUM AC ONLY. |
| 2. | CONNECT EITHER WIRE TO DESIGNATED TERMINALS OF UNIT TERMINAL BLOCK, PER WIRING DIAGRAM OF ASSOCIATED UNIT |
| 3. | MOTOR LEADS OF SAME COLOR ARE INTERCHANGEABLE. |
| | |
| 5. | EXTERNAL NOISE SUPPRESSION NETWORK CONSISTING OF 100 OHM, 1/2 WATT RESISTOR IN SERIES WITH 0.25 MFD IK V CAPACITOR CONNECTED ACROSS YELLOW AND BROWN WIRES. (FOR LMU45, 46) |
| 6. | MOTOR GROUND LEAD (GREEN) TERMINAL MUST BE FASTENED TO MOUNTING CRADLE OF MOTOR UNDER A SEPARATE GROUND SCREW ONLY. A SCREW USED FOR ANOTHER PURPOSE CANNOT BE USED FOR GROUNDING (UNDERWRITERS LABORATORIES REQUIREMENT). |
| 7. | WIRE COLOR CODE:<br>BK - BLACK  R - RED<br>BL - BLUE  O - ORANGE<br>BR - BROWN  Y - YELLOW<br>P - PURPLE  S - SLATE<br>W - WHITE  G - GREEN |
| 8 | (see below) |

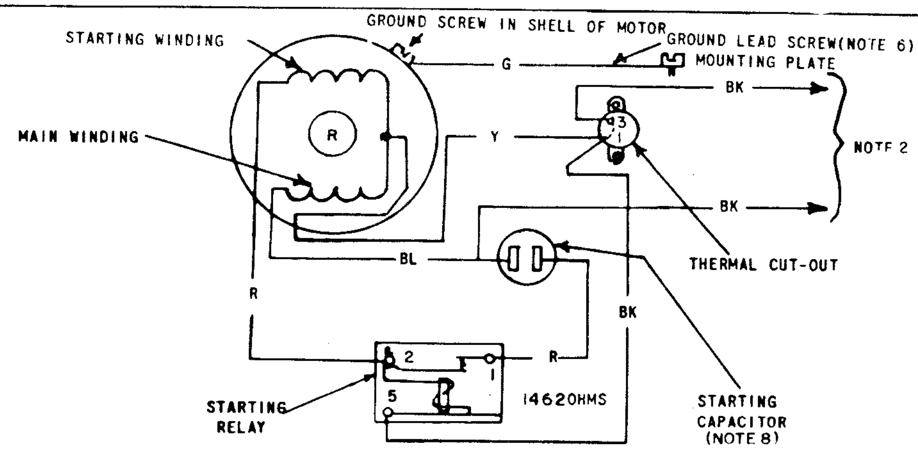
| LMU | STARTING CAPACITOR VALUE |
|---|---|
| 3,15,21,30,33, 36,37,38,42, 46,49,51,52 | 43 – 48 MFD |
| 11, 12 | 170 –226 MFD |
| 35 | 64-77 MFD |
| 55 | 15–18 MFD |
| 19,20,24,26, 31,45,56 | 88 – 108 MFD |
| 50, | 161 – 193 MFD |




LMU 3,11,12,15,21,30,37,42,46,49
FOR USE WITH 115V.A.C. 60~POWER SUPPLY
LMU 33, 36,38, 51,52
FOR 115V.AC 50~POWER SUPPLY.
LMU 55
FOR 230 V.A.C. 50~ POWER SUPPLY




LMU 19,20,24,26,31,45,56
FOR USE WITH 115V AC 60~POWER SUPPLY ONLY




LMU 50,
FOR USE WITH 115V AC 50~ POWER SUPPLY ONLY

LMU 35

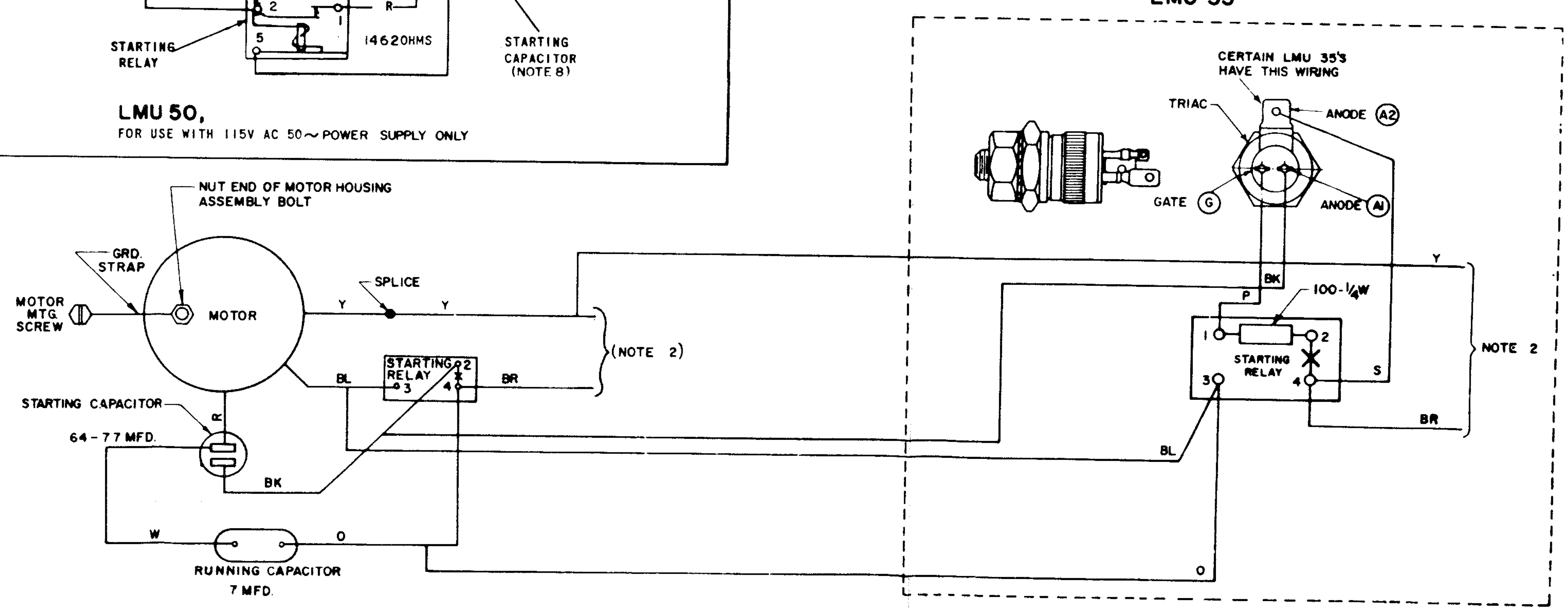



Figure 5-7. Wiring Diagram; Model 28 CPP Motor Units LMU37 and LMU51

Table 5-5. Lamp, Photocell, Fuse, and Semiconductor Index

| Qty | Name, Type, Part Number | Function, Location | Energizing Voltage |
|---|---|---|---|
| | KEYBOARD AND DISTRIBUTOR ASSEMBLIES | | |
| 5 | Lamps, Incandescent, 329266. | Photocell light source, Keyboard Transmitter. | 4.5 VAC |
| 6 | Lamps, Incandescent, 329266. | Photocell light source, Distributor. | 4.5 VAC |
| 1 | Photocell Assembly, 5 cells, 333094 (See Note). | Light sensors, Keyboard Transmitter. | -- |
| 1 | Photocell Assembly, 6 cells, 333148 (See Note). | Light sensors, Distributor | -- |
| | NOTE<br>If photocell problems are encountered, replace entire assembly. It is not recommended that photocells be replaced individually. | | |
| 1 | Diode Assembly, 329272. | Voltage dropping network for lamp assemblies, Keyboard Base. | -- |
| | ELECTRICAL SERVICE ASSEMBLIES | | |
| 2 (KSR)<br>1 (RO) | Fuse, 0.5 Amp 131807 | ESA power supply to protect power supply voltage regulator and subsequent ESA PCB circuits. | -- |
| 2 (KSR)<br>1 (RO) | Fuse, 0.8 Amp, Slo-Blo 162360 | ESA input circuit to protect ESA circuitry. | -- |
| 1 (KSR) | Diode, D-2, 177108 | LLK circuit board assembly - R3 shunt switch. | -- |

Table 5-5. Lamp, Photocell, Fuse, and Semiconductor Index - Continued

| Qty | Name, Type, Part Number | Function, Location | Energizing Voltage |
|---|---|---|---|
| 13 (KSR)<br>10 (RO) | Varistor, 100 Amp, 178844 | Power supply circuit card ±7 VDC reference voltage network and SMD and CMD circuit card temperature compensation circuits. | -- |
| 2 (KSR)<br>1 (RO) | Zener diode, 1N750A, 4.7 VDC ±5% 181667 | ESA SMD and CMD temperature compensation reference voltage | ±4.7 VDC |
| 1 (KSR) | Transistor, power, 181675 | CMD assembly, +47 to +53 VDC input circuit voltage regulator stage. | -- |
| 8 (KSR)<br>4 (RO) | Diode, 1N4383 182520 | Power supply circuit card rectifier diodes in ±58 VDC unregulated output supply to reference Zener diodes. | -- |
| 2 (KSR) | Diode, 1N914, 197464 | CMD DC amplifier transistor Q1 base protection circuitry. | -- |
| 1 (KSR) | Diode, 312341 | CMD DC amplifier transistor Q4 emitter voltage diode | -- |
| 2 (KSR)<br>1 (RO) | Transistor, power, 318835 | Power supply card power transistor, series voltage regulating circuit. | -- |
| 2 (KSR)<br>1 (RO) | Transistor, 2N2270, 321145 | Power supply card gain transistor, series voltage regulating circuit. | -- |
| 1 (KSR) | Diode, Zener, 39 VDC ±5%, 321149 | CMD assembly, regulator voltage reference | 39 VDC |

Table 5-5. Lamp, Photocell, Fuse, and Semiconductor Index - Continued

| Qty | Name, Type, Part Number | Function, Location | Energizing Voltage |
|---|---|---|---|
| 3 | Diode, 1N457A, 321154 | SMD assembly: transistor Q1, Q5 base protection circuit diodes, and transient suppression network diode | -- |
| 4 | Diode, 1N482A, 321156 | SMD assembly: DC amplifier Q4 collector clamps, and DC amplifier Q8, Q9 emitter diodes. | -- |
| 2 (KSR)<br>1 (RO) | Zener Diode, 1N748A, 3.9 VDC ±5% 321161 | SMD, CMD regulator circuit voltage reference diodes. | 3.9 VDC |
| 2 (KSR)<br>1 (RO) | Transistor, 2N3638A, 321165 | SMD, CMD DC amplifier circuits | -- |
| 3 (KSR)<br>2 (RO) | Transistor, 2N1893 321166 | SMD, CMD DC amplfier circuits | -- |
| 2 (KSR)<br>1 (RO) | Transistor, 2N4036, 321261 | SMD shunt regulator amplifier, power regulator stage; CMD DC amplifier circuit | -- |
| 4 (KSR)<br>2 (RO) | Zener Diode, 1N4749A, 321286, 24 VDC | Power supply, 24 VDC reference voltage Zener diodes to maintain series voltage regulator transistor base at 48 VDC | 24 VDC |
| 1 | Transistor, 2N3053, 323844 | SMD shunt regulator, power regulator stage | -- |
| 1 | Transistor, 40319, 323845 | SMD series regulator transistor, power regulator stage | -- |

Table 5-5. Lamp, Photocell, Fuse, and Semiconductor Index- Continued

| Qty | Name, Type, Part Number | Function, Location | Energizing Voltage |
|---|---|---|---|
| 3 (KSR) | Transistor, 2N3565, 323934 | LLK amplifier circuits | -- |
| 5 (KSR) 2 (RO) | Transistor, 2N4121, 324144 | SMD, CMD DC amplifier circuit transistors; LLK amplifier circuit transistors. | -- |
| 4 (KSR) 2 (RO) | Zener diode, 7.2 VDC, 327794 | Power supply reference voltage diodes for ±7 VDC output | 7.2 VDC |

are those provided at the end of this chapter and indexed in table 5-4.

(3) Troubleshooting for an ESA is required only to repair the power supply or to correct wiring defects in case of loose, broken, or faulty wiring. Wiring can be checked by following the different circuits on the appropriate wiring diagram, point-to-point, and comparing with the actual equipment wiring.

d. Power Supply Troubleshooting Procedures. If trouble should develop, it may be found by performing the checks outlined in the troubleshooting procedures in table 5-6 using a multimeter. The following instructions are applicable when troubleshooting power supply circuit cards.

(1) Colored test point jacks are provided on top of the power supply circuit card to accept standard meter probes.

(2) When a fault in the power supply is suspected but not obvious, disconnect all power from the ESA. Remove all keyer (LLK), selector magnet driver (SMD), and clutch magnet driver (CMD) circuit cards. Apply 100 to 130 volt ac power to the ESA and proceed with the troubleshooting procedure as outlined in table 5-6.

WARNING

Be extremely careful with capacitors, they may be charged. A severe electrical shock may be received from a capacitor or leads connected to the power supply while it is in operation.

(3) In following the procedure outlined in table 5-6, perform step 1. If a normal response is received, proceed to Step 2. If an abnormal response is received, repair or replace card. After this procedure, return to Step 1. Next, perform Step 2 and so on in the same manner.

(4) If this troubleshooting fails to reveal the difficulty, check for loose or cold solder connection or a broken or misplaced wire in the ESA. Recheck all wiring as indicated in paragraph 5-2.2c(1).

(5) Continually blowing fuses indicate a shorted component or components. Disconnect power, remove the circuit card assembly and make continuity checks between circuit card connector terminals B and N, N and H, and B and H. A zero or near zero reading on the one ohm scale of a multimeter indicates a short; disregard any other reading. Also, check continuity between the power transistor case and its heat sink; the power transistor must be electrically isolated from the heat sink with mica insulators. If the board assembly checks satisfactorily, examine the power line filter, power transformer, and rectifier filter capacitor for a shorted condition. (These components are located within the electrical service assembly.)

(6) Failure to detect the fault using the methods described above normally indicates a loose or cold solder connection, broken or misplaced wire in the service assembly. Check all wiring according to appropriate wiring diagrams.

e. Selector Magnet Driver (SMD) Troubleshooting Procedures. Table 5-7 provides information for use as a guide when troubleshooting the SMD. The following recommendations also are applicable when troubleshooting SMDs.

NOTE

The TP323810 selector magnet driver (SMD) is a circuit card assembly that needs only to be plugged into a properly keyed (polarizing key between pins E and F) 15-pin receptacle which is wired into the electrical service assembly (ESA).

(1) It is recommended that any damaged TP323810 selector magnet driver (SMD) unit be replaced in the field and maintained in a repair center. The repair center should have equipment capable of simulating normal operating condition.

(2) It is also recommended that the SMD be radio frequency interference (rfi) suppression tested after servicing and prior to final installation. Failures from this standpoint are not necessarily recognized by monitoring a typical communications operation.

f. Low-Level Keyer (LLK) Troubleshooting Procedures. Table 5-8 provides information

Table 5-6. Power Supply Troubleshooting Procedures (0.5 Ampere Card)

| Step | Action | Probe Posi-tion | Normal Response | Abnormal Response and Procedure |
|---|---|---|---|---|
| 1 | Check Voltage from -7 test jack. | COM-7 | Meter reading should be: Min-6.6 volts Max-7.8 volts | RESPONSE: Meter reading of zero volt. |
| | | | | DIFFICULTY: CR5 shorted or R5 open. |
| | | | If normal, proceed to Step 2. | PROCEDURE: Remove CR5 short-power supply card and repair or replace. |
| | | | | Recheck Step 1. |
| | | | | RESPONSE: Meter reading of +57 volts to +90 volts. |
| | | | | DIFFICULTY: CR5 open |
| | | | | PROCEDURE: Remove power supply card and repair or replace. |
| | | | | Recheck Step 1. |
| 2 | Check voltage from +7 test jack. | COM +7 | Meter reading should be: Min +6.6 volts Max +7.8 volts | RESPONSE: Meter reading of zero volt. |
| | | | | DIFFICULTY: CR6 shorted or R4 open. |
| | | | If normal, proceed to Step 3 | PROCEDURE: Remove power supply card and repair or replace. |
| | | | | Recheck Step 1. |
| | | | | RESPONSE: Meter reading of +57 volts to +90 volts. |
| | | | | DIFFICULTY: CR6 open. |
| | | | | PROCEDURE: Remove power supply card and repair or replace. |

Table 5-6. Power Supply Troubleshooting Procedures (0.5 Ampere Card) - Continued

| Step | Action | Probe Position | Normal Response | Abnormal Response and Procedure |
|---|---|---|---|---|
| | | | | Recheck Step 1. |
| 3 | Check voltage from UNREG. test jack. | COM UNREG. | Meter reading should be: Min +57 volts Max +90 volts | RESPONSE: Meter reading of zero volt. |
| | | | | DIFFICULTY: Loose or blown fuse. |
| | | | If normal, proceed to Step 4. | PROCEDURE: Remove power supply card and replace fuse. |
| | | | | Proceed to Step 5. |
| | | | | RESPONSE: Meter reading indicates voltage which is too low. |
| | | | | DIFFICULTY: CR1 and/or CR4 open or shorted. C8 defective. T1 and power line filter defective. |
| | | | | PROCEDURE: Remove power supply card or defective parts and repair or replace. |
| | | | | Recheck Step 1. |
| 4 | Check voltage from +50 test Jack. | COM +50 | Meter reading should be: Min +47 volts Max +53 volts | RESPONSE: Meter reading of zero volt. |
| | | | | DIFFICULTY: Q1 and/or Q2 open. |
| | | | If normal, end test. | PROCEDURE: Remove power supply card and repair or replace. |
| | | | | Recheck Step 1. |

Table 5-6. Power Supply Troubleshooting Procedures (0.5 Ampere Card) - Continued

| Step | Action | Probe Position | Normal Response | Abnormal Response and Procedure |
|---|---|---|---|---|
| | | | | <u>RESPONSE</u>: Meter reading of more than zero volt but less than +47 volts.<br><br><u>DIFFICULTY</u>: Too many shorting straps across CR8, CR9, CR10, and CR11.<br><br><u>PROCEDURE</u>: Remove power supply card and remove straps, as necessary to increase voltage. Replace card.<br><br>Recheck Step 1.<br><br><u>RESPONSE</u>: Meter reading of +57 volts to +90 volts.<br><br><u>DIFFICULTY</u>: Q1 and/or Q2 shorted.<br><br><u>PROCEDURE</u>: Remove power supply card and repair or replace.<br><br>Recheck Step 1. |
| 5 | Check voltage from UNREG. test jack. | COM UNREG. | Meter reading should be: Min +57 volts Max +90 volts | <u>RESPONSE</u>: Meter reading of zero volt.<br><br><u>DIFFICULTY</u>: Repeated fuse blowing. |

Table 5-6. Power Supply Troubleshooting Procedures (0.5 Ampere Card) - Continued

| Step | Action | Probe Position | Normal Response | Abnormal Response and Procedure |
|---|---|---|---|---|
| | | | Return to Step 4. | PROCEDURE: Disconnect power and remove power supply card. Make continuity checks between card terminals B and N, N and H, B and H. A zero or near zero reading on the 1-ohm scale of a multimeter indicates a short. Check continuity between Q1 case and its heat sink (Q1 must be electrically isolated from heat sink with mica insulators). If the power supply card checks satisfactorily, check power line filter T1 and C8 for shorted condition. Repair or replace card.<br><br>Recheck Step 1.<br><br>RESPONSE: Meter reading indicates voltage which is too low.<br><br>DIFFICULTY: CR1 and/or CR4 open or shorted. C8 defective. T1 and power line filter defective.<br><br>PROCEDURE: Remove power supply card or defective parts and repair or replace.<br><br>Recheck Step 1. |

Table 5-7. Selector Magnet Drive Troubleshooting Guide

| | Symptom | | Probable Cause |
|---|---|---|---|
| (a) | Switching levels out of tolerance | (1) | Improper adjustment of R3 and/or R15 |
| | | (2) | Q1 and/or Q5 low gain. |
| | | (3) | CR5 defective or out of tolerance |
| (b) | Circuit always marking | (1) | Q8 open |
| | | (2) | Q1, Q5, Q6, Q7 or Q9 collector-emitter shorted |
| (c) | Circuit always spacing | (1) | Q1, Q5, Q6, Q7, or Q9 collector-emitter open. |
| | | (2) | Q8 collector-emitter shorted |
| | | (3) | CR13 open |
| (d) | Output current too high | | R23 out of tolerance |
| (e) | Output current too low | | R23 out of tolerance |
| (f) | Transient suppressor network ineffective | (1) | CR14 open |
| | | (2) | R24 open |
| | | (3) | C6 open |
| (g) | Loss of receiving margin | (1) | Q8, Q9 improper gain |
| | | (2) | C4, C5, or C6 out of tolerance or defective |
| | | (3) | CR14 shorted |

Table 5-8. Low-Level Keyer Troubleshooting Guide

| | Symptom | Probable Cause |
|---|---|---|
| (a) | Circuit always marking | Photocell in keyboard or distributor shorted |
| (b) | Circuit always spacing | Photocell in keyboard or distributor open circuited |
| (c) | Mark - space bits detectable but will not go positive on mark | Q3 open and/or Q2 shorted |
| (d) | Mark - space bits detectable but will not go negative on space | Q4 open and/or Q1 shorted |

for use as a guide when troubleshooting the LLK. The following recommendations also are applicable when troubleshooting LLKs.

NOTE

The TP323130 low-level keyer is a circuit card assembly that needs only to be plugged into a properly keyed 15-pin receptacle which is wired into an appropriate ESA.

(1) It is recommended that any damaged keyer card be replaced in the field and maintained in a repair center. The repair center should have equipment capable of simulating normal operating conditions.

(2) It is also recommended that the keyer and associated filter cards (if any) be radio frequency interference (rfi) suppression tested after servicing and prior to final installation. Failures from this standpoint are not necessarily recognized by monitoring a typical communications operation.

g. Clutch Magnet Driver (CMD) Troubleshooting Procedures. Table 5-9 provides information for use as a guide when troubleshooting the CMD. The following recommendations also are applicable when troubleshooting CMDs.

NOTE

The clutch magnet driver (CMD) is a circuit card assembly that needs only to be plugged into a properly keyed 15-pin receptacle which is wired into an appropriate electrical service assembly (ESA).

(1) It is recommended that any damaged clutch magnet driver (CMD) unit be replaced in the field and maintained in a repair center. The repair center should have equipment capable of

Table 5-9. Clutch Magnet Driver Troubleshooting Guide

| Symptom | Probable Cause |
|---|---|
| (a) Switching levels out of tolerance | (1) Improper adjustment of R7 |
| | (2) Q1 low gain |
| | (3) CR7 defective or out of tolerance |
| (b) Circuit always marking | (1) Q3 open |
| | (2) Q1, Q2, or Q4 collector-emitter shorted |
| (c) Circuit always spacing | (1) Q1, Q2, or Q4 open |
| | (2) Q3 collector-emitter shorted |
| | (3) CR8 open |
| (d) Output current too high | (1) CR2 open |
| | (2) R17 cut of tolerance |
| (e) Output current too low | (1) R2 improperly adjusted or defective |
| | (2) R17 out of tolerance |
| (f) Transient suppresor network ineffective | (1) CR9 open |
| | (2) R16 open |
| | (3) C4 open |

simulating normal operating conditions.

(2) It is also recommended that the CMD be radio frequency interference (rfi) suppression tested after repair and prior to final installation. Failures from this standpoint are not necessarily recognized by monitoring a typical communications operation.

| NO. | NOTES |
|---|---|
| 1. | WIRING LEGEND: A-1-W — A: DISTANT TERMINATING AREA; 1: DISTANT TERMINATING DESIGNATION; W: WIRE COLOR CODE |
| 2. | COLOR CODE: BK - BLACK, BR - BROWN, R - RED, O - ORANGE, Y - YELLOW, G - GREEN, BL - BLUE, P - PURPLE, S - SLATE, W - WHITE |
| 3. | CONNECTORS VIEWED FROM SOLDER TERMINAL SIDE. |
| 4. | * INDICATES 18 GA. WIRE. |
| 5. | USE 4 AMP. SL-BL FUSE. |
| 6. | NUMBERS IN PARENTHESIS ARE NOT IDENTIFIED ON COMPONENTS. |
| 7. | 333079 CABLE ASSEMBLY. |
| 8. | 333151 CABLE ASSEMBLY. |
| 9. | ASSOCIATED WD'S<br>2900WD ACTUAL OF LMU37<br>8764WD ACTUAL OF LPC 403<br>8143WD SCHEMATIC OF 323810 SMD CARD<br>8763WD ACTUAL OF LP156<br>8299WD ACTUAL AND SCHEMATIC OF 319204 SELECTOR<br>8724WD ACTUAL OF 323120 ESA<br>8725WD SCHEMATIC OF 323120 ESA<br>8726WD ACTUAL OF 323121 ESA<br>8727WD SCHEMATIC OF 323121 ESA<br>8729WD SCHEMATIC OF 28RFC800IA, 28RFH800IA, ANDVSL500 INCORPORATING 323116 MODIFICATION KIT |
| 10. | S-NUMBER 61,600 S |
| 11. | (dashed) INDICATES SHIELDED WIRE. |
| 12. | 333147 GROUND STRAP IS USED IN CONJUNCTION WITH OLD STYLE TWO PIECE BONDED KEYBOARD END FRAMES AND IS NOT USED ON LATER STYLE UNITS USING SOLID ONE PIECE END FRAMES. |

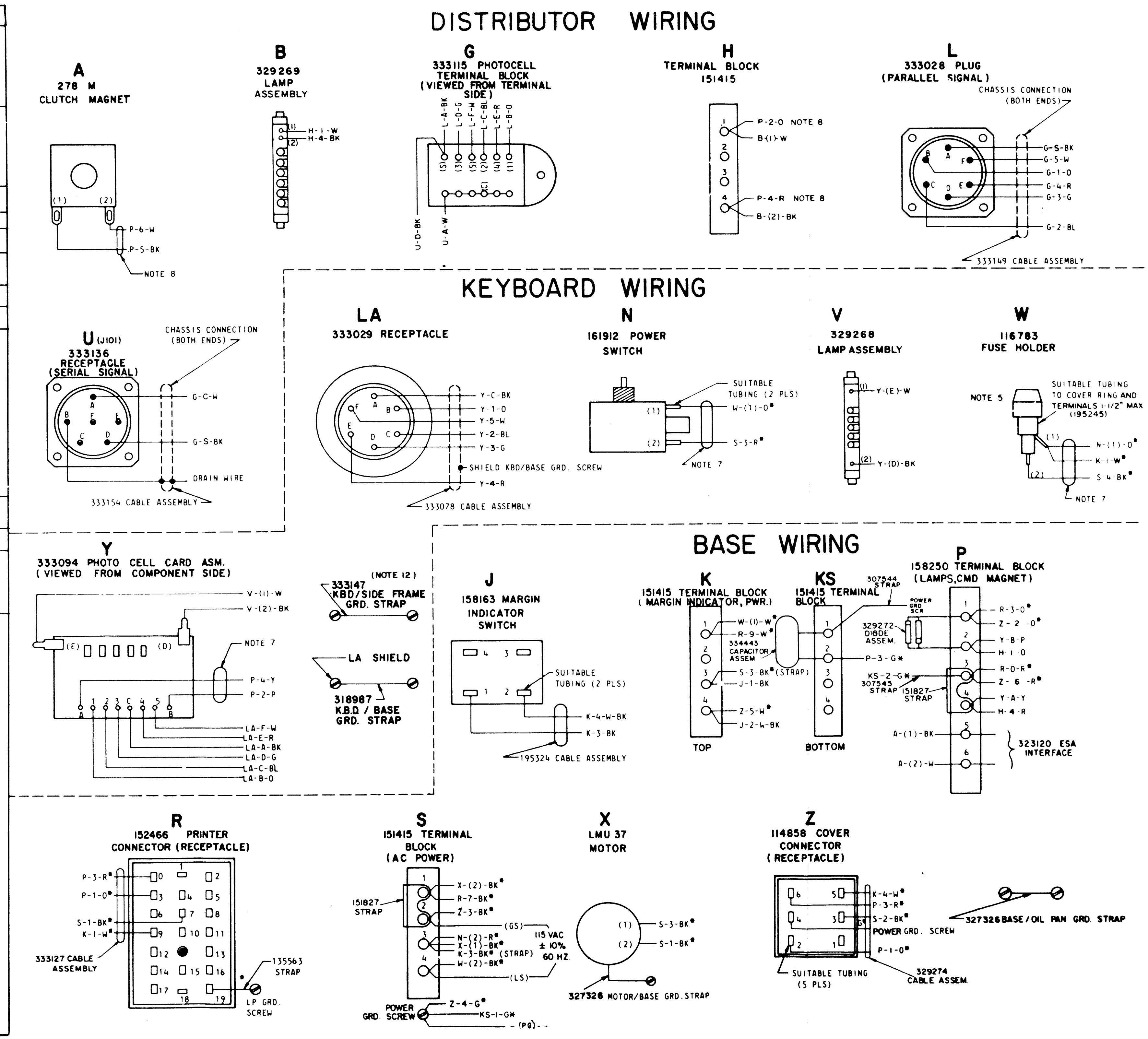



Figure 5-8. Wiring Diagram; Model 28 CPP KSR (Less Cover and Printer)

| NO. | NOTES |
|---|---|
| 1. | INDICATES FEMALE TERMINAL<br>INDICATES MALE TERMINAL |
| 2. | INDICATES SINGLE SHIELDING<br>INDICATES DOUBLE SHIELDING |
| 3. | SL-BL INDICATES SLOW BLOWING |
| 4. | TERMINAL DESIGNATIONS ENCLOSED IN PARENTHESES ARE FOR REFERENCE ONLY AND ARE NOT MARKED ON COMPONENT. |
| 5. | S NUMBER 61,600 S |
| 6. | ASSOCIATED WIRING DIAGRAMS<br>2900WD ACTUAL OF LMU37<br>8764WD ACTUAL OF LPC403<br>8763WD ACTUAL OF LP156<br>8724WD ACTUAL OF 323120 ESA<br>8726WD ACTUAL OF 323121 ESA<br>8299WD ACTUAL AND SCHEMATIC OF 319204 SELECTOR<br>8143WD SCHEMATIC OF 323810 SMD CARD<br>8725WD SCHEMATIC OF 323120 ESA<br>8727WD SCHEMATIC OF 323121 ESA<br>8728WD ACTUAL OF 28RFC8001A, 28-RFH8001A, AND VSL500 INCORPORATING 323116 MODIFICATION KIT |
| 7 | RESISTANCE VALUES IN OHMS UNLESS OTHERWISE SPECIFIED |
| 8 | 28-RFC8001A<br>OMIT:<br>323120 ESA<br>323121 ESA<br>28-RFH8001A<br>INCLUDE:<br>323120 ESA<br>323121 ESA<br>VSL500 INCORPORATING<br>323116 MOD. KIT<br>INCLUDE:<br>323120 ESA<br>323121 ESA |
| | |

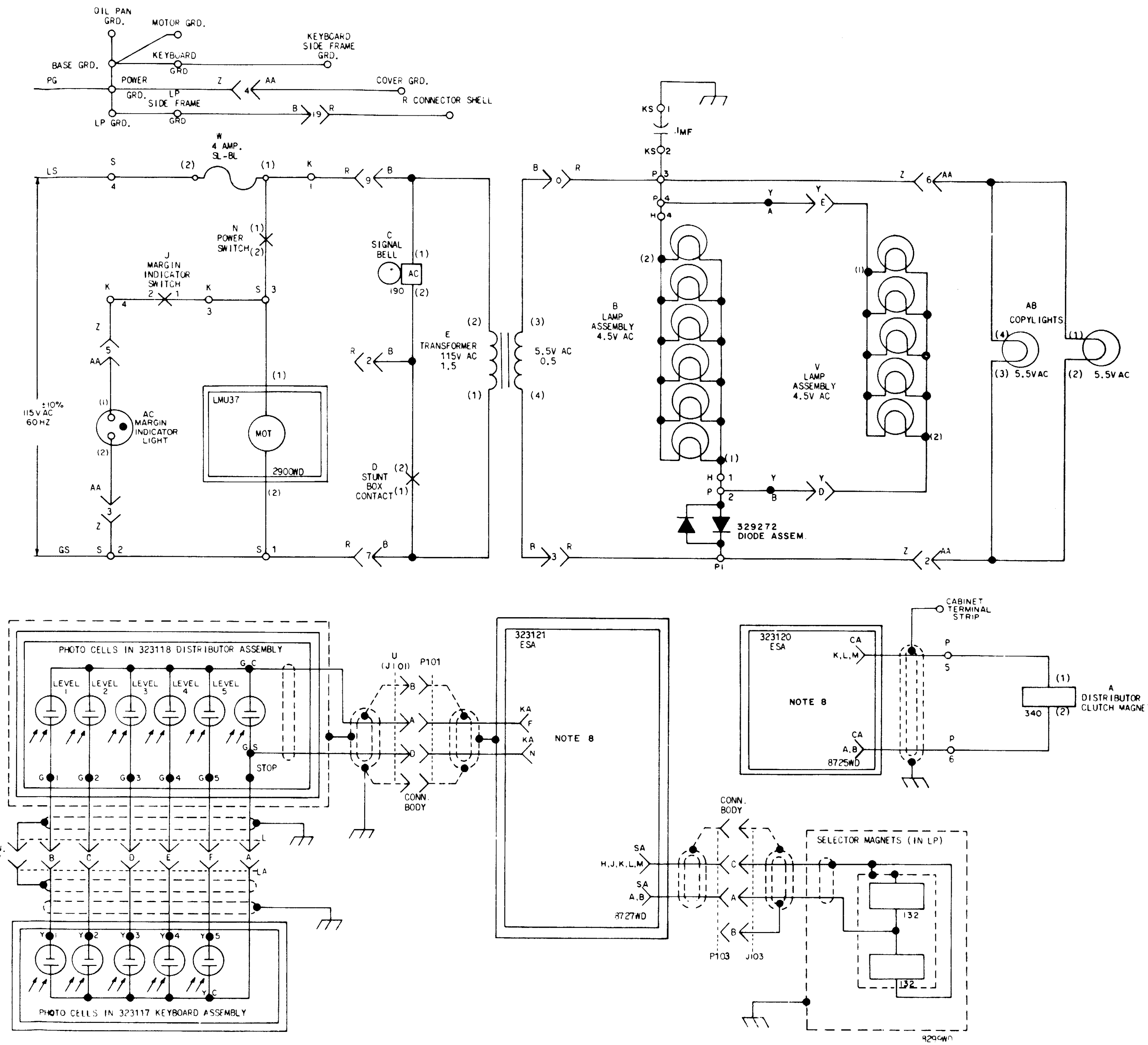



Figure 5-9. Schematic Diagram; Model 28 CPP KSR

| NO | NOTES |
|---|---|
| 1 | >—INDICATES FEMALE TERMINAL<br><—INDICATES MALE TERMINAL |
| 2. | TERMINAL DESIGNATIONS ENCLOSED IN PARENTHESES ARE FOR REFERENCE AND ARE NOT MARKED ON COMPONENT |
| 3 | ( ) INDICATES SHIELDED WIRE |
| 4. | 193781 CUT-OUT SWITCH USED FOR 50HZ OPERATION.<br>122249 CUT-OUT SWITCH USED FOR 60HZ OPERATION. |
| 5. | ASSOCIATED WIRING DIAGRAMS:<br>2900WD-MOTOR UNITS<br>8177WD-COVER, PRINTER SET<br>8242WD-PAGE PRINTER UNIT<br>8179WD-RFH8000B SETS<br>8137WD-321231 ESA |
| 6 | SL-BL INDICATES SLOW-BLOWING |
| 7. | GROUND SCREW LOCATED ON TERMINAL BLOCK MOUNTING BRACKET FOR CUSTOMERS TERMINAL GROUND CONNECTION. |
| 8 | ALL VOLTAGES D.C UNLESS OTHERWISE SPECIFIED |
| 9 | REFERENCE SPEC FOR TELETYPE CORPORATION EMPLOYEES ONLY 61351S |
| 10 | ( ) INDICATES DOUBLE SHIELDED WIRE |

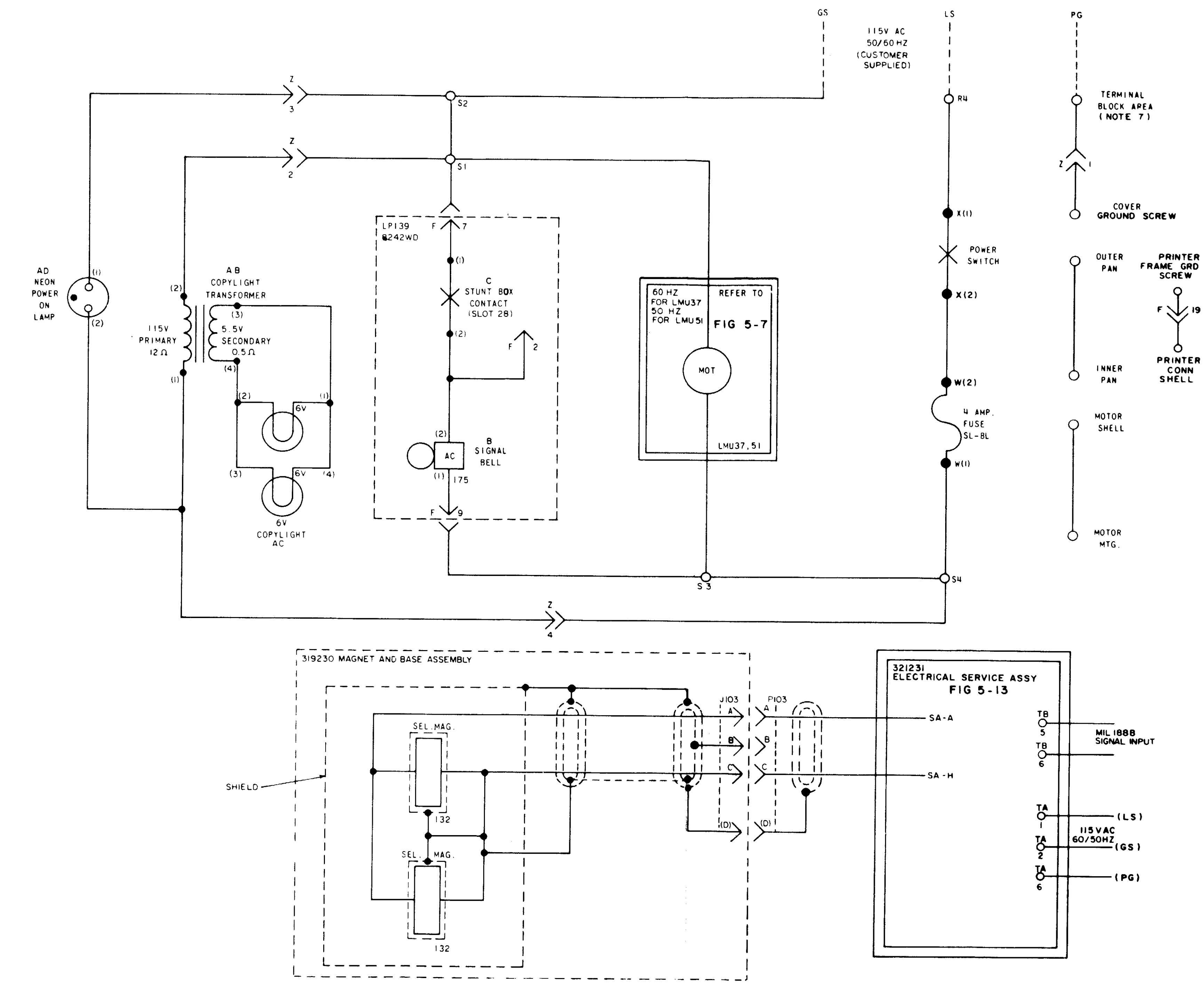



Figure 5-10. Schematic Diagram; Model 28 CPP RO

| NO. | NOTES |
|---|---|
| 1. | WIRING LEGEND:<br>DISTANT TERMINATING AREA<br>DISTANT TERMINATING DESIG.<br>AB-4-BR<br>WIRE COLOR CODE |
| 2. | COLOR CODE:<br>BK - BLACK R - RED<br>BL - BLUE Y - YELLOW<br>BR - BROWN W - WHITE<br>O - ORANGE P - PURPLE<br>S - SLATE G - GREEN |
| 3. | INDICATES SPLICE, SOLDER AND TAPE. |
| 4. | CONNECTOR VIEWED FROM SOLDER END |
| 5. | NUMERALS IN PARENTHESES ARE FOR REFERENCE ONLY AND DO NOT APPEAR ON COMPONENT. |
| 6. | USE 60373RM HEAT SHRINK TUBING ON THE CONNECTOR TERMINALS AFTER SOLDERING. |
| 7. | ON THE LPC402 THE 164856 NEON INDICATOR LIGHT IS USED AS A POWER "ON" INDICATOR. |
| 8. | COPYLIGHT SOCKETS PART OF 198562 CABLE ASSEMBLY. |
| 9. | SPLICE LEADS AB-3, AC-1,& AC-4 TAPE & TUCK & TIE NEAR "Z" CONN. |
| 10. | SPLICE LEADS AB-4,AC-2 & AC-3 TAPE & TUCK & TIE NEAR "Z" CONN. |
| 11. | ASSOCIATED WIRING DIAGRAMS:<br>8137WD: 321231 ESA WIRING<br>8176WD: RFH8000B RFH8001B SCHEMATIC<br>8178WD: 321231 ESA SCHEMATIC<br>8179WD RFH8000B RFH8001B<br>8242WD LP139 |
| 12. | REFERENCE SPEC FOR TELETYPE CORPORATION EMPLOYEES ONLY 61351 S |
| 13 | * DENOTES 18GA -ALL OTHER WIRES 24 GA. |

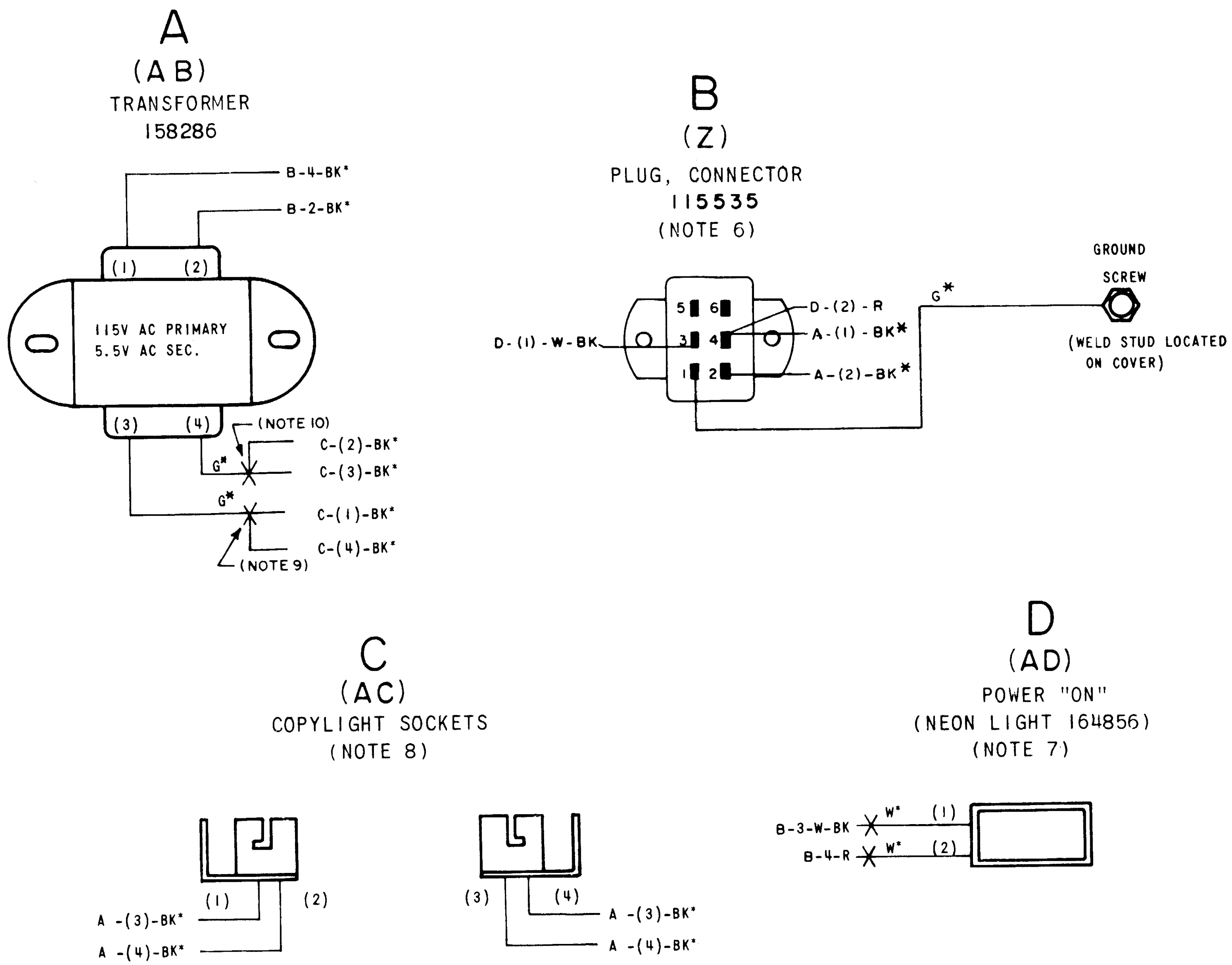



Figure 5-11. Wiring Diagram; Model 28 CPP RO Cover LPC402

| NO. | NOTES |
|---|---|
| 1. | WIRING LEGEND: DISTANT TERMINATING AREA; DISTANT TERMINATING DESIGNATION; AB-4-BR; WIRE COLOR CODE |
| 2. | COLOR CODE: BK – BLACK, BL – BLUE, BR – BROWN, O – ORANGE, S – SLATE, R – RED, Y – YELLOW, G – GREEN, W – WHITE, P – PURPLE |
| 3. | ASSOCIATED WIRING DIAGRAMS<br>8724 WD 323120 ESA ACTUAL<br>8725 WD 323120 ESA SCHEMATIC<br>8726 WD 323121 ESA ACTUAL<br>8727 WD 323121 ESA SCHEMATIC<br>8728 WD 323116 MOD KIT ACTUAL<br>8729 WD 323116 MOD KIT SCHEMATIC<br>8763 WD LP 156 ACTUAL |
| 4. | —✕— INDICATES SPLICE SOLDER AND TAPE |
| 5. | CONNECTOR VIEWED FROM SOLDER END. |
| 6. | USE 155755 INSULATING SLEEVE ON THE CONNECTOR TERMINALS AFTER SOLDERING. |
| 7. | S NUMBER 61600S |
| 8. | * DENOTES 18GA. ALL OTHER WIRES 24GA. |
| 9. | 151982 INCANDESCENT LAMP |
| 10. | TERMINAL DESIGNATIONS ENCLOSED IN PARENTHESIS ARE FOR REFERENCE ONLY AND ARE NOT MARKED ON COMPONENTS. |

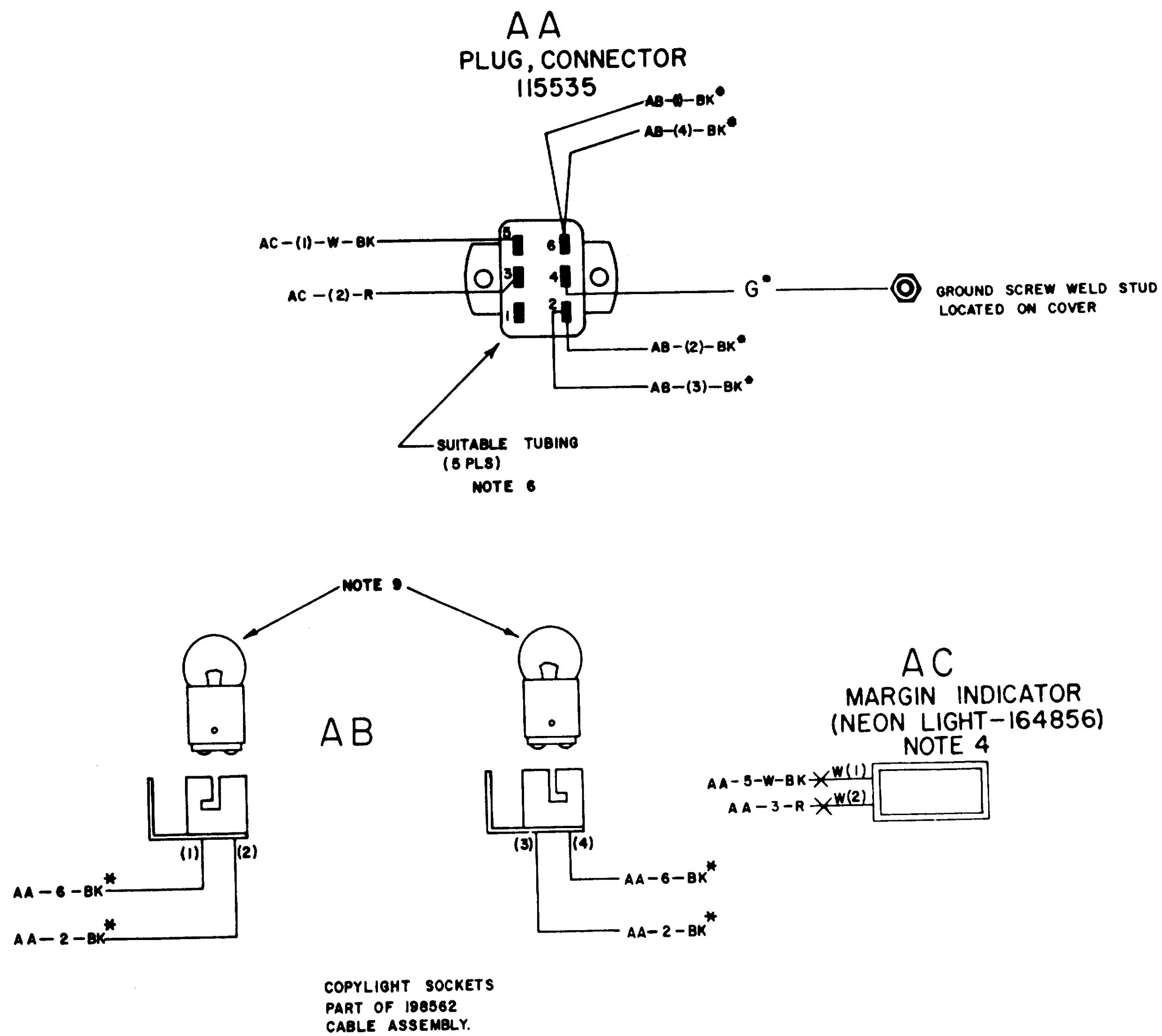



Figure 5-12. Wiring Diagram; Model 28 CPP KSR Cover LPC403

| NO | NOTES |
|---|---|
| 1 | ALL VOLTAGES DC UNLESS OTHERWISE SPECIFIED. |
| 2 | TERMINAL DESIGNATIONS ENCLOSED IN PARENTHESIS ARE FOR REFERENCE AND ARE NOT MARKED ON COMPONENT. |
| 3. | ALL SURFACE WIRE 24AWG GREEN, 31784RM, UNLESS OTHERWISE SPECIFIED. ALL STRAPPING WIRE 24 AWG BARE, 39603RM. USE SLEEVING WHERE REQUIRED. (1) INDICATES 18 AWG STRANDED WIRE. (2) INDICATES 24 AWG STRANDED WIRE. (3) INDICATES 24AWG 2 LEAD SINGLE SHIELDED CABLE. (4) INDICATES 24AWG SINGLE SHIELDED WIRE. |
| 4. | * INDICATES TO TAPE END TERMINATING POINT. |
| 5. | INDICATES SINGLE SHIELDING. INDICATES DOUBLE SHIELDING. |
| 6. | FUSE NUMBER 162360 8/10 AMP SLOW BLOWING. |
| 7. | ASSOCIATED CABLE ASSEMBLIES, 321246, 321248, 324154, 324136, 324137. |
| 8. | TERMINALS 7 & 9 ARE GROUNDED THRU THE MOUNTING SCREW OF THE TERMINAL STRAPS. |
| 9. | |
| 10. | INNER SHIELD GROUND NUT ON CONNECTOR MOUNTING. |
| 11. | COLOR CODE: BK-BLACK R-RED BL-BLUE O-ORANGE BR-BROWN W-WHITE S-SLATE G-GREEN Y-YELLOW P-PURPLE |
| 12. | ASSOCIATED WD 8727 WD SCHEMATIC DIAGRAM. |
| | NOTES CONTINUED ON SHEET 2 |

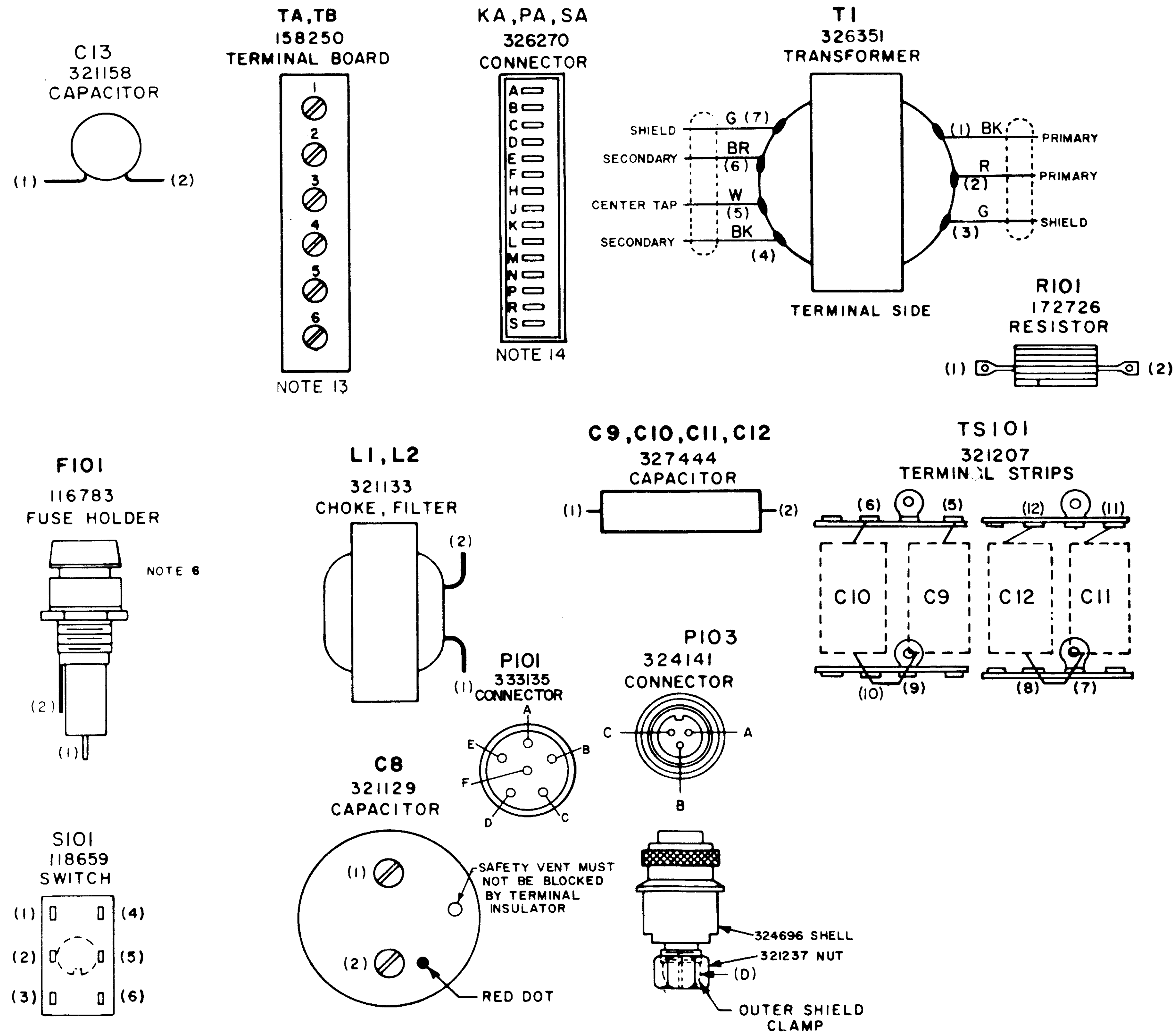



Figure 5-13. Wiring Diagram; Model 28 CPP RO ESA 321231 (Sheet 1 of 3)

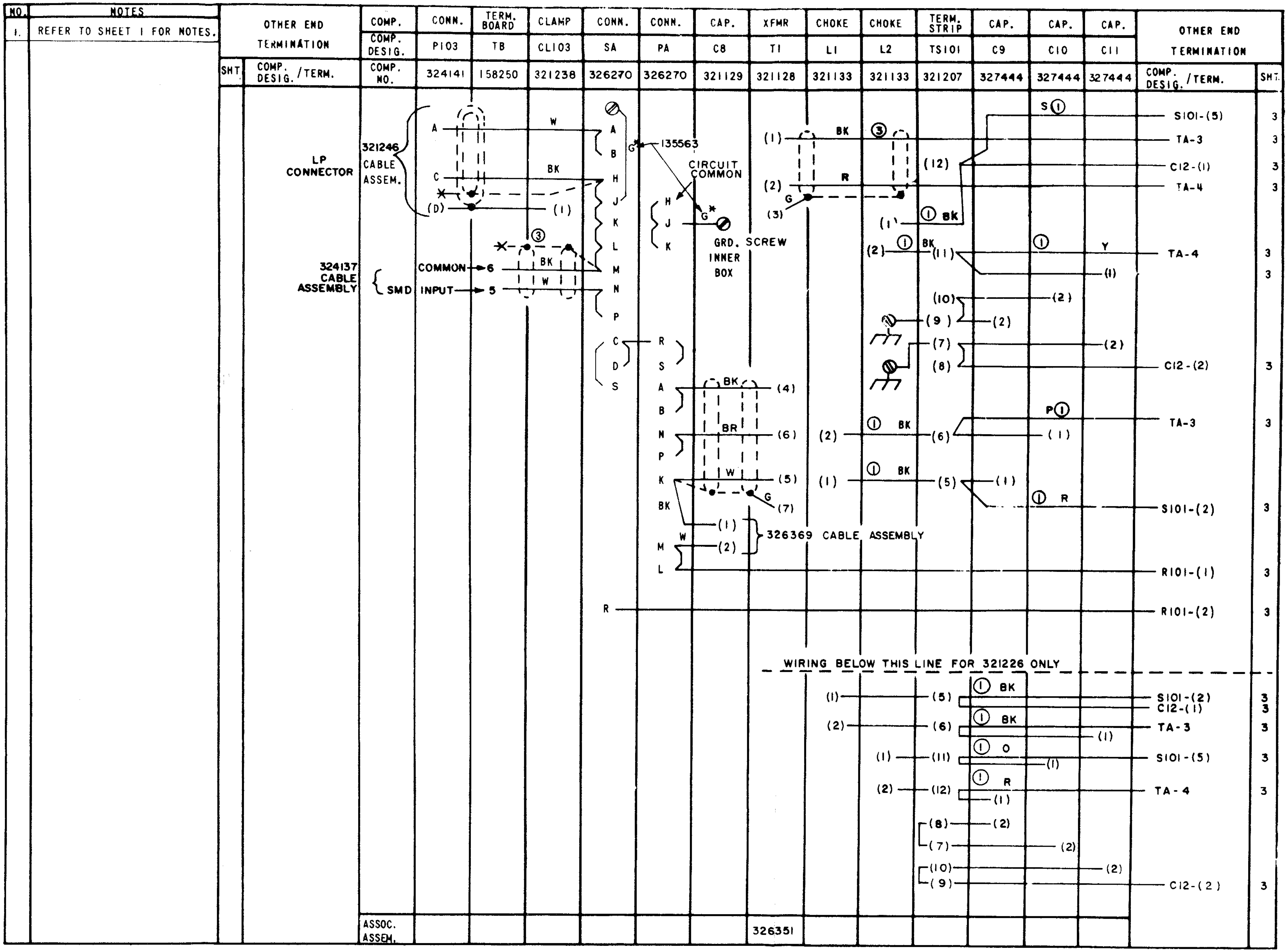



Figure 5-13. Wiring Diagram; Model 28 CPP RO
ESA 321231 (Sheet 2 of 3)

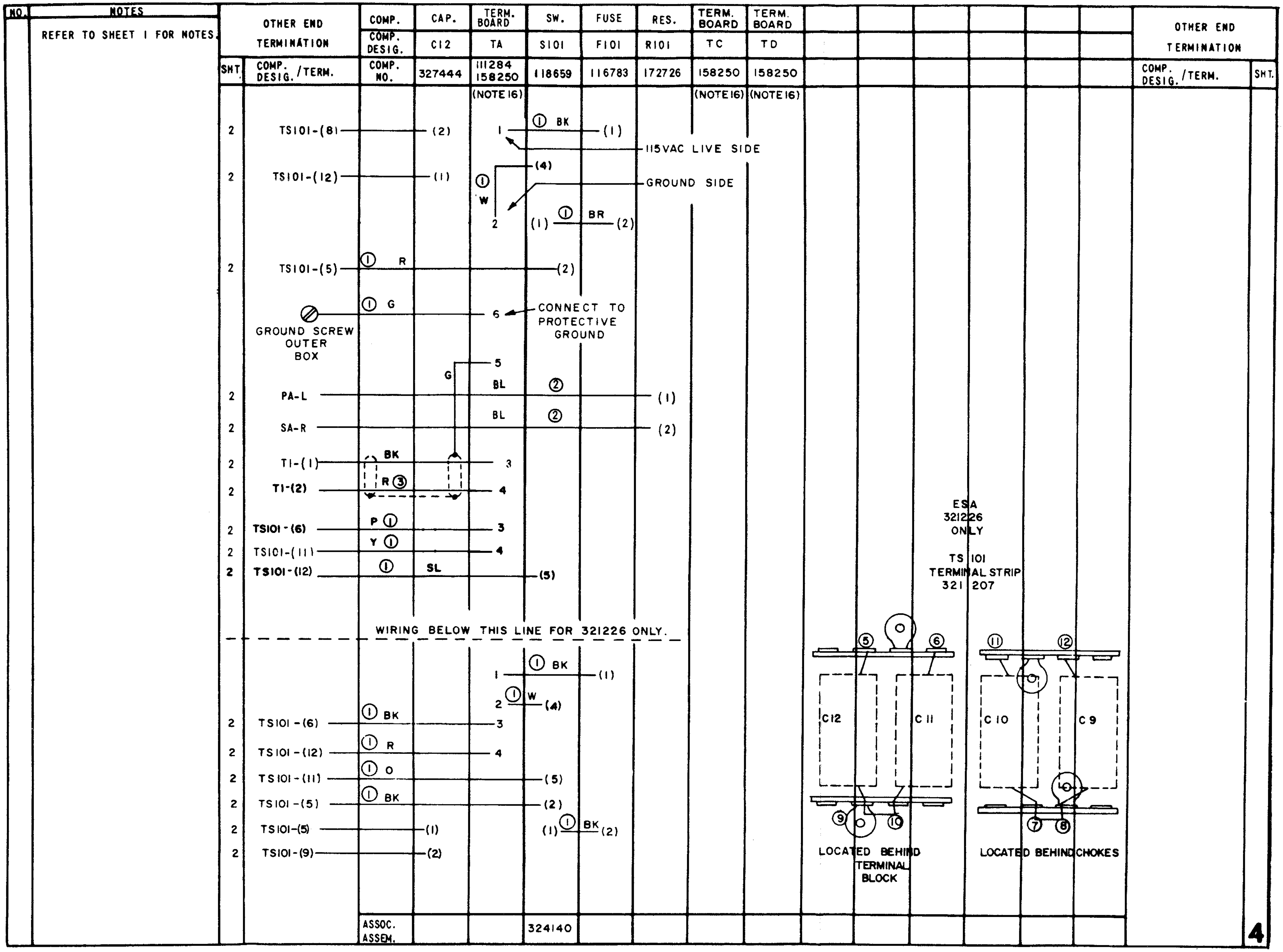



Figure 5-13. Wiring Diagram; Model 28 CPP RO
ESA 321231 (Sheet 3 of 3)

| NO. | NOTES |
|---|---|
| 1. | ——-- ——INDICATES OUTER SHIELD AND --------INDICATES INNER SHIELD |
| 2. | CAPACITANCE VALUES IN MICROFARADS, UNLESS OTHERWISE SPECIFIED. |
| 3. | ≻—— INDICATES FEMALE AND ——→ INDICATES MALE TERMINALS ON CONNECTORS |
| 4. | SL-BL INDICATES SLOW BLOWING. |
| 5. | ( ) INDICATES SHIELDED WIRE. |
| 6. | ALL VOLTAGES DC, UNLESS OTHERWISE SPECIFIED. |
| 7. | TERMINAL DESIGNATIONS ENCLOSED IN PARENTHESES ARE FOR REFERENCE AND ARE NOT MARKED ON COMPONENT. |
| 8. | WIPING DIAGRAM 8137WD |
| 9. | RESISTANCE VALUES IN OHMS, UNLESS OTHERWISE SPECIFIED. |
| 10 | —▷C DENOTES COMMON RETURN TO CIRCUIT GROUND. |
| 11 | REFERENCE SPEC FOR TELETYPE CORPORATION EMPLOYEES ONLY 61352 S |
| 12 | ( ) INDICATES DOUBLE SHIELDED WIRE |

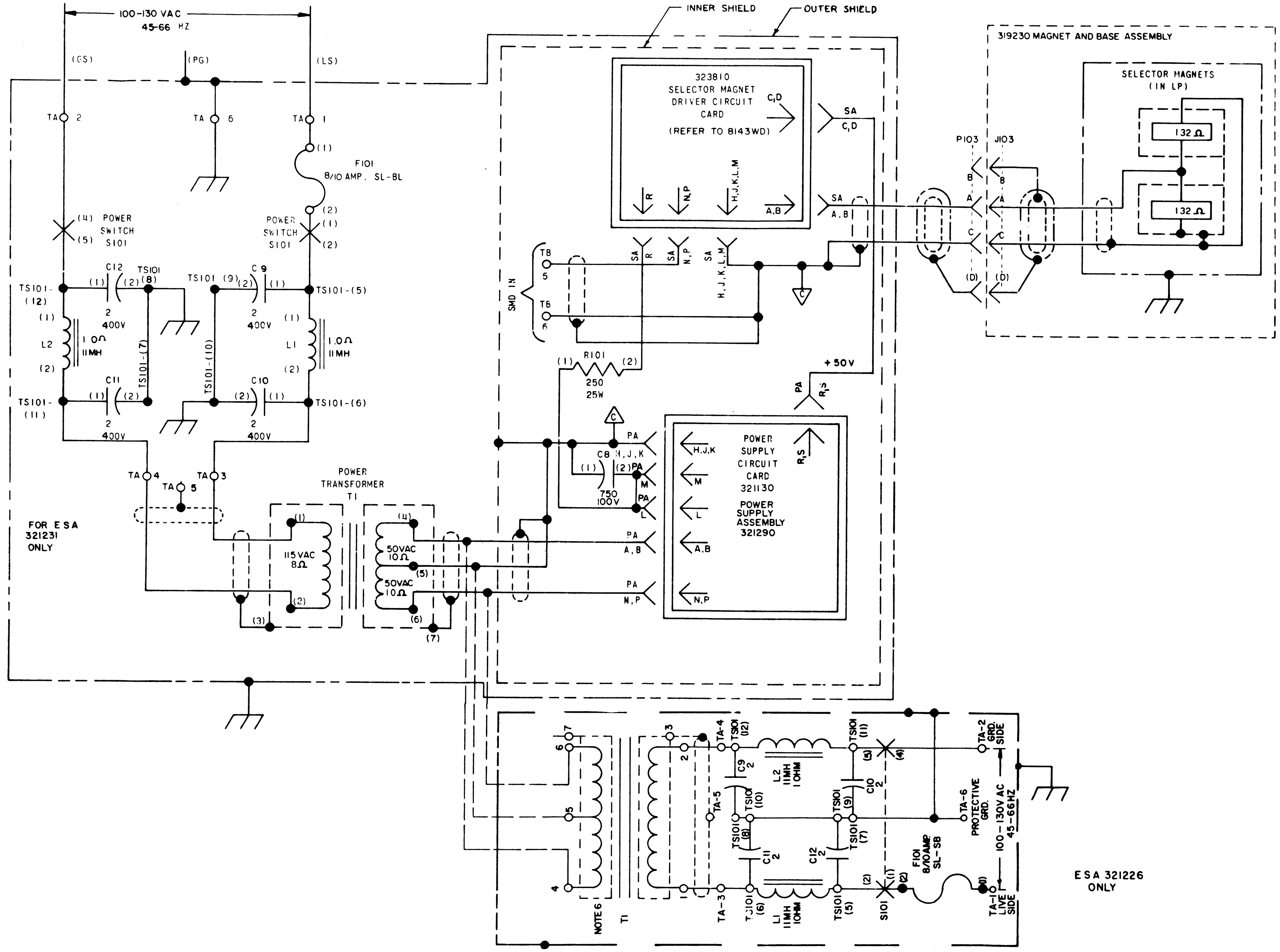
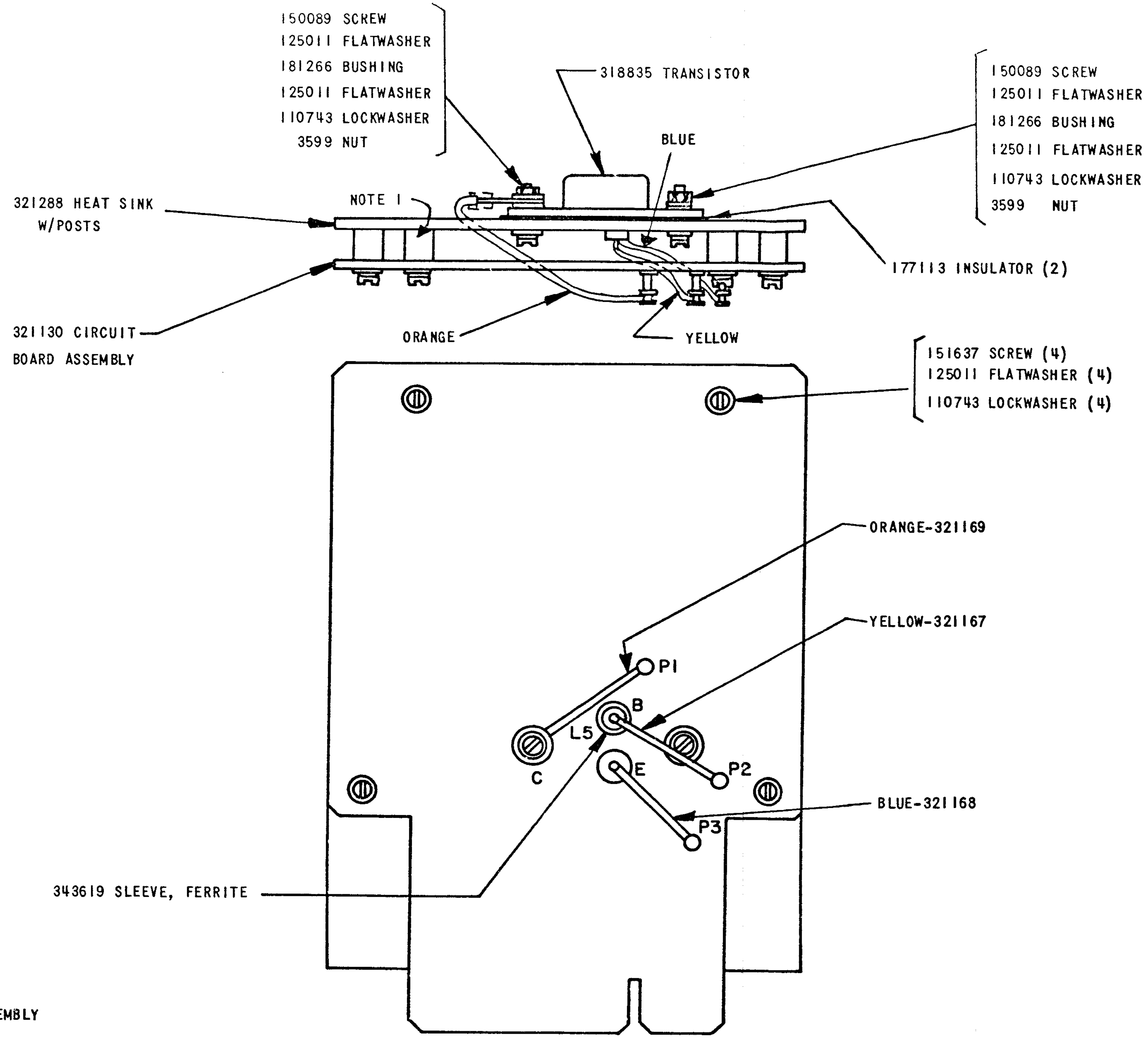



Figure 5-14. Schematic Diagram; Model 28 CPP RO ESA 321231




NOTE 1

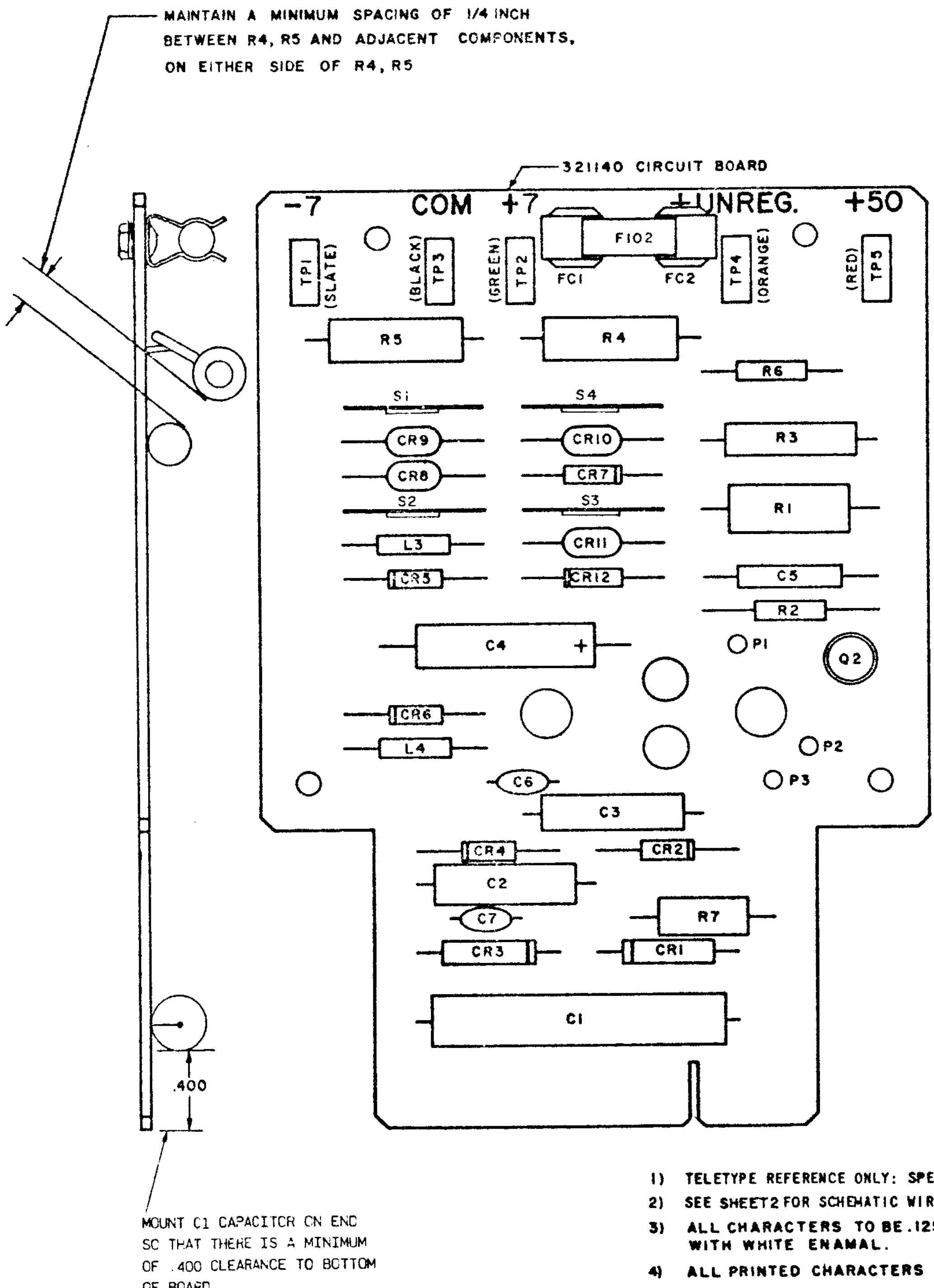
PART NUMBER 321290 TO BE SCREENED ON HEAT SINK WITH .250 HIGH CHARACTERS

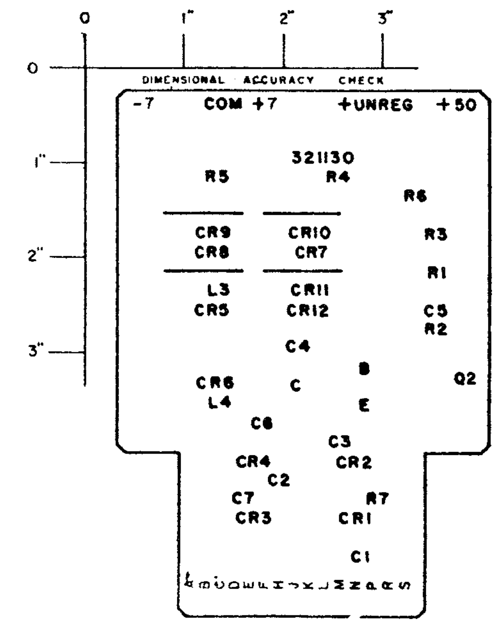
NOTE 2

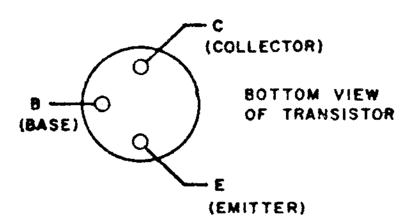
THIS ASSEMBLY MUST BE MADE USING THE HIGHEST CUSTOMER IDENTIFICATION ISSUE NUMBER OF THE 321130 CIRCUIT CARD ASSEMBLY EXISTING AT TIME OF ASSEMBLY.

CURRENT CUSTOMER I.D. ISSUE NUMBER IS 13.

Figure 5-15. Assembly Drawing; Model 28 CPP KSR and RO ESA Power Supply Circuit Board Assembly with Heat Sink




| CIRCUIT BOARD ASSEMBLY, POWER SUPPLY (47-53V.D.C. .5AMP MAX.) | | | | |
|---|---|---|---|---|
| REF. DESIGN. | PART NO. | TOTAL QTY. | NAME AND DESCRIPTION | FUNCTION |
| C1 | 312284 | 1 | CAPACITOR, 1.5 MFD 400V | RF FILTER |
| C2,3 | 171585 | 2 | CAPACITOR, .22MFD 200V | RF FILTER |
| C4 | 171831 | 1 | CAPACITOR, 10MFD 150V | RECTIFIER FILTER |
| C5 | 178860 | 1 | CAPACITOR, .022MFD 100V | RF FILTER |
| C6,7 | 312385 | 2 | CAPACITOR, .1MFD 10V | RF FILTER |
| | | | | |
| R1 | 198937 | 1 | RESISTOR, 2.7K 2W | |
| R2 | 182180 | 2 | RESISTOR, 200 OHM 1/2W | |
| R3 | 171533 | 1 | RESISTOR 4 OHM 5W | |
| R4,5 | 311664 | 2 | RESISTOR, 2.5K 8W | DROPPING |
| R6 | | | SAME AS R2 | RF FILTER |
| R7 | 305298 | 1 | RESISTOR, 3.3K 3W | BLEEDER |
| | | | | |
| CR1-4 | 171541 | 4 | DIODE (NOTE 7) | RECTIFIER |
| CR5,6 | 327794 | 2 | DIODE, ZENER (7.2V) | REFERENCE |
| CR7 | 321285 | 2 | DIODE, ZENER (1N4749A) | REFERENCE |
| CR8-11 | 178844 | 4 | VARISTOR (W.E. 10CA) | REFERENCE |
| CR12 | | | SAME AS CR7 | REFERENCE |
| | | | | |
| L3,4 | 321159 | 2 | INDUCTOR 39 uH | RF FILTER |
| | | | | |
| Q2 | 321145 | 1 | TRANSISTOR (2N2270) | GAIN |
| FC1,2 | 311068 | 2 | FUSE CLIP | |
| F102 | 131807 | 1 | FUSE .5 AMP. | |
| TP1 | 320042 | 1 | JACK, TEST (SLATE) | |
| TP2 | 320041 | 1 | JACK, TEST (GREEN) | |
| TP3 | 320039 | 1 | JACK, TEST (BLACK) | |
| TP4 | 320040 | 1 | JACK, TEST (ORANGE) | |
| TP5 | 320038 | 1 | JACK, TEST (RED) | |
| P1-3 | 137471 | 3 | TERMINAL POST | CONNECTOR |
| | 321140 | 1 | CIRCUIT CARD | |
| S1-S4 | 336470 | 4 | | |
| 1 | 151637 | 2 | SCREW 4-40 | |
| 2 | 151880 | 2 | NUT 4-40 | |
| 3 | 110743 | 2 | LOCK WASHER | |
| 4 | 125011 | 2 | FLAT WASHER | |

CIRCUIT DESCRIPTION (SEE SHEET 2)

DIODES CR1 AND CR3 FORM A RECTIFIER WITH ASSOCIATED TRANSFORMER (321123) T1 AND CAPACITOR C8 (321129) TO OBTAIN A MINIMUM +53V DC UNREGULATED. Q1 IS AN EMITTER FOLLOWER VOLTAGE REGULATING ELEMENT WHICH ABSORBS THE VOLTAGE DIFFERENCE BETWEEN THE UNREGULATED DC AND THE CONSTANT +50V DC REFERENCE ESTABLISHED BY DIODES CR7-CR12. Q2 PROVIDES GAIN FOR Q1. DIODES CR3,CR4, TRANSFORMER T1 AND CAPACITOR C4 FORM A FULL WAVE RECTIFIER TO OBTAIN NEGATIVE UNREGULATED DC. R4 AND CR6, R5 AND CR5 FORM BASIC SHUNT REGULATORS TO OBTAIN +7 AND -7V DC.

1) TELETYPE REFERENCE ONLY: SPECIFICATION 61,267S
2) SEE SHEET 2 FOR SCHEMATIC WIRING
3) ALL CHARACTERS TO BE .125 HIGH AND PRINTED WITH WHITE ENAMAL.
4) ALL PRINTED CHARACTERS TO BE LOCATED ±.031 FROM NOMINAL POSITION.
5) L5 ADDED TO SCHEMATIC AT DRAWING ISSUE 14
6) ANY REVISION OF CUSTOMER IDENTIFICATION NUMBER MUST BE REFLECTED IN NOTE 2 ON DRAWING OF 321290 CIRCUIT CARD ASSEMBLY WITH HEAT SINK.
7) CR1-4-182520 (1N4383) WAS REPLACED FOR STANDARDIZATION

Figure 5-16. Circuit Board Assembly; Model 28 CPP KSR and RO ESA Power Supply (47 - 53 VDC, 0.5 Amp Max) (Sheet 1 of 2)

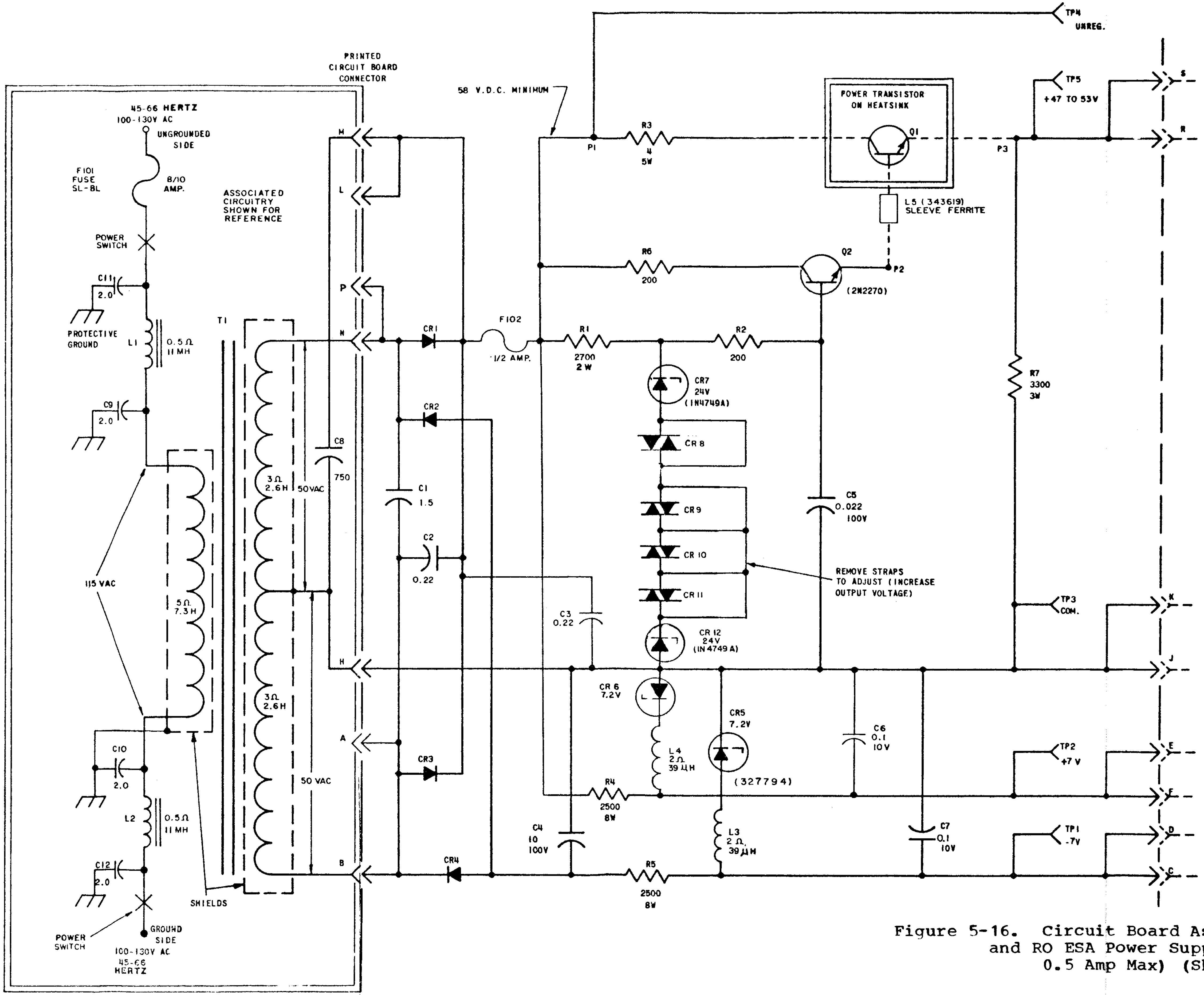
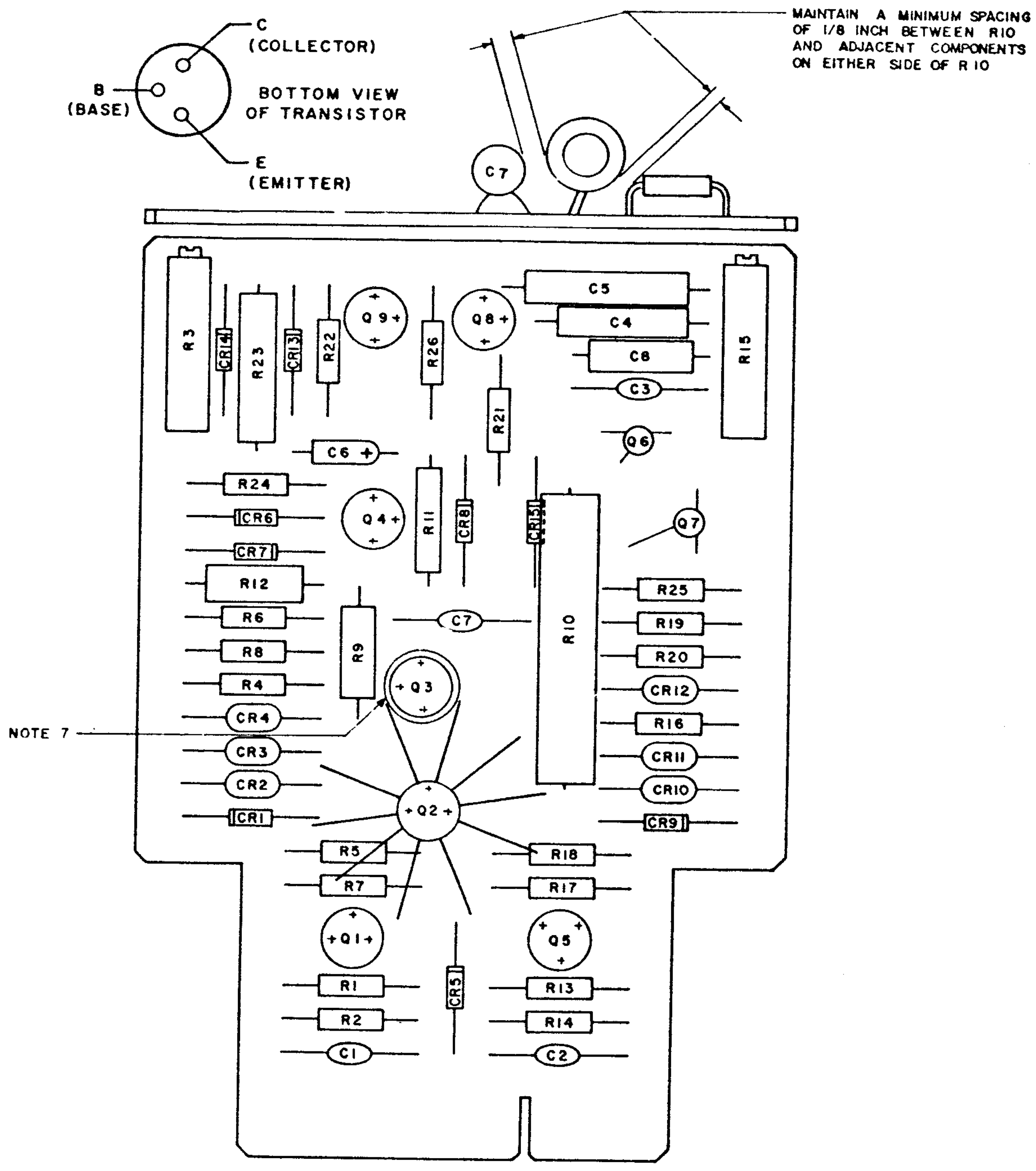


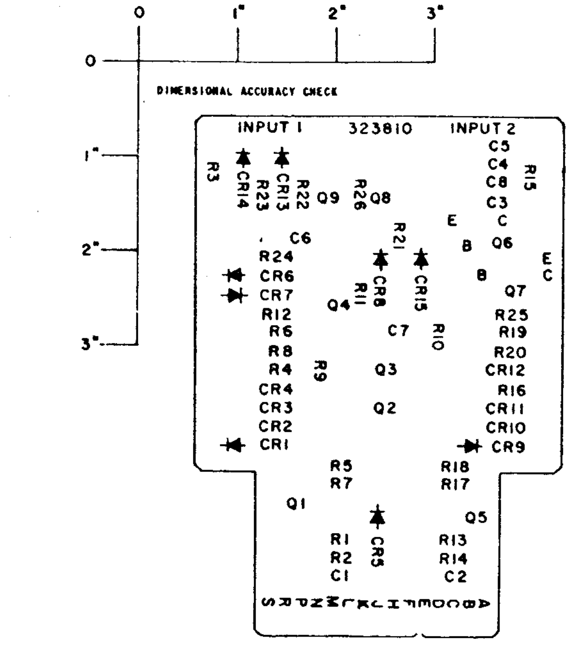

Figure 5-16. Circuit Board Assembly; Model 28 CPP KSR and RO ESA Power Supply (47 - 53 VDC, 0.5 Amp Max) (Sheet 2 of 2)

| REF. DESIG. | TELETYPE PART NO. | TOTAL QTY. | NAME AND DESCRIPTION | LOCATING FUNCTION |
|---|---|---|---|---|
| C1 | 321157 | 1 | CAPACITOR, 500 pf | R.F. BY-PASS CAP. |
| C2 | 321157 | 1 | CAPACITOR, 500 pf | R.F. BY-PASS CAP. |
| C3 | 321157 | 1 | CAPACITOR, 500 pf | R.F. BY-PASS CAP. |
| C4 | 171829 | 1 | CAPACITOR, .15 MFD | Q8 FEEDBACK CAP. |
| C5 | 326776 | 1 | CAPACITOR, .47 MFD | Q9 FEEDBACK CAP. |
| C6 | 321260 | 1 | CAPACITOR, 1 MFD 50V | TRANSIENT SUPP. |
| C7 | 321157 | 1 | CAPACITOR, 500 pf | R.F. BY-PASS CAP. |
| C8 | 178860 | 1 | CAPACITOR, .022 MFD | R F. BY-PASS CAP. |
| | | | | |
| R1 | 118720 | 1 | RESISTOR, 100K, 1/2W | Q1 OPEN LINE BIAS |
| R2 | 118720 | 1 | RESISTOR, 100K, 1/2W | INPUT 1 RES |
| R3 | 323964 | 1 | POTENTIOMETER 500K | Q1 BIAS |
| R4 | 129854 | 1 | RESISTOR, 10K, 1/2W | Q1 BIAS |
| R5 | 118177 | 1 | RESISTOR, 22K, 1/2W | Q1 LOAD RES. |
| R6 | 137604 | 1 | RESISTOR, 620, 1/2W | VOLTAGE DIVIDER |
| R7 | 118146 | 1 | RESISTOR, 4.7K, 1/2W | Q1 EMITTER RES. |
| R8 | 129850 | 1 | RESISTOR, 680, 1/2W | VOLTAGE DIVIDER |
| R9 | 309868 | 1 | RESISTOR, 1.3K, 3W | CR5 CURRENT LIMITER |
| R10 | 323841 | 1 | RESISTOR, 300, 12 W | Q2 LOAD RES. |
| R11 | 323842 | 1 | RESISTOR, 21, 1/2W, 1% | REG. CURRENT SET |
| R12 | 178864 | 1 | RESISTOR, 3.9K, 1W | CR8 CURRENT LIMITER |
| R13 | 118720 | 1 | RESISTOR, 100K 1/2W | Q5 OPENLINE BIAS |
| R14 | 118720 | 1 | RESISTOR, 100K, 1/2W | INPUT 2 RES. |
| R15 | 323964 | 1 | POTENTIOMETER 500K | Q5 BIAS |
| R16 | 129854 | 1 | RESISTOR, 10K, 1/2W | Q5 BIAS |
| R17 | 118177 | 1 | RESISTOR, 22K, 1/2W | Q5 LOAD RES. |
| R18 | 118146 | 1 | RESISTOR, 4.7K, 1/2W | Q5 EMITTER RES. |
| R19 | 137604 | 1 | RESISTOR, 620, 1/2W | VOLTAGE DIVIDER |
| R20 | 129850 | 1 | RESISTOR, 680, 1/2W | VOLTAGE DIVIDER |
| R21 | 321975 | 1 | RESISTOR, 33, 1/2W | Q8 EMITTER RES. |
| R22 | 118177 | 1 | RESISTOR, 22K, 1/2W | CR13 BIAS RES. |
| R23 | 323843 | 1 | RESISTOR, 590, 5W, 1% | COIL CURRENT LIMITER |
| R24 | 137442 | 1 | RESISTOR, 1 5K, 1/2W | C6 BLEEDER RES. |
| R25 | 118154 | 1 | RESISTOR 47K, 1/2W | Q6,Q7 LOAD RES. |
| R26 | 120424 | 1 | RESISTOR 4.3K, 1W | Q8 LOAD RES. |
| | | | | |
| CR1 | 197464 | 7 | DIODE, NOTE 9 | Q1 BASE PROT. |
| CR2 | 178844 | 1 | VARISTOR, 100-A | TEMP. COMP. |
| CR3 | 178844 | 1 | VARISTOR, 100-A | TEMP. COMP. |
| CR4 | 178844 | 1 | VARISTOR, 100-A | TEMP COMP. |
| CR5 | 181667 | 1 | DIODE, 1N750A | TEMP. COMP. REF. |
| CR6 | | | SAME AS CR1 | Q4 COLLECTOR CLAMP |
| CR7 | | | " " " | Q4 COLLECTOR CLAMP |
| CR8 | 321161 | 1 | DIODE, 1N748A | REG. VOLT REF. |
| CR9 | | | SAME AS CR1 | Q5 BASE PROT. |
| CR10 | 178844 | 1 | VARISTOR, 100-A | TEMP. COMP. |
| CR11 | 178844 | 1 | VARISTOR, 100-A | TEMP COMP. |
| CR12 | 178844 | 1 | VARISTOR, 100-A | TEMP. COMP. |
| CR13 | | | SAME AS CR1 | Q9 EMITTER DIODE |
| CR14 | | | " " " | TRANSIENT SUPP. |
| CR15 | | | " " " | Q8 EMITTER DIODE |
| Q1 | 321166 | 1 | TRANSISTOR, 2N1893 | DC AMP. |
| Q2 | 323844 | 1 | TRANSISTOR, 2N3053 | SHUNT REG |
| Q3 | 321261 | 1 | TRANSISTOR, 2N4036 | SHUNT REG. AMP. |
| Q4 | 323845 | 1 | TRANSISTOR, 40319 | SERIES REG. |
| Q5 | 321166 | 1 | TRANSISTOR, 2N1893 | DC AMP |
| Q6 | 324144 | 2 | TRANSISTOR, 2N4121 | DC AMP. |
| Q7 | | | SAME AS Q6 | |
| Q8 | 321165 | 1 | TRANSISTOR, 2N3638A | DC AMP. |
| Q9 | 321281 | 1 | TRANSISTOR, 2N4036 | DC AMP. |
| | 324147 | 2 | PAD, TRANSISTOR | |
| | 144495 | 6 | PAD, TRANSISTOR | |
| | 323846 | 1 | PAD, TRANSISTOR | |
| | 323847 | 1 | HEAT SINK | |
| | 323835 | 1 | CIRCUIT BOARD, ETCHED | |
| | 300116 | 1 | COVER, INSULATING | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

USED ON 323808.




SCALE 2/1




SCALE 1/1

NOTES:

1. TRANSISTOR Q2 HAS 323847 HEAT SINK PRESSED ON.
2. USE 323846 TRANSISTOR PAD UNDER TRANSISTOR Q3.
3. REFERENCE SPECIFICATION FOR TELETYPE CORP. EMPLOYEES ONLY: 61,264S
4. REFER TO 8143WD FOR SCHEMATIC WIRING DIAGRAM.
5. ALL CHARACTERS TO BE .125 HIGH AND PRINTED WITH WHITE ENAMEL.
6. ALL PRINTED CHARACTERS TO BE LOCATED +.031 FROM NOMINAL.
7. Q3 HAS 300116 INSULATING COVER. POSITION Q3 (WITH COVER) SO THAT 323847 HEAT SINK MAY BE FULLY SEATED ON Q2.
8. 144495 TRANSISTOR PAD REQUIRED ON Q1, Q4, Q5, Q8 AND Q9, AND Q2.
9. PARTS CHANGED FOR STANDARDIZATION WERE FORMERLY AS FOLLOWS CR1, CR9, CR14 — 321154 (1N457A) AND CR6, CR7, CR13, CR15 — 321156 (1N482A).

Figure 5-17. Circuit Board Assembly; Model 28 CPP KSR and RO ESA SMD with Signal Combiner

| NO. | NOTES |
|---|---|
| 1. | R3 AND R15 ARE ADJUSTED FOR SYMMETRICAL SWITCHING ABOUT ZERO VOLTS FOR INPUT 1 AND 2 RESPECTIVELY |
| 2. | PINS A,B - 60MA TO COILS<br>PINS C,D - 47 TO 53V DC POWER INPUT<br>PINS N,P - MS 188B SIGNAL INPUT 1<br>PINS E,F - MS 188B SIGNAL INPUT 2<br>PINS H,J,K,L,M, - CIRCUIT COMMON<br>(ALL INPUTS AND OUTPUTS REFERRED TO CIRCUIT COMMON). |
| 3. | REFERENCE SPEC. FOR TELETYPE CORP. EMPLOYEES ONLY:<br>61,264S. |
| 4. | ALL RESISTORS ARE 5%, 1/2 WATT UNLESS OTHERWISE SPECIFIED. |
| 5. | ALL CAPACITANCE VALUES IN PICOFARADS UNLESS OTHERWISE SPECIFIED. |
| 6. | DENOTES CIRCUIT COMMON. |
| | |

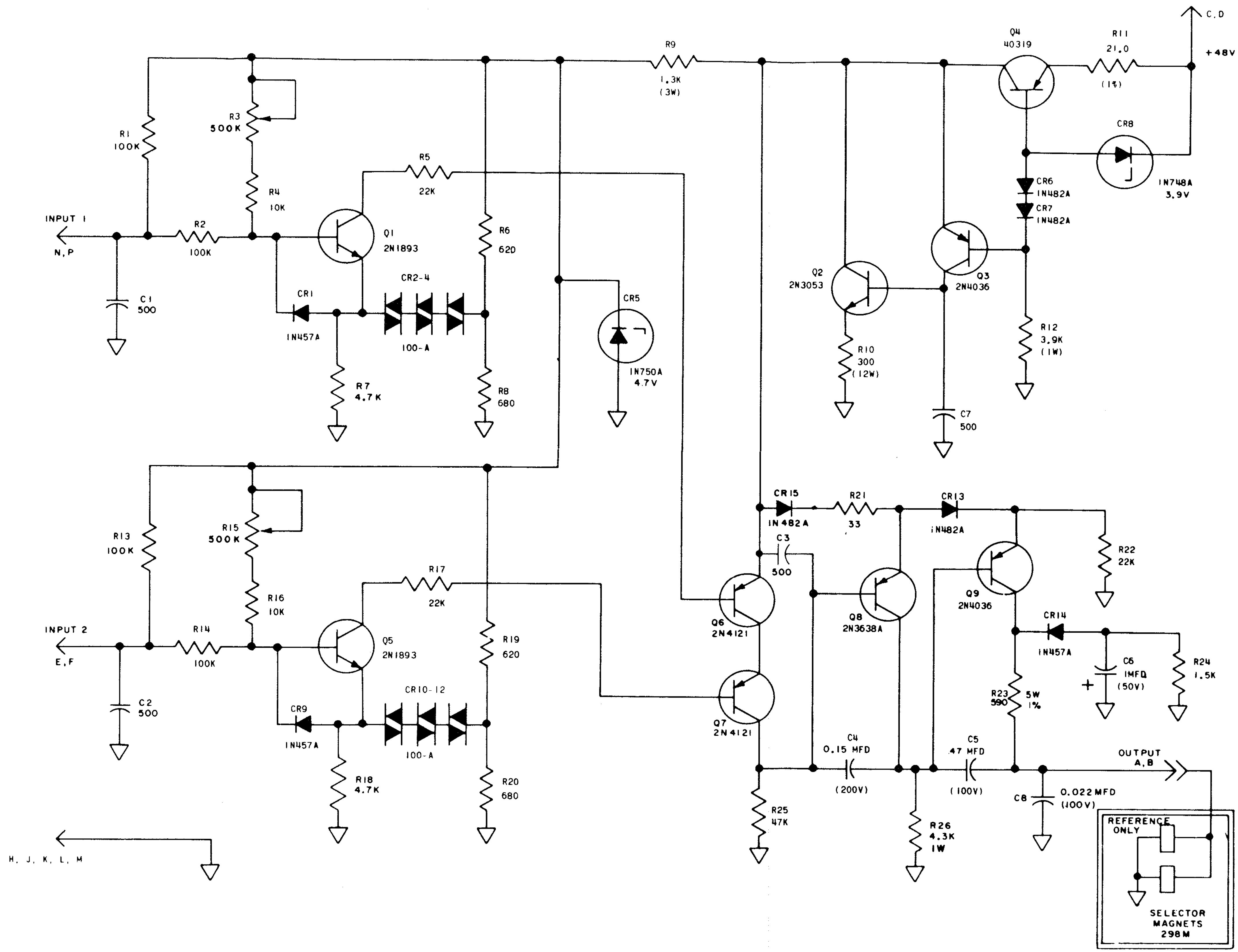



Figure 5-18. Schematic Diagram; Model 28 CPP KSR and RO ESA SMD with Signal Combiner, 323810

| NO. | NOTES |
|---|---|
| 1. | ALL VOLTAGES DC UNLESS OTHERWISE SPECIFIED. |
| 2. | TERMINAL DESIGNATION ENCLOSED IN PARENTHESIS ARE FOR REFERENCE AND ARE NOT MARKED ON COMPONENT. |
| 3. | FUSE NUMBER-162360 8/10 AMP SLOW BLOWING |
| 4. | TERMINALS 7 AND 9 ARE CONNECTED TO THE OUTER SHIELD THRU THE MOUNTING SCREWS |
| 5. | ✱ INDICATES TO TAPE END TERMINATING POINT. |
| 6. | INDICATES SINGLE SHIELDING |
| 7. | INDICATES DOUBLE SHIELDING |
| 8. | ALL STRAPPING WIRE 24 AWG. BARE, 39603 RM USE SLEEVING WHERE REQUIRED. ① INDICATES 18 AWG STRANDED WIRE. ② INDICATES 24 AWG STRANDED WIRE ③ INDICATES 24 AWG 2 LEAD SINGLE SHIELDED CABLE. ALL SURFACE WIRE 24 AWG GREEN, 31784 RM, UNLESS OTHERWISE SPECIFIED. |
| 9. | REFER TO 8725WD FOR SCHEMATIC WIRING DIAGRAM |
| 10. | COLOR CODE<br>BK - BLACK G - GREEN<br>BR - BROWN O - ORANGE<br>BL - BLUE P - PURPLE<br>R - RED Y - YELLOW<br>S - SLATE W - WHITE |
| 11. | OUTER SHIELD CONNECTED TO BOX AT CONNECTOR. |

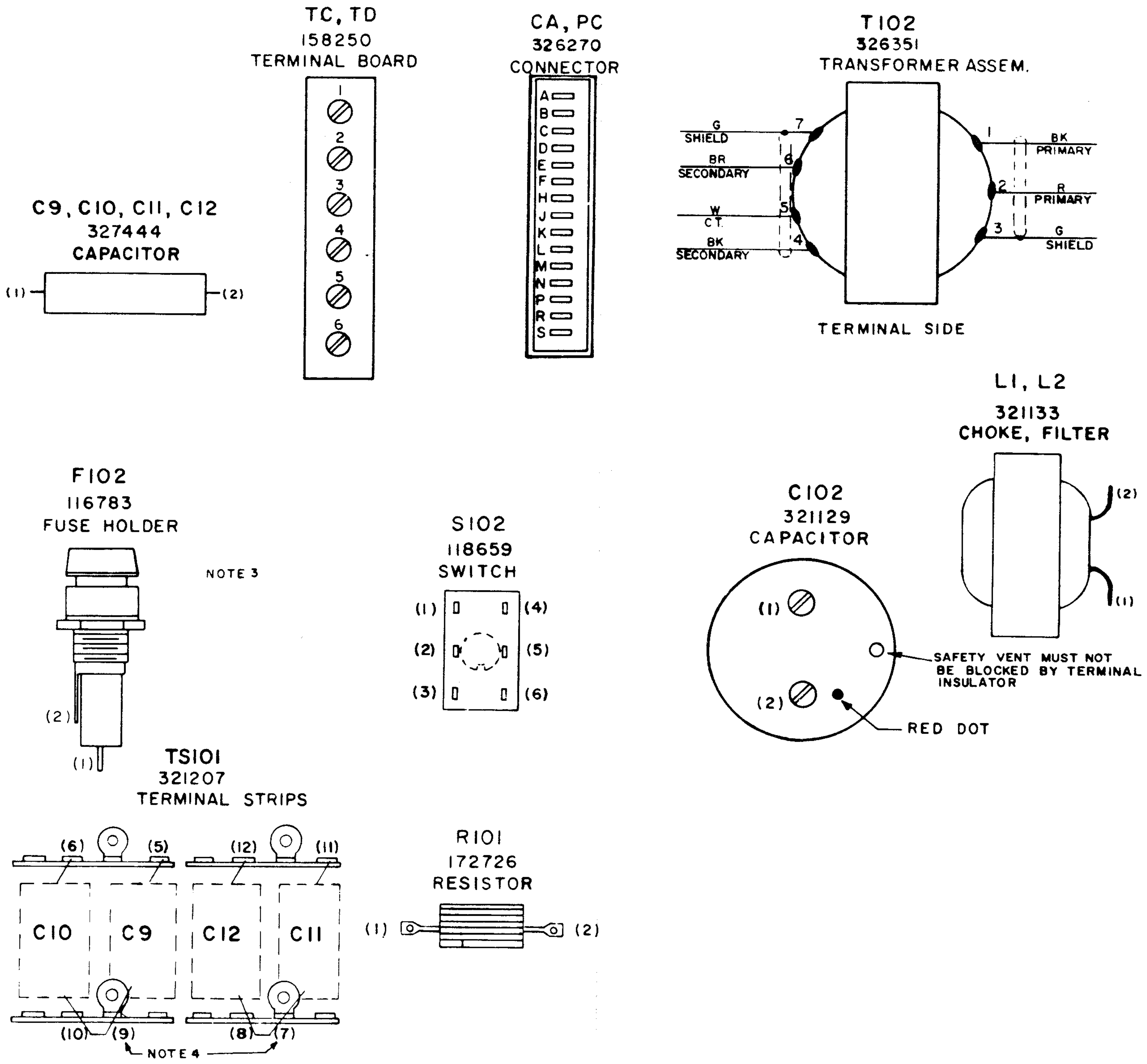
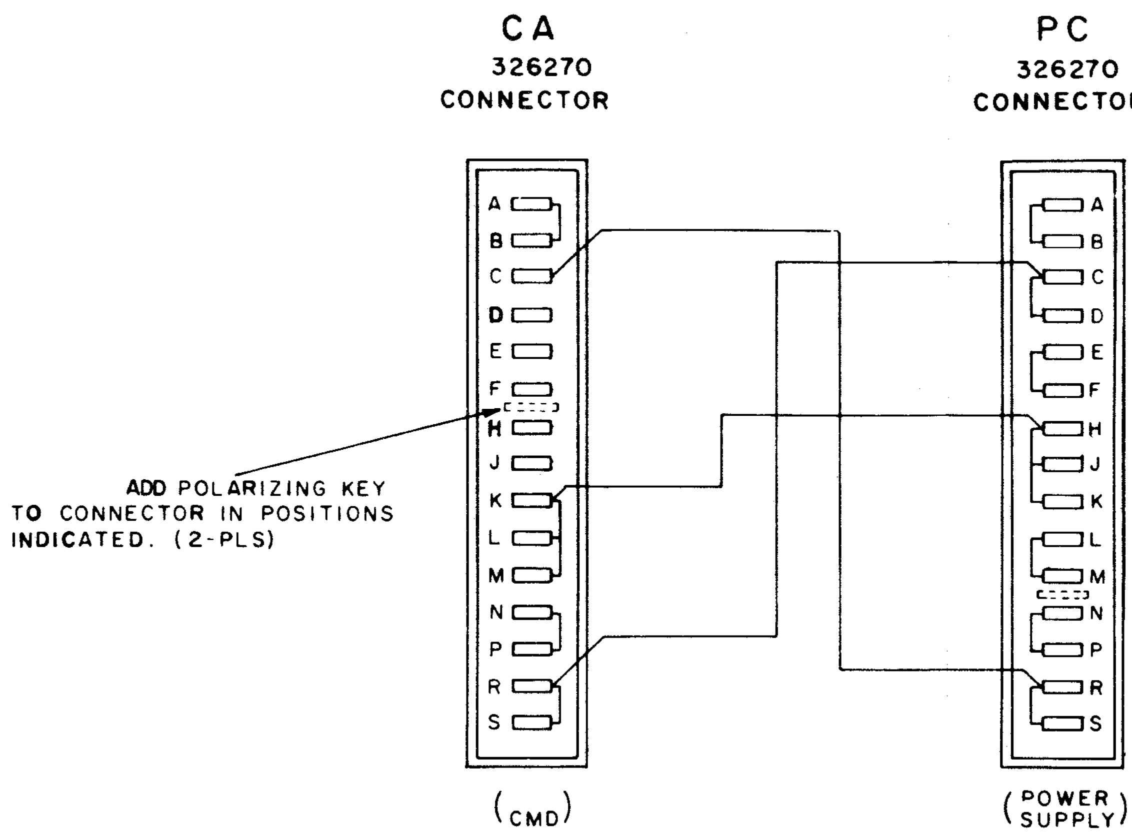



Figure 5-19. Wiring Diagram; Model 28 CPP KSR ESA 323120 (CMD) (Sheet 1 of 4)

| NO. | NOTES |
|---|---|
| 1. | SEE SHEET 1 FOR NOTES. |



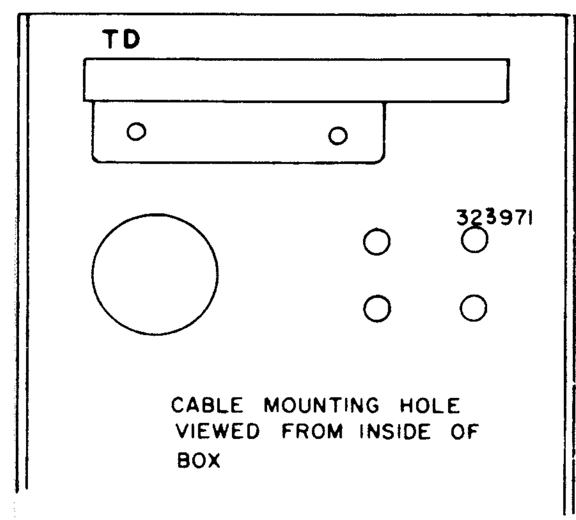
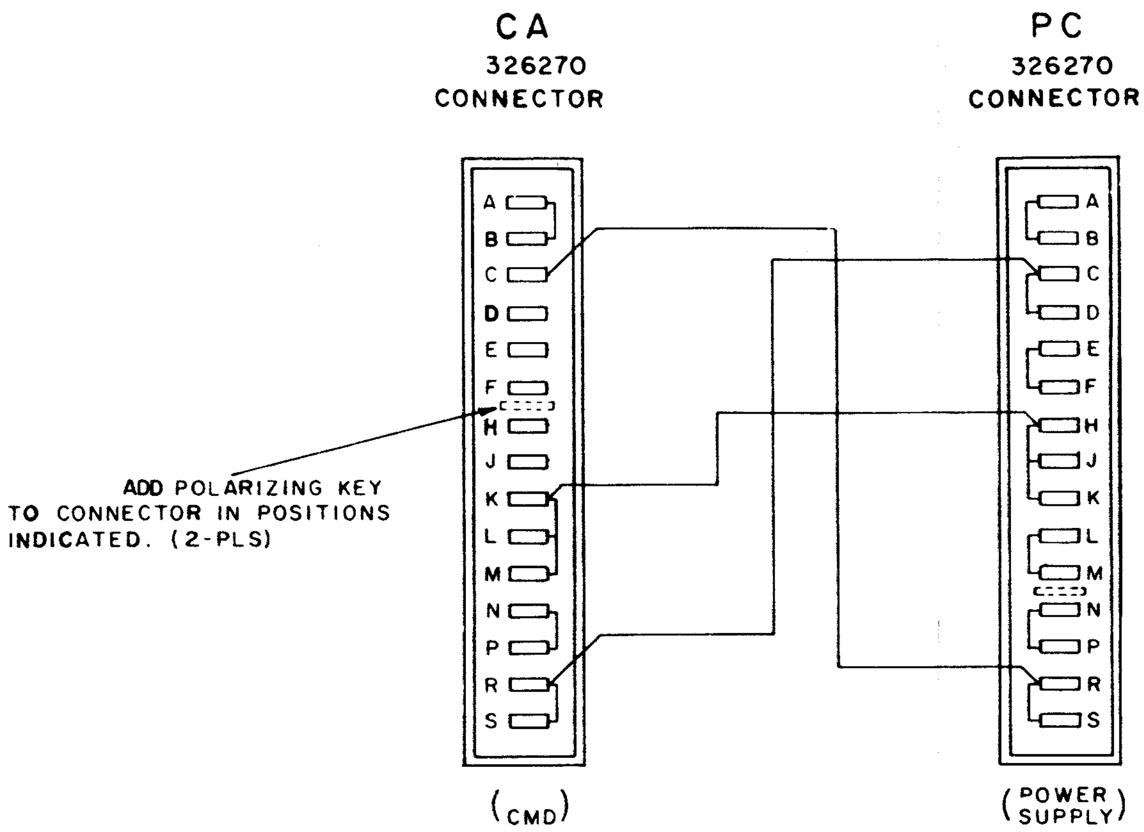




Figure 5-19. Wiring Diagram; Model 28 CPP KSR ESA 323120 (CMD) (Sheet 2 of 4)

| NO. | NOTES |
|---|---|
| 1. | SEE SHEET 1 FOR NOTES. |



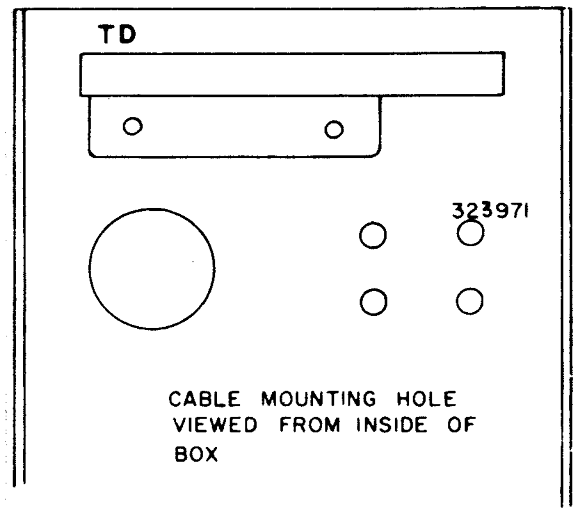




Figure 5-19. Wiring Diagram; Model 28 CPP KSR ESA 323120 (CMD) (Sheet 2 of 4)

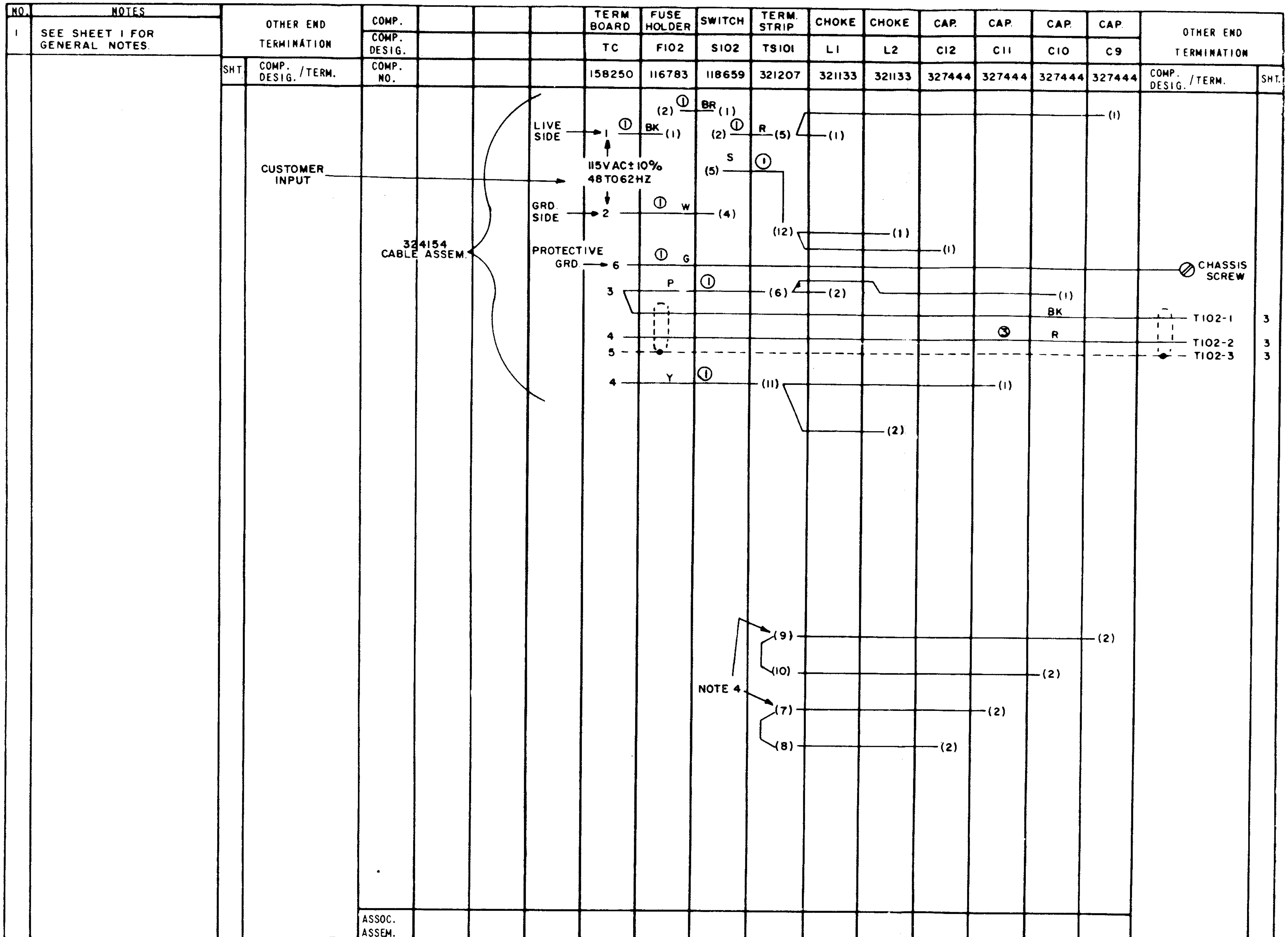



Figure 5-19. Wiring Diagram; Model 28 CPP KSR ESA 323120 (CMD) (Sheet 4 of 4)

| NO. | NOTES |
|---|---|
| 1. | ALL RESISTORS 1/2 WATT, RESISTANCE VALUES IN OHMS, CAPACITANCE VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED. |
| 2. | INDICATES FEMALE TERMINAL<br>INDICATES MALE TERMINAL |
| 3. | INDICATES SINGLE SHIELDING<br>INDICATES DOUBLE SHIELDING |
| 4. | REFER TO 8724WD FOR ACTUAL WIRING DIAGRAM. |
| 5. | SL-BL INDICATES SLOW-BLOWING. |
| 6. | INDICATES CIRCUIT COMMON |
| 7. | S-NUMBER 61,598 |
| 8. | TERMINAL DESIGNATIONS ENCLOSED IN PARENTHESIS ARE FOR REFERENCE AND ARE NOT MARKED ON COMPONENT. |
| 9. | REFER TO RELATED SET SCHEMATIC 8729WD FOR EXTERNAL CIRCUITS. |
| 10. | 8 OHMS (MAX.) PRIMARY RESISTANCE<br>10 OHMS (MAX.) SECONDARY RESISTANCE TO CENTER TAP. |

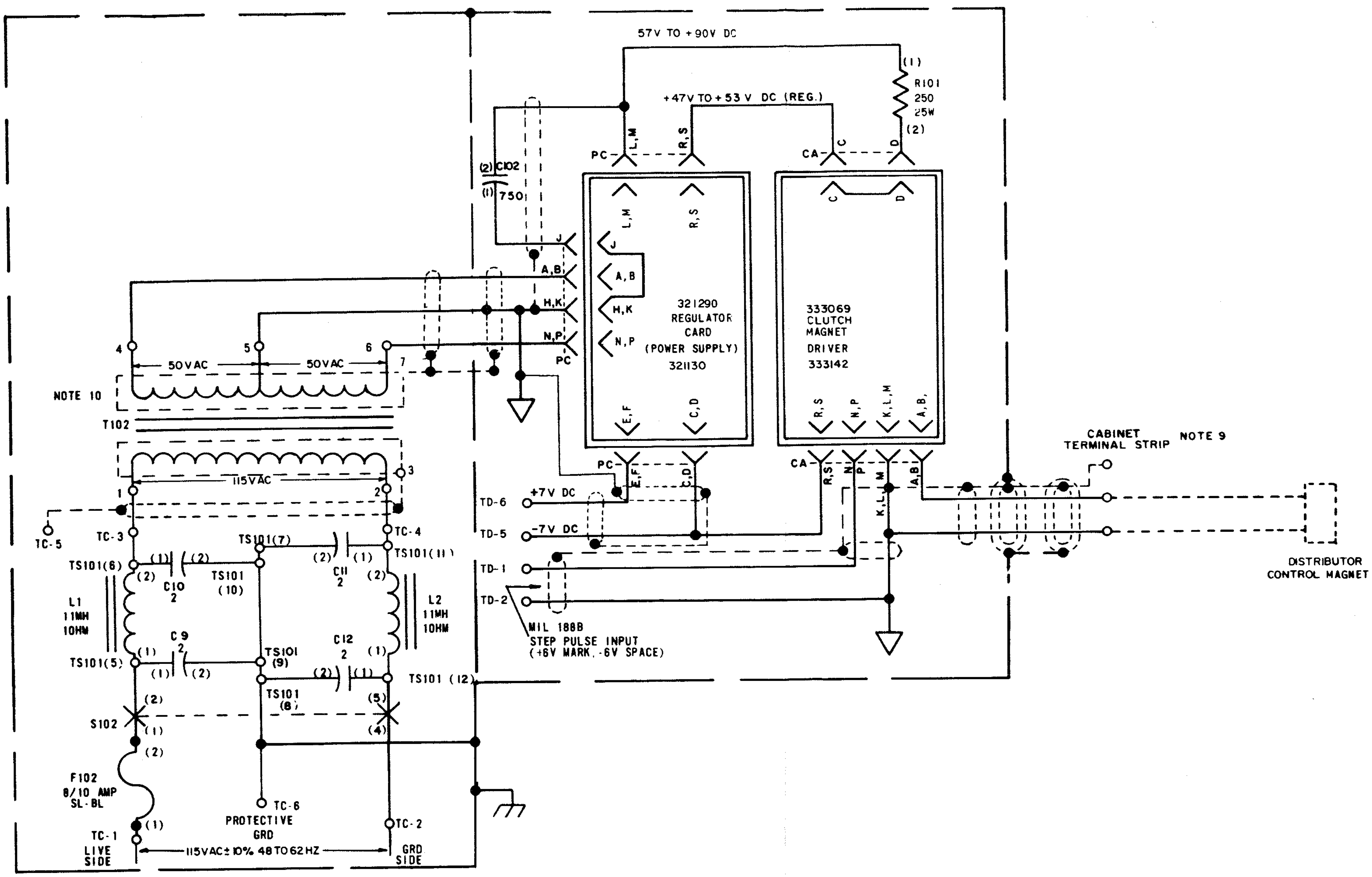



Figure 5-20. Schematic Diagram; Model 28 CPP KSR ESA
323120 (CMD)

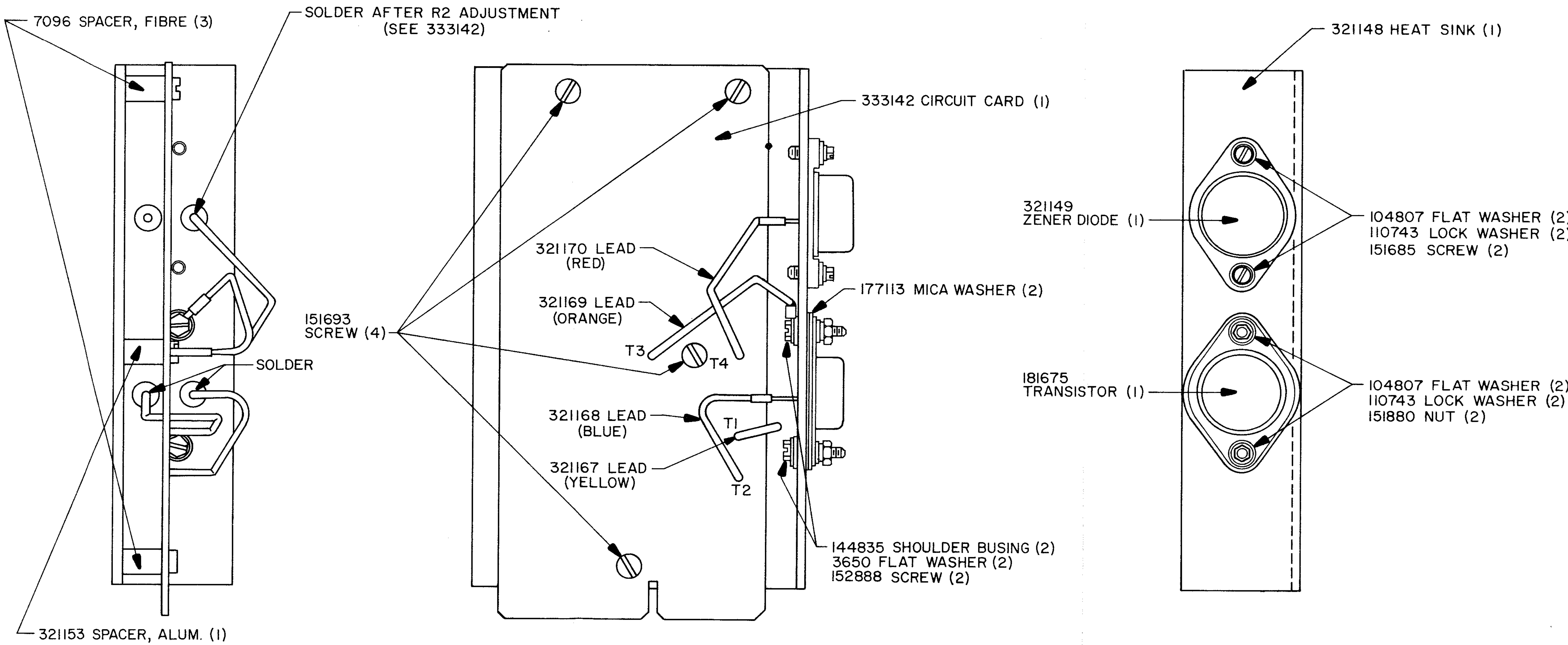
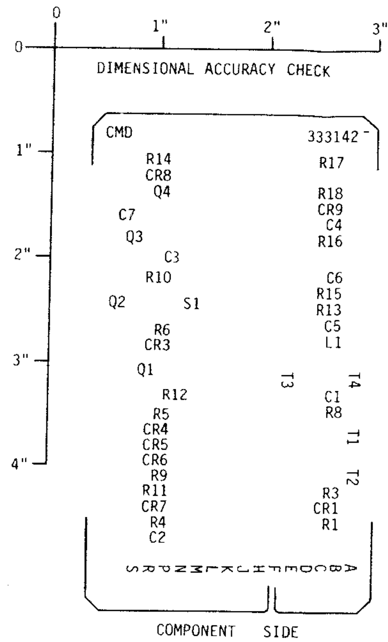


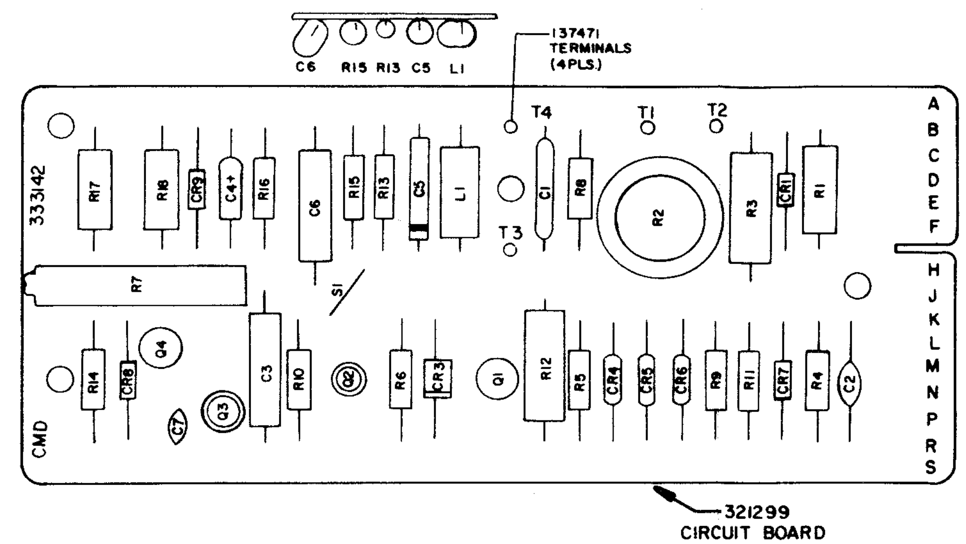

Figure 5-21. Assembly Drawing; Model 28 CPP KSR ESA CMD Circuit Board Assembly with Heat Sink

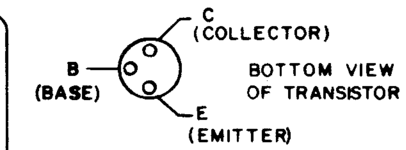
NOTES:

1. THIS VIEW MAY BE USED AS 1-TO-1 MASTER FOR ARTWORK.
2. ALL CHARACTERS TO BE 0.125 IN. HIGH AND PRINTED WITH WHITE ENAMEL.
3. ALL PRINTED CHARACTERS TO BE LOCATED +0.031 IN. FROM POSITION SHOWN IN VIEW.




| REF. DESIG. | TELETYPE PART NO. | TOTAL QTY | NAME AND DESCRIPTION | LOCATING FUNCTION |
|---|---|---|---|---|
| R1 | 329275 | 1 | RESISTOR,35 OHM, 1W, +1% | REG. CURRENT LIMITER |
| R2 | 182773 | 1 | POTENTIOMETER,30 OHM,2.5W | REG. CURRENT ADJ. |
| R3 | 32115 | 1 | RESISTOR, 2K, 2W, 5% | CR1 CURRENT LIMITER |
| R4 | 118720 | 1 | RESISTOR. 100K. 1/2W. 5% | Q1 OPEN LINE BIAS |
| R5 | 118720 | 1 | RESISTOR. 100K, 1/2W, 5% | INPUT RESISTOR |
| R6 | 129854 | 1 | RESISTOR, 10K, 1/2W | Q1 BIAS |
| R7 | 321160 | 1 | POTENTIOMETER, 5M | Q1 BIAS |
| R8 | 118146 | 1 | RESISTOR, 4.7K, 1/2W, 5% | Q1 EMITTER RES |
| R9 | 129850 | 1 | RESISTOR,680 OHM,1/2W,5% | VOLTAGE DIVIDER |
| R10 | 321258 | 1 | RESISTOR, 20K, 1/2W, 5% | Q1 LOAD RES |
| R11 | 137604 | 1 | RESISTOR,620 OHM,1/2W,5% | VOLTAGE DIVIDER |
| R12 | 321292 | 1 | RESISTOR, 1.3K, 2W, 5% | CR7 CURRENT LIMITER |
| R13 | 139143 | 1 | RESISTOR, 43K, 1/2W, 5% | Q2 LOAD RES |
| R14 | 321259 | 1 | RESISTOR,15 OHM,1/2W,5% | Q3 EMITTER RES |
| R15 | 165178 | 1 | RESISTOR,3.6K,1/2W,5% | Q3 LOAD RES |
| R16 | 137442 | 1 | RESISTOR,1.5K,1/2W,5% | C4 BLEEDER RES |
| R17 | 329273 | 1 | RESISTOR,470 OHM,31/4W,5% | COIL CURRENT LIMITER |
| R18 | 321258 | 1 | RESISTOR,20K,1/2W,5% | CR8 BIAS RES |
| | | | | |
| C1 | 321158 | 1 | CAPACITOR, 0.1 MFD | RF BYPASS CAPACITOR |
| C2 | 321157 | 1 | CAPACITOR, 500 PFD | RF BYPASS CAPACITOR |
| C3 | 171829 | 1 | CAPACITOR, 0.15 MFD | Q3 FEEDBACK CAPACITOR |
| C4 | 321264 | 1 | CAPACITOR, 50V, 1.7 MFD | TRANSIENT SUPPLY |
| C5 | 178860 | 1 | CAPACITOR,100V,0.022 MFD | RF BYPASS CAPACITOR |
| C6 | 171587 | 1 | CAPACITOR,200V,0.25 MFD | Q4-FEEDBACK CAPACITOR |
| C7 | 171583 | 1 | CAPACITOR, 0.003 MFD | RF BYPASS CAPACITOR |
| L1 | 321159 | 1 | CHOKE, 39.0 OHM | RF CHOKE |
| | | | | |
| CR1 | 321161 | 1 | DIODE,1N748A,3.9V±5% | REG VOLTAGE REF |
| CR3 | 197464 | 2 | DIODE, (NOTE 7) | Q1 BASE PROT |
| CR4 | 178844 | 1 | VARISTOR,100-A | TEMP COMP |
| CR5 | 178844 | 1 | VARISTOR,100-A | TEMP COMP |
| CR6 | 178844 | 1 | VARISTOR,100-A | TEMP COMP |
| CR7 | 181667 | 1 | DIODE,1N750A,4.7V ±5% | TEMP COMP REF |
| CR8 | 312341 | 1 | DIODE, (NOTE 7) | Q4 EMITTER DIODE |
| CR9 | | 1 | SAME AS CR3 | TRANSIENT SUPPLY |
| Q1 | 321166 | 1 | TRANSISTOR, 2N1893 | DC AMP |
| Q2 | 324144 | 1 | TRANSISTOR, 2N4121 | DC AMP |
| Q3 | 321165 | 1 | TRANSISTOR, 2N3638A | DC AMP |
| Q4 | 321261 | 1 | TRANSISTOR, 2N4036 | DC AMP |
| | 324147 | 1 | PAD, TRANSISTOR | |
| | 144495 | 3 | PAD, TRANSISTOR | |
| | 321299 | 1 | CIRCUIT BOARD, ETCHED | |
| | | | | |
| T1-T4 | 137471 | 4 | LUG, TERMINAL | |
| S1 | 39603RM | 1 | STRAP 5/8 IN. LONG | |




| NO. | NOTES |
|---|---|
| | ALL RESISTORS 1/2 WATT, ALL RESISTANCE VALUES IN OHMS AND ALL CAPACITANCE VALUES IN MFD. UNLESS OTHERWISE SPECIFIED. |
| | Q5 (181875) AND CR2 (321149) ARE MOUNTED TO 321148 HEAT SINK. SEE CMD ASSEMBLY 333069 |
| | R2 IS ADJUSTED FOR 12 TO 25 MA IN CR2 WITH INPUT MARKING (+6) AND OUTPUT CONNECTED TO A 330 OHM RESISTOR (5W) |
| | R7 IS ADJUSTED FOR SYMETRICAL SWITCHING ABOUT ZERO. |
| | PINS A,B — 46 MA TO COILS<br>PINS R,S — -7V DC<br>PINS C,D — -47 TO 53V DC POWER<br>PINS N,P — MS 188B SIGNAL INPUT<br>PINS K,L,M — COMMON<br>(ALL INPUTS AND OUTPUTS REFERRED TO COMMON) |
| | S NUMBER 61598S |
| | PARTS CHANGED FOR STANDARDIZATION WERE FORMERLY AS FOLLOWS: CR3, CR9-321154 (IN457A), CR8-177611 (IN682). |

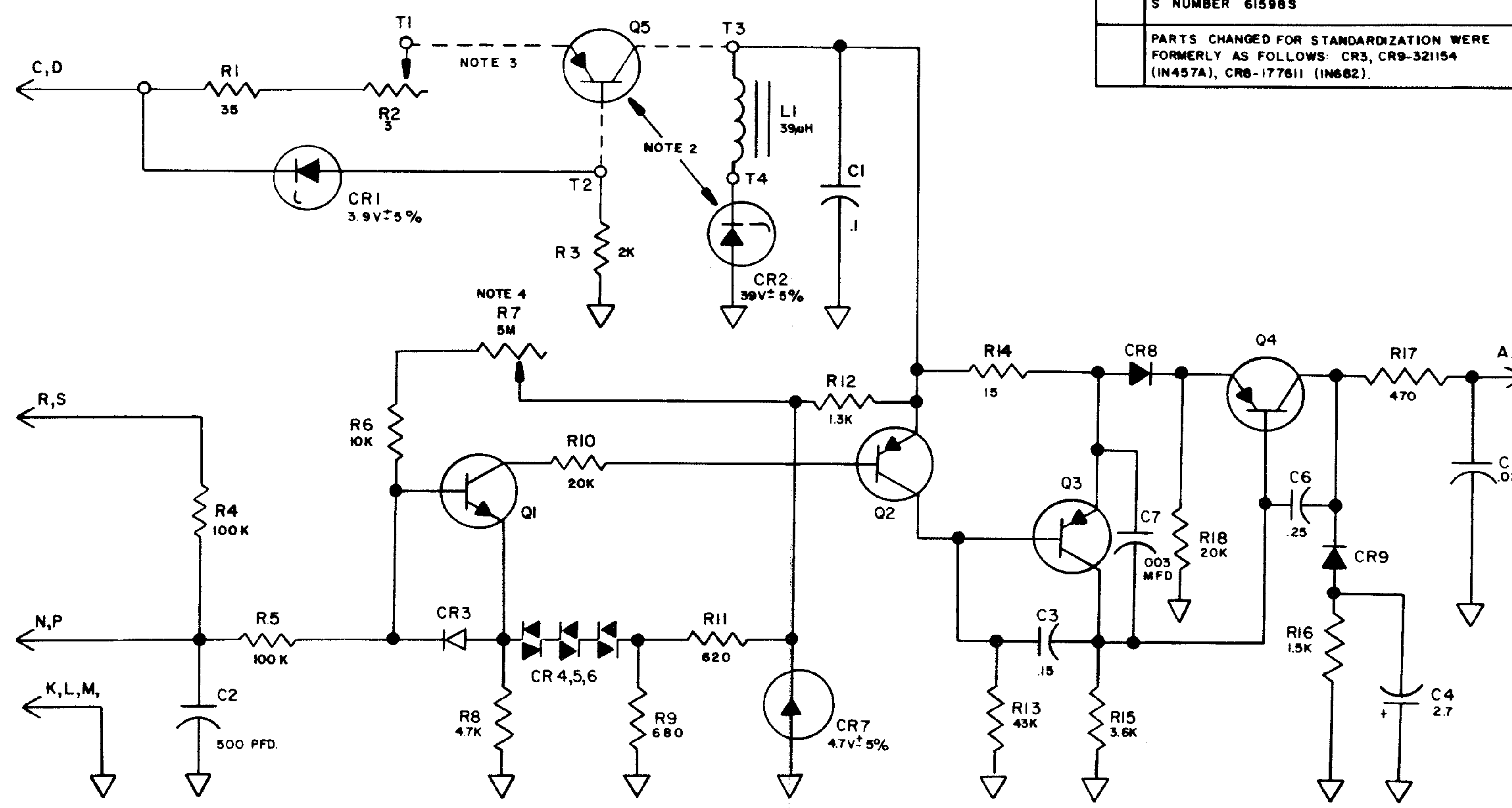



Figure 5-22. Schematic Diagram; Model 28 CPP KSR ESA CMD Circuit Board Assembly

| NO. | NOTES |
|---|---|
| 1. | ALL VOLTAGES DC UNLESS OTHERWISE SPECIFIED. |
| 2. | TERMINAL DESIGNATION ENCLOSED IN PARENTHESIS ARE FOR REFERENCE AND ARE NOT MARKED ON COMPONENT. |
| 3. | ALL SURFACE WIRE 24 AWG GREEN, 31784RM, UNLESS OTHERWISE SPECIFIED. |
| 4. | ALL STRAPPING WIRE 24 AWG BARE, 39603RM. USE SLEEVING WHERE REQUIRED. |
| 5. | ✱ INDICATES TO TAPE END TERMINATING POINT. |
| 6. | INDICATES SINGLE SHIELDING |
| 7. | INDICATES DOUBLE SHIELDING |
| 8. | THE PA CONNECTOR TAKES A 321290 CARD, THE SA TAKES A 323810 CARD. |
| 9. | ① INDICATES 18 AWG STRANDED WIRE. |
| 10. | ② INDICATES 24 AWG STRANDED WIRE. |
| 11. | ③ INDICATES 24 AWG 2 LEAD SINGLE SHIELDED CABLE. |
| 12. | FUSE NUMBER: 162360 8/10AMP SLOW BLOWING |
| 13. | SCHEMATIC DIAGRAM-8178WD |
| 14. | REFERENCE SPEC. FOR TELETYPE CORPORATION EMPLOYEES ONLY 61352S |
| 15. | COLOR CODE: BK-BLACK BL-BLUE W-WHITE R-RED Y-YELLOW BR-BROWN P-PURPLE O-ORANGE S-SLATE G-GREEN |
| 16. | 321226 ASSEMBLY USES TERMINAL BOARDS TA, TB,TC,TD AS SHOWN. 321231 ASSEMBLY USES 158250 TERMINAL BOARD AS TA,TB ONLY. |
| 17. | PLACE A POLARIZING KEY IN SA CONNECTOR BETWEEN E AND F, IN PA CONNECTOR BETWEEN M AND N. |

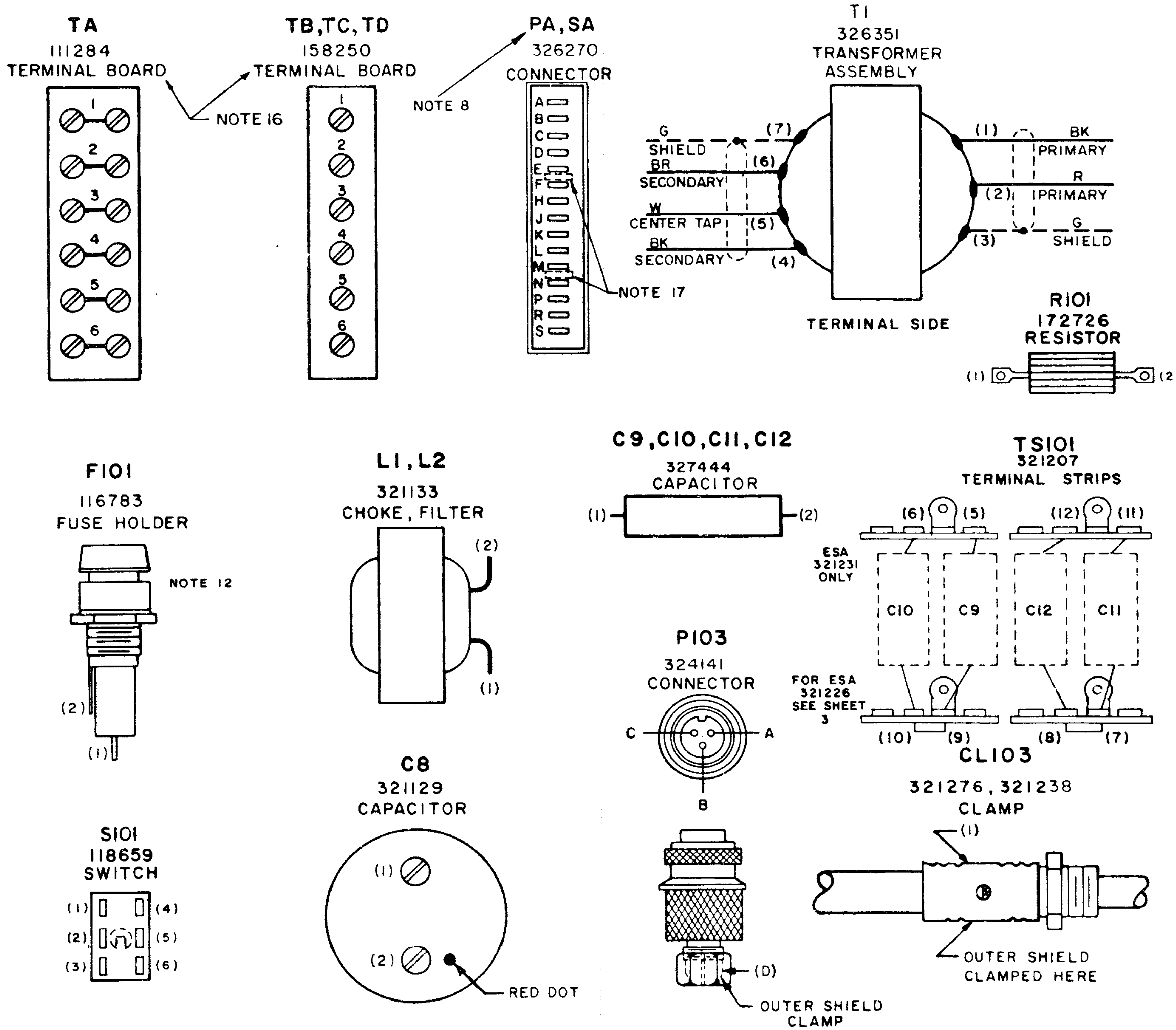



Figure 5-23. Wiring Diagram; Model 28 CPP KSR ESA 323121 (SMD and LLK) (Sheet 1 of 3)

| NO. | NOTES |
|---|---|
| | REFER TO SHEET 1 FOR NOTES 1 TO 12 |
| 13. | "TA" BOARD IS MOUNTED WITH NO.6 CLOSEST TO FUSE. "TB" BOARD HAS NO. 1 CLOSEST TO CABLE P101 |
| 14 | CONNECTORS SHOULD BE MOUNTED WITH "PA" AT CAPACITOR MOUNTING SIDE. "SA" SHOULD BE MOUNTED CLOSEST TO R101 AND KA SHOULD BE MOUNTED IN THE CENTER. POLARIZING KEYS SHOULD BE INSERTED BETWEEN E AND F OF SA, BETWEEN J AND K OF KA AND BETEEN M AND N OF PA |
| 15. | WHEN IT IS DESIRED TO USE EXTERNAL BATTERY, REMOVE TAPE AND TIE THESE LEADS CONNECT + BATTERY (6.6 TO 7.8V) TO TERMINAL TB2 AND -BATTERY (6.6 TO 7.8V) TO TERMINAL TB3. CONNECT COMMON OF SUPPLY TO TB6 IF ± 6V IS SUPPLIED OUTPUT OF KEYER WILL DROP TO ± 4.5V. |
| 16. | FOR LOCAL COPY OF KEYER STRAP TB4 TO TB1. |

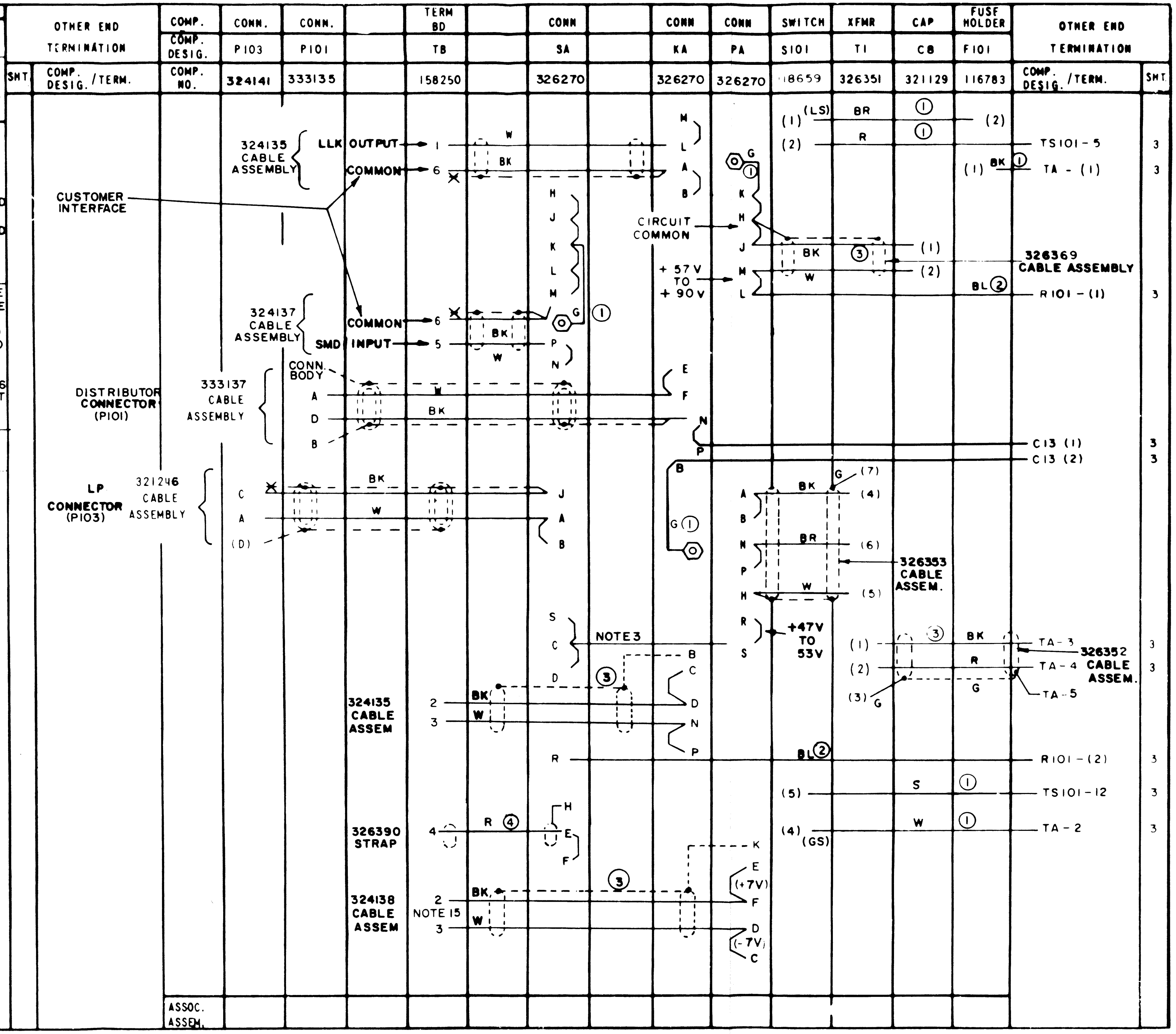



Figure 5-23. Wiring Diagram; Model 28 CPP KSR ESA 323121 (SMD and LLK) (Sheet 2 of 3)

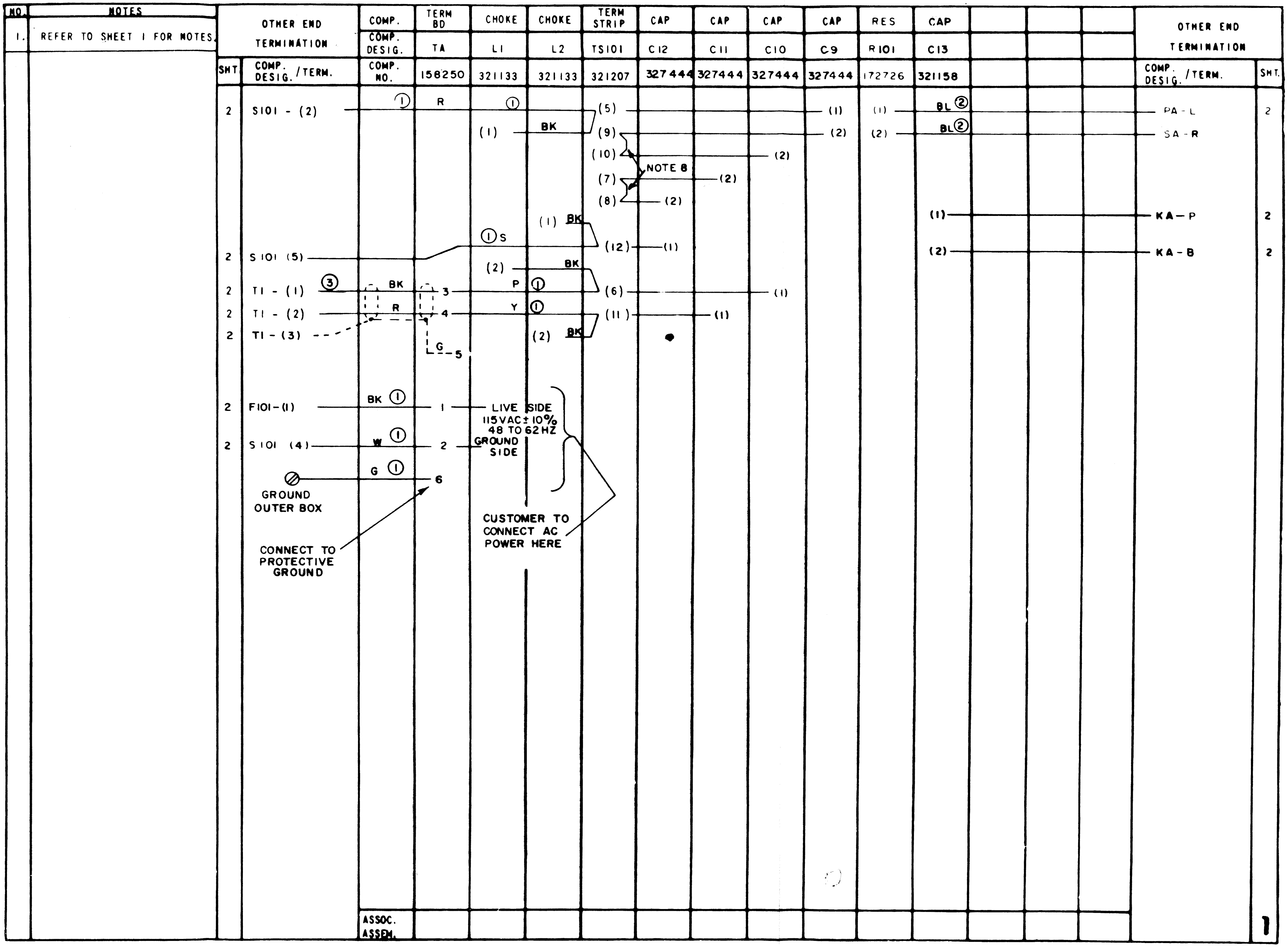



Figure 5-23. Wiring Diagram; Model 28 CPP KSR ESA 323121 (SMD and LLK) (Sheet 3 of 3)

| NO. | NOTES |
|---|---|
| 1. | ——— INDICATES OUTER SHIELD AND ------ INDICATES INNER SHIELD |
| 2. | CAPACITANCE VALUES IN MICROFARADS, UNLESS OTHERWISE SPECIFIED. |
| 3. | ≻—— INDICATES FEMALE AND ——≻ INDICATES MALE TERMINALS ON CONNECTORS |
| 4. | SL-BL INDICATES SLOW-BLOWING. |
| 5. | S-NUMBER 61,599 |
| 6. | ALL VOLTAGES DC, UNLESS OTHERWISE SPECIFIED. |
| 7. | TERMINAL DESIGNATIONS ENCLOSED IN PARENTHESES ARE FOR REFERENCE AND ARE NOT MARKED ON COMPONENT. |
| 8. | ACTUAL WIRING DIAGRAM - 8726 WD |
| 9. | RESISTANCE VALUES IN OHMS UNLESS OTHERWISE SPECIFIED. |
| 10. | FOR LOCAL COPY FROM KEYER, STRAP TB4 TO TB1. |
| 11. | WHEN IT IS DESIRED TO PROVIDE AN EXTERNAL +7V AND -7V. REMOVE THE +7V AND -7V LEADS FROM TB2 AND TB3. CONNECT COMMON OF EXTERNAL SUPPLY TO TB6 |
| 12. | REFER TO RELATED SET SCHEMATIC 8729 WD FOR EXTERNAL CIRCUITS. |
| 13. | INDICATES SINGLE SHIELDING; INDICATES DOUBLE SHIELDING |
| 14. | ▽ INDICATES CIRCUIT COMMON |

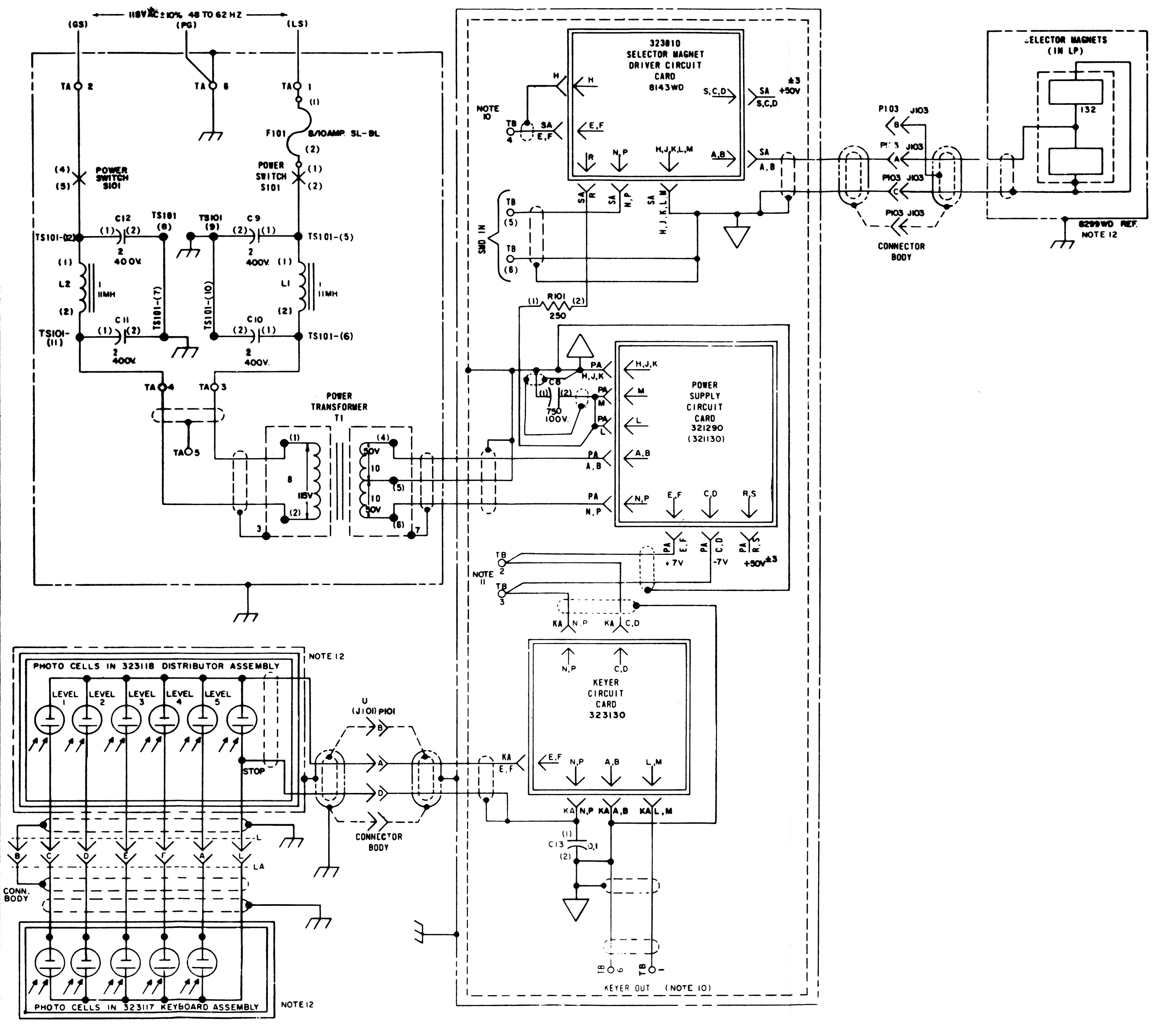
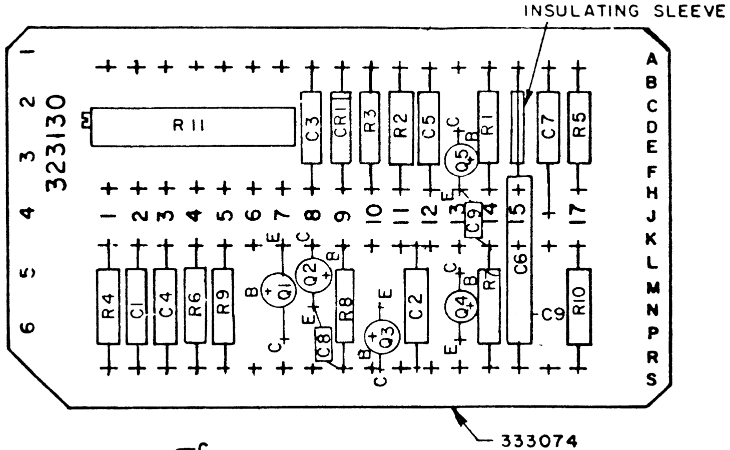
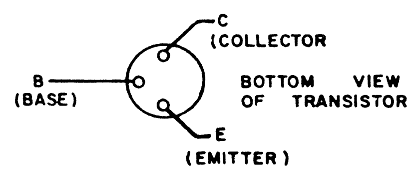



Figure 5-24. Schematic Diagram; Model 28 CPP KSR ESA 323121 (SMD and LLK)

NOTES:

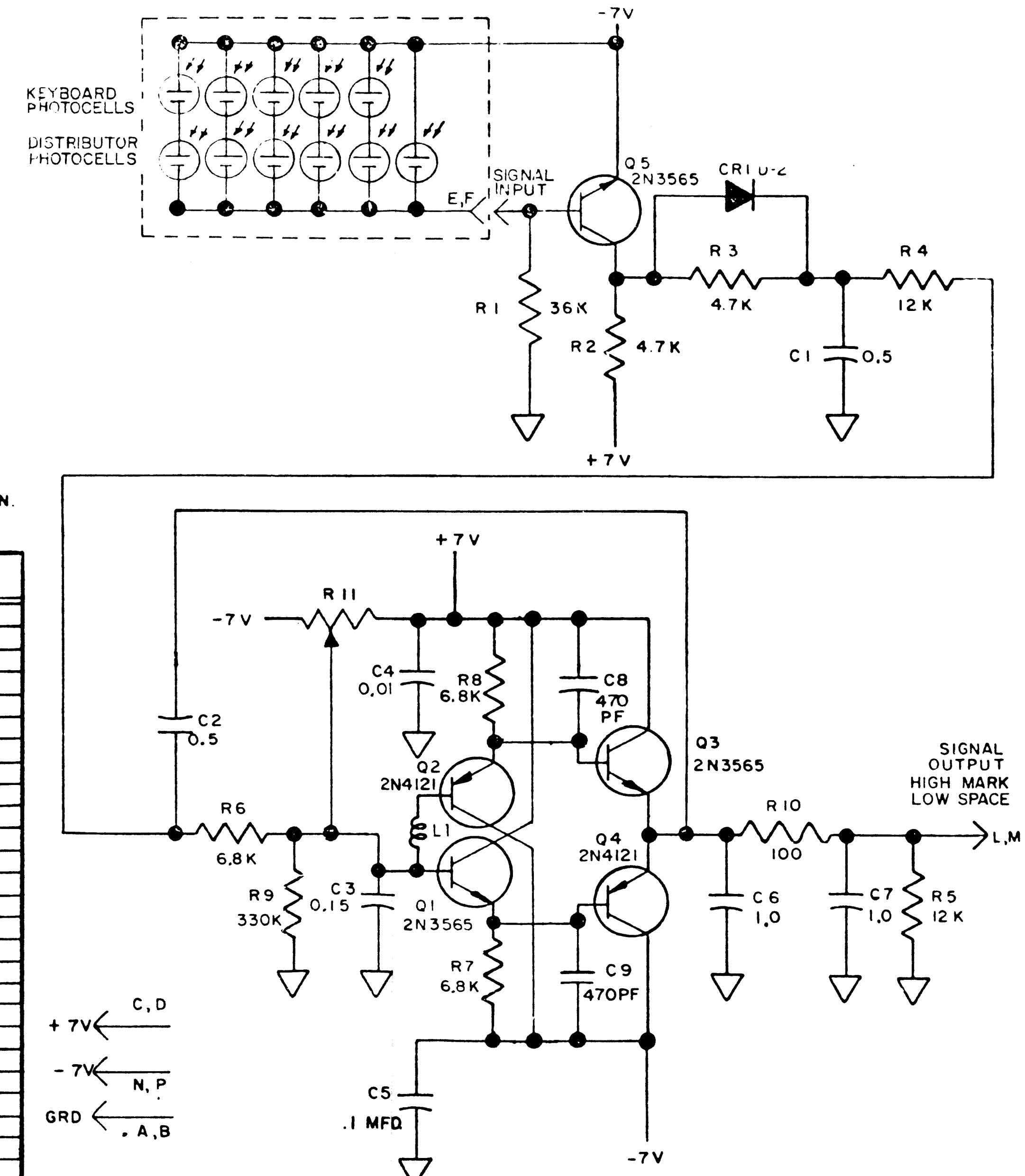
1. DUE TO VARIATIONS OF TRANSISTOR CHARACTERISTICS, "L1" WAS ADDED TO PROVIDE AN ACCEPTABLE RESPONSE TIME. "L1" SHOULD BE ADDED IF Q2 IS REPLACED.




**NOTE:** REFER TO MR2001 FOR MARKING INFORMATION.

| REF. DESIGN. | TELETYPE PART NO. | TOTAL QTY. | NAME AND DESCRIPTION | LOCATING FUNCTION |
|---|---|---|---|---|
| C1,2 | 320048 | 2 | CAPACITOR, .5 MFD ± 10% | |
| C8,9 | 315976 | 2 | CAPACITOR 470PF±20% 50V. | |
| C3 | 320049 | 1 | CAPACITOR .15MFD ±10% | |
| C4, | 181618 | 1 | CAPACITOR .01 MFD ± 20% | |
| C6,7 | 321262 | 2 | CAPACITOR 1.0 MFD ±20% | |
| R1 | 323147 | 1 | RESISTOR 36K OHMS. 1/4 WATT ±5% | |
| R2,3 | 118146 | 2 | RESISTOR 4.7K OHMS 1/2 WATT ±5% | |
| R4,5 | 118149 | 2 | RESISTOR 12 K OHMS 1/2 WATT ±5% | |
| R6,7,8 | 118147 | 3 | RESISTOR 6.8K OHMS 1/2 WATT ±5% | |
| R9 | 118179 | 1 | RESISTOR 330K OHMS 1/2 WATT ±5% | |
| R10 | 137438 | 1 | RESISTOR 100 OHMS 1/2 WATT ±5% | |
| R11 | 321160 | 1 | RESISTOR 5M OHMS(POT) 1/2 WATT ±5% | |
| Q1,3,5 | 323934 | 3 | TRANSISTOR, 2N3565 | |
| Q2,4 | 324144 | 2 | TRANSISTOR 2N4121 | |
| | | | | |
| CR1 | 177108 | 1 | DIODE, D-2 | |
| | | | | |
| C5 | 305821 | 1 | CAPACITOR .1 MFD. ± 20% 25 V. | |
| L1 | 343619 | 1 | FERRITE BEAD | |
| | 60340RM | 1" | INSULATING SLEEVE | |
| | | | | |
| | 333074 | 1 | BOARD, ETCHED CIRCUIT | |
| | | | | |
| | 324147 | 5 | TRANSISTOR PAD | |




**NOTE:**
CARD CONNECTIONS ARE REPRESENTED BY LETTERS
TEST POINTS ARE REPRESENTED BY NUMBERS.

Figure 5-25. Schematic Diagram; Model 28 CPP KSR ESA LLK Circuit Board Assembly

| NO. | NOTES |
|---|---|
| 1. | WIRING LEGEND:<br>DISTANT TERMINATING AREA<br>DISTANT TERMINATING DESIGNATION<br>G-9-W<br>WIRE COLOR CODE |
| 2. | COLOR CODE:<br>BK - BLACK G - GREEN<br>BL - BLUE R - RED<br>BR - BROWN O - ORANGE<br>Y - YELLOW S - SLATE<br>P - PURPLE W - WHITE |
| 3. | CONNECTORS VIEWED FROM SOLDER END. |
| 4. | SPARE TERMINAL BLOCK PROVIDED FOR CUSTOMER CONVENIENCE. |
| 5. | ALL WIRES TO BE 24 GA. EXCEPT AS NOTED:<br>*18 GA WIRE |
| 6. | 327326 GROUND STRAP CONNECTED BETWEEN INNER AND OUTER PAN NEAR MOTOR. |
| 7. | NUMERALS IN PARENTHESIS ARE NOT MARKED ON THE COMPONENTS BUT ARE SHOWN FOR PROPER ORIENTATION. |
| 8. | ASSOCIATED WIRING DIAGRAMS:<br>8137WD - 321231 ESA<br>8176WD - RFH8000B RFH8001B SCHEMATIC<br>8177WD - LPC402 COVER<br>8178WD - 321231 ESA SCHEMATIC<br>8242WD - LP139 |
| 9. | GROUND SCREW LOCATED ON TERMINAL BLOCK MOUNTING BRACKET FOR CUSTOMER'S TERMINAL GROUND CONNECTION. |
| 10. | ASSOCIATED CABLES:<br>324497 CABLE ASSEMBLY<br>324523 CABLE ASSEMBLY |
| 11 | ------- INDICATES CUSTOMER FURNISHED WIRING |
| 12 | REFERENCE SPEC FOR TELETYPE CORPORATION EMPLOYEES ONLY 61351S |

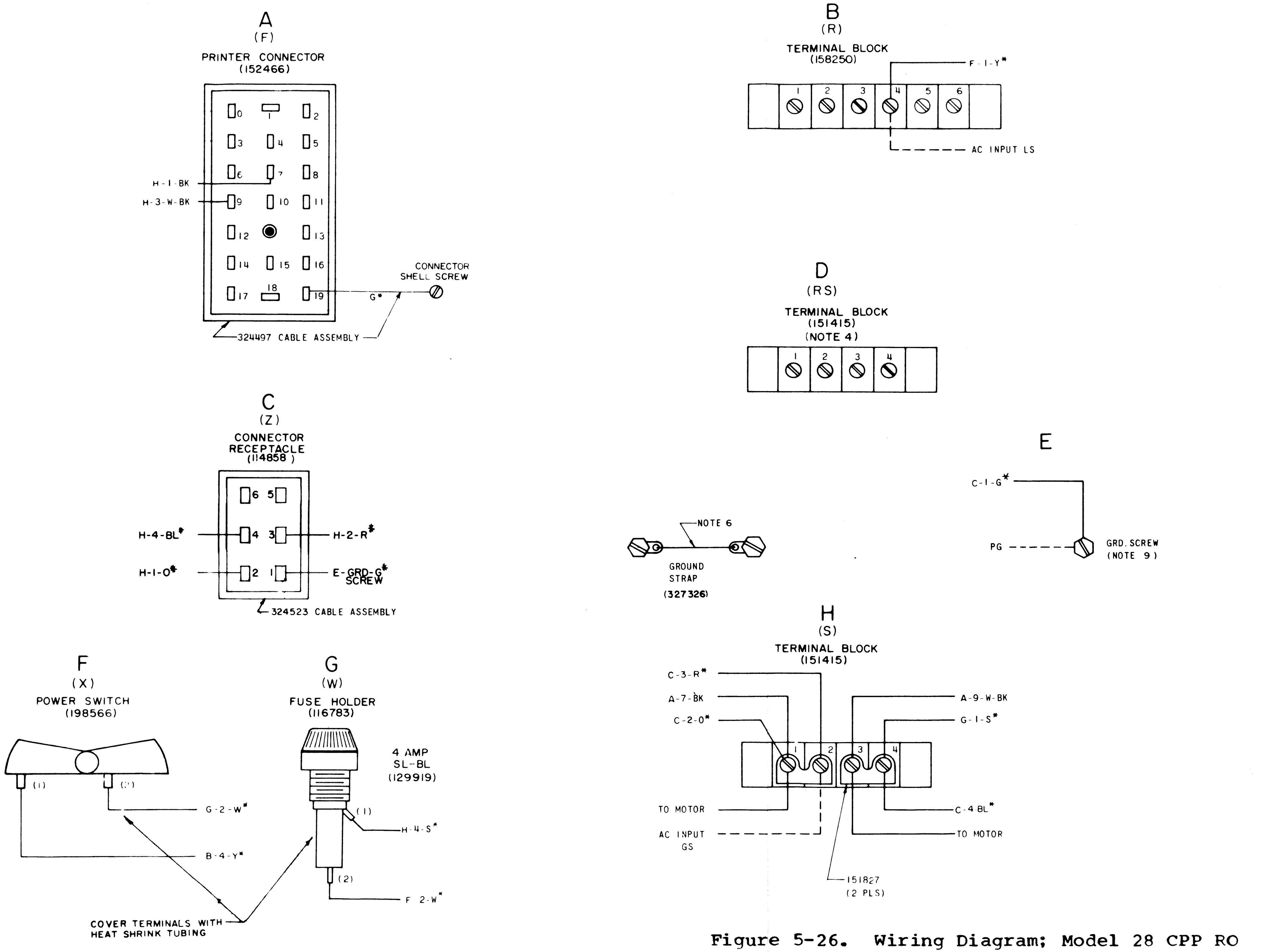
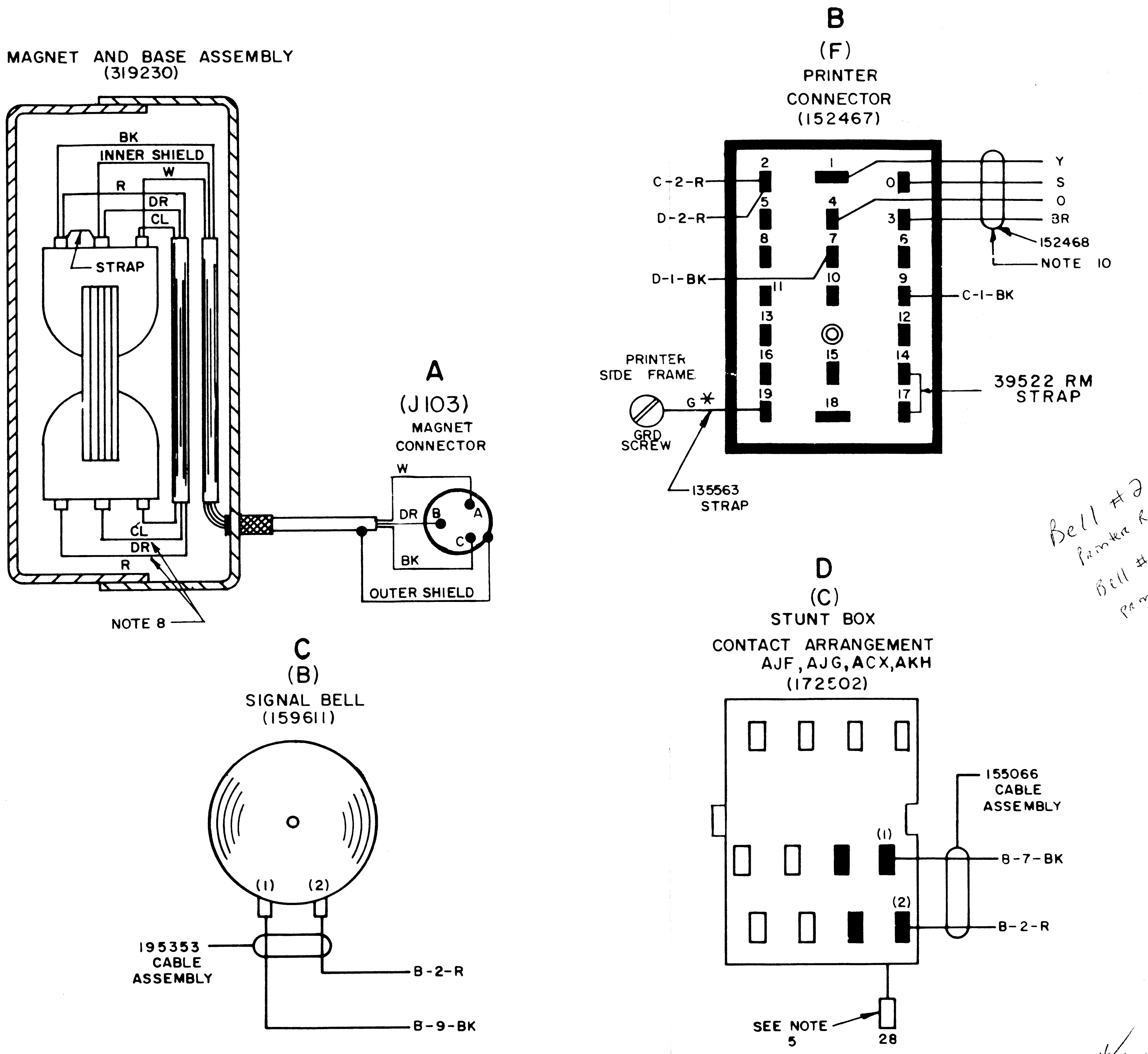



Figure 5-26. Wiring Diagram; Model 28 CPP RO Base LLB 5

| NO. | NOTES |
|---|---|
| 1. | G-3-BK — AREA DESIGNATION; TERMINATING DESIGNATION; COLOR CODE |
| 2. | COLOR CODE: BK-BLACK, W-WHITE, Y-YELLOW, P-PURPLE, S-SLATE, BL-BLUE, R-RED, BR-BROWN, O-ORANGE, G-GREEN |
| 3. | CONNECTOR VIEWED FROM SOLDERED TERMINAL ENDS. |
| 4. | *DENOTES 18GA.—ALL OTHER WIRES 24GA.. |
| 5. | NORMALLY OPEN CONTACT; NORMALLY CLOSED CONTACT |
| 6. | ASSOCIATED WIRING DIAGRAMS<br>8137WD-321231 ESA WIRING<br>8176WD-VSL 536 AND 537 SCHEMATIC<br>8177WD-LPC 402 WIRING<br>8178WD-321231 ESA SCHEMATIC<br>8179WD-VSL 536 AND 537 WIRING<br>8331WD-326471 ESA SCHEMATIC |
| 7. | ASSOCIATED CABLES:<br>155066-CABLE ASSEMBLY<br>195353-CABLE ASSEMBLY |
| 8. | LEGEND:<br>CL-CLEAR INSULATION.<br>DR-DRAIN LEAD. |
| 9. | REFERENCE SPEC. FOR TELETYPE CORPORATION EMPLOYEES ONLY 61351 S |
| 10. | TAPE ENDS AND TIE BACK 152468 CABLE IF NOT USED. |




Bell #2 to (Red)
Printer Recep #2
Bell #1 to
Printer Recep't #0
(Bl

Figure 5-27. Wiring Diagram; Model 28 CPP RO Typing Unit LP 139

ck/
Aly

| NO. | NOTES |
|---|---|
| 1 | CONNECTOR VIEWED FROM SOLDER TERMINAL END. |
| 2 | SELECTOR MAGNETS ARE WIRED FOR .060 AMPERE OPERATION OR USE WITH 323810 SELECTOR MAGNET DRIVER. |
| 3 | COLOR CODE<br>R- RED<br>W- WHITE<br>BK- BLACK |
| 4 | REFERENCE SPEC. FOR TELETYPE CORPORATION EMPLOYEES ONLY 61213S |
| 5. | LEGEND:<br>DR-DRAIN<br>CL-CLEAR INSULATION |
| 6. | REFER TO APPROPRIATE SET SCHEMATIC WIRING DIAGRAM FOR J CONNECTOR NUMBER. |

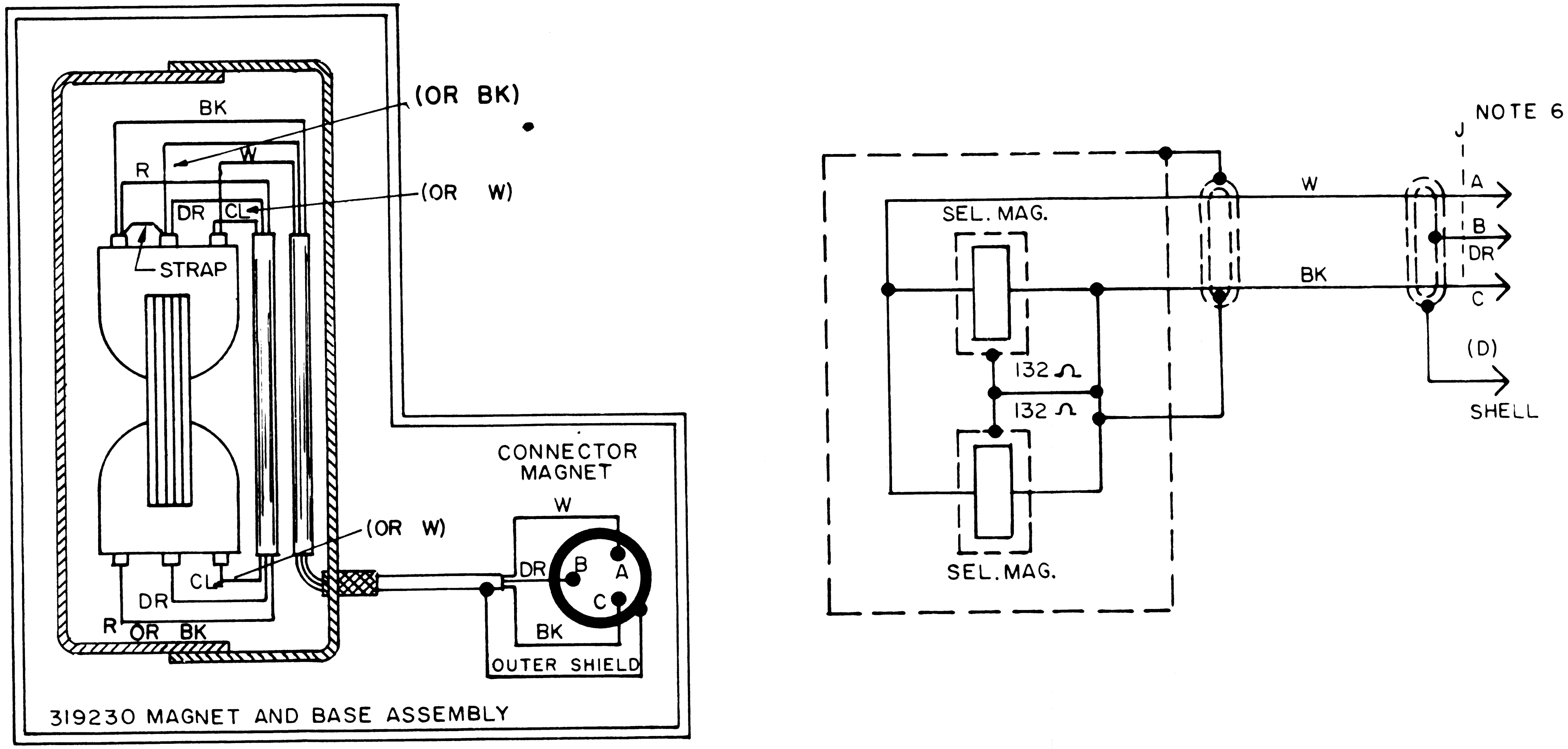



Figure 5-28. Wiring Diagram; Model 28 CPP RO Typing Unit Selector Assembly 319204

| NO. | NOTES |
|---|---|
| 1. | AREA DESIGNATION<br>TERMINATING DESIGNATION<br>G-3-BK<br>COLOR CORE |
| 2. | COLOR CODE:<br>BK—BLACK BL—BLUE<br>W—WHITE R—RED<br>Y—YELLOW BR—BROWN<br>P—PURPLE O—ORANGE<br>S—SLATE G—GREEN |
| 3. | CONNECTOR VIEWED FROM SOLDERED TERMINAL ENDS. |
| 4. | * DENOTES 18 GA., ALL OTHER WIRES 24 GA. |
| 5. | NORMALLY OPEN CONTACT<br>NORMALLY CLOSED CONTACT |
| 6. | ASSOCIATED WIRING DIAGRAMS:<br>8724WD 323120 ESA ACTUAL<br>8725WD 323120 ESA SCHEMATIC<br>8726WD 323121 ESA ACTUAL<br>8727WD 323121 ESA SCHEMATIC<br>8728WD 323116 MOD. KIT ACTUAL<br>8729WD 323116 MOD. KIT SCHEMATIC<br>8764WD LPC403 ACTUAL |
| 7. | ASSOCIATED CABLES:<br>155066 - CABLE ASSEMBLY<br>195353 - CABLE ASSEMBLY<br>333118 - CABLE ASSEMBLY |
| 8. | LEGEND:<br>CL - CLEAR INSULATION<br>DR - DRAIN LEAD |
| 9. | S NUMBERS 61,351S<br>61,600S |
| 10. | X INDICATES SPLICE |
| 11. | TERMINAL DESIGNATIONS ENCLOSED IN PARENTHESIS ARE FOR REFERENCE ONLY AND ARE NOT MARKED ON COMPONENTS |
| 12. | USE SUITABLE TUBING OVER TERMINALS. |
| 13. | CABLE 152468 (PART OF STUNT BOX) MAY BE CLIPPED AND DISCARDED. |

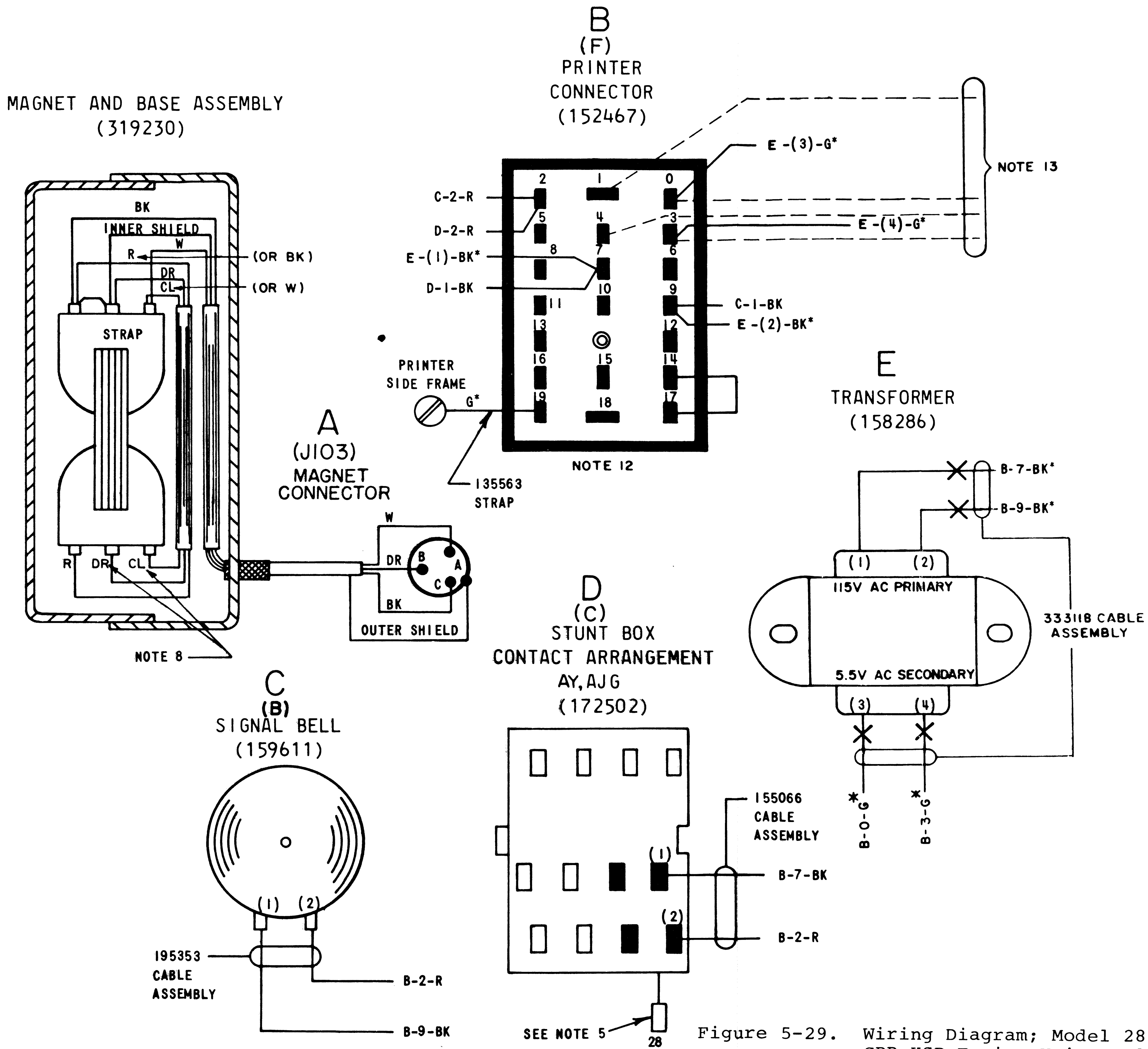



Figure 5-29. Wiring Diagram; Model 28 CPP KSR Typing Unit LP 156

# CHAPTER 6
# CORRECTIVE MAINTENANCE

6-1. INTRODUCTION. This chapter provides information regarding adjustments and repair of Model 28 Compact Page Printer (CPP) Keyboard Send-Receive (KSR) and Receive-Only (RO) Teletypewriter Sets. The chapter is divided in five sections as follows:

a. Section I - provides adjustment procedures for basic units.

b. Section II - provides additional adjustment procedures required for variable features of basic units.

c. Section III - provides adjustment procedures for basic units (earlier designs) that differ from those in Section I.

d. Section IV - provides additional adjustment procedures required for variable features of basic units (earlier designs) that differ from those in Section II.

e. Section V - provides repair information in the form of disassembly and reassembly procedures.

6-2. GENERAL. Adjustment procedures provided in this chapter are those required to be performed as a result of an abnormal indication in a periodic mechanical check (Chapter 4), to correct a fault discovered during troubleshooting (Chapter 5), or to be performed after reassembly (section IV of this chapter).

## SECTION I - ADJUSTMENTS (BASIC UNITS)

6-3. TYPING UNIT ADJUSTMENTS. When making a complete adjustment of the typing unit, the following conditioning operation should be performed to prevent damage:

a. Loosen clamp screw on code bar shift lever drive arm.

b. Move right and left vertical positioning lever eccentric studs in rocker shaft brackets to their lowest position.

c. Loosen two bearing stud mounting screws and two connecting strip clamp screws in horizontal positioning drive linkage.

d. Loosen clamp screws and move reversing slide brackets to their uppermost position.

e. Loosen function reset bail blade mounting screws.

f. For units equipped with two-stop function clutches, loosen shoulder bushings on each function stripper blade arm, and move stripper blade and arms to their lowest positions.

g. Loosen carriage return lever clamp screw.

h. Loosen clamp screws in the oscillating rail slide.

i. Loosen reversing slide adjusting stud.

j. Loosen clamp nuts on shift code bar guide plates.

6-3.1 TYPING UNIT ADJUSTMENTS (HIGH-LEVEL).

a. Code Bar Mechanism Adjustments. Perform code bar mechanism adjustments in accordance with the following paragraphs:

(1) Code Bar Detent. Adjust code bar detent as follows:

(a) Refer to figure 6-1.

(b) Remove front plate.

(c) Disengage all clutches.

(d) All suppression and shift code bars should detent equally.

(e) To adjust detenting of suppression and shift code bars, loosen screws and remove or add shims between casting and code bar bracket. Then tighten screws.

(2) Code Bar Detent Spring. Adjust code bar detent spring tension as follows:

NOTE

Unless there is reason to believe these springs are causing a malfunction, do not attempt this adjustment.

(a) Refer to figure 6-2.

(b) Carefully remove code bar detent bracket and code bars.

(c) Apply spring scale hook to each detent ball in sequence and pull in direction of ball travel. The force required to start ball moving against compression of spring should be between 1-1/2 and 3-1/2 ounces. If scale reading for any spring exceeds the limits, install a new spring.

(d) Replace code bars and code bar detent bracket.

(3) Code Bar Yield Spring. Adjust code bar yield spring tension as follows:

(a) Refer to figure 6-3.

(b) Disengage selector clutch, code bar clutch, and type box clutch.

(c) Place number one code bar in spacing position.

(d) Attach spring scale hook to number one code bar and pull against spring. Force required to start code bar shift bar pivot moving away from code bar should be between 14 and 23 ounces.

(e) Repeat steps (c) and (d) for number two and common code bar shift bars.

(f) If scale reading for any spring exceeds limits, install a new spring.

(4) Code Bar Shift Lever Link Bracket. Adjust code bar shift lever link bracket as follows:

(a) Refer to figure 6-4.

(b) Select blank combination.

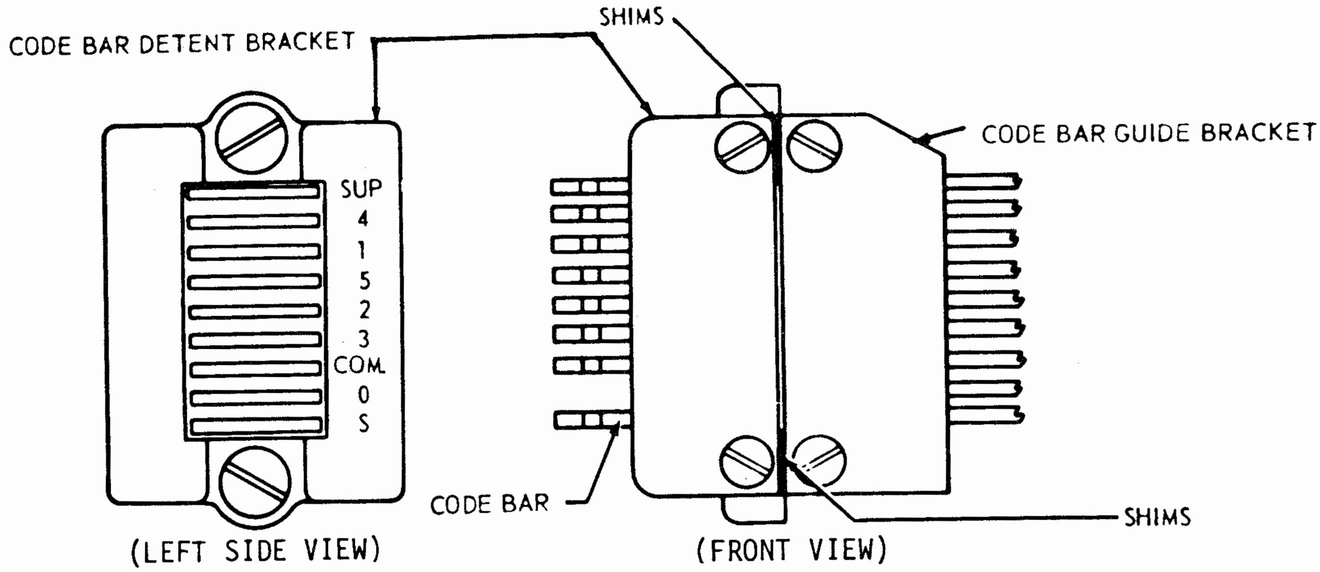



Figure 6-1. Code Bar Detent

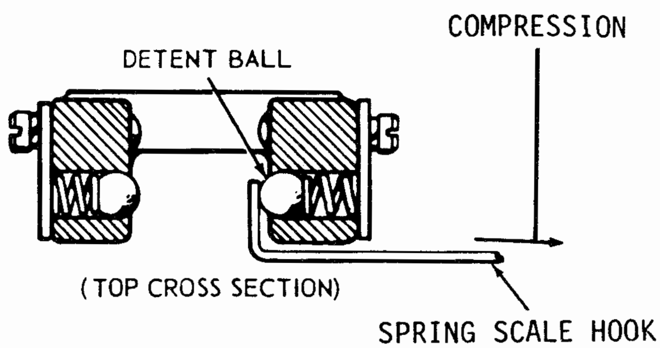



Figure 6-2. Code Bar Detent Spring

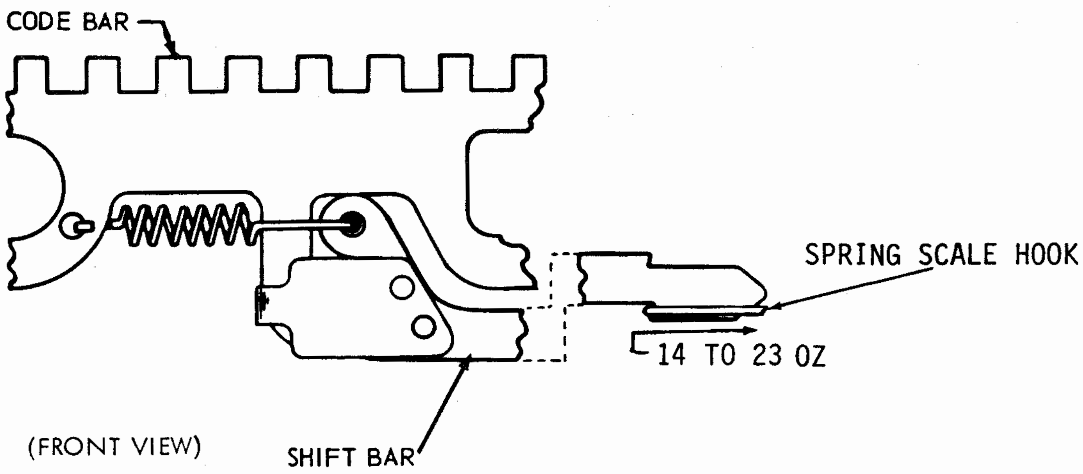



Figure 6-3. Code Bar Yield Spring

(c) Rotate main shaft until code bar shift lever link reaches maximum travel.

(d) Take up play for maximum clearance between front code bar shift lever and shoulder on nearest code bar shift bar.

(e) Clearance should be between 0.002 and 0.025 inch.

(f) If clearance exceeds specified limits, loosen clamp screw and position front adjusting plates to obtain clearance specified in step (e) between front code bar shift lever and shoulder on nearest code bar shift bar. Tighten clamp screws.

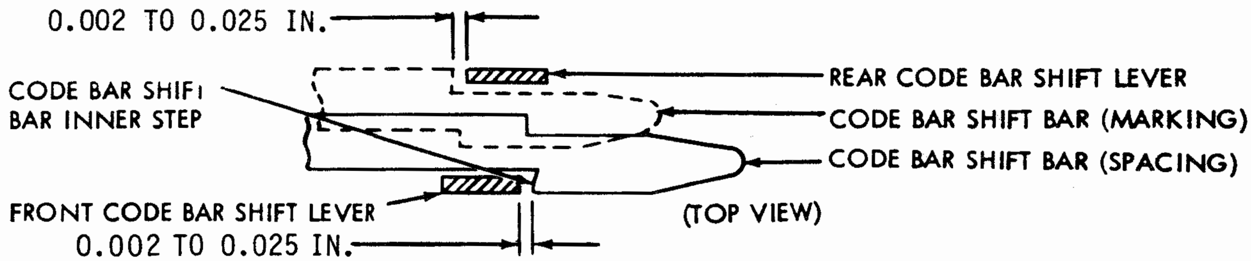
(g) Select letters combination.

(h) Rotate main shaft until code bar shift lever link reaches maximum travel.

(i) Take up play for maximum clearance between rear code bar shift lever and shoulder on nearest code bar shift bar.

(j) Clearance should be between 0.002 to 0.012 inch between rear code bar shift lever and shoulder on nearest code bar shift bar. Tighten clamp screws.

(5) <u>Code Bar Shift Lever Drive Arm</u>. Adjust code bar shift lever drive arm as follows:



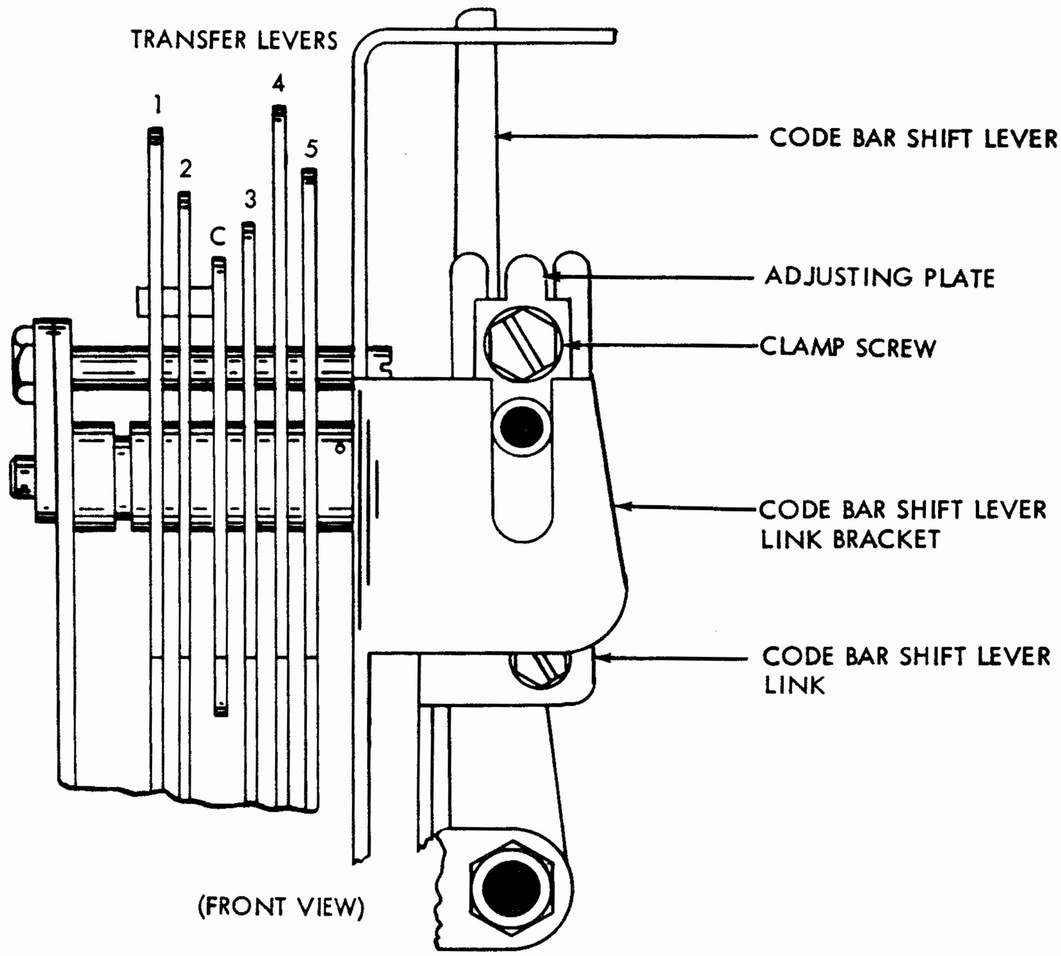




Figure 6-4. Code Bar Shift Lever Link Bracket

(a) Refer to figure 6-5.

(b) Place the code bar shift lever link in uppermost position.

(c) Measure clearance between top of rollers and top of cam slots in code bar shift levers. The clearance on closest lever should not be more than 0.025 inch.

(d) If clearance between top of rollers and top of cam slots in closest code bar shift lever exceeds specified limit, loosen clamp screw. Position code bar shift lever drive arm on its shaft to obtain clearance specified in step (c) and to provide some end play not to exceed 0.006 inch.

(e) Tighten clamp screw.

(6) Transfer Lever Spring. Adjust transfer lever spring as follows:

(a) Refer to figure 6-6.

(b) Hold transfer lever in spacing position.

(c) Attach spring scale to intermediate arm. Force required to start intermediate arm moving should be between 1-1/2 and 2-1/2 ounces.

(d) If scale reading exceeds limits, install a new spring.

(7) Common Transfer Lever Spring. Adjust common transfer lever spring as follows:

(a) Refer to figure 6-6.

(b) Place transfer lever in spacing position.

(c) Attach spring scale hook near upper end of common transfer lever. The force required to start lever moving should be between 1/2 and 1-1/4 ounce.

(d) If scale reading exceeds specified limits, install a new spring.

(8) Transfer Lever Eccentric. Adjust transfer lever eccentric as follows:

(a) Refer to figure 6-7.

(b) Position push levers for either E, LF, or letters.

(c) Disengage selector clutch.

(d) Place code bar shift lever link in uppermost position.

(e) Measure clearance between rear code bar shift lever and code bar shift bar farthest from rear code bar shift lever. Clearance should be between 0.010 and 0.025 inch when play of shift bar is taken up for maximum clearance.

(f) To adjust clearance, loosen clamp screw.

(g) Rotate eccentric bushing to obtain clearance specified in step (e). High part of eccentric should be above horizontal center line.

(h) Tighten clamp screw.

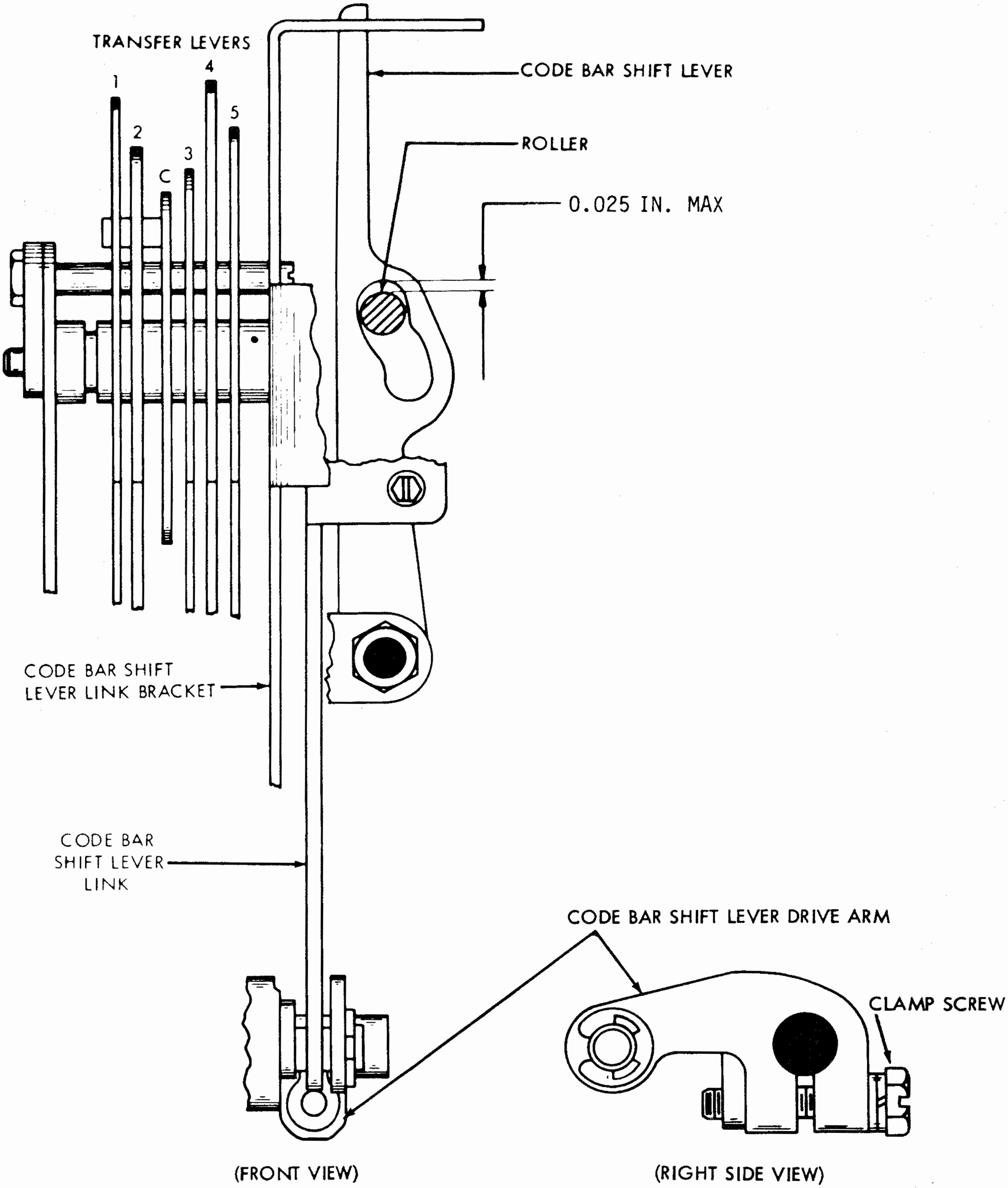



Figure 6-5. Code Bar Shift Lever Driver Arm

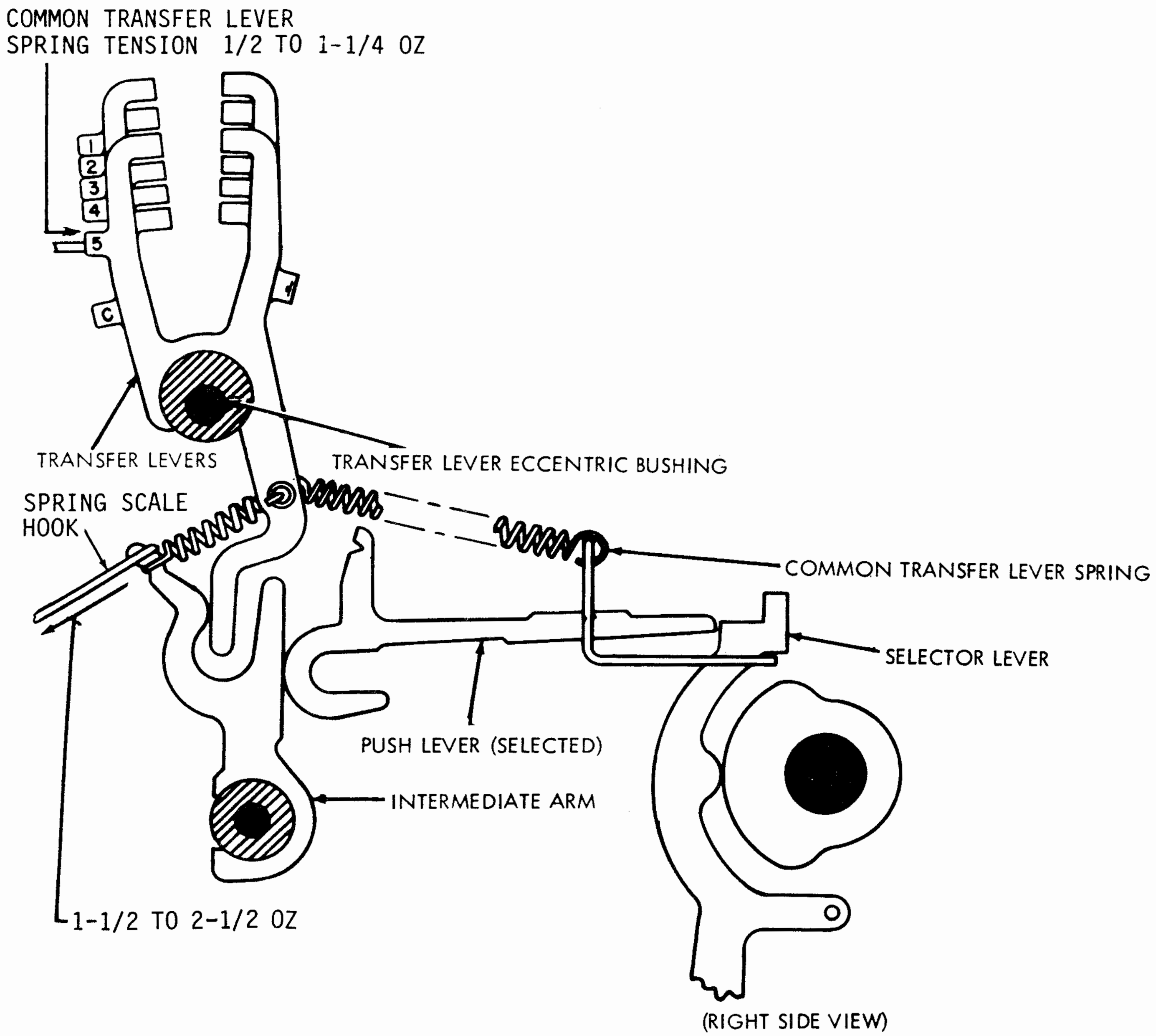



Figure 6-6. Transfer Lever Spring and Common Transfer Lever Spring

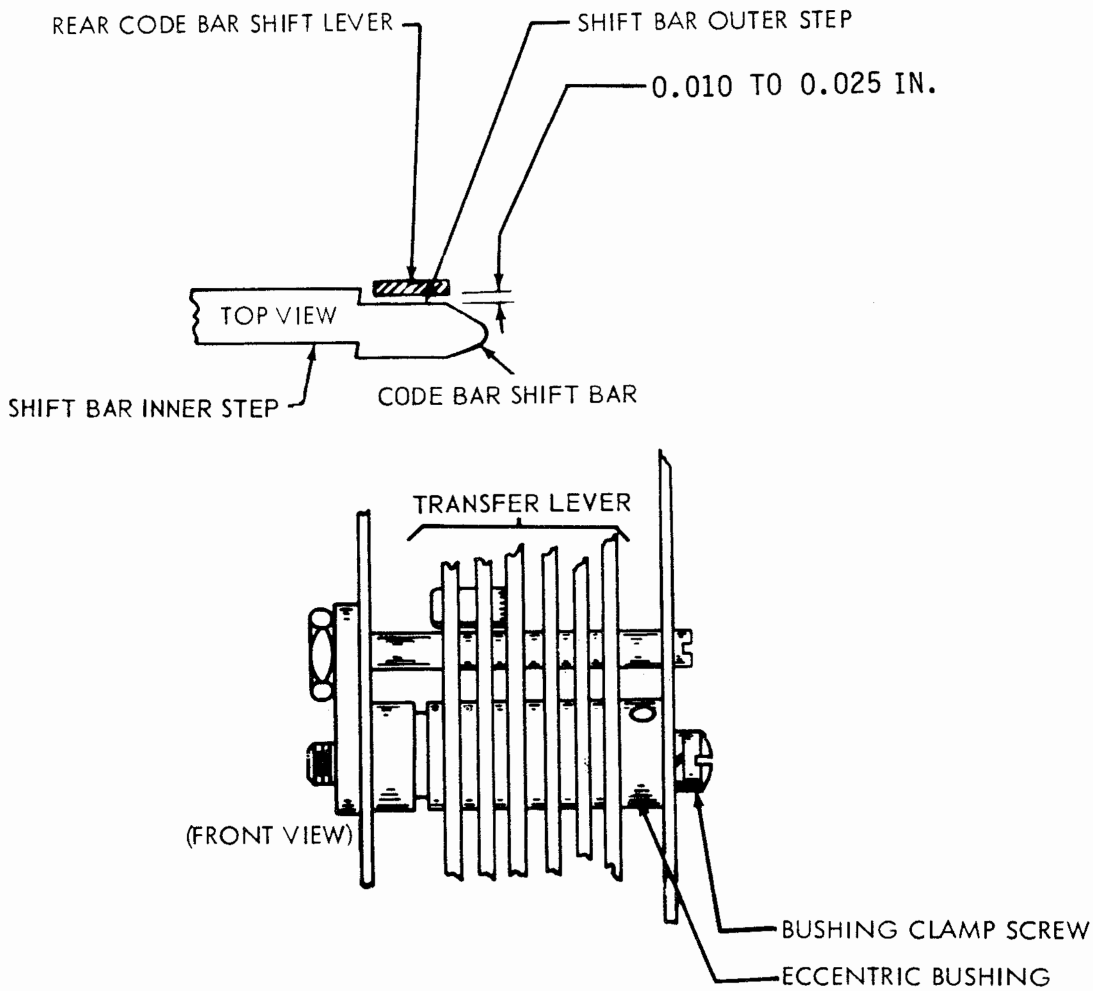



Figure 6-7. Transfer Lever Eccentric

NOTE

One or more code bar shift bars may touch code bar shift levers.

(9) Intermediate Arm Backstop Bracket. Adjust intermediate arm backstop bracket as follows:

(a) Refer to figure 6-8.

(b) Place push levers in not-selected position.

(c) Move all code bar shift bars to the right.

(d) Disengage selector clutch.

(e) Place code bar shift lever link in lowermost position.

(f) Measure clearance between front code bar shift lever and inner step of code bar shift bar farthest from front code bar shift lever. Clearance should be between 0.010 and 0.025 inch when play in parts is taken up for maximum clearance.

(g) To adjust clearance, loosen two clamp screws and position backstop bracket to obtain clearance specified in step (f).

(h) Tighten two clamp screws.

b. Function Mechanism Adjustments. Perform function mechanism adjustment in accordance with the following paragraphs.

(1) Figure-Letters Shift Code Bar Operating Mechanism. Adjust figures-letters shift code bar operating mechanism as follows:

(a) Refer to figure 6-9.

(b) If unit has one-stop clutches, rotate function clutch until clutch disc stop lug is toward bottom of unit, and hook figures function pawl over end of function bar. If unit has two-stop function clutches, disengage function clutch at stop giving least clearance.

(c) Clearance between upper guide plate extension and shift slide should be not more than 0.020 when play is taken up for maximum clearance.

(d) With a spring scale, apply 32 ounces pull to figures function pawl and measure clearance between shoulder of figures function pawl and face of function bar. Clearance should be not less than 0.002 inch.

(e) Repeat steps (c) and (d) for letters function pawl.

(f) If clearances exceed specified limits, loosen clamp nuts, and position upper or lower guide plate as necessary by the adjusting slot.

(g) Tighten clamp nuts.

NOTE

There should be some clearance between unoperated shift slide and its guide plate when shift slide has

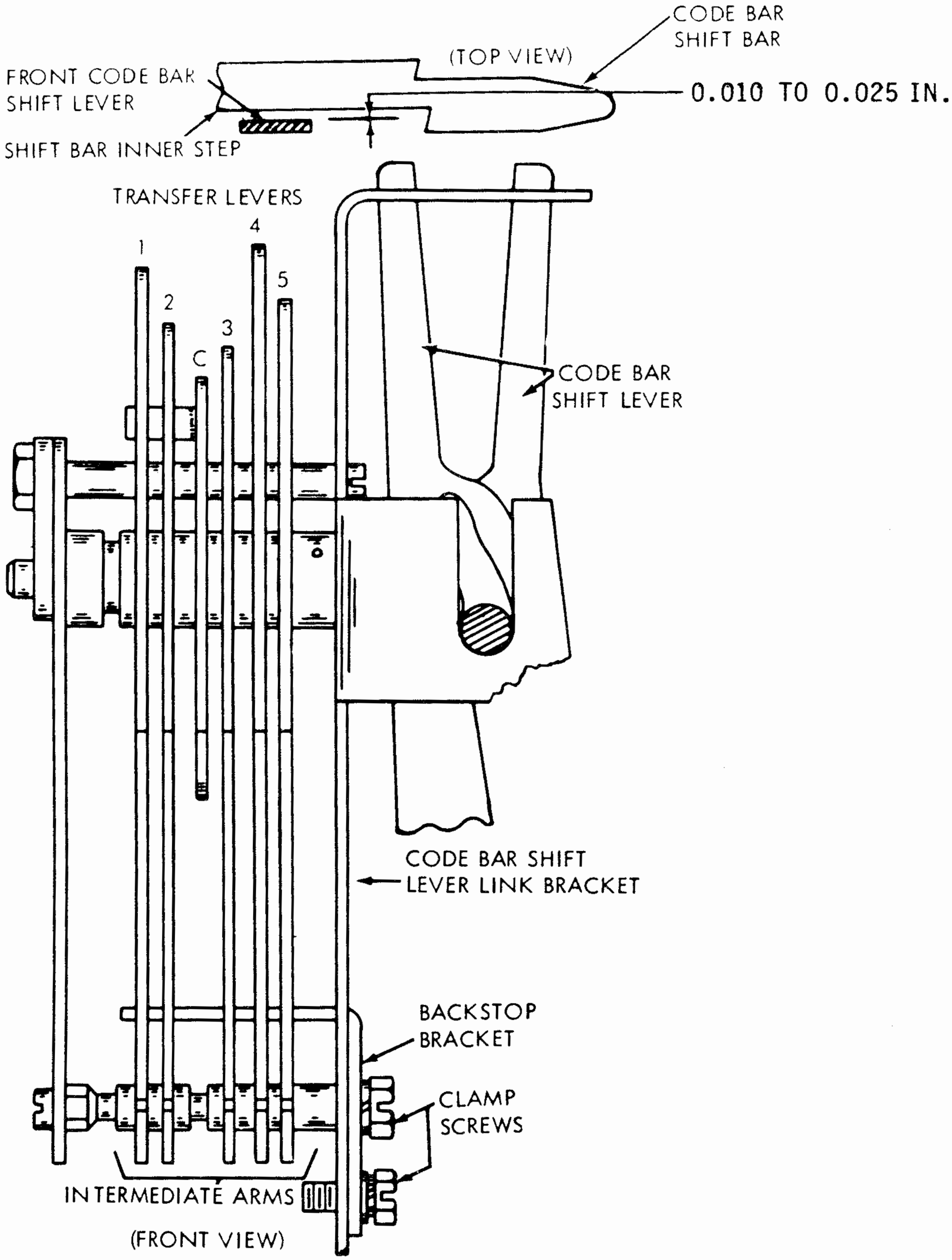



Figure 6-8. Intermediate Arm Backstop Bracket

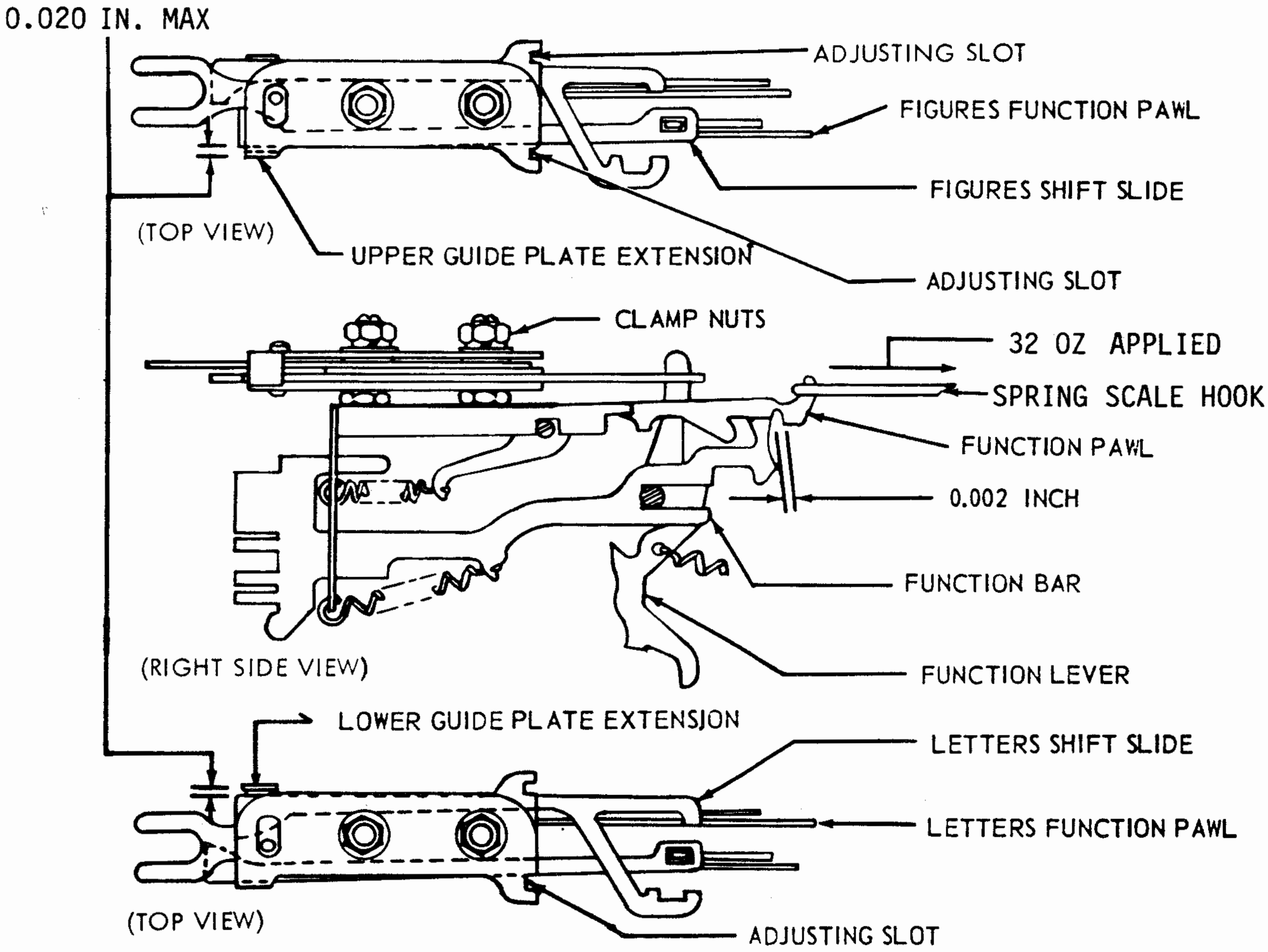



Figure 6-9. Figures-Letters Shift Code Bar Operating Mechanism

reached its position of maximum travel.

(2) <u>Function Bar Spring</u>. Adjust function bar spring as follows:

(a) Refer to figure 6-10.

CAUTION

Severe wear to the point of operational failure will result if the teletypewriter is operated without each function bar or, where a function bar is missing, a related function pawl clip to hold the function pawl away from the stripper bail.

(b) Disengage function clutch and hold function pawl away.

(c) Attach spring scale hook to function bar. The force required to start function bar moving should be between 2-1/2 and 3-1/2 ounces.

(d) If scale reading exceeds specified limits, install a new spring.

(3) <u>Function Lever Spring</u>. Adjust function lever spring as follows:

(a) Refer to figure 6-10.

(b) Place function lever in unoperated position.

NOTE

If a function lever operates a contact or a slide, hold off contact or slide when checking spring tension.

(c) Hold suppression bail in forward position.

(d) Attach spring scale hook to function pawl. The force required to start function lever moving should be between 1-1/2 and 2-3/4 ounces. If function lever has stud that operates two contacts, the required force should be between 2 ounces and 3-1/2 ounces.

(e) Repeat step (d) for each spring.

(f) If scale reading for any spring exceeds specified limits, install a new spring.

(4) <u>Function Pawl Spring</u>. Adjust function pawl spring as follows:

(a) Refer to figure 6-10.

(b) Position function pawl so that rear end rests on function bar.

(c) Attach spring scale hook to function pawl.

(d) If unit has a one-stop function clutch, the force required to start pawl moving should be between 3 and 5 ounces. If unit has a two-stop function clutch, the force should be between 7 and 10-1/2 ounces. If scale reading exceeds specified limits, install a new spring.

(5) <u>Function Contact Spring</u>. Adjust function contact spring as follows:

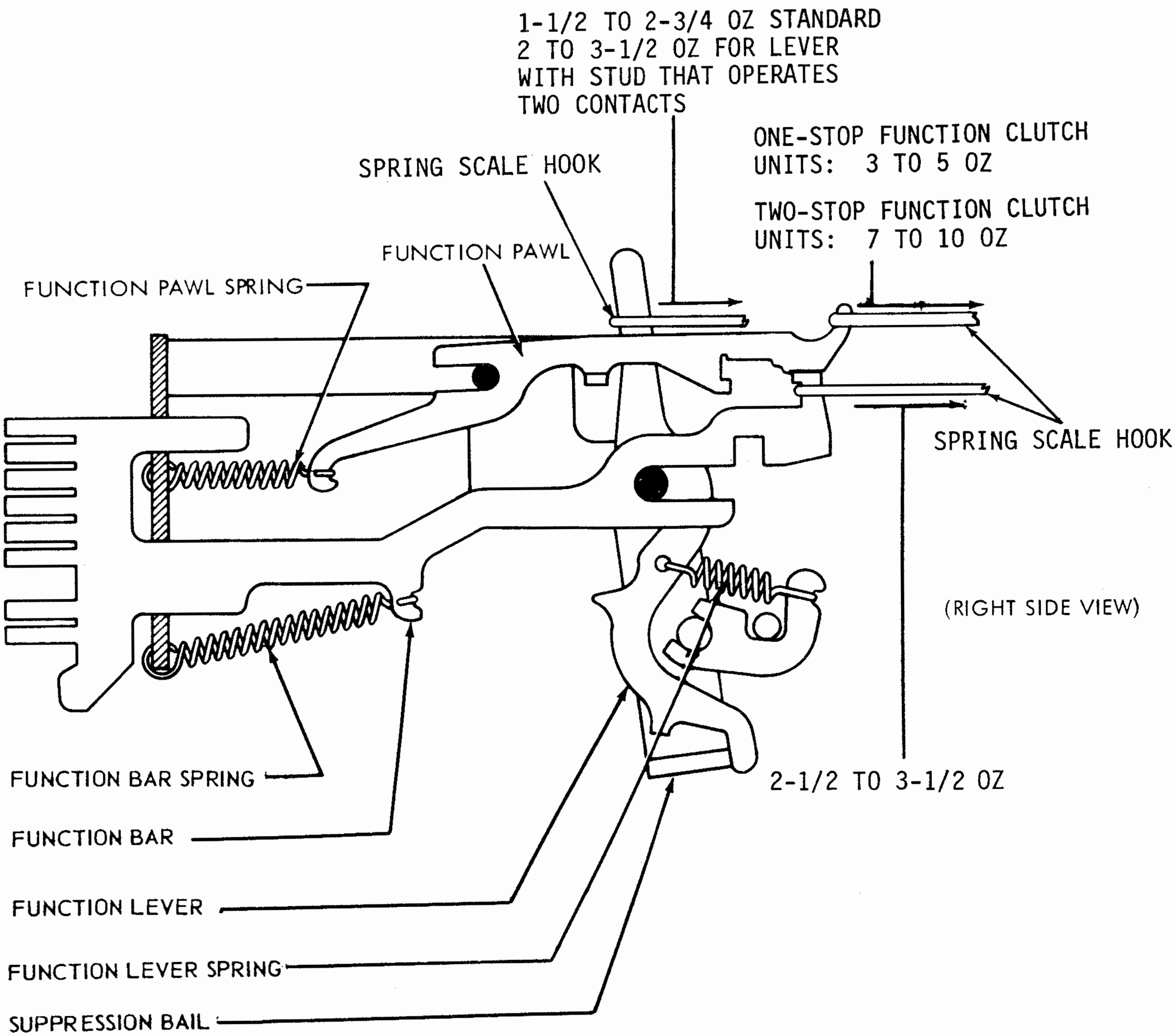



Figure 6-10. Function Bar Spring, Function Lever Spring, and Function Pawl Spring

(a) Refer to figure 6-11.

(b) Close switch contacts.

(c) Attach spring scale hook to contact arm. The force required to open switch contact should be between 1 and 2 ounces. If required force exceeds specified limits, install a new spring.

(d) If switch is removed from stunt box, perform the following adjustments:

1. Measure clearance between contact arm and vertical portion of contact clip. Clearance should be 0.006 inch minimum. If switch has contacts both front and rear, the same limit is applicable. If clearance is less than 0.006 inch, loosen contact plate screws, and position contact plate. Then tighten contact plate screws. Contact must be made before function lever touches top plate.

2. On switches with front and rear contacts, check gap between formed-over end of front contact clip and bottom of contact arm when rear contact is closed. Gap should be between 0.008 and 0.028 inch.

(6) <u>Function Reset Bail Blade</u>. Adjust function reset bail blade as follows:

(a) Refer to figure 6-12.

(b) Disengage all clutches.

(c) Trip code bar clutch and turn main shaft until code bar clutch trip lever just touches its stop lug.

(d) Unlatch all function pawls from their function bars.

(e) Hold respective function bar in its extreme rearward position with spring hook, using tension of not more than 32 ounces.

(f) Measure clearance between function bar and reset bail blade at bars in stunt box slot numbers 1, 4, 11, 18, 23, 33, 38, and 41 (slots are numbered left to right when viewed from rear). If a designated slot is vacant, use nearest bar or select bar with highest numbered slot when a bar is located on both sides of vacant slot.

(g) Clearance between function bar and reset bail blade should be between 0.018 and 0.035 inch.

(h) If clearance exceeds specified limits, loosen reset bail mounting screws.

(i) Tighten mounting screws friction tight. Position blade on reset bail to obtain clearance specified in step (g) between function bar and reset bail blade.

(j) Tighten mounting screws.

(k) Loosen carriage return lever clamp screw.

(l) Latch function pawls by lowered stripper blade.

(m) Trip code bar clutch and turn main shaft

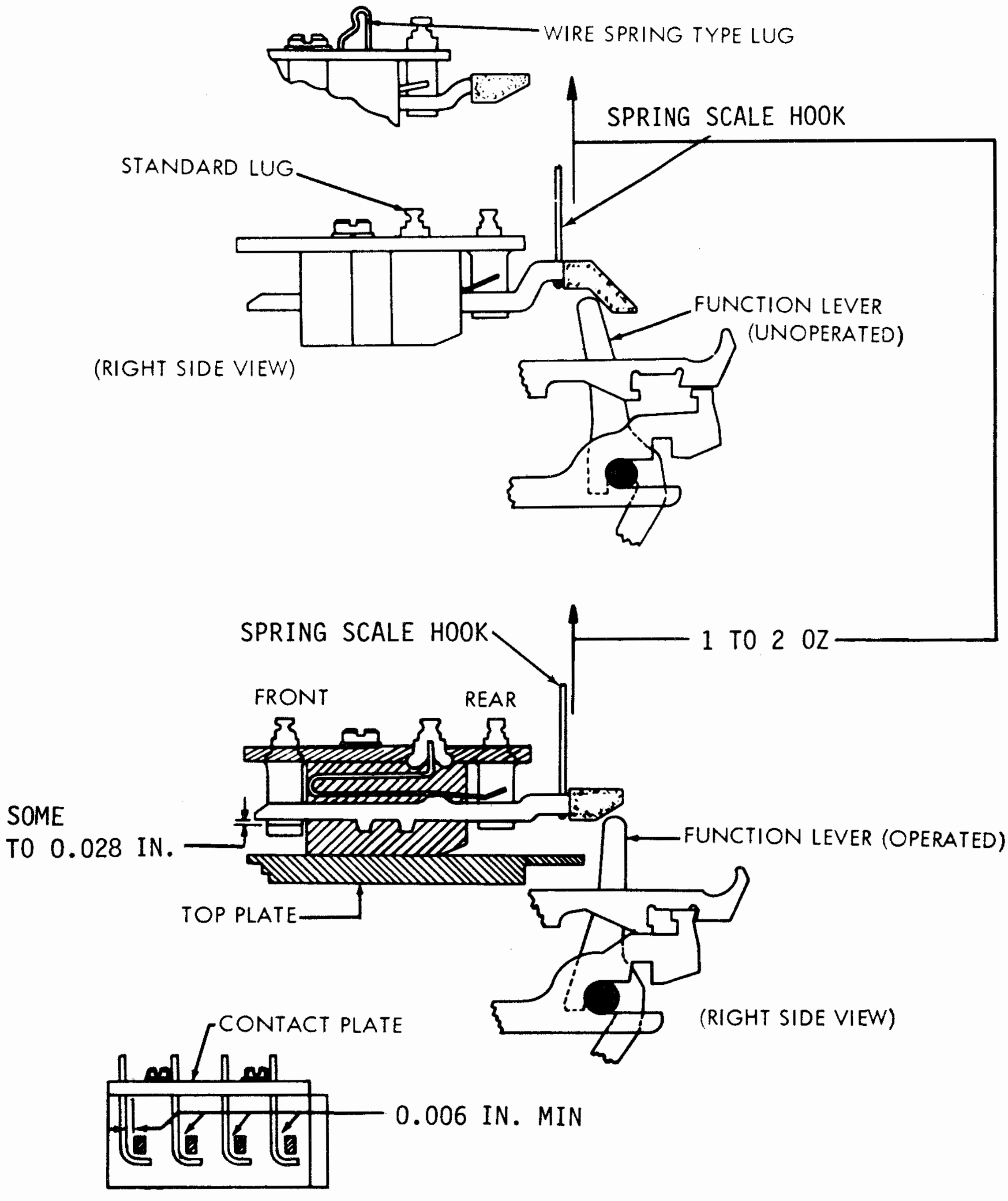



Figure 6-11. Function Contact Spring

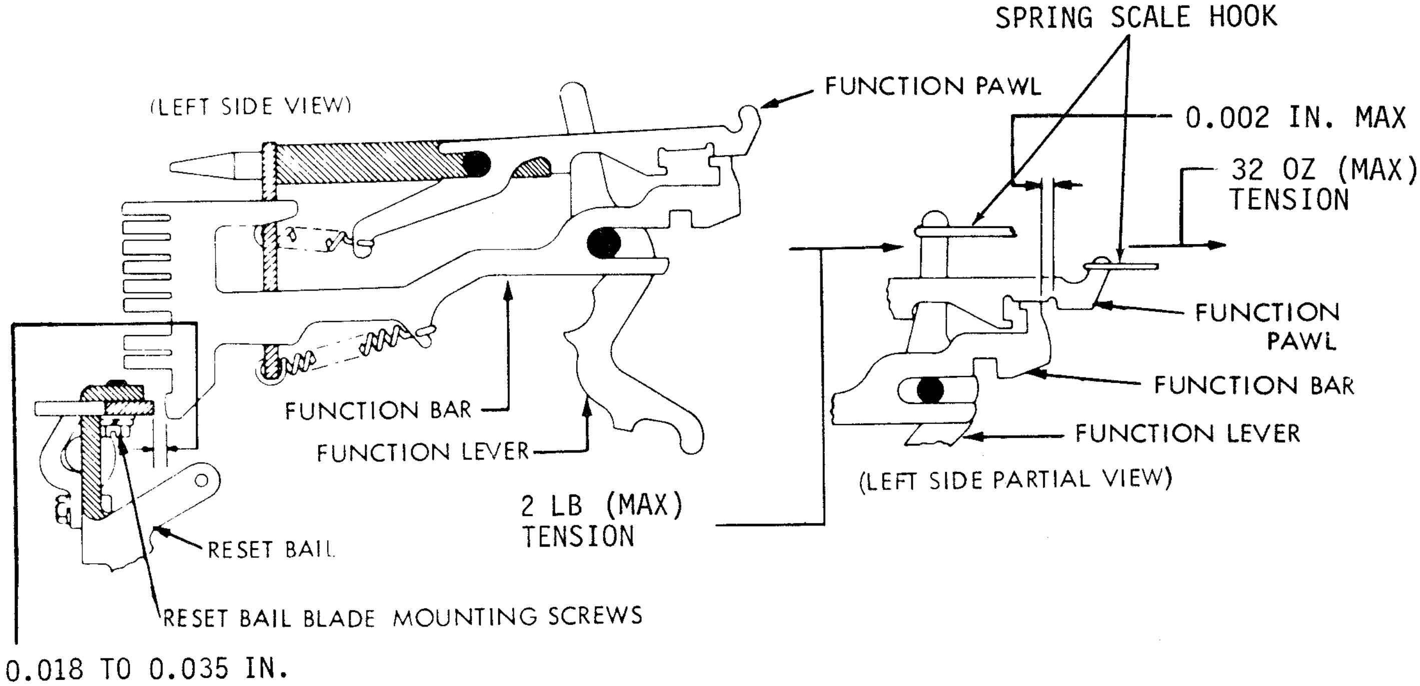



Figure 6-12. Function Reset Bail Blade

until code bar clutch trip lever touches its stop lug.

(n) Strip off any functions which may have been selected.

(o) With tension applied in step (e), each pawl should over-travel its function bar by at least 0.002 inch. Check each pawl separately at slot numbers checked in step (f).

(p) Repeat steps (f), (g), (h), and (i) for any function pawls whose overtravel is less than 0.002 inch, and tighten.

(q) Tighten mounting screws.

NOTE

If function reset bail blade is repositioned, check adjustment of figures-letters shift code bar operating mechanism (paragraph 6-3.1b(1)).

(7) Function Reset Bail Spring. Adjust function reset bail blade as follows:

(a) Refer to figure 6-13.

(b) With typing unit inverted, hold number one code bar in its marking position so that no function bar is selected.

(c) Rotate main shaft until function reset bail springs are in their minimum length position.

(d) Insert a 32-ounce spring scale between clutch trip shaft and space suppression bail, hook it on front edge of reset bail at middle of bail, and pull rearward. The force required to start bail moving should be between 10 and 22 ounces.

(e) If scale reading exceeds limits, install a new spring.

(8) Keyboard Lock Lever Spring. Adjust keyboard lock lever spring as follows:

(a) Refer to figure 6-14.

(b) With typing unit inverted, attach spring scale hook to bell crank. The force required to start keyboard lock lever moving should be between 1/2 and 1-1/2 ounces.

(c) If scale reading exceeds specified limits, install a new spring.

(9) Stripper Blade Drive Cam Position. Adjust stripper blade drive cam position as follows:

(a) Refer to figure 6-15.

(b) Disengage function clutch.

(c) Observe engagement of stripper blade drive cam upper peak with stripper blade cam arm. Rotate clutch to turn cam to its extreme downward position and observe engagement of lower cam peak. Stripper blade drive cam should move each stripper blade cam arm an equal distance above and below centerline of its pivot as gauged by eye.

(d) If distances above and below pivot centerline are not equal as

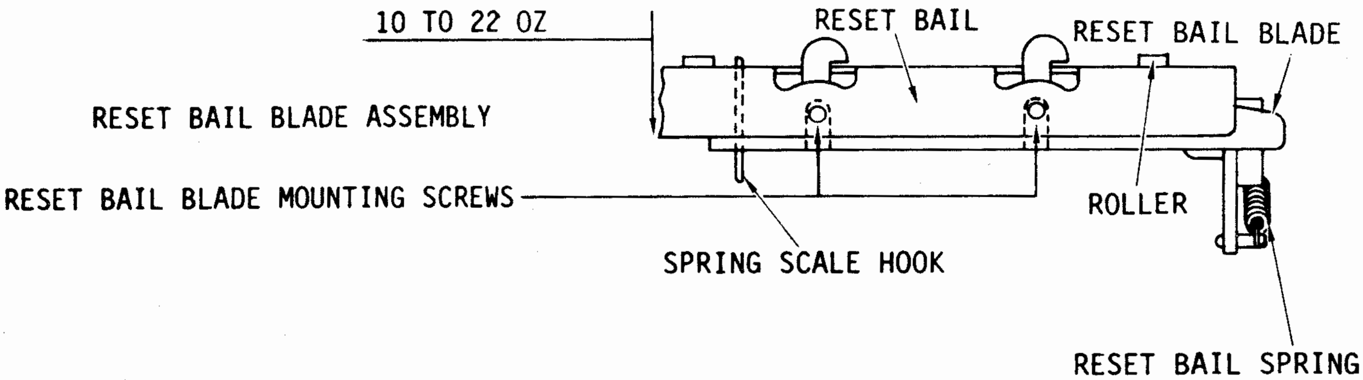



Figure 6-13. Function Reset Bail Spring

gauged by eye, loosen stripper blade drive arm mounting screws and equalize overtravel of each cam peak.

(e) Tighten mounting screws.

(10) Stunt Box Clip. Adjust stunt box clip as follows (for units equipped with clips only).

(a) Refer to figure 6-16.

(b) In right-hand position clip should not prevent associated function pawl from engaging its function bar.

(c) To adjust clip in right hand position, position clip in its extreme right-hand position with its mounting screw loosened, and tighten mounting screw.

(d) In center position, clip should hold function pawl out of engagement with its function bar, but should not interfere with function lever.

(e) To adjust clip in center position, position clip with its mounting screw loosened so that clip holds function pawl out of engagement with its function bar but does not interfere with function lever. Tighten mounting screw.

(f) In left-hand position, clip should hold function pawl upward out of engagement with its function bar

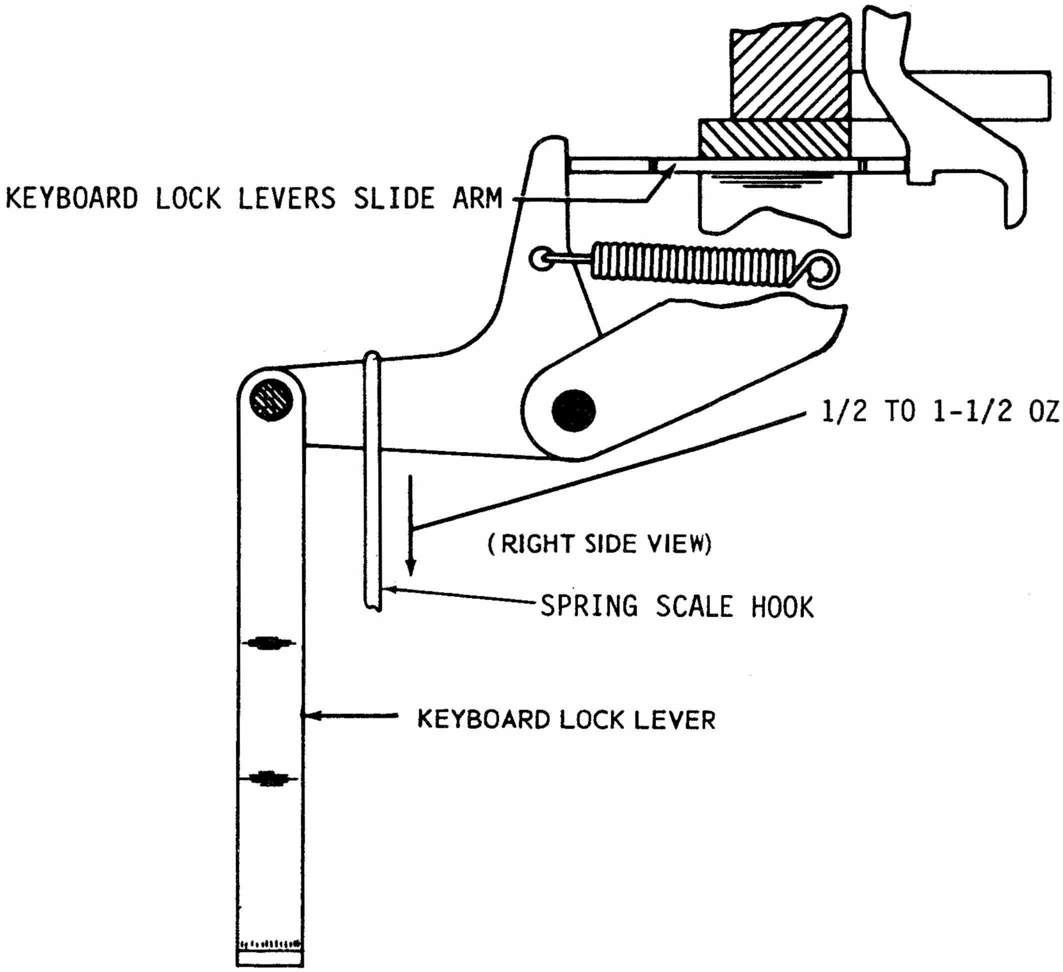



Figure 6-14. Keyboard Lock Lever Spring

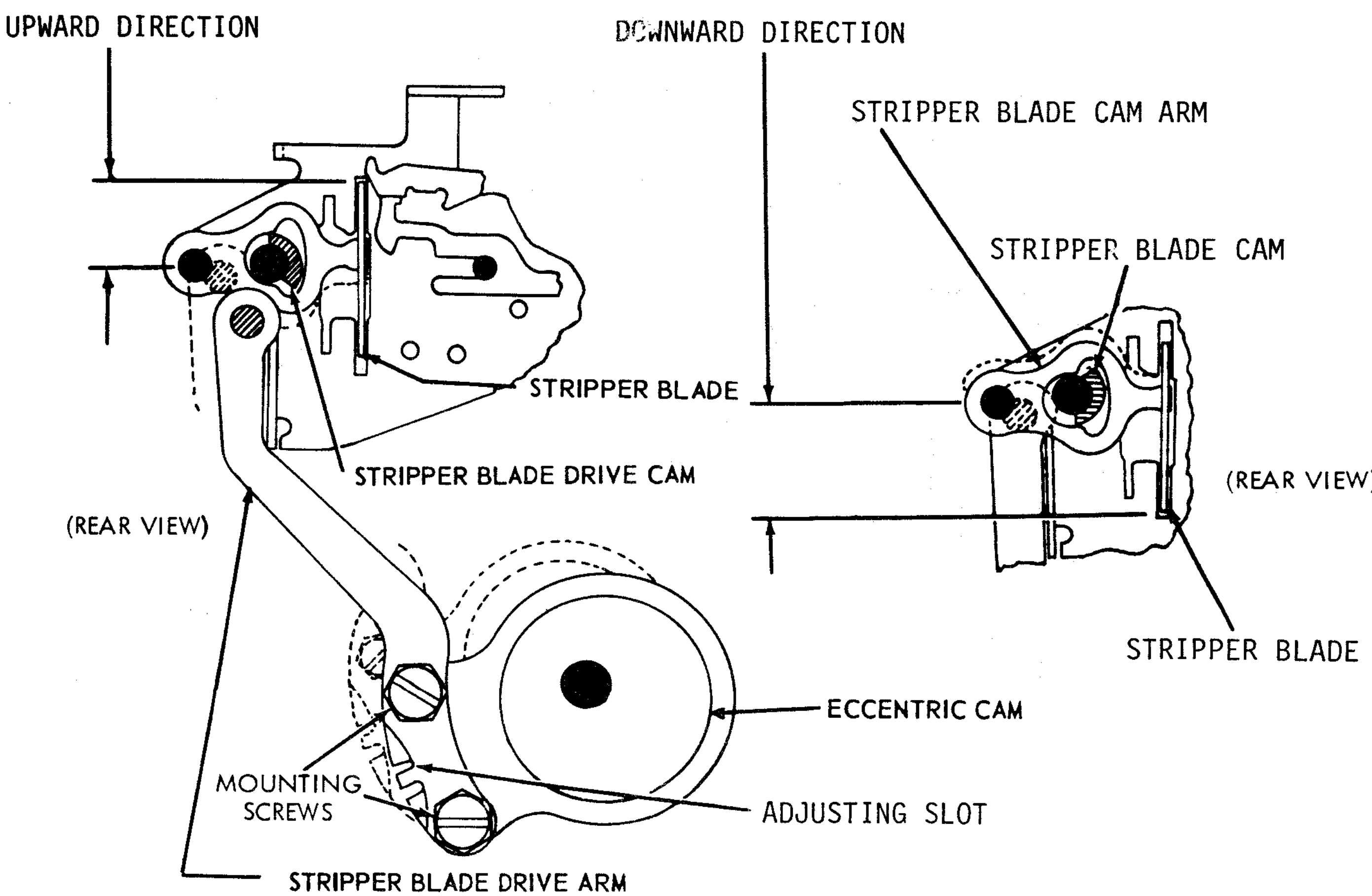



Figure 6-15. Stripper Blade Driver Cam Position

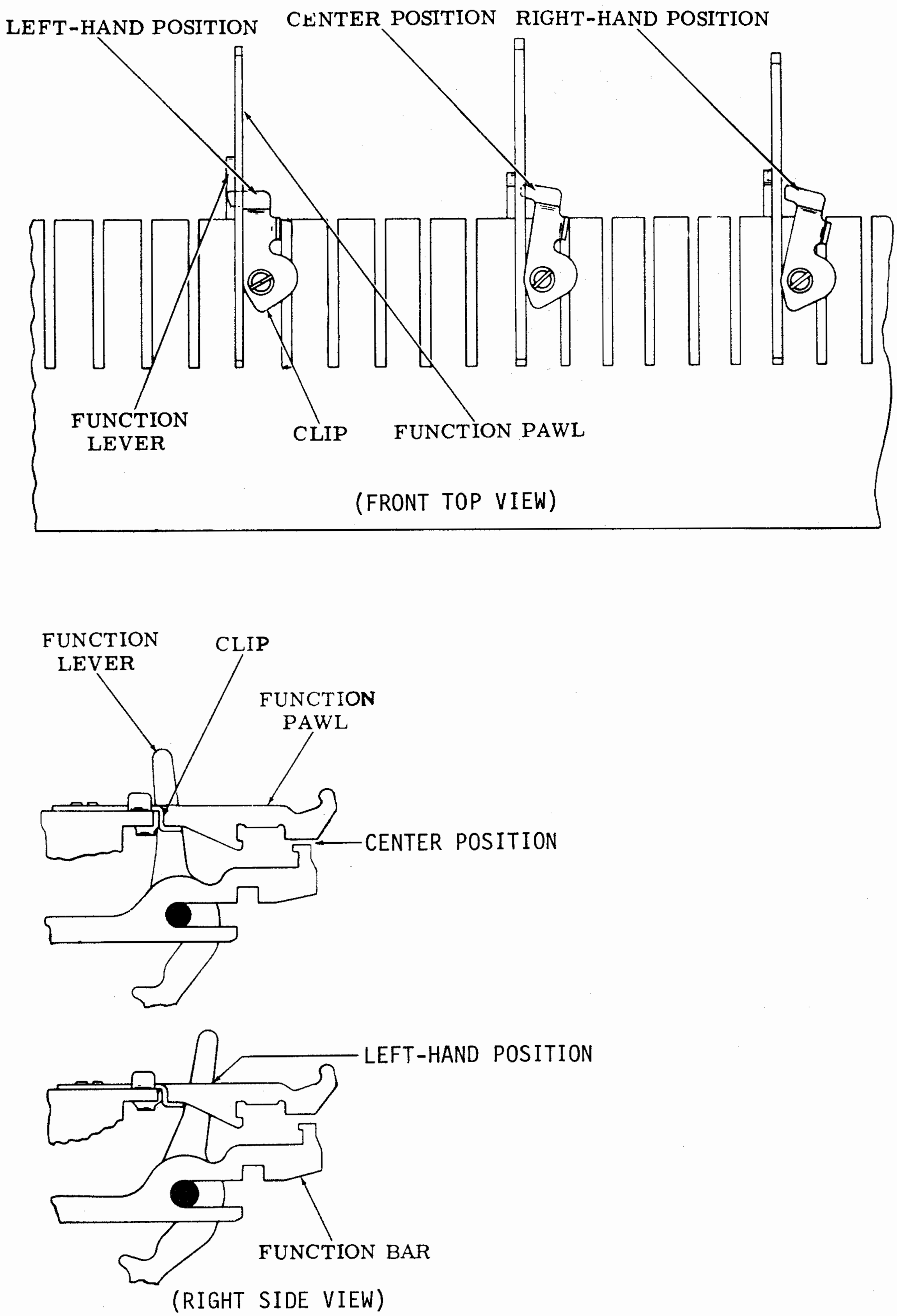



Figure 6-16. Stunt Box Clip

and should hold top end of lever in its rear position.

(g) To adjust clip in left-hand position, position clip in its extreme left hand position and tighten mounting screw.

(11) Unshift-on-Space Function Pawl. Adjust unshift-on-space pawl as follows:

(a) Refer to figure 6-17.

(b) To prevent unshift-on-space function, clearance between lower edge of unshift-on-space function pawl and its function bar should be between 0.015 and 0.060 inch.

(c) If clearance exceeds the limits, loosen disabling screw locknut and turn disabling screw in. Then tighten locknut.

(d) To restore unshift-on-space function, loosen locknut, back off disabling screw so that pawl fully engages function bar. Continue to turn screw out one to three turns. Tighten locknut.

c. Line Feed and Platen Mechanism Adjustments. Perform line feed and platen mechanism adjustments in accordance with the following paragraphs.

(1) Left Margin (Sprocket Feed). Adjust left margin as follows:

(a) Refer to figure 6-18.

(b) Disengage type box clutch, fully return spacing drum, and shift type box to letters position.

(c) Measure clearance between center of letters print indicator on type box and centerline of sprocket pins at left hub. Clearance should be between 5/16 and 7/16 inch.

(d) If clearance exceeds the limits, loosen carriage return ring mounting screws and position carriage return ring to obtain clearance specified in step (c). Then tighten mounting screws.

(e) Disengage spacing clutch, position front spacing feed pawl in its farthest advanced position, fully return spacing drum, and take up play in spacing gear in clockwise direction.

(f) Measure clearance between pawl and shoulder of ratchet wheel tooth immediately ahead. There should be some clearance not to exceed 0.008 inch, and rear pawl, when farthest advanced, should drop into indentation between ratchet wheel teeth and bottom firmly in notch.

(g) If adjustment is required, refine adjustment of step (d) above.

(2) Printing Hammer Stop Bracket (Sprocket Feed). Adjust printing hammer stop bracket as follows:

(a) Refer to figure 6-18.

(b) For units with thick type box and dummy type pallets, use corresponding standard adjustment except there should be some clearance between printing hammer and dummy type pallet, but not exceeding 0.020 inch.

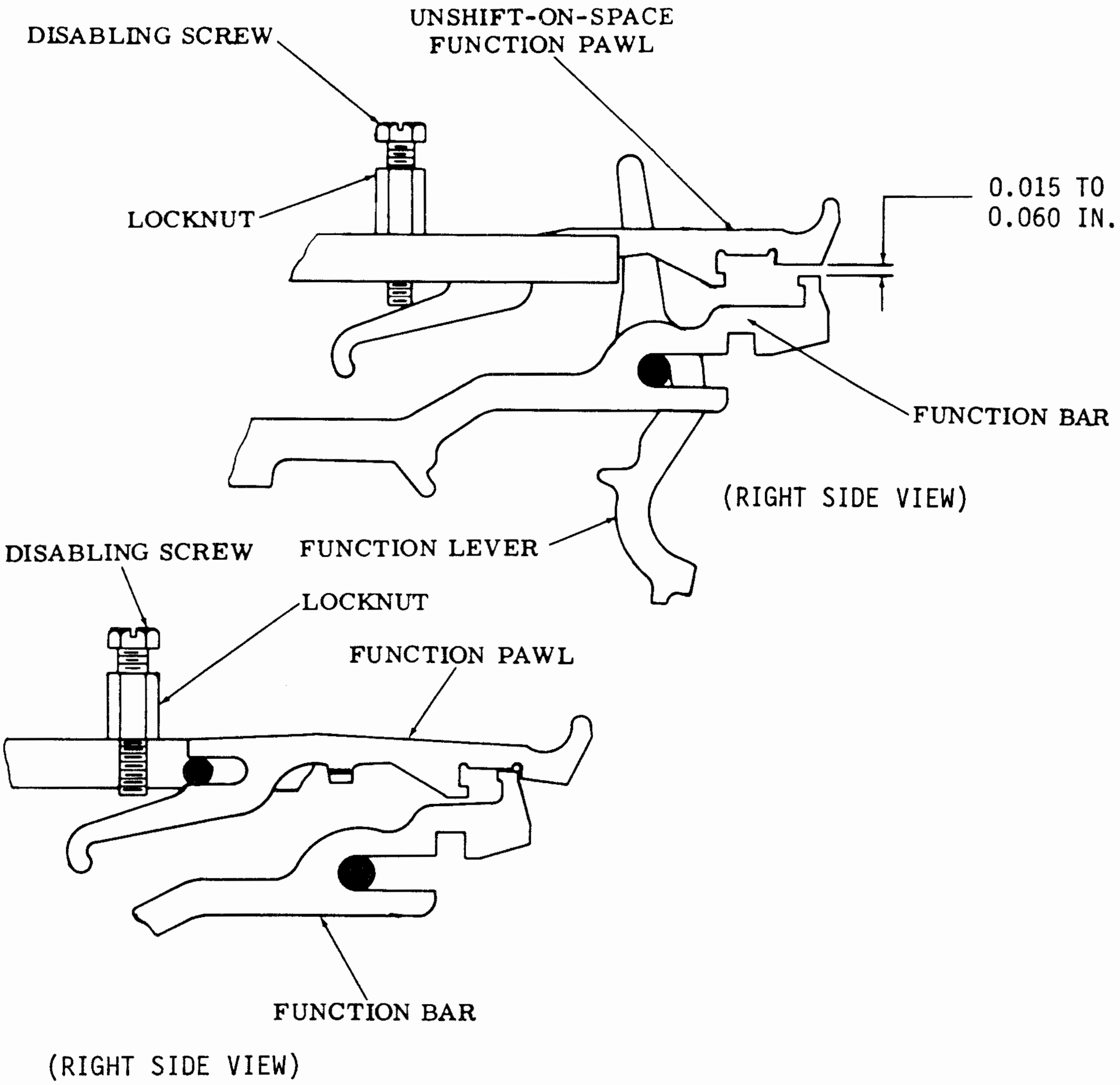
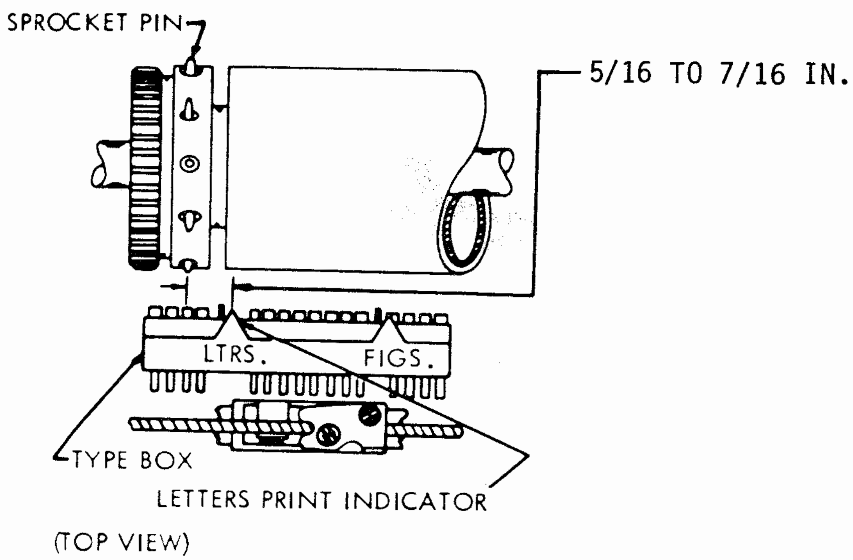



**Figure 6-17. Unshift-On-Space Function Pawl**



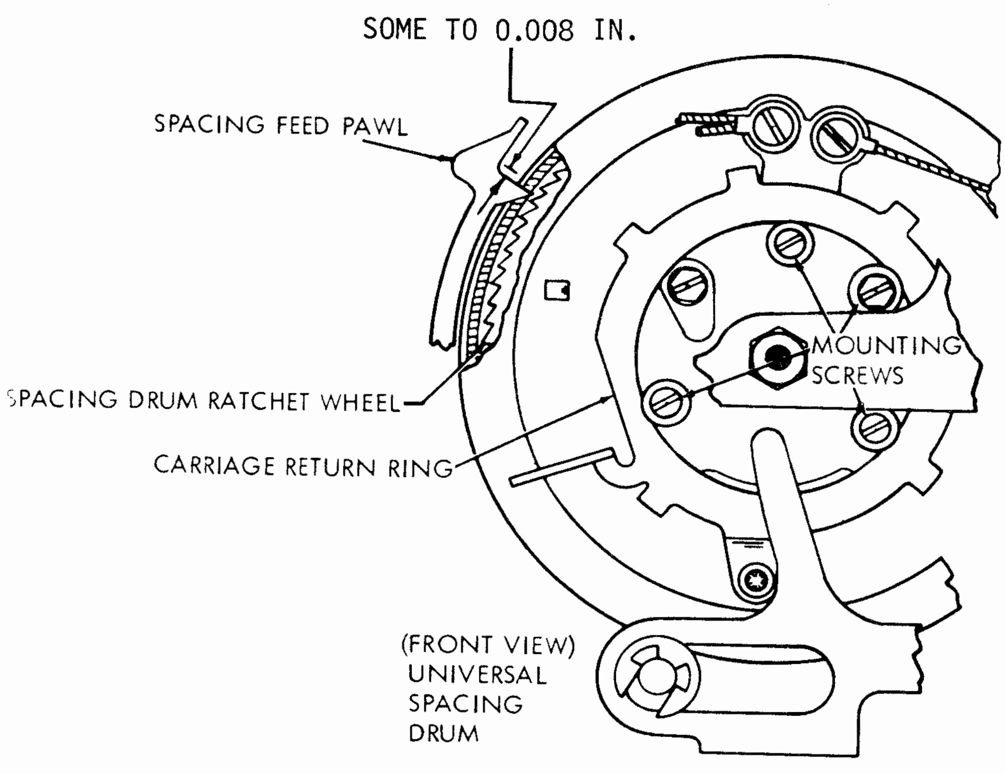




Figure 6-18. Left Margin (Sprocket Feed), Printing Hammer Stop Bracket (Sprocket Feed)

(c) For units with thin type box and no dummy type pallets, use corresponding standard adjustment.

(d) Certain multiple form units will require a refinement of standard adjustments for stop bracket to between 0.005 and 0.015 inch.

(3) Right Margin (Sprocket Feed). Adjust right margin as follows:

(a) Refer to figure 6-19.

(b) Disengage type box clutch.

(c) Place carriage in position to print character on which spacing cutout is to occur.

(d) Place front feed pawl in farthest advanced position.

(e) Hold spacing cutout transfer bail in its uppermost position.

(f) If unit has two-piece spacing cutout bail, push cutout bail toward rear through hole in front plate.

(g) Measure clearance between extension on space suppression ring and transfer bail. Clearance should be between 0.006 and 0.025 inch.

(h) If clearance exceeds specified limits, loosen four mounting screws and position space suppression ring to obtain clearance within specified limits.

(i) Tighten four mounting screws.

NOTE 1

If adjustment was necessary to bring clearance within specified limits, check adjustments in paragraphs 6-3.1h(13) and 6-3.1h(2).

NOTE 2

Range of adjustment is from 0 to 85 characters.

NOTE 3

This adjustment is not applicable to units equipped with automatic carriage return-line feed ring. (See paragraph 6-7.1h(7).

(4) Line Feed Bar Bell Crank Spring. Adjust line feed bar bell crank spring as follows:

(a) Refer to figure 6-20.

(b) Place left-hand line feed bar in rear position.

(c) Attach spring scale hook to line feed bar at upper end.

(d) The force required to start bar moving should be as follows: for friction feed, between 19 and 24 ounces; for sprocket feed, between 28 and 38 ounces.

(e) If scale reading exceeds limits, install a new spring.

(5) Line Feed Bar Release Lever Spring. Adjust line feed bar release lever spring as follows:

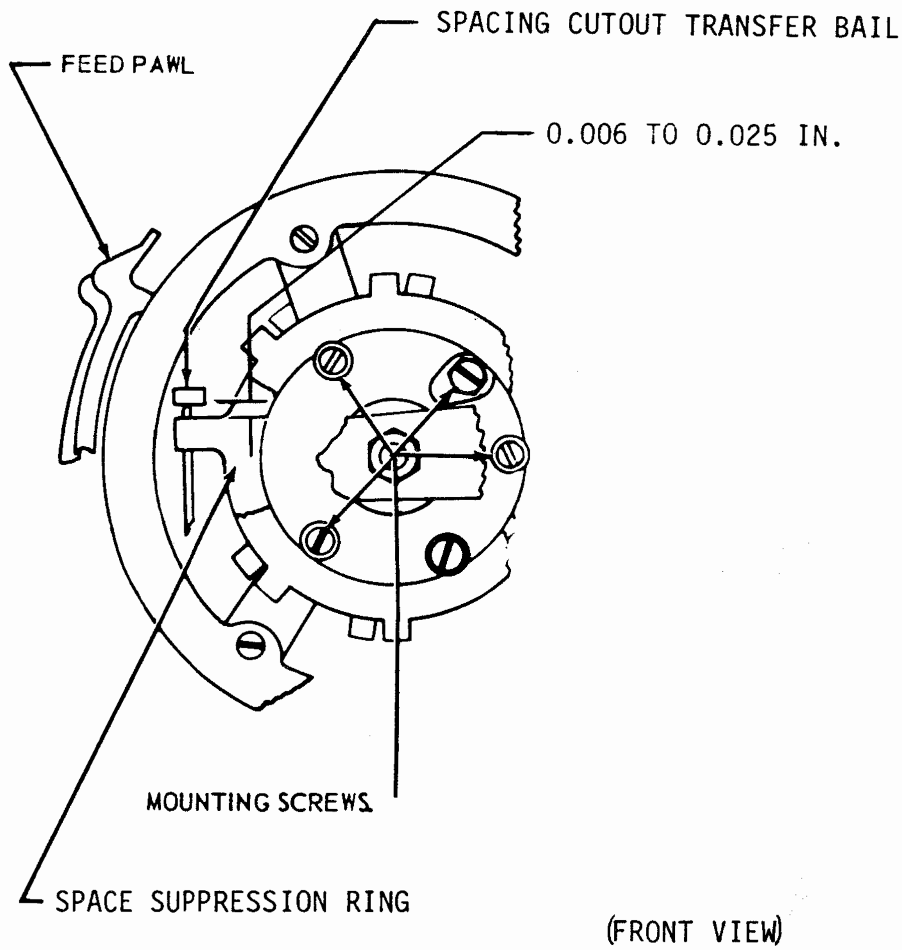



Figure 6-19. Right Margin (Sprocket Feed)

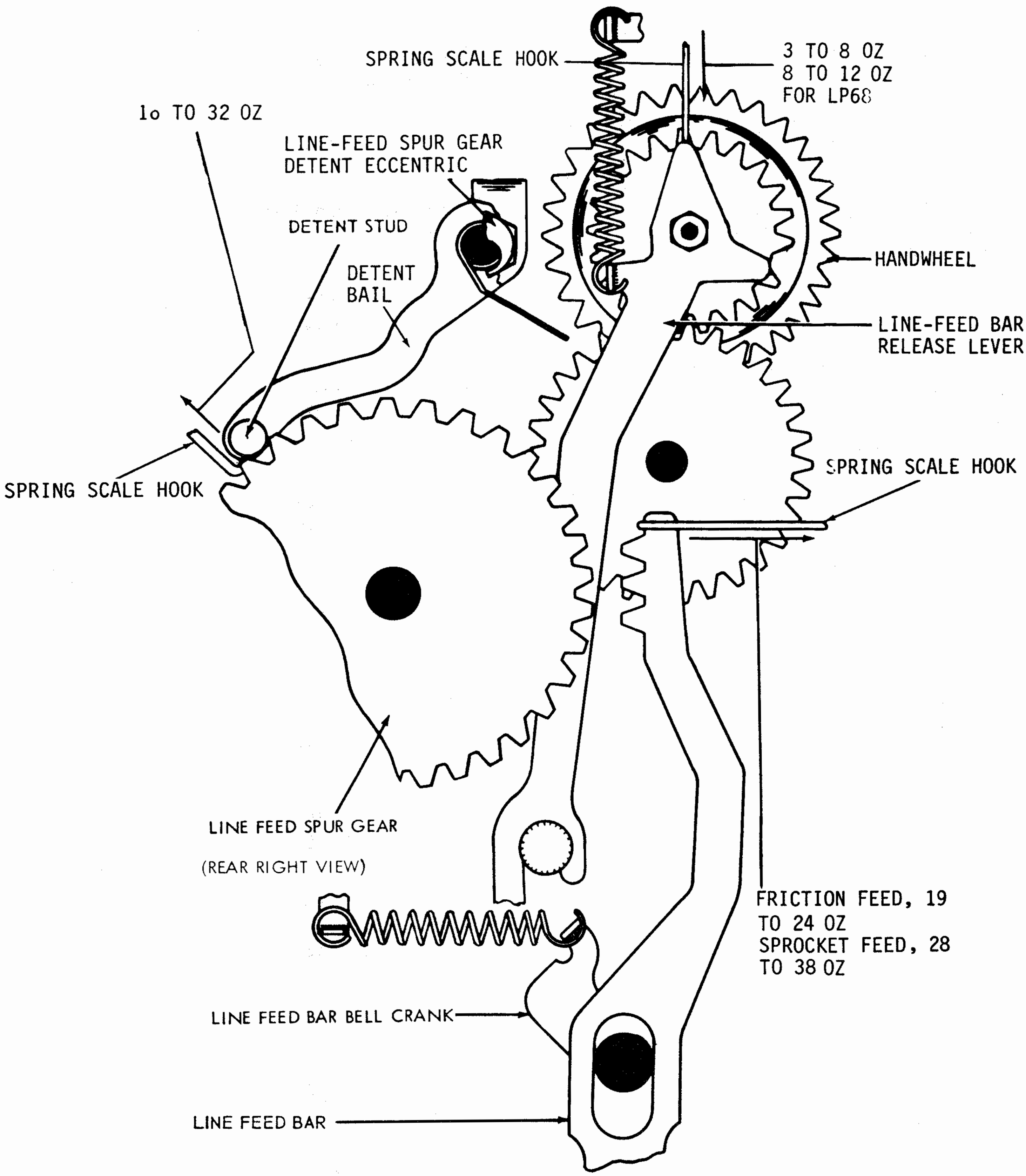



Figure 6-20. Line Feed Bar Bell Crank Spring, Line Feed Bar Release Lever Spring, Line Feed Spur Gear Detent Eccentric, and Platen Detent Bail Spring

(a) Refer to figure 6-20.

(b) Attach spring scale hook to line feed bar release lever.

(c) The force required to start lever moving should be between 3 and 8 ounces. For LP68 the required force should be between 8 and 12 ounces.

(d) If scale reading exceeds limits, install a new spring.

(6) Line Feed Spur Gear Detent Eccentric. Adjust line feed spur gear detent eccentric as follows:

(a) Refer to figure 6-20.

(b) Disengage feed clutch.

(c) Rotate platen until stud is seated between two teeth on line feed spur gear.

(d) When handwheel is released, manually set teeth on feed bars into engagement with teeth on line feed spur gear.

(e) Detent stud should contact one gear tooth and be not more than 0.010 inch from other tooth.

(f) If gap between teeth exceeds specified limit, loosen mounting screw and rotate detent eccentric, keeping high part of eccentric upward, to obtain proper gap dimension.

(g) Tighten mounting screw.

(7) Platen Detent Bail Spring. Adjust platen detent bail spring as follows:

(a) Refer to figure 6-20.

(b) Seat detent between two teeth on line feed spur gear.

(c) Attach spring scale hook to end of detent bail.

(d) Force required to start detent bail moving should be between 16 and 32 ounces.

(e) If scale reading exceeds specified limit, install a new spring.

(8) Line Feed Clutch Phasing. Adjust line feed clutch phasing as follows:

(a) Refer to figure 6-21.

(b) Disengage line feed clutch.

(c) Both line feed bars should engage teeth of line feed spur gear.

(d) To adjust, loosen assembly bearing post; remesh line feed eccentric spur gear with clutch gear.

(e) Tighten bearing post.

(9) Paper Finger (Friction Feed). Adjust paper finger as follows:

(a) Refer to figure 6-22.

(b) Pressure end of paper fingers should

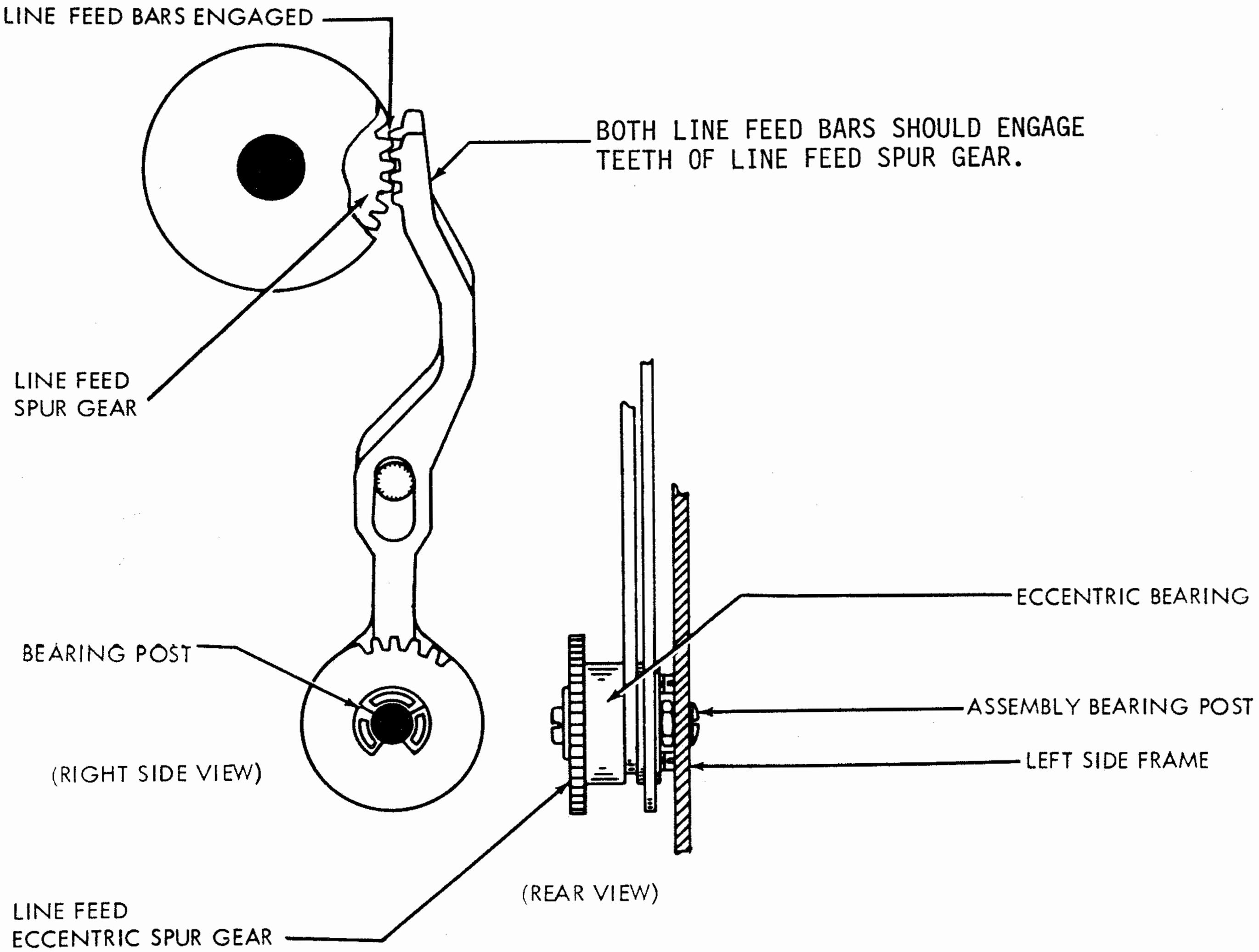



Figure 6-21. Line Feed Clutch Spring

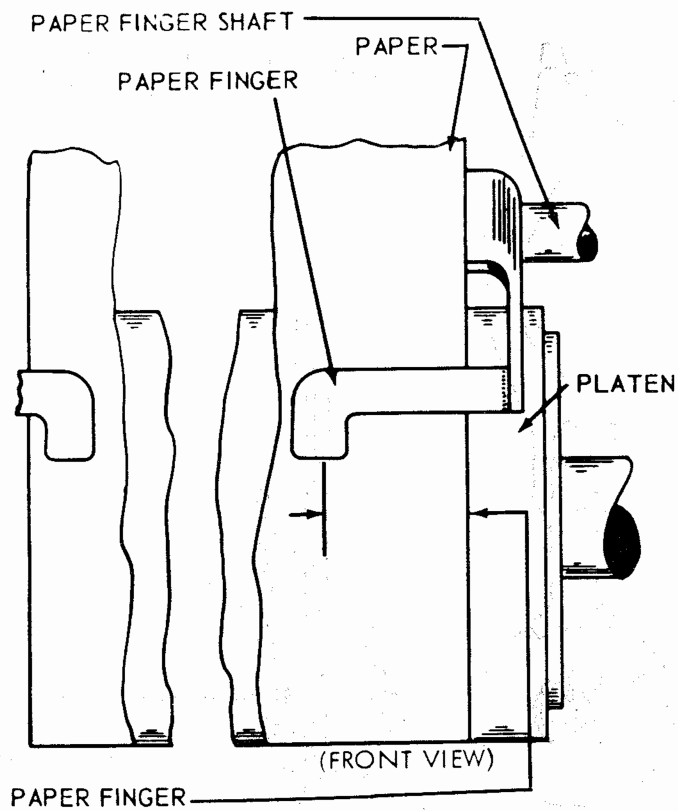



Figure 6-22. Paper Finger (Friction Feed)

overlap paper between 3/8 and 1/2 inch.

(c) If overlap is not as specified, position paper fingers by sliding them on their shaft.

(10) Paper Finger Spring. Adjust paper finger spring as follows:

(a) Refer to figure 6-23.

(b) Attach spring scale hook under end of right paper finger.

(c) Force required to start left paper spring moving from platen should be between 3 and 6 ounces.

(d) If scale reading exceeds specified limits, install a new spring.

(11) Paper Pressure Bail Spring. Adjust paper pressure bail spring as follows:

(a) Refer to figure 6-23.

(b) Hook spring scale over pressure bail at either end of platen.

(c) Force required to move pressure bail from platen should be between 7 and 20 ounces.

(d) Repeat step (b) and (c) at opposite end of plate-

(e) If scale reading for either spring exceeds specified limits, replace spring.

(12) Pressure Roller Lever Spring. Adjust pressure roller lever spring as follows:

(a) Refer to figure 6-23.

(b) Attach spring scale hook to each center lever alternately.

(c) Force required to start each center lever moving should be between 28 and 36 ounces.

(d) If scale reading exceeds specified limits, install a new spring.

(13) Paper Finger Locking Arm Spring (Sprocket Feed). Adjust paper finger locking arm spring as follows:

(a) Refer to figure 6-24.

(b) Attach spring scale hook to locking arm.

(c) Force required to move arm away from platen should be between 1 and 1-1/2 ounces.

(d) If scale reading exceeds specified limits, install new spring.

(14) Paper Finger or Guide Bracket Latch Spring. Adjust paper finger or guide latch spring as follows:

(a) Refer to figure 6-24.

(b) Place paper finger or guide bracket against platen.

(c) Attach spring scale hook to paper finger or guide bracket latch.

(d) Force required to start latch moving

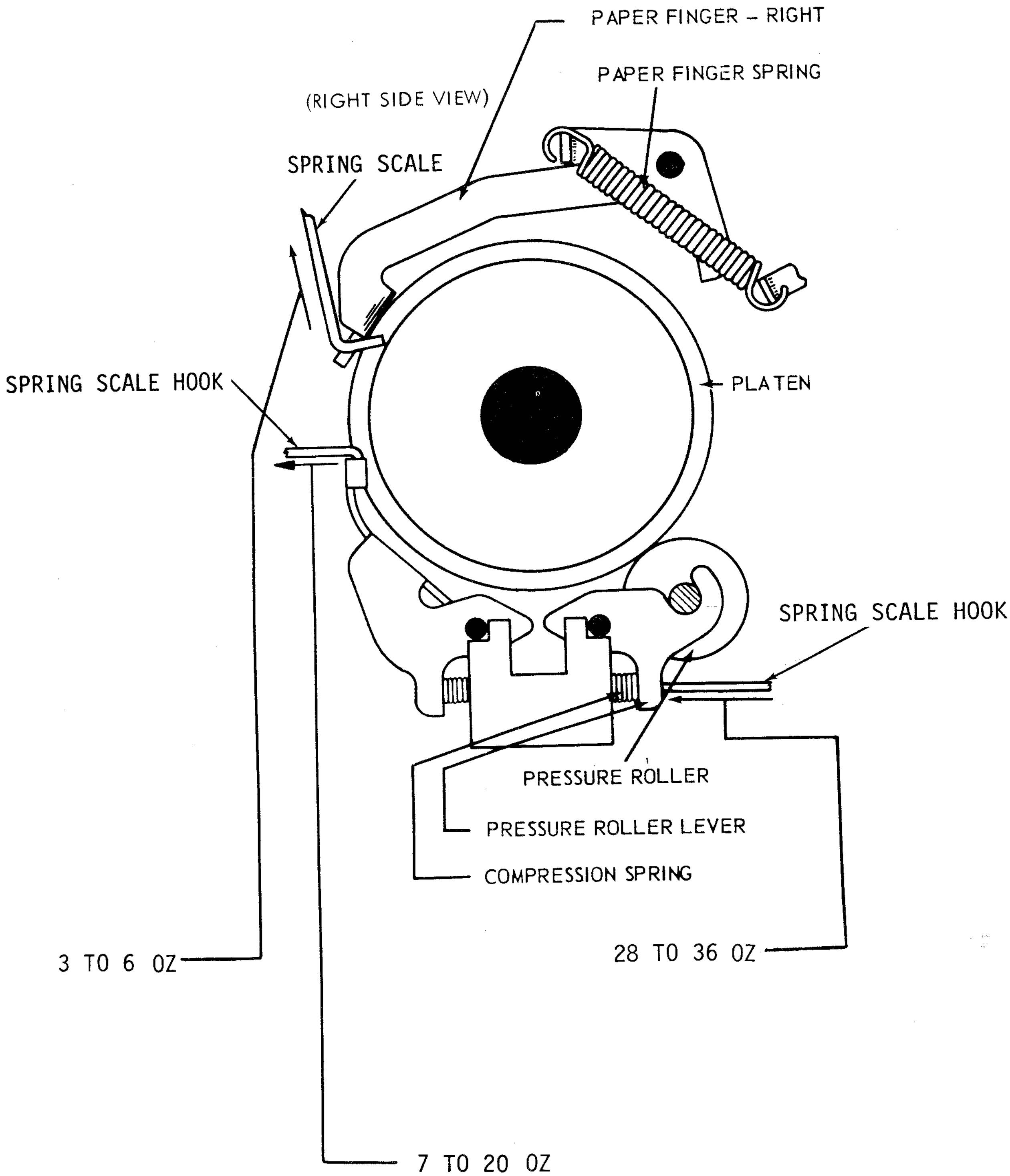



Figure 6-23. Paper Finger Spring, Paper Pressure Bail Spring, and Pressure Roller Lever Spring

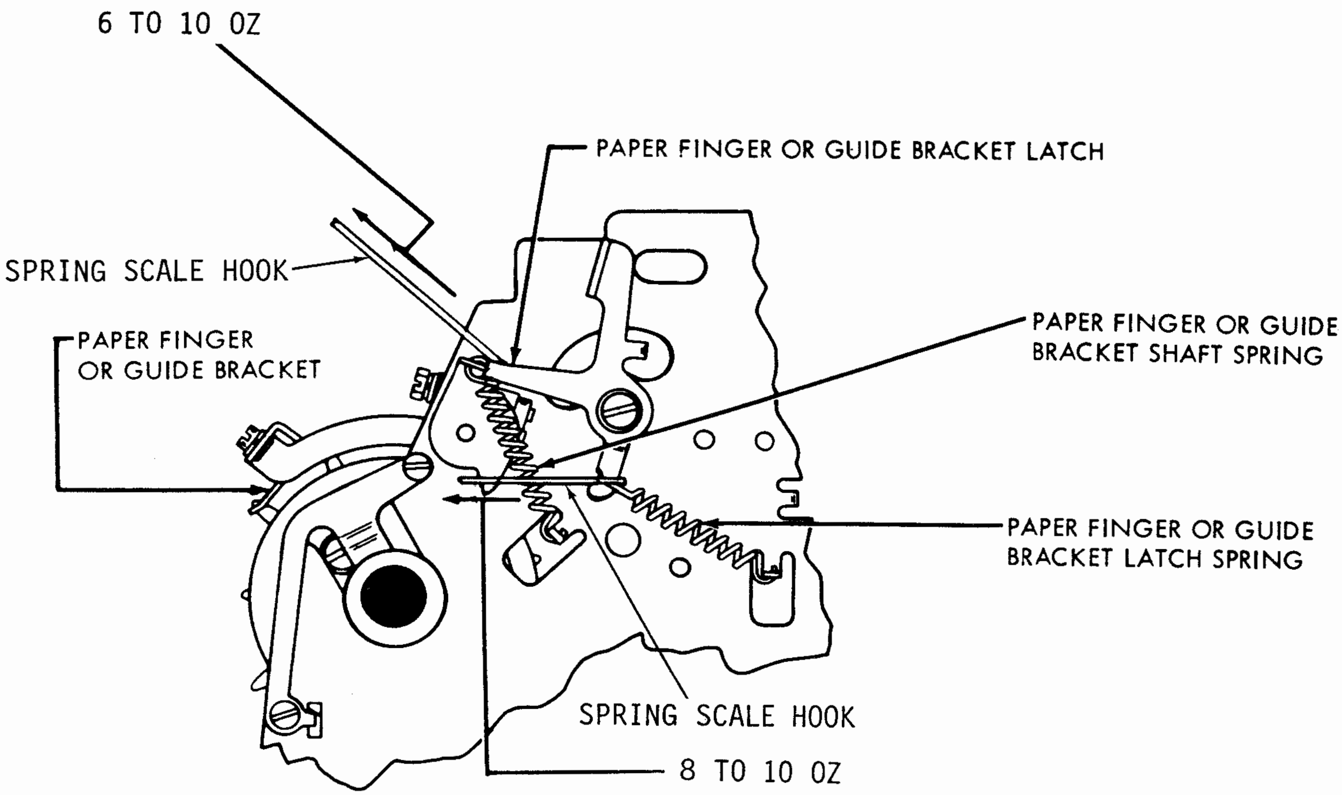



Figure 6-24. Paper Finger Locking Arm Spring, Paper Finger or Guide Bracket Latch Spring, and Paper Finger or Guide Bracket Shaft Spring

should be between 8 and 12 ounces.

(e) If scale reading exceeds specified limits, install new spring.

(15) Paper Finger or Guide Bracket Shaft Spring. Adjust paper finger or guide shaft spring as follows:

(a) Refer to figure 6-24.

(b) Attach spring scale hook to end of paper finger on guide bracket shaft spring.

(c) Force required to move paper finger or guide bracket against platen should be between 6 and 10 ounces.

(d) If scale reading exceeds specified limits, install new spring.

(16) Paper Finger or Guide Bracket (Sprocket Feed). Adjust paper finger or guide bracket as follows:

(a) Refer to figure 6-25.

(b) Ensure sprocket pin is centered in paper finger or guide bracket slot. If any change is made in the above adjustment, recheck following related adjustments:

Horizontal positioning drive linkage

Right vertical positioning lever eccentric stud

Left vertical positioning lever eccentric stud

Vertical positioning lock lever

Ribbon feed lever bracket

Function stripper blade arms

Spacing trip lever bail cam plate

Reversing slide brackets

Ribbon reverse spur gear

Printing track

Printing arm

(c) To adjust, loosen both clamp screws and position assembly horizontally to center sprocket pin in paper finger or guide bracket slot. Tighten clamp screws.

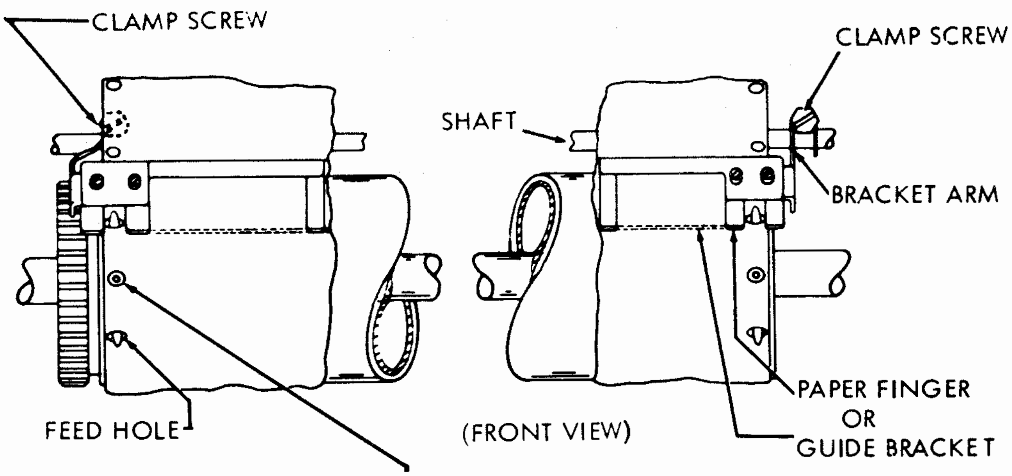
(d) Gap between platen and paper finger or guide bracket slot should be as follows:

1. For stapled multiple copy, between 0.050 and 0.105 inch.

2. For single copy or unstapled multiple copy, between 0.020 and 0.060 inch.

(e) If gap between platen and paper finger or guide bracket slot exceeds specified limits, loosen both clamp screws and rotate assembly to obtain gap specified in step (d).

(f) Measure clearance between leading edge of paper finger or guide bracket and ribbon guide (not illustrated). The clearance should be a minimum of 0.035 inch, and both right and left paper fingers must be parallel to same printed line as gauged by eye.




SPROCKET PIN SHOULD BE CENTRALLY LOCATED IN THE PAPER FINGER OR GUIDE BRACKET SLOT.

STAPLED MULTIPLE COPY, 0.050 TO 0.105 IN. SINGLE COPY OR UNSTAPLED MULTIPLE COPY, 0.020 TO 0.060 IN.

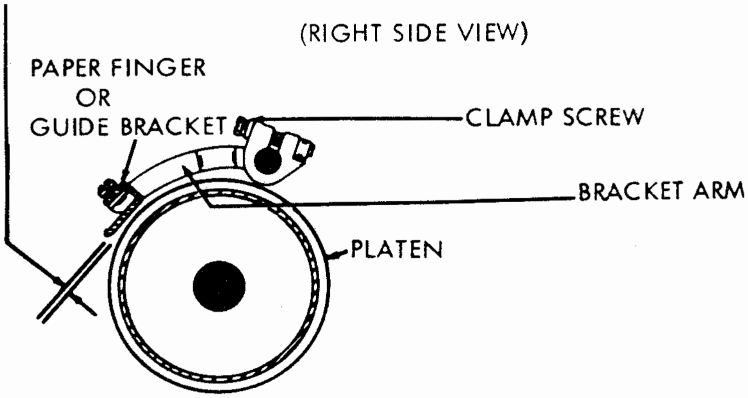



Figure 6-25. Paper Finger or Guide Bracket (Sprocket Feed)

(g) If clearance exceeds specified limit or paper fingers are not parallel to same printed line, loosen both clamp screws, select letters combination, and rotate type box clutch 1/2 revolution. Position paper fingers by means of elongated mounting holes.

(h) Tighten clamp screws and repeat steps (e) and (f).

(17) <u>Paper Guide (Sprocket Feed)</u>. Adjust paper guide as follows:

(a) Refer to figure 6-26.

(b) Measure clearance between platen and front edge of paper guide. Clearance should be as follows:

1. For stapled multiple copy, between 0.050 and 0.105 inch.

2. For single copy or unstapled multiple copy, between 0.020 and 0.060 inch,

(c) If clearance exceeds specified limits, loosen mounting screws, position guide to obtain specified clearance, and tighten mounting screws.

(18) <u>Sprocket Pin Spring</u>. Adjust sprocket pin spring as follows:

(a) Refer to figure 6-26.

(b) Apply spring scale to sprocket spring.

(c) Force required to start depressing pin should be between 6 and 8 ounces.

(d) If scale reading exceeds specified limits, install new spring.

(19) <u>Paper Straightener Collar (Friction Feed)</u>. Adjust paper straightener collar as follows:

(a) Refer to figure 6-27.

(b) Measure distance from paper straightener shaft left shoulder to left collar.

(c) Distance should be 9/32 to 21/64 inch.

(d) If distance exceeds specified limits, loosen left collar set screw, position collar to obtain specified distance and tighten set screw.

(e) Measure distance from paper straightener shaft right shoulder to right collar.

(f) Distance should be 1/16 to 5/64 inch.

(g) If distance exceeds specified limits, loosen right collar set screw; position collar to obtain specified distance, and tighten set screw.

(20) <u>Paper Straightener Lever Spring</u>. Adjust paper straightener lever spring as follows:

(a) Refer to figure 6-27.

(b) Attach spring scale pushrod to paper straightener lever at point of attachment to paper straightener lever spring.

(c) Force required to start lever moving

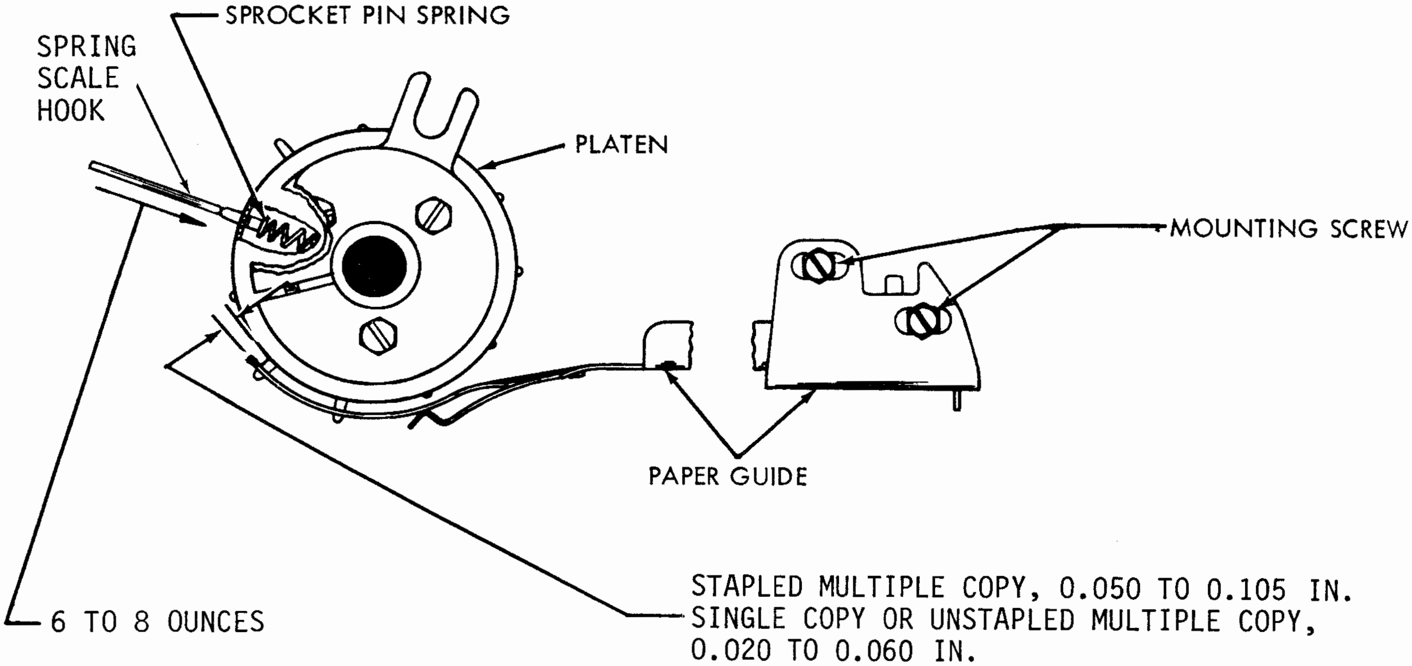



Figure 6-26. Paper Guide (Sprocket Feed) and Sprocket Pin Spring

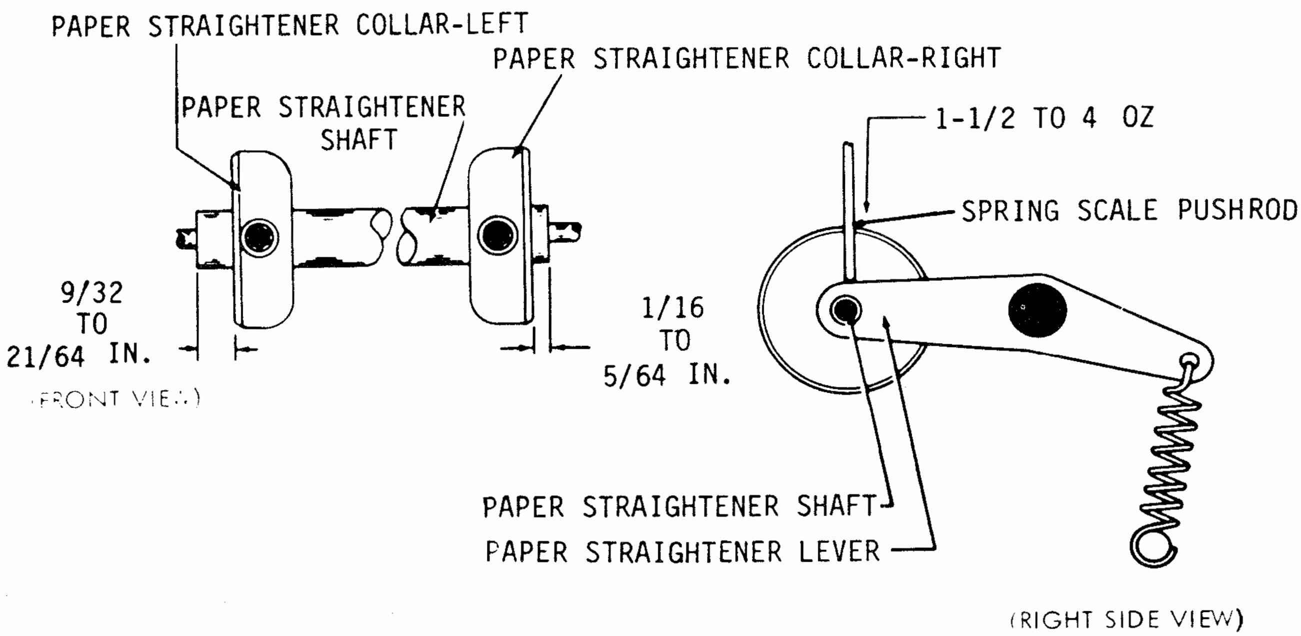



Figure 6-27. Paper Straightener Collar (Friction Feed) and Paper Straightener Lever Spring

should be between 1-1/2 and 4 ounces.

(d) If scale reading exceeds specified limits, install a new spring.

(21) Platen End Play (Sprocket Feed). Adjust platen end play as follows:

(a) Refer to figure 6-28.

(b) Disengage line feed pawls.

(c) Measure platen shaft end play.

(d) End play should be 0.010 maximum.

(e) If end play exceeds specified limit, loosen clamp screw and position platen spur gear to obtain specified end play.

(f) Tighten clamp screw.

(22) Printed Line (Sprocket Feed). Adjust printed line as follows:

NOTE

This adjustment is a field adjustment.

(a) Refer to figure 6-29.

(b) The bottom of the printed line should be 1/32 $\pm$1/64 inch (plus a multiple of 1/6 inch) above horizontal

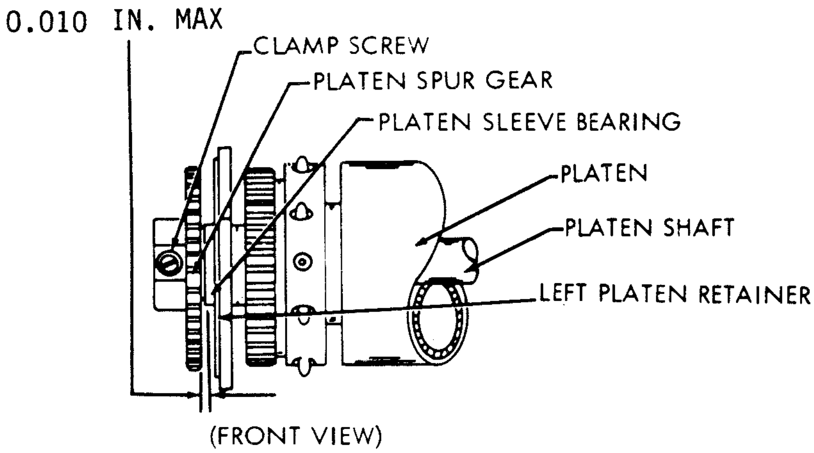



Figure 6-28. Platen End Play (Sprocket Feed)

line drawn even with the bottom edge of any sprocket hole.

(c) If necessary to adjust, loosen screws and position left sprocket. If other than standard paper is used, it may be necessary to make a variation in this adjustment.

(23) Sprocket Pin Separation. Adjust sprocket pin separation as follows:

(a) Refer to figure 6-29.

(b) Place a single sheet of sprocket feed paper on platen with paper feed holes centered on sprocket pins.

(c) Printed line should be parallel within ±1/32 inch to a line drawn perpendicular to edge of paper.

(d) If drawn line is not perpendicular to printed line within specified limits, loosen clamp screw and position right sprocket.

(e) Tighten clamp screw.

(24) Single-Double Line Feed Stripper Bail Assembly Spring. Adjust single-double line feed stripper bail assembly springs as follows:

(a) Refer to figure 6-30.

(b) Disengage line feed clutch.

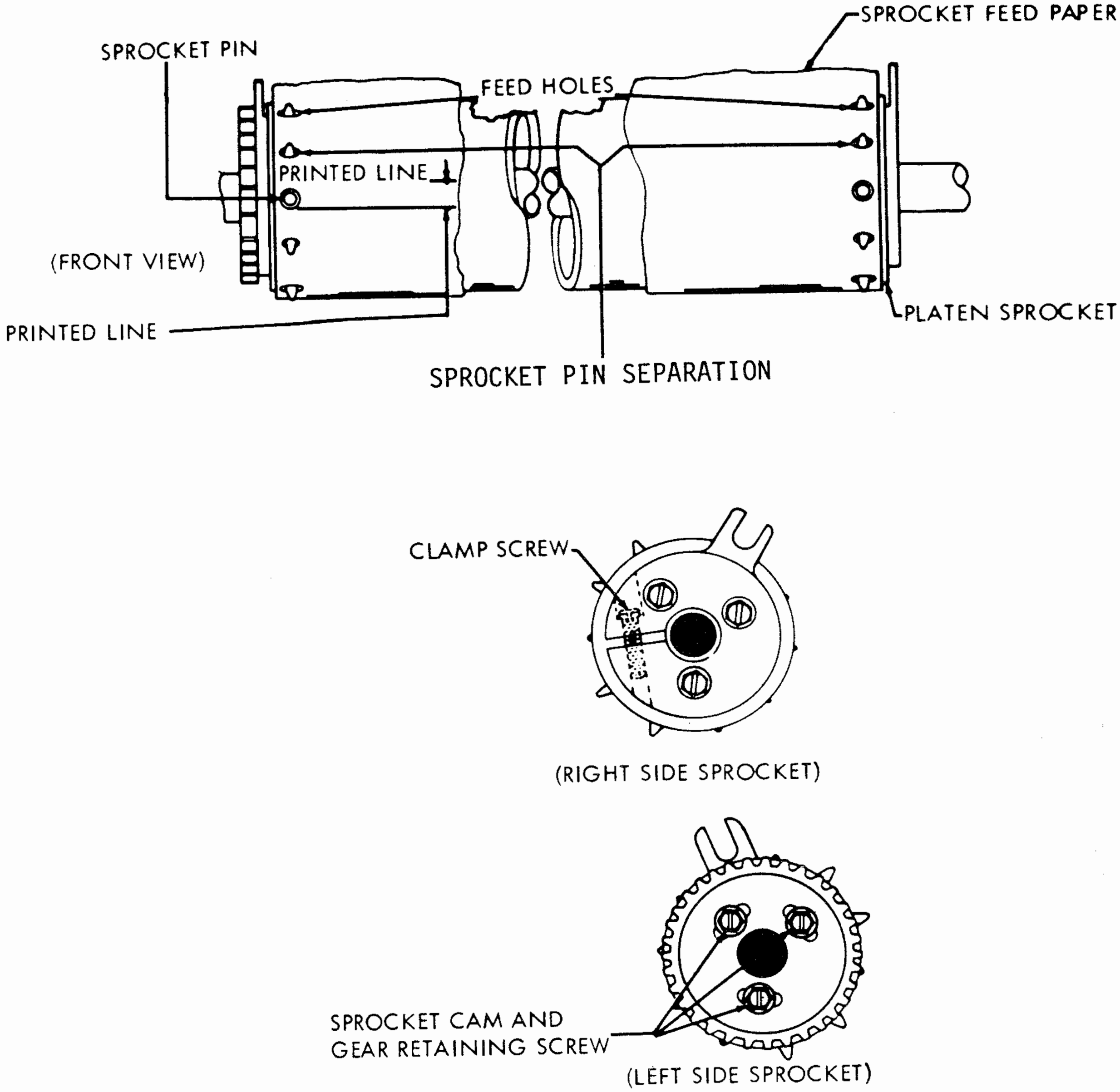



Figure 6-29. Printed Line (Sprocket Feed) and Sprocket Pin Separation

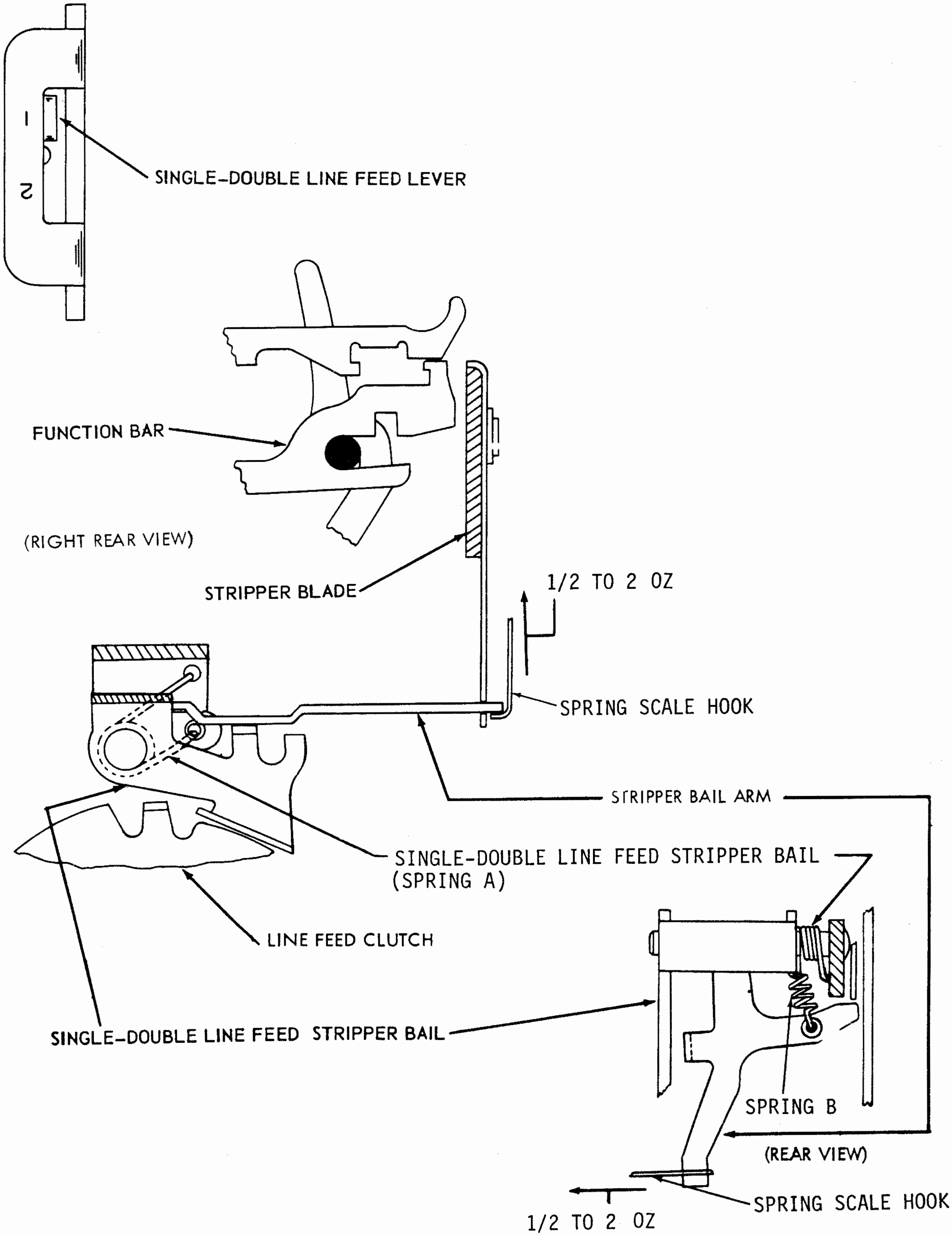



Figure 6-30. Single-Double Line Feed Stripper Bail Assembly Springs

(c) Set single-double line feed lever in single line feed position.

(d) Attach spring scale hook to stripper bail arm so as to move arm upward. Force required to start stripper bail arm moving upward should be between 1/2 and 2 ounces.

(e) If scale reading exceeds specified limits, replace spring A.

(f) Attach spring scale hook to stripper bail arm so as to move arm to left. Force required to start stripper bail arm moving to left should be between 1/2 and 2 ounces.

(g) If scale reading exceeds specified limits, replace spring B.

(25) Paper Finger. Adjust paper finger as follows:

(a) Refer to figure 6-31.

(b) Check to see that pressure ends of paper fingers overlap the paper between 3/8 and 1/2 inch.

(c) If overlap is not as specified, position fingers by sliding them on their shaft to obtain specified overlap.

d. Mainshaft and Tripshaft Mechanisms Adjustments. Perform mainshaft and tripshaft mechanisms adjustments in accordance with the following paragraphs.

(1) Clutch Drum Position (Except Selector). Adjust clutch drum postion as follows:

(a) Refer to figure 6-32.

(b) Hold clutch shoe lever disengaged and measure clutch end play.

(c) There should be some end play but not exceeding 0.015 inch.

(d) If end play exceeds specified limit, loosen mounting screws and postion each drum and spacing clutch set collar.

(e) Tighten mounting screws.

(2) Clutch Shoe Lever Spring. Adjust clutch shoe lever spring as follows:

(a) Refer to figure 6-32.

(b) Engage clutch.

(c) Hold cam disc to prevent turning.

(d) Attach spring scale hook to clutch shoe lever and pull at tangent to clutch.

(e) Force required to move shoe lever in contact with stop lug should be as follows: for one-stop clutches, 15 to 20 ounces; for two-stop clutches, 16 to 22 ounces.

(f) If scale reading exceeds specified limits, install a new spring.

(3) Clutch Shoe Spring. Adjust clutch shoe spring as follows:

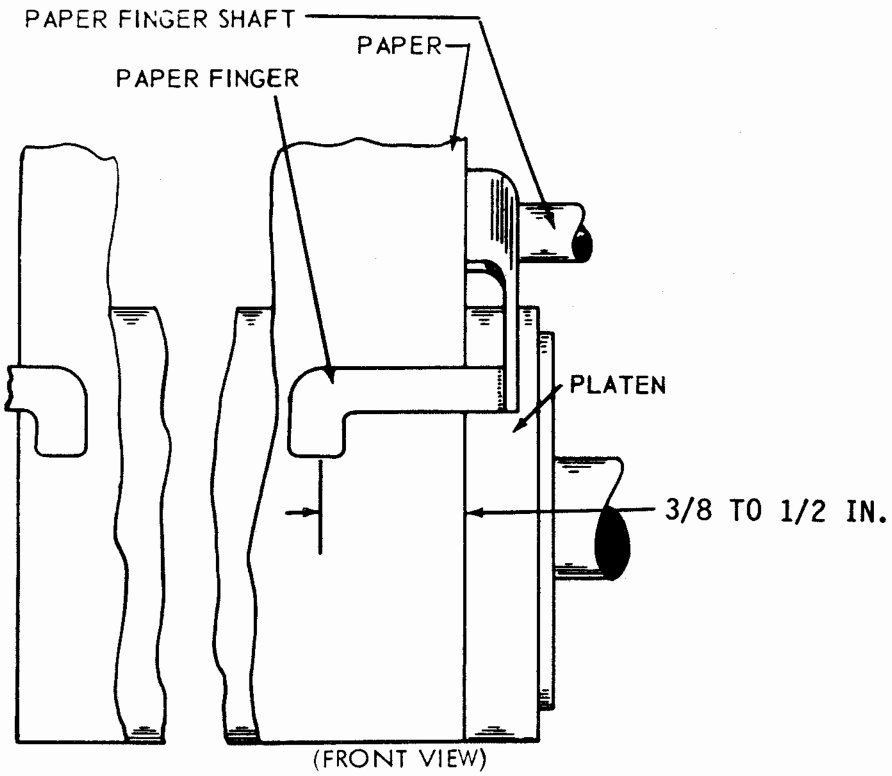



Figure 6-31. Paper Finger

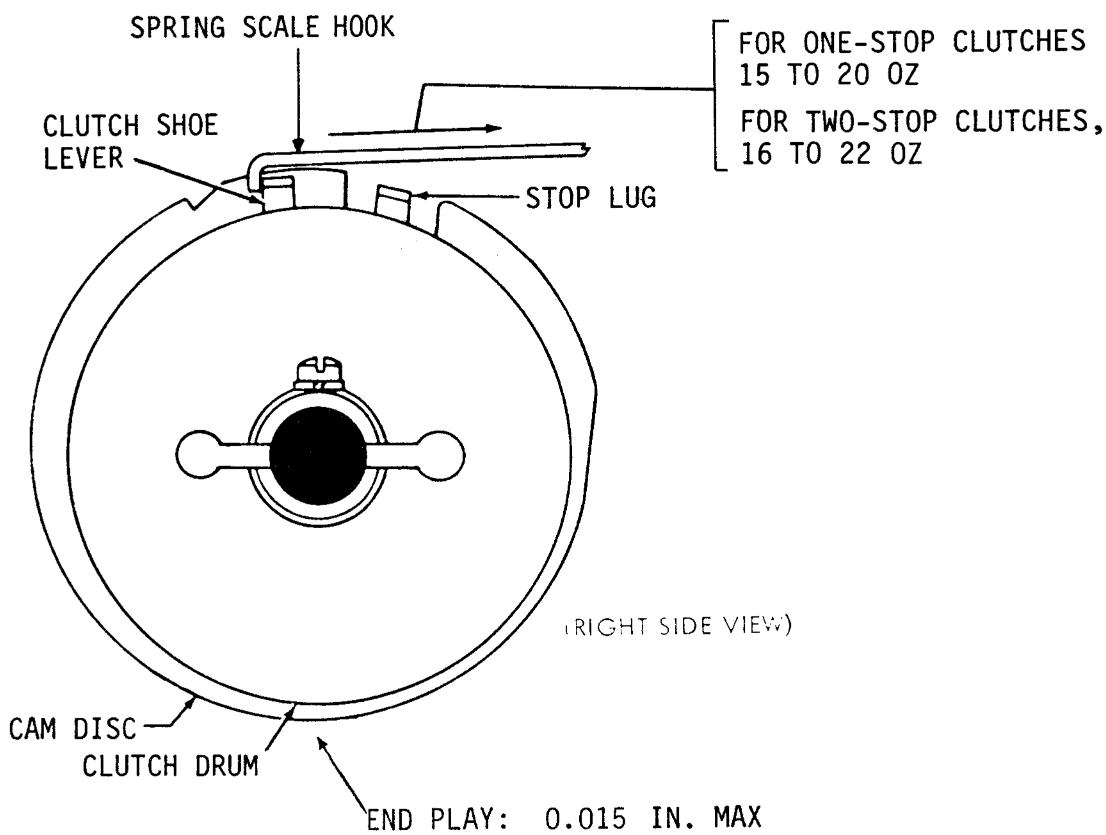



Figure 6-32. Clutch Drum Position and Clutch Shoe Lever Spring

NOTE

In order to check this spring tension it is necessary to remove clutch from main shaft. Therefore, it should not be checked unless there is reason to believe that is does not meet its requirement.

(a) Refer to figure 6-33.

(b) Remove clutch drum.

(c) Attach spring scale hook to primary shoe at a tangent to friction surface.

(d) Force required to start primary shoe moving away from secondary shoe at point of contact should be between 3 and 5 ounces.

(e) If scale reading exceeds specified limits, install a new spring.

(4) <u>Clutch Latch-Lever Spring (Except Selector)</u>. Adjust clutch latchlever spring as follows:

(a) Refer to figure 6-34. This adjustment applies to code bar clutch, function clutch, spacing clutch, line feed clutch, and type box clutch.

(b) Turn clutch to stop position, but with latch lever not latched.

(c) Attach spring scale hook to latch lever.

(d) Force required to move latch lever from lug should be between 5 and 7-1/4 ounces.

(e) If scale reading exceeds specified limits, install a new spring.

(5) <u>Code Bar Clutch Trip Lever</u>. Adjust code bar clutch trip lever as follows:

(a) Refer to figure 6-34.

(b) Disengage selector clutch and code bar clutch.

(c) Code bar clutch should engage clutch shoe lever by full thickness of shoe lever and have some end play, but not exceeding 0.006 inch.

(d) If engagement is not as specified, loosen clamp screw and position trip lever on its shaft.

(e) Tighten clamp screw.

(6) <u>Trip Shaft Lever Spring</u>. Adjust trip shaft lever spring as follows:

(a) Refer to figure 6-34.

(b) Position trip shaft lever on low part of cam.

(c) Engage code bar clutch and rotate one quarter turn.

(d) Attach spring scale hook to trip shaft lever.

(e) Force required to start lever moving should be between 1 and 2 ounces.

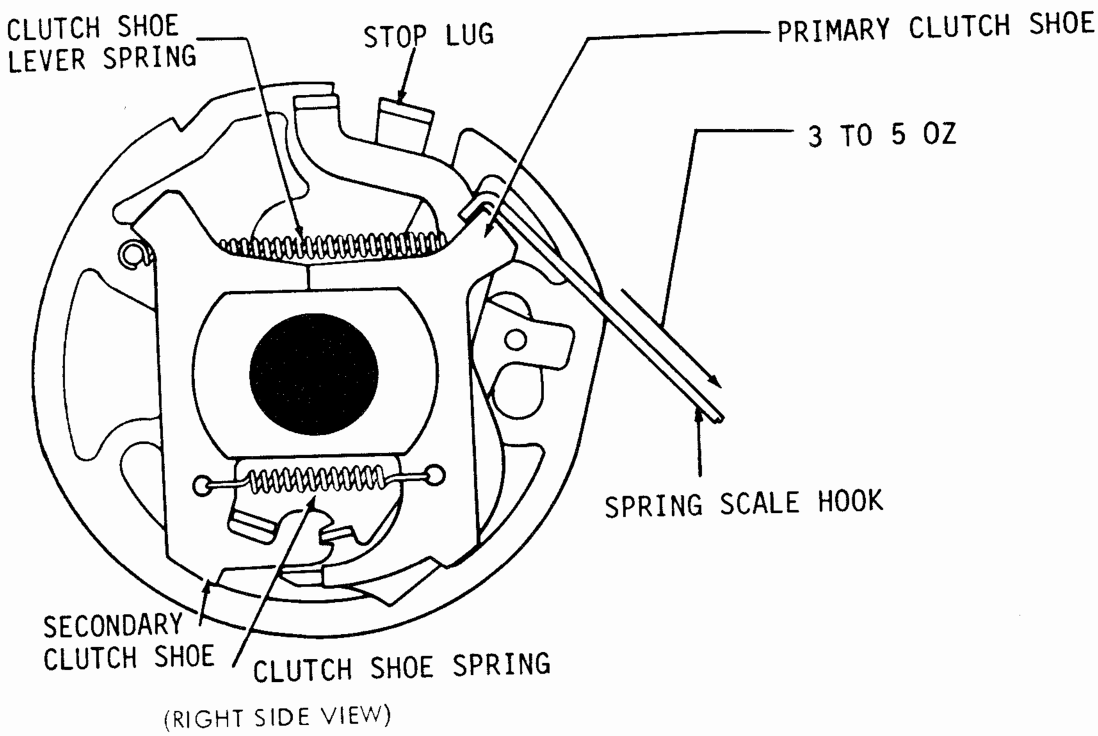



Figure 6-33. Clutch Shoe Spring

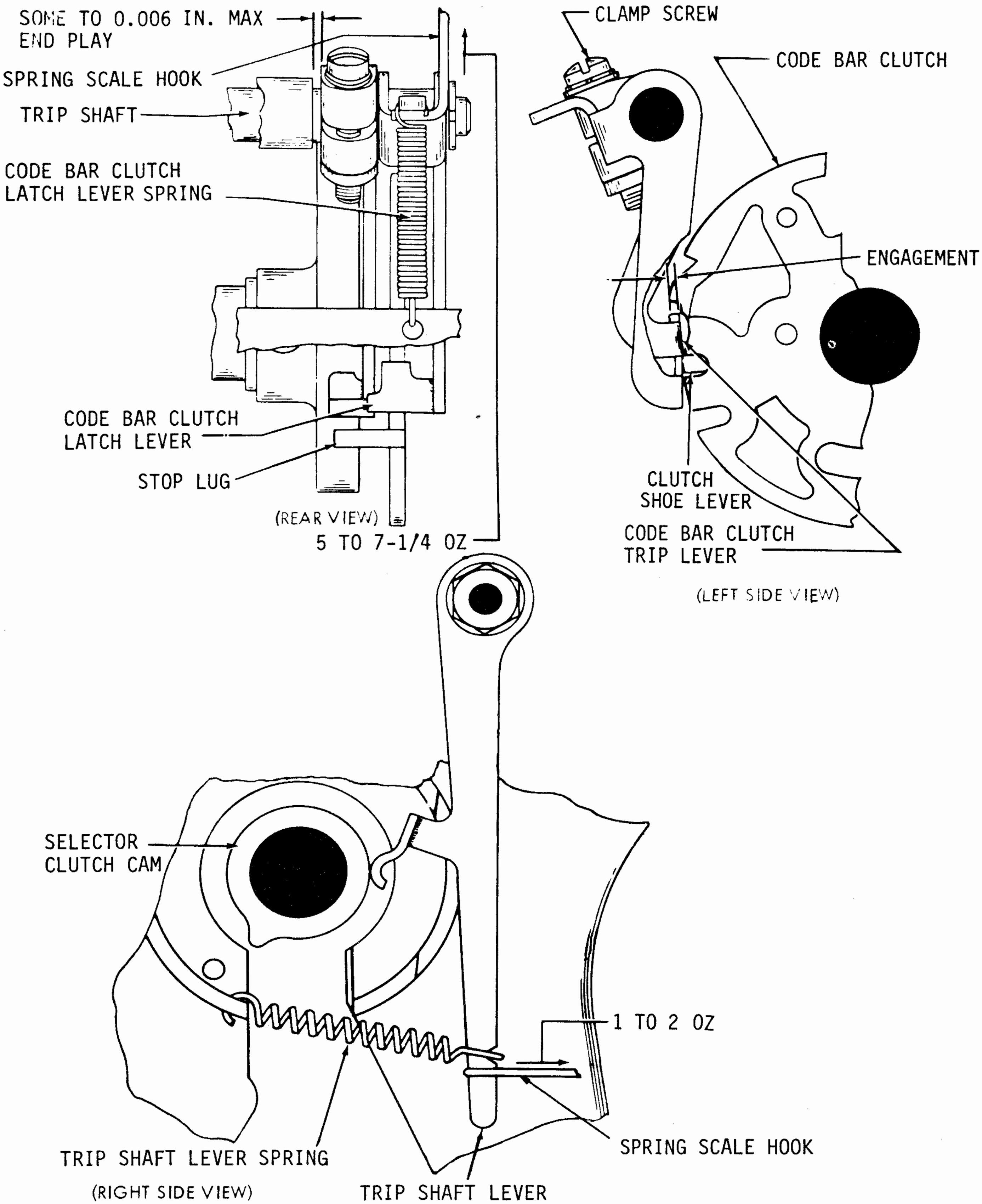



Figure 6-34. Clutch Latch Lever Spring (Except Selector), Code Bar Clutch Trip Lever, and Trip Lever Spring

(f) If scale reading exceeds specified limits, install new spring.

(7) Clutch Shoe Lever. Adjust clutch shoe lever as follows:

(a) Refer to figure 6-35.

(b) Disengage clutch and measure gap between clutch shoe lever and its stop lug. Make note of gap measurement.

(c) Engage clutch by tripping clutch and rotating it until clutch shoe lever is toward bottom of unit and again measure gap between clutch shoe lever and its stop lug. Make note of gap measurement.

(d) Find difference between the two gap measurements, by subtracting measurement with clutch disengaged from measurement with clutch engaged. Difference should be beween 0.055 and 0.085 inch.

(e) If difference exceeds specified value, loosen two clamp screws on clutch disc.

(f) Engage wrench or screwdriver with adjusting disc lug and rotate disc.

(g) Tighten clamp screws.

(8) Type Box Clutch Trip Lever. Adjust type box clutch trip lever as follows:

(a) Refer to figure 6-36.

(b) Position trip shaft cam follower roller on lowest surface of cam (located on code bar clutch).

(c) Measure clearance between inner face of type box clutch trip lever and clutch disc stop lug. Clearance should be between 0.025 and 0.045 inch.

(d) If clearance exceeds specified limits, loosen clamp screw and position stop to obtain specified clearance.

(9) Clutch Trip Lever Spring. Adjust trip lever spring as follows:

(a) Refer to figure 6-37.

(b) Engage and rotate clutch until trip lever rests on stop lug.

(c) Apply spring scale hook to trip lever.

(d) Force required to move lever away from stop lug should be as follows: for spacing clutch, between 11 and 16 ounces; for line feed clutch, between 9 and 12 ounces; for type box clutch, between 5 and 7-ounces.

(e) If scale reading exceeds specified limits, install new spring.

(10) Spacing Clutch Trip Lever. Adjust spacing clutch trip lever as follows:

(a) Refer to figure 6-38.

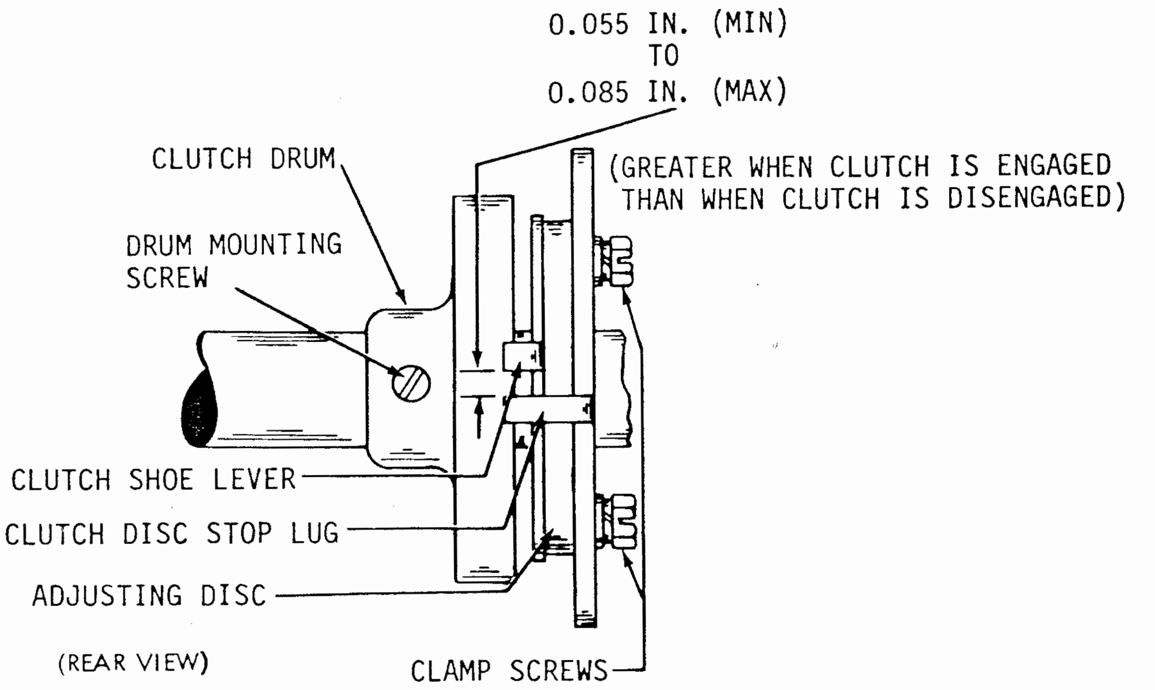



Figure 6-35. Clutch Shoe Lever

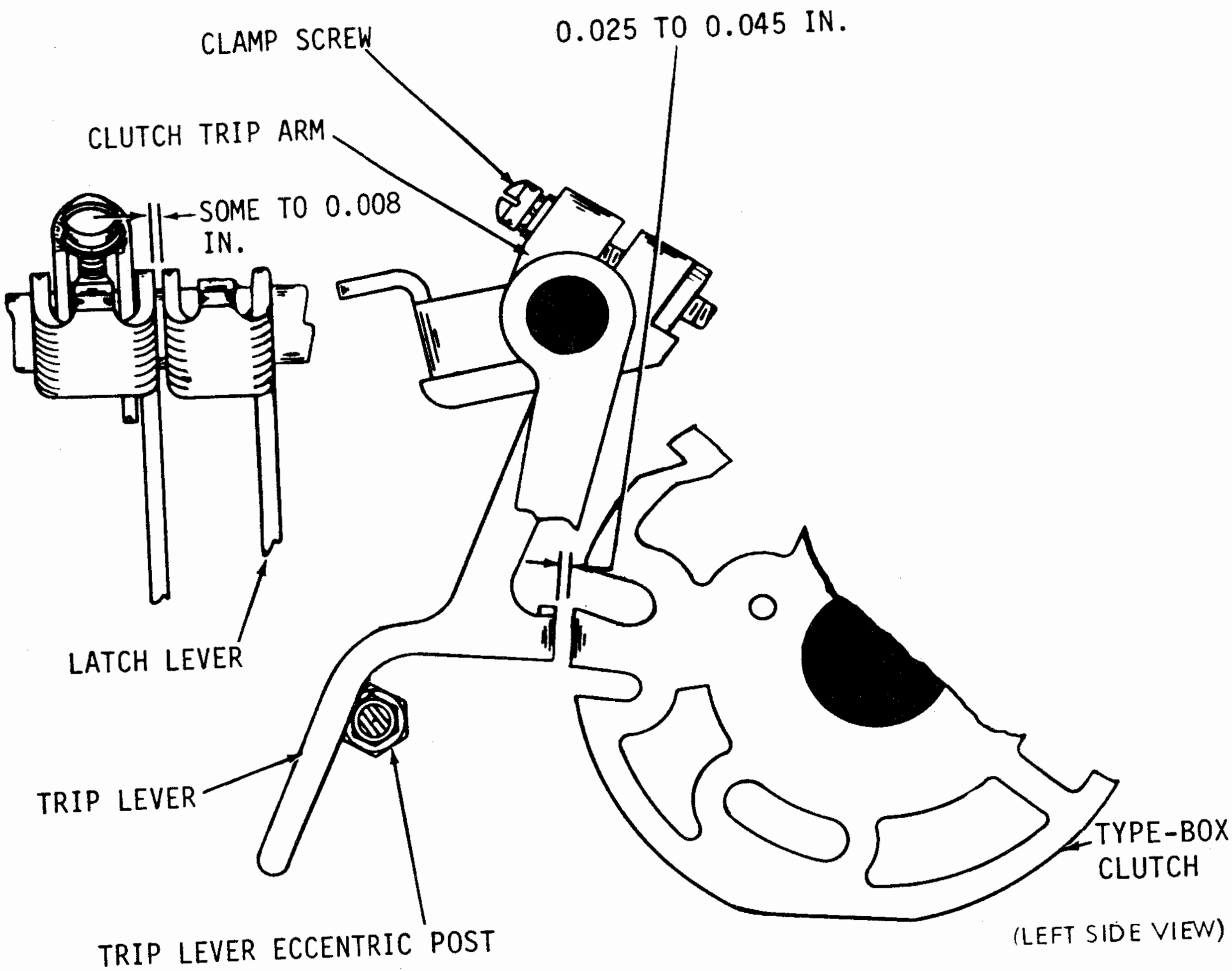



Figure 6-36. Type Box Clutch Trip Lever

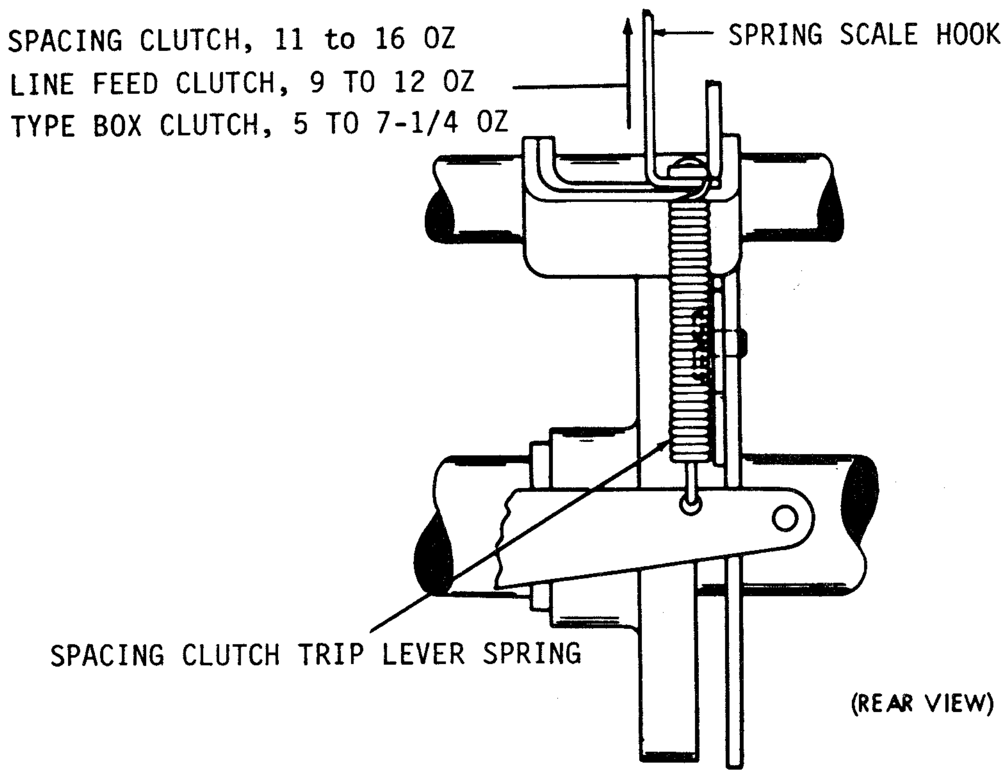



Figure 6-37. Clutch Trip Lever Spring

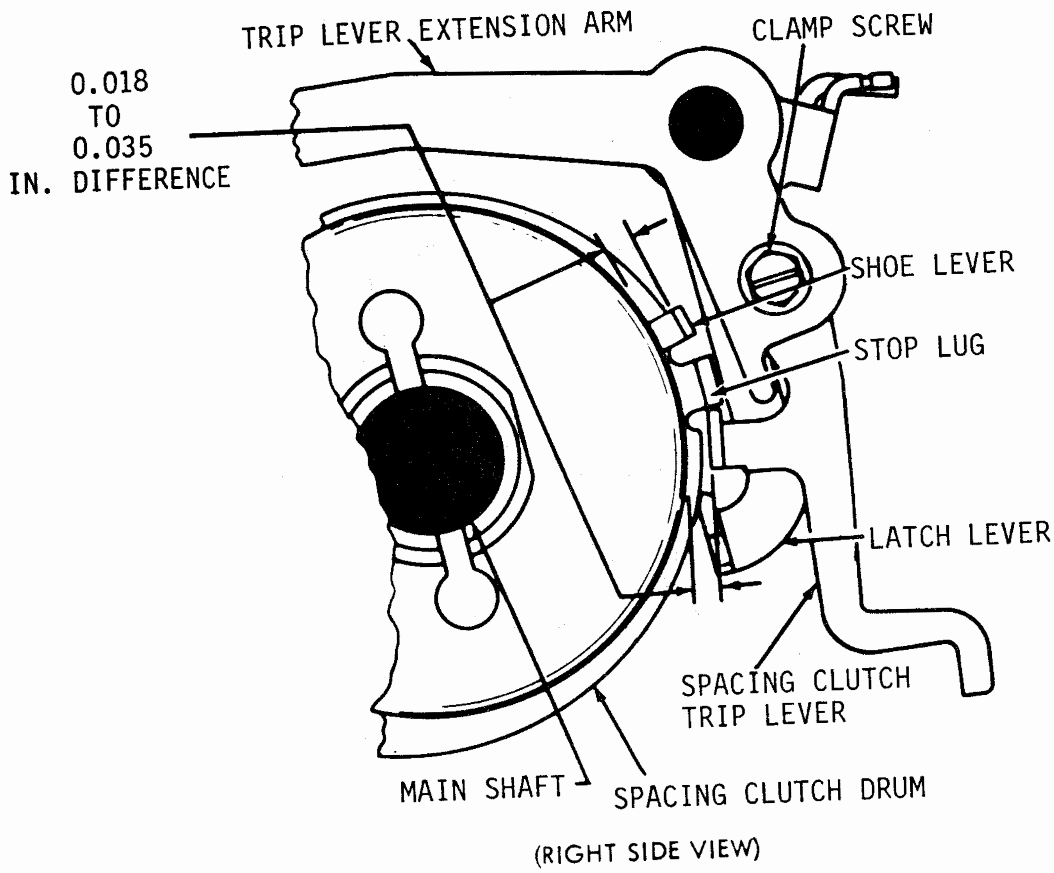



Figure 6-38. Spacing Clutch Trip Lever

(b) Disengage clutch.

(c) Trip clutch trip lever and rotate main shaft until trip lever is over shoe lever.

(d) Take up shoe lever play inward by snapping trip lever over shoe lever.

(e) Measure and note clearance between shoe lever and drum at each stop position to find stop position which yields greatest clearance. As gauged by eye, there should be some overbite on all stop lugs.

(f) Position trip lever at stop which yields greatest clearance and rotate main shaft slowly until trip lever just falls off stop lug.

(g) Measure and note clearance between trip lever and clutch drum.

(h) Find difference between greatest clearance measured in step (e) and clutch drum measured in step (g) by subtracting.

(i) The greatest clearance in step (e) should be between 0.018 and 0.035 inch greater than clearance between trip lever and clutch drum obtained in step (g).

(j) If difference in clearances exceeds specified limits, loosen clamp screw and position trip lever to adjust clearance between trip lever and clutch drum.

(k) Tighten clamp screw.

(11) <u>Clutch Trip Shaft Set Collars</u>. Adjust trip shaft set collars as follows:

(a) Refer to figure 6-39.

(b) Measure spacing cut-out lever side play.

(c) There should be some side play not exceeding 0.008 inch.

(d) If side play exceeds specified limits, loosen spacing cutout lever set collar set screw and position set collar to obtain specified side play.

(e) Visually gauge right end of stop extensions on trip lever and shoe lever for approximate alignment.

(f) If stop extensions are misaligned, loosen line feed clutch trip lever set collar set screw and position set collar to obtain approximate alignment of stop extensions.

(g) Measure line feed clutch latch lever side play.

(h) There should be some side play not exceeding 0.008 inch.

(i) If side play exceeds specified limits, loosen latch lever set collar set screw and position set collar to obtain specified side play.

(12) <u>Code Bar Clutch Cam Follower Spring</u>. Adjust code bar clutch cam follower spring as follows:

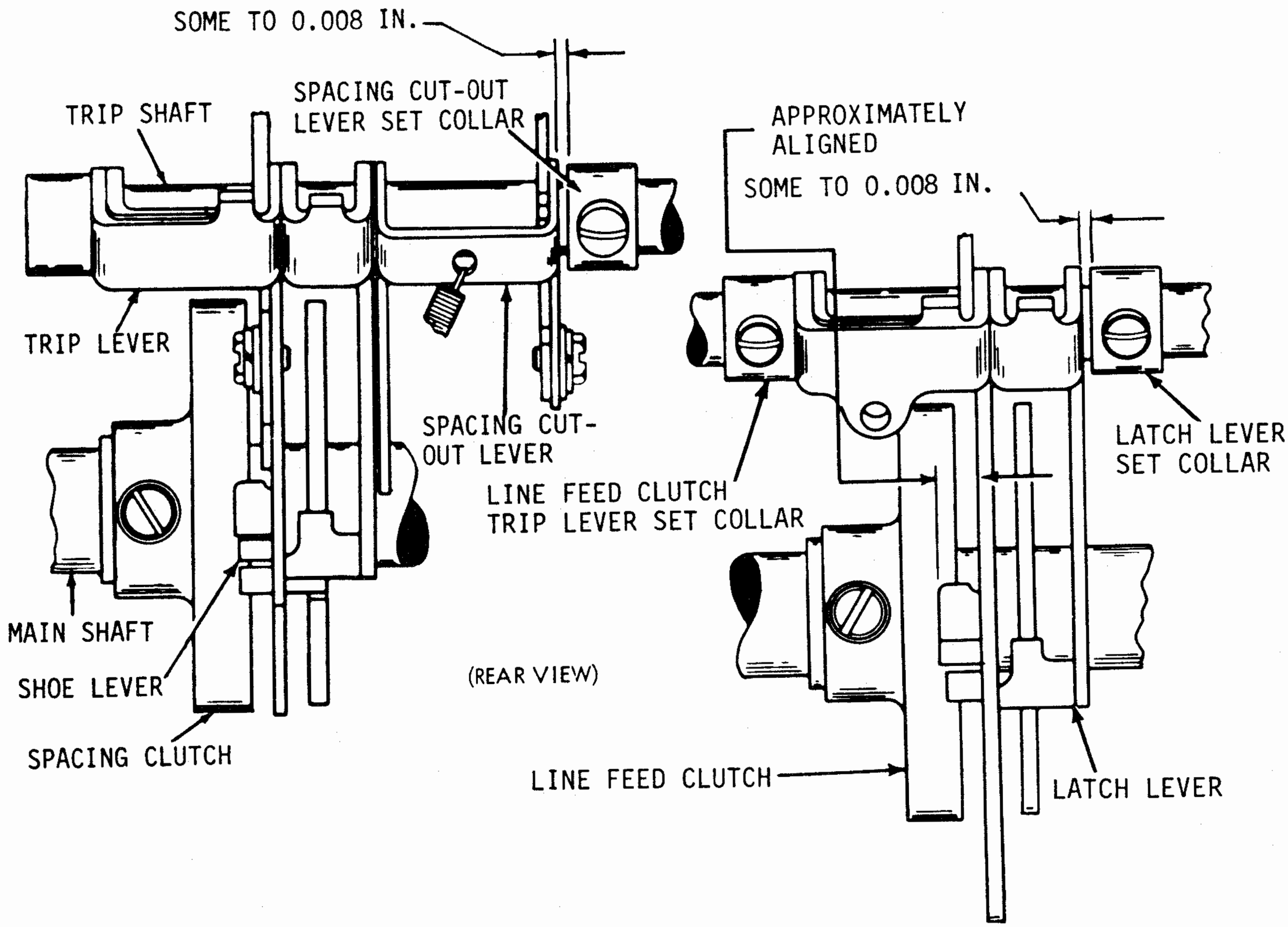



Figure 6-39. Clutch Trip Shaft Set Collars

(a) Refer to figure 6-40.

(b) Position cam so that cam follower roller rests on low part of cam.

(c) Unhook code bar clutch cam follower spring from spring bracket.

(d) Attach spring scale hook to loose end of spring.

(e) Force required to pull spring to installed length should be between 20 and 24 ounces. Hook spring on spring hook.

(f) If scale reading exceeds specified limits, install new spring.

(13) Function Clutch Trip Lever. Adjust function clutch trip lever as follows:

(a) Refer to figure 6-41.

(b) Disengage code bar clutch and function clutch trip lever.

(c) Function clutch trip lever should engage clutch shoe lever by full thickness of shoe lever. On two-stop clutches, make this check at lug having least bite.

(d) There should be some end play on trip shaft lever, but not in excess of 0.006 inch.

(e) If either engagement in step (c) or end play in step (d) is not as specified, loosen clamp screw and position trip lever on its shaft.

(f) Tighten clamp screw.

(14) Type Box Clutch Trip Lever Eccentric Post.

(a) Refer to figure 6-42.

(b) Disengage type box clutch.

(c) Trip lever should engage clutch shoe lever by full thickness of shoe lever.

(d) If engagement of trip lever and clutch shoe lever is not as specified, loosen trip lever eccentric post clamping nut and position eccentric post to obtain specified engagement.

(e) Tighten clamping nut.

(15) Line Feed Clutch Trip Lever Eccentric Post. Adjust line feed clutch trip lever adjusting post as follows:

(a) Refer to figure 6-43.

(b) Disengage clutch.

(c) Trip clutch trip lever and rotate main shaft until trip lever is over shoe lever.

(d) Take up play of shoe lever inward by snapping trip lever over shoe lever.

(e) Measure and note clearance between shoe lever and drum at each stop position to find stop position which yields greatest clearance. As gauged by eye, there should be some overbite on all stop lugs.

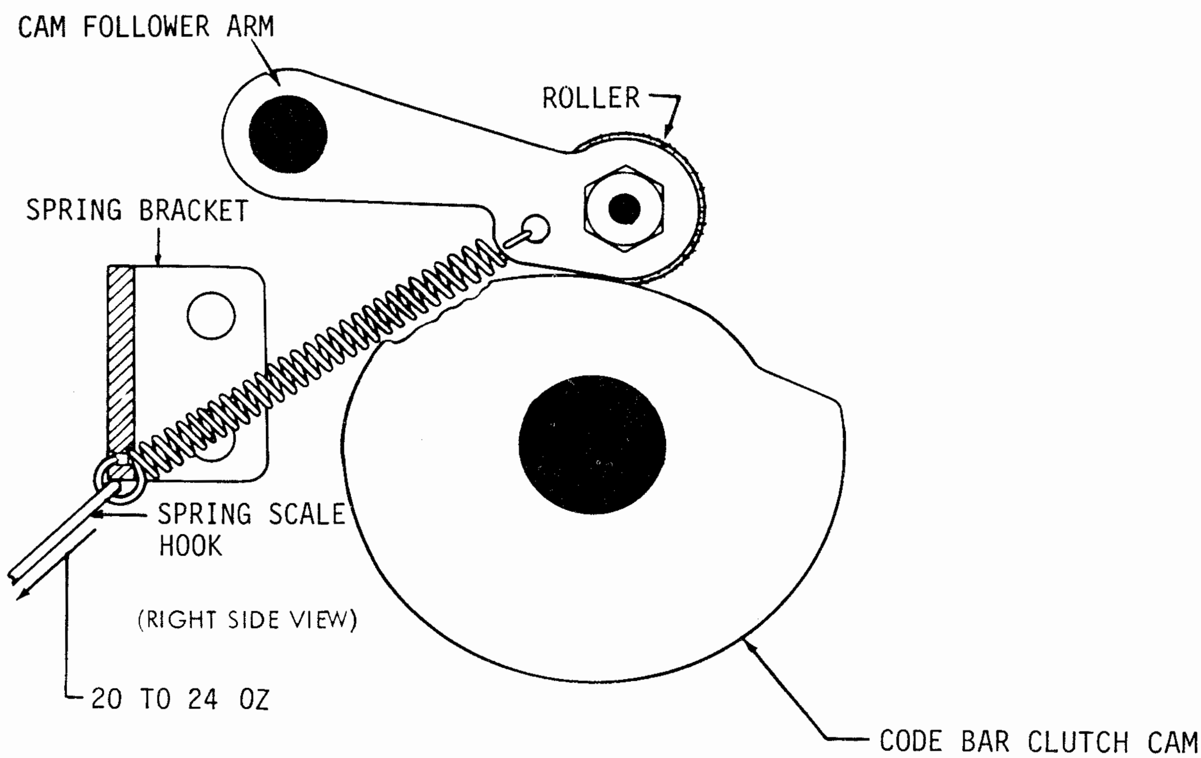



Figure 6-40. Code Bar Clutch Cam Follower Spring

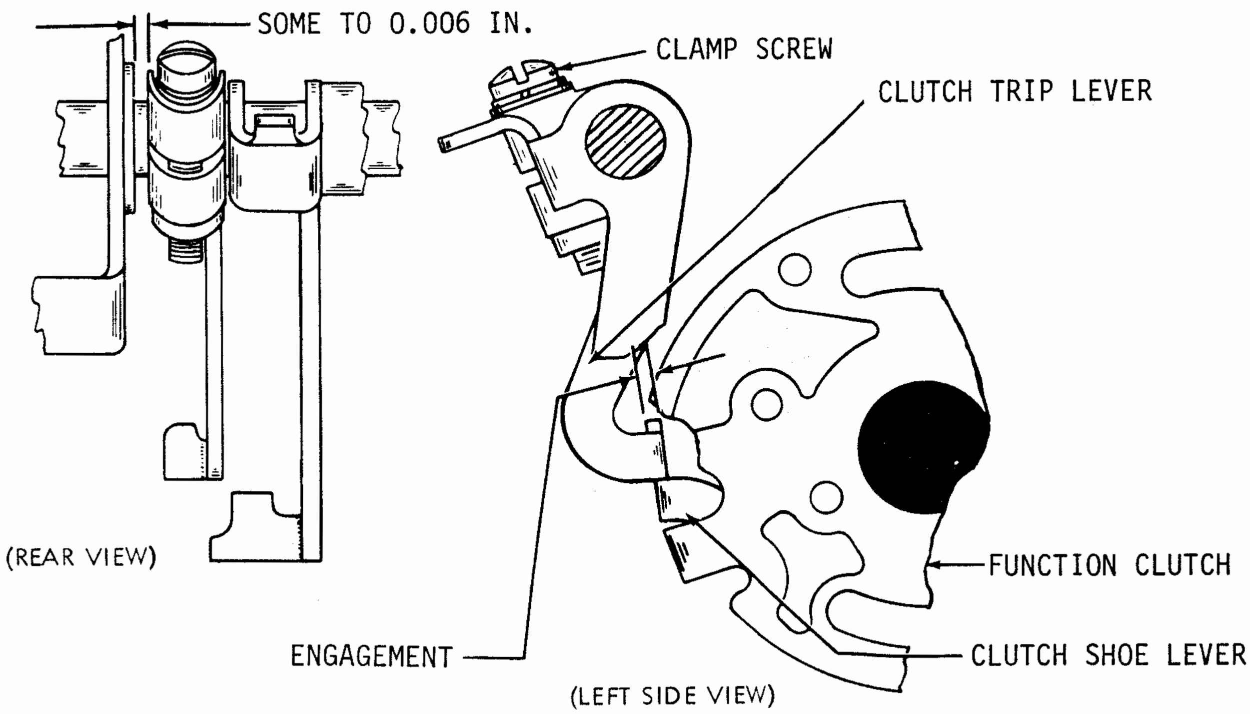



Figure 6-41. Function Clutch Trip Lever

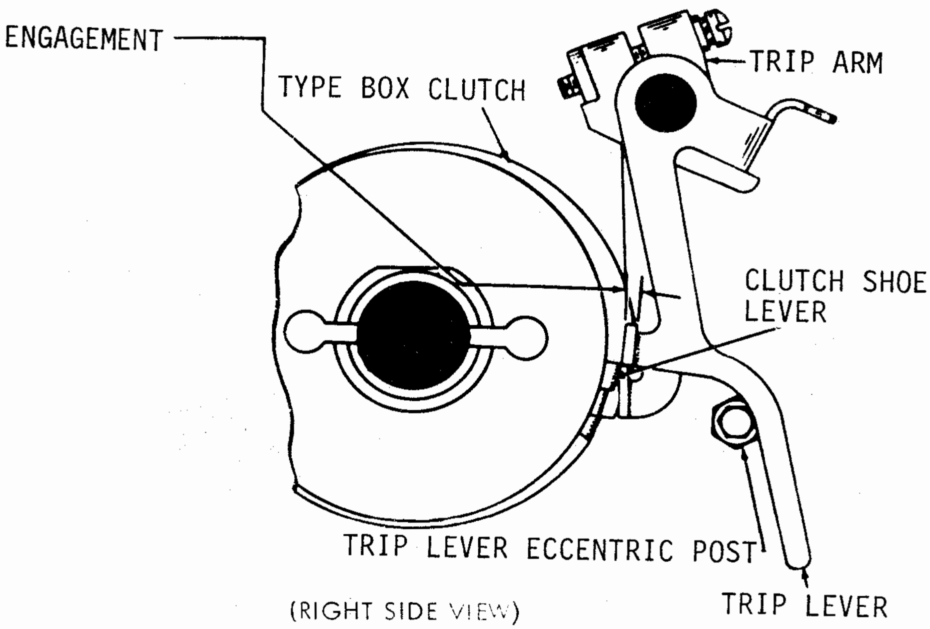



Figure 6-42. Type Box Clutch Trip Lever Eccentric Post

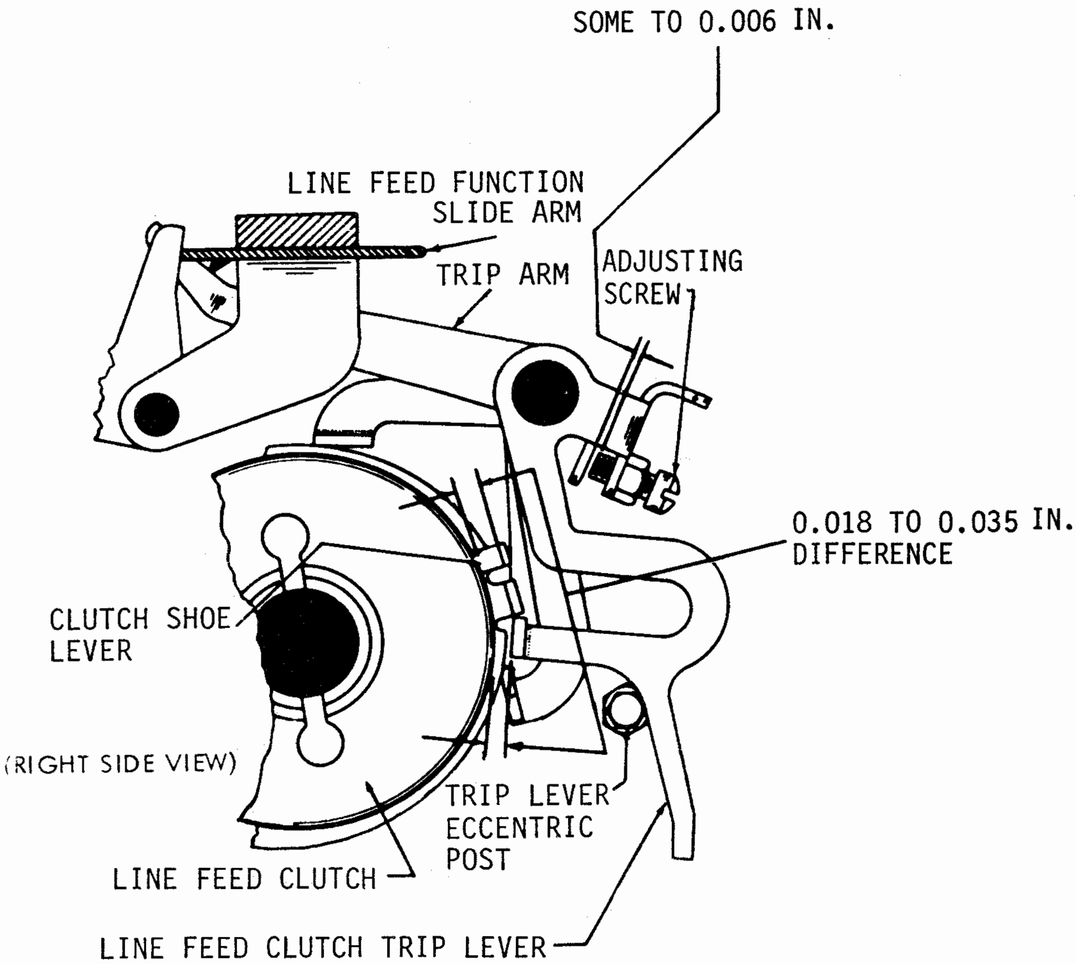



Figure 6-43. Line Feed Clutch Trip Lever Eccentric Post and Line Feed Clutch Trip Lever Adjusting Screw

(f) Position trip lever at stop which yields greatest clearance and rotate main shaft slowly until trip lever just falls off stop lug.

(g) Measure and note clearance between trip lever and clutch drum.

(h) Find difference between greatest clearance measured in step (e) and clearance between trip lever and clutch drum measured in step (g) by subtracting.

(i) The greatest clearance in step (e) should be between 0.018 and 0.035 inch greater than clearance between trip lever and clutch drum obtained in step (g).

(j) If difference in clearance exceeds specified limits, loosen clamp nut, back off trip lever adjusting screw, and position trip lever eccentric stop post.

(k) Tighten clamp nut.

(16) Line Feed Clutch Trip Lever Adjusting Screw. Adjust line feed clutch trip lever adjusting screw as follows:

(a) Refer to figure 6-43.

(b) Place line feed function slide arm in rear position.

(c) Place clutch trip lever against its eccentric post.

(d) Hold trip arm against its function slide arm.

(e) There should be some clearance not exceeding 0.006 inch.

(f) If clearance exceeds specified limits, loosen adjusting screw clamp nut and adjust screw to obtain specified clearance.

(g) Tighten adjusting nut clamp nut.

e. Positioning Mechanism Adjustments. Perform positioning mechanism adjustments in accordance with the following paragraphs.

(1) Breaker Slide Bail Spring. Adjust breaker slide bail spring as follows:

(a) Refer to figure 6-44.

(b) Place break lever bails in lower position.

(c) Attach spring scale hook to breaker slide bail.

(d) Force required to start bail moving should be between 1/2 and 1-3/4 ounces.

(e) If scale reading exceeds specified limits, install new spring.

(2) Horizontal Positioning Lock Lever Spring. Adjust horizontal positioning lock lever spring as follows:

(a) Refer to figure 6-45.

(b) Place lock lever in upper position.

(c) Attach spring scale hook to horizontal positioning lock lever.

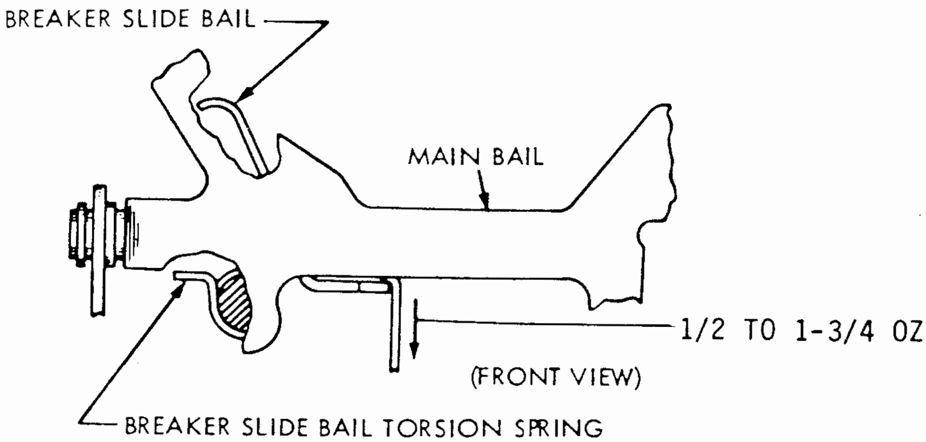



Figure 6-44. Breaker Slide Bail Spring

(d) Force required to start lever moving upward should be between 28 and 43 ounces.

(e) If scale reading exceeds specified limits, install new spring.

(3) Rocker Shaft Bracket Eccentric Stud. Adjust rocker shaft bracket eccentric stud as follows:

(a) Refer to figure 6-45.

(b) Disengage type box clutch.

(c) Take up play in locking arm toward front.

(d) Measure gap between lower side of lock lever roller and top edge of shoulder on horizontal positioning lock lever.

(e) Gap should be between 0.055 and 0.090 inch.

(f) If gap exceeds specified limits, loosen nut and position eccentric stud in lower end of rocker shaft left bracket. Tighten nut. Keep high part of eccentric (marked with dot) below centerline of drive link.

(g) Ensure rocker shaft drive link is free in its bearing (not under load) when clutch is in its stop position and when it is rotated 180 degrees from its stop position.

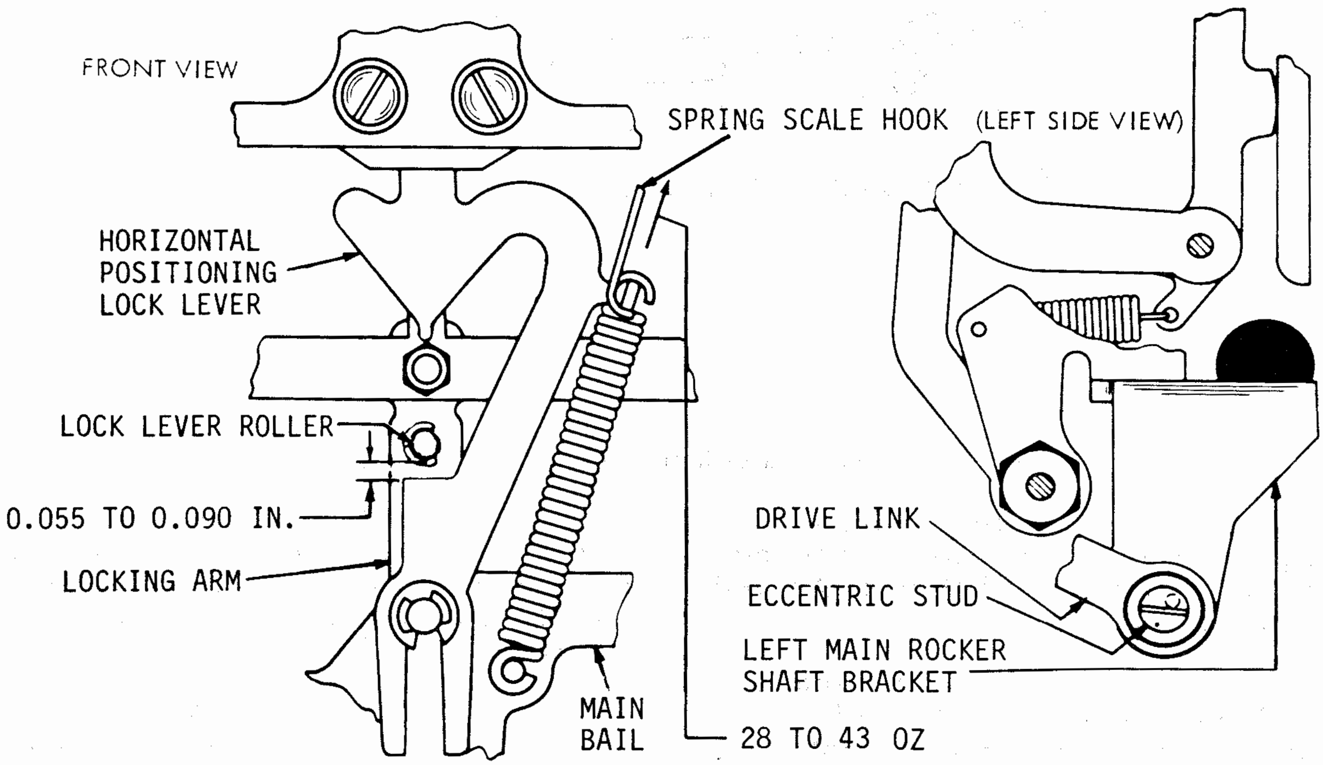



Figure 6-45. Horizontal Positioning Lock Lever Spring and Rocker Shaft Bracket Eccentric Stud

(h) If rocker shaft drive link is not free in its bearing, check manually by moving link toward left side frame and then in reverse direction. Ensure that stud is free in type box clutch bearing when clutch is in its stop position and when it is rotated 180 degrees from stop position.

(i) If any change is made in the above adjustment, recheck following related adjustments:

Horizontal positioning drive linkage

Right vertical positioning lever eccentric stud

Left vertical positioning lever eccentric stud

Vertical positioning lock lever

Ribbon feed lever bracket

Function stripper blade arms

Spacing trip lever bail cam plate

Reversing slide brackets

Ribbon reverse spur gear

Printing track

Printing arm

(4) Decelerating Slide Spring. Adjust decelerating slide spring as follows:

(a) Refer to figure 6-46.

(b) Place printing bail in downward position.

(c) Place printing carriage and decelerating slide assembly in right hand position.

(d) Attach spring scale hook to right hand decelerating slide.

(e) Force required to start slide moving should be between 1/2 and 1-1/2 ounces.

(f) If scale reading exceeds specified limits, install new spring.

(g) Repeat steps (c), (d), (e), and (f) for left hand decelerating slide spring.

(5) Horizontal Positioning Drive Linkage. Adjust horizontal positioning drive linkage as follows:

(a) Refer to figure 6-47.

(b) Disengage type box clutch.

(c) Move code bars 4 and 5 to spacing (right).

(d) Measure clearance between each side of center horizontal stop and decelerating slides on side where knee link is straight. Clearances should be between 0.090 and 0.110 inch and should be equal within 0.008 inch.

(e) If clearances exceed specified limits, loosen bearing stud mounting screws and connecting strip mounting screws so they are friction tight.

(f) Position one or both bearing studs on connecting strip to provide

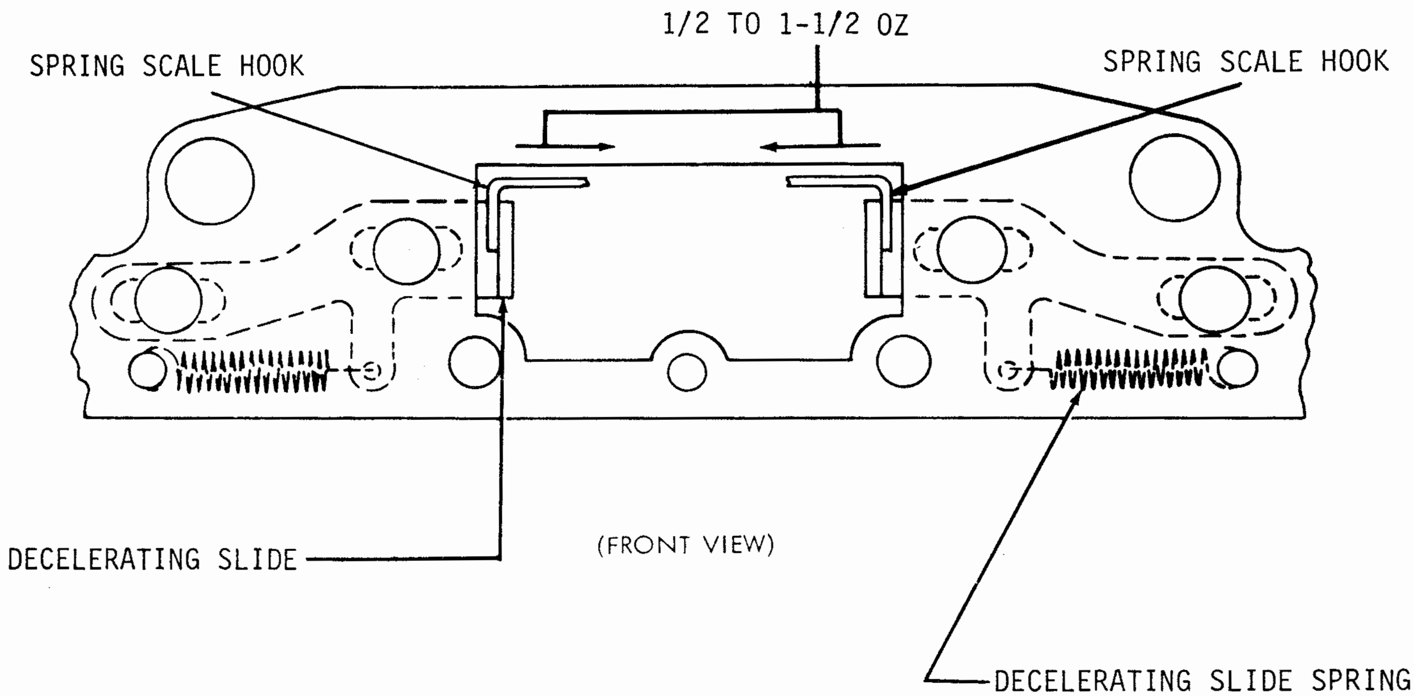



Figure 6-46. Decelerating Slide Spring

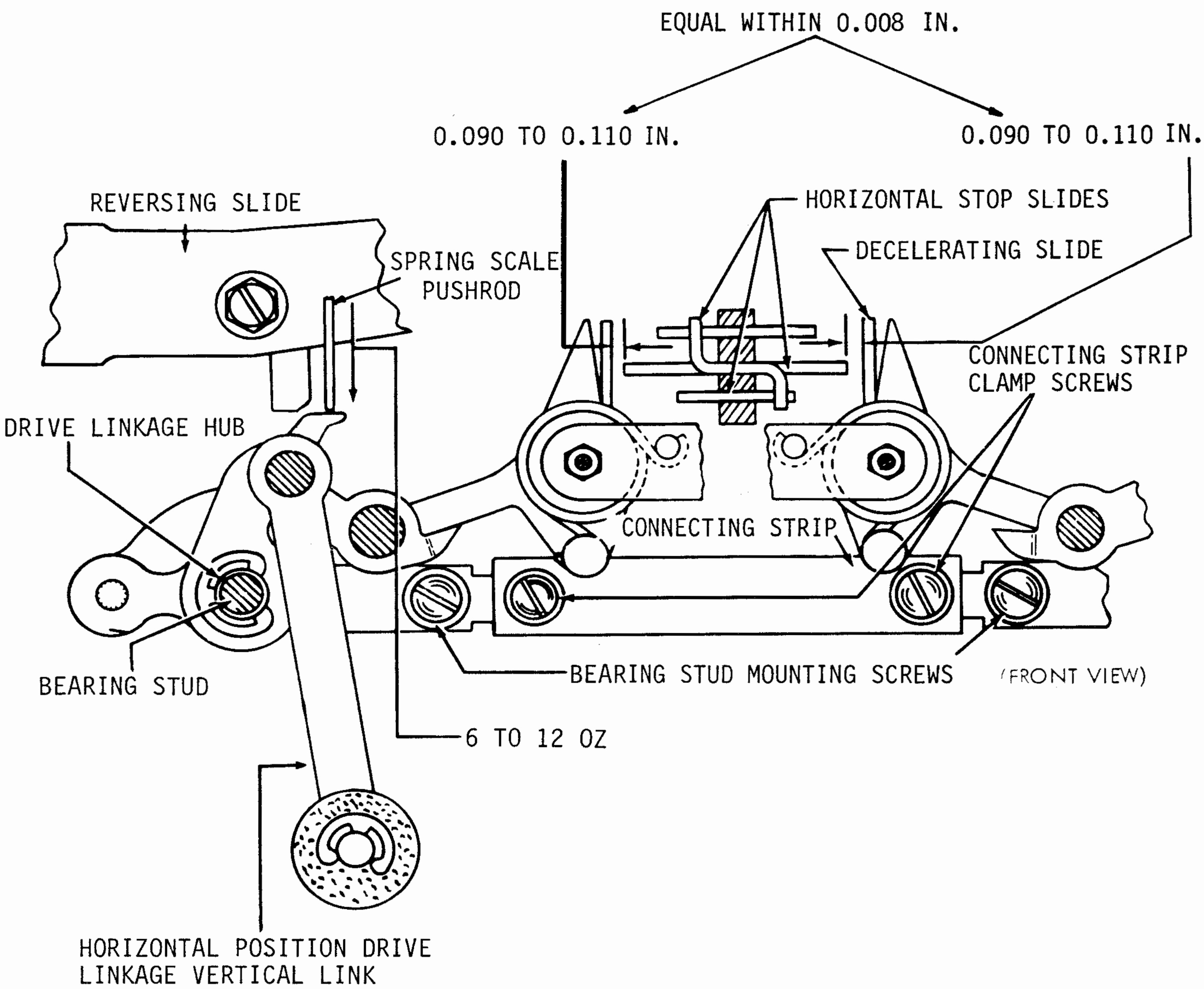



Figure 6-47. Horizontal Positioning Drive Linkage and Horizontal Positioning Drive Linkage Spring

0.095 to 0.105 inch between center horizontal slide and decelerating slide on side where linkage is not buckled.

(g) Tighten two inner mounting screws.

(h) Change position of reversing slide and check opposite clearance. Equalize by shifting both studs and connecting strip as a unit.

(i) Hold drive linkage hub against lower vertical link of drive linkage and tighten two outer bearing stud mounting screws.

(j) Check linkage for freeness throughout a complete cycle.

(k) Type box clutch disc should have some movement in normal direction of rotation in stop position.

(6) <u>Horizontal Positioning Drive Linkage Spring</u>. Adjust horizontal positioning drive linkage spring as follows:

(a) Refer to figure 6-47.

(b) Place linkage in unbuckled position.

(c) Apply spring scale pushrod near end of upper extensions of right hand spring.

(d) Force required to start link buckling should be between 6 and 12 ounces.

(e) If scale reading exceeds specified limits, install new spring.

(f) Repeat steps (b), (c), (d), and (e) for left hand spring.

(7) <u>Horizontal Stop Slide Spring</u>. Adjust horizontal stop slide spring as follows:

(a) Refer to figure 6-48.

(b) Place code bars in marking position (left).

(c) Rotate type box clutch one quarter turn from its stop position.

(d) Hold horizontal motion decelerating slides away from horizontal stop slides.

(e) Attach spring scale hook to each slide and measure force required to start slide moving.

NOTE

When checking upper and lower slides, hold middle slide 1/32 inch forward.

(f) Force required to start slides moving should be as follows: for upper and lower slides, between 1/2 and 1-1/2 ounces; for middle slide, between 1-3/4 and 3 ounces.

(8) <u>Left Vertical Positioning Lever Eccentric Stud</u>. Adjust left vertical positioning lever eccentric stud as follows:

(a) Refer to figure 6-49.

(b) Place common code bar in spacing position.

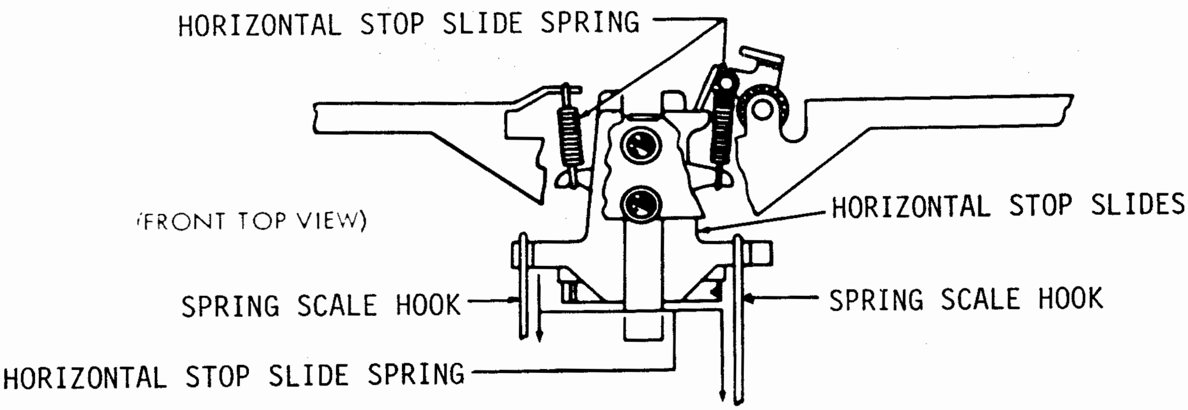



Figure 6-48. Horizontal Stop Slide Spring

(c) Trip type box clutch.

(d) Rotate main shaft until right vertical positioning lever toe touches common code bar. Lower link of right vertical positioning lever should buckle 0.008 inch maximum. Left vertical positioning lever toe should touch common code bar, buckling its lower link equally with lower link of right vertical positioning lever within 0.006 inch. Neither lower link should buckle more than 0.008 inch.

(e) If buckling exceeds specified limits, loosen eccentric stud nut.

(f) Position eccentric stud on rocker shaft left bracket inner arm, and position high part of cam (marked with dot) toward rear.

(g) Tighten eccentric stud nut.

(9) Vertical Positioning Lock Lever Spring. Adjust vertical positioning lock lever spring as follows:

(a) Refer to figure 6-49.

(b) Disengage type box clutch.

(c) Attach spring scale hook to upper end of left vertical positioning lock lever.

(d) Force required to start lock lever

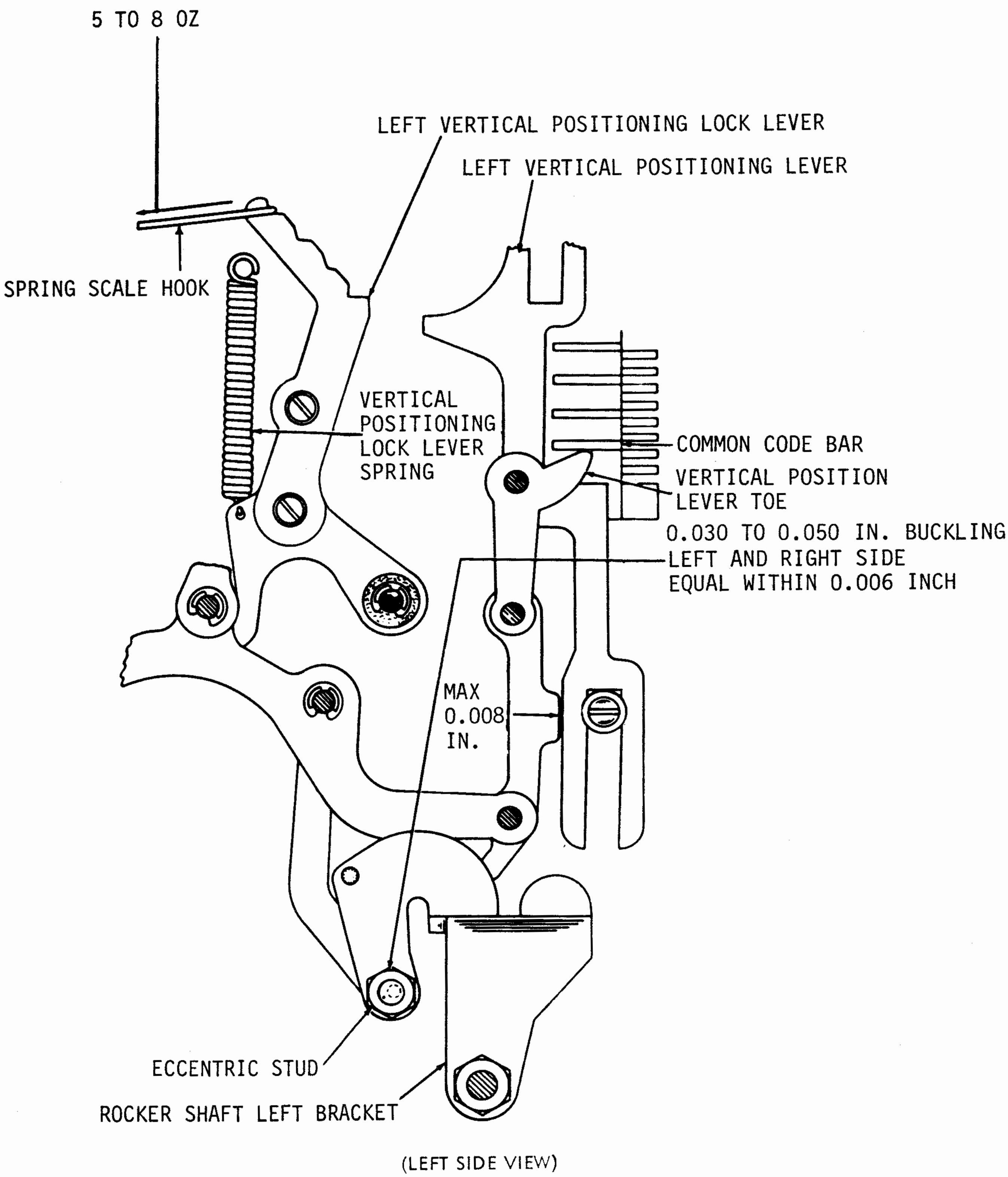



Figure 6-49. Left Vertical Positioning Lever Eccentric Stud and Vertical Positioning Lock Lever Spring

moving should be between 5 and 8 ounces.

(e) If scale reading exceeds specified limits, install new spring.

(f) Repeat steps (c), (d), and (e) for right vertical positioning lock lever spring.

(10) Reversing Slide Adjusting Stud. Adjust reversing slide adjusting stud as follows:

(a) Refer to figure 6-50.

(b) Disengage type box clutch.

(c) Place number 3 code bar in spacing position (right). Reversing slide detent should be fully seated in right hand notches of detent lever.

(d) Place number 3 code bar in marking position (left). Reversing slide detent should be fully seated in left hand notches of detent lever.

(e) If reversing slide detent rollers do not seat fully in both right hand and left hand notches of detent lever, loosen reversing slide stud mounting nut.

(f) Position reversing slide stud in its elongated hole to allow full seating of reversing slide detent rollers in both left hand and right hand notches of detent lever.

(g) Tighten mounting nut.

(11) Reversing Slide Detent Spring. Adjust reversing slide detent spring as follows:

(a) Refer to figure 6-50.

(b) Place reversing slide in left hand position.

(c) Attach spring scale hook in upper right detent notch.

(d) Force required to start detent moving should be between 2 and 4-1/2 ounces.

(e) If scale reading exceeds specified limits, install new spring.

(12) Reversing Slide Brackets. Adjust reversing slide brackets as follows:

(a) Refer to figure 6-51.

(b) Disengage type box clutch, code bar clutch, and function clutch.

(c) Move reversing slide to its extreme right hand position.

(d) Measure amount of buckling of left horizontal positioning drive linkage. Buckling should be between 0.030 and 0.050 inch.

(e) Move reversing slide to its extreme left hand position.

(f) Measure amount of buckling of right horizontal positioning drive linkage. Buckling should be between 0.030 and 0.050 inches.

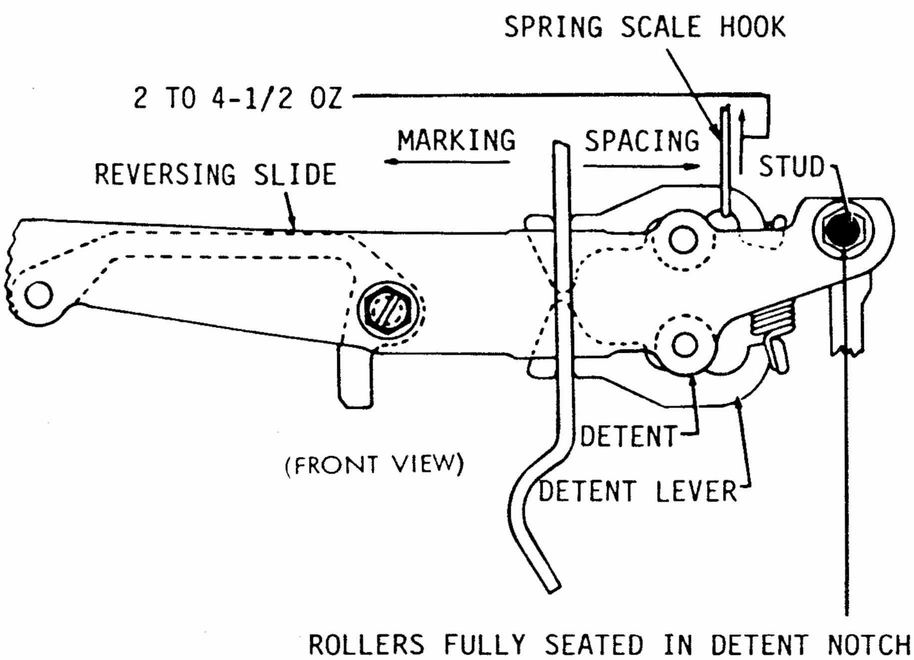



Figure 6-50. Reversing Slide Adjusting Stud and Reversing Slide Detent Spring

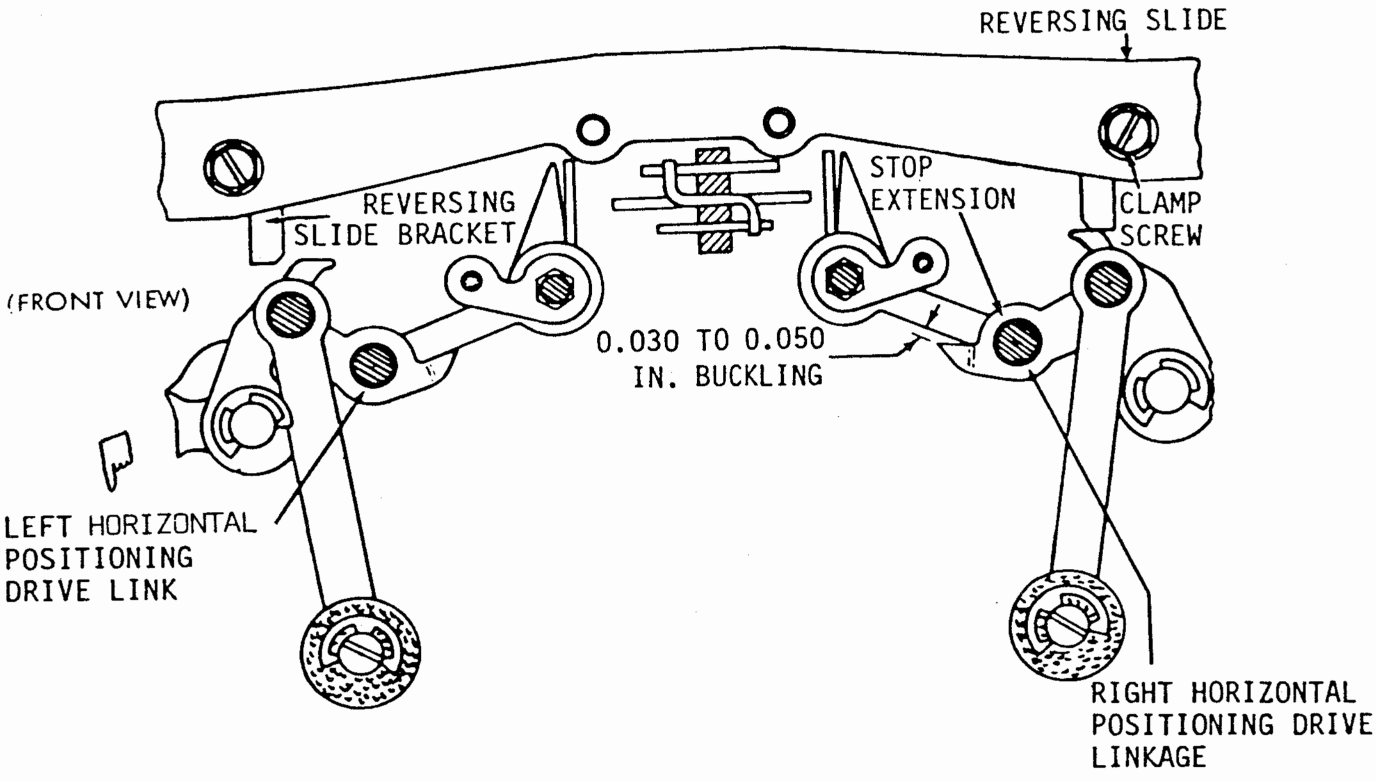



Figure 6-51. Reversing Slide Brackets

(g) If buckling of either left or right horizontal positioning drive linkage exceeds specified limits, loosen corresponding clamp screw and position reversing slide bracket.

(h) Tighten clamp screw.

(13) <u>Right Vertical Positioning Lever Eccentric Stud</u>. Adjust right vertical positioning lever eccentric stud as follows:

(a) Refer to figure 6-52.

(b) Disengage type box clutch.

(c) Place common code bar in spacing position.

(d) Take up play by pressing downward on common code bar at guide block to minimize clearance between toe of vertical positioning lever and bottom of common code bar.

(e) While holding common code bar downward, measure clearance between toe of vertical positioning lever and bottom of common code bar. Clearance should be between 0.030 and 0.050 inch.

(f) If clearance exceeds specified limits, loosen eccentric stud nut.

(g) Position eccentric stud in right rocker shaft bracket so that high part of eccentric (marked with dot) is toward rear. (High part of eccentric can also be identified by exposed portion of flat surface of vertical positioning link.)

(h) Tighten link.

(14) <u>Vertical Positioning Lever Spring</u>. Adjust vertical positioning lever spring as follows:

(a) Refer to figure 6-52.

(b) Place right and left vertical positioning lever toes in contact with suppression code bar with levers not buckled.

(c) Attach spring scale hook to lower right vertical positioning lever just above link extension.

(d) Force required to move link extension away from vertical positioning lever should be between 4 and 12 ounces.

(e) If scale reading exceeds specified limits, install new spring.

(15) <u>Rocker Shaft Left Bracket</u>. Adjust rocker shaft left bracket as follows:

(a) Refer to figure 6-53.

(b) Rocker shaft left bracket should be firmly seated against inner bearing race.

(c) If seating is not firm as specified, loosen mounting screws.

(d) Hold rocker shaft in extreme left position and position bracket against inner bearing race.

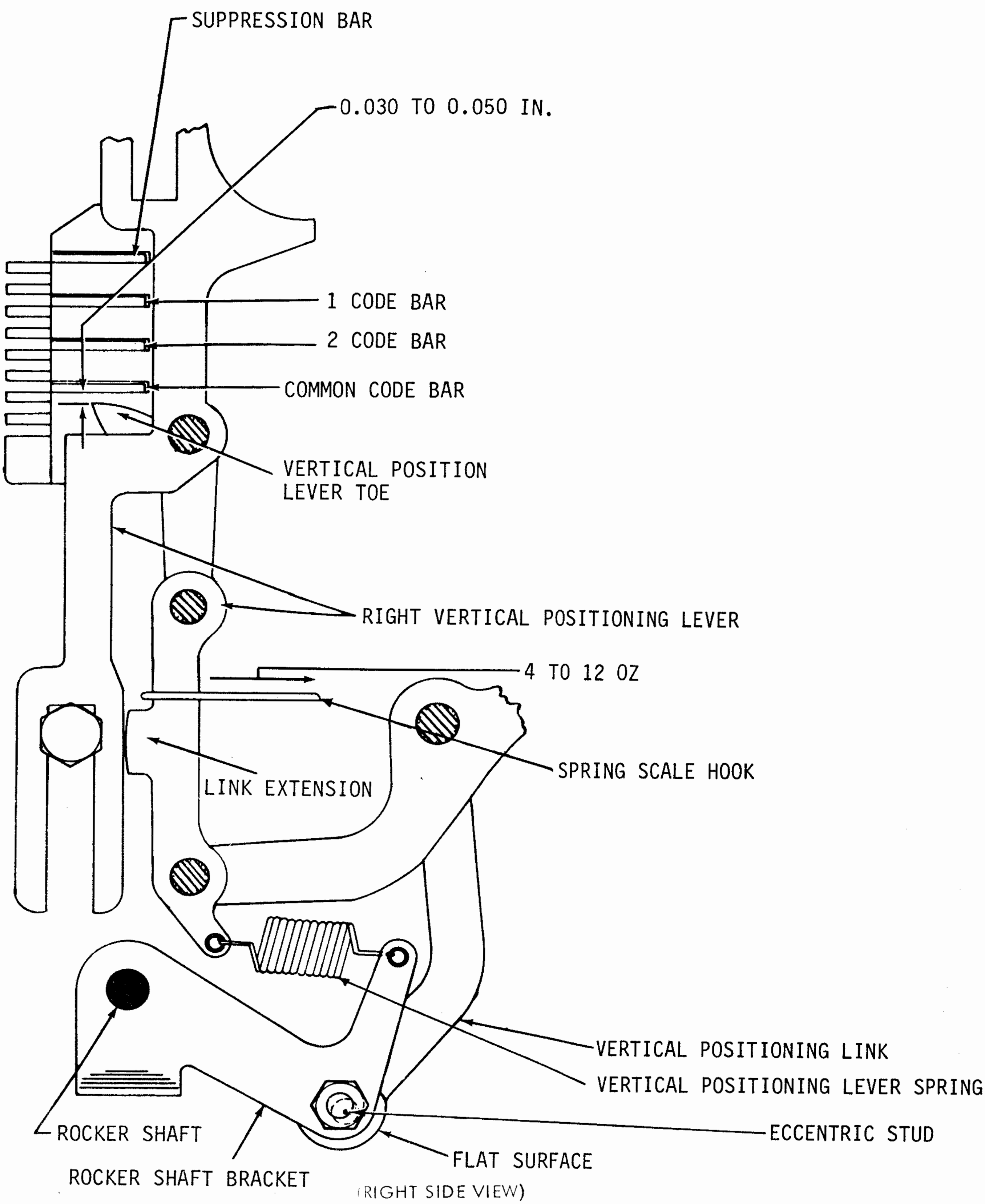



Figure 6-52. Right Vertical Positioning Lever Eccentric Stud and Vertical Positioning Lever Spring

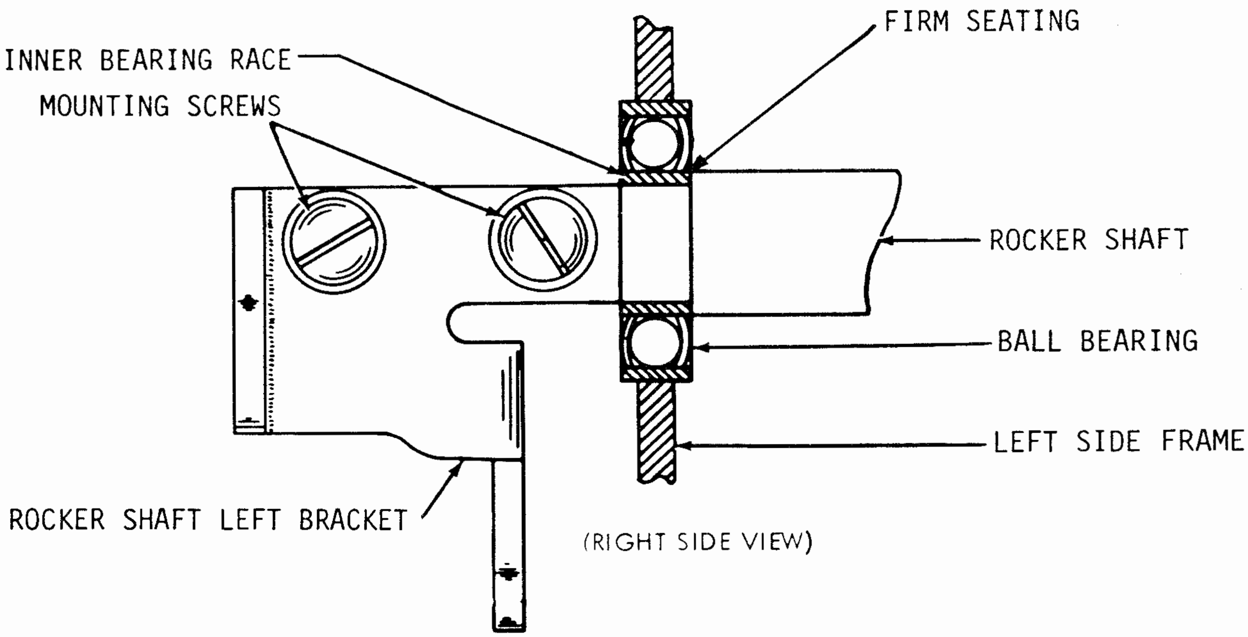



Figure 6-53. Rocker Shaft Left Bracket

(e) Tighten mounting screws.

(16) Shift Linkage. Adjust shift linkage as follows:

(a) Refer to figure 6-54.

(b) Position carriage near midpoint of platen. Place type box in position to print letter "O".

(c) Manually buckle right shift linkage.

(d) Shift type box to left.

(e) Figure "9" type pallet should be approximately in center of printing hammer when hammer is just touching figure "9" type pallet.

(f) If figure "9" type pallet is not centered as specified, loosen two clamp screws and position left shift linkage on oscillator rail.

(g) Tighten two clamp screws.

(h) To recheck, shift alternately from "W" to "2" and take up play in each direction. Refine adjustment, if necessary, by repeating steps (f) and (g).

(17) Shift Linkage Spring. Adjust shift linkage spring as follows:

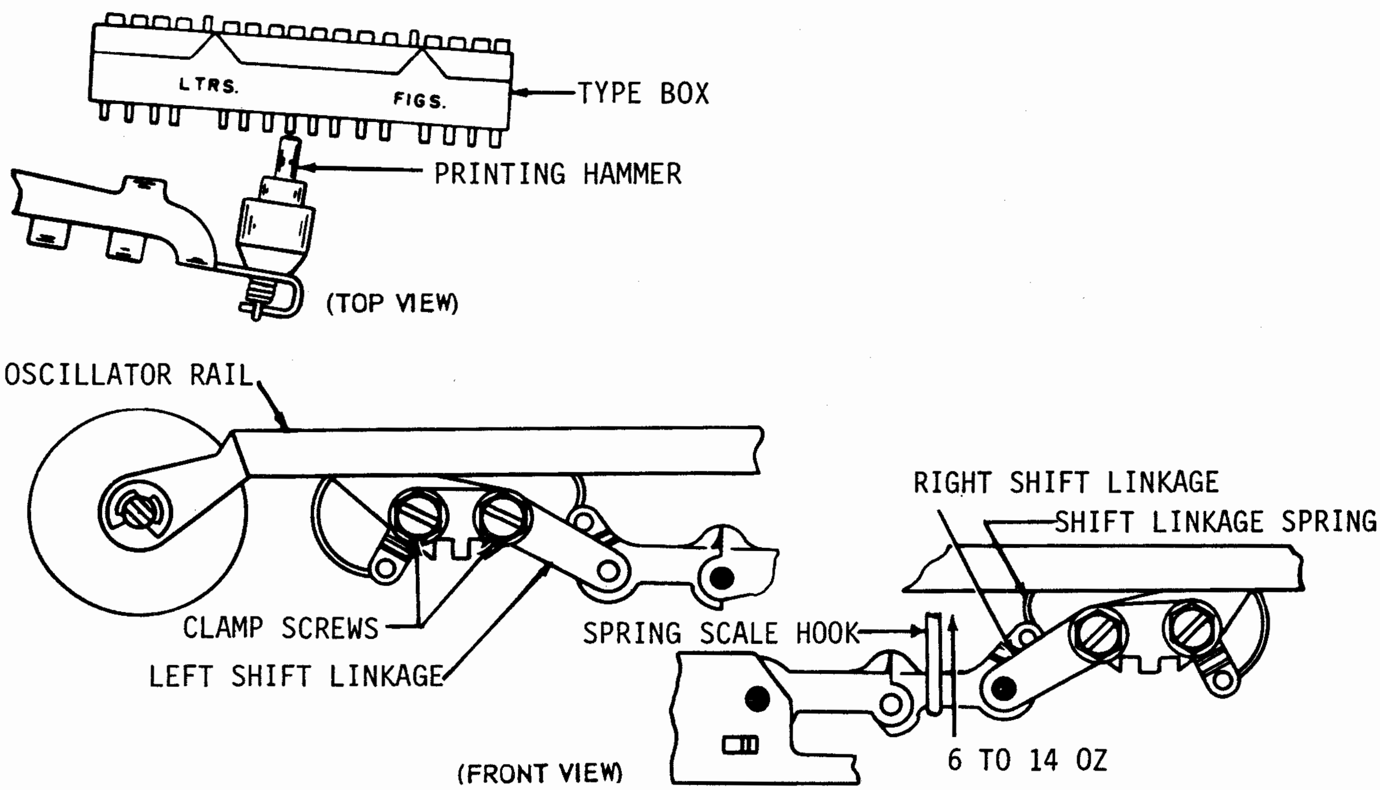



Figure 6-54. Shift Linkage and Shift Linkage Spring

NOTE

For shift mechanisms with torsion springs, see paragraph 6-15.1e(3).

(a) Refer to figure 6-54.

(b) Position right shift linkage in straight position.

(c) Attach spring scale hook to right shift linkage.

(d) Force required to start link moving should be between 6 and 14 ounces.

(e) If scale reading exceeds specified limits, install new spring.

(f) Repeat steps (b) through (e) for left shift linkage spring.

(18) Type Box Position (Sprocket Feed). Adjust type box position as follows:

(a) Refer to figure 6-55.

(b) Disengage type box and spacing clutches.

(c) Shift type box to letters position.

(d) Loosen four mounting screws so that space suppression ring, or automatic carriage return line feed ring is free to rotate on drum.

(e) If unit is equipped with limited adjustment spacing drum place spacing cutout and automatic carriage return line feed arms in maximum counterclockwise position. Engage farthest advanced feed pawl with tooth above drum cutaway section.

(f) Measure clearance between letters print indicator and centerline of sprocket pins in right hub. Clearance should be between 5/16 and 7/16 inch.

(g) If clearance exceeds specified limits, loosen two type box clamp screws and two printing carriage clamp screws.

(h) Position type box to obtain clearance specified in step (f).

(i) Tighten type box clamp screws. Tighten printing carriage clamp screws only after printing carriage position adjustment paragraph 6-3.1f(4) has been completed.

(19) Vertical Positioning Lock Lever. Adjust vertical positioning lock lever as follows:

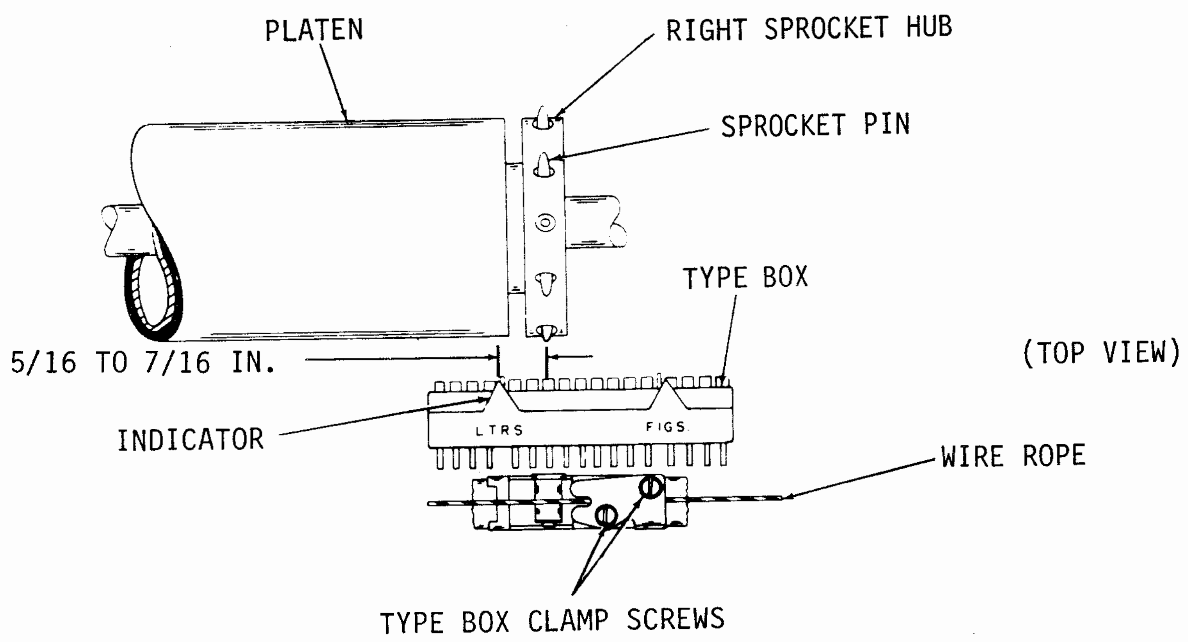
(a) Refer to figure 6-56.

(b) Set up letters combination on code bars.

(c) Position main side operating levers at upper end of travel.

(d) Fully engage (manually, if necessary) upper notch of vertical positioning lock lever with vertical slide projection.

(e) Measure clearance between upper surface of follower arm rear extension and inner extension of main side



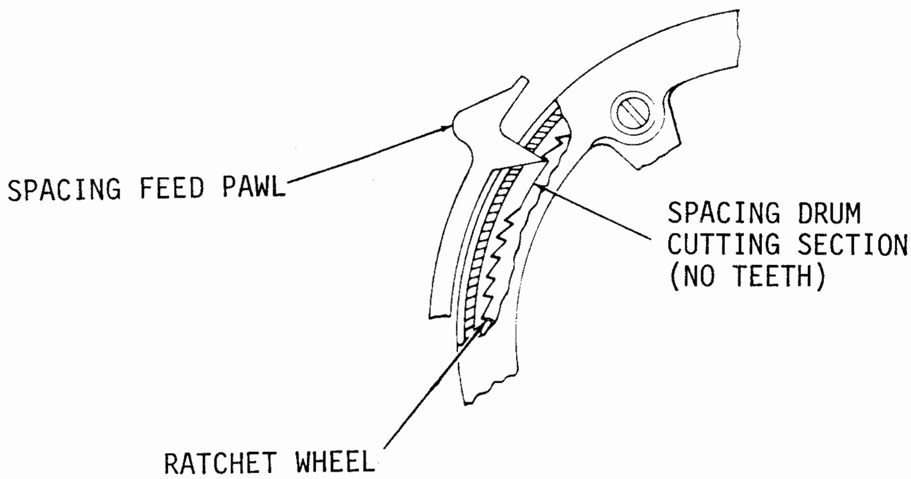




Figure 6-55. Type Box Position (Sprocket Feed)

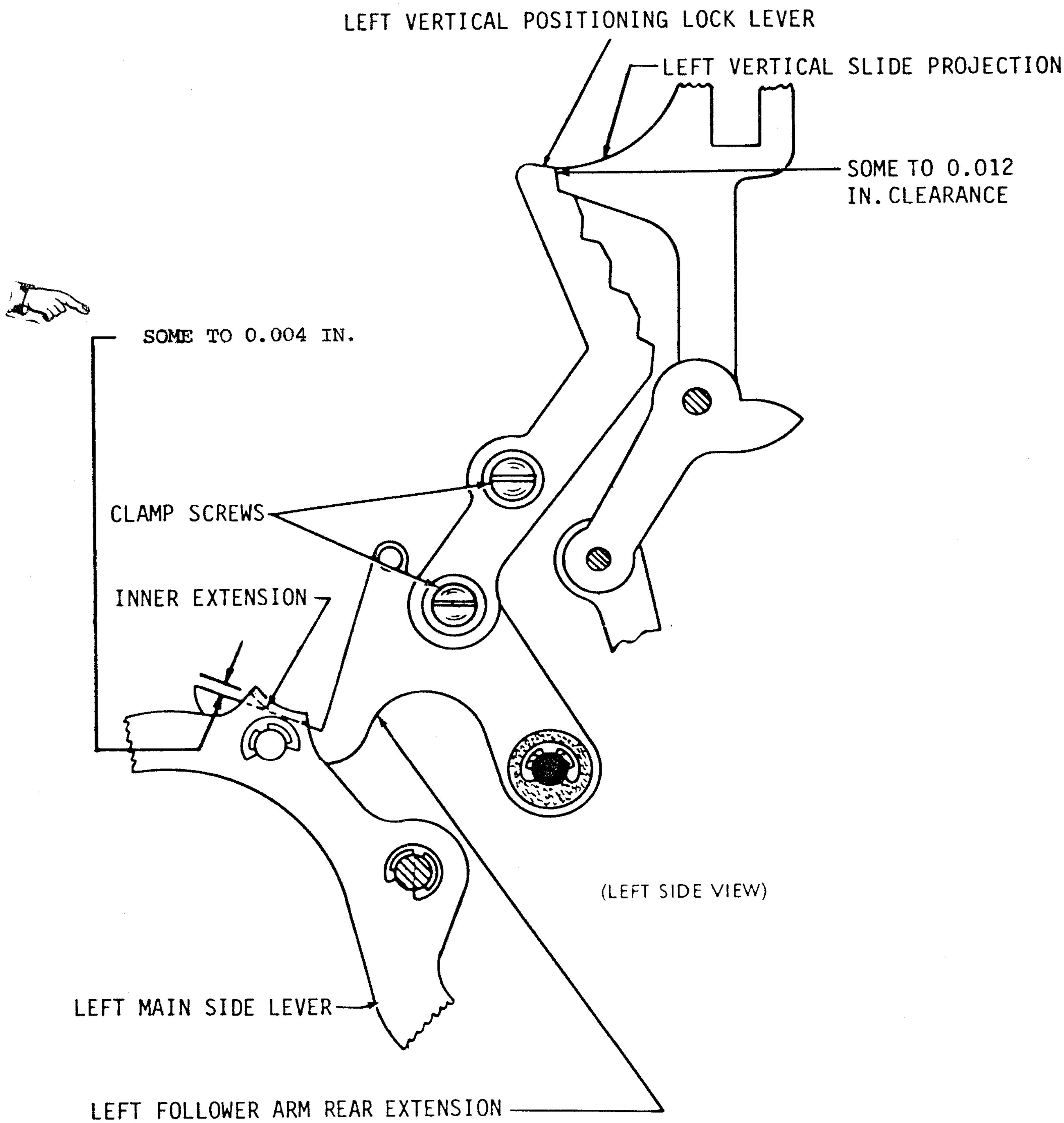



Figure 6-56. Vertical Positioning Lock Lever

lever. Clearance should be some not more than 0.004 inches.

(f) Take up play by pulling upward with 8 ounces tension on type box carriage track, and measure clearance between vertical surfaces of left vertical positioning lock lever and left vertical slide projection. Clearance should be some not more than 0.012 inch.

(g) If either clearance measured in (e) or (f) exceeds specified limits, loosen clamp screws and position right and left vertical positioning lock levers.

(h) Tighten clamp screws.

f. Printing Mechanism Adjustments. Perform printing mechanism adjustment in accordance with the following paragraphs.

(1) Printing Arm. Adjust printing arm as follows:

(a) Refer to figure 6-57.

(b) Place printing track in maximum downward position.

(c) Position printing hammer operating bail against its stop.

(d) Place printing hammer operating bail spring brakcet in the number 1 position. (The number 2 and number 3 positions are to be used only for marking multiple copies.)

(e) With printing arm slide held downward over each printing track mounting screw for maximum clearance, measure clearance between secondary printing arm and forward extension of hammer operating bail. There should be some clearance not exceeding 0.015 inch.

(f) Place printing track in uppermost position.

(g) Latching extension of printing hammer operating bail should overtravel latching surface of operating bail latch by not less than 0.006 inch. Check right and left positions.

(h) If either measurement obtained in (e) or (g) exceeds specified limits, loosen secondary printing arm clamp screws and position secondary printing arm as necessary.

(i) Tighten secondary printing arm clamp screws.

(2) Printing Hammer Stop Bracket. Adjust printing hammer stop bracket as follows:

(a) Refer to figure 6-57.

(b) Place type box in position to print character "M".

(c) Place printing track in its maximum downward position.

(d) Hold printing hammer stop bracket toward platen with 8 ounces force.

(e) Measure clearance between printing hammer at any point along entire length of platen. Clearance should be 0.005 to 0.050 inch.

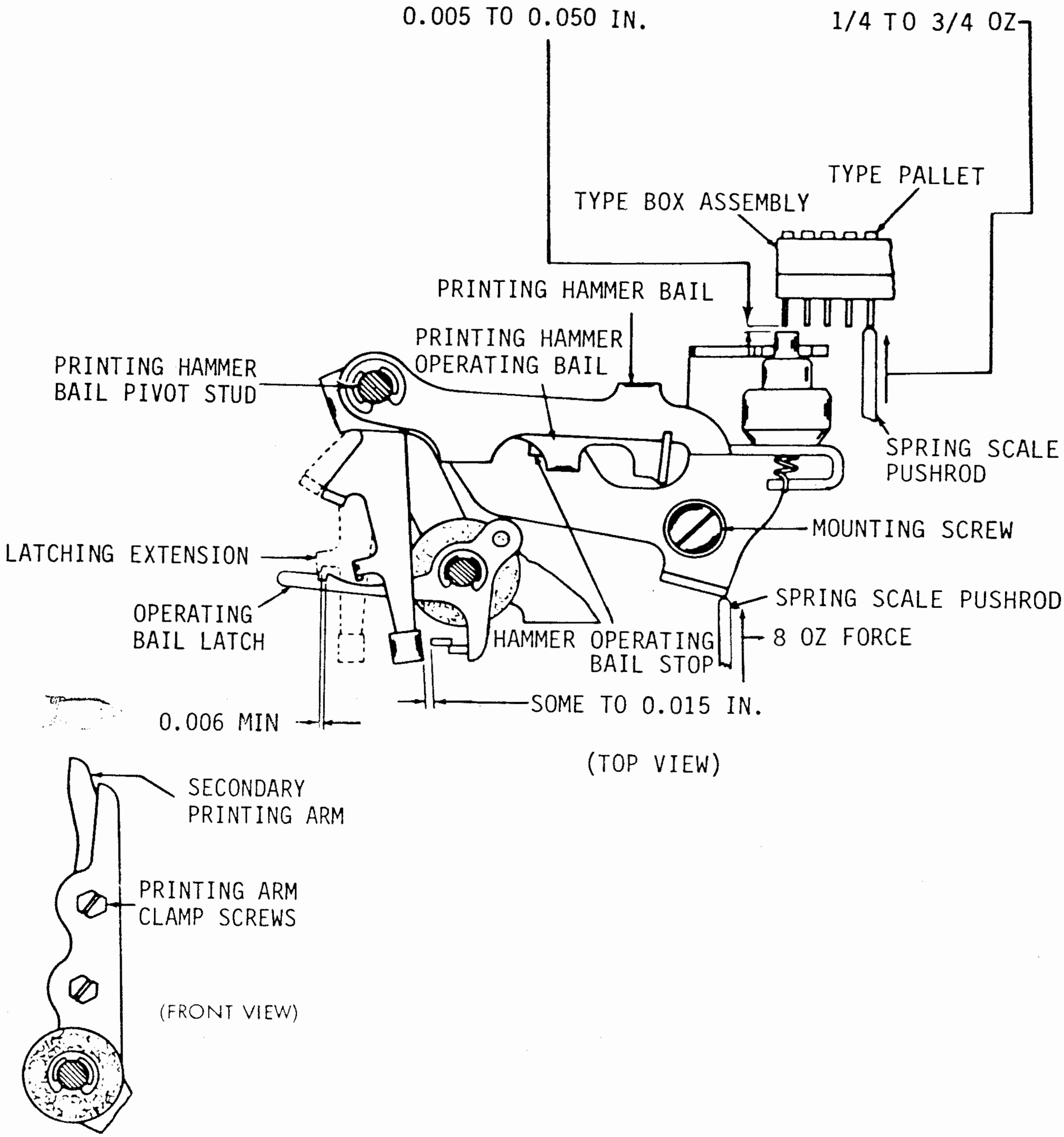



Figure 6-57. Printing Arm, Printing Hammer Stop Bracket, and Type Pallet Spring

(f) If clearance exceeds specified limits, loosen position mounting bracket by means of its mounting screw.

(g) Tighten screws.

(3) <u>Type Pallet Spring</u>. Adjust type pallet spring as follows:

(a) Refer to figure 6-57.

(b) Remove box from unit.

(c) Apply 8 ounce spring scale pushrod vertically to end of pallet shank.

(d) Force required to start pallet moving should be between 1/4 and 3/4 ounce.

(e) If scale reading exceeds limits, install new spring.

(4) <u>Printing Carriage Lower Roller</u>. Adjust printing carriage lower roller as follows:

(a) Refer to figure 6-58.

(b) Loosen carriage wire rope clamp screws.

(c) Ensure play of carriage on track is minimum with no binding throughout full length of track.

(d) To adjust (eccentric bushings) loosen screw nut and position lower roller keeping high part of eccentric (chamfered corner) toward right.

(e) Tighten nut.

(f) To adjust (sliding screw) loosen mounting screw and position lower roller.

(g) Tighten screw.

(5) <u>Type Box Carriage Roller Arm Spring</u>. Adjust type box carrier roller arm spring as follows:

(a) Refer to figure 6-59.

(b) Attach spring scale hook to type box latch.

(c) Force required to start upper roller nearest type box latch moving away from carriage track should be 28 to 36 ounces.

(d) If scale reading exceeds specified limits, install new spring.

(6) <u>Printing Carriage Position</u>. Adjust printing carriage position as follows:

(a) If this adjustment is made, check the following related adjustments:

6-3.1h(13)
6-3.1h(8)
6-3.1h(9)
6-3.1h(15)

(b) Refer to figure 6-60.

(c) Place type box in letters position.

(d) Select "M" type pallet.

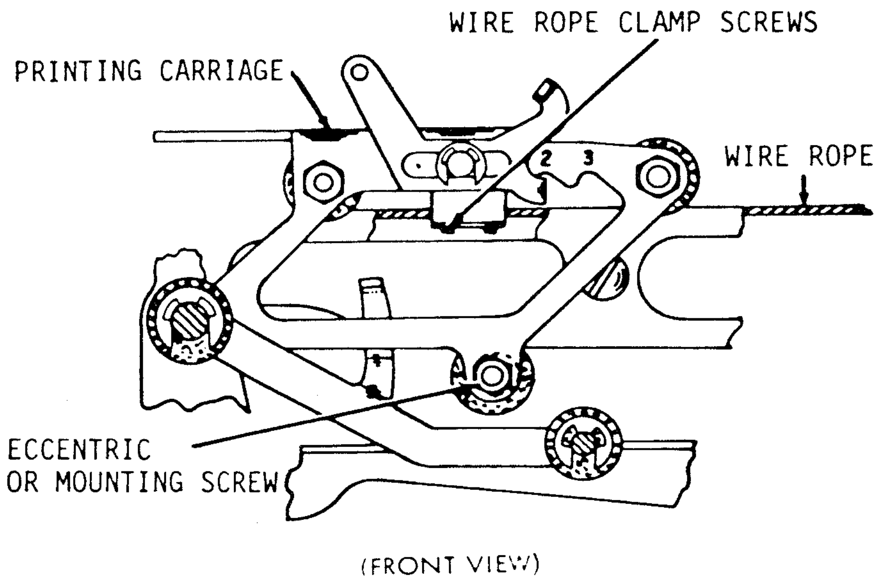



Figure 6-58. Printing Carriage Lower Roller

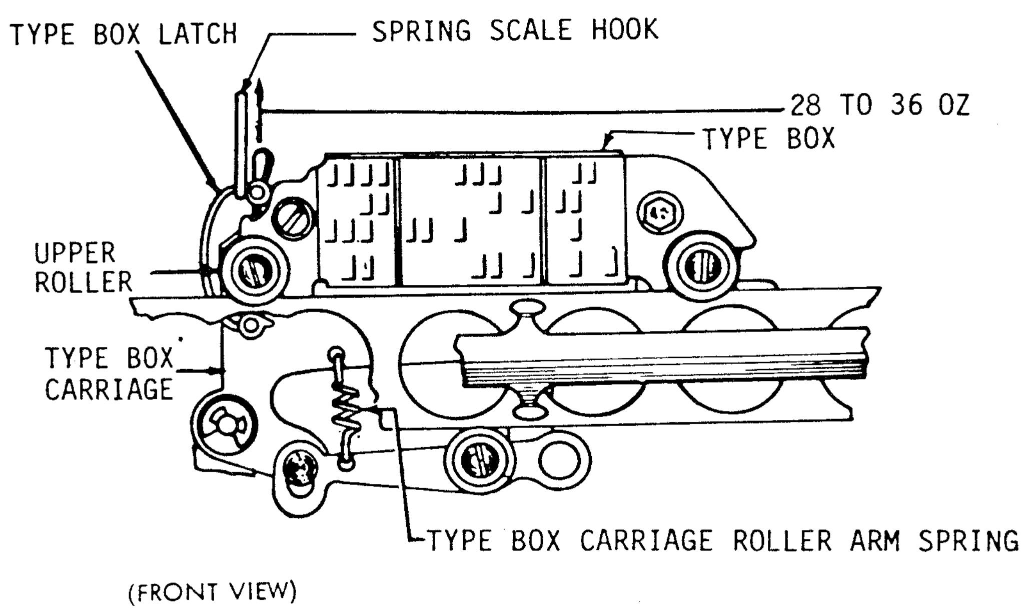



Figure 6-59. Type Box Carriage Roller Arm Spring

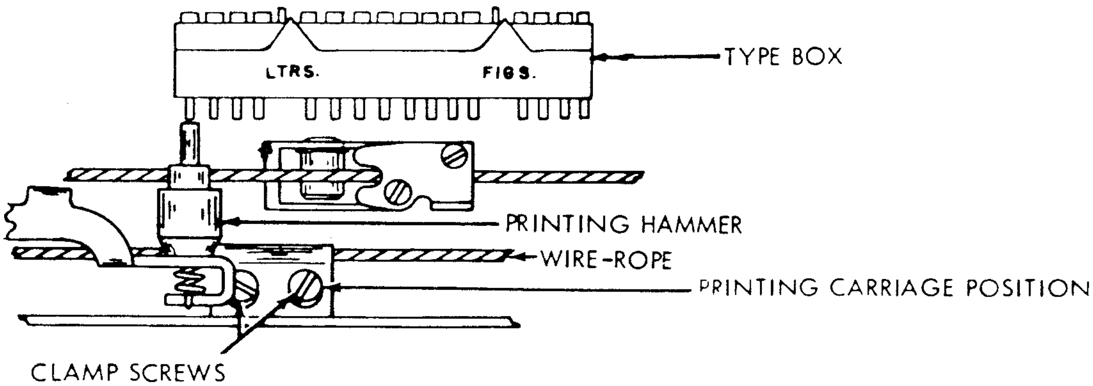



Figure 6-60. Printing Carriage Position

(e) Place type box in printing position.

(f) "M" type pallet should be approximately in center of printing hammer when hammer is just touching "M" type pallet.

(g) Take up play in type box carriage in each direction and set hammer in center of play.

(h) If adjustment is required, loosen clamp screws and position printing carriage on wire rope.

(i) Tighten clamp screws.

(7) <u>Printing Hammer Bearing Stud</u>. Adjust printing hammer bearing stud as follows:

(a) Refer to figure 6-61.

(b) Place type box at midpoint of platen and in position to print period.

(c) Place printing hammer in contact with type pallet and press it downward at bearing stud.

(d) Hammer should be fully on end of type pallet.

(e) If face of hammer is not fully on end of

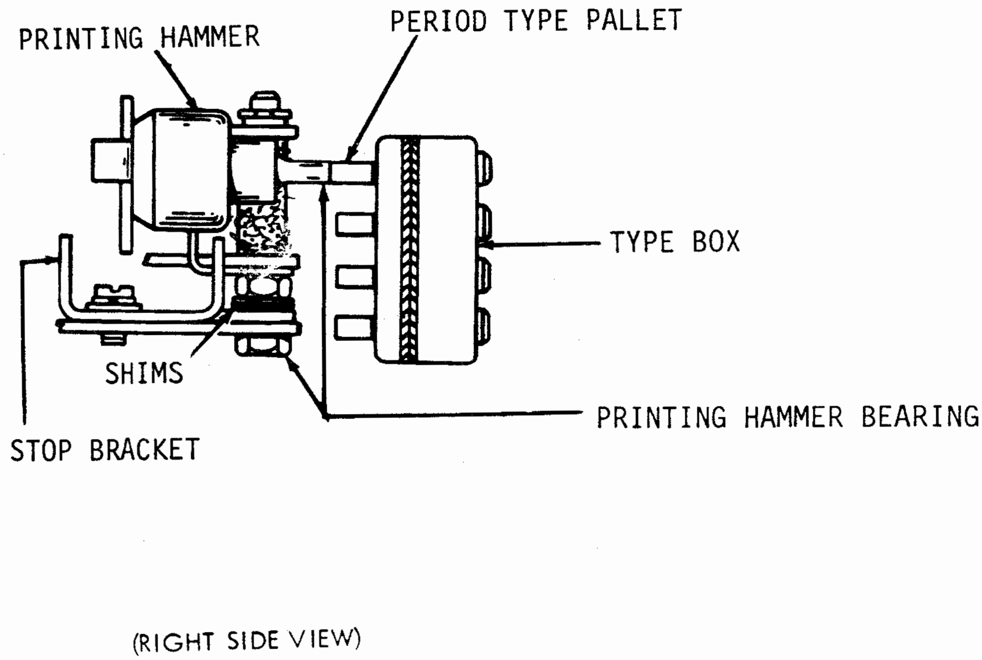



Figure 6-61. Printing Hammer Bearing Stud

type pallet, loosen nut and add or remove shims between shoulder on bearing post and stop bracket.

(8) Printing Hammer Operating Bail Latch Spring. Adjust printing hammer operating bail latch spring as follows:

(a) Refer to figure 6-62.

(b) Place printing track in its extreme upward position.

(c) Apply spring scale pushrod to printing hammer bail.

(d) Place printing track in its extreme upward position.

(e) Force required to start latch moving should be between 3 and 4-1/2 ounces.

(f) If spring scale reading exceeds specified limits, install new spring.

(9) Printing Hammer Operating Bail Spring. Adjust printing hammer operating bail spring as follows:

(a) Refer to figure 6-62.

(b) Place operating bail in latched position.

(c) Position spring adjusting bracket in left hand notch.

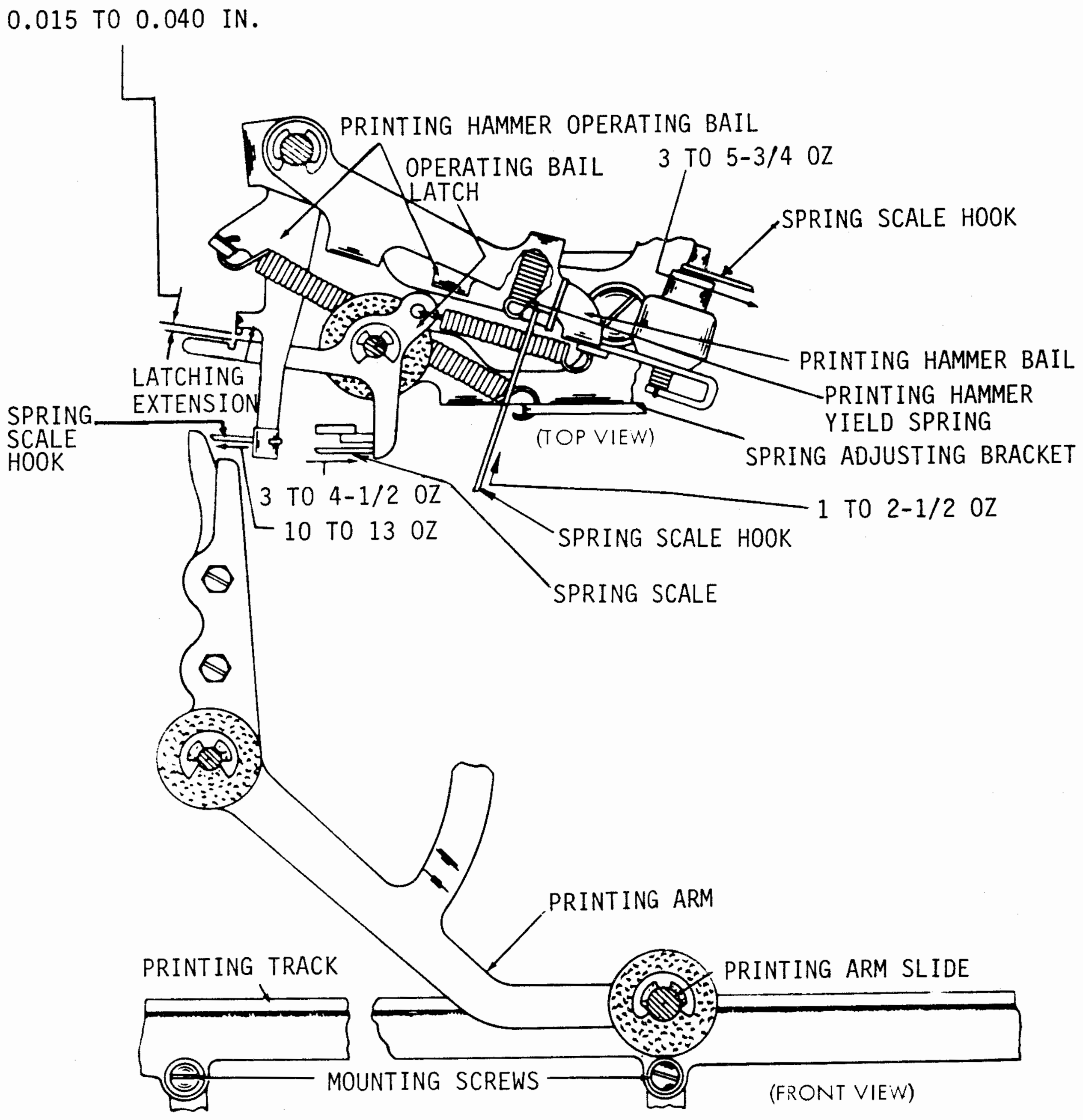



Figure 6-62. Printing Hammer Operating Bail Latch Spring, Printing Hammer Bail Spring, Printing Hammer Plunger Spring, Printing Hammer Yield Spring, and Printing Track

(d) Unhook hammer yield spring.

(e) Attach spring scale hook to printing hammer operating bail.

(f) Force required to start bail moving should be between 10 and 13 ounces.

(g) If spring scale reading exceeds specified limits, install new spring.

(10) <u>Printing Hammer Plunger Spring</u>. Adjust printing hammer plunger spring as follows:

(a) Refer to figure 6-62.

(b) Attach spring scale hook to printing hammer plunger.

(c) Force required to start plunger moving should be between 3 and 5-3/4 ounces.

(d) If scale reading exceeds specified limits, install new spring.

(11) <u>Printing Hammer Yield Spring</u>. Adjust printing hammer yield spring as follows:

(a) Refer to figure 6-62.

(b) Position printing hammer operating bail against its stop.

(c) Attach spring scale hook to hammer bail.

(d) Force required to start hammer bail moving should be between 1 and 2-1/2 ounces.

(e) If scale reading exceeds specified limits, install new spring.

(12) <u>Printing Track</u>. Adjust printing track as follows:

(a) Refer to figure 6-62.

(b) Place printing track in its extreme downward position.

(c) ("Blank selection in figures")

(d) Hold printing hammer operating bail latching extension with left face in line with latch shoulder.

(e) Position printing arm slide alternately over each track mounting screw.

(f) Reset printing bail each time.

(g) Measure clearance between latching extension and operating bail. Clearance should be between 0.015 and 0.040 inch.

(h) If clearance exceeds specified limits, loosen printing track mounting screws and position printing track up or down to obtain specified clearance.

(13) <u>Ribbon Feed Lever Bracket</u>. Adjust ribbon feed lever bracket as follows:

(a) Refer to figure 6-63.

(b) Place left reversing lever in upward position.

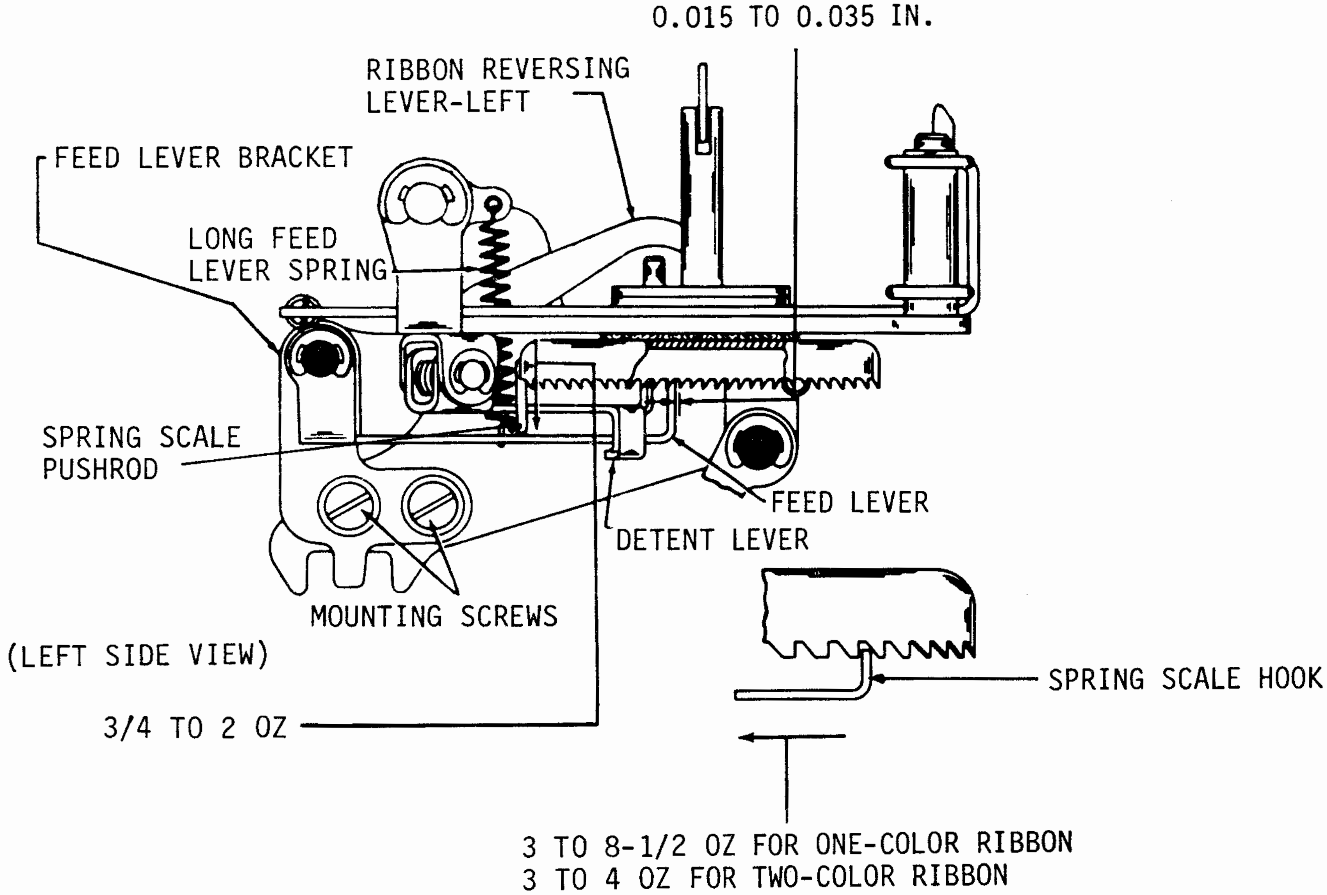



Figure 6-63. Ribbon Feed Lever Bracket, Ribbon Feed Lever Spring, and Ribbon Ratchet Wheel Friction Spring

(c) Place ribbon mechanism in upper position.

(d) Hold ratchet against detent lever.

(e) Measure clearance between front face of feed lever and shoulder of tooth on ratchet wheel. Clearance should be between 0.015 and 0.035 inch.

(f) If clearance exceeds specified limits, loosen feed lever bracket mounting screws and position feed lever bracket to obtain specified clearance.

(g) Tighten screws.

(h) Place right reversing lever in upward position.

(i) Repeat steps (c) through (g) for right-hand mechanism.

NOTE

Rotate main shaft. Ratchet wheel should step one tooth only with each operation. On units with two-color ribbon, position feed lever bracket to upper forward position to meet maximum requirement.

(14) Ribbon Feed Lever Spring. Adjust ribbon feed lever spring as follows:

(a) Refer to figure 6-63.

(b) Place both long and short ribbon feed lever springs in uppermost position.

(c) Apply spring scale pushrod to long ribbon feed lever at point near its spring and push downward.

(d) Force required to start lever moving should be between 3/4 and 2 ounces.

(e) If scale reading exceeds specified limits, install new spring.

(f) Apply spring scale pushrod to short ribbon feed lever at point near long lever spring and push downward.

(g) Force required to start lever moving should be between 3/4 and 2 ounces.

(h) If scale reading is less than 3/4 ounces, pull lower end of torsion spring to rear. If scale reading is greater than 2 ounces, install new spring.

(i) Measure all four pawls in like manner.

(15) Ribbon Ratchet Wheel Friction Spring. Adjust ribbon ratchet wheel friction spring as follows:

(a) Refer to figure 6-63.

(b) Disengage feed levers.

(c) Apply spring scale hook to ratchet wheel.

(d) Force required to start ratchet wheel moving should be as follows: for one-color ribbon, between 3 and 8-1/2 ounces; for two-color ribbon, between 3 and 4 ounces.

(16) Ribbon Lever Spring. Adjust ribbon lever spring as follows:

(a) Refer to figure 6-64.

(b) Attach spring scale to right ribbon lever.

(c) Force required to start lever moving should be between 1-1/2 and 3 ounces.

(d) If scale reading exceeds specified limits, install new spring.

(e) Repeat steps (b), (c), and (d) for left spring.

(17) Ribbon Tension Spring. Adjust ribbon tension spring as follows:

(a) Refer to figure 6-64.

(b) Position ribbon ratchet wheel so that each driving pin is toward outside of spool shaft.

(c) Attach spring scale hook to spool.

(d) Force required to start spool shaft moving should be between 3 and 5-1/2 ounces.

(e) If scale reading exceeds specified limits, install a new spring.

(18) Ribbon Reverse Detent. Adjust ribbon reverse detent as follows:

(a) Refer to figure 6-65.

(b) Buckle ribbon reverse detent in its downward position.

(c) Take up play in detent lever lightly toward right side of printer.

(d) Measure clearance between detent link and detent lever.

(e) There should be some clearance not exceeding 0.055 inch.

(f) If clearance exceeds specified limits, loosen upper and lower set screws, hold left ribbon lever in its downward position, and position detent link. Tighten upper set screw in hub of detent link.

(g) Buckle detent link upward and tighten lower set screw.

(19) Ribbon Reverse Detent Lever Spring (If Unit is Equipped). Adjust ribbon reverse detent lever spring as follows:

(a) Refer to figure 6-65.

(b) Buckle link in upward position.

(c) Attach spring scale hook to detent lever at point where spring is attached.

(d) Force required to start detent lever moving toward rear should be between 10 and 18 ounces.

(e) If scale reading exceeds specified limits, install new spring.

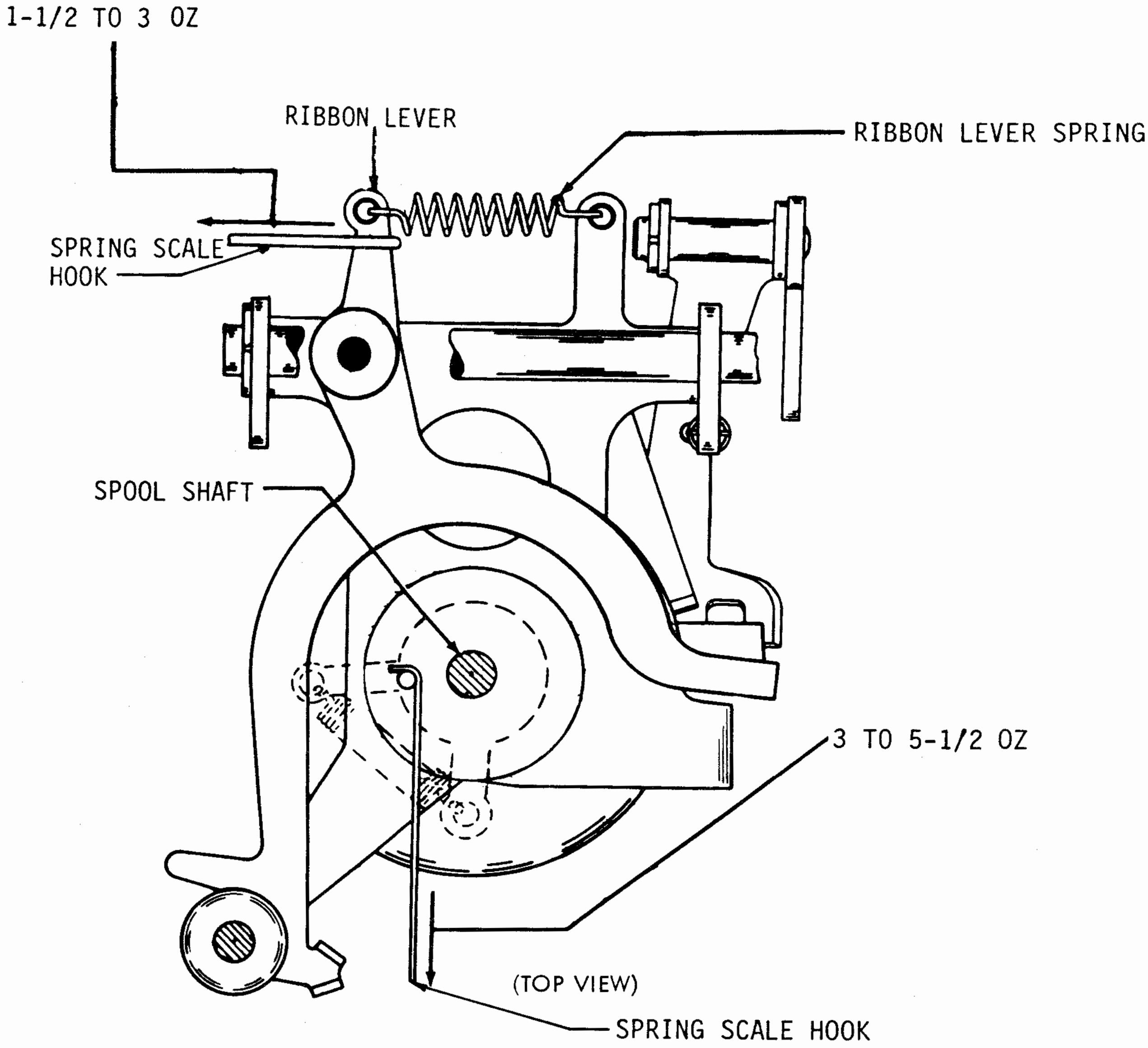



Figure 6-64. Ribbon Lever Spring and Ribbon Tension Spring

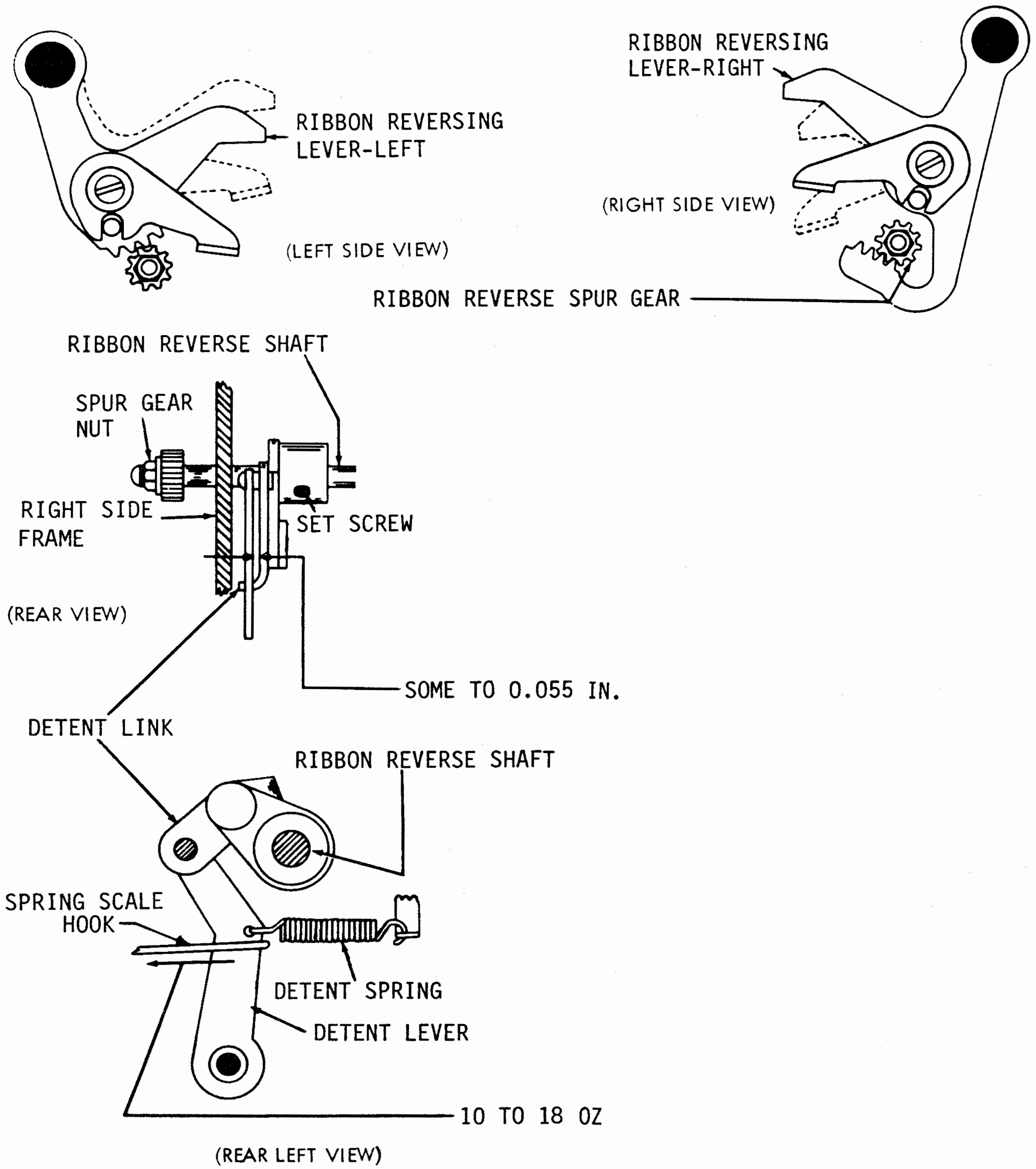



Figure 6-65. Ribbon Reverse Detent, Ribbon Reverse Detent Lever Spring, and Ribbon Reverse Spur Gear

(20) Ribbon Reverse Spur Gear. Adjust ribbon reverse spur gear as follows:

(a) Refer to figure 6-65.

(b) Place right reversing lever in its maximum downward position.

(c) Left reversing lever should be in its maximum upward position.

(d) If left reversing lever is not in its maximum upward position, loosen set screws in detent cam. Loosen left spur gear unit.

(e) Securely tighten right spur gear nut.

(f) Move right reversing lever to its maximum downward position, hold left reversing lever in its maximum upward position, and tighten left spur gear nut.

(g) Rotate type box clutch 1/2 turn and move right reversing lever under segment.

(h) There should be some clearance between segment and lever.

(i) If there is no clearance, repeat steps (d) through (h).

(21) Type Box Alignment. Adjust type box alignment as follows:

(a) Refer to figure 6-66.

NOTE

This adjustment applies only to units so equipped and should be made with the type box in its upper position.

(b) Examine a line of printed characters. As gauged visually, top and bottom of each character should be impressed equally.

(c) If impression of tops and bottoms are not equal, loosen adjusting screw and clamp nut.

(d) Operate unit under power. Repeat characters E and Z. Turn adjusting screw in or out in steps of 1/4 turn until tops and bottoms of all characters make equal impression.

NOTE

Some typing units are equipped with a ribbon guide which has a type box retaining clip with a limited yield. In cases where it is necessary to back the adjusting screw out to provide heavier printing at the top of a character, it may be necessary to bend the spring clip on the ribbon guide toward the front so that the tab at the bottom of the type box is held against the head of the adjusting screw.

(e) Tighten adjusting screw clamp nut.

(f) Recheck printing stop bracket adjustment (6-3.1c(3)) and readjust if necessary.

g. Selector Mechanism Adjustments. Perform selector mechanism adjustments in accordance with the following paragraphs.

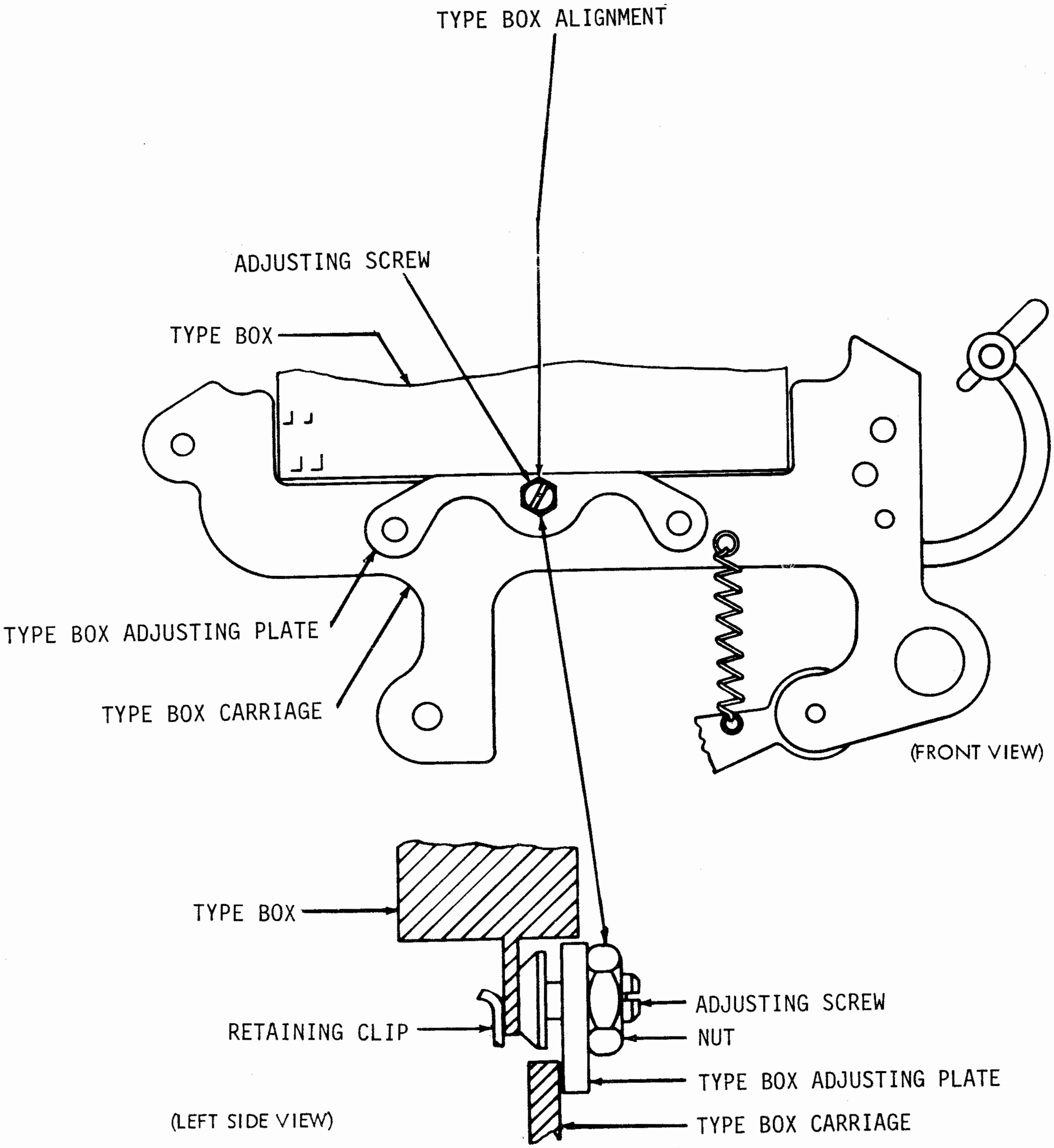



Figure 6-66. Type Box Alignment

(1) Marking Lock Lever Spring. Adjust marking lock lever spring as follows:

(a) Refer to figure 6-67.

(b) Select letters combination.

(c) Rotate main shaft until selector clutch is disengaged.

(d) Apply spring scale pushrod to lower extension of marking lock lever.

(e) Force required to start lock lever moving should be between 1-1/2 and 3 ounces.

(f) If scale reading exceeds specified limits, install new spring.

(2) Start Lever Spring. Adjust start lever spring as follows:

(a) Refer to figure 6-68.

(b) Unhook latch lever spring.

(c) Position stop arm bail in indent of its cam.

(d) Set range scale at 60.

(e) Apply spring scale pushrod to clutch stop arm.

(f) Force required to start stop arm moving should be between 2-1/2 and 4-1/2 ounces.

(g) If scale reading exceeds specified limits, install new spring.

(h) Reinstall latch lever spring unhooked in step (b).

(3) Push Lever Reset Bail Spring. Adjust push lever reset bail spring as follows:

(a) Refer to figure 6-69.

(b) Position push lever reset bail on low part of cam.

(c) Apply spring scale pushrod to reset bail.

(d) Force required to move bail from cam should be between 4 and 8 ounces.

(e) If scale reading exceeds specified limits, install new spring.

(4) Selector Clutch Latch Lever Spring. Adjust selector clutch latch lever spring as follows:

(a) Refer to figure 6-70.

(b) Position latch so it rests on low part of its cam disc.

(c) Attach spring scale hook to latch lever.

(d) Force required to start latch moving should be between 2 and 3-1/2 ounces.

(e) If scale reading exceeds specified limits, install new spring.

(5) Spacing Lock Lever Spring. Adjust spacing lock lever spring as follows:

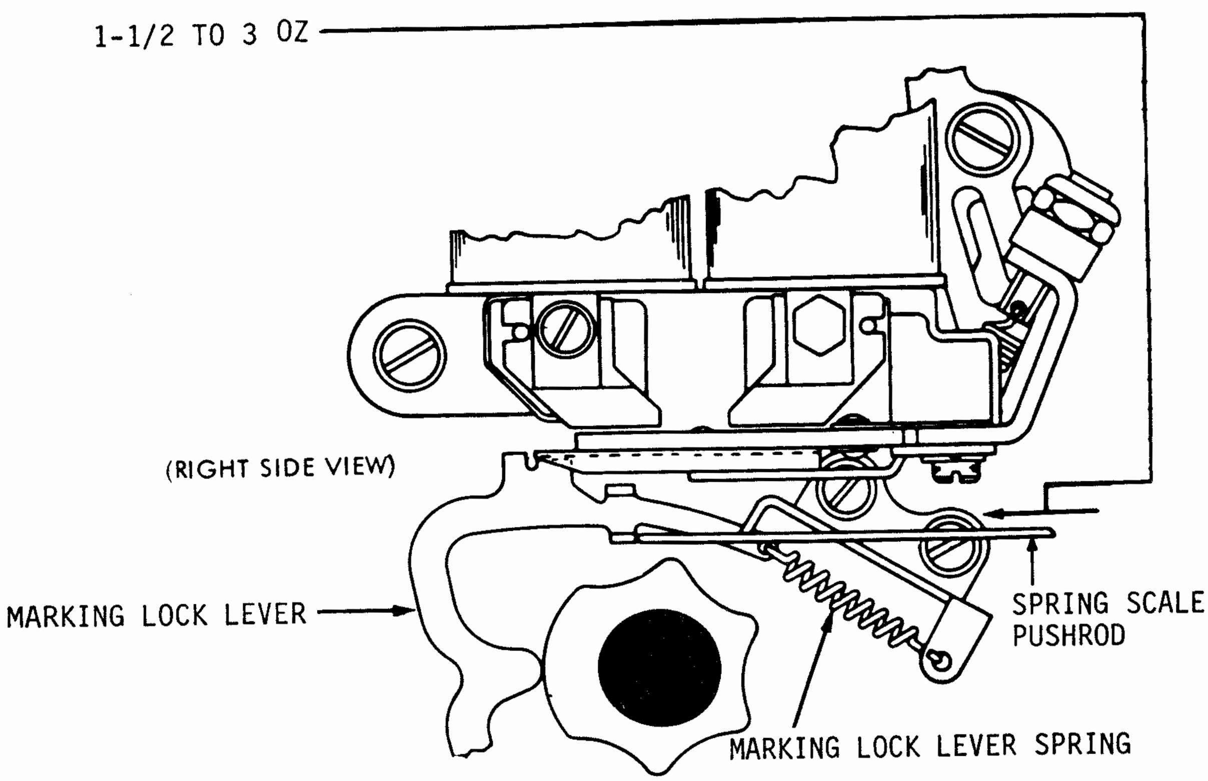



Figure 6-67. Marking Lock Lever Spring

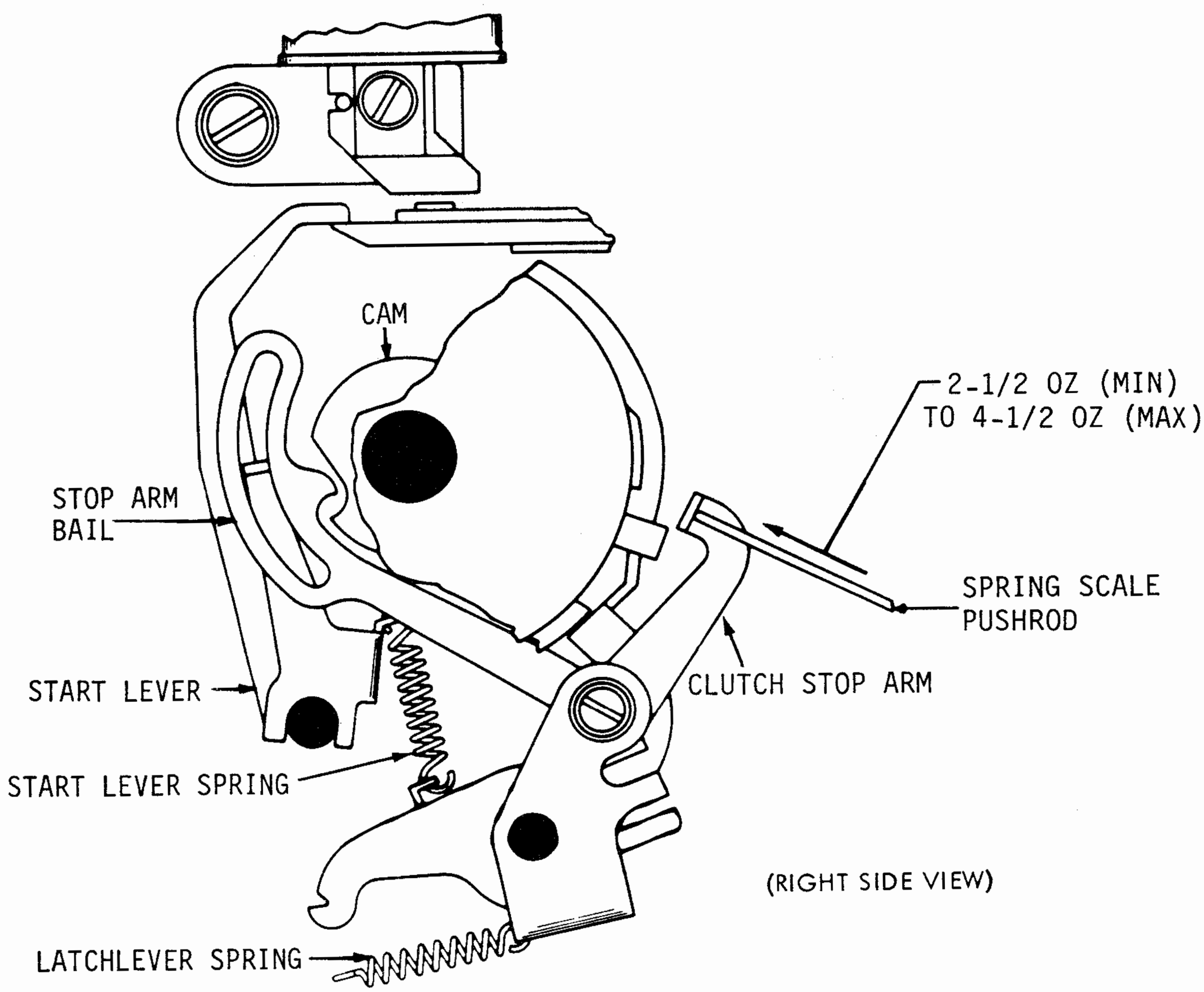



Figure 6-68. Start Lever Spring

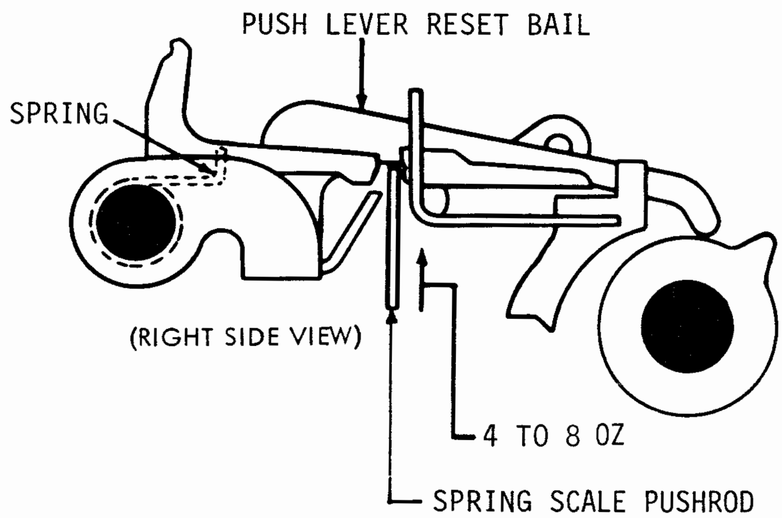



Figure 6-69. Push Lever Reset Bail Spring

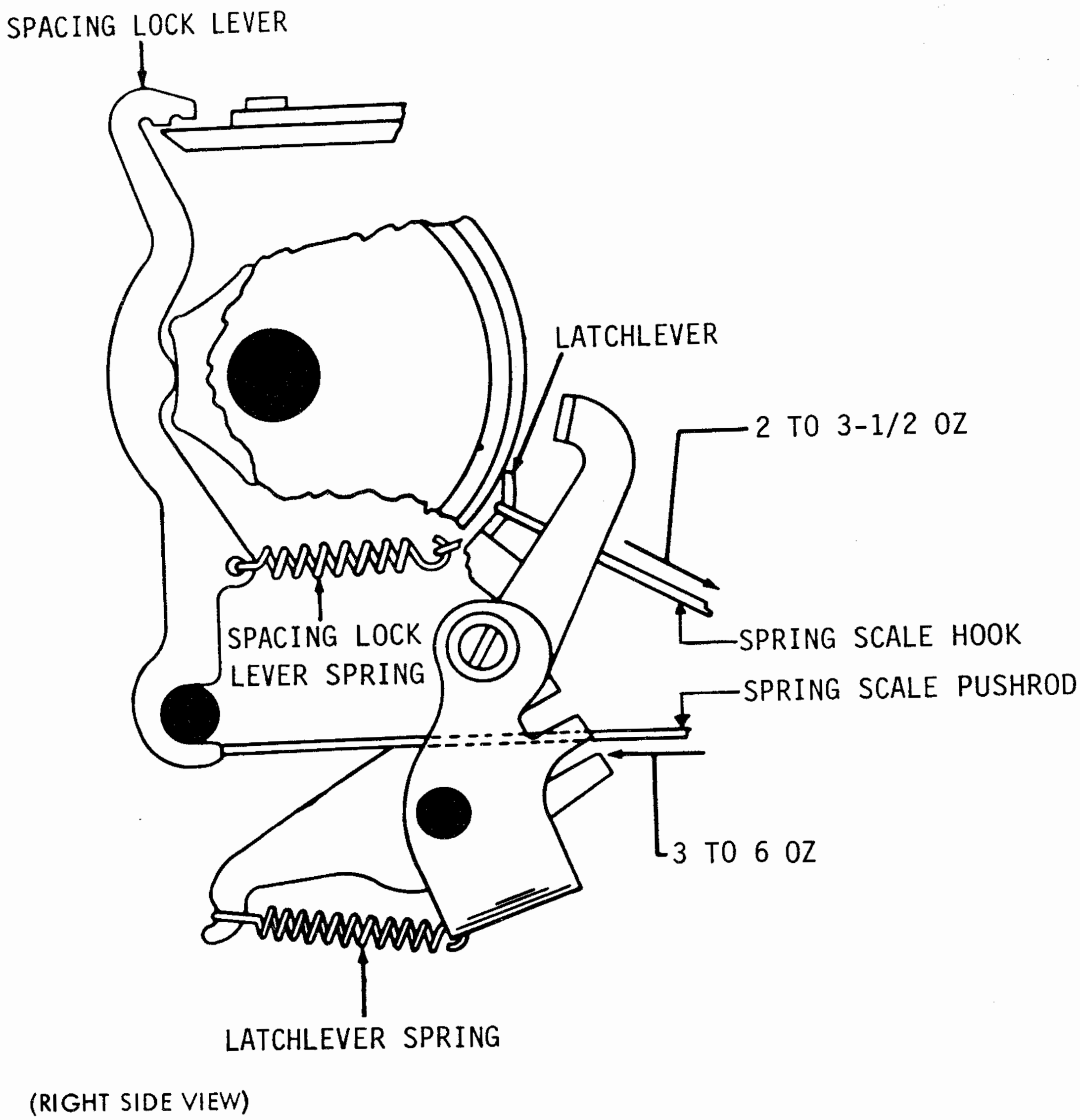



Figure 6-70. Selector Clutch Latch Lever Spring and Spacing Lock Lever Spring

(a) Refer to figure 6-70.

(b) Release selector armature.

(c) Position spacing lock lever on low part of its cam.

(d) Apply spring scale pushrod to lower end of lock lever.

(e) Force required to move spacing lock lever from its pivot shaft should be between 3 and 6 ounces.

(f) If scale reading exceeds specified limits, install new spring.

(6) <u>Range Finder Knob Phasing</u>. Adjust range finder knob phasing as follows:

(a) Refer to figure 6-71.

(b) Rotate range finder knob either clockwise or counterclockwise to the stop.

(c) Zero on range scale should be within 3 points of index mark.

(d) If zero is more than 3 points away from index, remove mounting nut and disengage knob from rack.

(e) Position knob so that 0 on range scale is at index.

(f) Engage knob with rack and replace mounting nut.

(g) Rotate knob to set 60 on range scale at index.

(7) <u>Selector Clutch Stop Arm</u>. Adjust selector clutch stop arm as follows:

(a) Refer to figure 6-71.

(b) Set range scale at 60.

(c) Disengage selector clutch.

(d) Position armature in marking position.

(e) Clutch stop arm should engage clutch shoe lever by approxiamtely full thickness of shoe lever. If not, loosen clamp screw and position stop arm on stop arm bail.

(f) Tighten clamp screw.

(8) <u>Selector Receiving Margin for Dual Speed Operation (60 and 100 WPM)</u>.

(a) Refer to figure 6-72.

(b) Set range scale at common optimum setting for dual speed operation.

(c) Page printer should accept signals with 35 percent bias and end distortion when operating at 60 or 100 words per minute (wpm).

(d) Set bias selector between limits of 0 and -7 percent internal bias at 100 wpm. (Do not readjust for 60 wpm.)

(e) Calculate common optimum bias as follows:

$$O_c = \frac{UMB_{100} + LSB_{60}}{2}$$

where

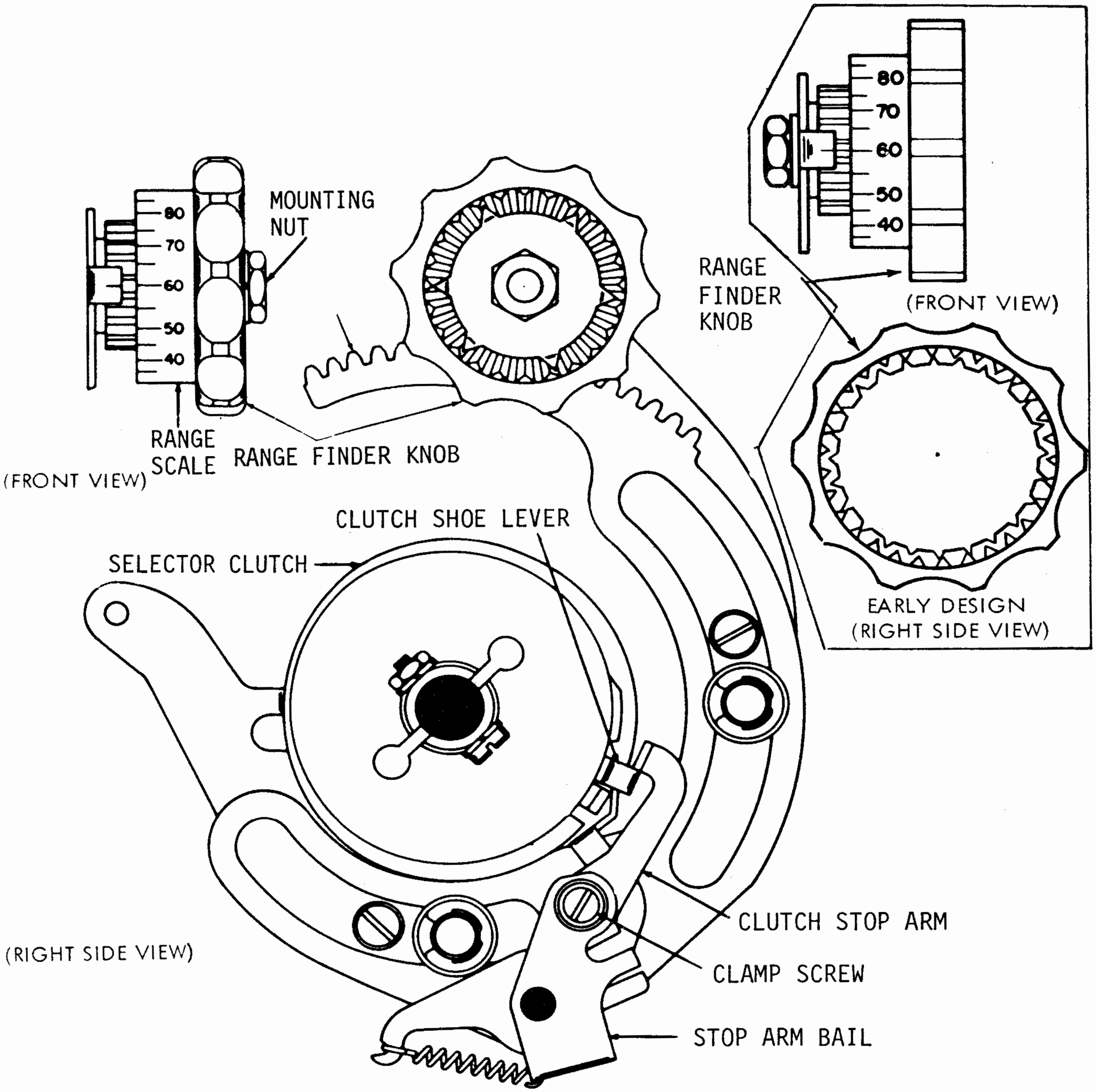



Figure 6-71. Range Finder Knob Phasing and Selector Clutch Stop Arm

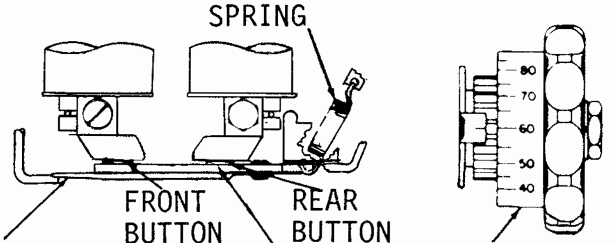



Figure 6-72. Selector Receiving Margin (Dual Speed Operation)

$O_c$ = common optimum bias setting
$UMB_{100}$ = upper orient limit marking bias at 100 wpm
$LSB_{60}$ = lower orient limit spacing bias at 60 wpm

(9) Selector Receiving Margin. Adjust selector receiving margin as follows:

(a) Refer to figure 6-72.

(b) When adjusting units employing armature with one anti-freeze button and a signal distortion test is used for determining receiving margins of selector and where condition of components is equivalent to that of new equipment, range and distortion tolerances specified in table 6-1 should be met.

(c) When checking units with a single button armature (for bell service only), shunt signal line by a switchboard simulator.

(d) If adjustment is required, perform the adjustments described in 6-3.1g(13) and (14).

(e) When adjusting units employing armature with two anti-freeze buttons, adjust selector armature spring tension as described in 6-3.1g(13) and (14) when a distortion test set is available. Do not use simulator with units employing two-button armature.

Table 6-1. Selector Margin Minimum Requirements

| Current | Speed WPM | Points Range (Zero Distortion) | Percent Marking and Spacing Bias Tolerated | End Distortion Tolerated (Scale) Set at Bias Optimum |
|---|---|---|---|---|
| 0.060 amp (windings parallel) | 70<br>75<br>100<br>50 + 75 baud | 72 | 40 | 35 |
| 0.020 amp (windings series) | 60<br>75 | 72 | 40 | 35 |

(f) Front anti-freeze button must contact magnet core when magnet coils are energized.

NOTE

Separate 50 baud or 75 baud tests are not required. Units geared for 74 baud are tested with the usual 74.2 baud 60 opm, 7.42 unit signals.

(10) Selector Armature. Adjust selector armature as follows:

NOTE

The following selector armature adjustments may be omitted if selector magnet bracket, paragraph 6-3.1g(14) and selector receiving margin, paragraph 6-3.1g(9) adjustments have been completed.

(a) Refer to figure 6-73.

(b) Measure clearance between armature clamp strip and magnet bracket casting. Clearance should be 0.010 inch minimum.

(c) Outer edge of armature should be flush with outer edge of pole pieces within 0.015 inch.

(d) Start lever should drop freely into armature extension slot.

(e) If any of the requirements of (b), (c), and (d) are not met, loosen mounting screws and position armature spring adjusting nut to hold armature firmly against pivot edge of casting.

(f) Tighten mounting screws.

(11) Selector Armature Downstop (Preliminary). Adjust selector armature downstop as follows:

(a) Refer to figure 6-74.

(b) De-energize magnet.

(c) Position lock levers on high part of their cams.

(d) Position armature so it rests against its downstop.

(e) Measure clearance between end of armature and left edge of left pole piece. Clearance should be between 0.030 and 0.035 inch.

(f) If clearance exceeds specified limits, loosen mounting screw and position downstop to obtain specified clearance.

(g) Tighten mounting screw.

(12) Selector Armature Downstop (Final). Adjust selector armature downstop as follows:

(a) Refer to figure 6-75.

(b) De-energize magnet.

(c) Position locklevers on low part of their cams.

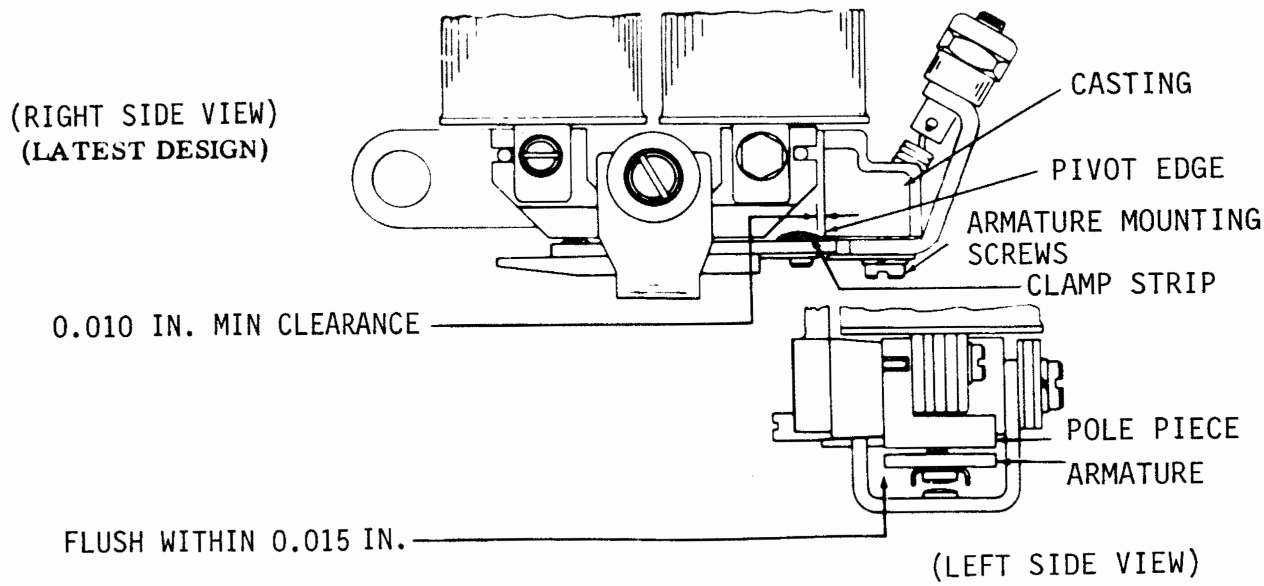



Figure 6-73. Selector Armature

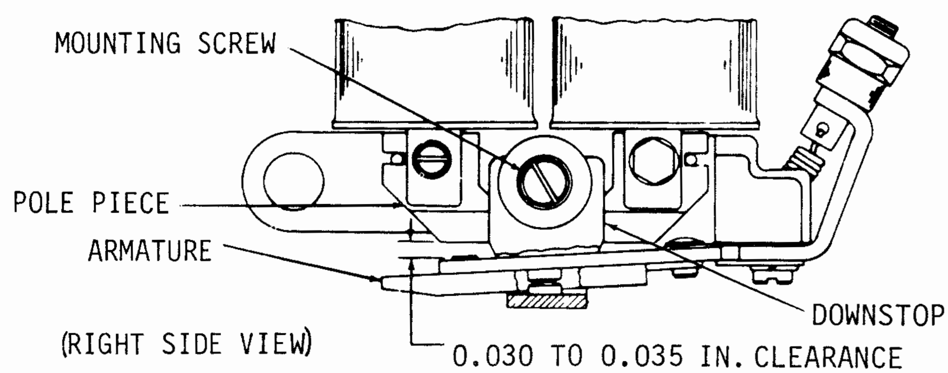



Figure 6-74. Selector Armature Downstop (Preliminary)

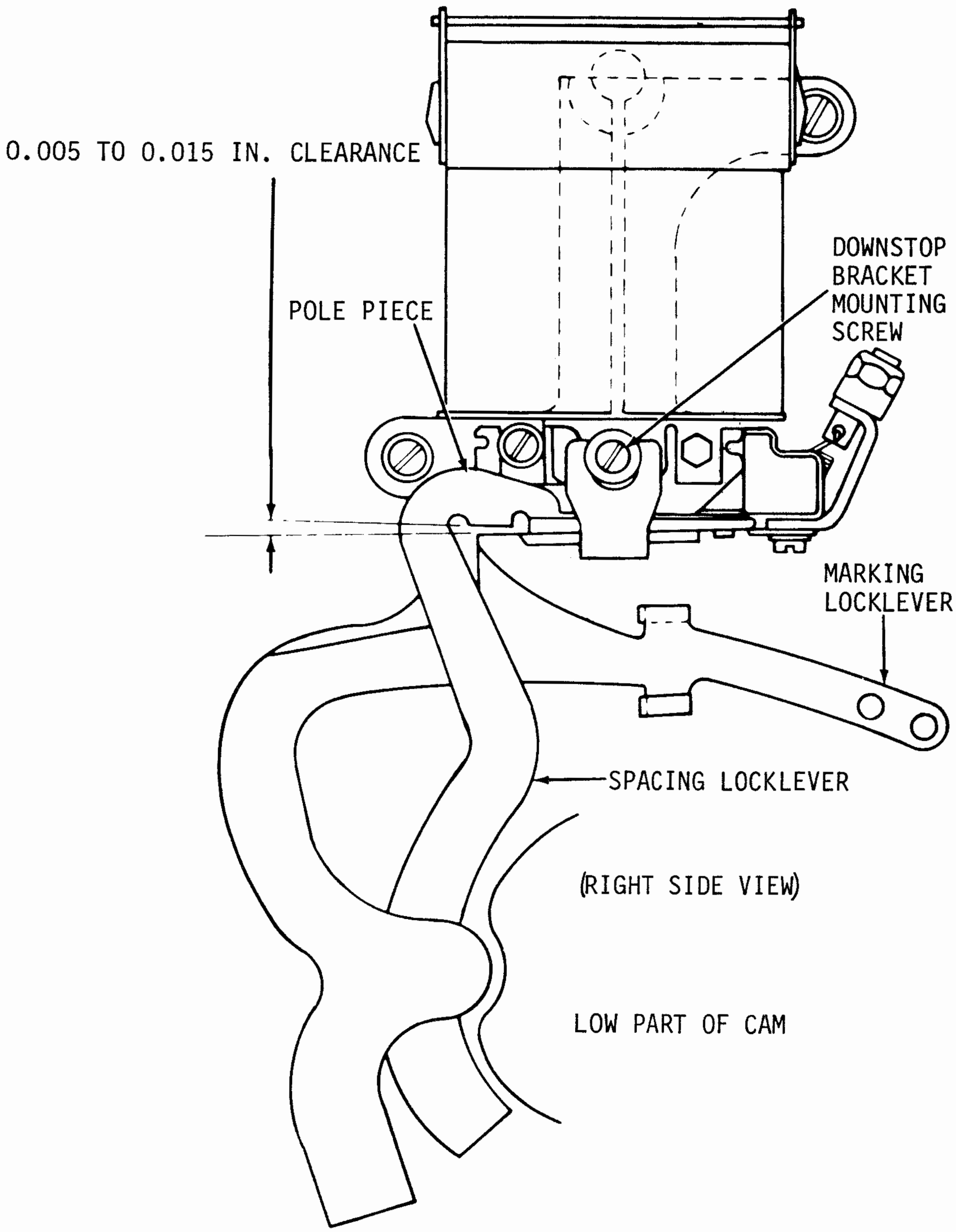



Figure 6-75. Selector Armature Downstop (Final)

(d) Measure clearance between top of armature extension and bottom of spacinq locklever. Clearance should be between 0.005 and 0.015 inch.

(e) If clearance exceeds specified limits, loosen mountinq screw and position downstop to obtain specified clearance.

(f) Tiqhten mountinq screw.

(13) Selector Armature Sprinq (Double Button). Adjust selector armature spring as follows:

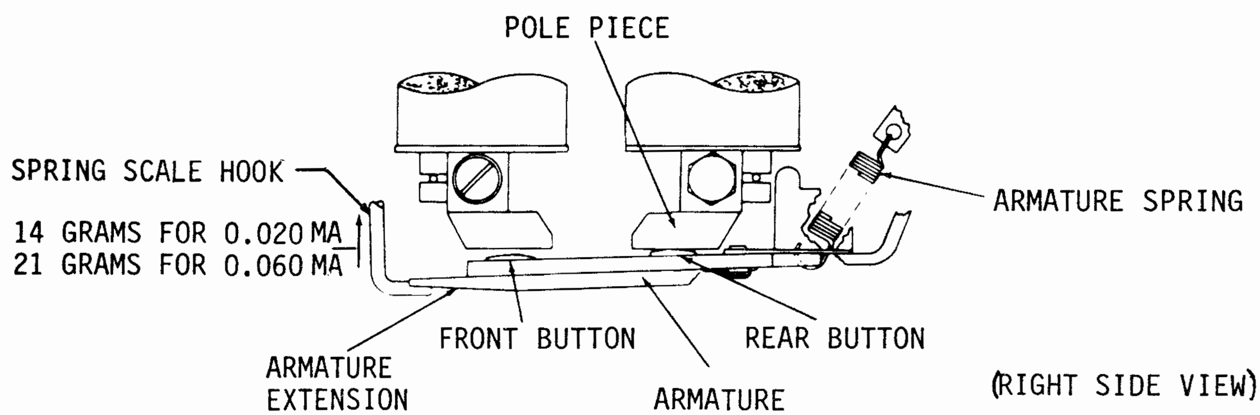
(a) Refer to fiqure 6-76.

(b) Position start lever, marking lock lever, and spacing lock lever on high part of their cams.

(c) Attach spring scale hoook to armature by hookinq it under end of armature extension.

(d) Holding spring scale as nearly vertical as possible, measure force required to pull rear button of armature against its pole piece.

(e) Force reqluired to pull rear button against its pole piece should be 14 grams for 0.020-ampere series-connected selector maqnets or 21 qrams for 0.060-ampere parallel-connected selector magnets.




Fiqure 6-76. Selector Armature Spring (Double Button)

(f) If required force is not as specified in step (e), adjust armature spring tension by positioning adjusting nut.

NOTE

Armature spring tension can be adjusted for maximum selector performance only when the printer is connected to the specific circuit over which it is to operate under service conditions. Since there are several operating speeds and since circuits vary widely, it is impossible to adjust the spring for maximum performance at the factory. The foregoing spring tension requirement is given to permit operation prior to measurement of receiving margins. Readjustment made to obtain satisfactory receiving margin should not be disturbed in order to meet the requirements of this adjustment. The final spring tension should be held as close as possible to the values given above -- consistent with good receiving margins.

(g) If a distortion test set is available, refine selector armature spring adjustment to meet selector receiving margin as described in 6-3.1g(9).

(14) <u>Selector Magnet Bracket</u>. Adjust selector magnet bracket as follows:

NOTE

The appropriate selector armature spring tension preliminary adjustments, paragraphs 6-3.1g(15) or (13), must be made prior to the selector magnet adjustment.

(a) Refer to figure 6-77.

(b) Position cam so that spacing lock lever rests on one of the high spots of the cam.

(c) Energize magnets to position armature in contact with pole piece.

(d) Measure clearance between end of armature extension and shoulder on spacing lock lever.

(e) Repeat steps (b), (c), and (d) for each remaining high spot of cam. Clearance at each high spot should be between 0.020 and 0.035 inch.

(f) If clearance at any high spot exceeds specified limits, loosen two magnet bracket mounting screws and adjusting link clamp screw.

(g) Position magnet bracket to obtain specified clearance at each high spot.

(h) Tighten adjusting link clamp screw only.

(i) Repeat steps (b) and (c).

(j) Measure clearance between upper surface of armature extension and lower surface of spacing lock lever when lock lever is held downward.

(k) Repeat steps (i) and (j) for each

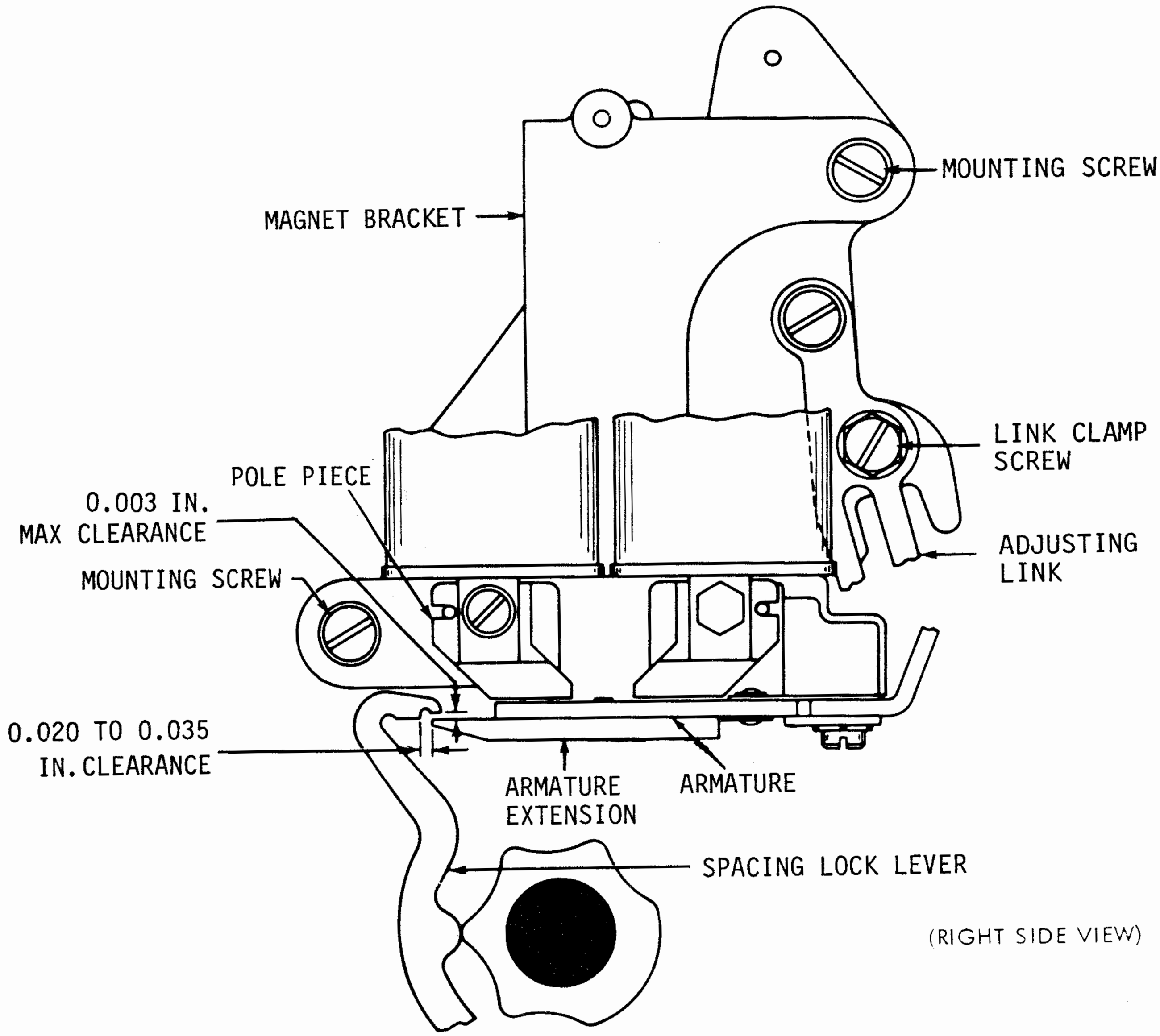



Figure 6-77. Selector Magnet Bracket

remaining high spot of cam. Clearance at each high spot should be 0.003 inch maximum.

(l) If clearance at any high spot exceeds specified limit, position upper end of magnet bracket to obtain specified clearance at each high spot.

(m) Tighten two magnet bracket mounting screws.

(n) Repeat steps (b) through (g).

(o) If further clearance adjustment was required in step (f), tighten adjusting link clamp screw and two magnet bracket mounting screws.

(15) <u>Selector Armature Spring (Single Button)</u>. Adjust selector armature spring as follows:

<u>CAUTION</u>

Before proceeding with the adjustment of the selector armature spring, the type of armature (one anti-freeze button or two anti-freeze buttons) must be known. Excessive tension on or mishandling of a two-button armature can damage the thin leaf attached to the pivot end.

(a) If removal for examination is necessary, disassemble as follows:

1. Disconnect armature spring.

2. Remove armature mounting screws.

3. Withdraw armature from selector.

4. Reassemble and recheck the following adjustments:

Selector Armature, paragraphs 6-15.1g(5) or 6-3.1g(10)

Selector Armature Downstop Bracket, paragraph 6-3.1g(12)

Selector Magnet Bracket, paragraph 6-3.1g(14)

(b) Refer to figure 6-78.

(c) Position start lever, marking lock lever, and spacing lock lever on high part of their cams.

(d) Attach spring scale hook to armature by hooking it under end of armature extension.

(e) Holding spring scale as nearly vertical as possible, measure force required to pull armature to marking position.

(f) Force required to pull armature to marking position should be between 1-1/2 and 2 ounces for 0.020-ampere series-connected selector magnets or between 2-1/2 and 3 ounces for 0.060-ampere parallel-connected selector magnets.

(g) If required force is not as specified in step (e), adjust armature spring tension by positioning adjusting nut.

NOTE

Spring tensions shown in this paragraph permit operation of printer prior to measurement of receiving margins.

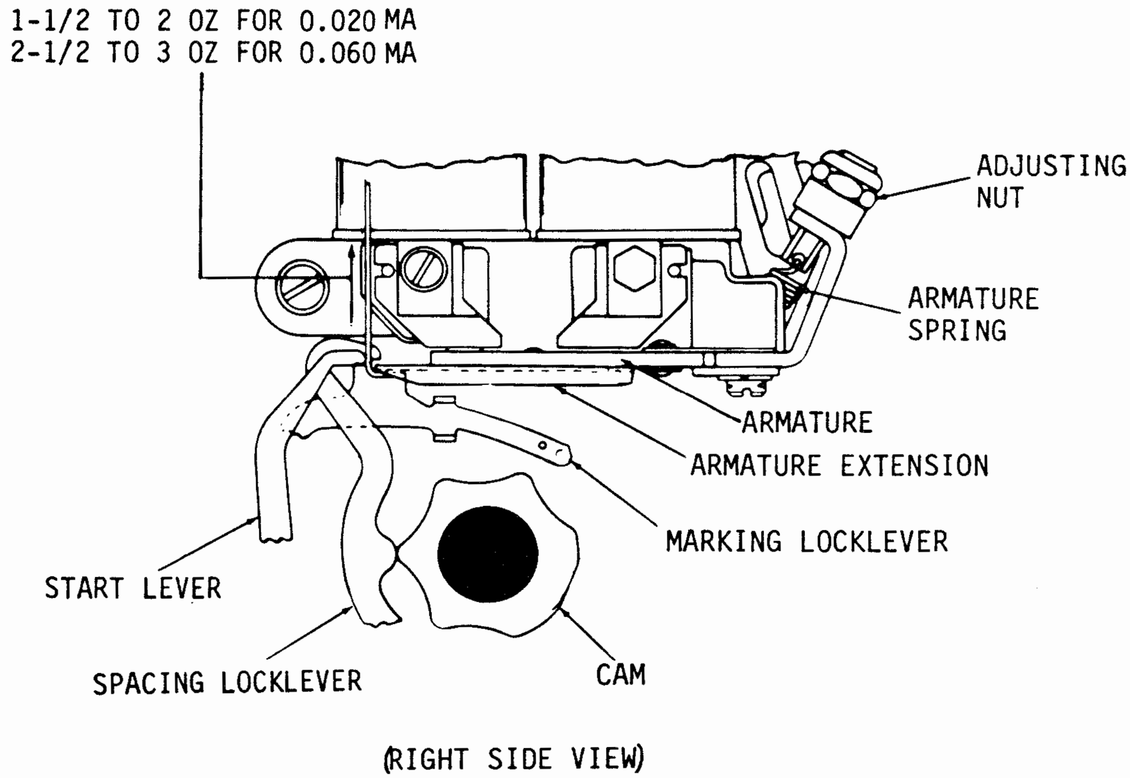



Figure 6-78. Selector Armature Spring (Single Button)

Refine spring tensions for maximum selector performance with unit connected to specific circuits in which it is to function (operating at desired speed and line current). See paragraph 6-3.1g(9).

(16) Selector Cam Lubricator. Adjust selector cam lubricator as follows:

(a) Refer to figure 6-79.

(b) Measure clearance between lubricator tube and high part of lock lever cam. Clearance should be 0.020 inch minimum.

(c) High part of selector lever cam should touch lubricator wick, but should not raise it more than 1/32 inch.

NOTE

There should be some clear- between marking lock lever spring and reservoir.

(d) If clearance in (b) or (c) exceeds specified tolerances, loosen lubricator bracket mounting screws, and position bracket to obtain specified clearance.

(e) Tighten screws.

(17) Selector Clutch Drum. Adjust selector clutch drum as follows:

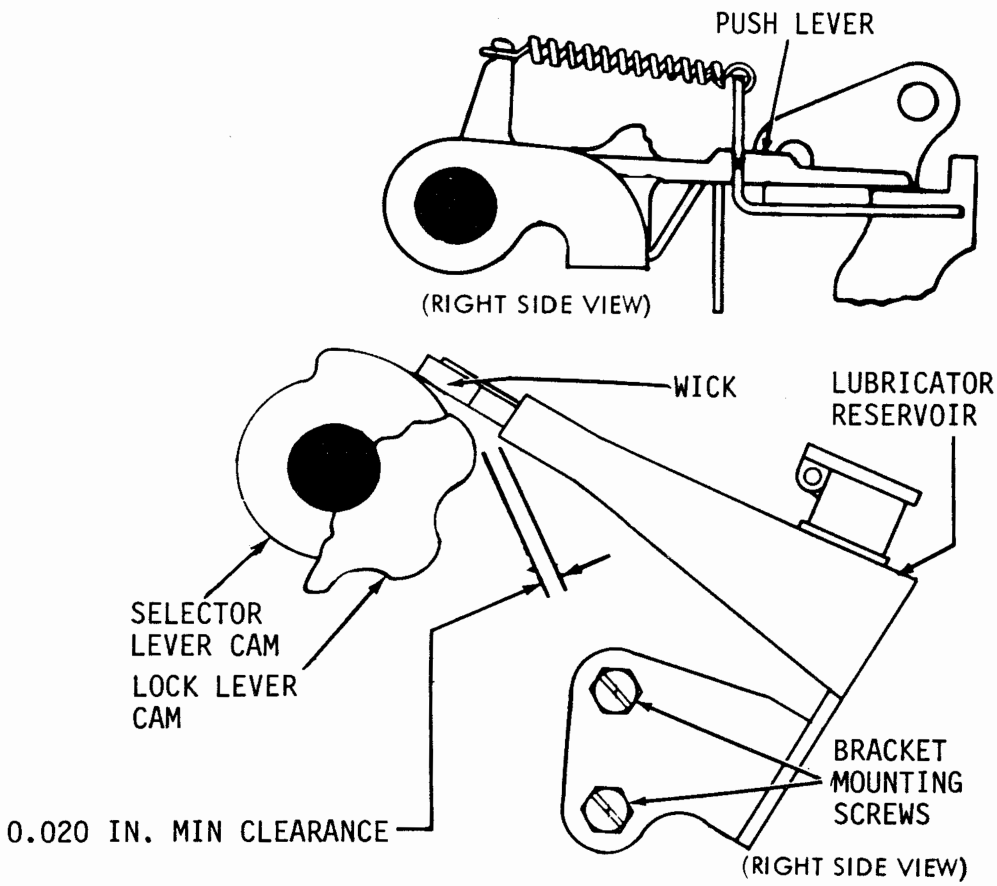



Figure 6-79. Selector Cam Lubricator

(a) Refer to figure 6-80.

(b) Latch selector clutch in stop position.

(c) Measure cam-clutch assembly end play. There should be some end play not exceeding 0.010 inch.

(d) If end play exceeds specified limits, loosen clutch drum mounting screw and position drum to obtain specified clearance.

(e) Tighten mounting screws.

(18) Selector Lever Spring. Adjust selector lever spring as follows:

(a) Refer to figure 6-81.

(b) Place unit upside down on bench.

(c) Position reset bail on peak of its cam.

(d) Apply spring scale hook to each of five selector levers.

(e) Force required to start each lever should be between 1-1/4 and 2-1/2 ounces.

NOTE

When checking No. 4 selector lever spring, unhook start lever spring if necessary and reconnect spring when check is completed.

(f) If scale reading for any spring exceeds specified limits, install a new spring.

(19) Selector Push Lever Spring. Adjust selector push lever spring as follows:

(a) Refer to figure 6-82.

(b) Place push lever in spacing position.

(c) Apply spring scale pushrod to each of five push levers.

(d) Force required to move each push lever from corresponding selector lever should be between 3/4 and 1-1/2 ounces.

(e) If scale reading for any spring exceeds specified limits, install a new spring.

h. Spacing Mechanism Adjustments. Perform spacing mechanism adjustments in accordance with the following paragraphs.

(1) Automatic Carriage Return/Line Feed Bell Crank Spring. Adjust automatic CR and LF bell crank spring as follows:

(a) Refer to figure 6-83.

(b) Attach spring scale hook to bell crank.

(c) Force required to move bell crank should be between 2-1/2 and 7 ounces.

(d) If spring scale reading exceeds specified limits, install a new spring.

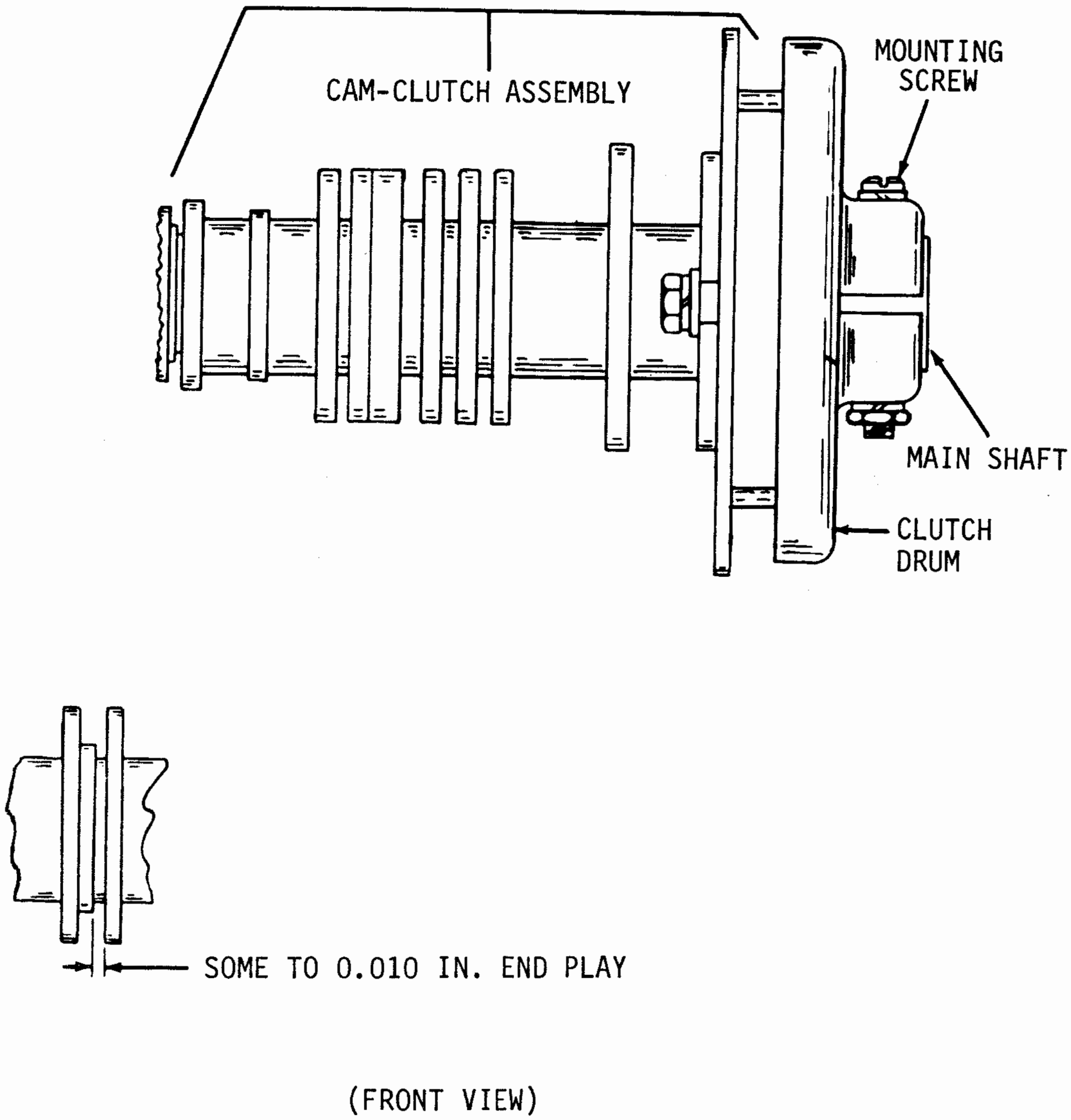



Figure 6-80. Selector Clutch Drum

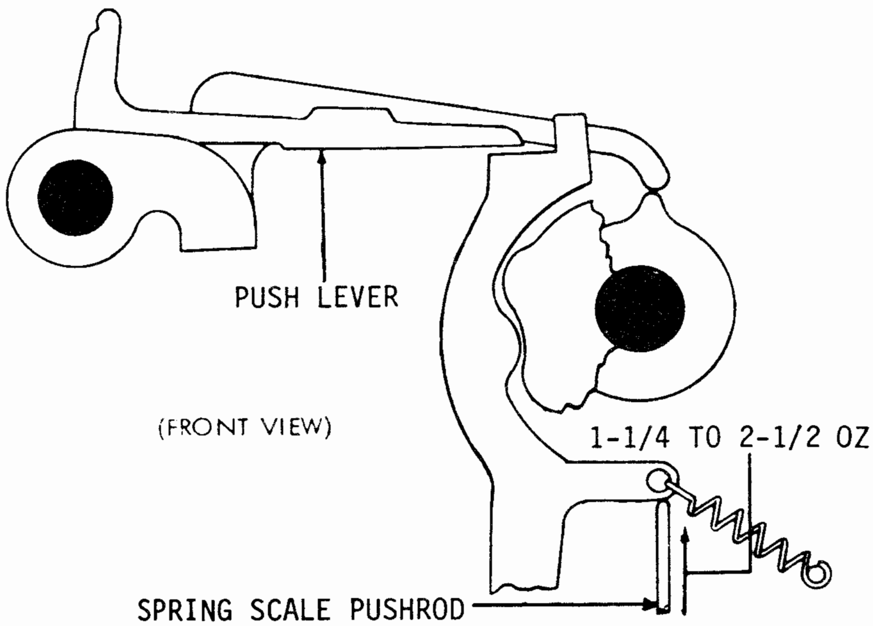



Figure 6-81. Selector Lever Spring

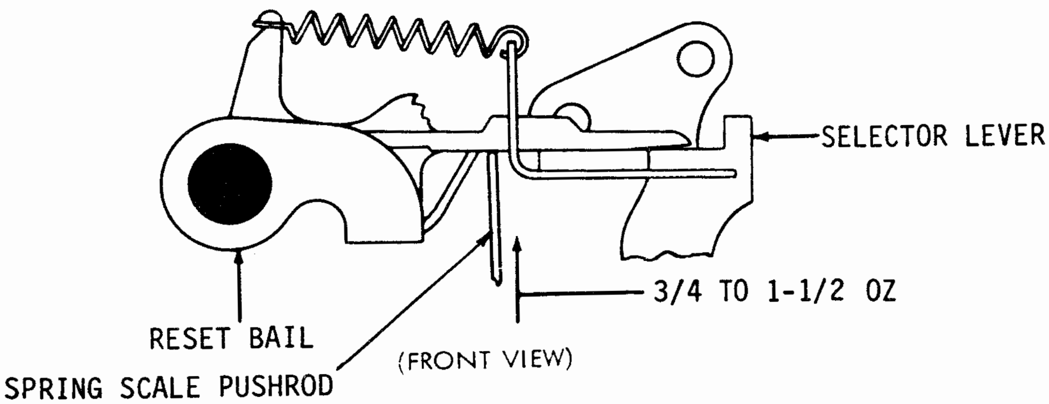



Figure 6-82. Selector Push Lever Spring

(2) Left Margin. Adjust left margin as follows:

(a) Refer to figure 6-84.

(b) Disengage type box clutch.

(c) Place spacing drum in its return position.

(d) Shift type box to letters condition.

(e) Measure clearance between left edge of platen and letters print indicator. Clearance between left edge of platen and letters print indicator should be between 15/16 and 1-1/16 inch.

NOTE

Left margin may be varied as required from 0 to 1 inch. Maximum range adjustment for mechanisms with standard 10-characters per inch spacing is 85 characters for friction feed platen or 74 characters for sprocket feed platen.

(f) If clearance exceeds specified limits, loosen clamp screws and position spacing drum stop arm to obtain specified clearance.

(g) Disengage spacing clutch.

(h) Place front spacing feed pawl in farthest advanced position.

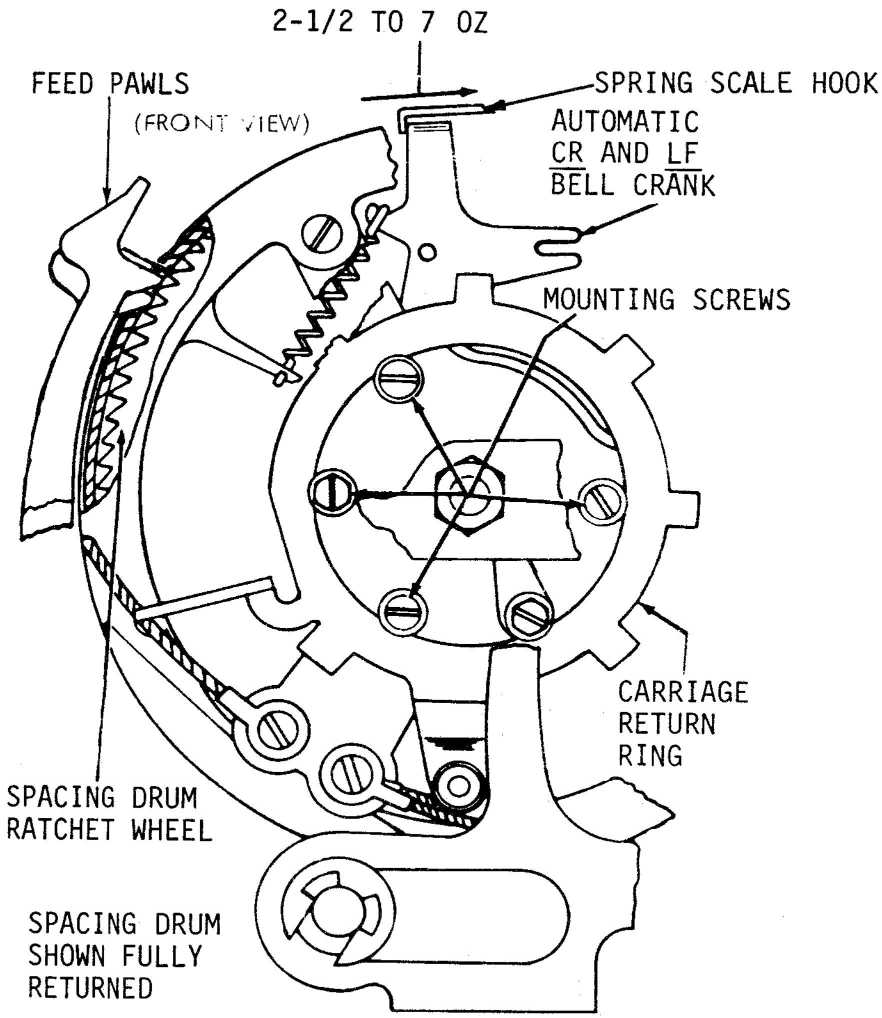



Figure 6-83. Automatic Carriage Return/Line Feed Bell Crank Spring

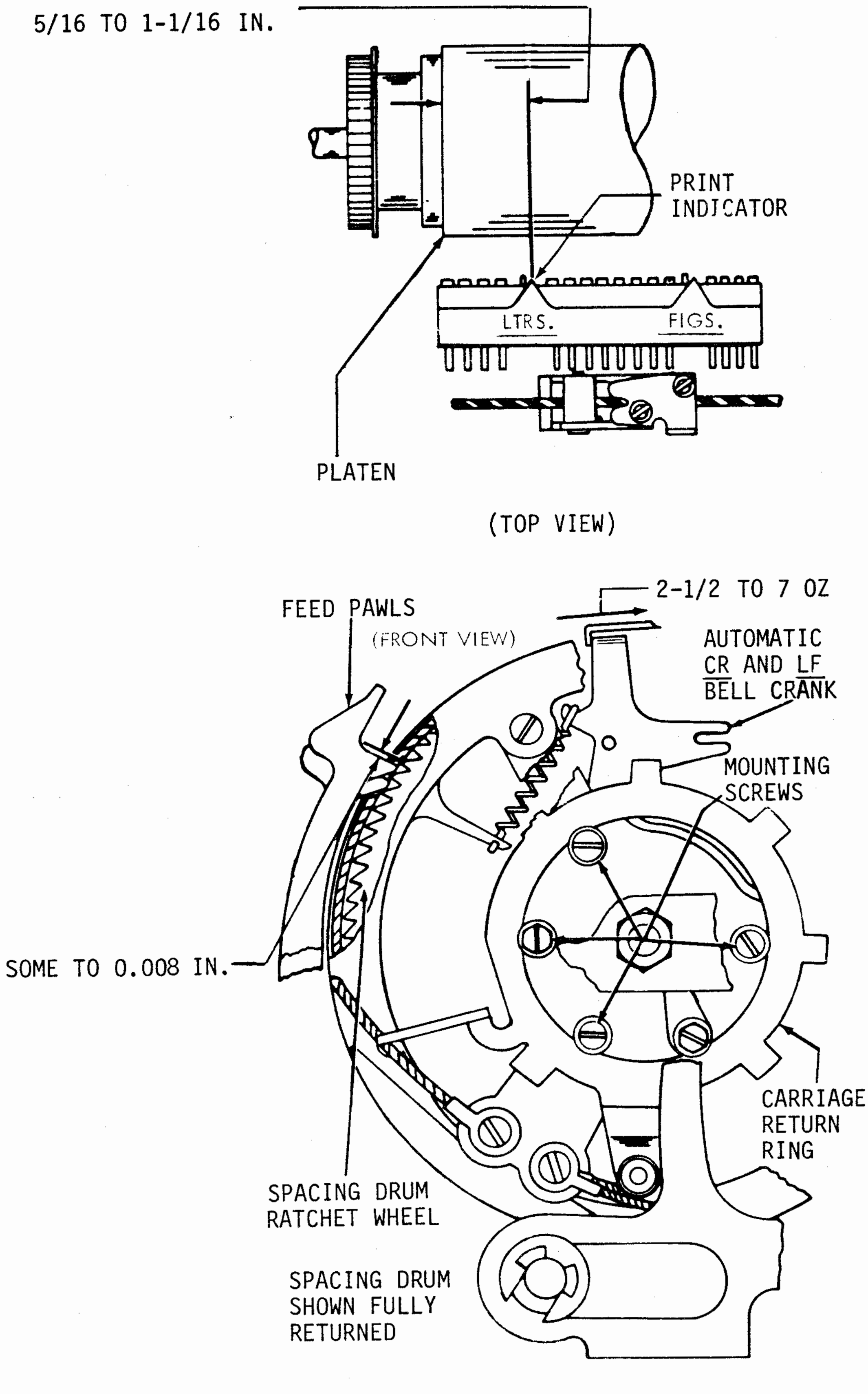



Figure 6-84. Left Margin

(i) Place spacing drum in fully returned position (dashpot plunger fully depressed).

(j) Take up play in spacing shaft gear in counterclockwise direction (see Spacing Gear Phasing, paragraph 6-3.1h(19).

(k) Measure clearance between pawl and shoulder of ratchet wheel tooth immediately ahead. There should be some clearance not exceeding 0.008 inch.

(l) Ensure that rear pawl, when farthest advanced, drops into indentation between ratchet wheel teeth and bottoms firmly in notch.

(m) If rear pawl does not seat as specified, return the print carriage to its left position and loosen four carriage return ring mounting screws.

(n) Hold carriage return ring in its counterclockwise position and position type box so that LTRS indicator aligns with required margin.

(o) Tighten mounting screws.

NOTE

If adjustments are made to satisfy requirements specified in steps (k) and (l), recheck the adjustment of 6-3.1h(13), 6-3.1h(15), and 6-3.1f(6).

(3) Carriage Draw-Wire Rope. Adjust carriage draw-wire rope as follows:

(a) Refer to figure 6-85.

(b) Place horizontal positioning mechanism in its lowest position.

(c) Measure clearance between lower draw-wire rope and carriage return latch bail post. Clearance shall be a minimum of 0.006 inch.

(d) Measure clearance between lower draw-wire rope and left horizontal positioning mechanism drive linkage. Clearance should be a minimum of 0.030 inch.

(e) If clearance in either step (e) or (d) exceeds limits, advance printing carriage to extreme right-hand position.

(f) Rotate type box clutch 1/2 revolution.

(g) Loosen rope clamp screw one turn only.

(h) Loosen pulley bearing stud mounting screws, and position pulley bearing studs to obtain clearances as specified in step (c) and (d).

(i) Tighten mounting screws.

(j) Ensure cable has moved around its equalizing clamp so that rear cable has slightly greater tension than front cable as gauged by feel.

(k) Tighten clamp screw.

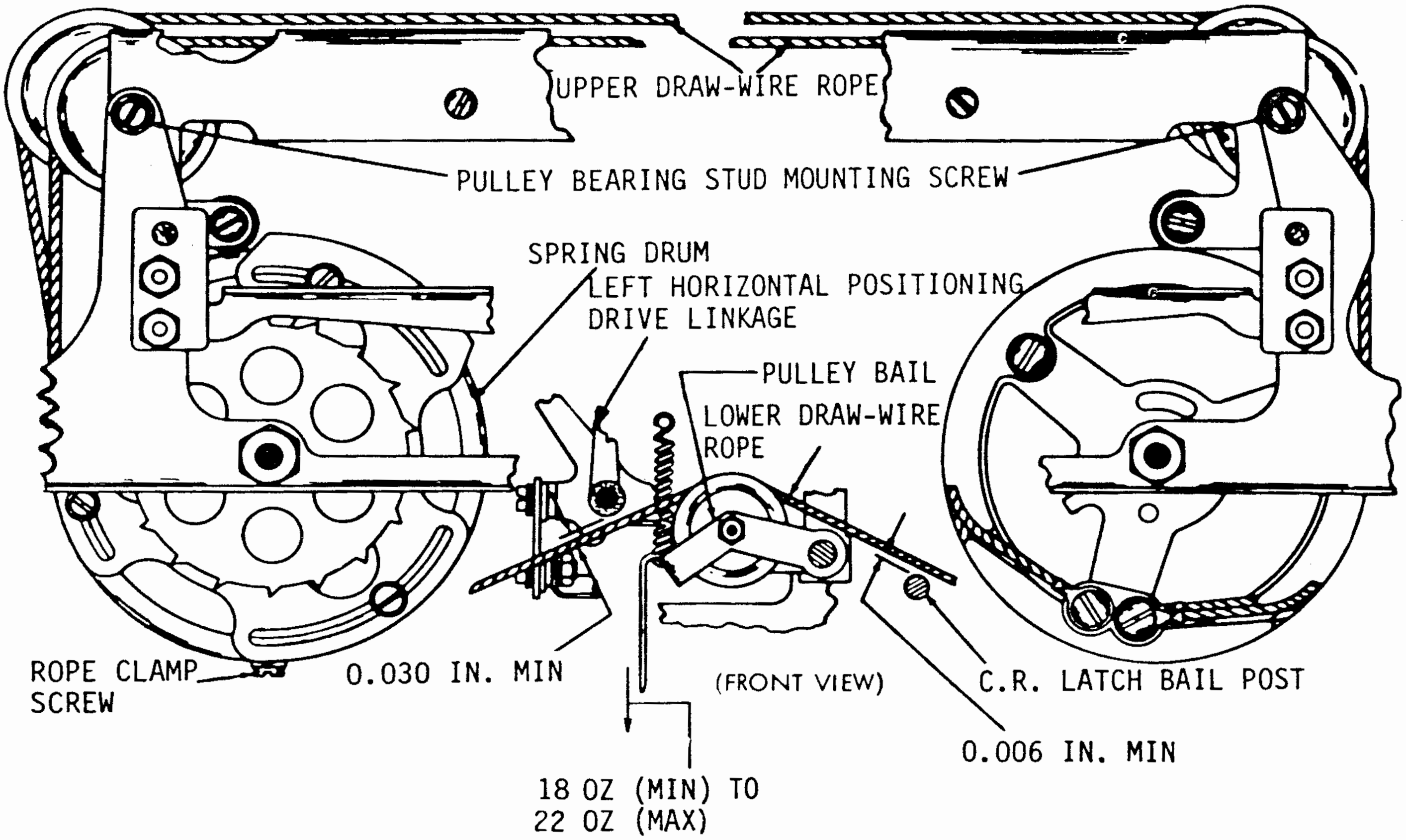



Figure 6-85. Carriage Draw-Wire Rope and Lower Draw-Wire Rope Pulley Bail Spring

(4) Lower Draw-Wire Rope Pulley Bail Spring. Adjust lower draw-wire rope pulley bail spring as follows:

(a) Refer to figure 6-85.

(b) Unhook spring from pulley bail.

(c) Rest bail extension on opening in front plate.

(d) Attach spring scale hook to free end of spring.

(e) Force required to extend spring to position length should be between 18 and 22 ounces.

(f) If scale reading exceeds specified limits, install new spring.

(5) Carriage Return Latch Bail. Adjust carriage return latch bail as follows:

(a) Refer to figure 6-86.

(b) Place carriage in fully returned position.

(c) Hold right side of bail against its retainer to take up play in carriage return bail to right.

(d) Measure clearance between carriage return latch bail and carriage return lever. Clearance should be between 0.004 and 0.040 inch.

(e) If clearance exceeds specified limits, loosen clamp screw and position latch bail plate to obtain specified clearance.

(6) Carriage Return Latch Bail Spring. Adjust carriage return latch bail spring as follows:

(a) Refer to figure 6-86.

(b) Place spacing drum in fully returned position.

(c) Attach spring scale hook to carriage return latch bail.

(d) Force required to start latch bail moving should be between 3 and 4-1/2 ounces.

(e) If scale reading exceeds specified limits, install new spring.

(7) Carriage Return Lever. Adjust carriage return lever as follows:

(a) Refer to figure 6-87.

(b) Set up carriage return function on selector.

(c) If unit is equipped with one-stop function clutch, rotate main shaft until function clutch stop lug is toward bottom of unit. If unit is equipped with two-stop function clutch, rotate main shaft until function clutch is disengaged in stop position that results in least clearance.

(d) Hook carriage return function pawl over its function bar.

(e) Hold spacing drum so that carriage return latch bail is latched.

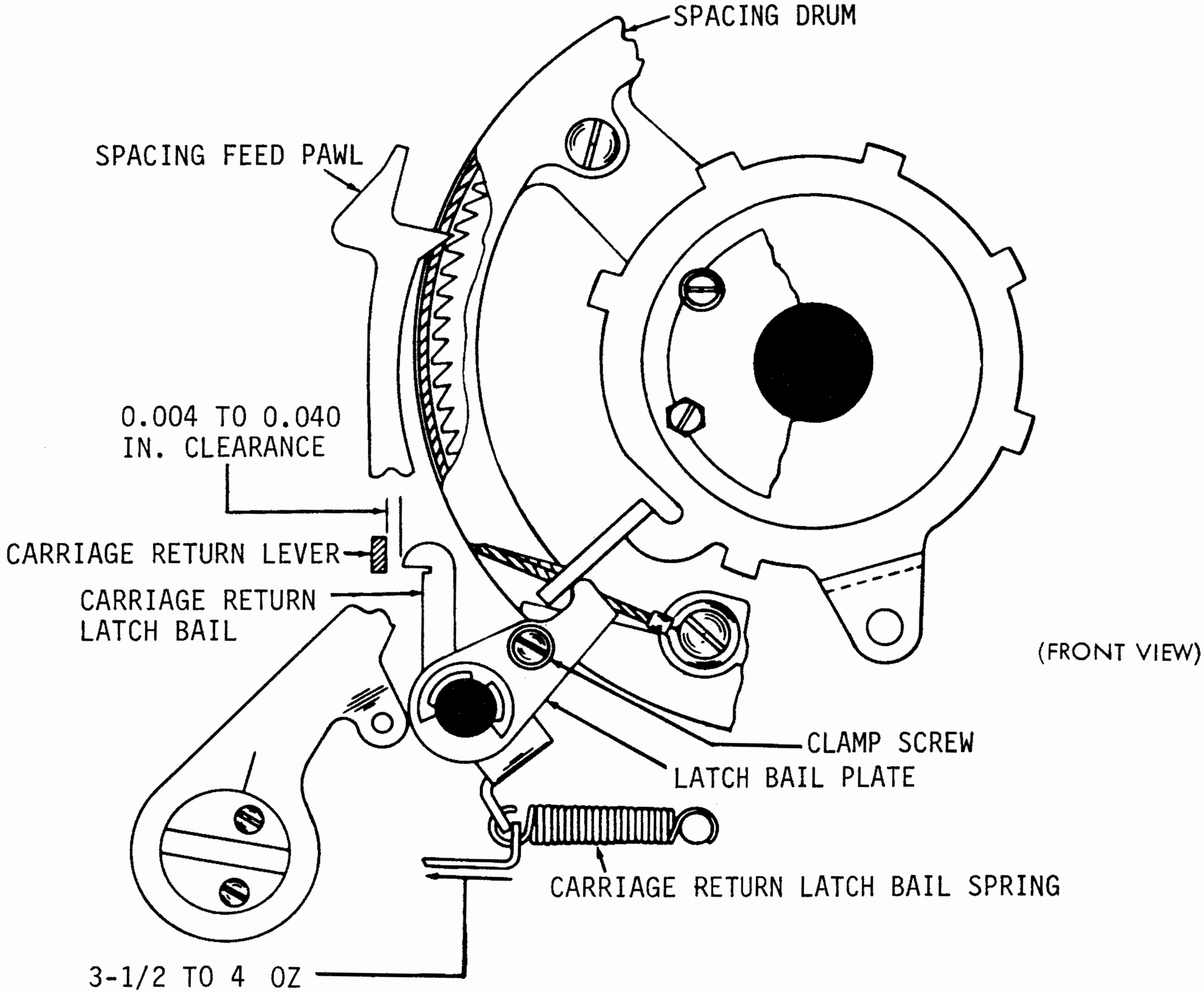



Figure 6-86. Carriage Return Latch Bail and Carriage Return Latch Bail Spring

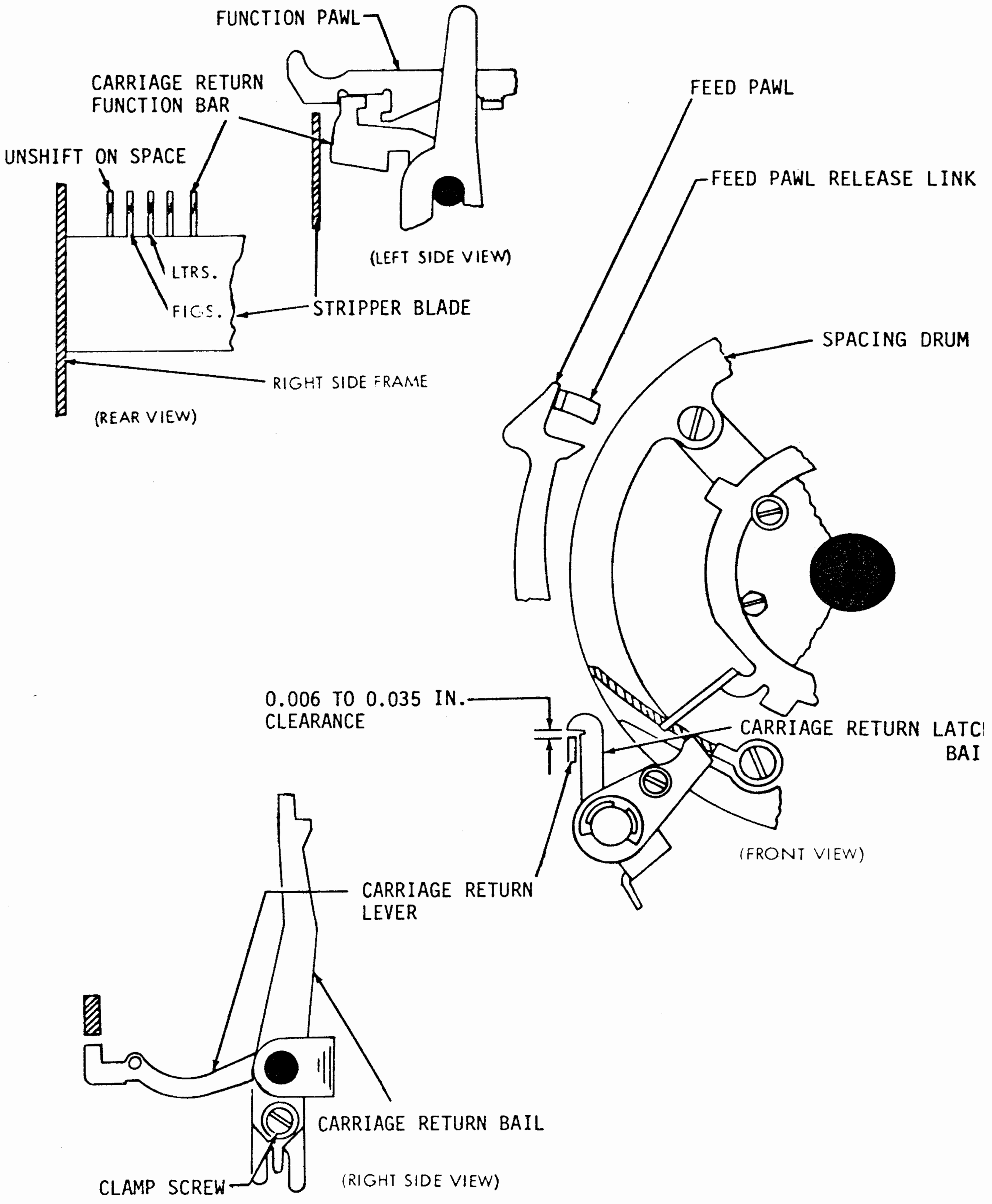



Figure 6-87. Carriage Return Lever

(f) Measure clearance between latch bail and carriage return lever. Clearance should be between 0.006 and 0.035 inch.

(g) If clearance exceeds specified limits, loosen clamp screw.

(h) Position carriage return lever on carriage return bail to obtain specified clearance between carriage return lever and latch bail.

(i) Tighten clamp screw.

(8) Carriage Return Spring. Adjust carriage return spring as follows:

(a) Refer to figure 6-88.

(b) Place spacing drum in returned position.

(c) Place printing track in lower position.

(d) Remove lower cable roller spring. Hold spacing pawl, buffer slide, and carriage return latch to prevent interference with spacing drum.

(e) Attach spring scale hook to a tooth on spring drum.

(f) Force required to start spring drum moving should be between 3-1/2 and 4-1/4 pounds.

(g) If spring scale reading exceeds specified limits, loosen spring drum nut.

(h) To increase spring tension, rotate spring drum ratchet wheel. To decrease spring tension, operate escapement lever to decrease tension.

(i) Tighten nut.

(9) Spacing Feed Pawl Release Link Spring. Adjust spacing feed pawl release link spring as follows:

(a) Refer to figure 6-88.

(b) Attach spring scale hook to feed pawl release link.

(c) Force required to start spring stretching should be between 1/2 and 2-1/2 ounces.

(d) If scale reading exceeds specified limits, install new spring.

(10) Dashpot Vent Screw. Adjust dashpot vent screw as follows:

(a) Refer to figure 6-89.

(b) Operate printer at any speed from automatic transmission with one carriage return and one line feed signal between lines. First character of each line should be printed in same location as if unit was manually operated slowly.

(c) Type box carriage should return from any length of line without bouncing.

(d) If bouncing occurs, loosen vent screw locking nut and turn down vent screw until slight pneumatic bounce is perceptible, then back off screw until effect

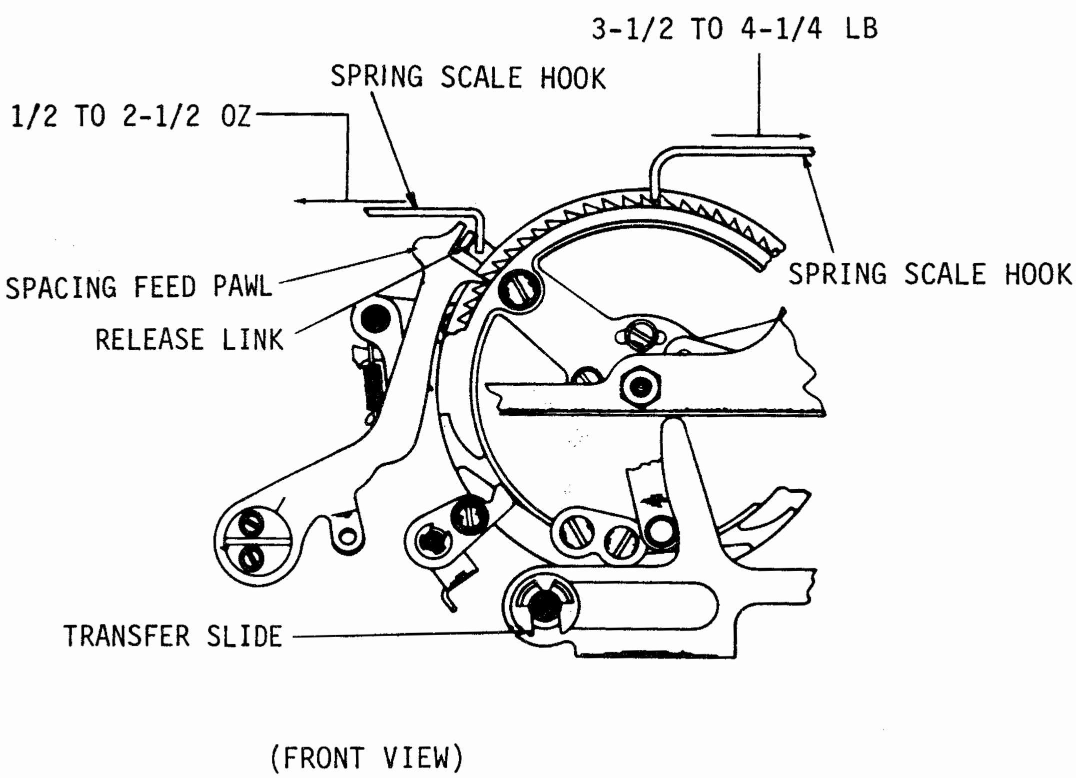



Figure 6-88. Carriage Return Spring and Spacing Feed Pawl Release Link Spring

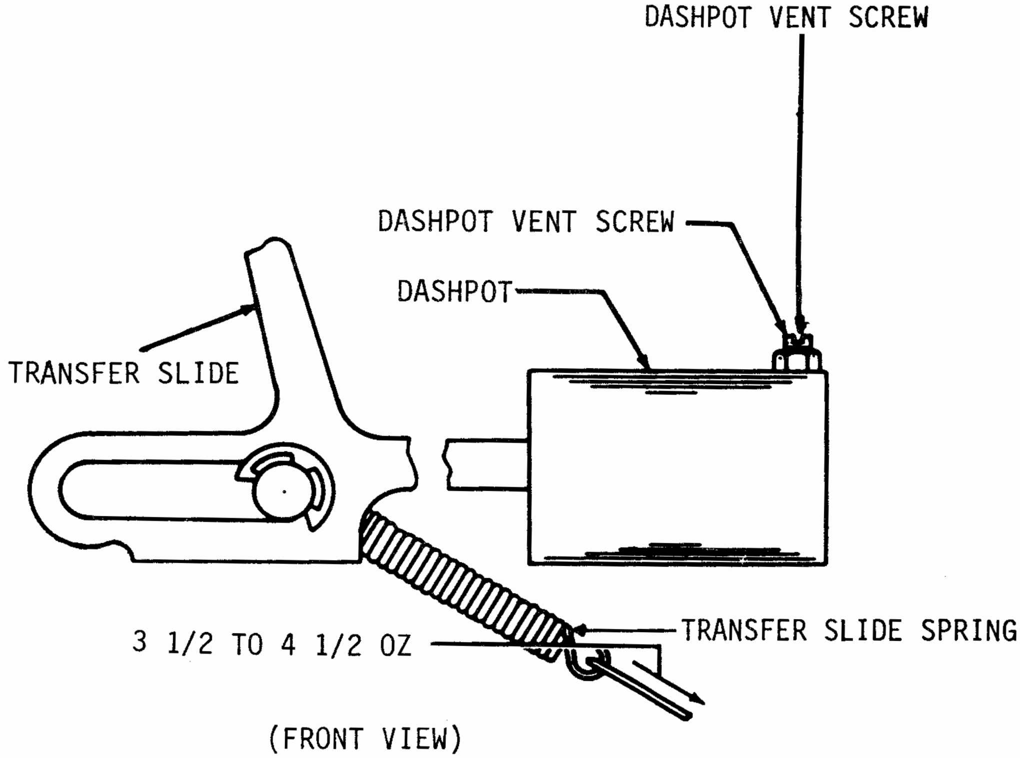



Figure 6-89. Dashpot Vent Screw and Transfer Slide Spring

disappears. Continue backing off screw 1/4 turn if dashpot has two vent holes, or 1 full turn if dashpot has only one vent hole.

(e) Tighten vent screw locking nut.

NOTE

At altitudes higher than 2000 feet above sea level, it may also be necessary to reduce carriage return spring tension toward minimum limit. See paragraph 6-3.1h(8).

(11) Transfer Slide Spring. Adjust transfer slide spring as follows:

(a) Refer to figure 6-89.

(b) Place transfer slide in extreme left position.

(c) Unhook transfer slide spring end which is not connected to transfer slide.

(d) Attach spring scale hook to free end of spring.

(e) Force required to extend spring to its installed length should be between 3-1/2 and 4-1/2 ounces.

(f) If scale reading exceeds specified limits, install new spring. Otherwise, reconnect free spring end.

(12) Margin Indicator Lamp. Adjust margin indicator lamp as follows:

(a) Refer to figure 6-90.

(b) Operate the unit under power. Margin indicator lamp should light on the desired character.

(c) If lamp does not light on desired character, loosen three mounting screws.

(d) Set type box carriage to print desired character and position cam disc counterclockwise so that margin indicator switch just opens.

(e) Tighten three mounting screws.

NOTE

In the event of a line shorter than 72 characters is required, it may be necessary to remove cam disc screws and insert them in adjacent slots in the disc if the rotation in one slot is not enough.

(13) Oscillating Rail Slide Position. Adjust oscillating rail slide position as follows:

(a) Refer to figure 6-91.

(b) Place carriage return ring and automatic carriage return-line feed ring free in maximum counterclockwise position on spacing drum.

(c) Disengage spacing clutch.

(d) Engage farthest advanced feed pawl with tooth immediately above cutaway section of ratchet.

(e) Measure clearance between rail slide and pulley. Clearance should be between 0.025 and 0.050 inch.

(f) If clearance exceeds specified limits, loosen five mounting screws and position slide on wire rope to obtain specified clearance.

(g) Tighten five mounting screws.

NOTE

If adjustment in step (f) is necessary perform the adjustments in paragraph 6-3.1h(2), 6-2.1h(15), and 6-3.1f(6).

(14) Spacing Feed Pawl Spring. Adjust spacing feed pawl spring as follows:

(a) Refer to figure 6-91.

(b) Place each spacing pawl in least advanced position resting against ratchet wheel.

(c) Unhook each spring from bracket.

(d) Attach spring hook to each spring in succession.

(e) Force required to extend each spring to its installed length should be between 2-1/2 and 6 ounces.

(f) If scale reading for any spring exceeds specified limits, install a new spring.

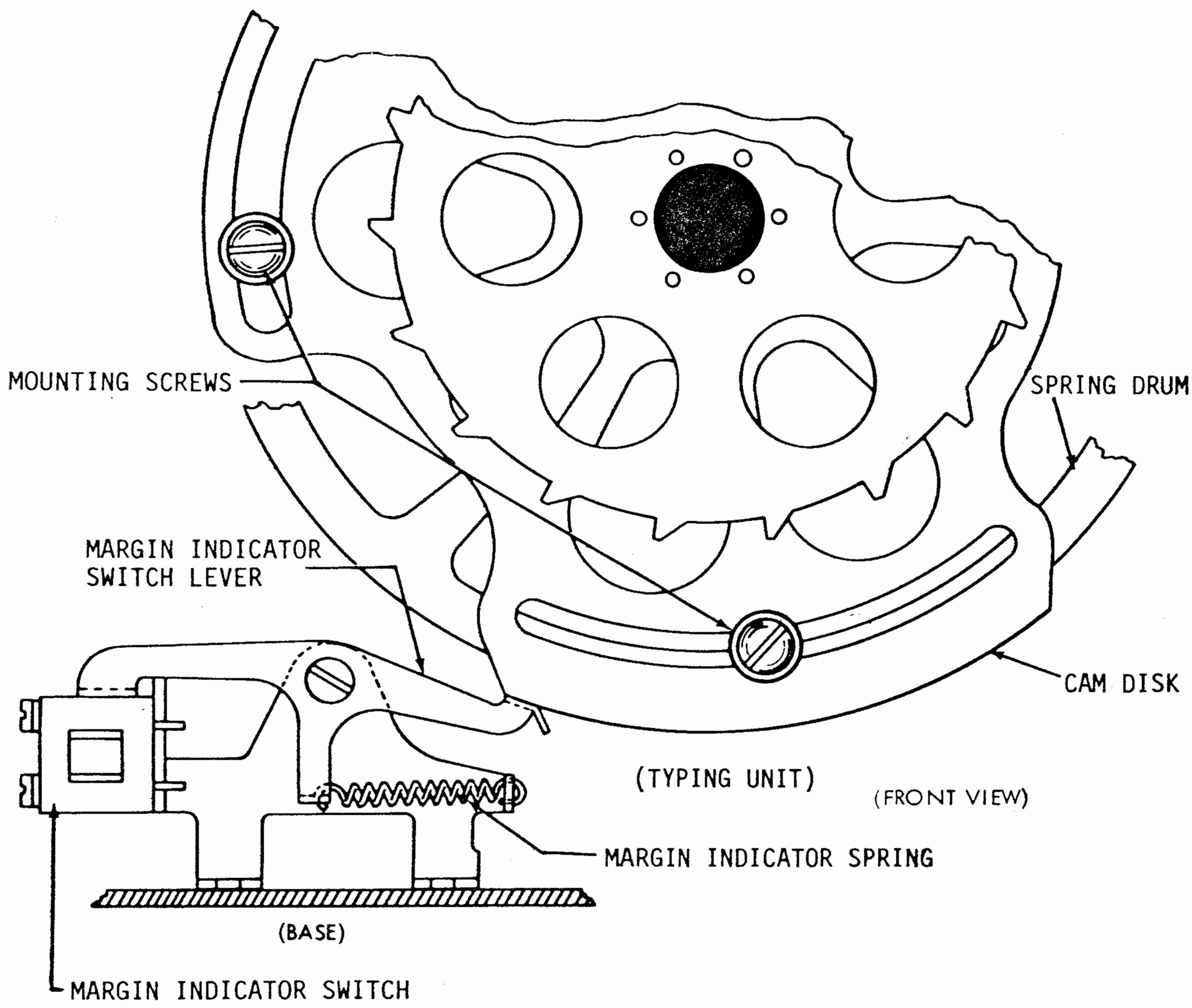



Figure 6-90. Margin Indicator Lamp

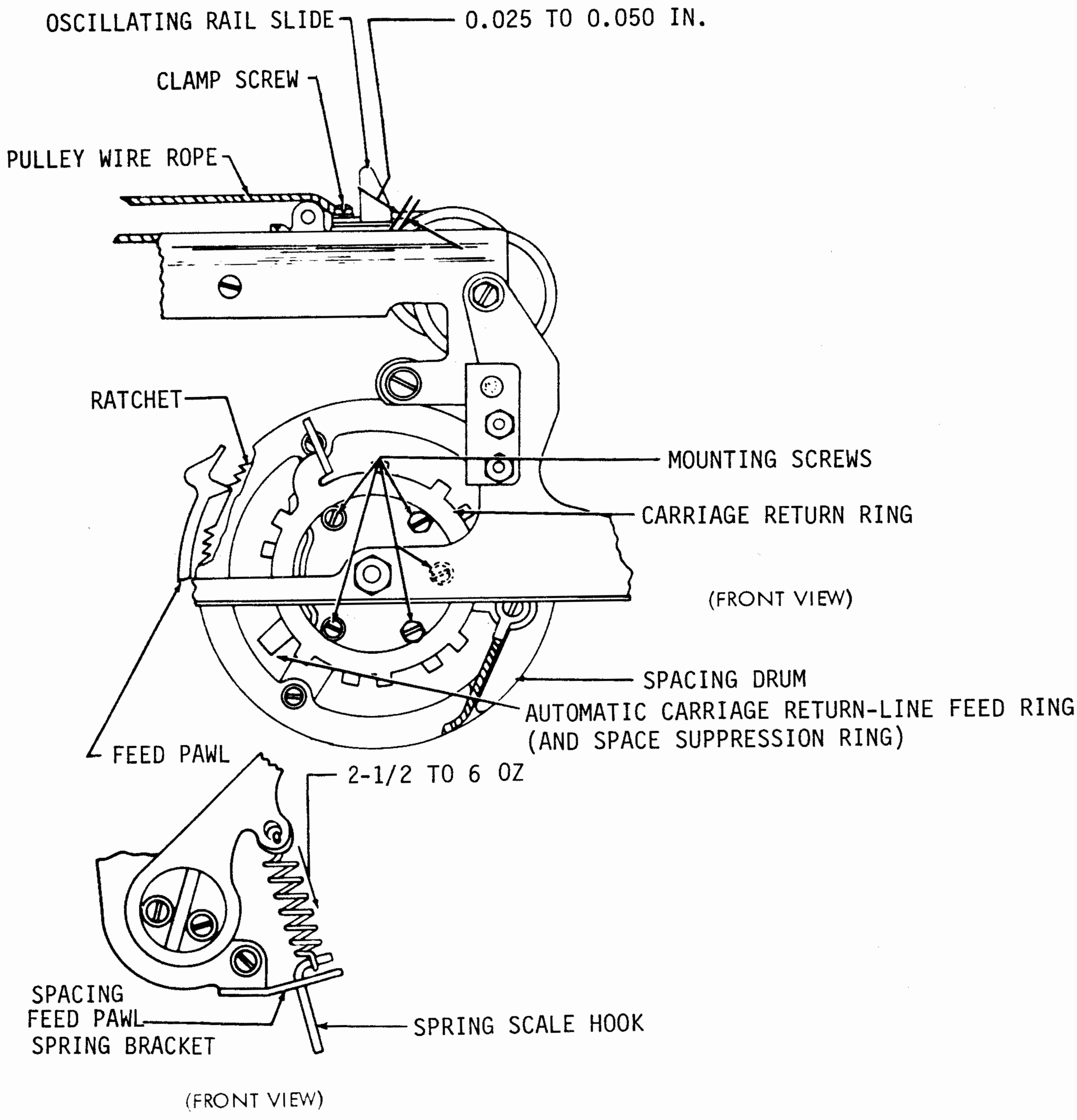



Figure 6-91. Oscillating Rail Slide Position and Spacing Feed Pawl Spring

NOTE

If it is necessary to install a new spring perform adjustments in paragraphs 6-3.1h(13), 6-3.1h(15), and 6-3.1f(6).

(15) Right Margin. Adjust right margin as follows:

NOTE

This adjustment is not applicable to units equipped with automatic carriage return-line feed ring. For units so equipped perform the adjustment procedure of paragraph 6-3.1h(17).

(a) Refer to figure 6-92.

(b) Disengage type box clutch.

(c) Place carriage in position to print character on which spacing cutout is to occur.

(d) Place front feed pawl in farthest advanced position.

(e) Hold spacing cutout transfer bail in its uppermost position.

(f) If unit has two-piece spacing cutout bail, push cutout bail toward rear of unit through hole in front plate.

(g) Measure clearance between extension on space suppression ring and transfer bail. Clearance should be between 0.006 and 0.025 inch.

(h) If clearance exceeds specified limits, loosen four mounting screws indicated in the figure and position space suppression ring. Range of adjustment is from 0 to 85 characters.

(i) Tighten four mounting screws.

NOTE

If adjustment in step (h) is necessary, perform adjustments in paragraphs 6-3.1h(13), 6-3.1h(2) and 6-3.1f(6).

(16) Spacing Cutout Transfer Bail Spring. Adjust spacing cutout transfer bail spring as follows:

(a) Refer to figure 6-92.

(b) Apply spring scale pushrod to spacing cutout transfer bail.

(c) Force required to start bail moving should be between 1 and 3-1/2 ounces.

(d) If spring scale reading exceeds specified limits, install new spring.

NOTE

If it is necessary to install a new spring, perform adjustments in paragraphs 6-3.1f(13), 6-3.1h(2), and 6-3.1f(6).

(17) Right Margin with Automatic Carriage Return Line Feed Ring. Adjust right margin on units equipped with automatic carriage return-line feed ring as follows:

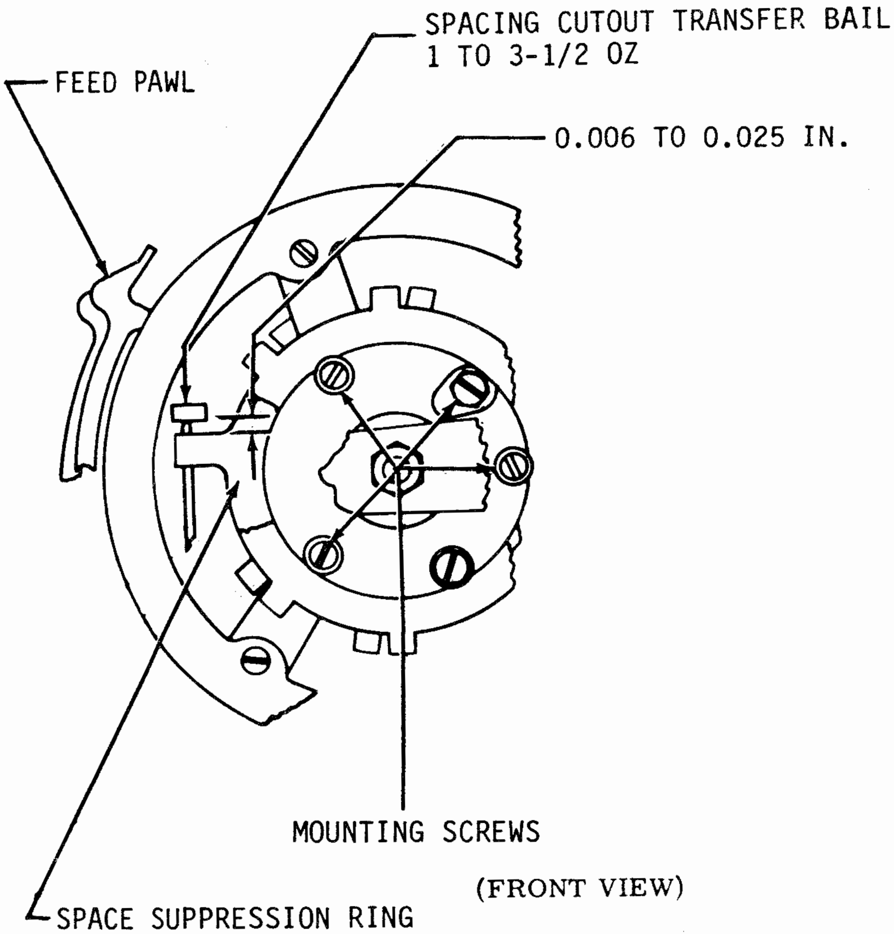



Figure 6-92. Right Margin and Spacing Cutout Transfer Bail Spring

(a) Refer to figure 6-93.

(b) Disengage type box clutch.

(c) Position carriage two spaces before character on which automatic carriage return-line feed is to occur.

(d) Advance front feed pawl to farthest position.

(e) Measure clearance between extension on ring and automatic carriage return-line feed bell crank. Clearance should be between 0.040 and 0.055 inch.

(f) If clearance exceeds specified limits, loosen four mounting screws indicated in the figure and position ring. Range of adjustment is from 0 to 85 characters.

(g) Tighten four mounting screws.

(18) Spacing Gear Clearance. Adjust spacing gear clearance as follows:

(a) Refer to figure 6-94.

(b) Place carriage in fully returned position.

(c) There should be a minimum of backlash without binding.

(d) To increase clearance, loosen upper mounting screw and insert shims between spacing shaft bearing and front plate. Tighten upper mounting screw.

(e) To decrease backlash, loosen lower mounting screw and insert shims between spacing shaft bearing and front plate. Tighten lower mounting screw.

(19) Spacing Gear Phasing. Adjust spacing gear phasing as follows:

(a) Refer to figure 6-94.

(b) Disengage spacing clutch.

(c) Ensure index line on spacing pawl is centered between the two lines on pawl retaining washer.

(d) If index line is not centered, remove mounting screw from spacing shaft gear.

(e) Hold pawls in alignment and engage spacing shaft gear with clutch gear at a point where spacing shaft gear mounting screw hole is in line with tapped hole in spacing shaft.

(f) Insert mounting screw in spacing shaft gear and tighten.

(20) Spacing Suppression Bail Spring. Adjust spacing suppression bail spring as follows:

(a) Refer to figure 6-95.

(b) Place suppression bail in rear position.

(c) Apply spring scale pushrod near center of horizontal portion of suppression bail.

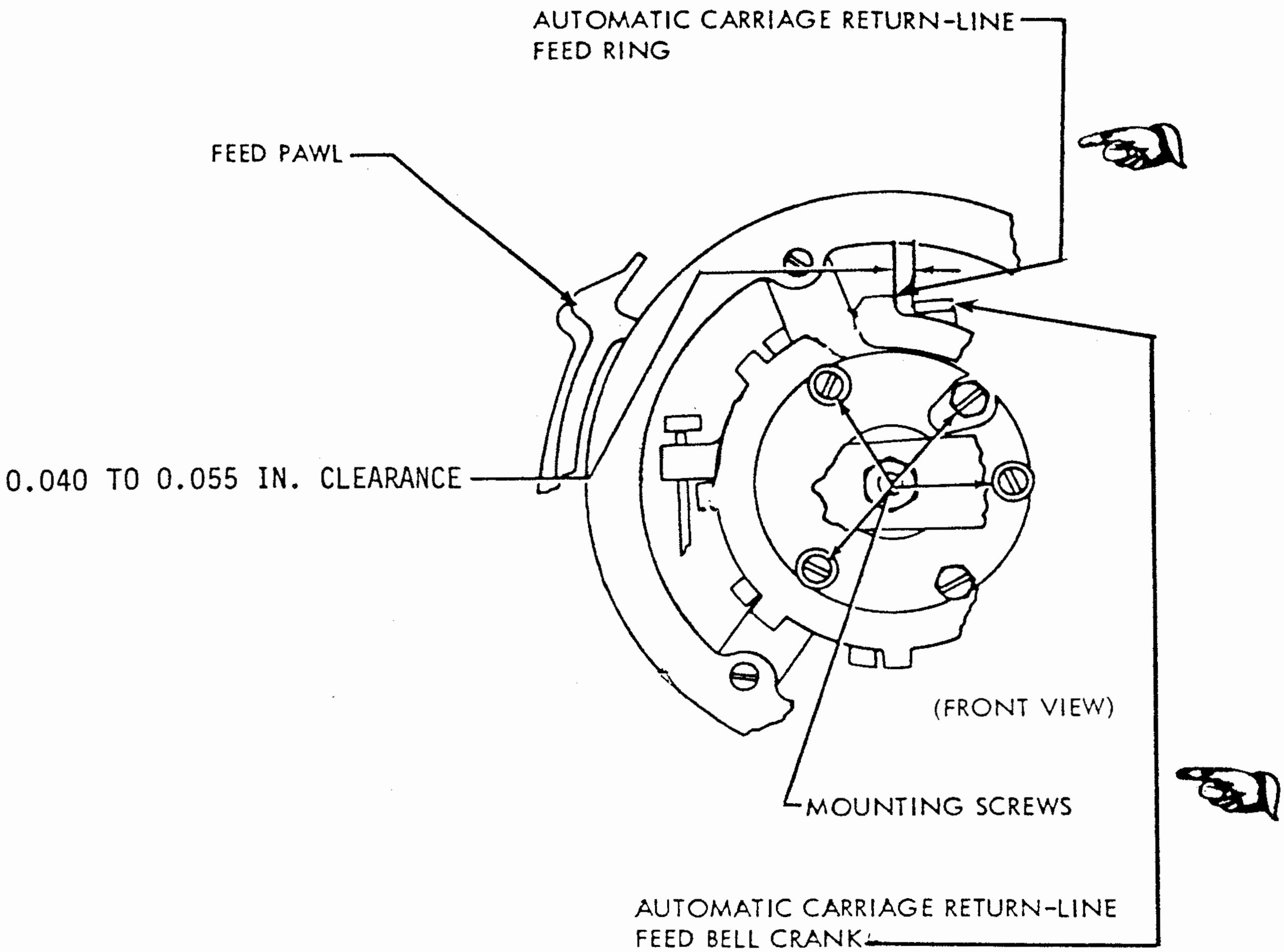



Figure 6-93. Right Margin with Automatic Carriage Return-Line Feed Ring

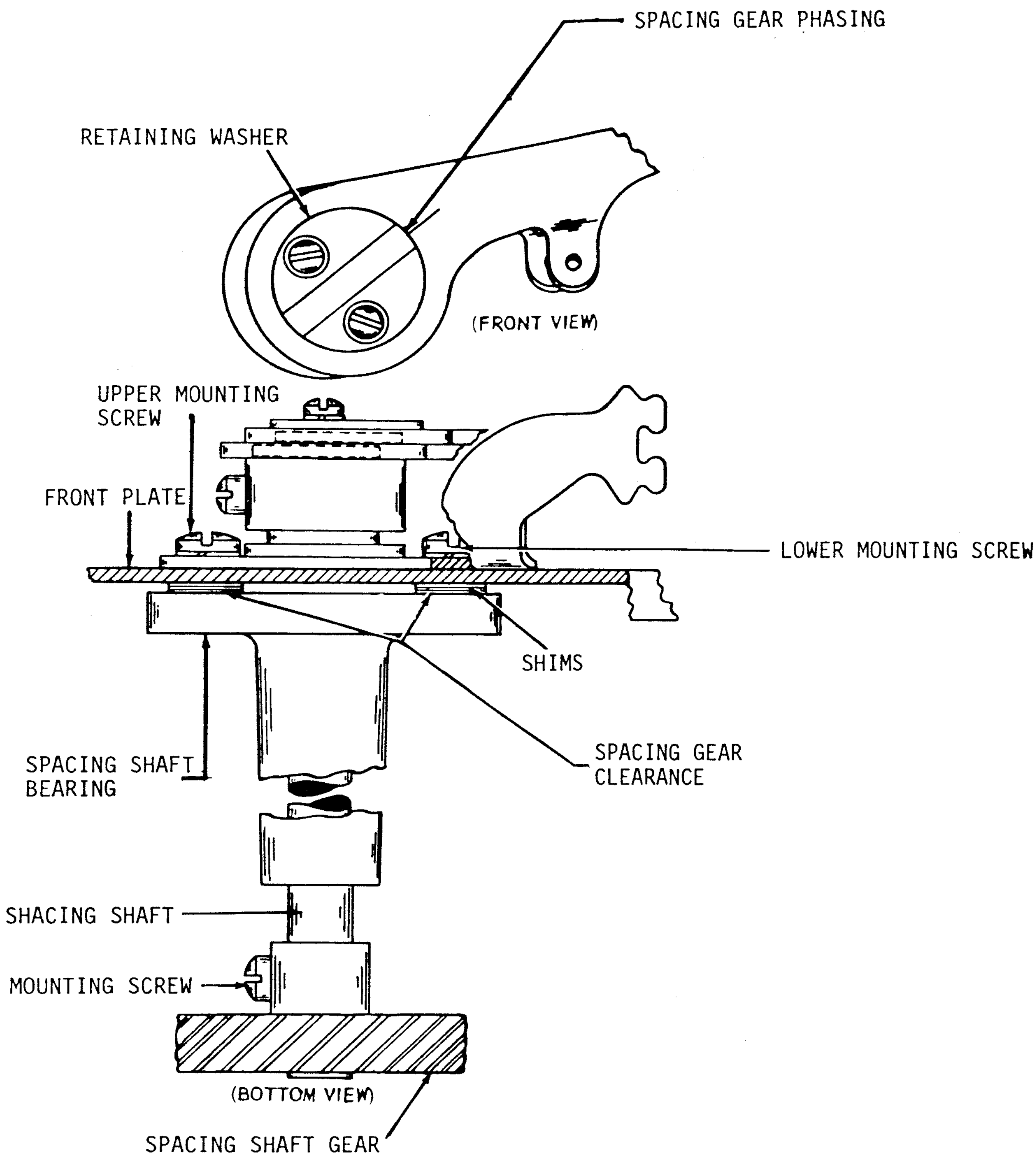



Figure 6-94. Spacing Gear Clearance and Spacing Gear Phasing

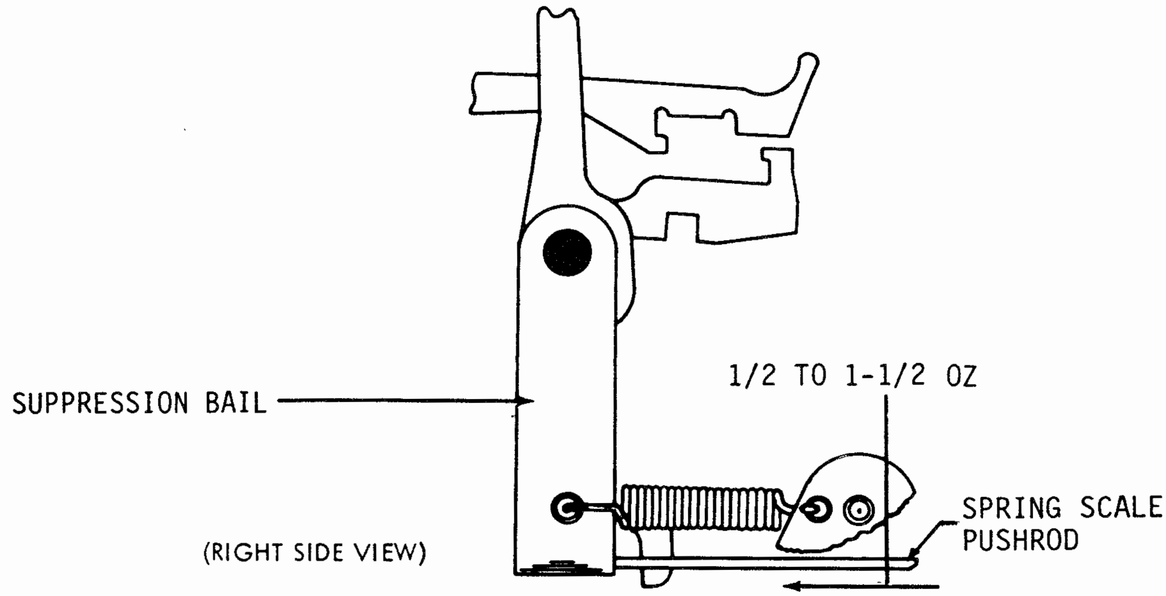



Figure 6-95. Spacing Suppression Bail Spring

(d) Force required to start bail moving should be between 1/2 and 1-1/2 ounces.

(e) If scale reading exceeds specified limits, install new spring.

(21) Spacing Trip Lever Bail Cam Plate. Adjust spacing trip lever bail cam plate as follows:

(a) Refer to figure 6-96.

(b) Place spacing trip lever arm in upward position.

(c) Rotate type box clutch through approximately one-half of its cycle.

(d) Disengage all function pawls from function bar.

(e) Measure clearance between top surface of trip lever arm extension and spacing trip lever shoulder. Clearance should be between 0.010 and 0.040 inch.

(f) Loosen mounting screws and position cam plate on rocker shaft to obtain specified clearance, keeping forward edge of cam plate parallel to shaft.

(g) Tighten mounting screws.

(22) Spacing Trip Lever Bail Spring. Adjust spacing trip lever bail spring as follows:

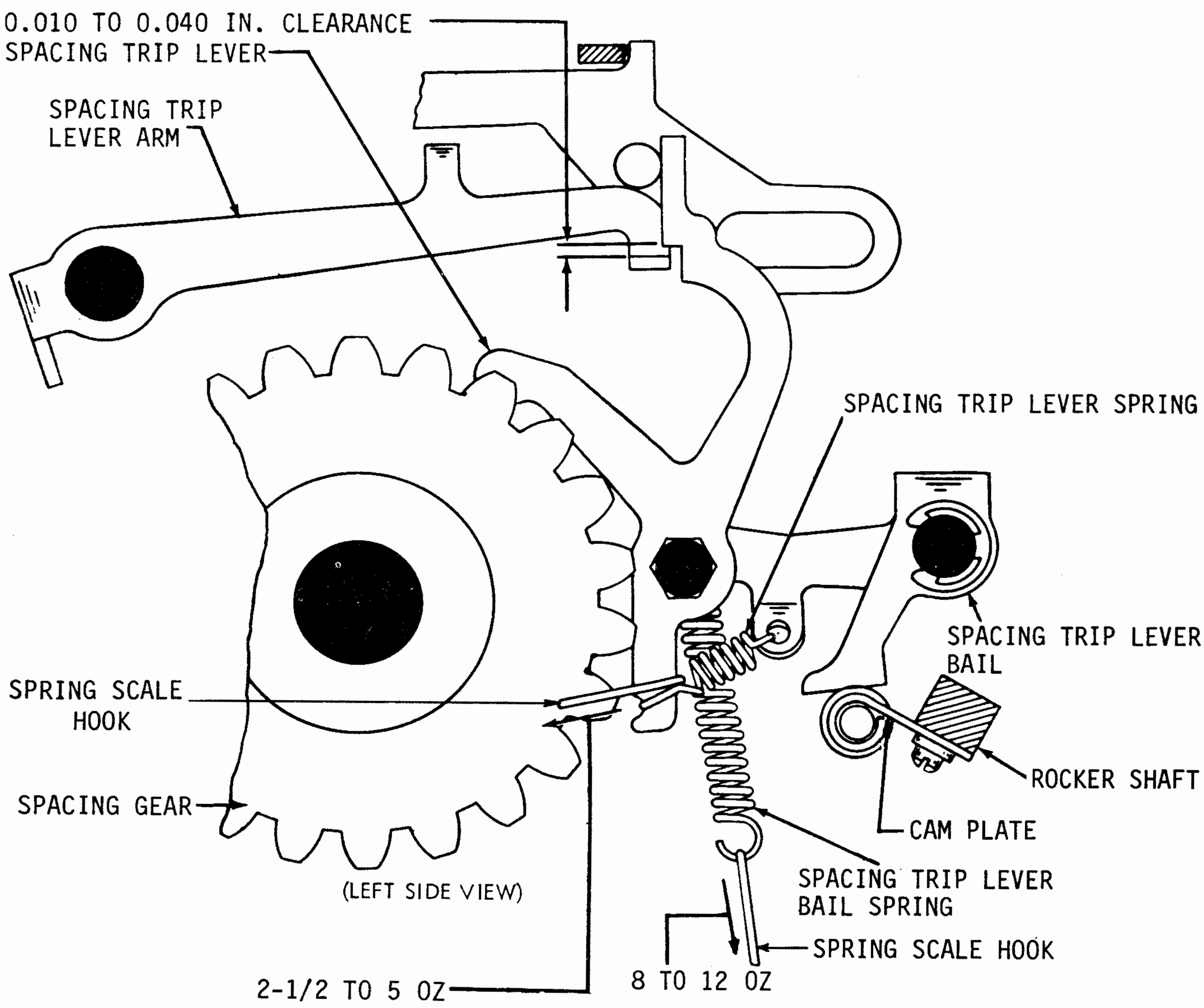



Figure 6-96. Spacing Trip Lever Bail Cam Plate, Spacing Trip Lever Bail Spring, and Spacing Trip Lever Spring

(a) Refer to figure 6-96.

(b) Position spacing trip lever bail against stop.

(c) Unhook spacing trip lever bail spring.

(d) Attach spring scale hook to free end of spring.

(e) Force required to extend spring to its installed length should be between 8 and 12 ounces.

(f) If scale reading exceeds specified limits, install new spring Otherwise reconnect free end of spring.

(23) Spacing Trip Lever Spring. Adjust spacing trip lever as follows:

(a) Refer to figure 6-96.

(b) Disengage type box clutch.

(c) Attach spring scale hook to spacing trip lever at point of spring attachment.

(d) Force required to start lever moving should be between 2-1/2 and 5 ounces.

(e) If scale reading exceeds specified limits, install new spring.

6-3.2 TYPING UNIT ADJUSTMENTS (LOW-LEVEL). Perform selector mechanisms adjustments in accordance with the following paragraphs.

a. Selector Armature. Adjust selector armature as follows:

(1) Refer to figure 6-97.

(2) De-energize magnet assembly and remove from base.

(3) Loosen down-stop mounting screw friction tight.

(4) With armature resting against downstop, measure clearance between end of armature and left edge of left pole piece: clearance should be between 0.025 inch (minimum) and 0.030 inch inch (maximum).

(5) Position down-stop to meet requirement, and tighten mounting screw.

(6) Loosen armature mounting screws, and position armature so that its left edge should be flush within 0.010 inch with left edge of left pole piece.

(7) Tighten screws.

b. Selector Armature Alignment. Adjust selector armature alignment as follows:

(1) Refer to figure 6-98.

(2) Ensure rear edge of armature is flush with rear edge of pole piece within 0.010 inch.

(3) Ensure there is some clearance not exceeding 0.020 inch between front edge of armature and pole

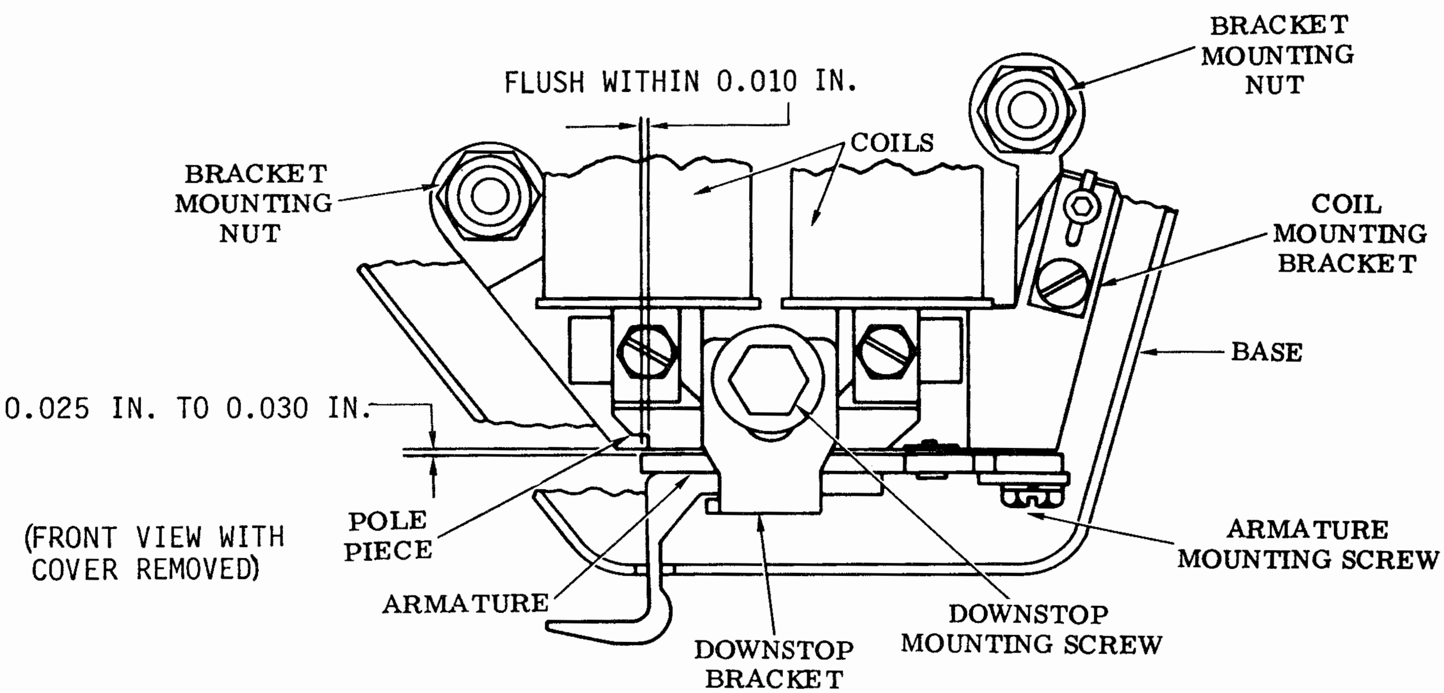



Figure 6-97. Selector Armature

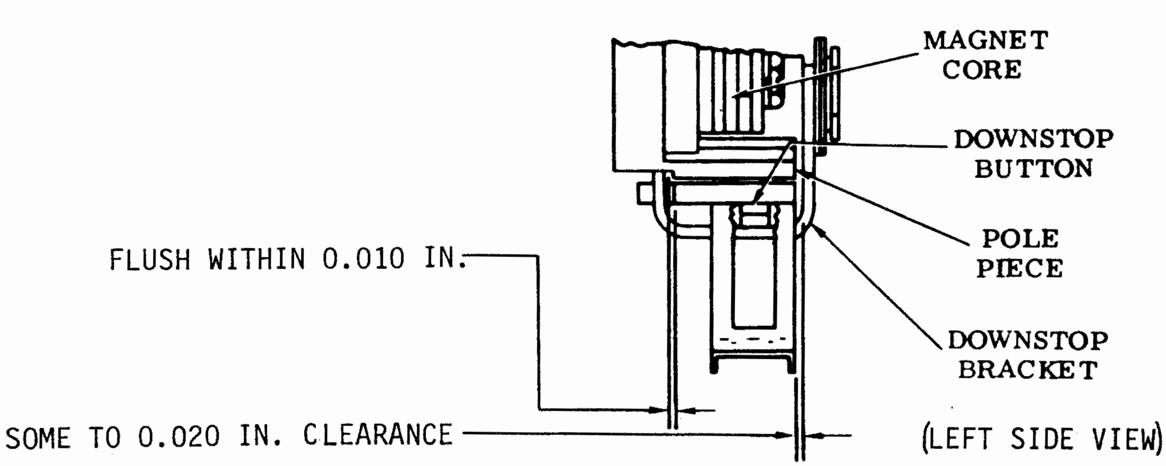



Figure 6-98. Selector Armature Alignment

piece and inside of downstop bracket.

(4) Loosen mounting screws.

(5) Position armature so that armature spring has enough tension to hold armature firmly against pivot edge of casting.

(6) Tighten mounting screws.

c. Selector Armature Spring. Adjust selector armature spring as follows:

(1) Refer to figure 6-99.

(2) Attach spring scale hook as nearly vertical as possible to end of armature extension. Force required to pull armature marking position should be between 1-3/4 and 2-1/4 ounces.

(3) If scale reading exceeds specified limits, turn adjusting screw clockwise to increase spring tension or counterclockwise to decrease spring tension.

NOTE

Spring tensions given will permit operation of printer prior to measurement of receiving margins. Refine spring tension for maximum selector performance with unit connected to specific circuit in which it is to function (operating at desired speed and line current). See Selector Receiving Margin, paragraph 6-3.1g(9).

d. Selector Base (Magnets Energized). Adjust selector base as follows:

NOTE

Before making this adjustment, reassemble the magnet assembly by reversing the disassembly procedure. Reassemble and install the cam-clutch assembly, the metallic container, and the range finder on the typing unit. Then proceed with the following adjustment.

(1) Refer to figure 6-100.

(2) Position spacing locklever on high part of cam.

(3) Place armature in contact with left pole piece.

(4) Measure clearance between end of armature extension and shoulder of spacing locklever. Clearance should be between 0.020 and 0.035 inch.

(5) Measure clearance between upper surface of armature extension and upper step of spacing locklever with locklever held downward. There should be some clearance not exceeding 0.003 inch.

(6) If either clearance exceeds specified limits, use a 1/16-inch hex wrench to loosen two magnet and base mounting posts to point of friction tightness.

(7) Adjust lower lower right eccentric to obtain specified clearance between end

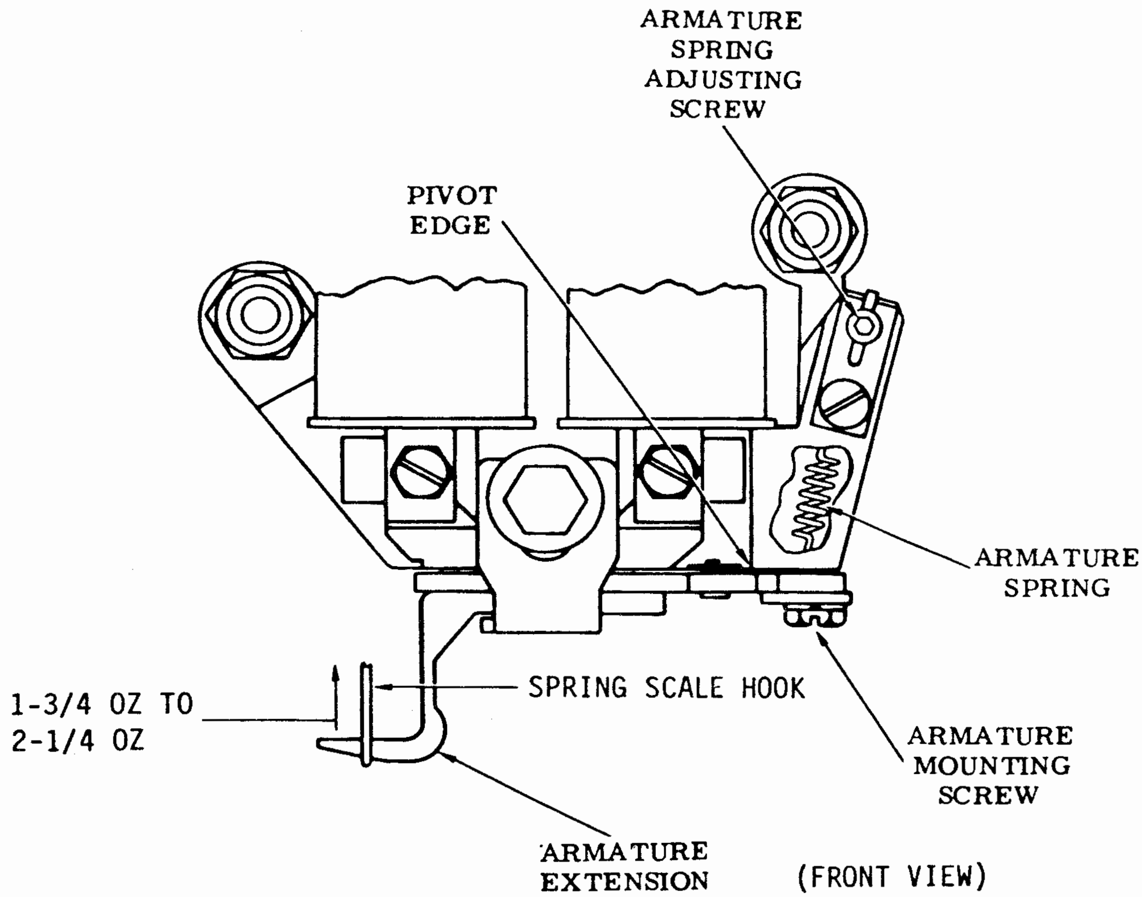



Figure 6-99. Selector Armature Spring

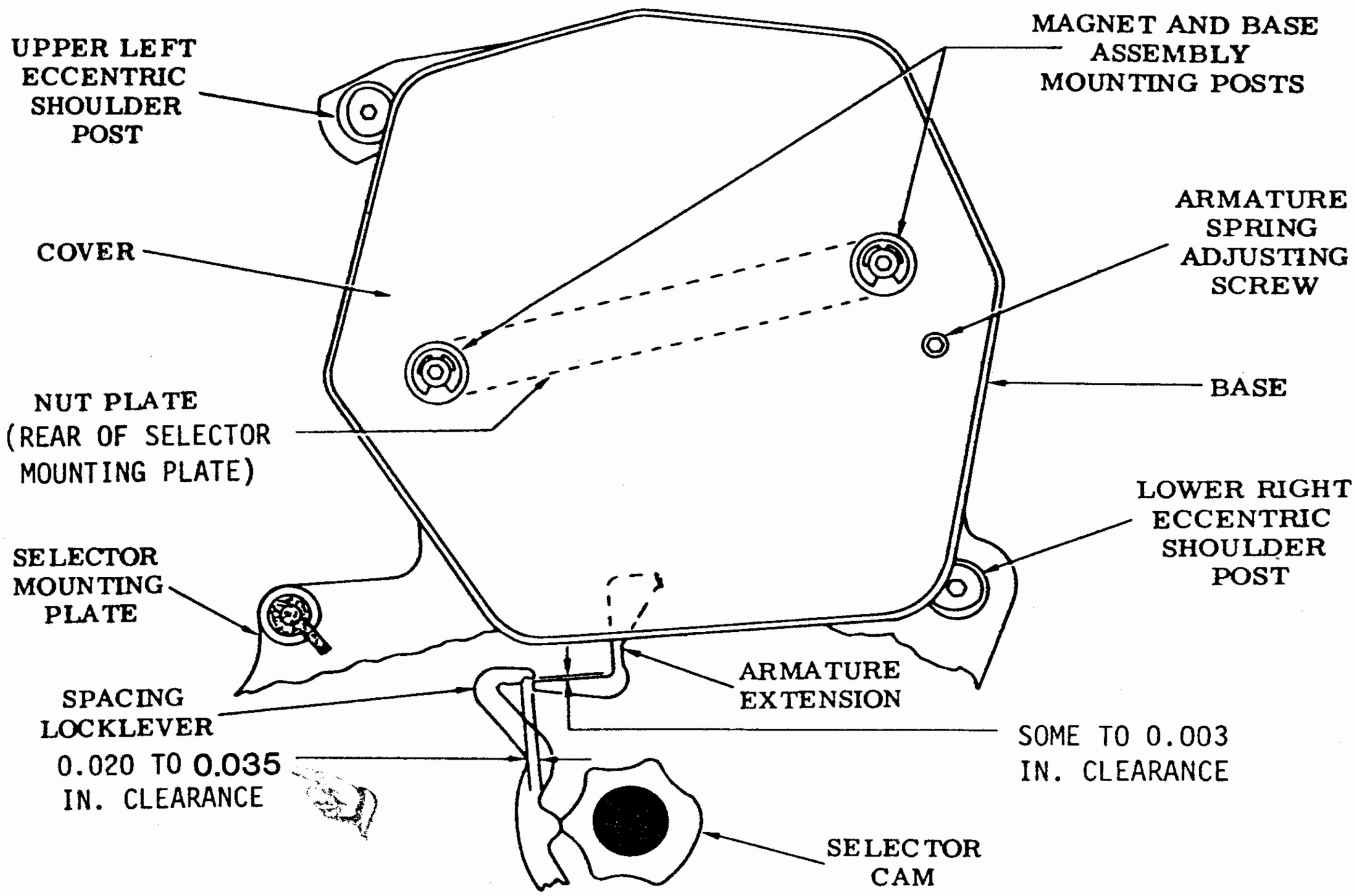



Figure 6-100. Selector Base (Magnets Energized)

of armature extension and shoulder of spacing locklever.

(8) Adjust upper left eccentric to obtain specified clearance between upper surface of armature extension and upper step of spacing locklever.

(9) Using a 1/16-inch hex wrench, tighten two magnet and base mounting posts.

6-4. KEYBOARD UNIT ADJUSTMENTS. The following paragraphs describe keyboard unit adjustment procedures for Model 28 Compact Page Printer (CPP) Keyboard Send-Receive (KSR) and Receive-Only (RO) Teletypewriter Sets.

6-4.1 KEYBOARD UNIT ADJUSTMENTS (HIGH-LEVEL).

a. Keyboard Transmitter Mechanism Adjustments. Perform keyboard transmitter adjustments in accordance with the following paragraphs.

NOTE

Disconnect power and remove keyboard from subbase.

(1) Universal Link. Adjust universal link as follows:

(a) Refer to figure 6-101.

(b) With keyboard transmitter in reset condition, there should be from 0.089 inch (minimum) to 0.103 inch (maximum) clearance between universal link and keyboard frame.

(c) To adjust, insert screwdriver through opening and bend tab on frame.

(2) Contact Wires. Adjust contact wires as follows:

(a) Refer to figure 6-102.

(b) Latch universal lever; take up play (downward) in contact block and release; place "T" levers to marking position; take up play (upward) of contact wires and release.

(c) Measure clearance between contact wires and terminal: clearance should be from 0.018 inch (minimum) to 0.027 inch (maximum).

(d) Place "T" levers in spacing position; unlatch universal lever; take up play (downward) of contact block and release.

(e) Measure clearance between contact wires and terminal: this should be from 0.020 inch (minimum) to 0.040 inch (maximum).

(f) To adjust, bend wires to requirements.

(3) Spacebar Spring. Adjust spacebar spring as follows:

(a) Refer to figure 6-103.

(b) With spacebar depressed and then released, use spring scale to measure force required to start spacebar moving: this should be from 5 grams (minimum) to 25 grams (maximum).

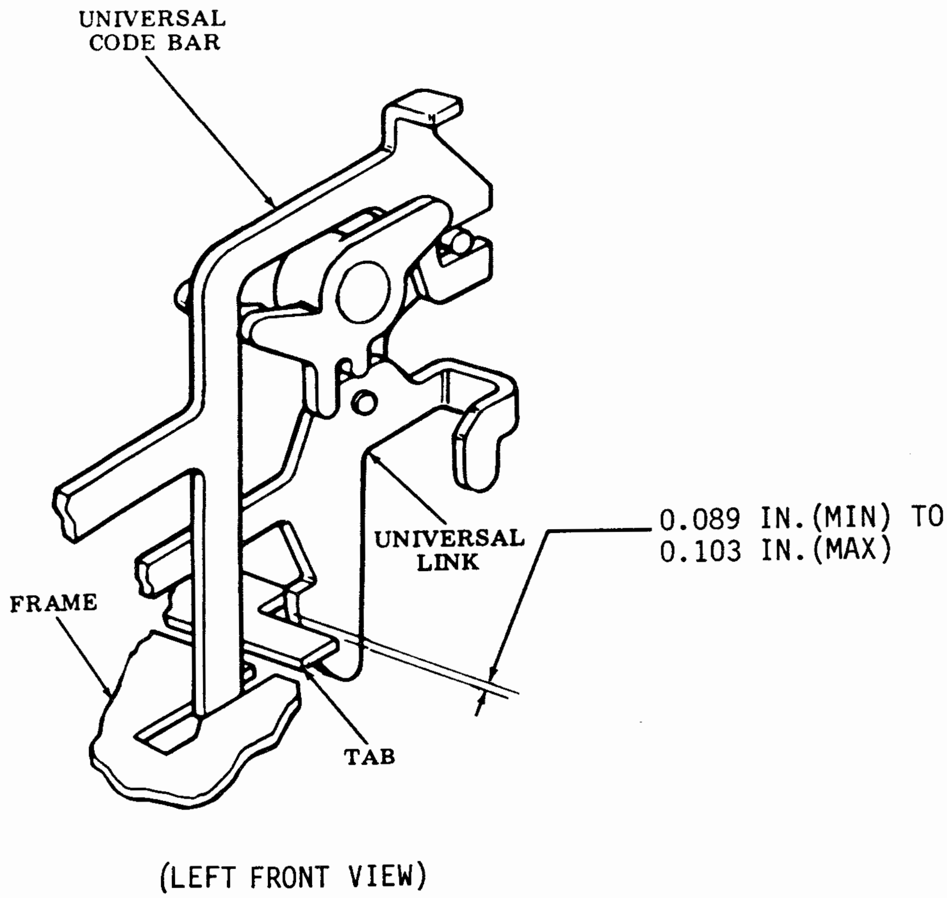



Figure 6-101. Universal Link

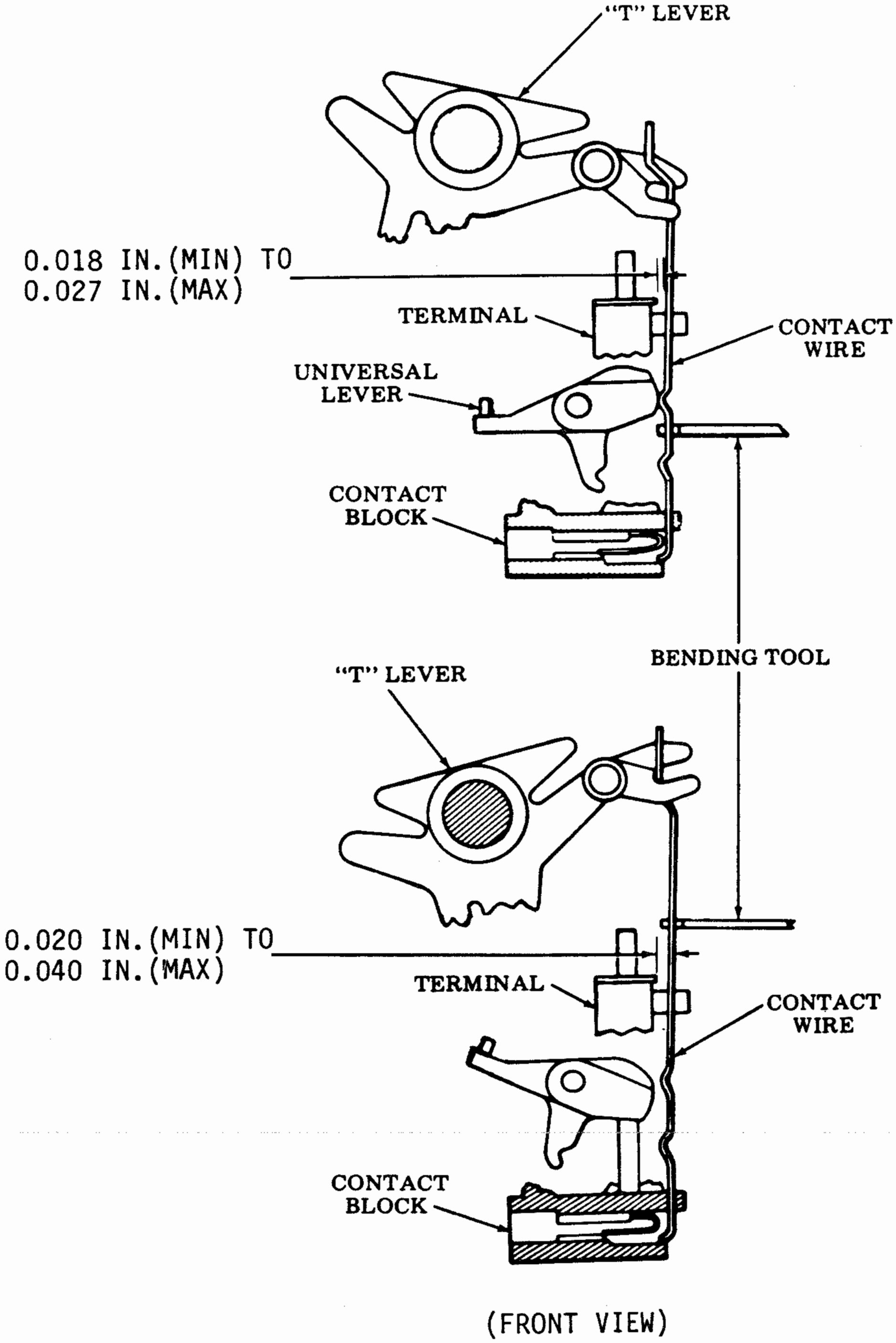



Figure 6-102. Contact Wires

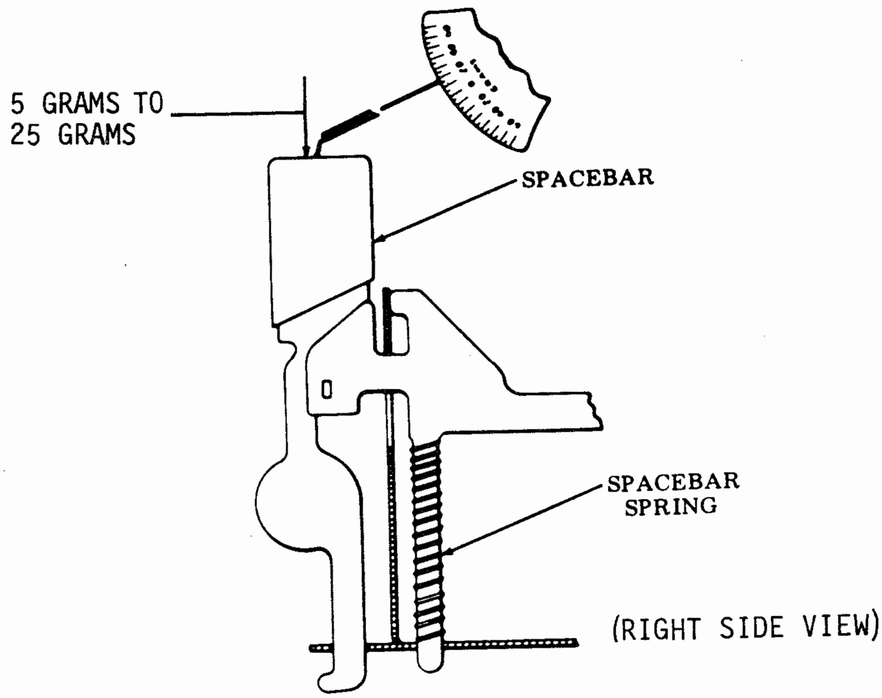



Figure 6-103. Spacebar Spring

(c) If force required does not meet specifications, replace spring.

(4) Keylever Spring. Adjust keylever spring as follows:

(a) Refer to figure 6-104.

(b) With key depressed (except REPT key) and then released, use spring scale to measure force required to start key moving: this should be between 5 grams (minimum) and 30 grams (maximum).

(c) If force required does not meet specifications, replace spring.

(5) Non-repeat Lever Spring. Adjust non-repeat lever spring as follows:

(a) Refer to figure 6-105.

(b) Use spring scale to measure force necessary to start non-repeat lever moving (keyboard transmitter in reset condition): force should be from 1/4 ounce (minimum) to 3/4 ounce (maximum).

(c) If force does not meet specifications, replace spring.

(6) Latchlever Spring. Adjust lathclever spring as follows:

(a) Refer to figure 6-105.

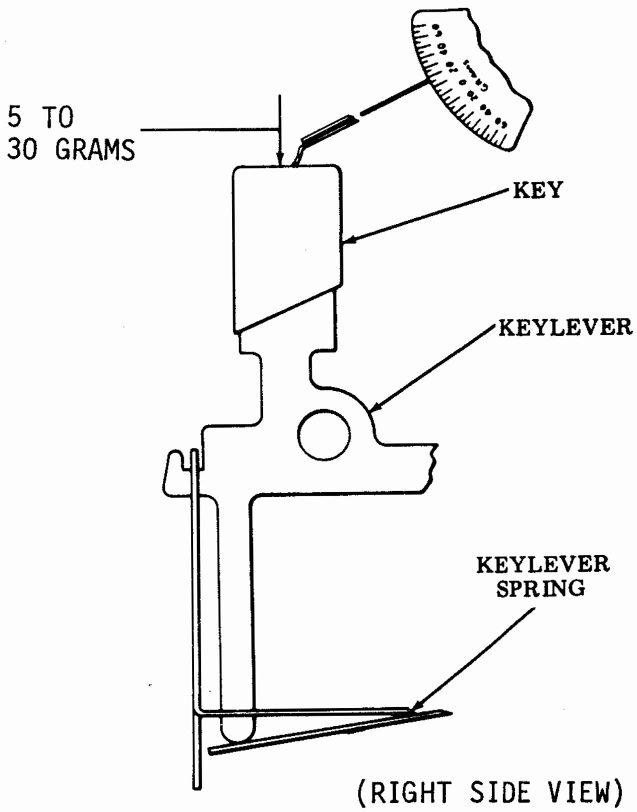



Figure 6-104. Keylever Spring

(b) With universal lever held away, use spring scale to measure force required to start latchlever moving: force should measure from 1/2 ounce (minimum) to 1 ounce (maximum).

(c) If force required does not meet specifications, replace spring.

(7) <u>Contact Block Spring</u>. Adjust contact block spring as follows:

(a) Refer to figure 6-106.

(b) Use spring scale to measure force necessary to start both sides of contact block moving: force should measure from 18 ounces (minimum) to 42 ounces (maximum).

(c) If force required does not match specifications, replace spring.

(8) <u>Contact Wire Spring</u>. Adjust contact wire spring as follows:

(a) Refer to figure 6-107.

(b) Place "T" levers in marking (clockwise) positions; trip contact wire reset bail by depressing universal code bar.

(c) Use spring scale to measure force required to start contact wire moving away from terminal; this should be from 3/4 ounce (minimum to 1-1/2 ounces (maximum).

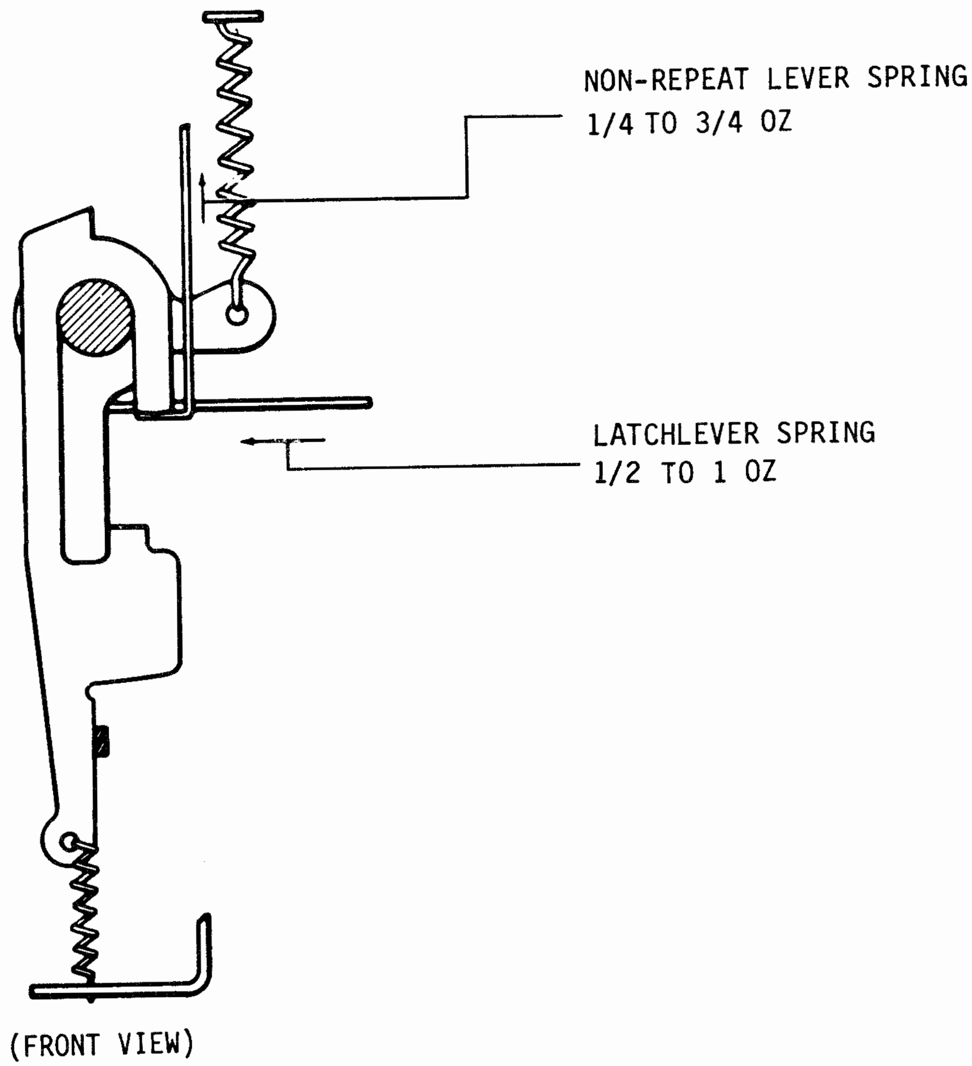



Figure 6-105. Non-Repeat and Latchlever Spring

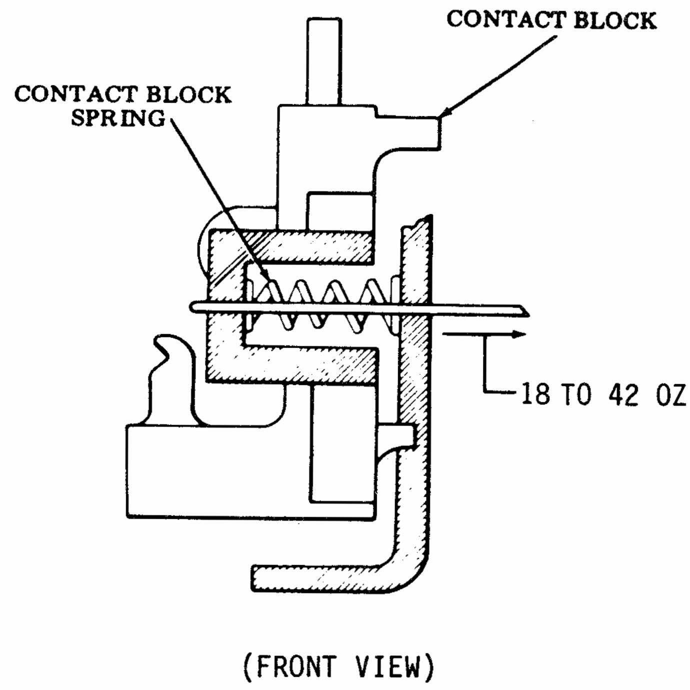



Figure 6-106. Contact Block Spring

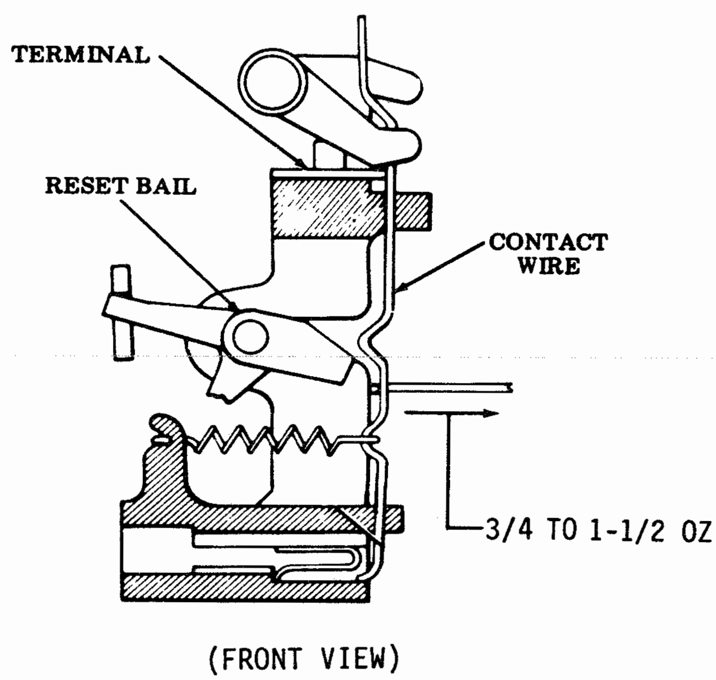



Figure 6-107. Contact Wire Spring

(d) If force does not meet specifications, replace spring.

(9) Repeat Keylever Spring. Adjust repeat keylever spring as follows:

(a) Refer to figure 6-108.

(b) Apply spring scale to key: it should require from 15 grams (minimum) to 30 grams (maximum) to start keylever moving.

(c) If force required does not match specifications, replace spring.

(10) Break Keylever Spring. Adjust break keylever spring as follows:

(a) Refer to figure 6-108.

(b) Apply spring scale to key: it should require from 12 ounces (minimum) to 18 ounces (maximum) to start lever moving.

(c) If force required does not match specifications, replace spring.

(11) Reset Bail Spring. Adjust reset bail spring as follows:

(a) Refer to figure 6-109.

NOTE

Remove keyboard from base.

(b) With "LTRS" keylever tripped, it should require from 1-1/4 ounces (minimum) to 2-1/2 ounces (maximum) to start reset bail moving.

(c) If force does not match requirements, replace spring.

(12) Universal Link Spring. Adjust universal link spring as follows:

(a) Refer to figure 6-110.

(b) With keyboard tripped, use spring scale to measure force required to start universal link moving: force should be from 1/2 ounce (minimum) to 1-1/4 ounces (maximum).

(c) If force required does not meet specification, replace spring.

(13) Universal Lever Spring. Adjust universal lever spring as follows:

(a) Refer to figure 6-111.

(b) Use spring scale to extend spring to installed length: this should require from 15 ounces (minimum) to 17 ounces (maximum).

(c) If force required does not meet specificatons, replace spring.

(14) Reset Solenoid Position. Adjust reset solenoid position as follows:

(a) Refer to figure 6-112.

(b) Check plunger movement; it should move freely in solenoid core.

(c) If plunger binds, adjust by loosening mounting screws and repositioning solenoid.

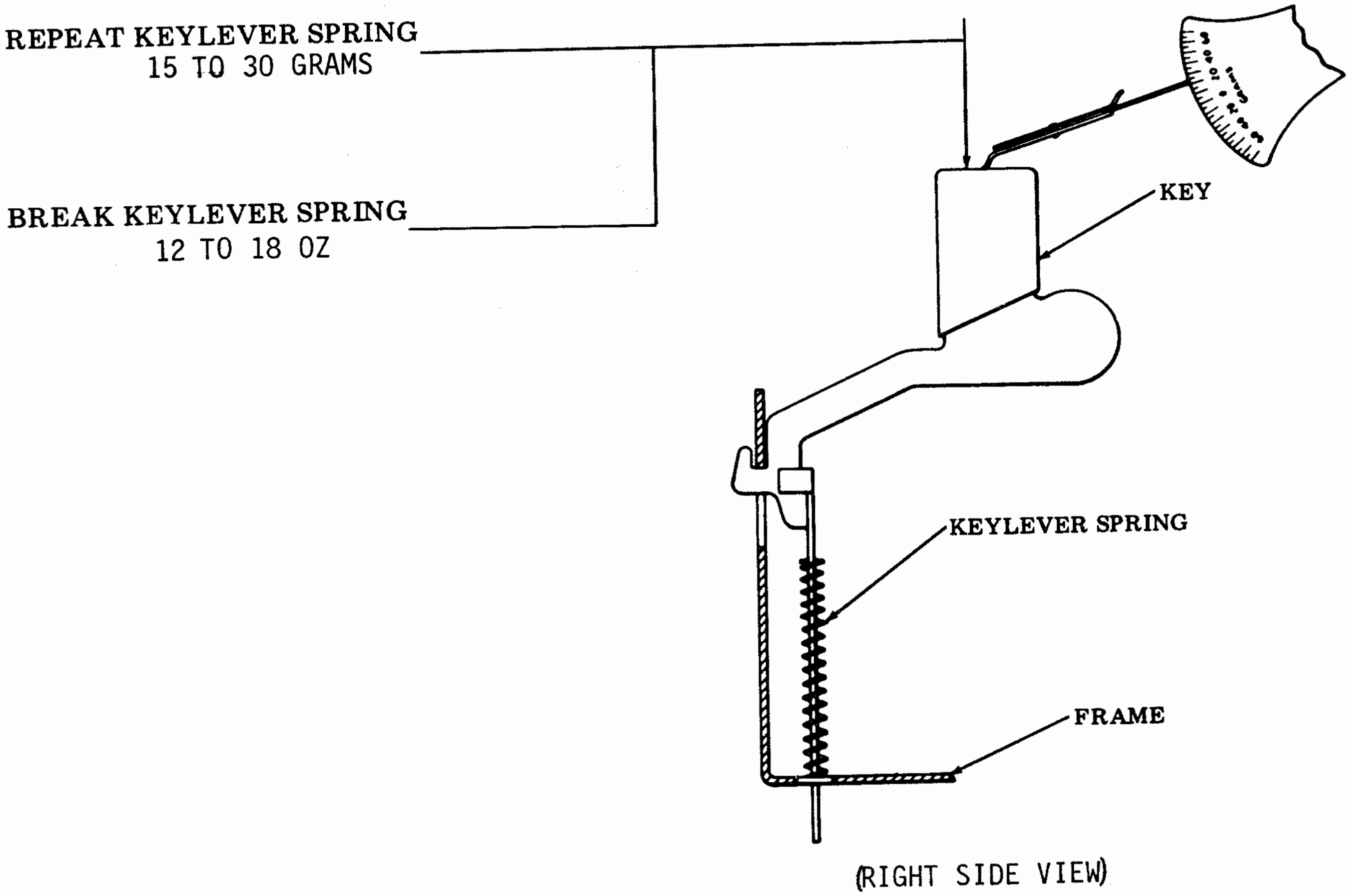



Figure 6-108. Repeat Keylever and Break Keylever Springs

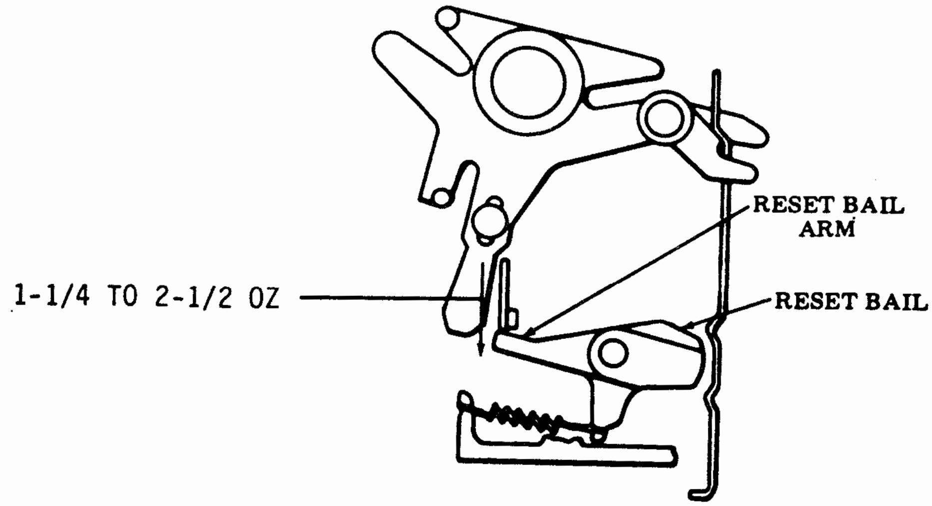



Figure 6-109. Reset Bail Spring

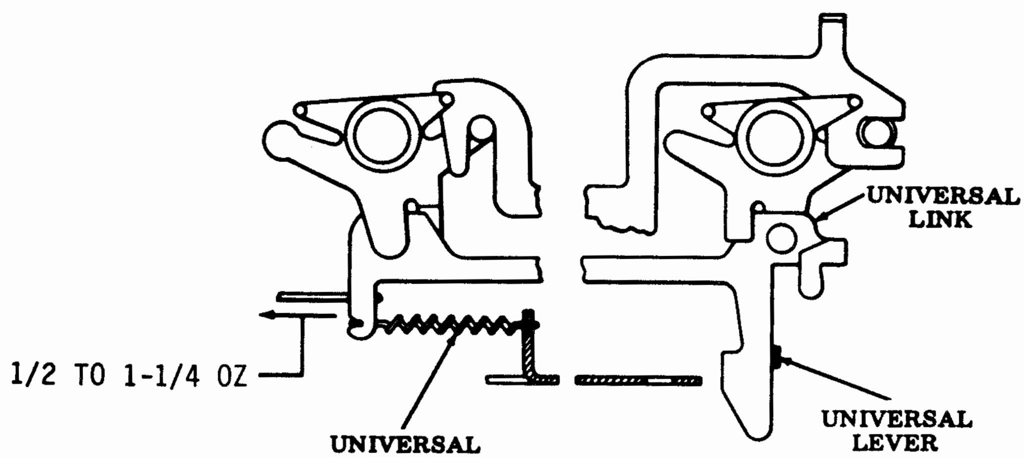



Figure 6-110. Universal Link Spring

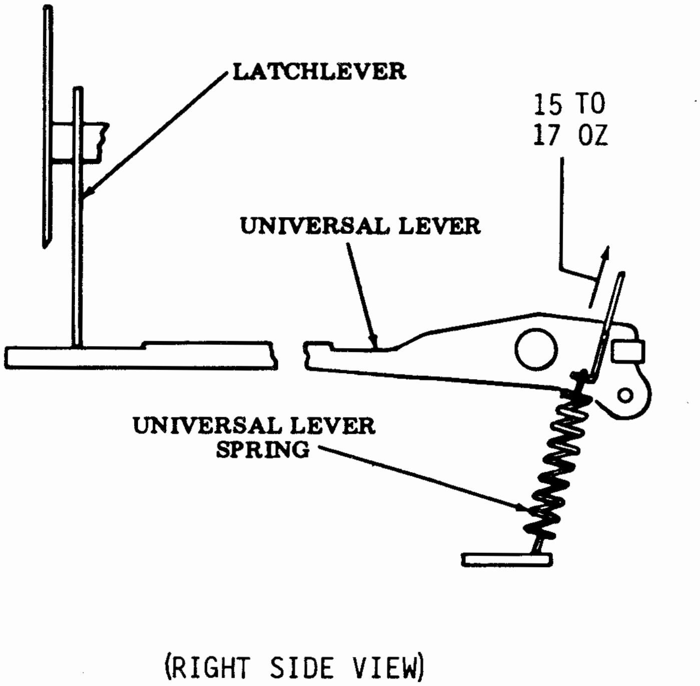



Figure 6-111. Universal Lever Spring

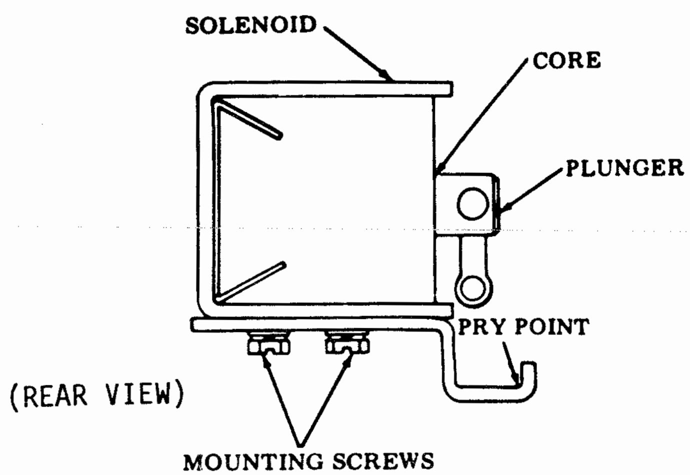



Figure 6-112. Reset Solenoid Position

(d) Tighten mounting screws.

(15) Reset Arm. Adjust reset arm as follows:

(a) Refer to figure 6-113.

(b) Hold plunger in fully operated position with screwdriver in pry point and against plunger. In this position, there should be from 0.020 inch (minimum) to 0.045 inch (maximum) clearance between universal lever and latchlever.

(c) To adjust, loosen reset arm clamp screw, using screwdriver to hold plunger in fully operated position.

(d) Position reset arm to clearance requirement.

NOTE

Do not bind reset arm against mounting bracket when tightening clamp screw.

(16) Universal Contact. Adjust universal contact as follows:

(a) Refer to figure 6-114.

(b) With keyboard in reset condition, and contact wire moved out of fiberboard guide slot, clearance between contact wire and metal contact strap should be between

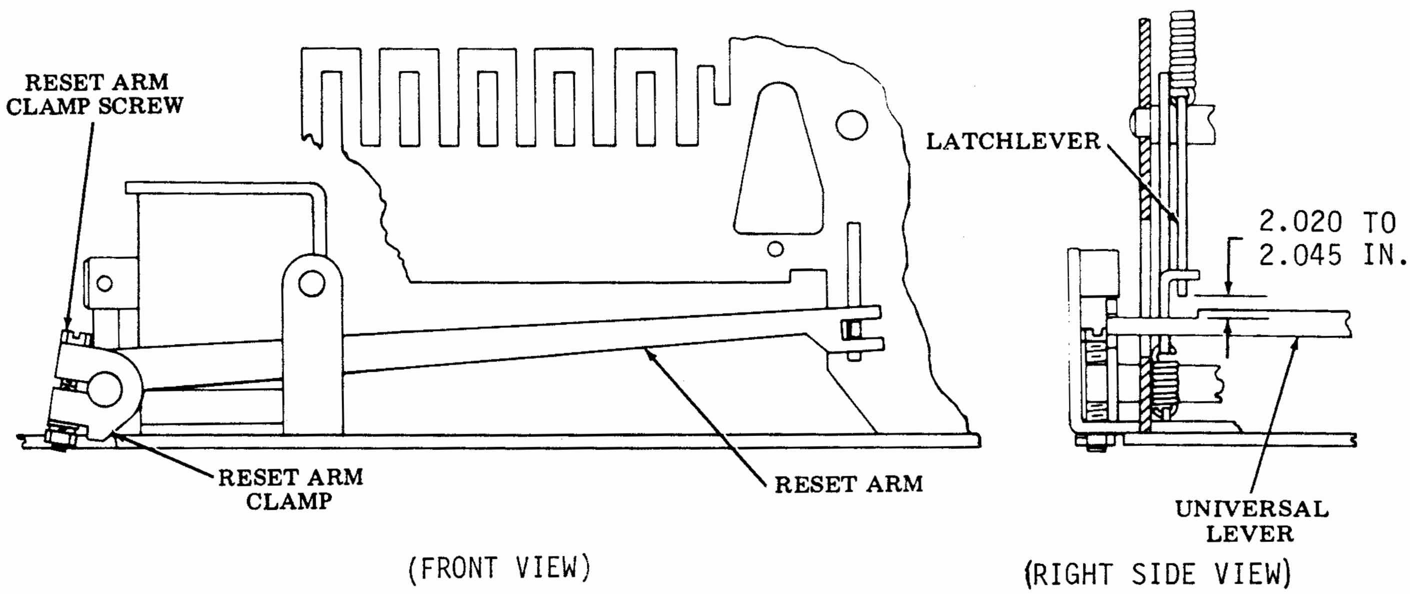



Figure 6-113. Reset Arm

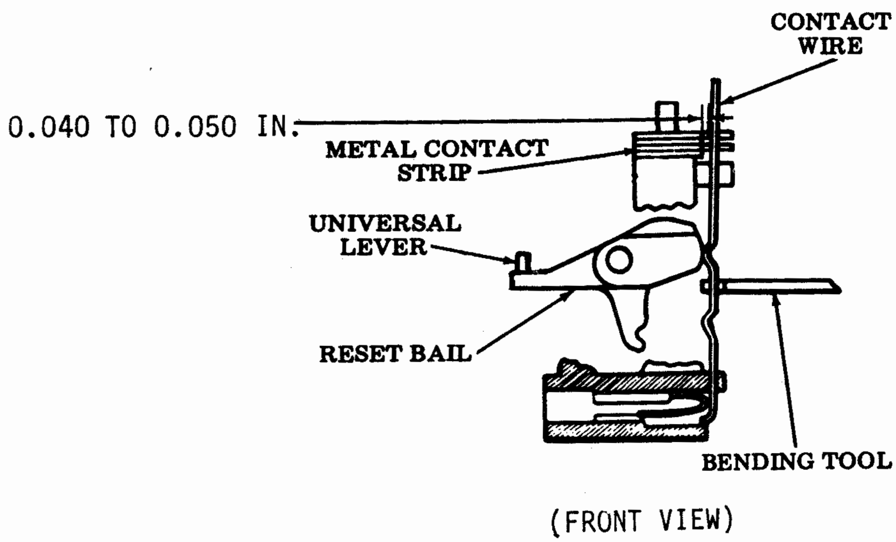



Figure 6-114. Universal Contact

0.040 inch (minimum) and 0.050 inch (maximum).

(c) Adjust by bending wire with TP98055 bending tool.

(d) Replace wire in guide slot.

(17) Keyboard Transmitter Positioning. Adjust transmitter positioning as follows:

(a) Refer to figure 6-115.

(b) Loosen mounting screws.

(c) Position assembly so that end of slots in left and right brackets are against rear mounting screws.

(d) Tighten mounting screws.

b. Distributor Mechanism Adjustments. Perform distributor mechanism adjustments as follows:

(1) Clutch Trip Armature Air Gap. Adjust armature air gap as follows:

(a) Refer to figure 6-116.

(b) Remove armature bail spring, and hold armature flush against magnet core.

(c) Measure clearance between armature and magnet bracket: it should be between 0.004 inch (minimum) and 0.008 inch (maximum).

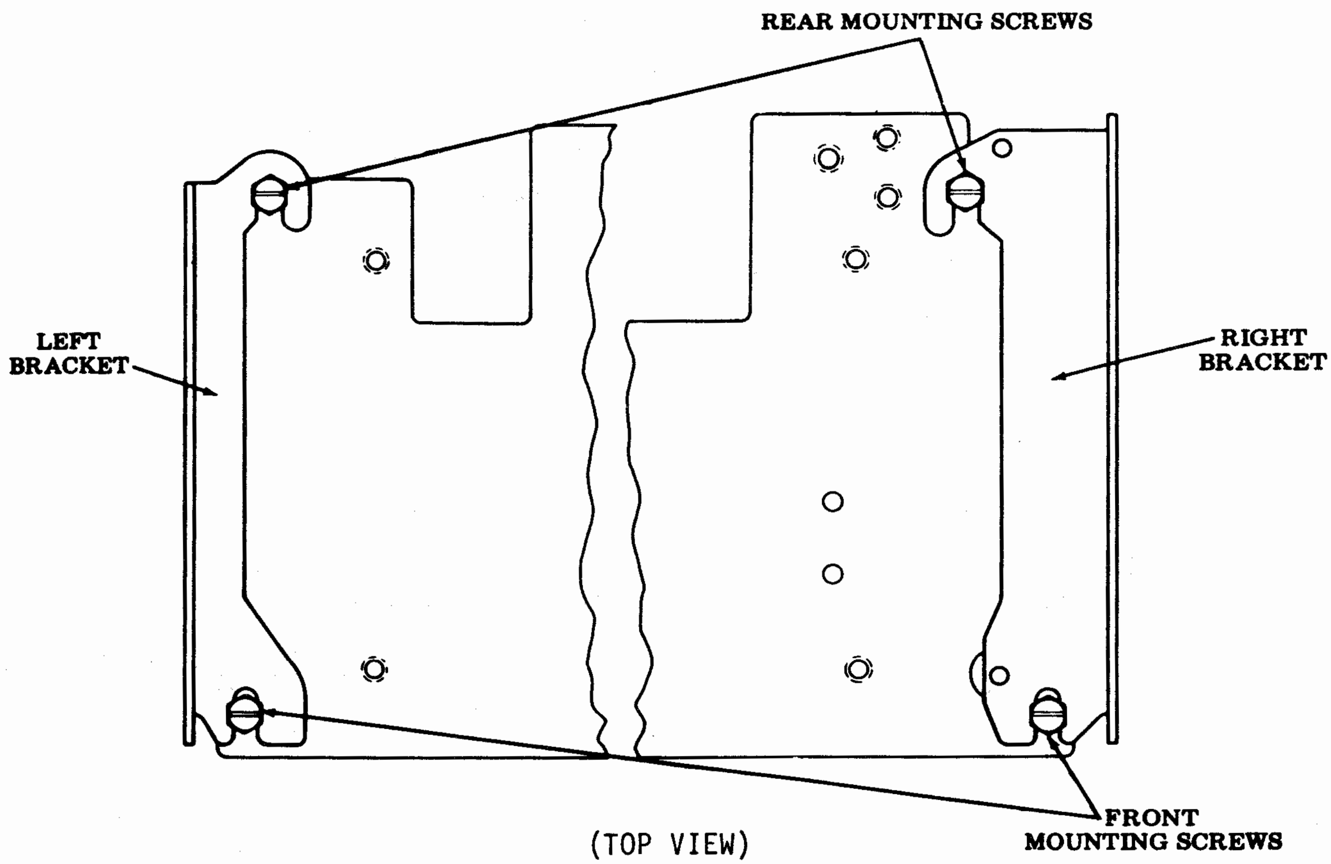



Figure 6-115. Keyboard Transmitter Positioning

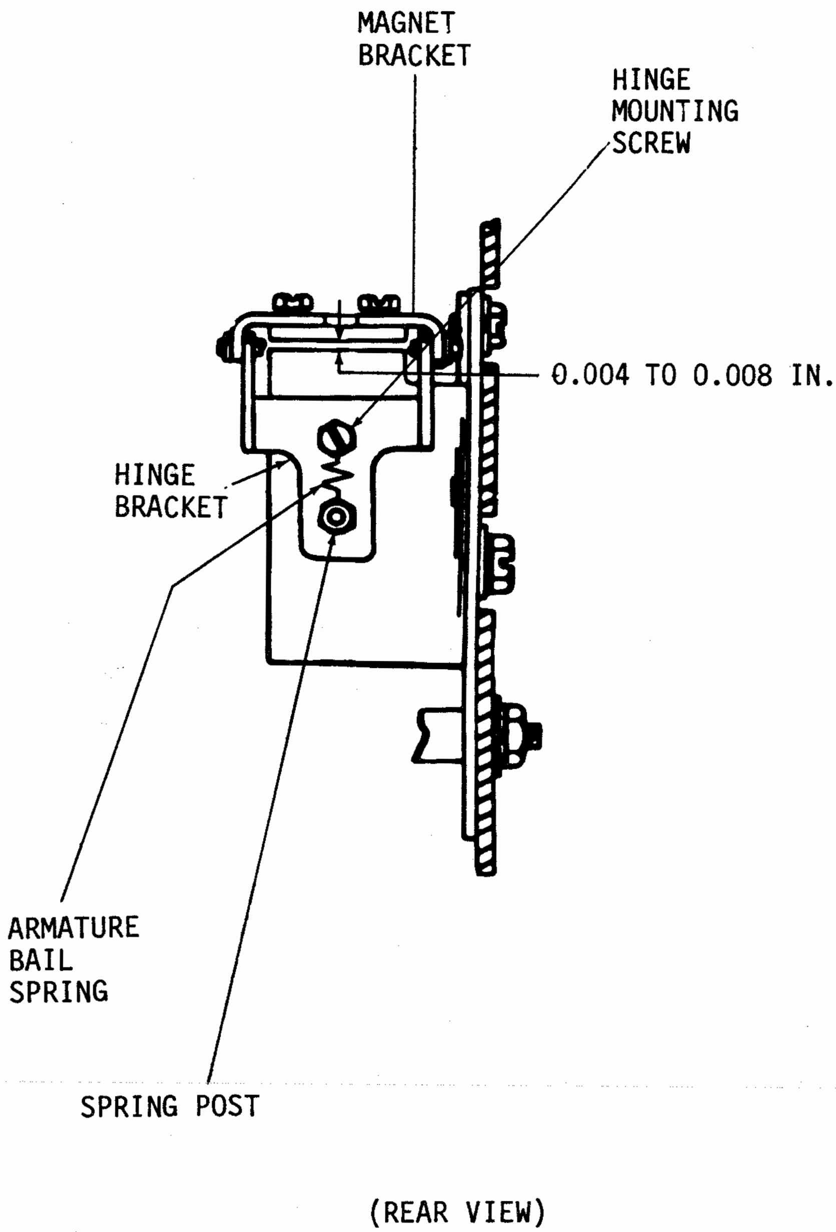



Figure 6-116. Clutch Trip Armature Air Gap

(d) To adjust, loosen spring post and hinge mounting screws. Position hinge to meet requirement.

(e) Tighten spring post and hinge mounting screw.

(2) Clutch Trip Lever. Adjust clutch trip lever as follows:

(a) Refer to figure 6-117.

(b) With clutch trip lever on high part of cam, measure clearance between latching surfaces of clutch trip lever and armature extension: clearance should be between 0.020 inch (minimum) and 0.030 inch (maximum).

(c) Loosen plate adjusting and plate mounting screws.

(d) Tighten screws.

(3) Armature Extension. Adjust armature extension as follows:

(a) Refer to figure 6-118.

(b) With clutch trip lever on high part of cam, and armature held flush against magnet core, measure clearance between armature extension lever and clutch trip lever: clearance should be between 0.030 inch (minimum) and 0.040 inch (maximum).

(c) To adjust, loosen bracket mounting and plate adjusting screws.

(d) Insert screwdriver into slot below bracket mounting screw, and position bracket to meet requirement.

(e) Tighten screws.

(4) Clutch Stop Lug. Adjust clutch stop lug as follows:

(a) Refer to figure 6-119.

(b) Clutch trip lever in latched position should fully engage clutch shoe lever.

(c) To adjust, place clutch in stop position, loosen clutch trip lever clamping screw, and position clutch stop arm to obtain full bite with clutch shoe lever.

NOTE

When armature is in attracted position, clutch stop lug should clear trip lever (some).

(5) Clutch Shoe Lever. Adjust clutch shoe lever as follows:

(a) Refer to figure 6-120.

(b) With clutch engaged, measure clearance between shoe lever and stop lug.

(c) Repeat same measurement with clutch disengaged: measurement in step (b) should be from 0.055 inch (minimum) to 0.085 inch (maximum) greater than measurement in step (c).

(d) To adjust, loosen two clamp screws in clutch disc: rotate adjusting

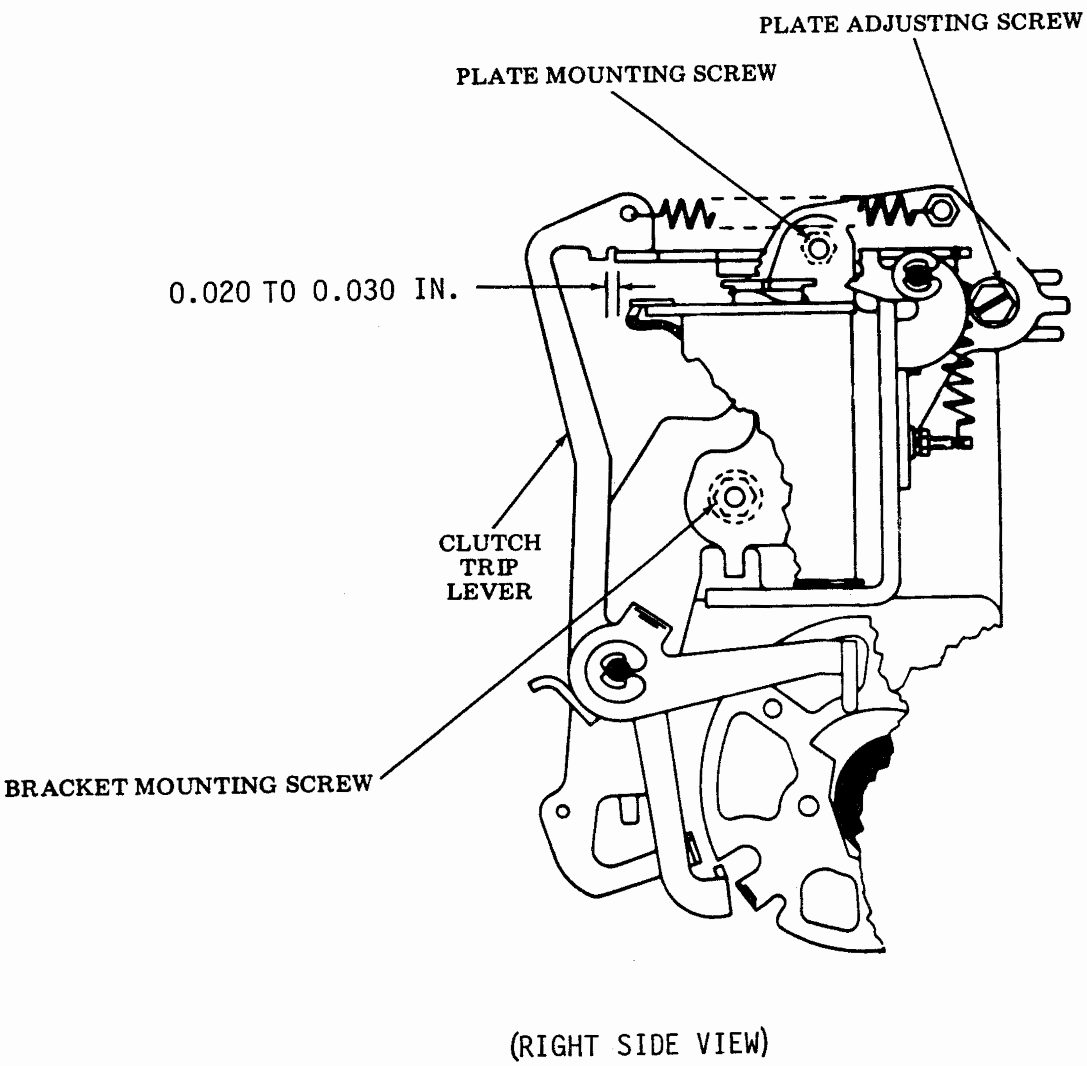



Figure 6-117. Clutch Trip Lever

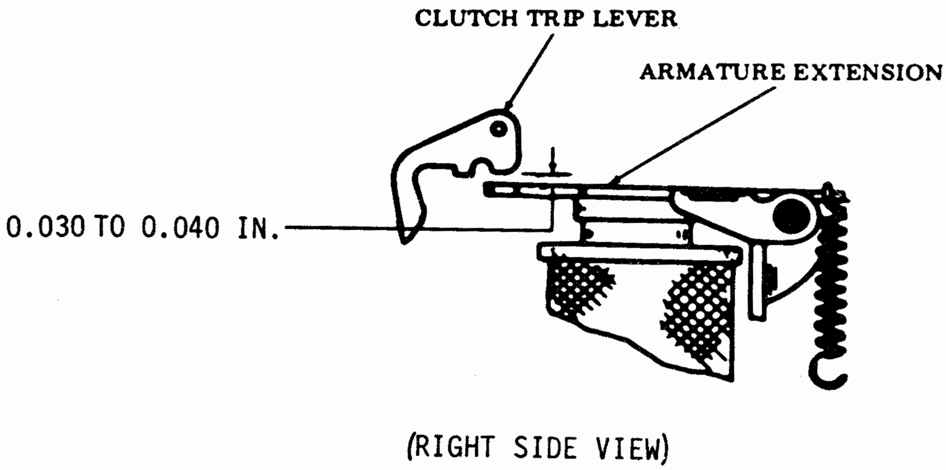



Figure 6-118. Armature Extension

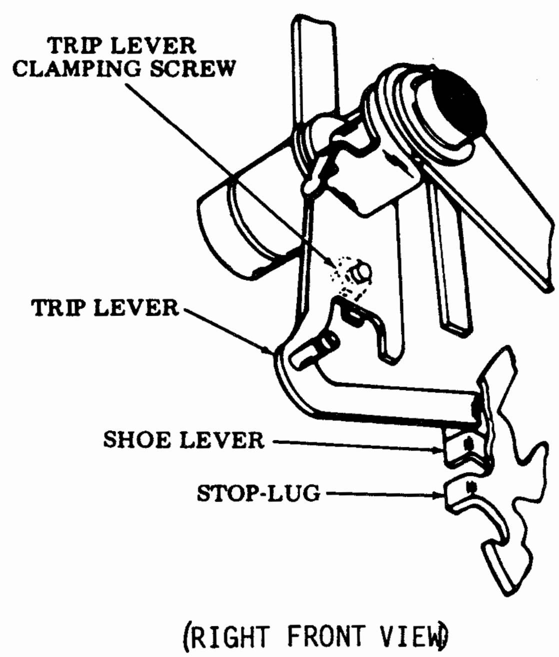



Figure 6-119. Clutch Stop Lug

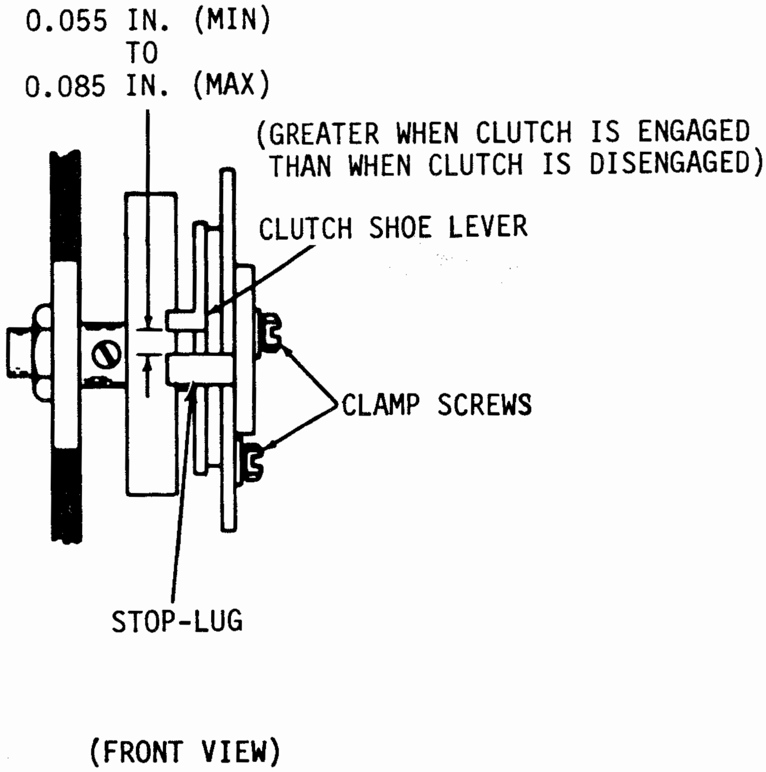



Figure 6-120. Clutch Shoe Lever

disc to obtain correct clearance differential.

(e) Tighten clamp screws.

NOTE

After adjustment, disengage clutch and rotate drum. If drum drags on shoes, refine adjustment.

(6) <u>Cam Follower Guide</u>. Adjust cam follower guide as follows:

NOTE

Remove typing unit from base before making adjustment.

(a) Refer to figure 6-121.

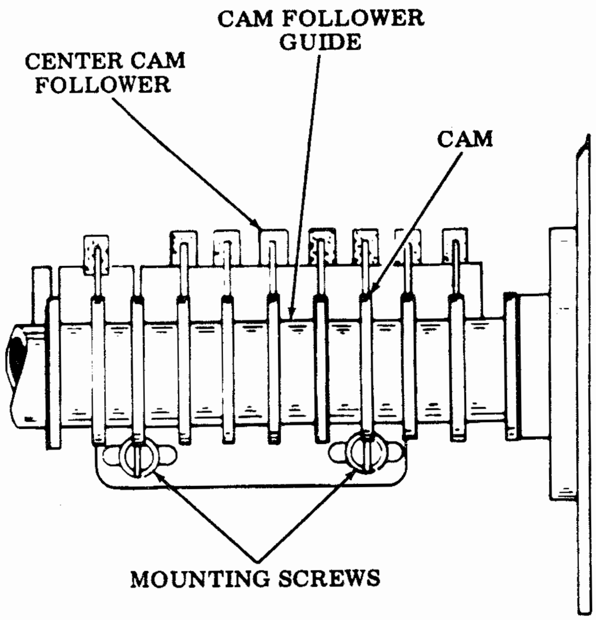
(b) Loosen mounting screws.

(c) Position guide so that center cam follower is fully on cam when follower is moved sideways in slot.

(d) Other followers must have at least 75 percent bite when moved in either direction, and be free in guide slots.

(e) Tighten mounting screws; check for dragging or binding.

(7) <u>Mounting Typing Unit on Base</u>. Mount typing unit as follows:




(TOP REAR VIEW)

Figure 6-121. Cam Follower Guide

(a) Refer to figure 6-122.

(b) When replacing typing unit on base, tilt it to the right, and engage the right end with the right locating stud.

(c) Rotate motor by hand to mesh gears properly.

(d) Secure with four mounting screws.

(8) <u>Distributor Block</u>. Adjust distributor block as follows:

NOTE

Remove insulator from terminal block to adjust distributor contact assembly; replace after adjustments.

(a) Refer to figure 6-123.

(b) Loosen mounting screws.

(c) Position distributor block so that rocker levers are fully engaged with bakelite on follower levers.

(d) Tighten mounting screws.

(9) <u>Code Level Contact Gaps</u>. Adjust code level contact gaps as follows:

(a) Refer to figure 6-124.

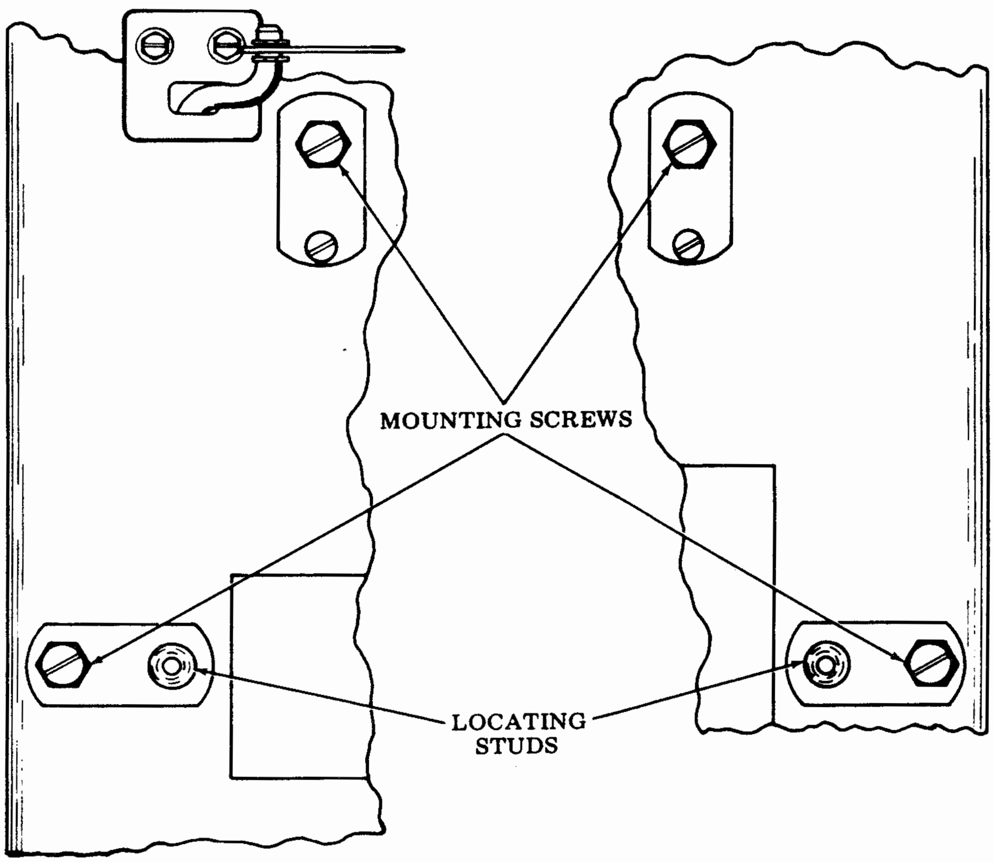



Figure 6-122. Mounting Typing Unit

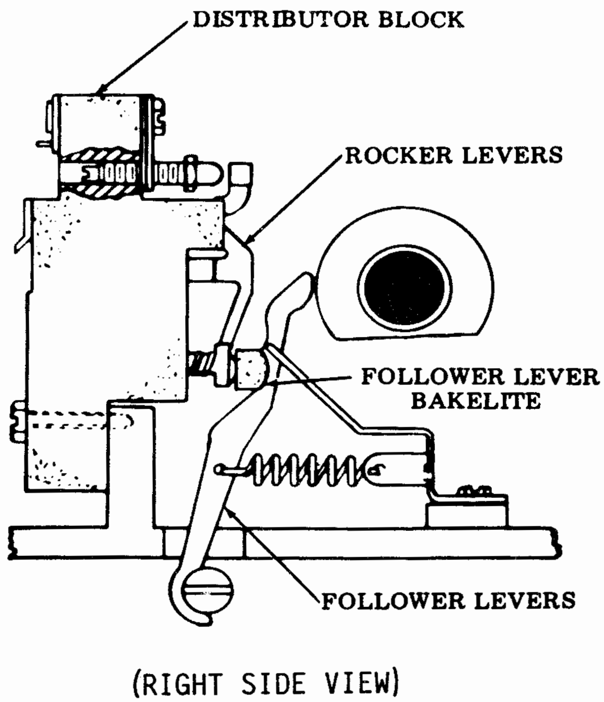
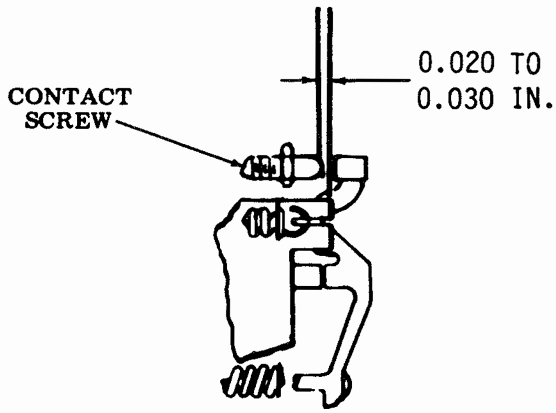



Figure 6-123. Distributor Block




(RIGHT SIDE VIEW)

Figure 6-124. Code Level Contact Gaps

(b) Trip clutch manually and rotate shaft, to position cam follower lever on high part of cam. At this point, measure contact gap: it should measure from 0.020 inch (minimum) to 0.030 oinch (maximum).

(c) To adjust, turn contact screw at socket end.

(d) Check first six contact gaps from clutch end of shaft.

(10) Clutch Timing Contact Gap. Adjust clutch timing contact gap as follows:

(a) Refer to figure 6-125.

(b) Disengage distributor clutch and back off timing contact screw until gap is visible.

(c) Apply power to unit and depress any keytop except REPT: distributor clutch should engage.

(d) If clutch does not engage, turn contact screw until clutch engages; then give contact screw an additional 1/16th to 1/8th turn.

(e) Depress another keytop (except REPT): refine adjustment if necessary.

(11) Solenoid Contact Gap. Adjust solenoid contact gap as follows:

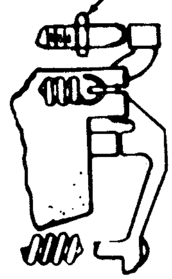



Figure 6-125. Clutch Timing Contact Gap

(a) Refer to figure 6-126.

(b) Disengage distributor clutch.

(c) Measure gap at No. 10 contact (10th from clutch end): this should be between 0.025 inch (minimum) and 0.030 inch (maximum).

(d) Use contact screw to adjust.

NOTE

This adjustment applies to units with cams marked "XX" after part no. TP198579, and serial numbers above 734.

(12) Clutch Shoe Lever Spring. Adjust clutch shoe lever spring as follows:

(a) Refer to figure 6-127.

(b) Remove cover and top plate. Engage distributor clutch and hold disc to prevent it turning.

(c) Use spring scale to measure force necessary to pull shoe lever into contact with stop lug. Force should range from 15 ounces (minimum) to 20 ounces (maximum).

(d) If force does not match requirements, replace spring.

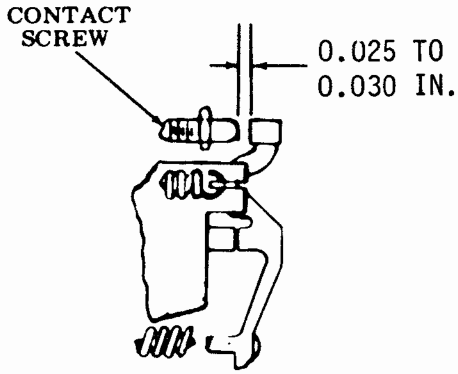



Figure 6-126. Solenoid Contact Gap

(13) Clutch Shoe Spring. Adjust clutch shoe spring as follows:

(a) Refer to figure 6-128.

NOTE

This adjustment requires removal of clutch from shaft. Do not perform unless spring tension is definitely suspect.

(b) Use spring scale to measure tension: it should require between 3 ounces (minimum) to 5 ounces (maximum) to start primary shoe away from secondary shoe.

(c) If required force does not meet specifications, replace spring.

(14) Cam Follower Spring. Adjust cam follower spring as follows:

(a) Refer to figure 6-129.

(b) Remove distributor block.

(c) Use spring scale to measure force necessary to start cam follower lever moving when lever is on high point of cam. This should require from 1/2 ounce (minimum) to 1-1/2 ounces (maximum).

(d) If force required does not match requirements, replace spring.

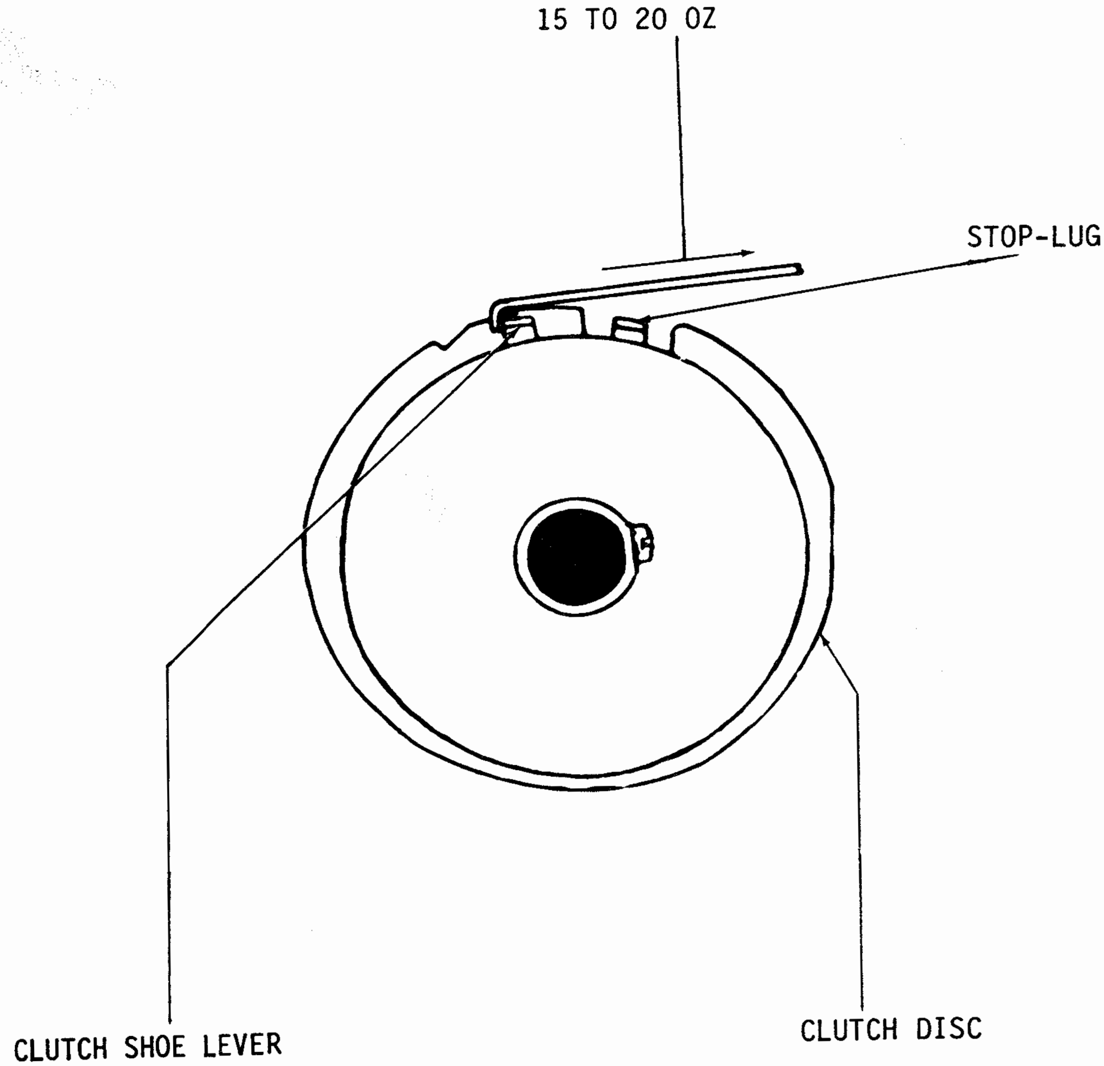



Figure 6-127. Clutch Shoe Lever Spring

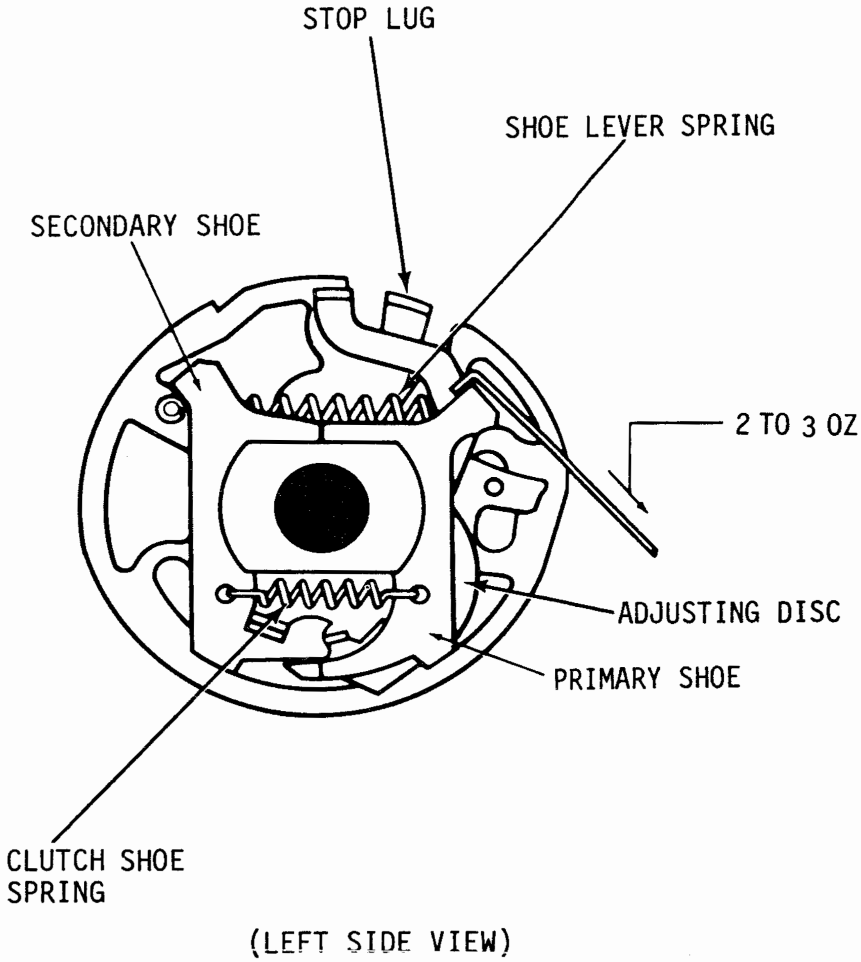



Figure 6-128. Clutch Shoe Spring

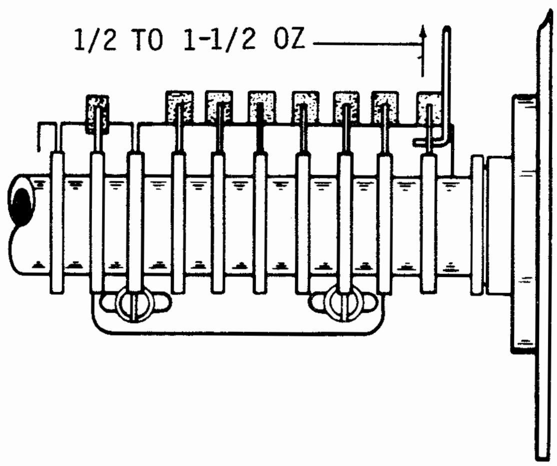



Figure 6-129. Cam Follower Spring

(15) Rocker Spring. Adjust rocker spring as follows:

(a) Refer to figure 6-130.

(b) Remove compression springs.

(c) Adjust contacts so that contact surface is approximately 1/32 inch below outer surface of contact block.

(d) Use a spring scale to separate contacts: this should require from 3 ounces (minimum) to 4 ounces (maximum).

(e) If required force does not match specifications, replace spring.

(16) Rocker Compression Spring. Adjust rocker compression spring as follows:

(a) Refer to figure 6-130.

(b) Install compression springs.

(c) Use spring scale to measure force required to just separate contacts: this should require from 6-1/2 ounces (minimum) to 9-1/2 ounces (maximum)

(d) If force required does not match specificiations, replace spring.

(17) Clutch Latchlever Spring. Adjust clutch latchlever spring as follows:

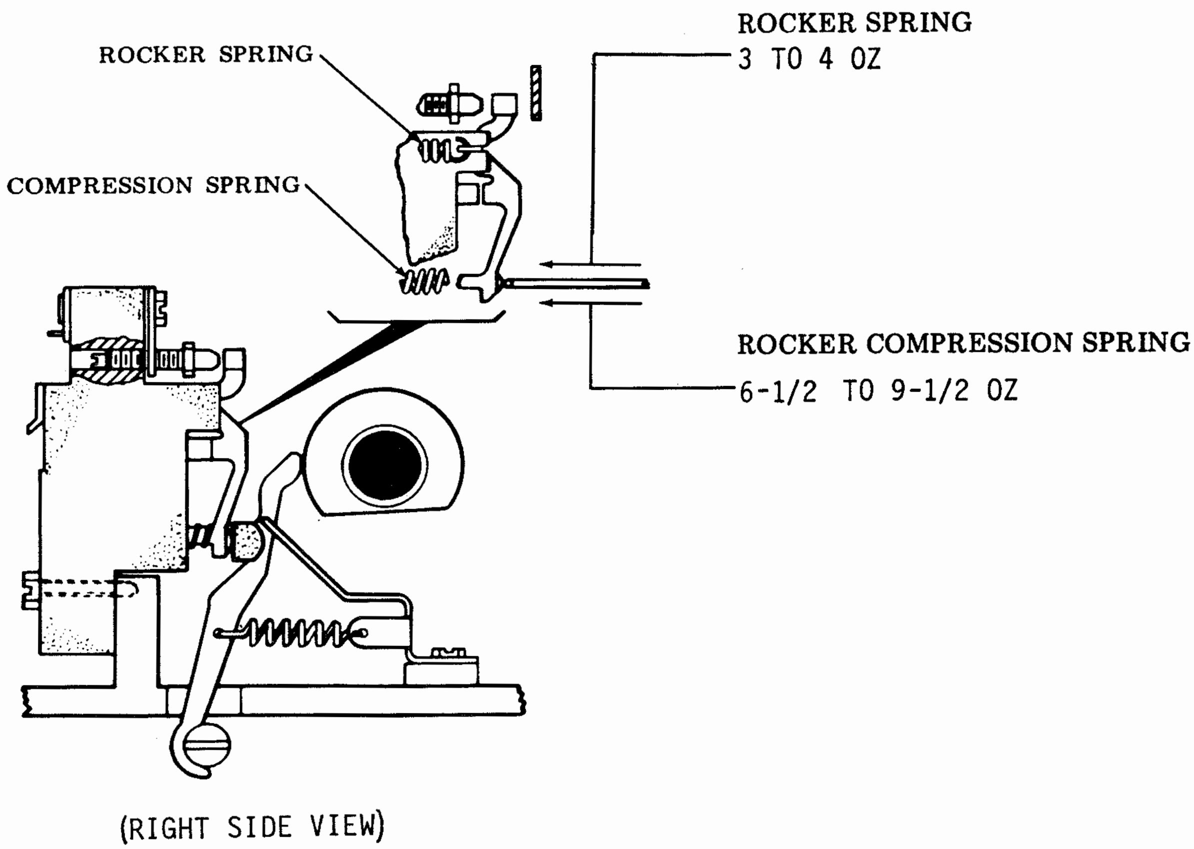



Figure 6-130. Rocker Spring and Rocker Compression Springs

(a) Refer to figure 6-131.

(b) Position latchlever on low part of clutch disc (without latching).

(c) Apply pull end of scale to latchlever, and extend diagonally: it should require from 2-1/2 ounces (minimum) to 4-1/2 ounces (maximum) to start latchlever moving.

(d) If force required does not match specifications, replace spring.

(18) Clutch Trip Lever Spring. Adjust clutch trip lever spring as follows:

(a) Refer to figure 6-132.

(b) Engage distributor clutch, and hold armature against magnet core.

(c) Use spring scale to measure force necessary to start trip lever moving: this should require from 2 ounces (minimum) to 3-1/2 ounces (maximum).

(d) If force does not match requirements, replace spring.

(19) Clutch Magnet Armature Bail Spring. Adjust spring as follows:

(a) Refer to figure 6-133.

(b) Trip clutch magnet armature lever, and rotate main shaft until trip follower arm is on high part of cam.

(c) Use spring scale to measure force necessary to start armature extension lever moving: this should be between 3 ounces (minimum) to 4-1/2 ounces (maximum).

(d) If force does not match requirements, replace spring.

c. Gear Shift Assembly Adjustments. Perform gear shift assembly adjustments in accordance with the following paragraphs.

(1) Typing Unit Gear Backlash. Adjust typing unit gear backlash as follows:

(a) Refer to figure 6-134.

NOTE

Replace typing unit in base, and insulator on distributor terminal block.

(b) There should be perceptible backlash between the typing unit gear and the associated gear shift pinion at their closest point.

(c) If not, remove typing unit from base, and terminal block bracket from gear shift casting.

(d) Loosen three clamp screw locknuts on gear shift casting.

(e) Replace printer.

(f) Slide gear shift casting forward or backward to obtain proper gear tooth engagement.

(g) Replace terminal block bracket.

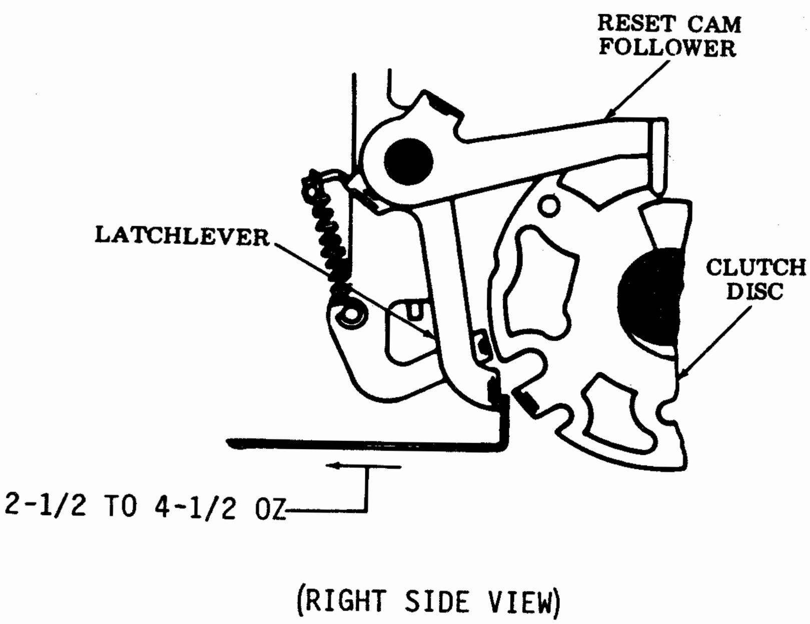



Figure 6-131. Clutch Latchlever Spring

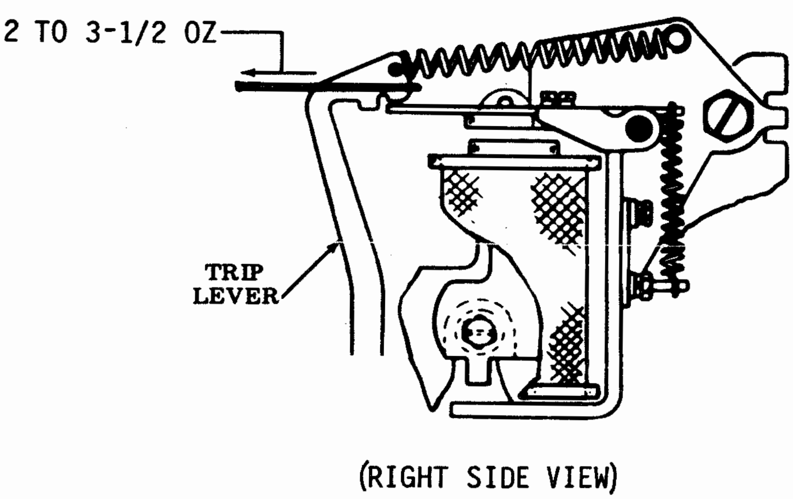



Figure 6-132. Clutch Trip Lever Spring

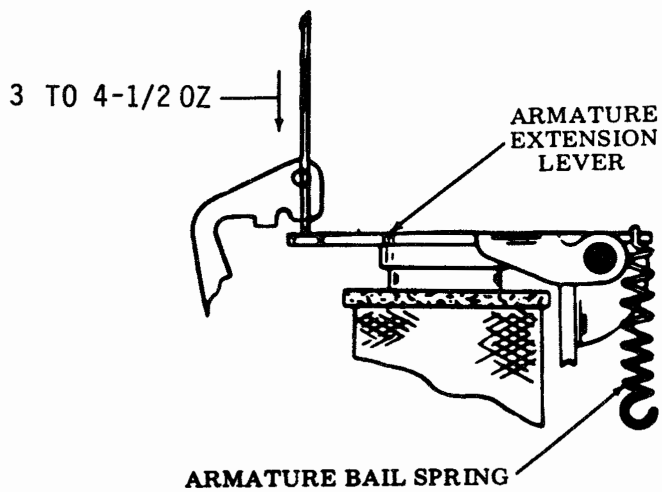



Figure 6-133. Clutch Magnet Armature Bail Spring

(2) Motor Pinion Backlash. Adjust motor pinion backlash as follows:

(a) Refer to figure 6-134.

(b) There should be perceptible backlash between the motor pinion and the associated driver gear at their closest point.

(c) If not, loosen the two bushing locknuts, and raise or lower the two adjustable bushings to obtain proper gear tooth engagement.

(d) Tighten bushing locknuts.

NOTE

After making this adjustment, check the typing unit gear backlash. Refine both backlash adjustments, if necessary.

(3) Baud Selector Stop Plate. Adjust Baud selector stop plate as follows:

(a) Refer to figure 6-135.

(b) Apply power to unit, and rotate Baud selector knob to engage all three variable gear speeds.

(c) Highest and lowest gear speed should engage variable speed shaft without binding or locking out.

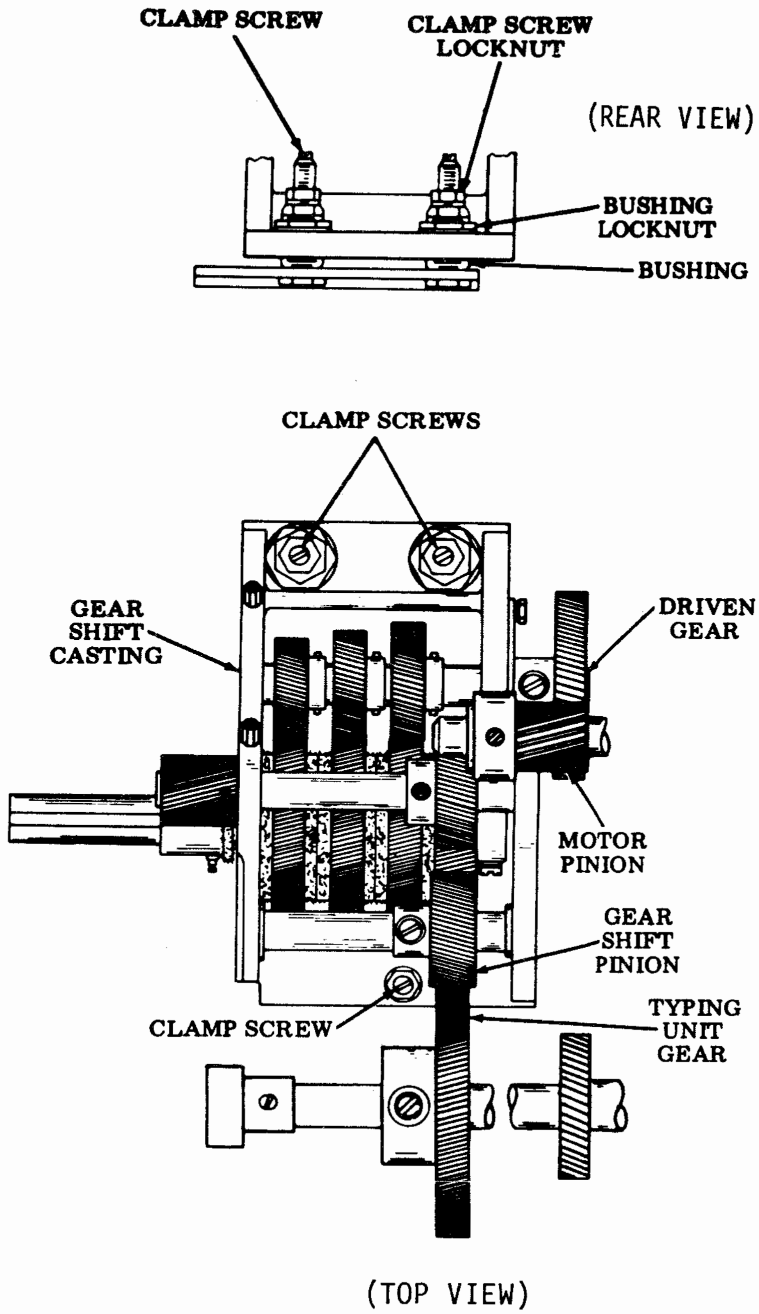
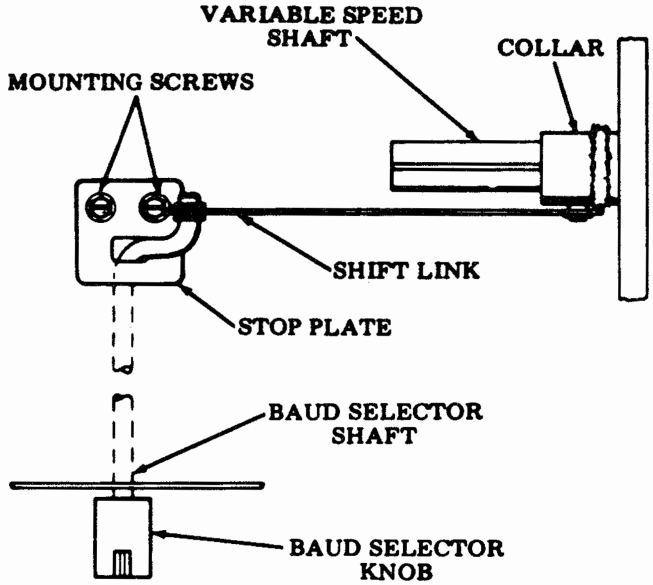



Figure 6-134. Typing Unit Gear Backlash and Motor Pinion Backlash




(TOP VIEW)

Figure 6-135. Baud Selector Stop Plate

(d) If not, loosen mounting screws, and position stop plate left or right for full range.

(4) Gear Shift Spring. Adjust gear shift spring as follows:

(a) Refer to figure 6-136.

(b) Disconnect shift link from collar by removing retainer ring.

(c) Slide key out from under gears.

CAUTION

To avoid loss of pin and spring, pull key slowly to left and hold head of pin as it emerges until completely out of collar.

(d) Use spring scale to measure force necessary to depress key to lowermost position: this should require from 25 ounces (minimum) to 40 ounces (maximum) pressure.

(e) If force required does not match specifications, replace spring.

(5) Distributor Gear Backlash. Adjust distributor gear backlash as follows:

(a) Refer to figure 6-137.

(b) There should be perceptible backlash between the distributor idler

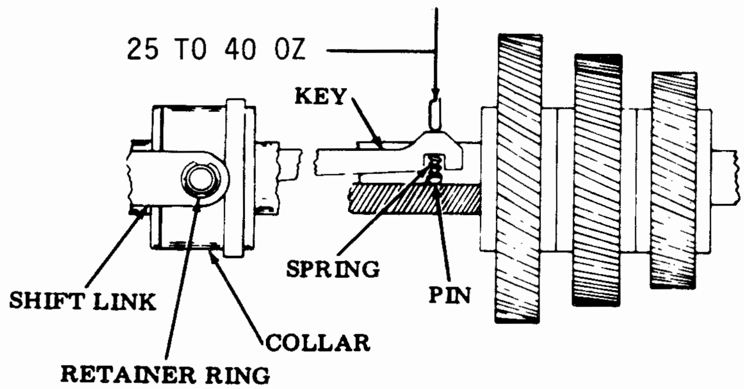



Figure 6-136. Gear Shift Spring

gear and associated gear shift pinion at their closest point.

(c) If not, loosen four distributor mounting screws, and move distributor forward or backward to obtain proper gear tooth engagement.

(d) Tighten mounting screws.

(6) Margin Indicator Spring. Adjust margin indicator spring as follows:

(a) Refer to figure 6-138.

(b) Use spring scale to measure force required to start lever moving: this should be from 7 ounces (minimum) to 11 ounces (maximum).

(c) If force does not match requirement, replace spring.

d. Local Function Mechanism Adjustments. Perform local function mechanism adjustments in accordance with the following paragraph.

(1) Local Carriage Return Spring. Adjust local carriage return spring as follows:

(a) Refer to figure 6-139.

(b) Unhook free end of spring.

(c) Use spring scale to extend spring to full length: force required should

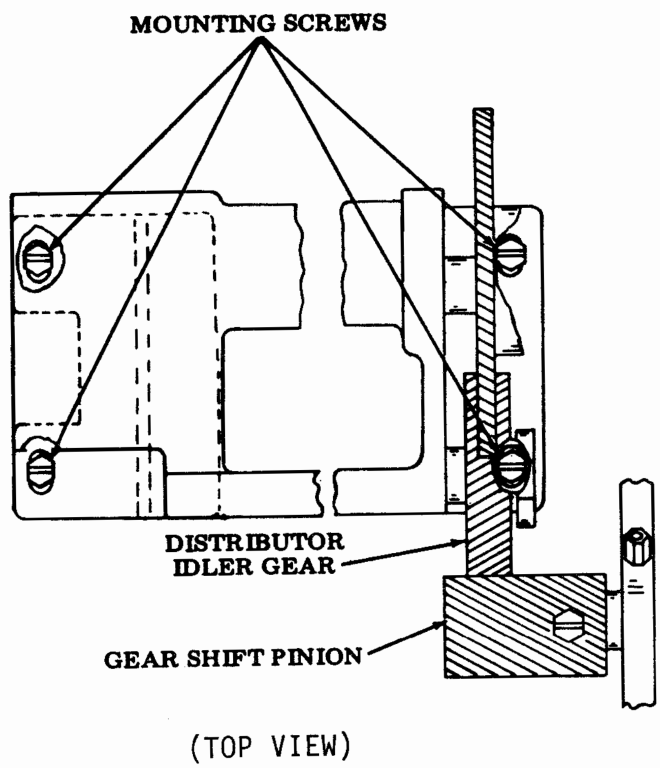
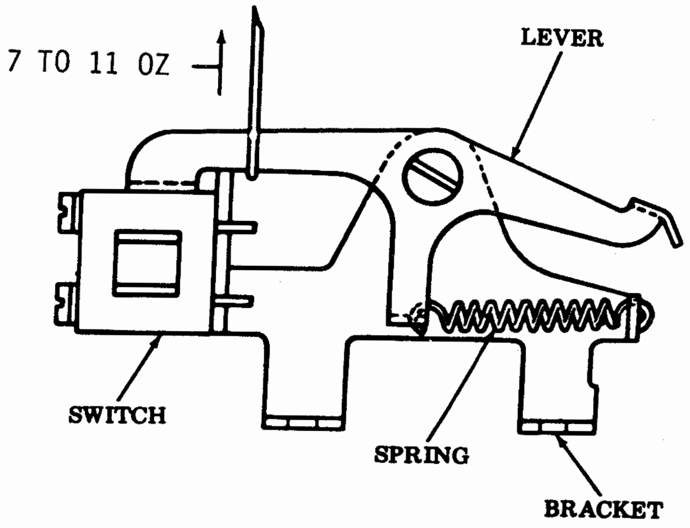
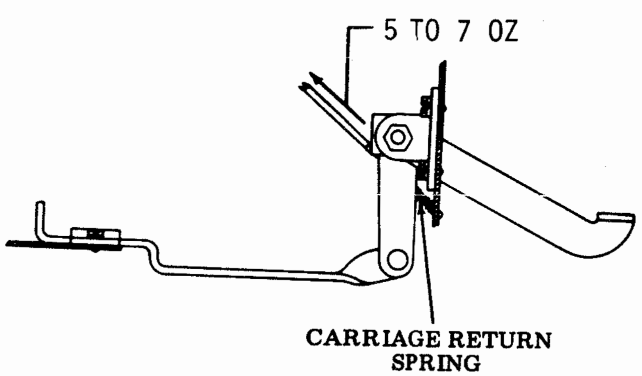



Figure 6-137. Distributor Gear Backlash




(RIGHT SIDE VIEW)

Figure 6-138. Margin Indicator Spring




(LEFT SIDE VIEW)

Figure 6-139. Local Carriage Return Spring measure from 5 ounces (minimum) to 7 ounces (maximum).

(d) If force does not meet requirements, replace spring.

(2) Local Line Feed Spring. Adjust local line feed spring as follows:

(a) Refer to figure 6-140.

(b) Use spring scale to measure force necessary to start trip link moving toward rear: this should require from 1 ounce (minimum) to 3 ounces (maximum).

(c) If force does not match requirements, replace spring.

(3) Line Break Key. Adjust line break key as follows:

(a) Refer to figure 6-141.

NOTE

The adjustments and spring tensions listed below are pertinent to the receive-only base. When making a complete readjustment of the base, they should precede the adjustments in this part.

Typing Unit Gear Backlash, paragraph 6-4.1c(1)

Motor Pinion Backlash, paragraph 6-4.1c(2)

Mounting Typing Unit on Base, paragraph 6-4.1b(7)

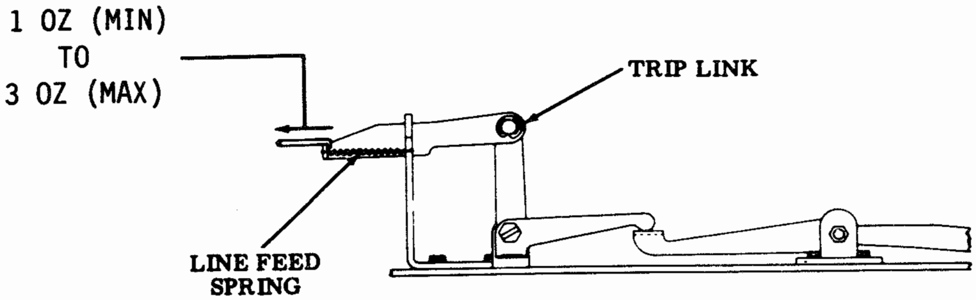



Figure 6-140. Local Line Feed Spring

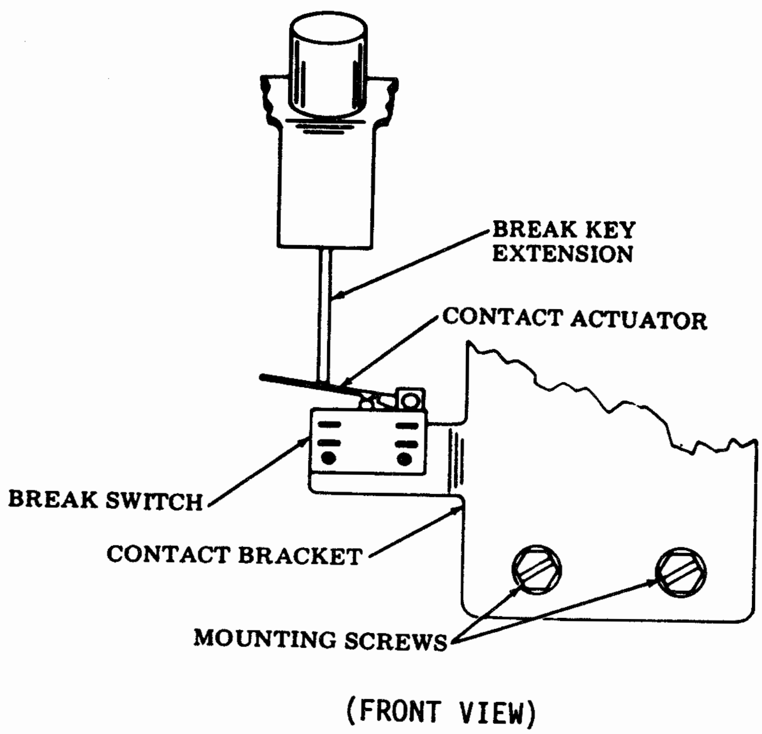



Figure 6-141. Line Break Key

Baud Selector Stop Plate, paragraph 6-4.1c(3)

Gear Shift Spring, paragraph 6-4.1c(4)

Local Carriage Return Spring, paragraph 6-4.1d(1)

Local Line Feed Spring, paragraph 6-4.1e(2)

(b) Depress BREAK key; typing unit should run open, and break key extension should fully engage actuator.

(c) To adjust, loosen mounting screws and position contact bracket to meet requirements.

(4) Local Line Feed. Adjust local line feed as follows:

(a) Refer to figure 6-142.

(b) With cover in place, advance platen by depressing LOC LF key.

(c) Keylever extension must fully engage the local line feed adjusting screw: this releases the line feed clutch, allowing the platen to advance.

(d) To adjust, loosen the locknut and turn the adjusting screw.

(e) Tighten locknut.

NOTE

Leave slot in adjusting screw perpendicular to keylever extensions.

(5) Local Carriage Return. Adjust local carriage return as follows:

(a) Refer to figure 6-143.

(b) With cover in place and type box to the right, depress LOC CR key: type box should return to the left margin.

(c) To release the carriage return clutch, keylever extension should engage the adjusting screw by at least half the width of the keylever extension.

(d) To adjust, loosen the locknut and turn the adjuting screw.

(e) Tighten locknut.

NOTE

Leave slot in adjusting screw perpendicular to keylever extension.

e. Latch and Hinge Mechanism Adjustments. Perform latch and hinge mechanism adjustments in accordance with the following paragraphs.

(1) Cover Latch. Adjust cover latch as follows:

(a) Refer to figure 6-144.

(b) Remove typing unit, and place cover on base.

(c) Latches should hold cover snugly in place by tight fit against latching posts.

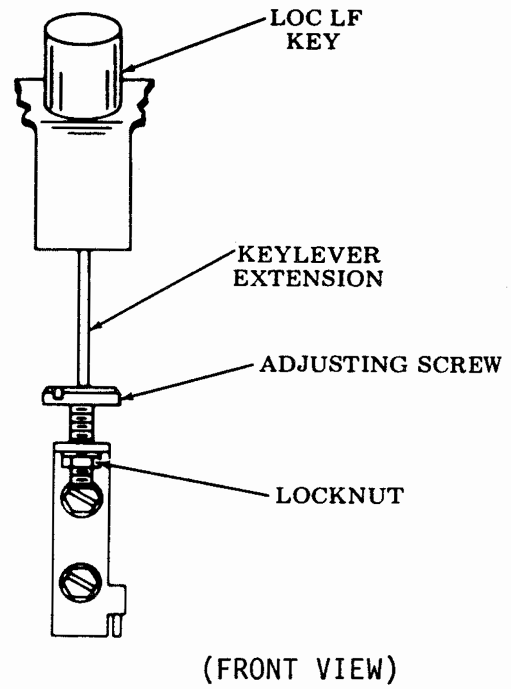



Figure 6-142. Local Line Feed

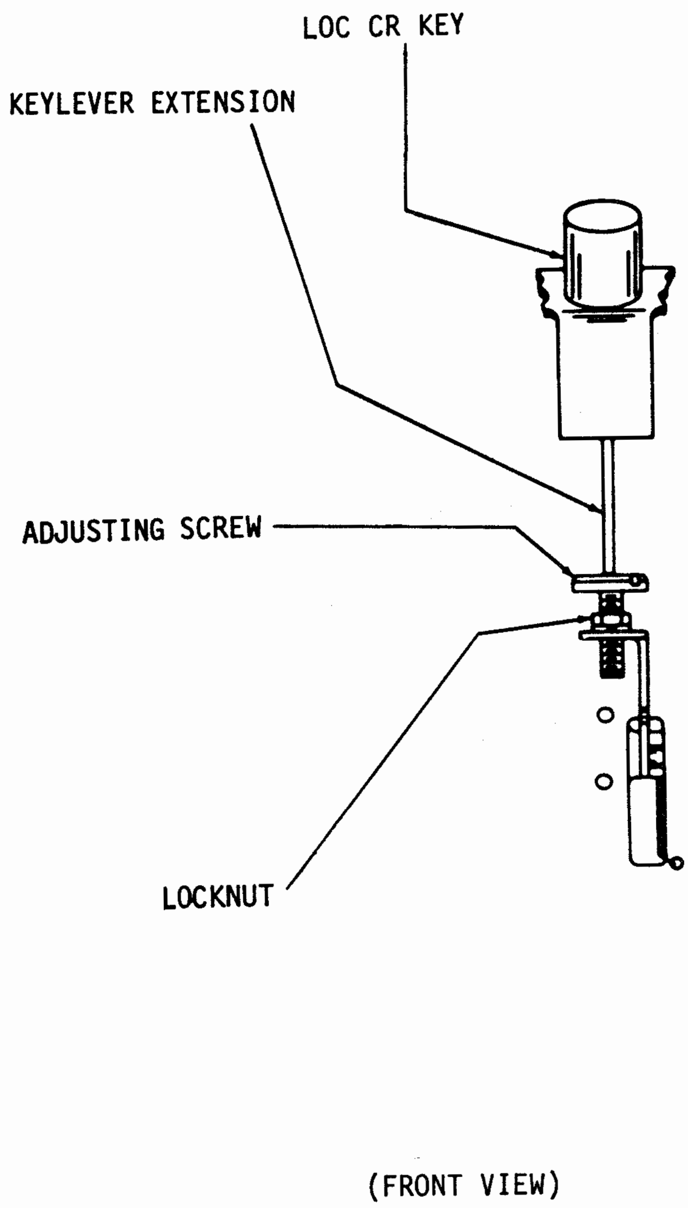



Figure 6-143. Local Carriage Return

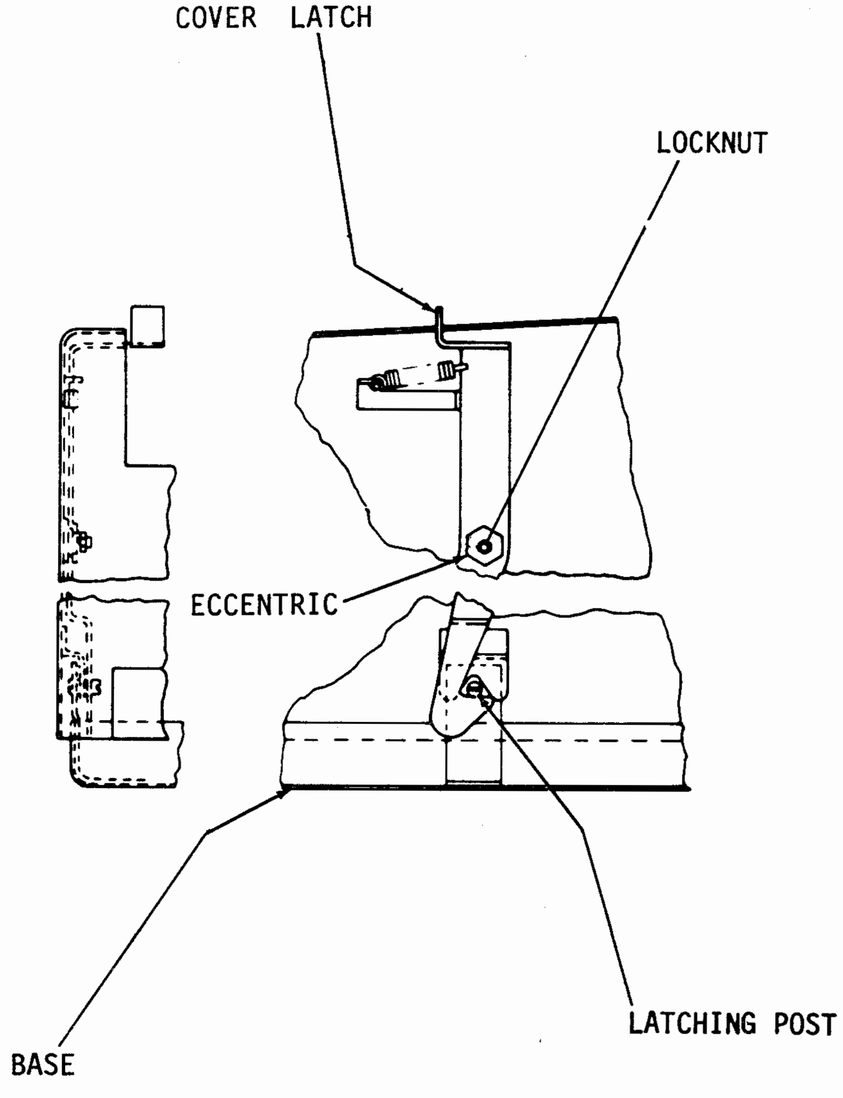



Figure 6-144. Cover Latch

(d) If not, loosen locknuts which hold eccentrics in place.

(e) Adjust eccentrics for correct fit.

(f) Tighten locknuts.

(2) Window Door Hinge. Adjust window door hinge as follows:

(a) Refer to figure 6-145.

(b) Loosen mounting nuts.

(c) Position hinge brackets so that window door conforms with curvature of cover when dome is latched.

(d) Tighten mounting nuts.

(3) Dome Hinge Clearance. Adjust dome hinge clearance as follows:

(a) Refer to figure 6-146.

(b) With dome closed, measure clearance between dome and cover: it should be 0.010 inch (minimum) to 0.062 inch (maximum).

(c) Loosen cover mounting nuts.

(d) Raise or lower hinges to match specifications.

(e) Tighten mounting nuts.

(4) Dome Centering. Adjust dome centering as follows:

(a) Refer to figure 6-146.

(b) With dome closed, clearance between dome and cover should measure from 5/32 inch (minimum) to 1/4 inch (maximum), and sides of dome should be approximately centered and parallel on cover.

(c) To adjust, loosen mounting nuts and position dome.

(d) Tighten mounting nuts.

(5) Dome Latch. Adjust dome latch as follows:

(a) Refer to figure 6-147.

(b) With dome closed, latch should engage cover by 0.031 inch (minimum) to 0.085 inch (maximum). Latches should be parallel, and freely engage underside of cover.

(c) Loosen mounting screws, and position mounting brackets to meet requirements.

(d) Tighten mounting screws.

(6) Paper Guide. Adjust paper guide as follows:

(a) Refer to figure 6-148.

(b) Measure clearance between lower edges of paper guide and dome: this should be 3/8 inch (minimum) to 15/32 inch (maximum).

(c) To adjust, loosen mounting nuts and position paper guide parallel with lower edge of dome.

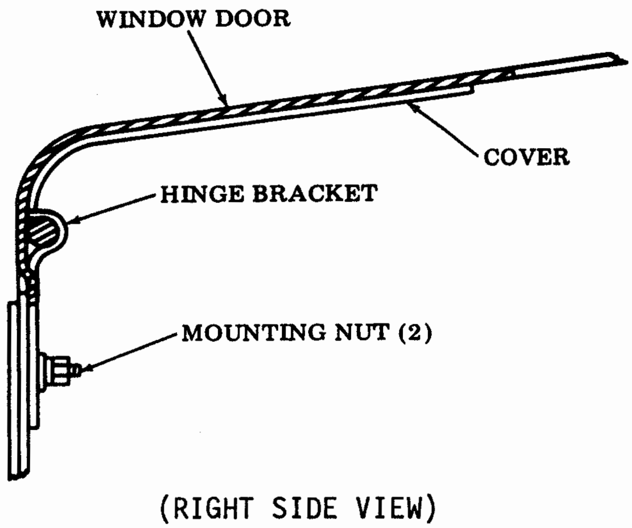



Figure 6-145. Window Door Hinge

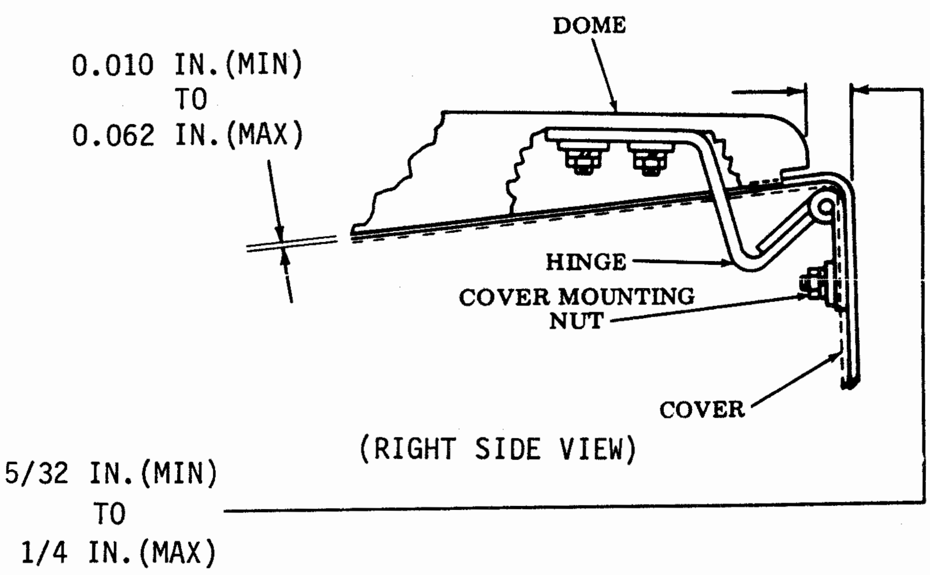



Figure 6-146. Dome Hinge Clearance and Dome Centering

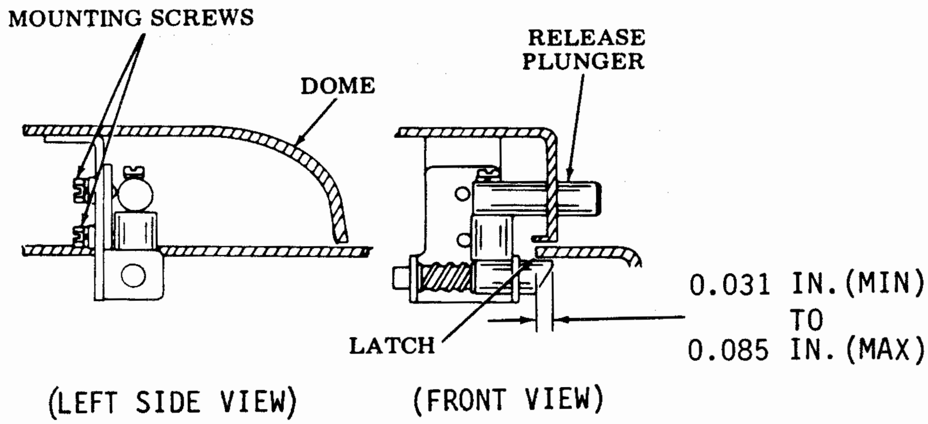



Figure 6-147. Dome Latch

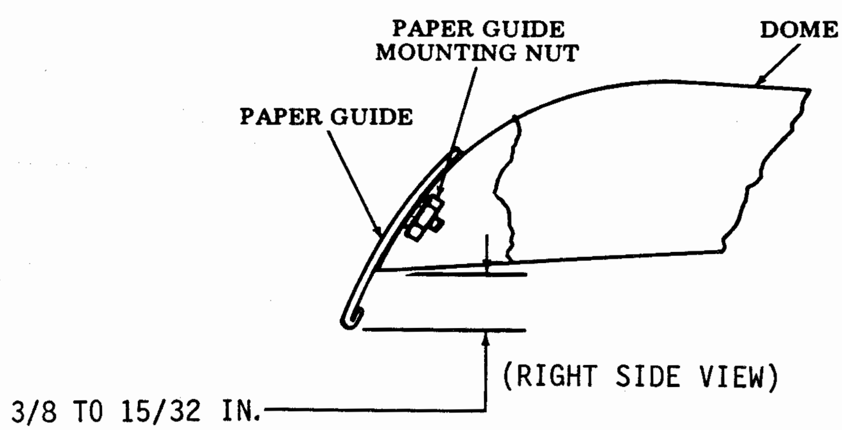



Figure 6-148. Paper Guide

(d) Tighten mounting nuts.

(7) Window. Adjust window as follows:

(a) Refer to figure 6-149.

(b) With window door closed and dome latched, measure clearance between window edge and paper guide: this should be 0.187 inch (minimum) and 0.218 inch (maximum).

(c) Loosen clamp screws and position window to meet requirements.

(d) Tighten clamp screws.

NOTE

Paper guide should clear window when dome is opened. If not, refine Paper Guide adment, paragraph 6-4.1b(6).

(8) Keyboard Hood (KSR Only). Adjust keyboard hood as follows:

(a) Refer to figure 6-150.

(b) As gauged by eye, bottom of keyboard hood should be within 1/16 inch of cover bottom.

(c) Loosen mounting nuts, and posiiton hood (cover removed from base).

(d) Tighten mounting nuts.

(9) Base Hood (RO Only). Adjust base hood as follows:

(a) Refer to figure 6-151.

(b) As gaged by eye, bottom of base hood should be within 1/16 inch of cover bottom.

(c) Loosen mounting nuts and posititon base hood (cover removed from base).

(d) Tighten mounting screws.

(10) Line Guide. Adjust line guide as follows:

(a) Refer to figure 6-152.

(b) As gauged by eye, line guide should be parallel with bottom of window door.

(c) Loosen mounting screws and position line guide mounting bracket.

(d) Tighten mounting screws.

6-4.2 KEYBOARD UNIT ADJUSTMENT (LOW-LEVEL).

a. Keyboard Transmitting Mechanism Adjustments. Perform keyboard transmitting mechanism adjustments in accordance with the following paragraphs.

(1) Shutter Window Gap. Adjust shutter window gap as follows:

(a) Refer to figure 6-153.

(b) Depress LTRS key to move all T levers to their lowermost position

(c) Lift up first and last shutter with approximately 1 ounce of force.

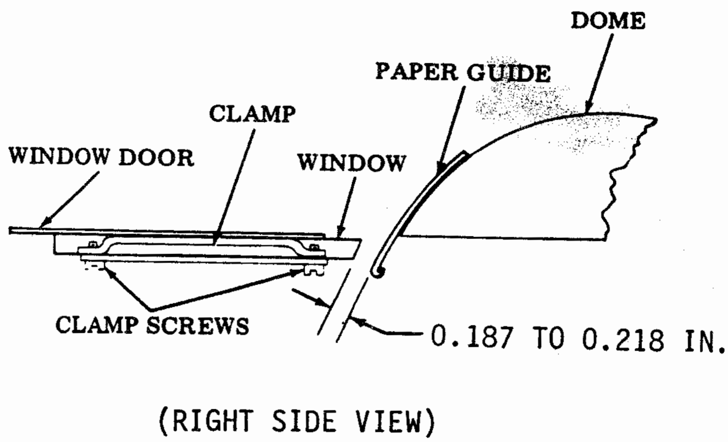
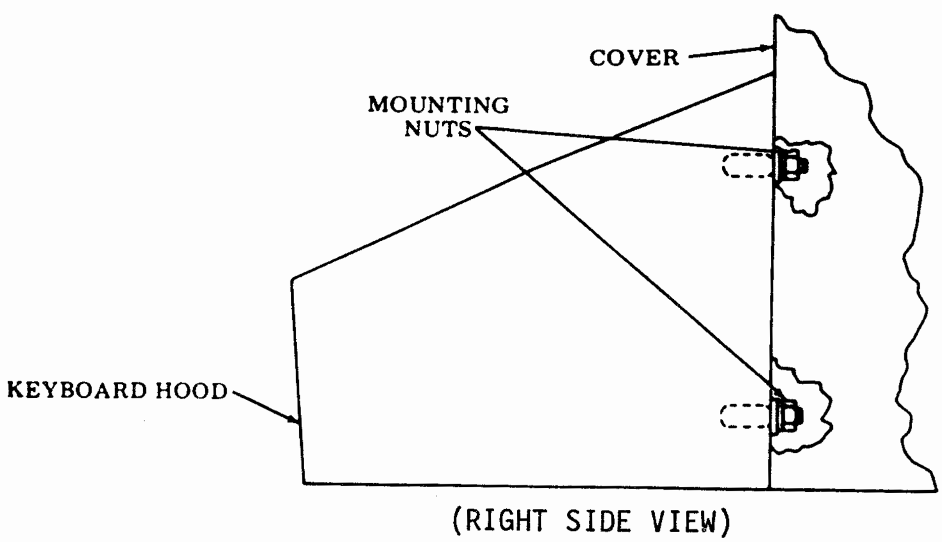



Figure 6-149. Window




Fiqure 6-150. Keyboard Hood (KSR Set Only)

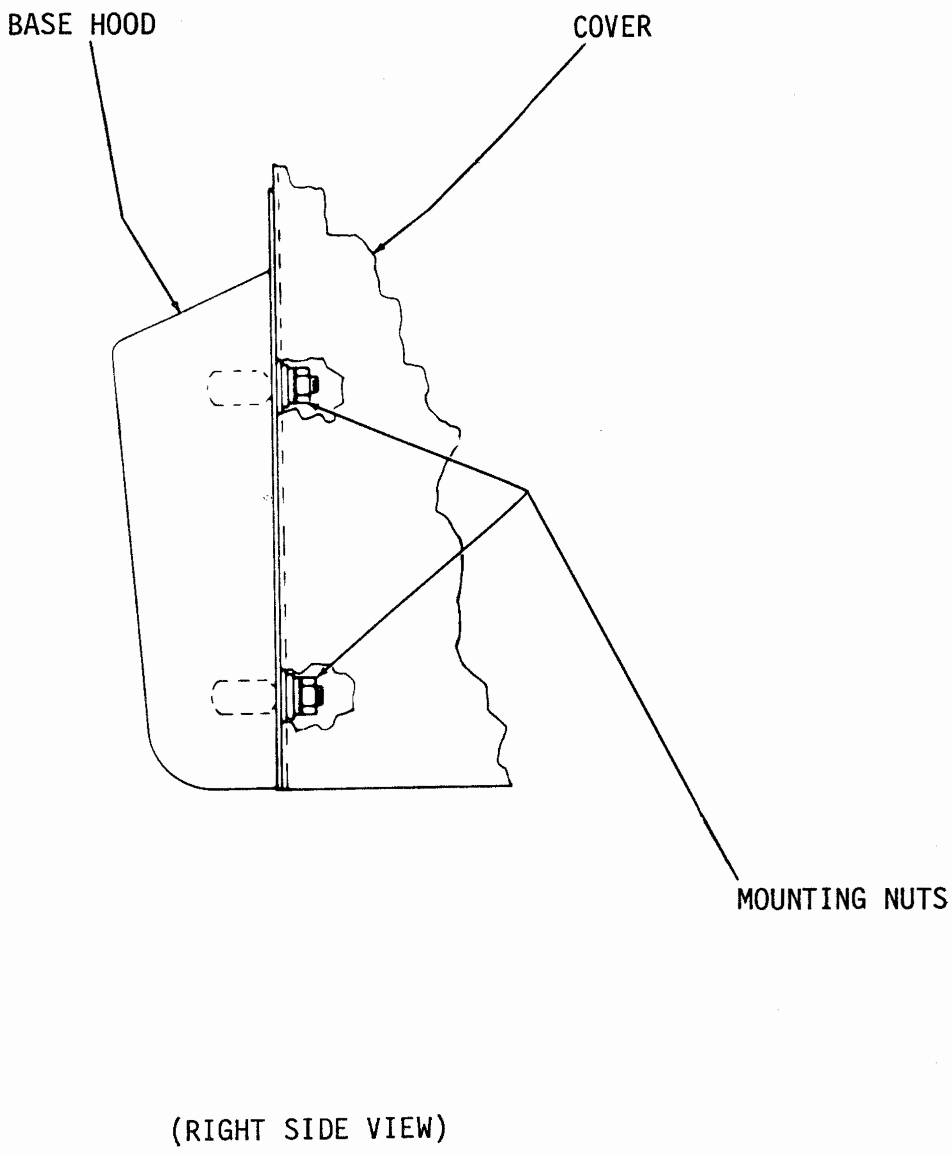
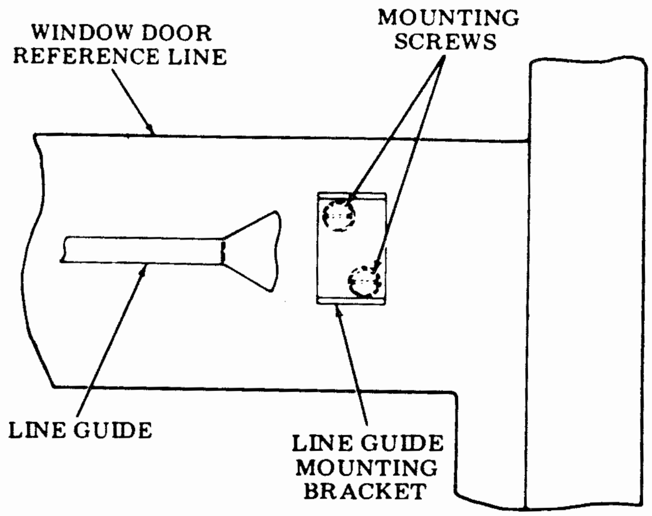



Figure 6-151. Base Hood (RO Set Only)




(FRONT VIEW)

Figure 6-152. Line Guide

(d) Loosen adjusting screws and position lamp assembly to meet requirement: there should be from 0.065 inch (minimum) to 0.075 inch (maximum) gap between upper end of shutter window and shutter gate.

(2) Universal Link. Adjust universal link as follows:

(a) Refer to figure 6-154.

(b) Push universal lever down until latched by latchlever.

(c) Measure clearance between universal link and frame: it should be between 0.089 inch (minimum) and 0.013 inch (maximum).

(d) Insert screwdriver through front and bend tab to adjust.

(3) Universal Link Spring. Adjust universal link spring as follows:

(a) Refer to figure 6-154.

(b) With keyboard tripped, use spring scale to measure force required to start universal link moving: force should be 1/2 ounce (minimum) to 1-1/4 ounce (maximum).

(c) If force required does not match specifications, replace spring.

(4) Keyboard Reset Lever Spring. Adjust keyboard reset lever spring as follows:

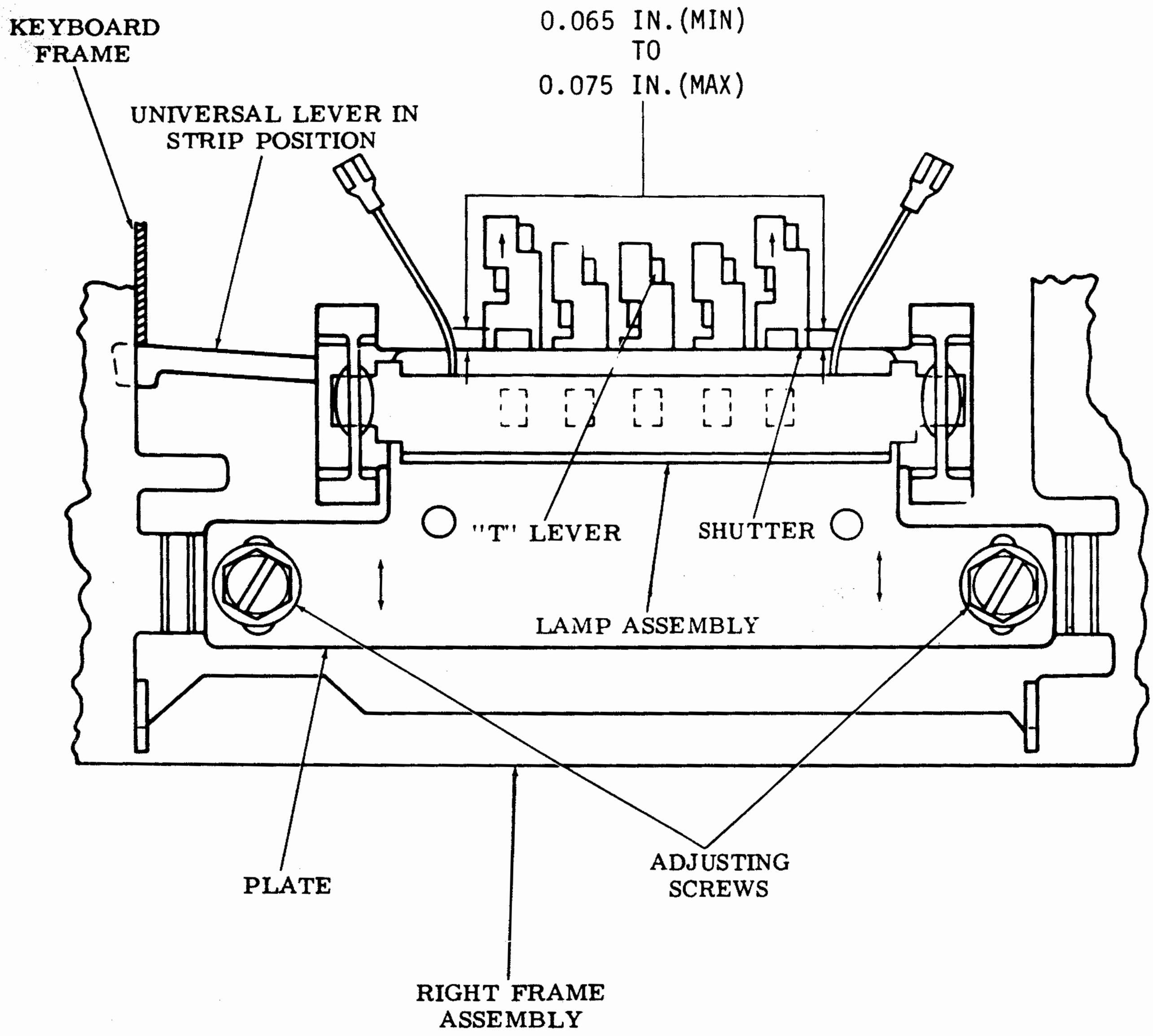



Figure 6-153. Shutter Window Gap

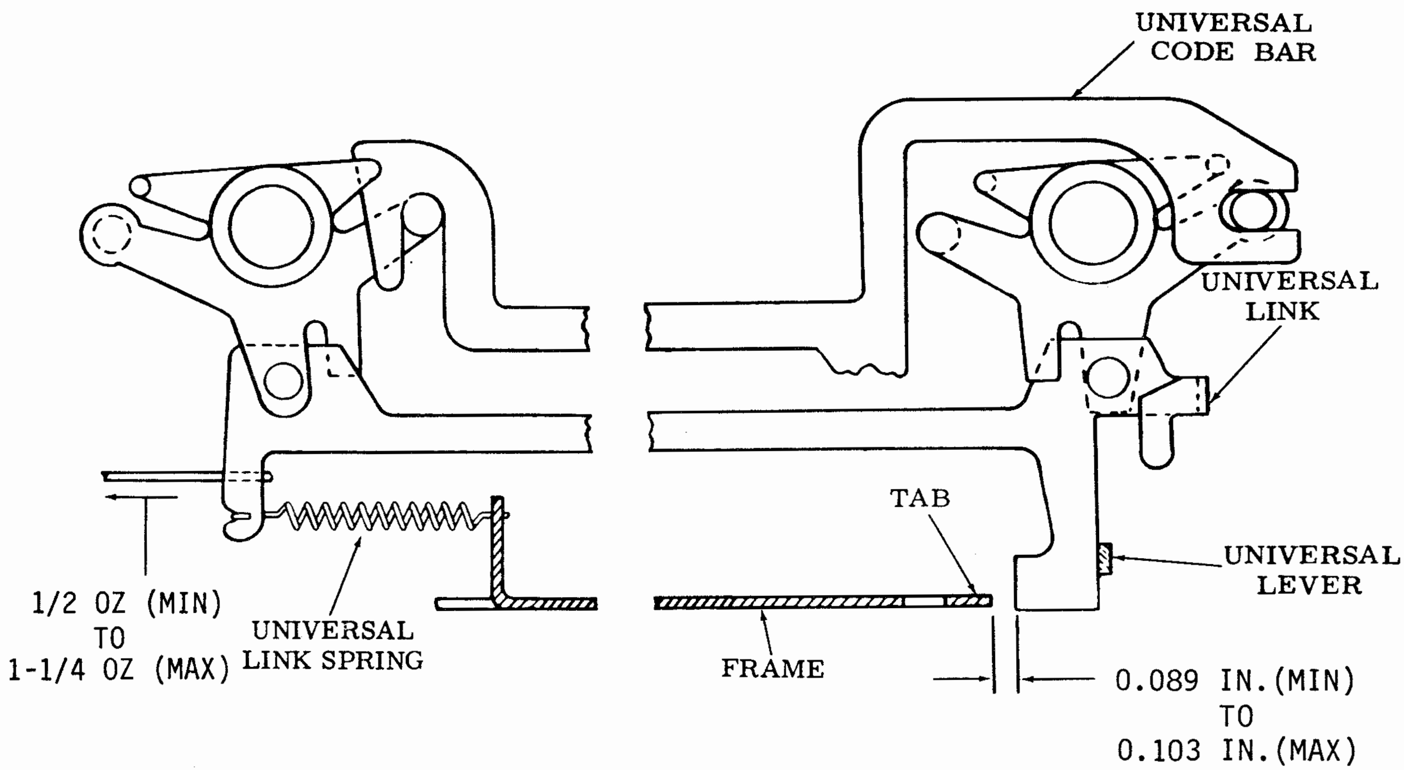



Figure 6-154. Universal Link and Universal Link Spring

(a) Refer to figure 6-155.

(b) With lever latched, use spring scale to measure force required to start lever moving downward: force should be between 24 ounces (minimum) and 28 ounces (maximum).

(c) If force required does not match specifications, replace spring.

b. <u>Distributor Mechanism Adjustments</u>. Perform distributor mechanism adjustments in accordance with the following paragraphs.

(1) <u>Clutch Drum</u> Adjust clutch drum as follows:

(a) Refer to figure 6-156.

(b) With clutch manually disengaged and pressed against clutch drum, measure distance between ring and hub protrusion: this should be between 0.005 inch (minimum) and 0.010 inch (maximum).

(c) To adjust, loosen clutch drum mounting screw and position drum on its shaft.

NOTE

Do not distort ring when measuring clearance.

(d) Gauge (by eye) to see that drive arm is parallel to surface of drum assembly.

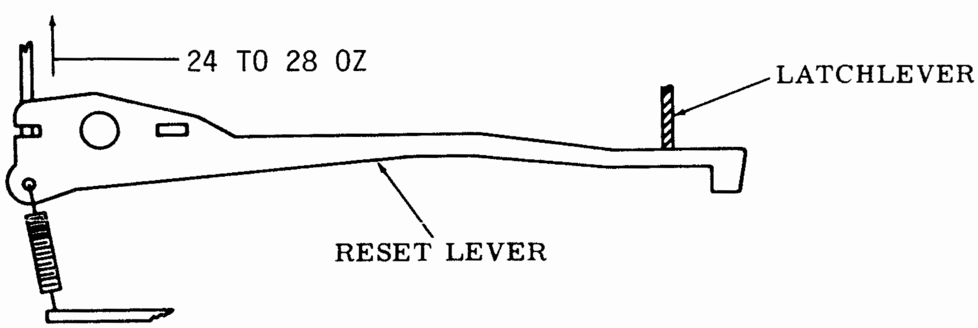



Figure 6-155. Keyboard Reset Lever Spring

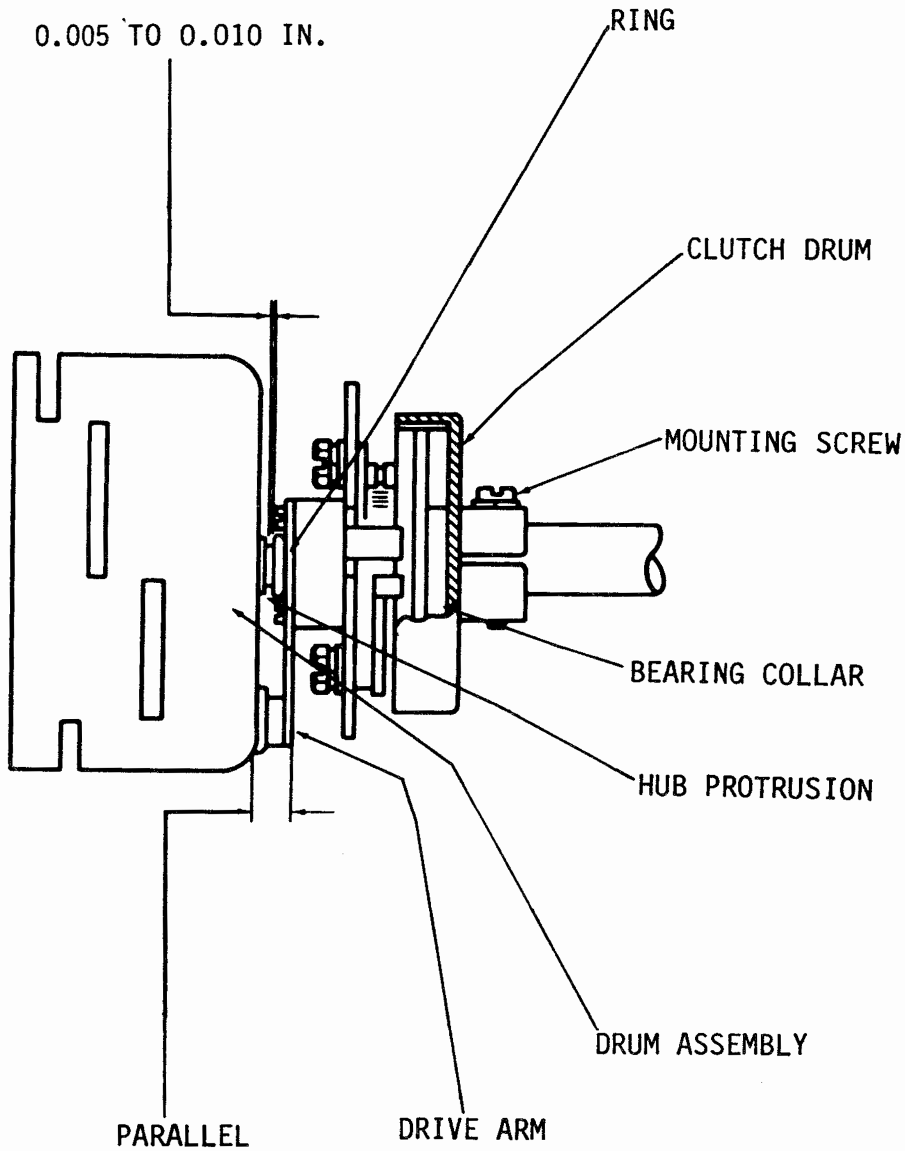



Figure 6-156. Clutch Drum

(e) If not, bend drive arm by hand to meet requirement.

NOTE

Clutch shoes should fully engage drum after adjustment.

(2) Clutch Shoe Lever. Adjust clutch shoe lever as follows:

(a) Refer to figure 6-157.

(b) With clutch engaged, measure clearance between clutch shoe lever and its stop lug.

(c) Repeat same measurement with clutch disengaged.

(d) Measurement b. (clutch engaged) should be from 0.055 inch (minimum) to 0.085 inch (maximum) greater than measurement c.

(e) To adjust, loosen adjusting screws and rotate disc.

(f) Tighten screws.

(3) Clutch Trip Lever. Adjust clutch trip lever as follows:

(a) Refer to figure 6-158.

(b) Clutch trip lever should engage clutch shoe lever by full thickness of the shoe lever.

(c) To adjust, disengage distributor clutch and rotate eccentric post to meet requirement.

(4) Magnet Plate. Adjust magnet plate as follows:

(a) Refer to figure 6-159.

(b) Place distributor in stop position, control lever in remote, and latch bail against armature.

(c) Measure clearance between latch bail and trip lever: it should be from 0.020 inch (minimum) and 0.040 (maximum).

(d) To adjust, loosen both mounting screws and adjust gap by moving pry points.

(e) Tighten mounting screws.

NOTE

If distributor is mounted to keyboard base and mechanically linked to keyboard, depress key to trip keyboard.

(5) Distributor Gear. Adjust distributor gear as follows:

(a) Refer to figure 6-160.

(b) There should be from 0.002 inch (minimum) and 0.005 inch (maximum) backlash between pinion and driven gear.

(c) To adjust, loosen four adjusting screws and position distributor assembly to meet requirement.

(d) Tighten adjusting screws.

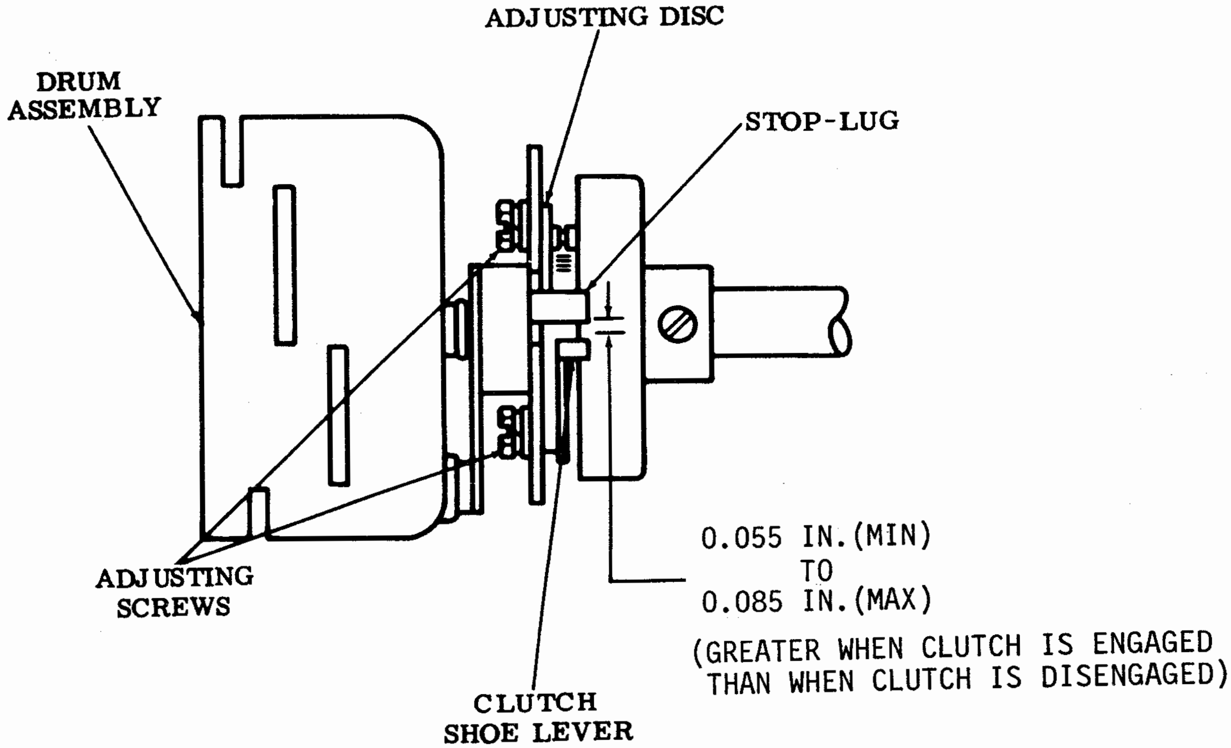



Figure 6-157. Clutch Shoe Lever

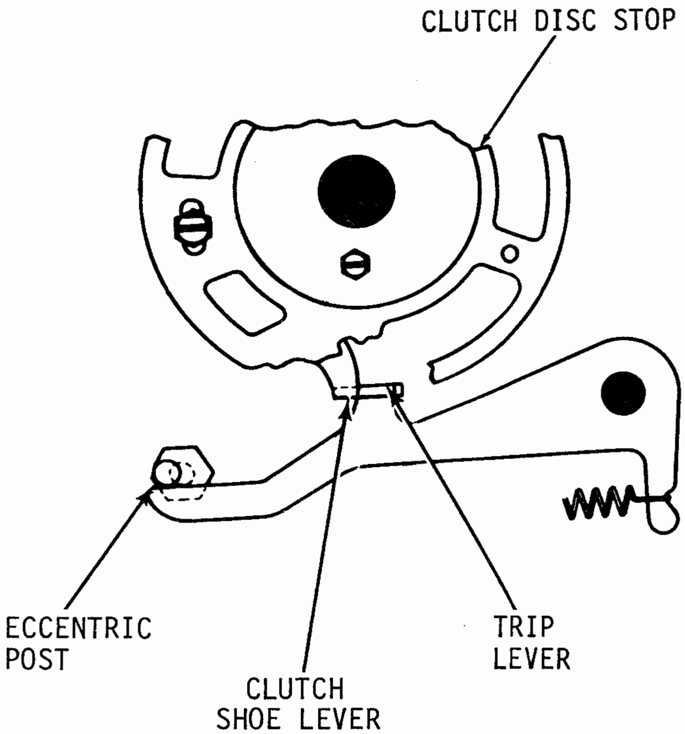



Figure 6-158. Clutch Trip Lever

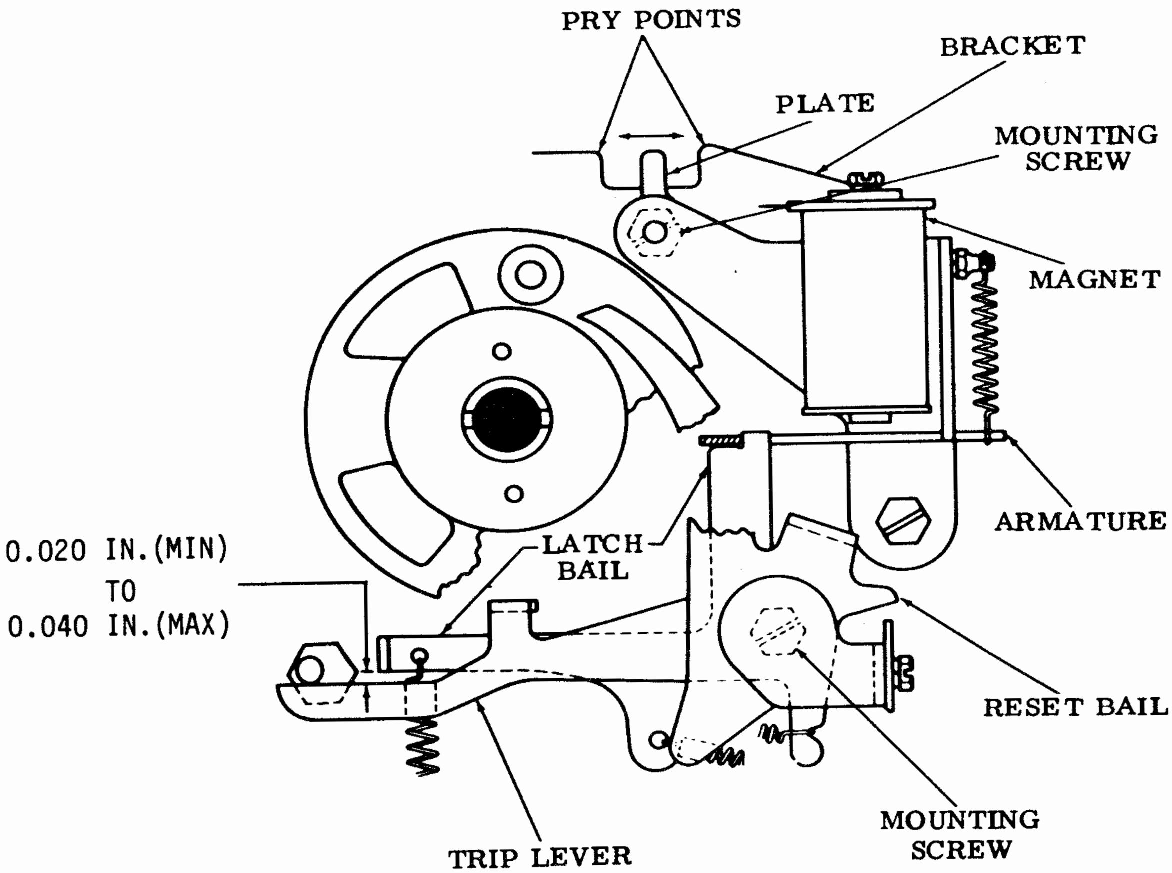



Figure 6-159. Magnet Plate

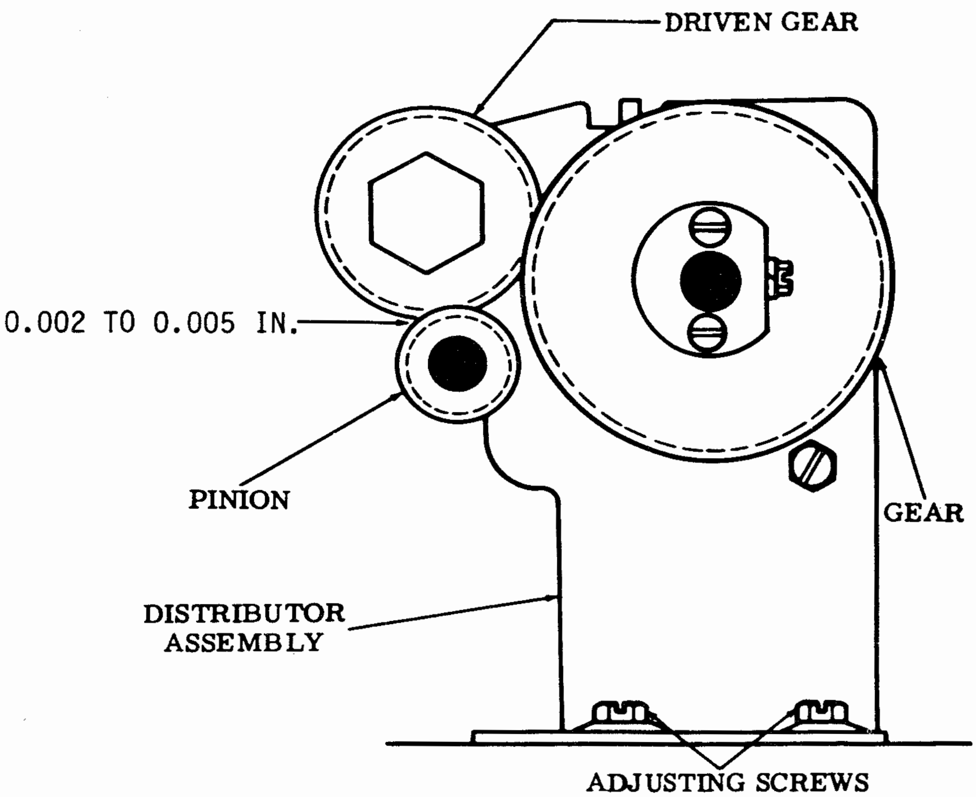



Figure 6-160. Distributor Gear

NOTE

Distributor shaft and pinion gear shaft should remain parallel.

(6) Reset Lever. Adjust reset lever as follows:

(a) Refer to figure 6-161.

(b) Rotate distributor so that roller contacts reset bail at high point of travel.

(c) Measure clearance between latchlever and reset lever: this should be from 0.030 inch (minimum) and 0.045 inch (maximum).

(d) Measure clearance between base and links: this should be from 0.050 inch (minimum) to 0.090 inch (maximum).

(e) To adjust, loosen adjusting screws and position link.

(f) Tighten screws.

(7) Latch Bail. Adjust latch bail as follows:

(a) Refer to figure 6-162.

(b) Place distributor in stop position, keyboard in reset position, and control lever in remote position.

(c) Measure clearance between latch bail and the armature: this should be between 0.010 inch (minimum) and 0.018 inch (maximum).

(d) Loosen mounting screw and move adjusting plate so that it contacts reset bail.

(e) Tighten screw.

(8) Clutch Shoe Lever Spring. Adjust clutch shoe lever spring as follows:

(a) Refer to figure 6-163.

(b) With clutch engaged and cam disc held to prevent turning, use spring scale to pull shoe lever tangent to clutch: it should require a force of from 15 ounces (minimum) to 20 ounces (maximum) to pull lever into contact with stop lug.

(9) Clutch Shoe Spring. Adjust clutch shoe spring as follows:

(a) Refer to figure 6-164.

NOTE

This adjustment should not be performed unless spring tension is suspect, since adjustment necessitates removal of clutch from shaft.

(b) Remove drum; apply spring scale to primary shoe tangent to friction surface.

(c) It should require from 3 ounces (minimum) to 5 ounces (maximum) to start primary shoe moving away from secondary shoe.

(10) Armature Spring. Adjust armature spring as follows:

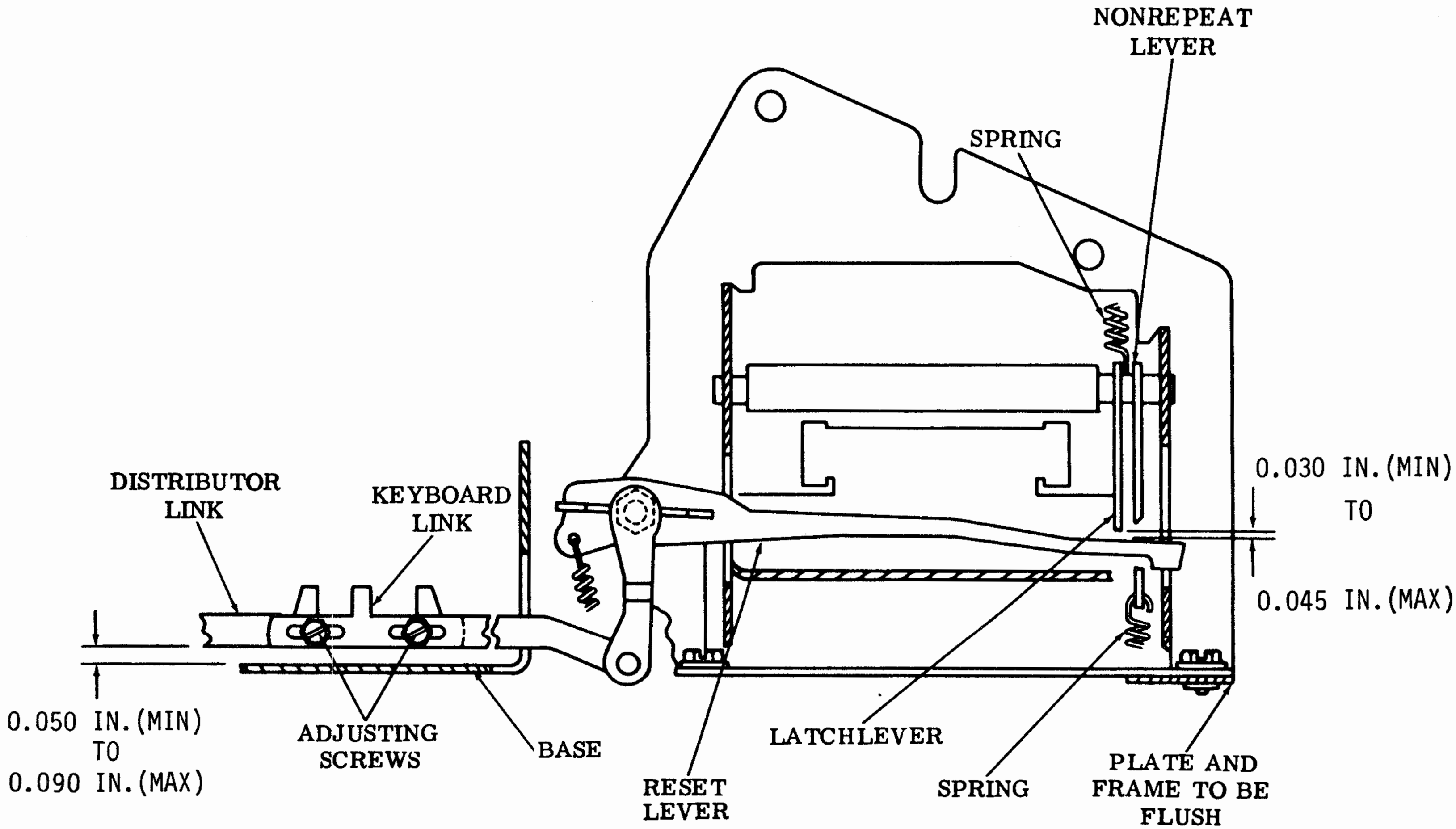



Figure 6-161. Reset Lever

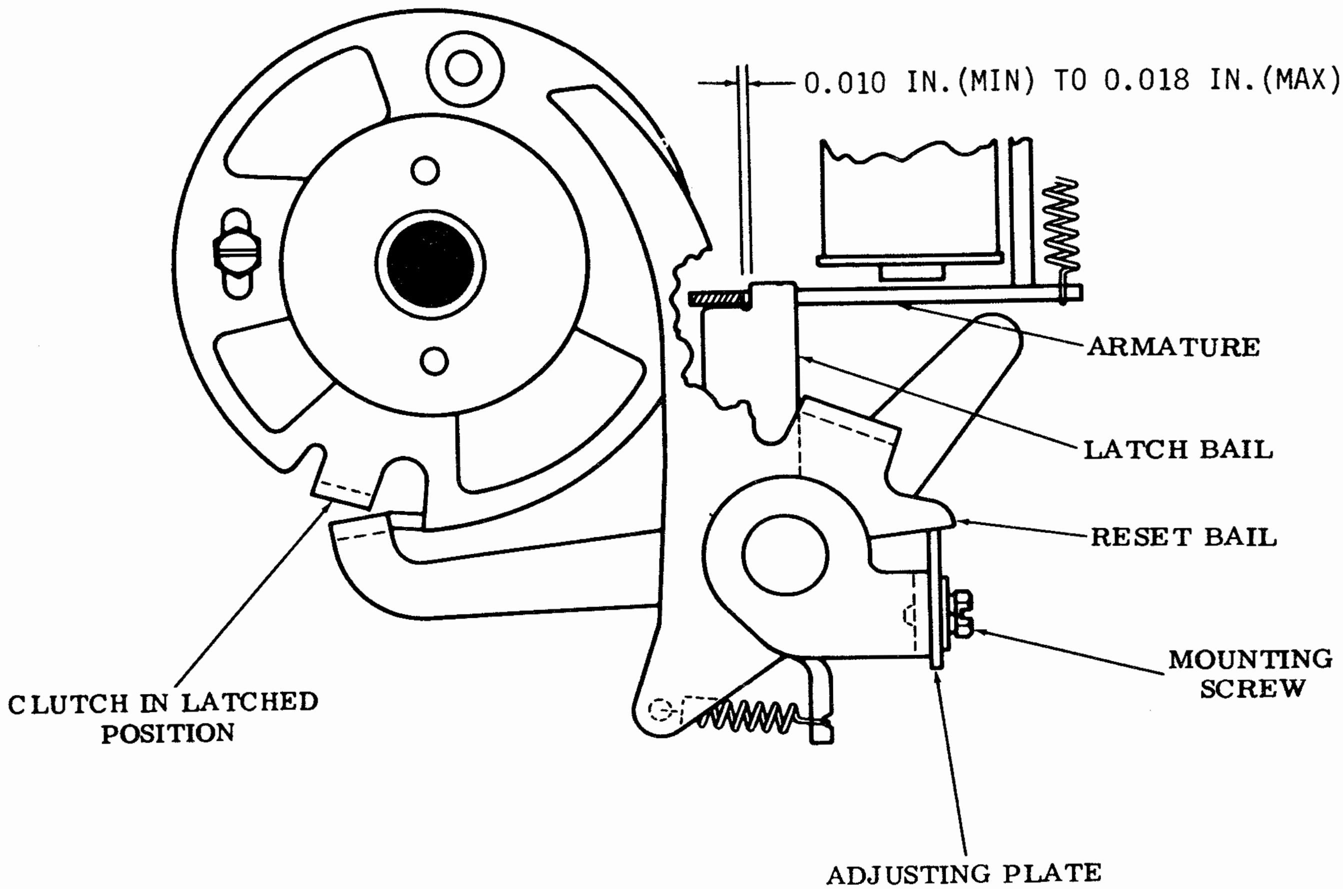



Figure 6-162. Latch Bail

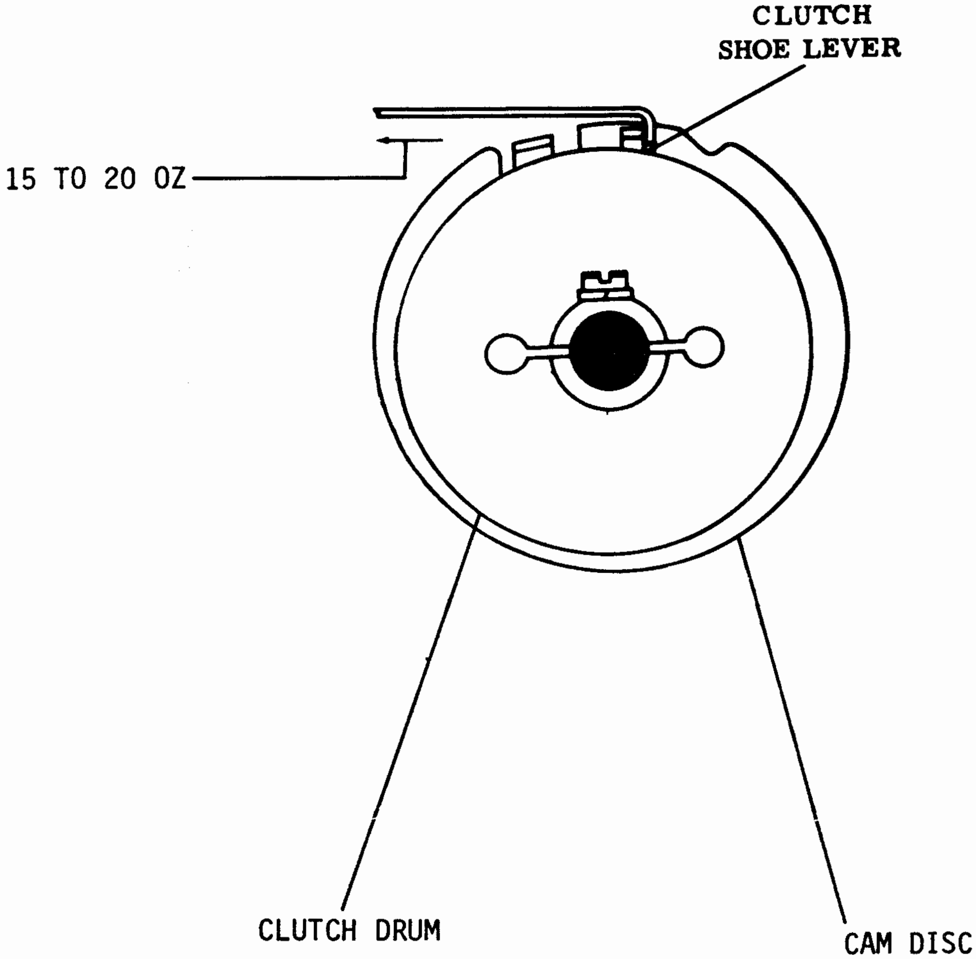



Figure 6-163. Clutch Shoe Lever Spring

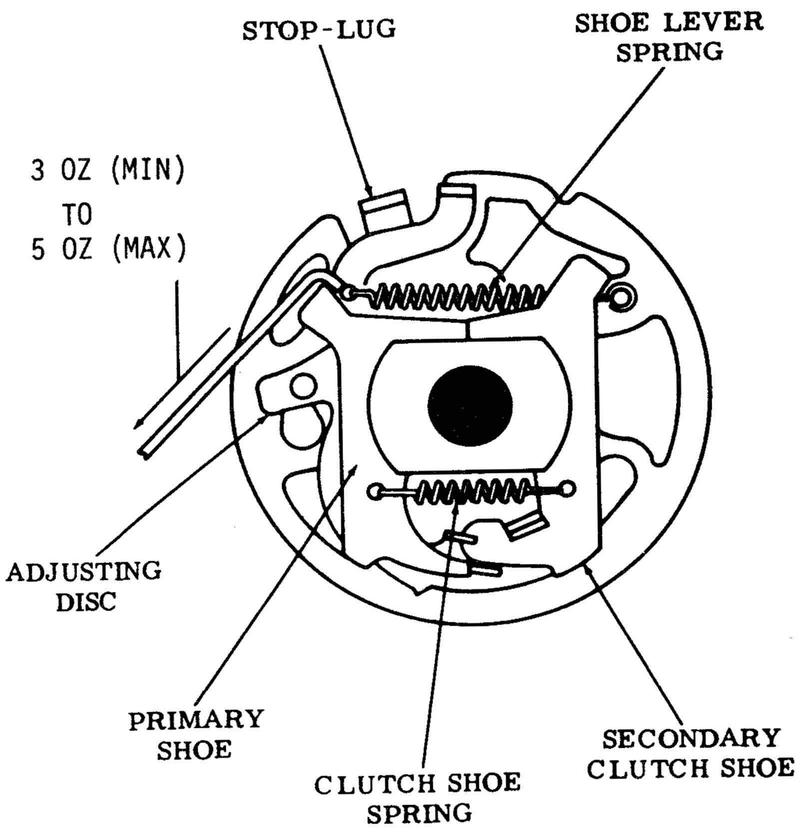



Figure 6-164. Clutch Shoe Spring

(a) Refer to figure 6-165.

(b) Unhook spring from post.

(c) Use spring scale to pull spring to installed length: this should require from 6 ounces (minimum) to 7-1/2 ounces (maximum).

(11) Latch Bail Spring. Adjust latch bail spring as follows:

(a) Refer to figure 6-165.

(b) Use spring scale to measure force required to start latch bail moving: this should be from 3 ounces (minimum) to 4 ounces (maximum).

(12) Latchlever Spring. Adjust latchlever spring as follows:

(a) Refer to figure 6-165.

(b) Use spring scale to measure force required to start latchlever moving: this should be from 2-1/2 ounces (minimum) to 4 ounces (maximum).

(13) Magnet Blocking Lever Spring. Adjust magnet blocking lever spring as follows:

(a) Refer to figure 6-165.

(b) Use spring scale to measure force required to start blocking lever moving: this should be between 20 ounces (minimum) to 26 ounces (maximum).

(14) Trip Lever Spring. Adjust top lever spring as follows:

(a) Refer to figure 6-165.

(b) Use spring scale to measure force necessary to start trip lever moving: this should be from 3 ounces (minimum) to 5 ounces (maximum).

NOTE

Failure to meet requirements in Items (10 through (14) wrrants replacement of specific springs.

SECTION II - ADJUSTMENTS (VARIABLE FEATURES)

6-5. TYPING UNIT ADJUSTMENTS. The following paragraphs describe typing unit adjustments: Variable Feature CPP Teletypewriter sets. (Low-level adjustments apply only to Basic Units).

a. Answer-Back Mechanism Adjustment. Perform answer-back mechanism adjustment in accordance with the following paragraph. Adjust "figures" stunt box contact as follows:

(1) Refer to figure 6-166.

(2) With stunt box mounted on typing unit, manually set up letters combination on typing unit selector.

(3) Rotate typing unit main shaft until function lever is in extreme forward position toward contact insulator.

(4) Rotate typing unit main shaft until function

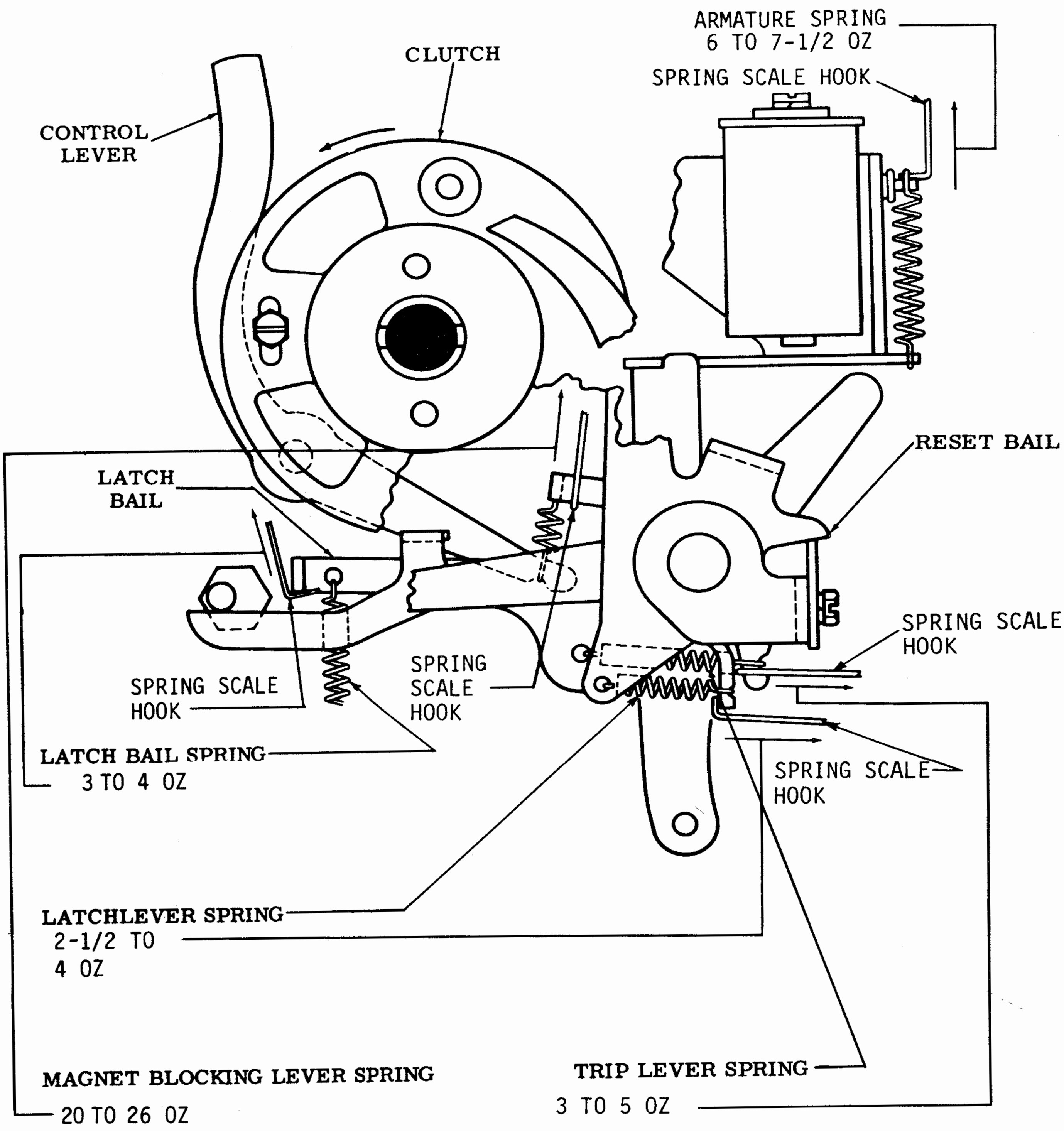



Figure 6-165. Armature, Latch Bail, Latchlever, Magnet Blocking Lever, and Trip Lever Springs

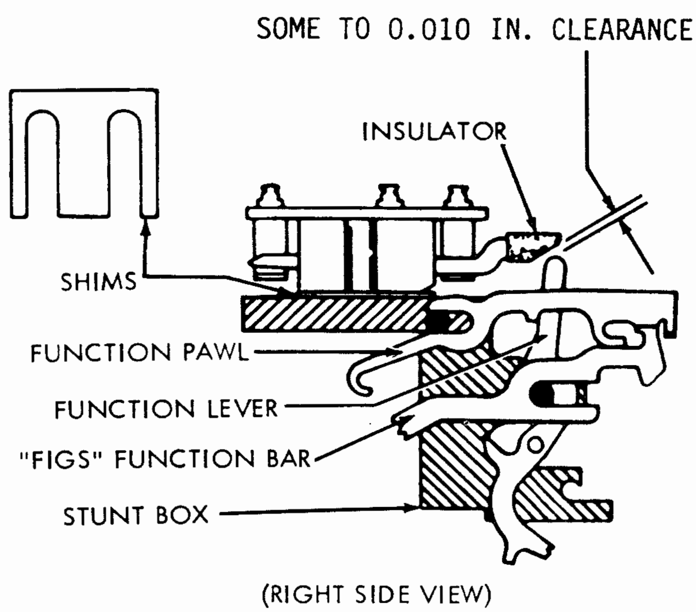



Figure 6-166. "Figures" Stunt Box Contact

lever is in extreme forward position toward contact insulator.

(5) Measure clearance between contact insulator and function lever. There should be some clearance not exceeding 0.010 inch.

(6) If clearance exceeds specified limits, loosen contact mounting screws and add or remove shims to obtain specified clearance.

(7) Tighten mounting screws.

b. Continuous Spacing Mechanism Adjustments. Perform continuous spacing mechanism adjustments in accordance with the following paragraphs.

(1) Carriage Return Lever. Adjust carriage return lever as follows:

NOTE

Before making the following adjustment, check the carriage return lever adjustment. With the stunt box removed, the standard adjusting procedure cannot be followed. Refer to paragraph 6-3.1h(7) and use the procedures described in the following steps.

(a) Refer to figure 6-87.

(b) Place printing carriage on returned position.

(c) Trip function clutch and rotate main shaft until suppression bail is in extreme forward position.

(d) Locate spacing drum so carriage return bail rests against carriage return lever extension.

(e) Measure clearance between carriage return latch bail and carriage return lever. Clearance should be between 0.006 and 0.040 inch.

(f) If clearance exceeds specified limits, loosen clamp screw and position cariage return lever on carriage return latch bail to obtain specified clearance.

(g) Tighten clamp screw.

(2) Reset Bail Operating Spring. Adjust reset bail operating spring as follows:

(a) Refer to figure 6-167.

(b) Place function reset bail in forward position.

(c) Apply spring scale hook to connecting link.

(d) Force required to start bail moving should be between 2-1/4 and 3-1/2 pounds.

(e) If scale reading exceeds specified limits, install new spring.

(3) Suppression Bail Adjusting Bracket. Adjust suppression bail adjusting bracket as follows:

(a) Refer to figure 6-168.

(b) Rotate function clutch until suppression bail is in extreme forward position.

(c) Push carriage return and line feed function slide arms forward manually until carriage return and line feed levers are tripped.

(d) Ensure slide arms rest against slide arm brackets.

(e) Measure clearance between projection on carriage return slide arm and guide bars should be between 0.070 inch and 0.095 inch.

(f) If clearance exceed specified limits, loosen adjusting bracket clamp screw and adjust bracket to obtain specified clearance.

(g) Tighten clamp screw.

(h) Repeat steps (e), (f), and (g).

NOTE

When checking two stop clutches, check clearance with clutch in each position.

(4) Function Clutch Trip Lever. Adjust function clutch trip lever as follows:

(a) Refer to figure 6-169.

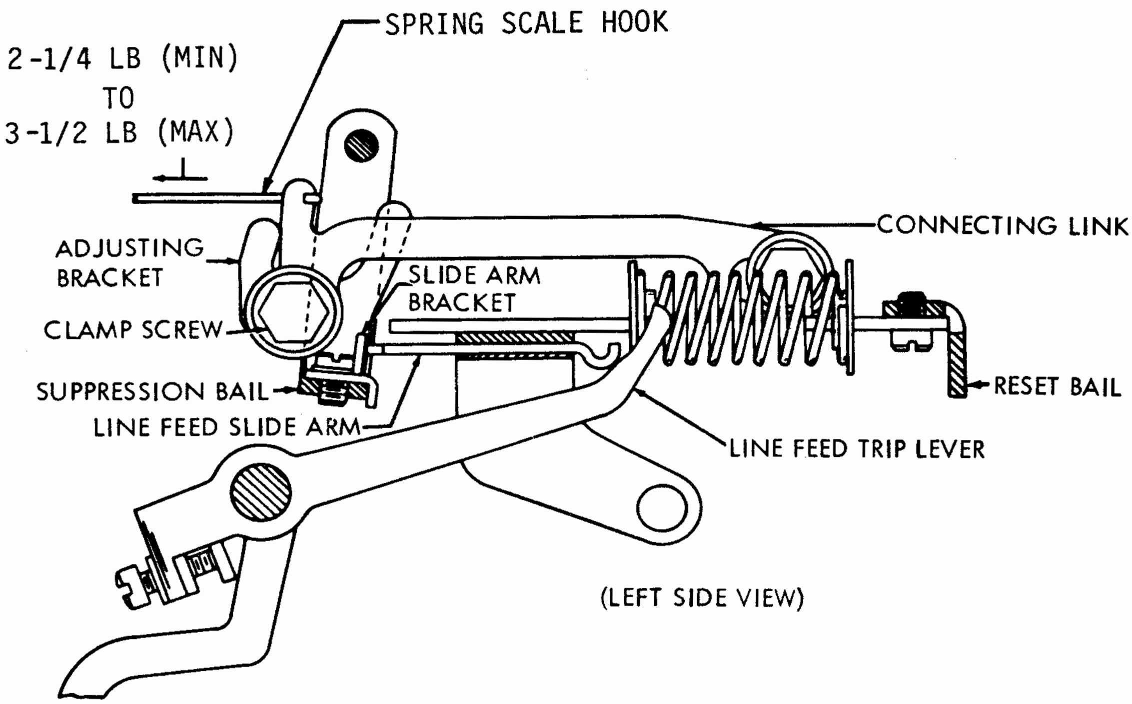



Figure 6-167. Reset Bail Operating Spring

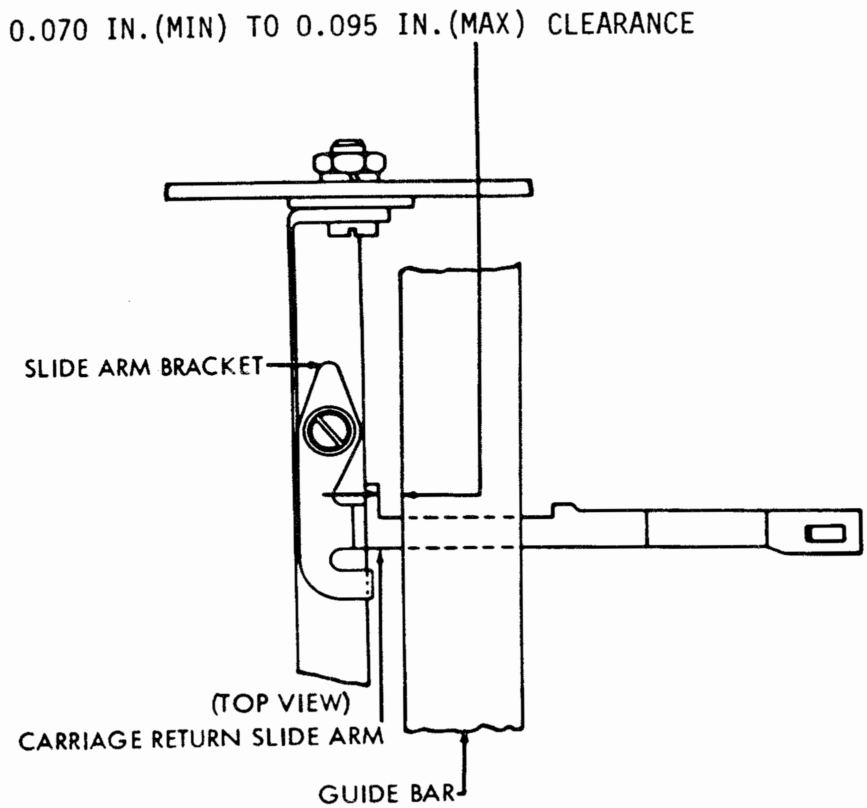



Figure 6-168. Suppression Bail Adjusting Bracket

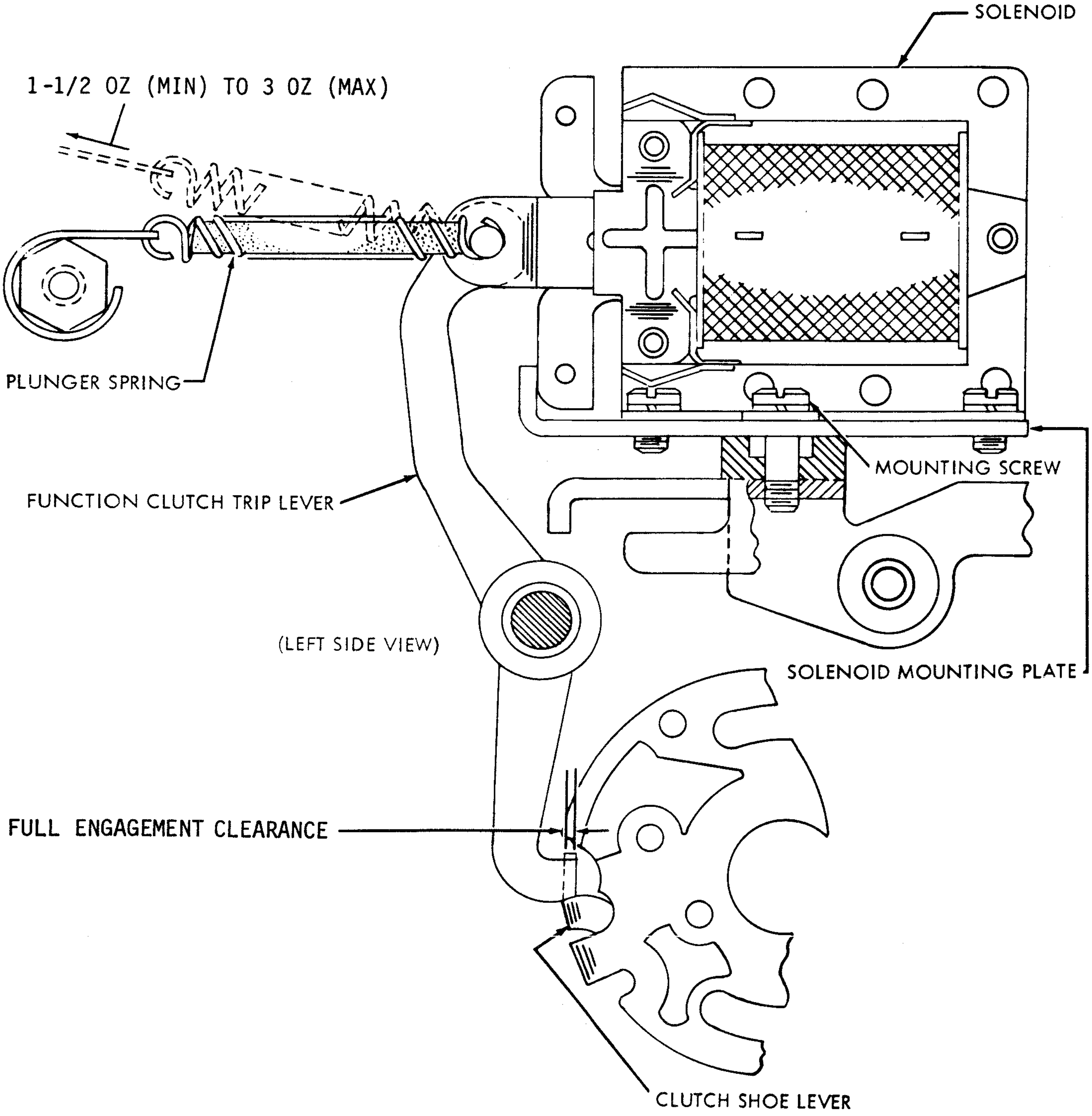



**Figure 6-169. Function Clutch Trip Lever and Solenoid Plunger Spring**

(b) De-energize solenoid.

(c) Disengage function clutch.

(d) Function clutch trip lever should engage clutch shoe lever by full thickness of shoe lever. When checking two-stop clutches, check at lug with least bite.

(e) If engagement is not as specified, loosen mounting screws and position solenoid mounting plate to obtain specified engagement.

NOTE

When positioning the solenoid mounting plate, move each end equally to avoid binding between solenoid plunger and function clutch trip lever.

(f) Tighten mounting screws.

(5) Solenoid Plunger Spring. Adjust solenoid plunger spring as follows:

(a) Refer to figure 6-169.

(b) De-energize solenoid.

(c) Unhook spring end farthest from function clutch trip lever.

(d) Attach spring scale hook to free end of spring.

(e) Force required to pull spring to position length should be between 1-1/2 and 3 ounces.

(f) If scale reading exceeds specified limits, install new spring.

c. DC Magnet Operated Print Suppression Adjustments. Perform DC Manget operated print suppression adjustments in accordance with the following paragraphs.

(1) Armature Extension Clearance. Adjust armature extension as follows:

(a) Refer to figure 6-170.

(b) Release armature.

(c) Measure clearance between end of armature extension and suppression arm. Clearance should be between 0.012 and 0.030 inch.

(d) If clearance exceeds specified limits loosen armature stop screw clamp nut. Position armature with armature stop screw to obtain specified clearance.

(e) Tighten nut.

(f) Perform the adjustment procedure of paragraph 6-5.c.

(2) Blocking Bail Extension Clearance. Adjust blocking bail extension clearance as follows:

(a) Refer to figure 6-170.

(b) Ensure there is no interference between armature extension and blocking bail extension.

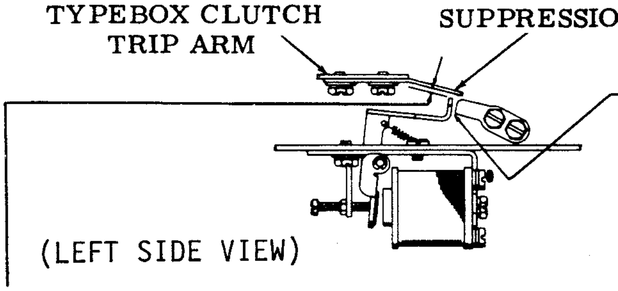



Figure 6-170. Armature Extension Clearance Blocking Bail Extension Clearance

(c) If there is intereference, refine the adjustments of 6-5.c(1) and (2).

(3) Armature Extension Overtravel. Adjust armature extension overtravel as follows:

(a) Refer to figure 6-171.

(b) Place blocking bail extension in position block suppression arm.

(c) Hold armature against magnet pole face.

(d) Measure overtravel of armature extension. Overtravel should be between 0.010 and 0.015 inch.

(e) Ensure there is no clearance between blocking surface of armature extension and bottom surface of suppression arm.

(f) With suppression arm blocked by armature extension, rotate blocking bail extension.

(g) Ensure blocking bail extension slides under suppression arm with no perceptible clearance.

(h) If armature extenson overtravel exceeds specified limits, loosen magnet bracket mounting screws.

(i) Using an eccentric adjusting tool, pivot magnet up or down and front or rear to obtain specified

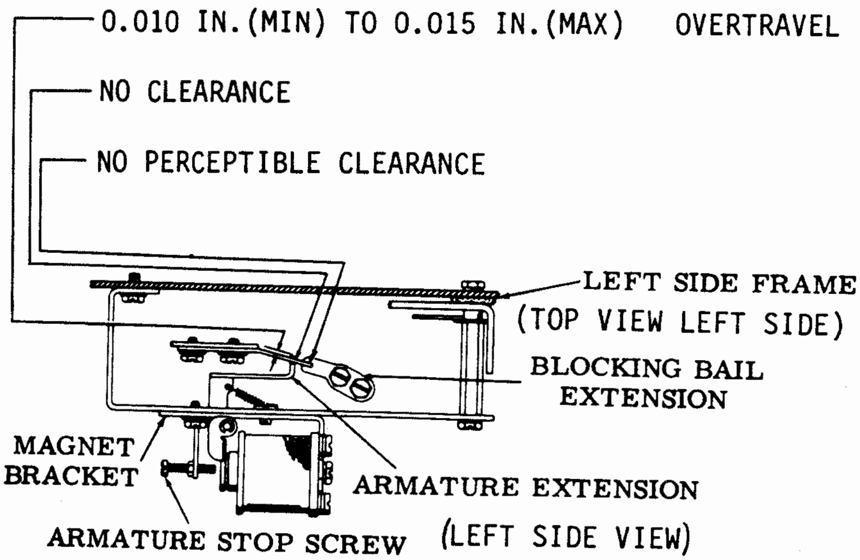



Figure 6-171. Armature Extension Overtravel

overtravel of aramture extension.

(j) Tighten magnet bracket mounting screws.

(k) Press armature extension firmly against bottom of suppression arm. If necessary, add or remove shims between suppression arm and type box clutch trip arm. Recheck paragraph 6-5.c.

(4) Type Box Clutch Trip Lever. Adjust type box clutch trip lever as follows:

(a) Refer to figure 6-172.

(b) Position tripshaft cam follower roller on lowest surface of cam (located on code bar clutch).

(c) Measure clearance between inner face of type box clutch trip lever and clutch disc stop lug. Clearance should be between 0.025 and 0.045 inch.

(d) If clearance exceeds specified limits, loosen clamp screw and position stop to obtain specified clearance.

d. Form Alignment Switch Mechanism Adjustments. Perform alignment switch mechanism in accordance with the following paragraphs.

(1) Form Alignment Switch. Adjust form alignment switch as follows:

CAUTION

Remove power from form alignment switch before performing this adjustment.

(a) Refer to figure 6-173.

(b) Rotate form-out disc until form alignment lever falls into notch.

(c) Lift lever just enough to place a 0.010 inch feeler gauge in notch. Then allow lever to rest on feeler gauge. Switch should be activated.

(d) If switch is not activated, loosen mounting screws.

(e) Position switch at pry points so switch is activated.

(f) Tighten mounting screws.

(g) Rotate disc until lever rests on outer edge. Switch should not be activated.

(h) If switch is activated, loosen mounting screws.

(i) Position switch at pry points so switch is not activated.

(j) Tighten mounting screws.

(k) If steps (b) through (j) were performed, repeat steps (b) through (d).

(2) Form Alignment Switch Spring. Adjust form alignment switch spring as follows:

(a) Refer to figure 6-173.

(b) Rotate form-out disc so form alignment

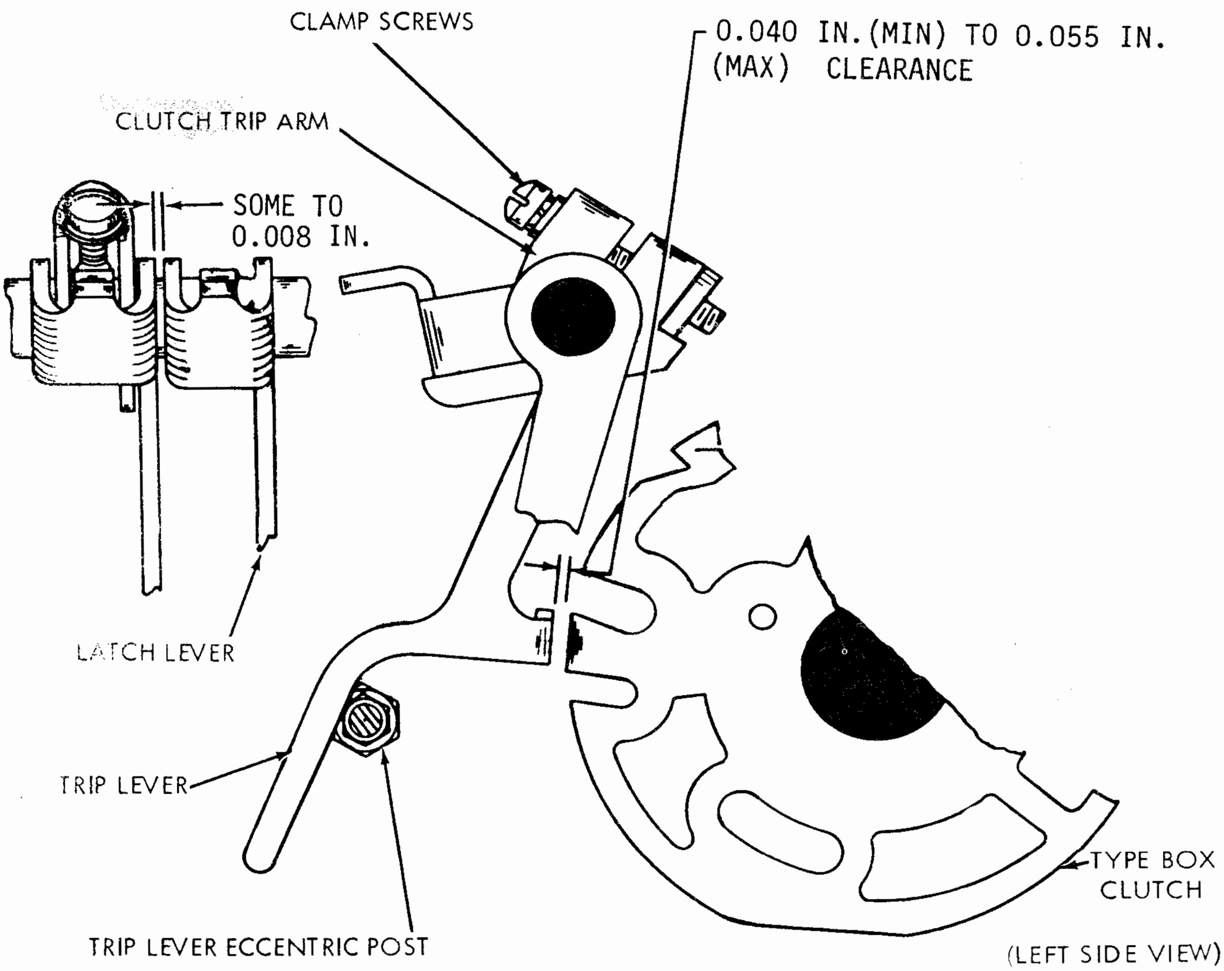



Figure 6-172. Type Box Clutch Trip Lever

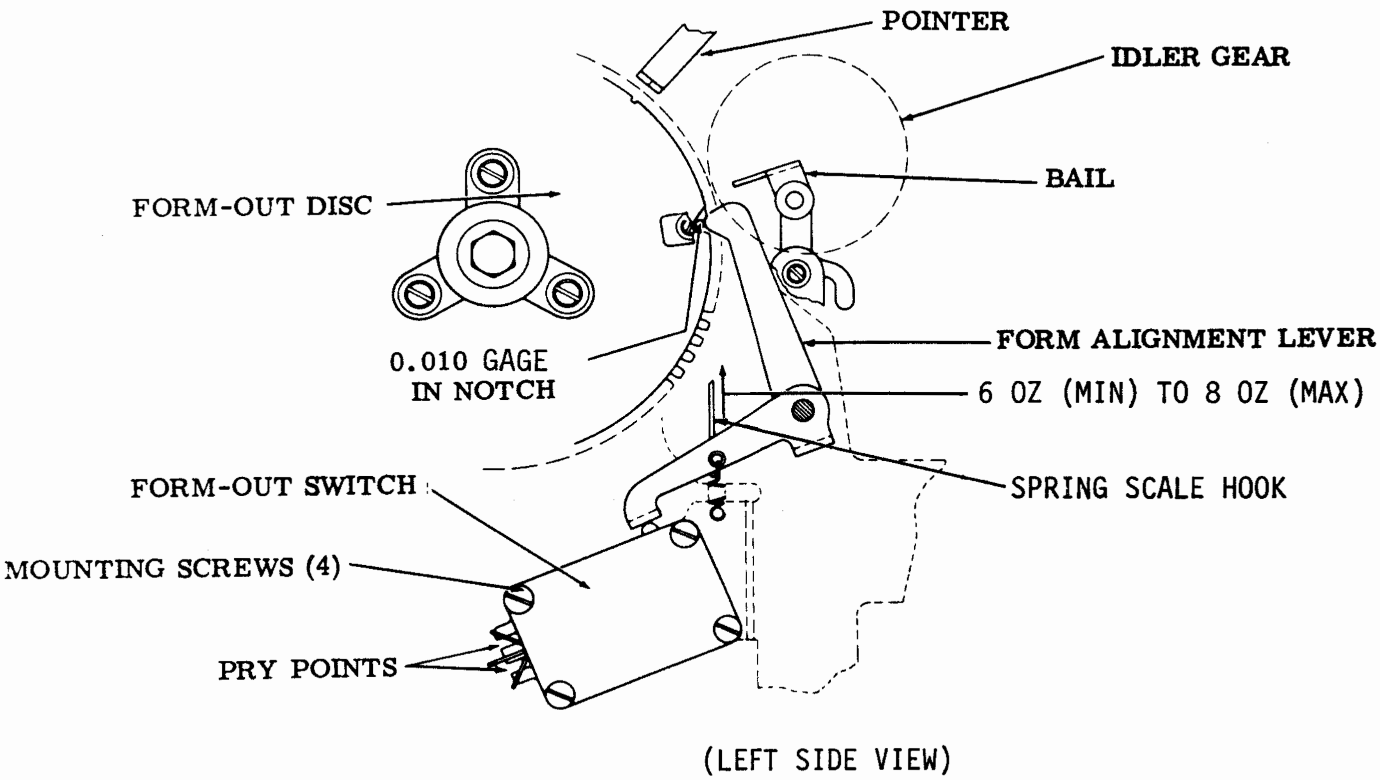



Figure 6-173. Form Alignment Switch and Form Alignment Switch Spring

lever rests on outer edge of disc (not in notch).

(c) Attach spring scale hook to switch operating lever at point of spring attachment.

(d) Force required to move lever from outer edge of disc should be between 6 and 8 ounces.

(e) If scale reading exceeds specified limits, install new spring.

(3) Form Feed-Out Adjustment. The form feed-out adjustment consists of the page feed-out mechanism adjustment procedures described in paragraph 6-5.i.

e. Form Feed-Out Mechanism Adjustment. Perform form feed-out adjustment in accordance with the following paragraph. Adjust form feed-out torsion spring as follows:

(1) Refer to figure 6-174.

(2) Disengage line line feed clutch trip lever.

(3) Attach spring scale hook at lower end of bail.

(4) Force required to start bail moving should be between 1/8 and 1-1/4 ounces for KSR units or between 2 and 6 ounces for RO units.

(5) Is spring scale reading exceeds specified limits, install new spring.

f. Horizontal Tabulator Mechanism Adjustments. Perform horizontal tabulator mechanism adjustments in accordance with the following paragraphs.

(1) Blocking Lever Return Spring. Adjust blocking lever return spring as follows:

(a) Refer to figure 6-175.

(b) Hold 6-extension link to rear.

(c) Attach spring scale hook to blocking lever at junction between blocking and tabulator pawl.

(d) Force required to start blocking lever moving should be between 2-1/2 and 4-1/2 ounces.

(e) If scale reading exceeds specified limits, install new spring.

(2) Tabulator Pawl-Vertical (Final). Adjust tabulator pawl as follows:

(a) Refer to figure 6-175.

(b) Position spacing drum so reference tabulator stop as determined by preliminary tabulator pawl adjustment, paragraph 6-5.f(19) is opposite shoulder on pawl.

(c) Block extension link with blocking lever.

(d) Measure clearance between tabulator pawl and stop. Clearance should be between 0.055 and 0.075 inch.

(e) If clearance is not within

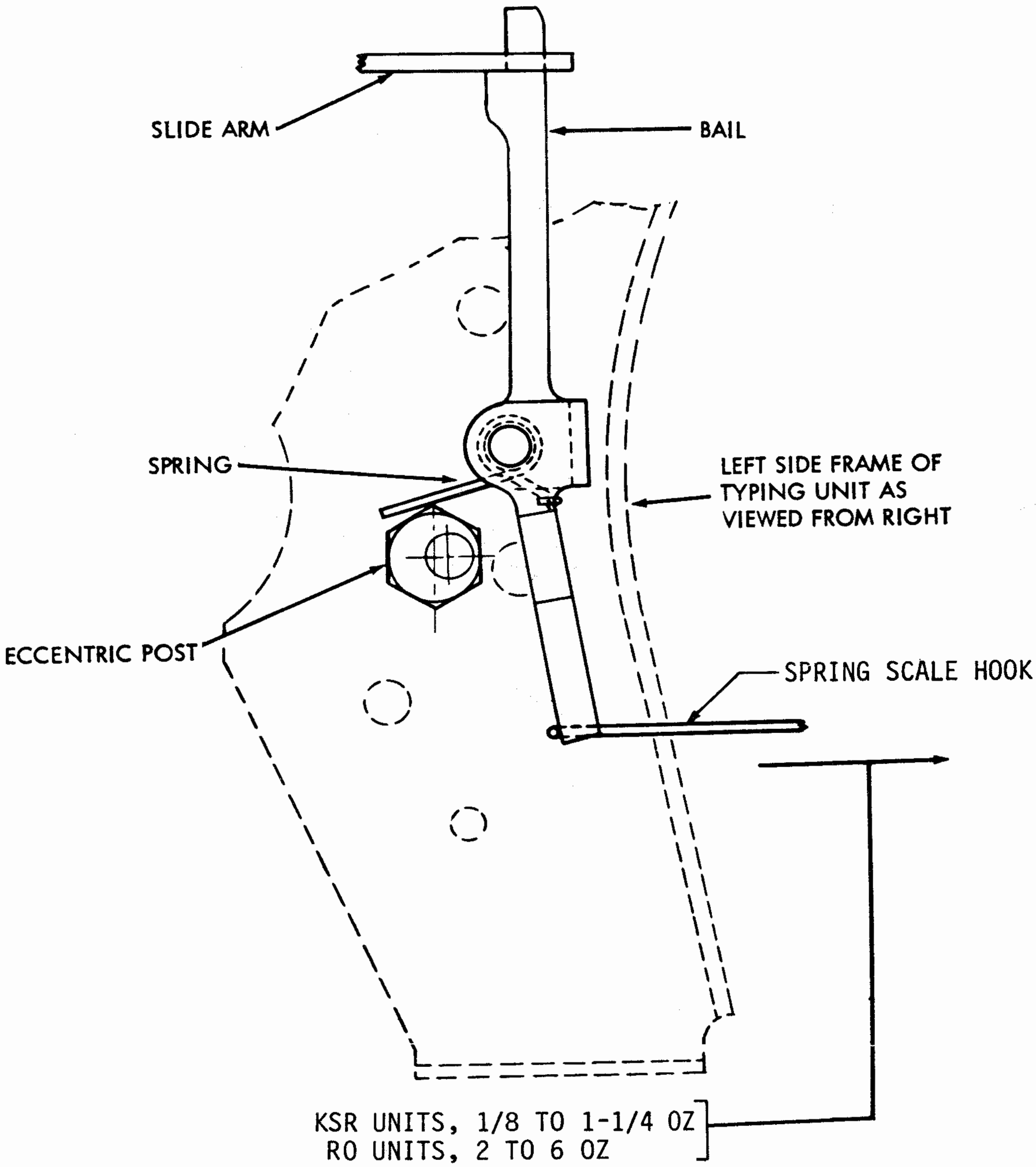



Figure 6-174. Form Feed-Out Torsion Spring

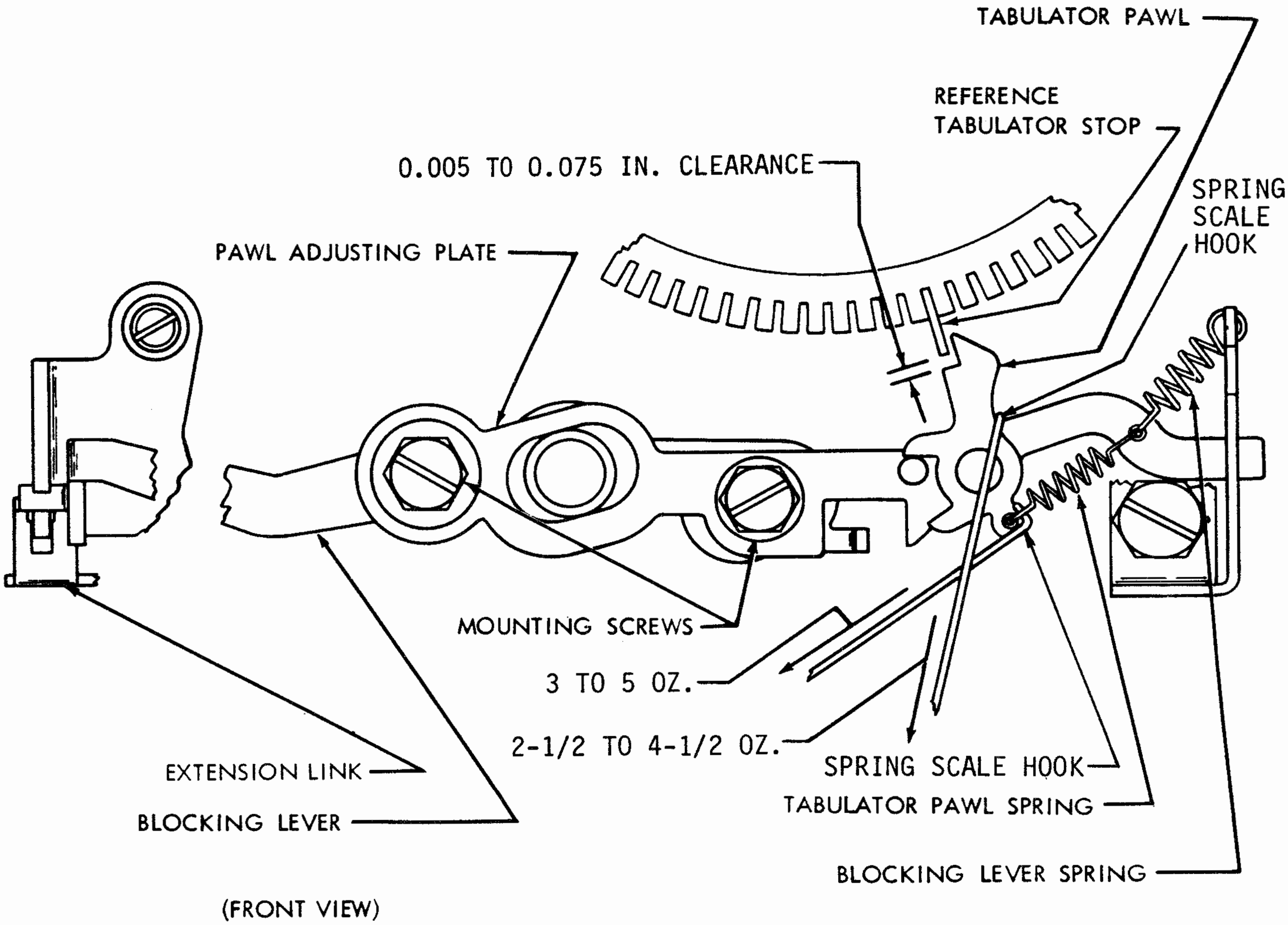



Figure 6-175. Blocking Lever Return Spring, Tabulator Pawl-Vertical (Final) and Tabulator Pawl Spring

specified limits loosen two mounting screws.

(f) Position pawl adjusting plate.

(g) Tighten right screw only, using wrench to prevent bushing from turning.

(3) Tabulator Pawl Spring. Adjust tabulator pawl spring as follows:

(a) Refer to figure 6-175.

(b) Apply spring scale hook to tabulator pawl at point of spring attachment.

(c) Force required to start tabulator pawl moving should be between 3 and 5 ounces.

(d) If scale reading exceeds specified limits, install new spring.

(4) Cam Plate Stripper Bail. Adjust cam plate stripper bail as follows:

(a) Refer to figure 6-176.

(b) Place operating lever and tabulator slide arm in unoperated position.

(c) Rotate spacing clutch until high part of restoring cam is opposite stripper bail.

(d) Measure clearance between restoring cam and stripper bail. Clearance should be between 0.010 and 0.025 inch.

(e) If clearance exceeds specified limits, loosen stripper bail arm so it is friction tight.

(f) Position stripper bail plate on stripper bail to obtain specified clearance.

(g) Tighten screw.

(5) Horizontal Tabulator Slide Arm Spring. Adjust horizontal tabulator slide arm spring as follows:

(a) Refer top figure 6-176.

(b) Place operating lever in operated position.

(c) Place slide arm in unoperated position.

(d) Apply spring scale pushrod to horizontal tabulator slide arm.

(e) Force required to start slide arm moving should be between 1-1/2 and 4-1/2 ounces.

(f) If scale reading exceeds specified limits, install new spring.

(6) Operating Lever Cam Arm Spring. Adjust operating lever cam arm spring as follows:

(a) Refer to figure 6-176.

(b) Place operating lever in unoperated position.

(c) Unlatch horizontal tabulator function pawl.

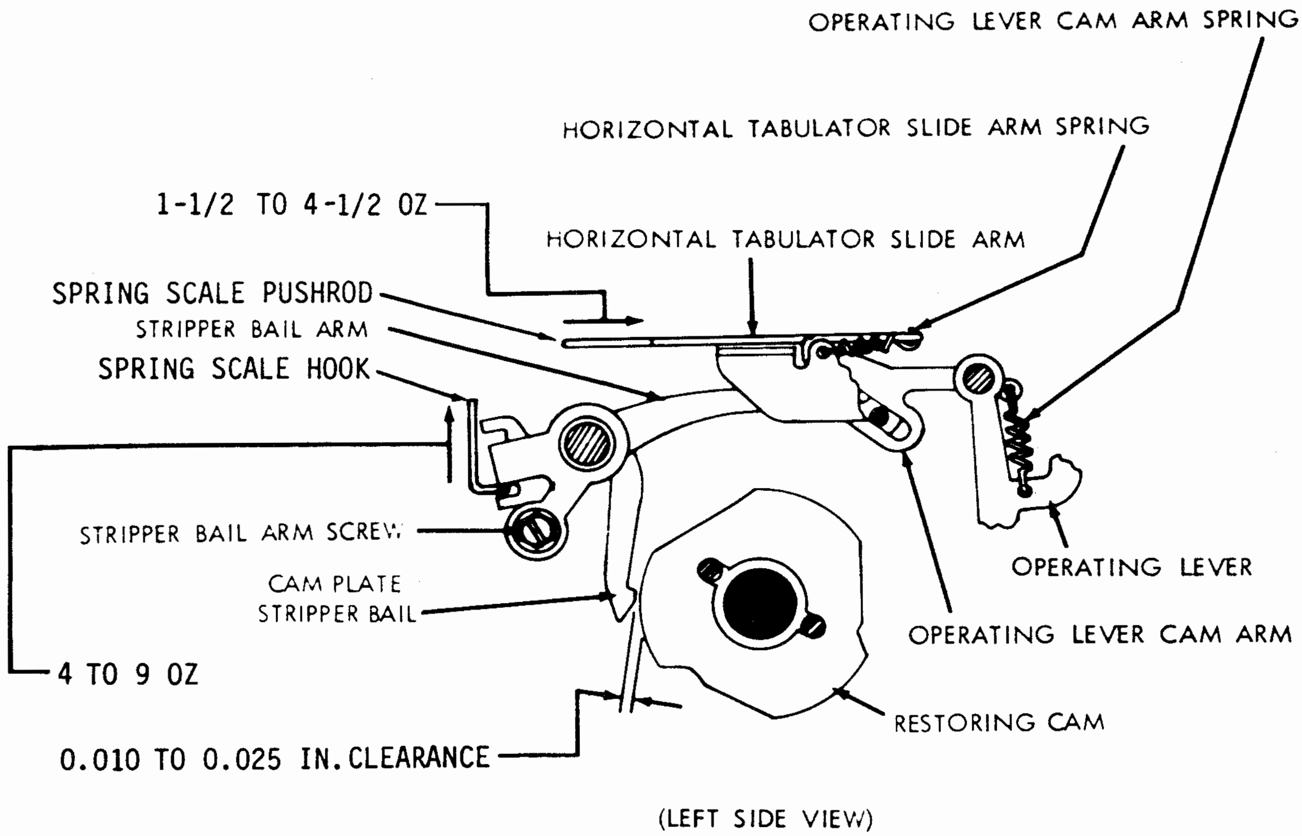



Figure 6-176. Cam Plate Stripper Bail, Horizontal Tabulator Slide Arm Spring, and Operating Lever Cam Arm Spring

(d) Apply spring scale hook to stripper bail arm.

(e) Force required to start stripper bail moving should be between 4 and 9 ounces.

(f) If scale reading exceeds specified limits, install new spring.

(7) Spacing Cutout Transfer Bail Set Collar. Adjust spacing cutout transfer bail set collar as follows:

(a) Refer to figure 6-177.

(b) Measure spacing cutout transfer bail set collar end play.

(8) Clutch Trip Lever Spring. Adjust clutch trip lever spring as follows:

(a) Refer to figure 6-178.

(b) Engage spacing clutch.

(c) Rotate clutch until trip lever rest on stop lug.

(d) Attach spring scale hook to clutch trip lever at point of sprng attachment.

(e) Force required to move trip lever away from stop lug should be between 11-1/2 and 14-1/4 ounces.

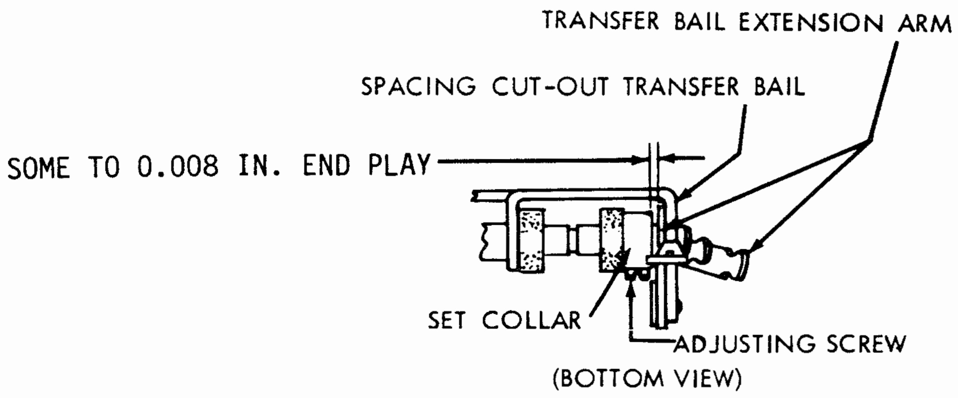



Figure 6-177. Spacing Cut-Out Transfer Bail Set Collar

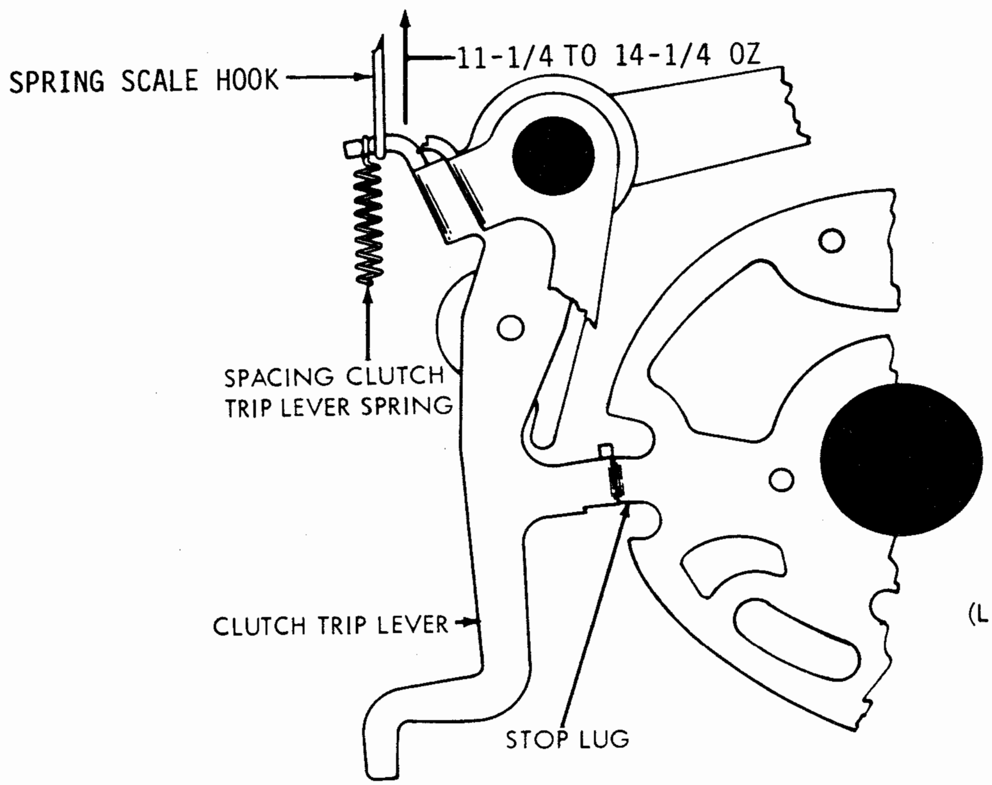



Figure 6-178. Clutch Trip Lever Spring

(f) If scale reading exceeds specified limits, install new spring.

(9) Spacing Clutch Stop Lever. Adjust spacing clutch stop lever as follows:

(a) Refer to figure 6-179.

(b) Disengage spacing clutch.

(c) Place trip lever arm and intermediate bail in their upward position.

(d) Outer surface of trip lever should be flush with outer surface of shoe lever or under-flush to 0.010 inch when checked at stop lug with least bite.

(e) If surfaces are not flush within specified limits, loosen adjusting screw until it becomes friction tight and position spacing clutch stop lever.

(f) Tighten screw. Repeat adjustment of latch bail adjusting plate, paragraph 6-5.f(11).

(10) Intermediate Bail Spring. Adjust intermediate bail spring as follows:

(a) Refer to figure 6-180.

(b) Place stop arm and intermediate bail in unoperated position.

(c) Unhook one end of spring.

(d) Attach spring scale hook to free end of spring.

(e) Force required to extend spring to installed length should be between 1-1/2 to 3-1/2 ounces.

(f) If scale reading exceeds specified limits, install new spring. Otherwise, reconnect free end of spring.

(11) Latch Bail Adjusting Plate. Adjust latch bail adjusting plate as follows:

(a) Refer to figure 6-180.

(b) Position operating lever extension link to rear and latch it on blocking lever.

(c) Place latch bail in fully latched position.

(d) Push forward on space suppression bail to disengage spacing trip lever from intermediate bail.

(e) Measure clearance between clutch stop arm and clutch shoe lever having least clearance. There should be some clearance not to exceed 0.008 inch.

(f) If clearance exceeds specified limits, loosen mounting screws.

(g) Position latch bail adjusting plate to obtain specified clearance.

(h) Tighten mounting screws.

(12) Trip Lever Arm Latch Bail. Adjust trip lever arm latch bail as follows:

(a) Refer to figure 6-181.

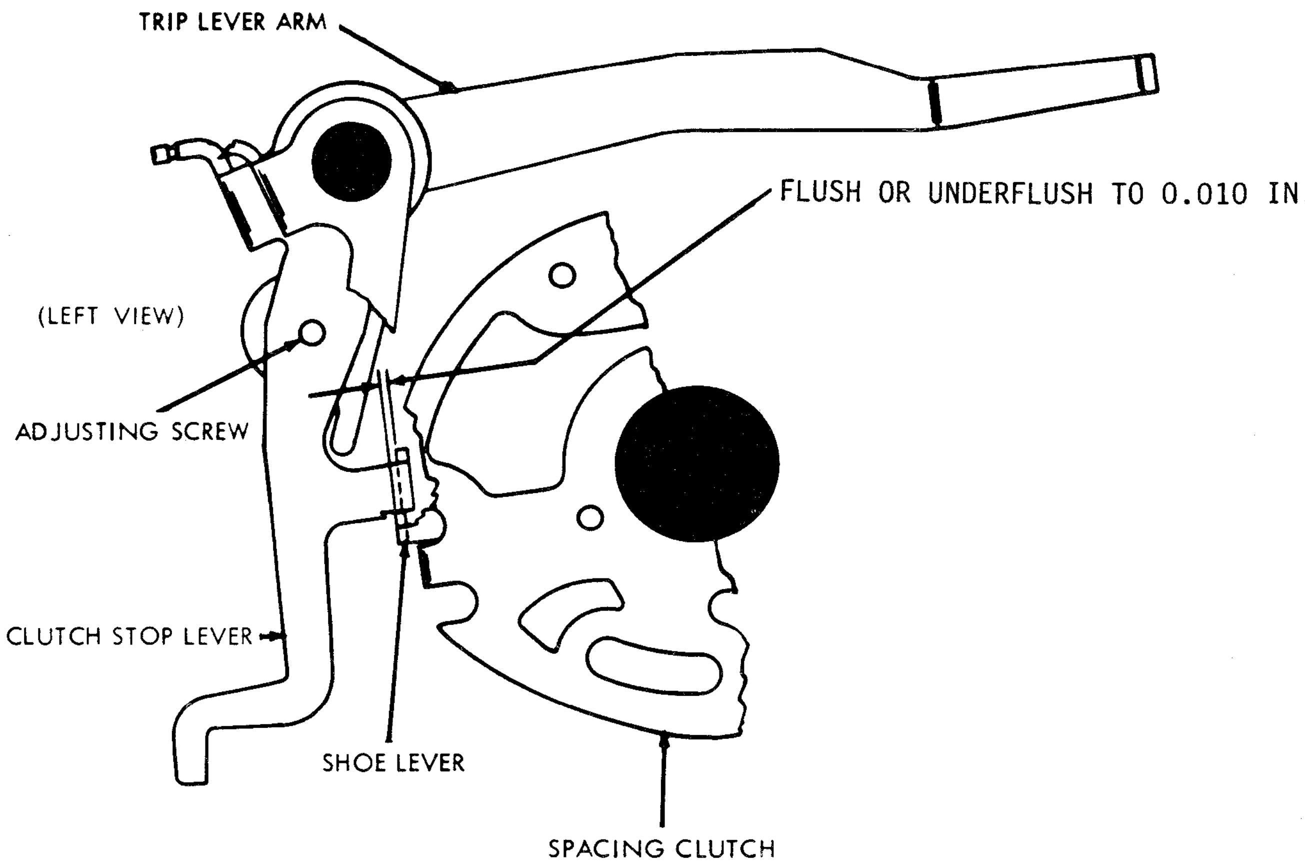



Figure 6-179. Spacing Clutch Stop Lever

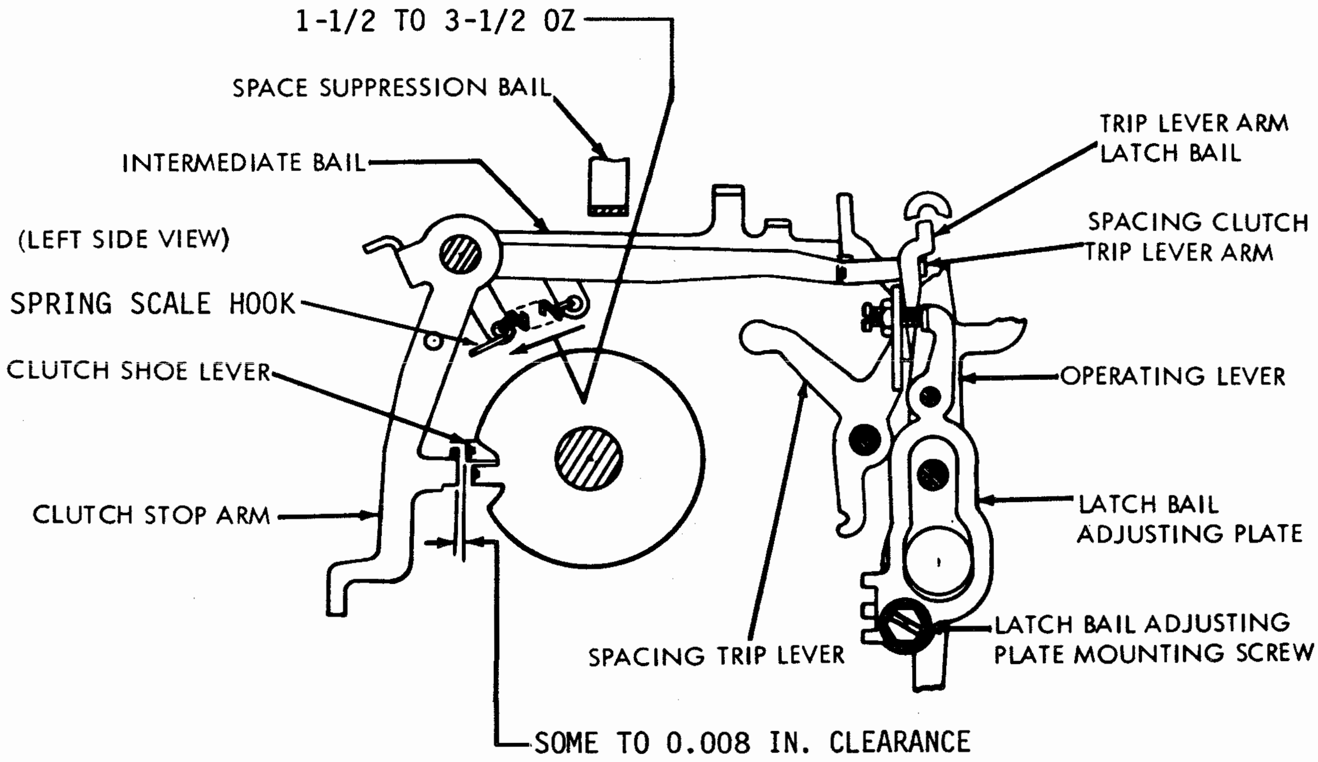



Figure 6-180. Intermediate Bail Spring and Latch Bail Adjusting Plate

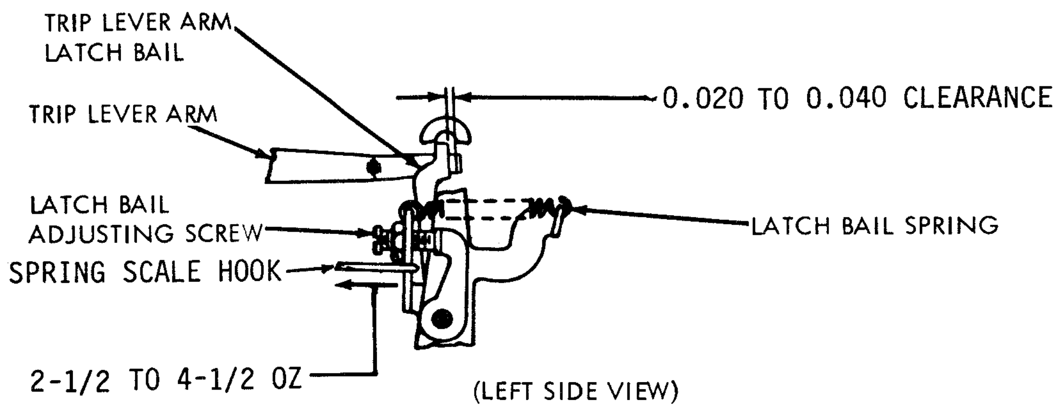



Figure 6-181. Trip Lever Arm Latch Bail and Trip Lever Arm Latch Bail Spring

(b) Place operating lever in operated position.

(c) Position trip lever upward.

(d) Measure clearance between trip lever arm and trip lever arm latch bail. Clearance should be between 0.020 and 0.040 inch.

(e) If clearance exceeds specified limits, loosen latch bail adjusting screw locknut and position adjusting screw to obtain specified clearance between trip lever arm and trip lever arm latch bail.

(f) Tighten locknut.

(13) Trip Lever Arm Latch Bail Spring. Adjust trip lever arm latch bail spring as follows:

(a) Refer to figure 6-181.

(b) Place operating lever in unoperated condition.

(c) Attach spring scale hook.

(d) Force required to start latch bail moving should be between 2-1/2 and 4-1/2 ounces.

(e) If scale reading exceeds specified limits, install new spring.

(14) Operating Lever Adjusting Plate. Adjust operating lever adjusting plate as follows:

(a) Refer to figure 6-182.

(b) Place operating lever in unoperated position.

(c) Take up play in extension link and blocking lever to minimize clearance between front end of extension link and lower projection of blocking lever.

(d) Measure clearance. Clearance should be between 0.020 and 0.045 inch.

(e) If clearance exceeds specified limits, loosen mounting screws. Position adjusting plate on bracket to obtain specified clearance.

(f) Tighten mounting screws.

NOTE

If unit is equipped with a transmitter control contact, check transmitter control contact gap adjustment, paragraph 6-3.2f(22), and readjust gap, if necessary.

(15) Operating Lever Eccentric Link. Adjust operating lever extension link as follows:

NOTE

Prior to this adjustment, check the function reset bail blade adjustment, paragraph 6-3b(6).

(a) Refer to figure 6-183.

(b) If unit has two-stop function clutch, disengage function clutch, rotate type box clutch 1/2 revolution past stop position. If unit has one-stop function clutch, rotate function clutch until function pawl stripper blade is in its lower position and fucntion reset bail roller is on high part of its cam.

(c) Pull horizontal tabulator function pawl to rear until it latches on its function bar.

NOTE

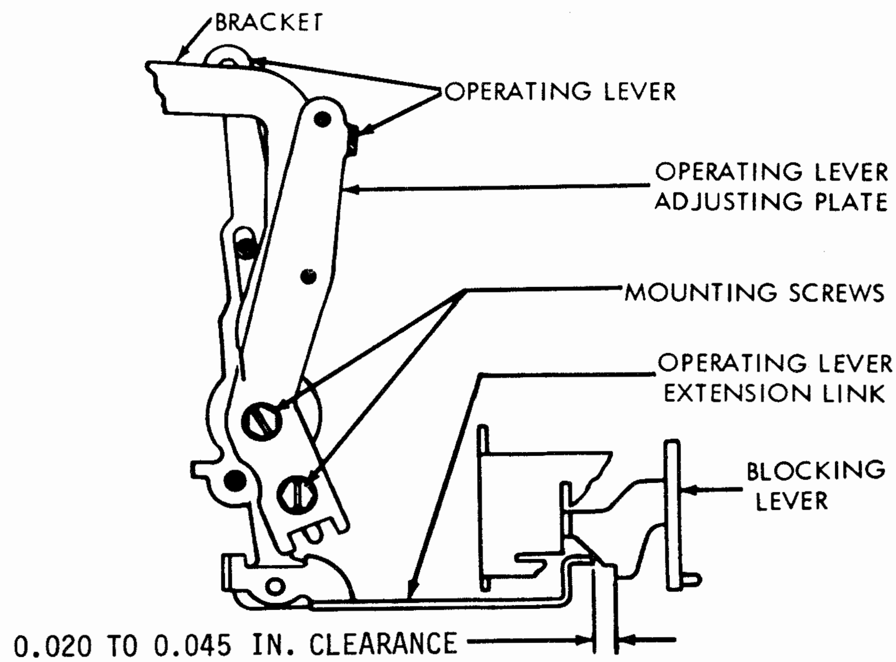
When pulling function pawl to rear, if the operating lever cam arm should strip off the tabulator slide arm before the function pawl is latched on th function bar, temporarily disable cam plate stripper bail arm by loosening its adjusting screw.

(d) Measure clearance between front end of operating lever extension link and blocking surface of blocking lever. Clearance should be between 0.015 and 0.035 inch.

(e) If clearance exceeds specified limits, loosen mounting stud so it is friction tight.

(f) Position extension link on operating lever to obtain clearance within specified limits.

(g) Tighten mounting stud.




(LEFT SIDE VIEW)

Figure 6-182. Operating Lever Adjusting Plate

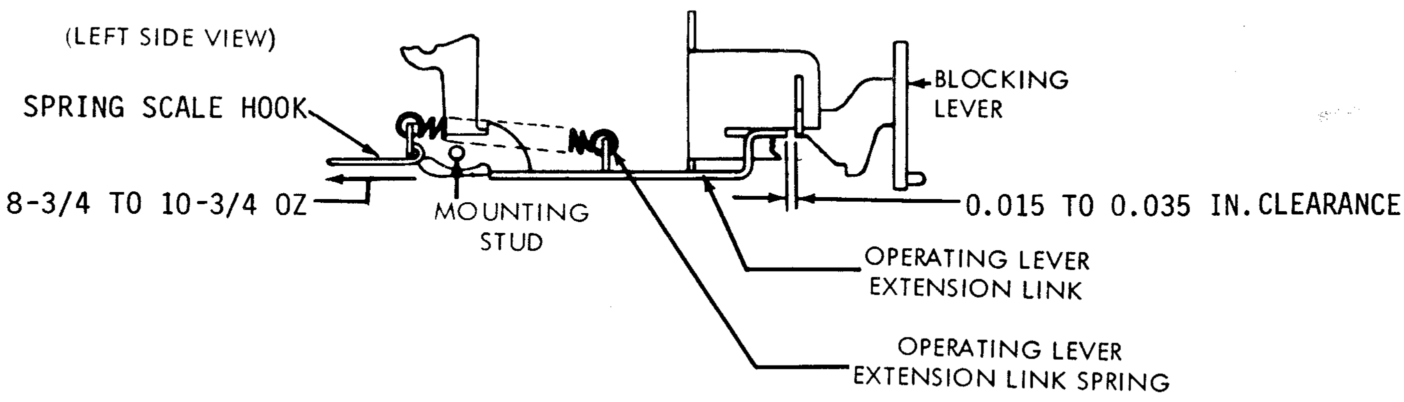



Figure 6-183. Operating Lever Extension Link and Operating Lever Extension Link Spring

NOTE

If unit is equipped with a transmitter control contact, check transmitter control contact gap adjustment, paragraph 6-5.f(22) and readjust gap, if necessary.

(16) Operating Lever Extension Link Spring. Adjust operating lever extension link spring as follows:

(a) Refer to figure 6-183.

(b) Unhook trip arm latchlever spring.

(c) Place operating lever in operated position with extension link against blocking lever.

(d) Attach spring scale hook as shown in figure 6-111.

(e) Force required to start operating lever extension link moving should be between 8-3/4 and 10-3/4 ounces.

NOTE

If unit is equipped with transmitter control contact, hold contact spring away from stud when measuring tension.

(f) If scale reading exceeds specified limits, install new spring.

(g) Reconnect trip arm latchlever spring.

(17) Right Margin. Adjust right margin as follows:

(a) Refer to figure 6-184.

(b) Place type box in position to print character on whcih spring cutout is desired.

(c) Pull forward on part of transfer bail extending below mounting shaft until it is in fully operted position.

(d) Measure clearance between spacing cutout lever on spacing drum and bail extension arm. Clearance should be between 0.006 and 0.025 inch.

(e) If clearance exceeds specified limits, loosen clamp screw and position to obtain specified clearance.

(f) Tighten clamp screw.

(18) Space Suppression Bypass Spring. Adjust space suppression bypass spring as follows:

(a) Refer to figure 6-184.

(b) Detach end of spring opposite bail extension pawl.

(c) Attach spring scale hook to free end of spring.

(d) Force required to start bail extension pawl moving should be between 20 and 26 ounces.

(e) If scale reading exceeds specified limits, install new spring. Otherwise, reconnect free end of spring.

(19) Tabulator Pawl (Preliminary). The purpose of this preliminary adjustment is to select tabulator stop to be used as reference in making final tabulator pawl horizontal and vertical adjustments.

NOTE

Before making this adjustment, check left margin, paragraph 6-3.1h(2) and spacing gear phasing, paragraph 6-3.1h(19).

(a) Refer to figure 6-185.

(b) Beginning with fifteenth slot counterclockwise from roller on tabulator ring, place tabulator stops on approximately equal number of slots apart around the periphery of ring corresponding to length of printed line.

(c) To move stops, hook small spring hook in hole and pull out radially from drum. Holding stop away from drum, slide it on garter spring to desired position and insert in slot. Spacing drum may have to be rotated to make some slots accessible.

CAUTION

Make sure all stops are firmly seated and not turned sideways Do not use pliers to move stops.

(d) Disengage all clutches so front facing feed pawl is in lower position. Position pawl adjusting plate at center of horizontal and

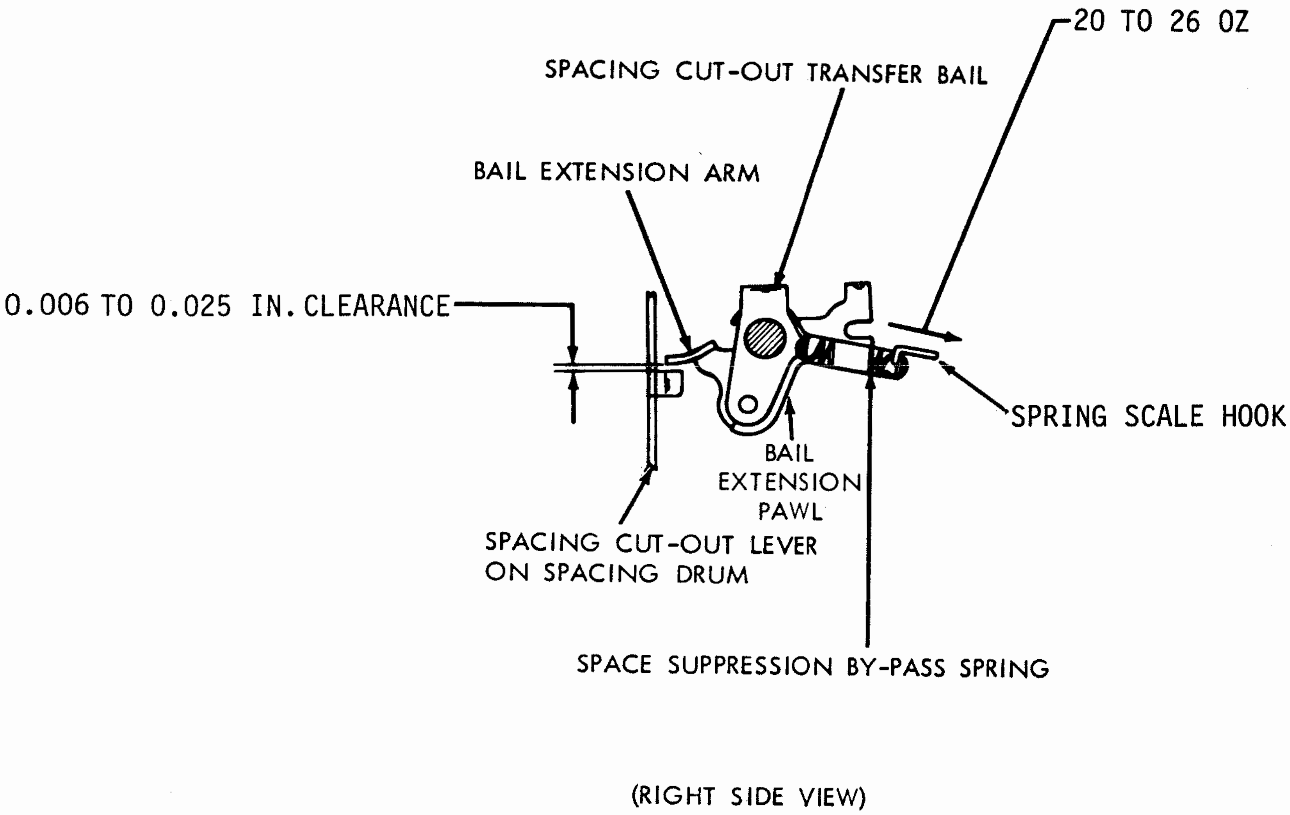



Figure 6-184. Right Margin and Space Suppression Bypass Spring

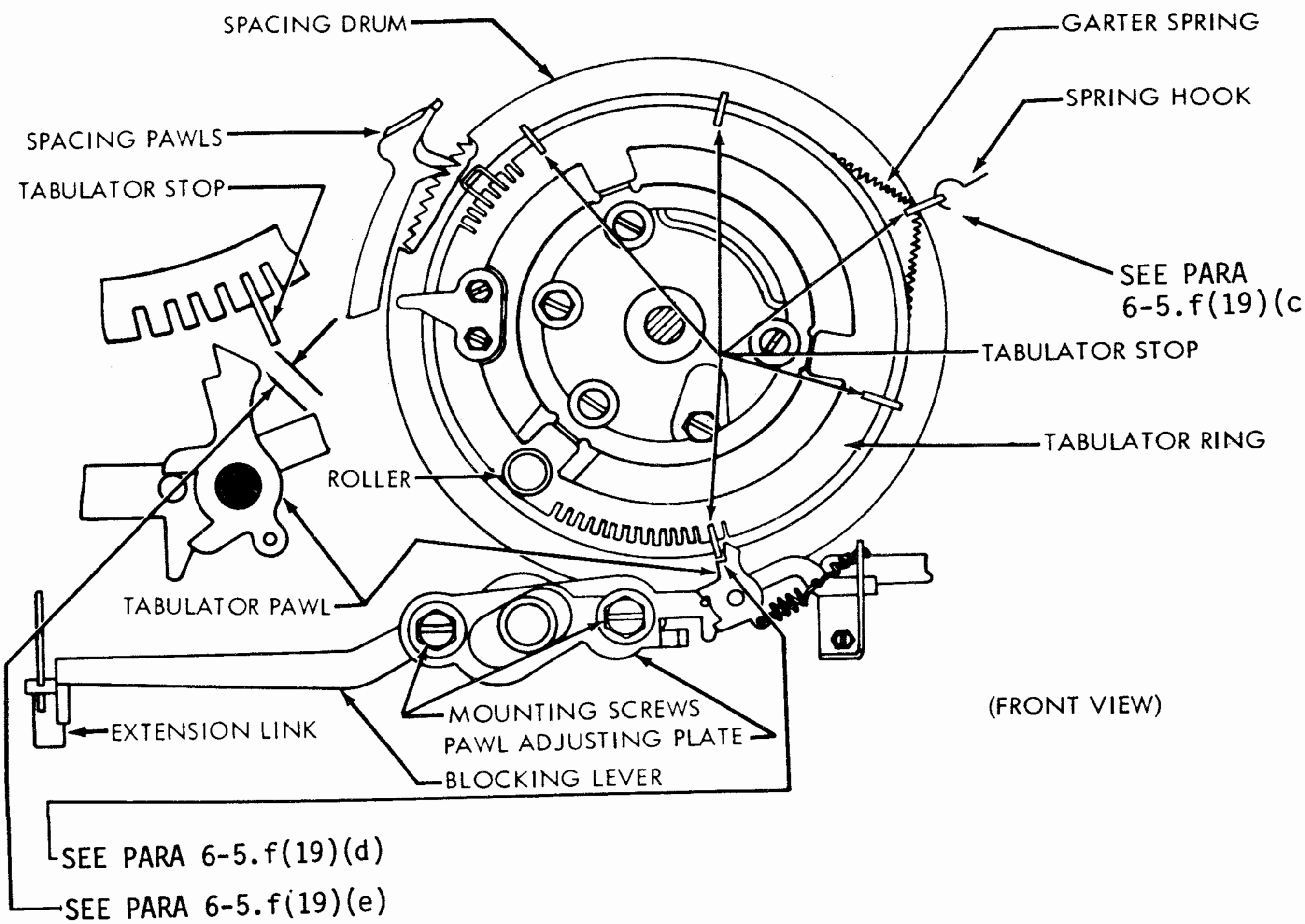



Figure 6-185. Tabulator Pawl (Preliminary)

vertical adjustments. To adjust vertically, loosen both mounting screws. To adjust horizontally, loosen left screw only. Vertical adjustment should be made before horizontal adjustment. Disengage spacing feed pawls and allow drum to rotate to extreme counterclockwise position. Keeping spacng clutch disengaged; manually advance drum until first stop is to immediate left of pawl. Position adjusting plate horizontally so stop is aligned with left edge of pawl shoulder.

(e) Place blocking lever and operating lever slide arm in unblocked position. Disengage feed pawls and let drum rotate two spaces counterclockwise. Both feed pawls should be fully engaged. Block extension link with blocking lever. Measure and note clearance between stop and slope on pawl.

(f) Rotate drum clockwise until next stop is just to left of pawl. Repeat procedure described in step (e) for this and all remaining stops.

(g) Use stop having greatest clearance as reference in making final horizontal and vertical pawl adjustments.

(20) <u>Tabulator Pawl-Horizontal (Final)</u>. Adjust tabulator pawl-horizontal as follows:

(a) Refer to figure 6-186.

(b) Disengage all clutches so that front spacing feed pawl is in lower position as shown in figure 6-185.

(c) Position spacing drum so that reference tabulator stop determined in paragraph 6-5.f(19) is immediately to left of pawl. Operating lever slide arm should be forward in unblocked position.

(d) Disengage feed pawls and allow drum to rotate one space counterclockwise. Both feed pawls should be fully engaged.

(e) Move extension link rearward to blocked position.

(f) Take up play in spacing shaft toward rear.

(g) Ensure some portion of clutch disc stop lug is aligned with rear surface of gear.

(h) If alignment does not occur, repeat step (a) through (e).

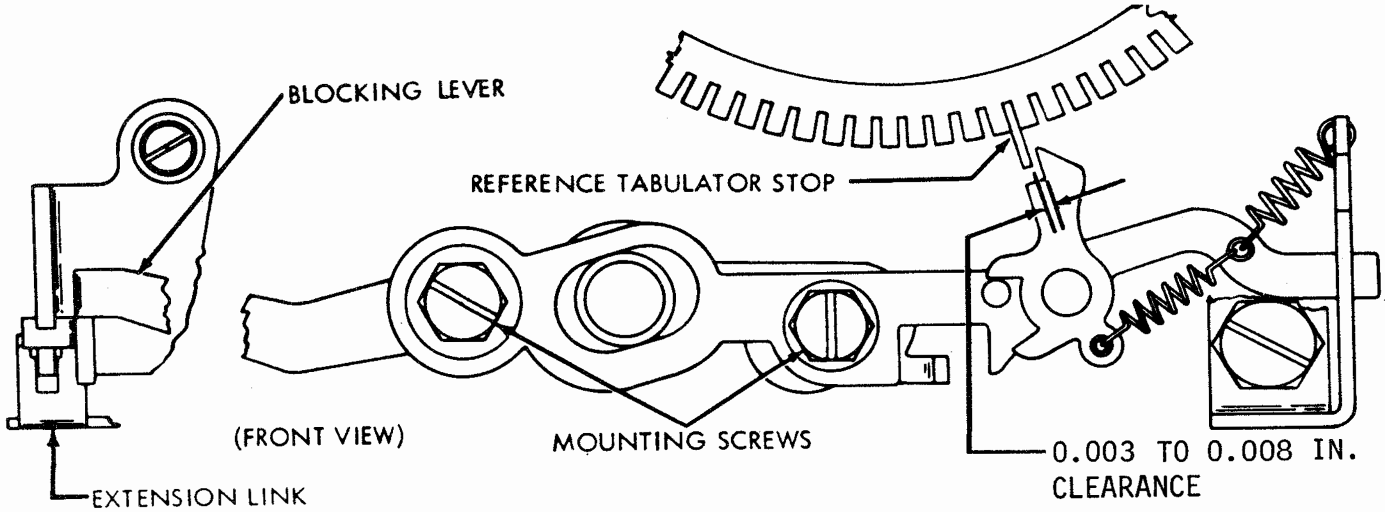
(i) Trip spacing clutch and rotate shaft until middle of stop lug is in line with rear surface of gear.

(j) If blocking lever trips too soon, loosen left mounting screw.

(k) Move pawl adjusting plate to left until extension link can be blocked.

(l) Slowly move plate to right until blocking lever just trips.

(m) When adjusting trip-off point, care should be taken that blocking lever is cammed down by stop and not manually moved out of blocked position.



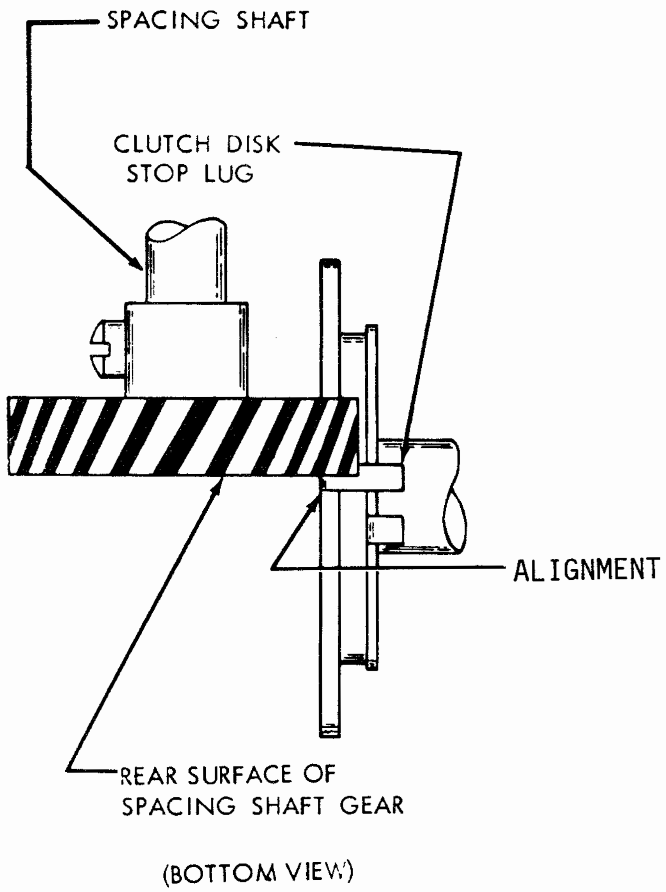




Figure 6-186. Tabulator Pawl - Horizontal (Final)

(n) Reensure that some portion of clutch disc stop lug is aligned with rear surface of spacing shaft gear.

(o) After obtaining trip-off point, continue rotating main shaft until spacing clutch is disengaged. Pawl should be to right of stop. When extension link is moved to rear, blocking lever should move to blocked position.

(p) If tip of pawl rests on end of stop, readjust plate to right so that clearance between pawl and stop is between 0.003 and 0.008 inch.

(q) Tighten left mounting screw.

(21) Tabulator Stop Settings. Adjust tabulator stop settings as follows:

(a) Refer to figure 6-187.

(b) To adjust columnar tabulator stop place carriage in position to print first character in column.

(c) Place stop in slot immediately to left of pawl.

NOTE

For instructions on how to move stops, see paragraph 6-5.f(19).

(d) To facilitate inserting stops, mark desired slot and rotate drum to more accessible position.

(e) For setting near left margin, count number of spacing operations from left margin and place stop corresponding number of slots counterclockwise from roller.

NOTE

When printing forms, check stop settings in relation to columns. Corresponding stops on all machines on a circuit must be the same number of slots from left margin.

(f) To adjust right margin tabulator stop (with wide shelf), position printing carriage at right margin (spacing cutout operated).

NOTE

Before making this adjustment, check right margin and tabulator pawl adjustments.

(g) Insert stop with wide shelf in slot immediately to left of pawl. Shelf should extend to right so pawl rests on it.

(22) Transmitter Control Contact Gap. Adjust transmitter control contact gap as follows:

(a) Refer to figure 6-188.

(b) Pull operating lever extension link to rear until it is blocked by blocking lever.

(c) Measure gap between contacts. Gap should be between 0.010 and 0.020 inch.

(d) If contact gap exceeds specified limits, loosen mounting screw and

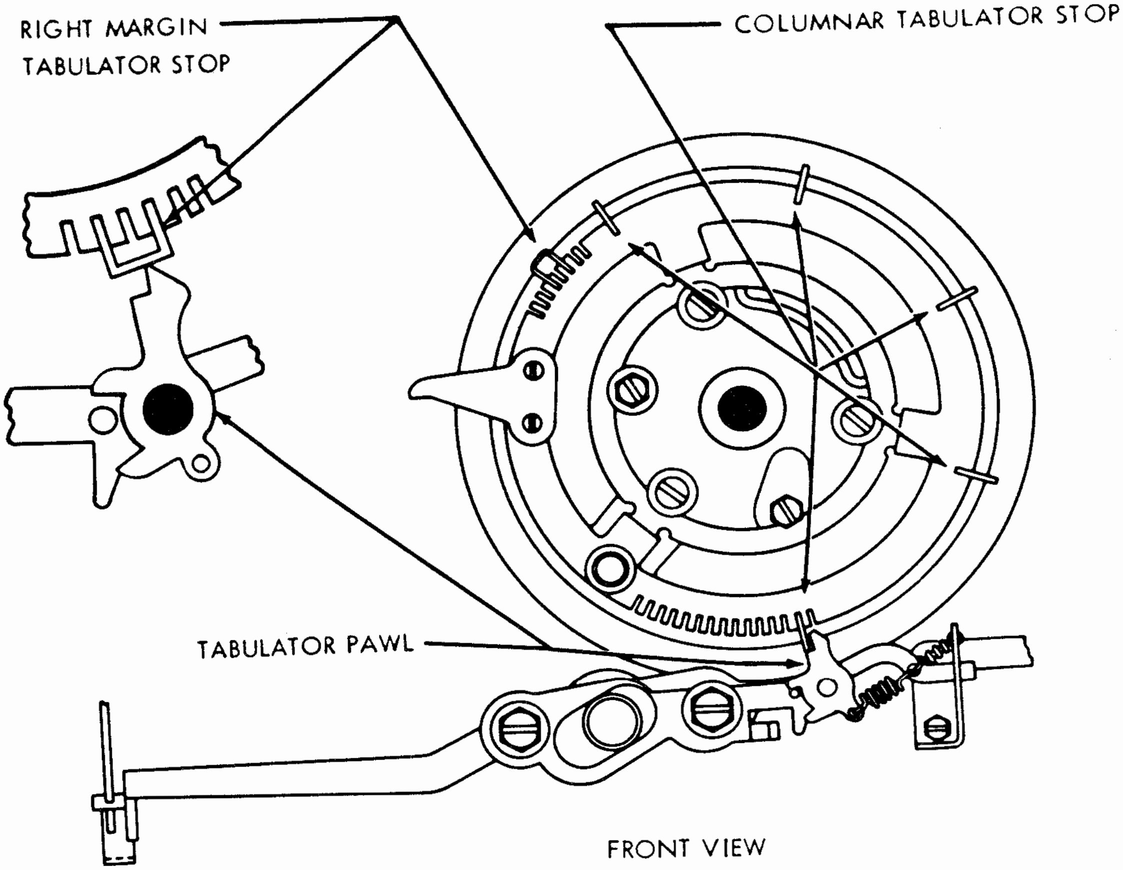



Figure 6-187. Tabulator Stop Settings

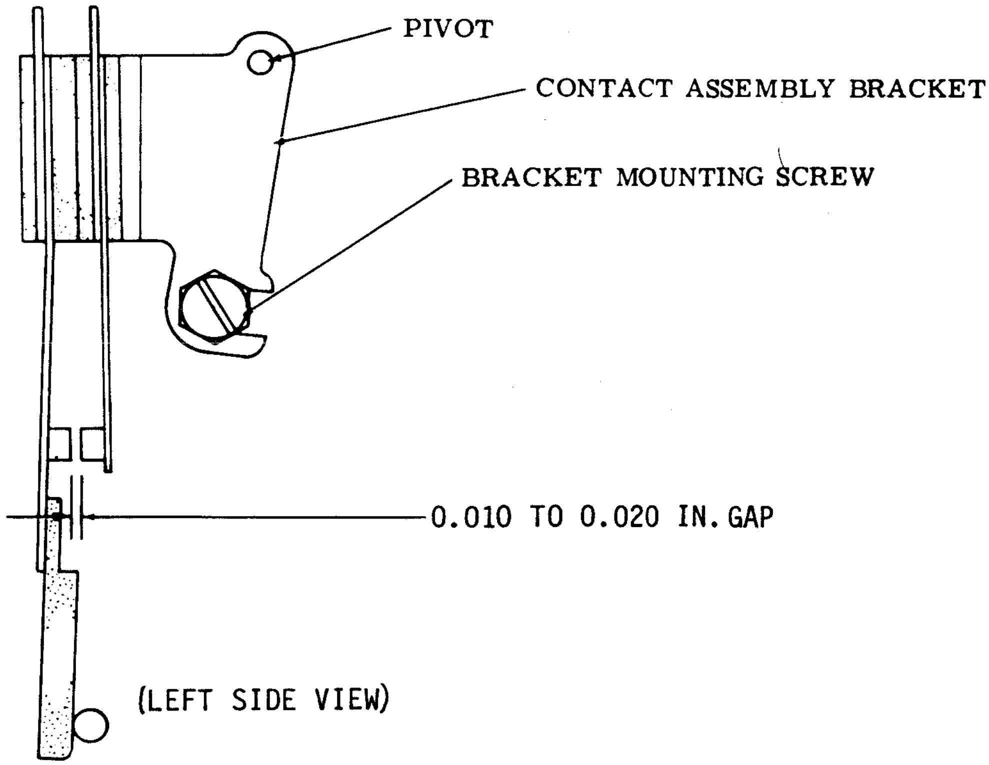



Figure 6-188. Transmitter Control Contact Gap

position contact assembly bracket to obtain specified contact gap. Bracket pivots about pin at upper end of bracket.

NOTE

If slack in switch cable assembly is insufficient to permit access to mounting screws, loosen cable ties and reposition cable to obtain a slight amount of slack at switch end.

(23) Transmitter Control Contact Spring. Adjust transmitter control contact springs as follows:

(a) Refer to figure 6-189.

(b) Place operating lever in unoperated position.

(c) Attach spring scale hook to long contact spring.

(d) Force required to barely open contacts should be between 3-1/2 and 4-1/2 ounces.

(e) If scale reading exceeds specified limits, loosen mounting screw.

(f) Pivot contact bracket toward rear until it clears mounting screw. Slide bracket to left of pin in upper end of bracket mounting plate and lift switch out to a more accessible position.

(g) Adjust spring tension by bending long contact spring.

(h) Install contact bracket assembly by following reverse procedure in step (f).

(i) Tighten mounting screw.

g. Letters-Figures Code Bar Shift Magnet Mechanism Adjustments. Perform letters-figures code bar shift magnet mechanism adjustments in accordance with the following paragraphs.

(1) Shift Magnet Yoke. Adjust as follows:

(a) Refer to figure 6-190.

(b) Hold magnet armature against core.

(c) Measure clearance between armature and end of heel piece. There should be some clearance not exceeding 0.003 inch.

(d) If clearance exceeds specified limits, loosen clamp screw and position clamp screw to obtain specified clearance.

(e) Tighten clamp screw.

NOTE

Keep pole face free of oil and grease.

(2) Shift Magnet Armature. Adjust shift magnet armature as follows:

(a) Refer to figure 6-190.

(b) Operate magnet armature and place shift

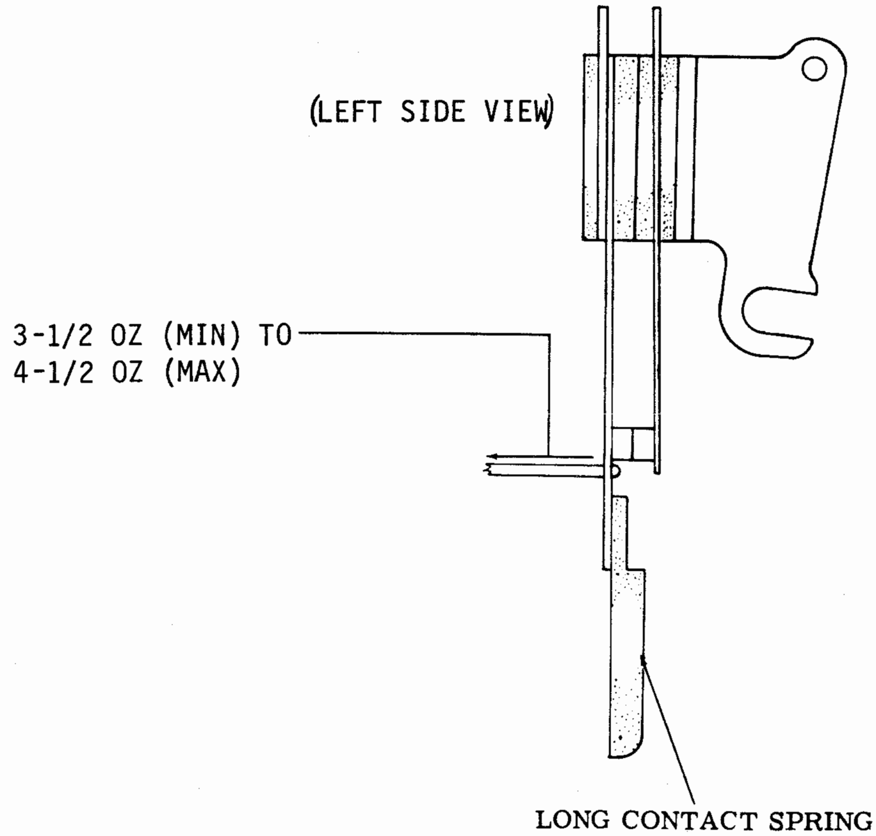



Figure 6-189. Transmitter Control Contact Spring

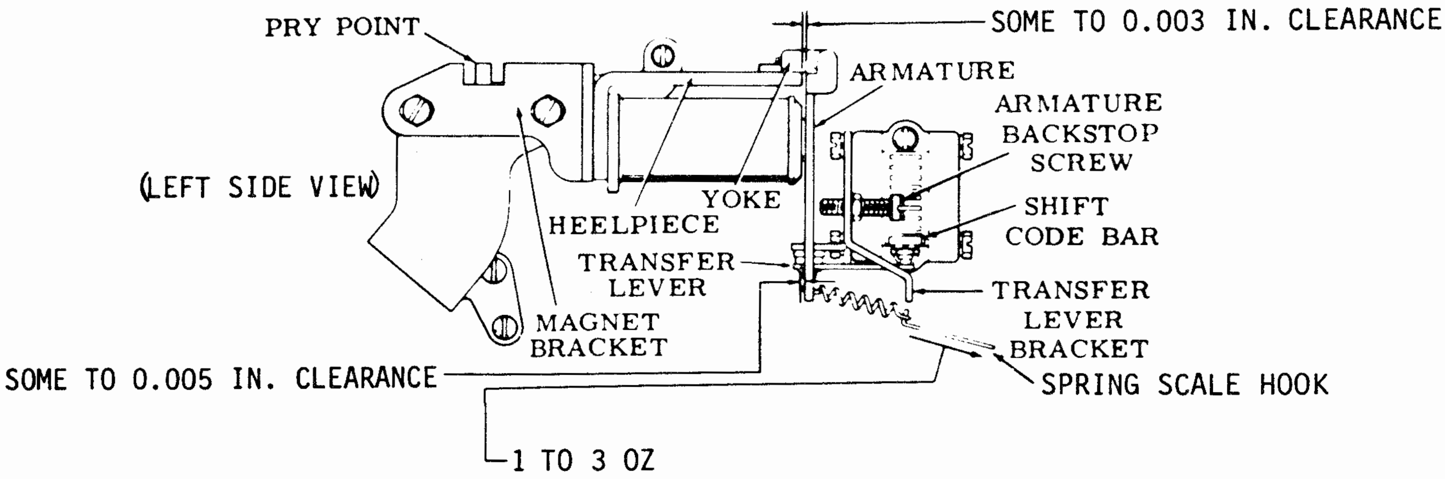



**Figure 6-190. Shift Magnet Yoke, Shift Magnet Armature, and Shift Magnet Armature Return Spring**

code bar in full marking position.

(c) Measure clearance between armature and transfer lever. There should be some clearance not exceeding 0.005 inch.

(d) If clearance exceeds specified limits, loosen bracket mounting screws and position magnet forward or backward.

(e) Tighten bracket mounting screw.

(f) Place magnet armature in unoperated position and place shift code bar in full spacing condition.

(g) Measure clearance between armature and transfer lever. There should be some clearance not to exceed 0.010 inch.

(h) Loosen locknut and position armature backstop screw to obtain specified clearance.

(i) Tighten locknut.

(3) Shift Magnet Armature Return Spring. Adjust shift magnet armature return spring as follows:

(a) Refer to figure 6-190.

(b) Unhook one end of shift magnet armature return spring. Attach spring scale hook to free end of spring.

(c) Force required to extend spring to its installed length should be between 1 and 3 ounces.

(d) If scale reading exceeds specified limits, install new spring.

(4) Shift Code Bar Return Spring. Adjust shift code bar return spring as follows:

(a) Refer to figure 6-191.

(b) Trip type box clutch and rotate main shaft until printing track is in lowest position.

(c) Attach spring scale hook to pilot pin.

(d) Force required to start code bar moving should be between 3 and 7 ounces.

(e) If scale reading exceeds specified limits, install new spring.

h. Local Backspace Mechanism Adjustments. Perform local backspace mechanism adjustments in accordance with the following paragraphs.

(1) Camming Bail Spring. Adjust camming bail spring as follows:

(a) Refer to figure 6-192.

(b) Apply spring scale pushrod to backspace camming bail.

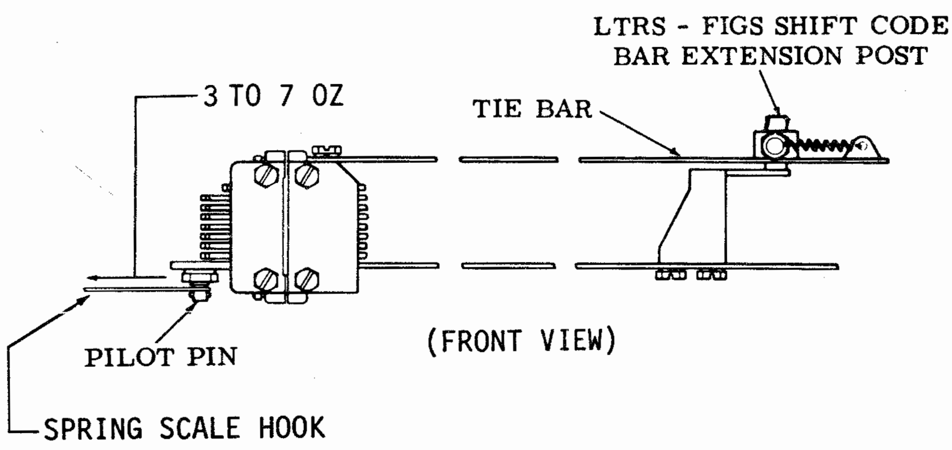



Figure 6-191. Shift Code Bar Return Spring

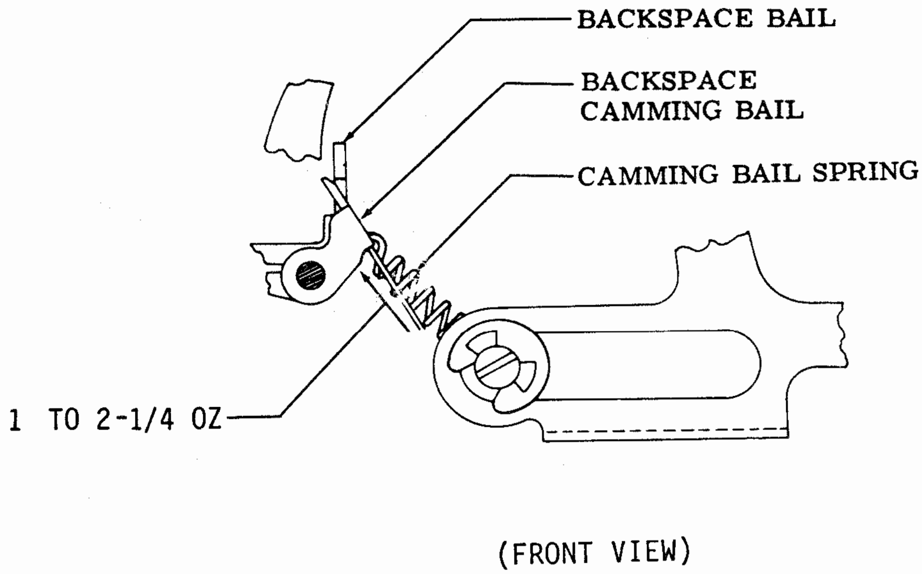



Figure 6-192. Camming Bail Spring

(c) Force required to start bail moving should be between 1 and 2-1/2 ounces.

(d) If scale reading exceeds specified limits, install new spring.

(2) <u>Camming Bail Stop Arm</u>. Adjust camming bail stop arm as follows:

(a) Refer to figure 6-193.

(b) Disengage spacing clutch.

(c) Place front feed pawl in lower position.

(d) Hold backspace bail in operated position.

(e) Trip clutch and rotate main shaft until front and rear feed pawl teeth are in line.

(f) Measure clearance between pawl and tooth on spacing drum ratchet wheel. Clearance should be between 0.015 and 0.035 inch.

(g) If clearance exceeds specified limits, position adjusting plate on intermediate arm in center of its adjusting range.

(h) Loosen stop arm mounting screw and make it friction tight. Position camming bail stop arm to obtain specified clearance.

(i) Tighten mounting screw.

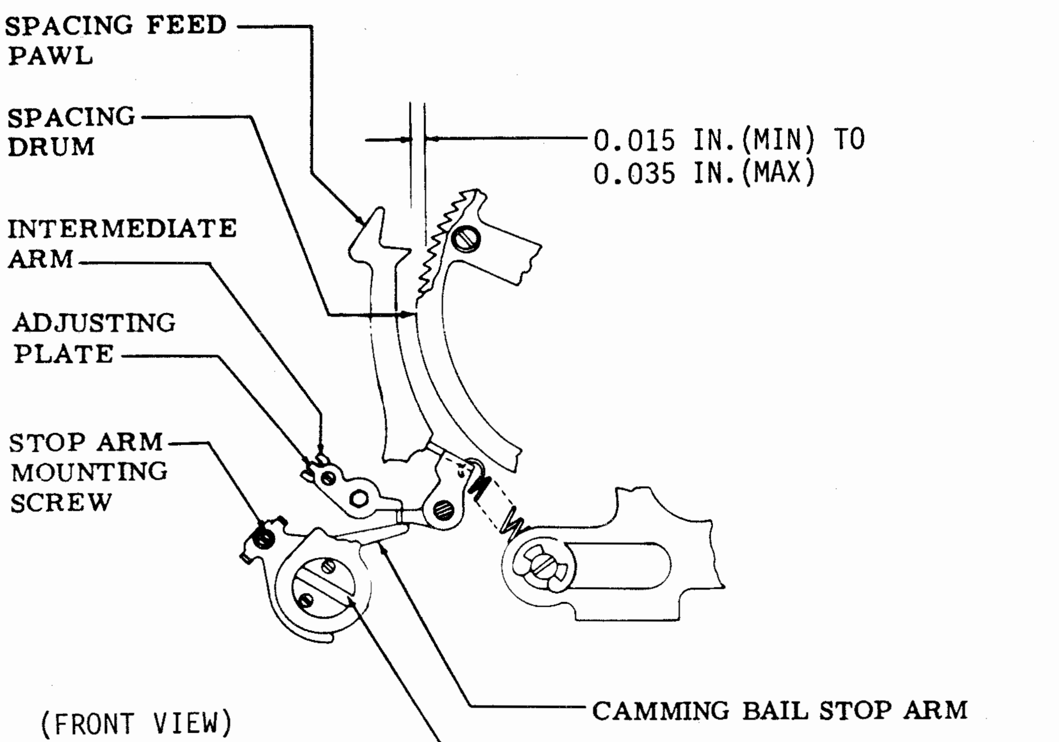



Figure 6-193. Camming Bail Stop Arm

(j) There should be some clearance between feed pawl teeth and ratchet throughout travel of carriage from left to right.

(k) Refine adjustment described in steps (g) through (i).

i. Page Feed-Out Mechanism Adjustments. Perform page feed-out mechanism adjustments in accordance with the following paragraphs.

(1) Pointer. Adjust pointer as follows:

(a) Refer to figure 6-194.

(b) Disengage line feed clutch.

(c) Position index plate adjacent to bail.

(d) Ensure pointer is aligned with notch in indexing disc and clears disc by approximately 1/16 inch.

(e) If pointer is misaligned or clearance exceeds specified limit, loosen mounting screws.

(f) Position pointer to obtain proper alignment and clearance.

(2) Blocking Arm. Adjust blocking arm as follows:

(a) Refer to figure 6-194.

(b) Set bail on peak of index plate.

(c) Measure clearance between blocking arm and upper surface of page feed-out slide. Clearance should be between 0.005 and 0.045 inch.

(d) If clearance is not within specified limits loosen mounting screws.

(e) Position adjustable arm to obtain specified clearance between blocking arm and upper surface of page feed-out slide.

NOTE

If requirement cannot be met for each plate, reposition plate with mounting screw loosened.

(3) Blocking Arm Spring. Adjust blocking arm spring as follows:

(a) Refer to figure 6-194.

(b) Place blocking arm in unblocked position.

(c) Unhook end of spring from blocking arm.

(d) Attach spring scale hook to free end of spring.

(e) Force required to extend spring to its operating length should be between 3 and 5 ounces.

(f) If scale reading exceeds specified limits, install new spring.

(4) Page Feed-Out Gear Play. Adjust page feed-out gear play as follows:

(a) Refer to figure 6-195.

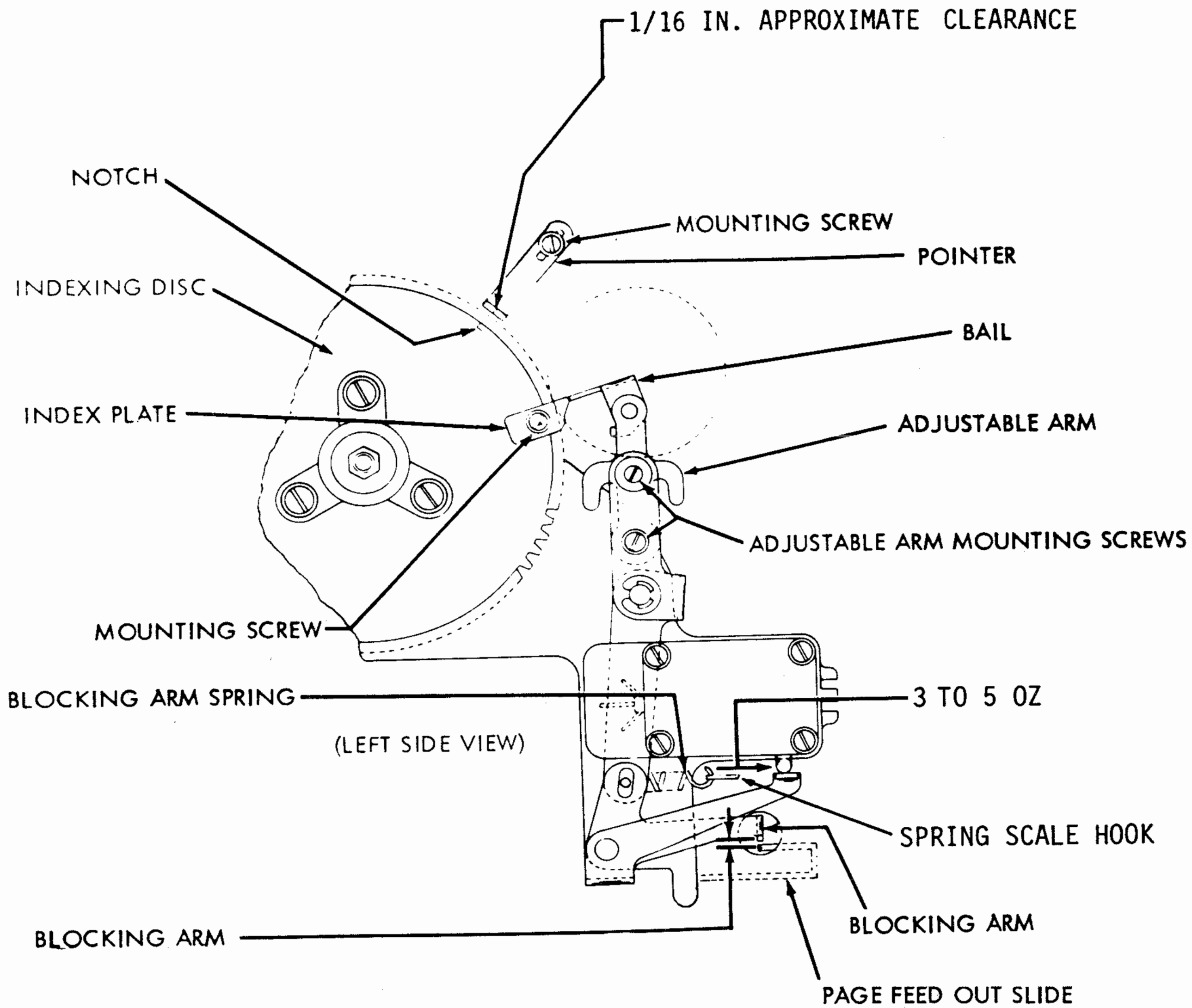



Figure 6-194. Pointer, Blocking Arm, and Blocking Arm Spring

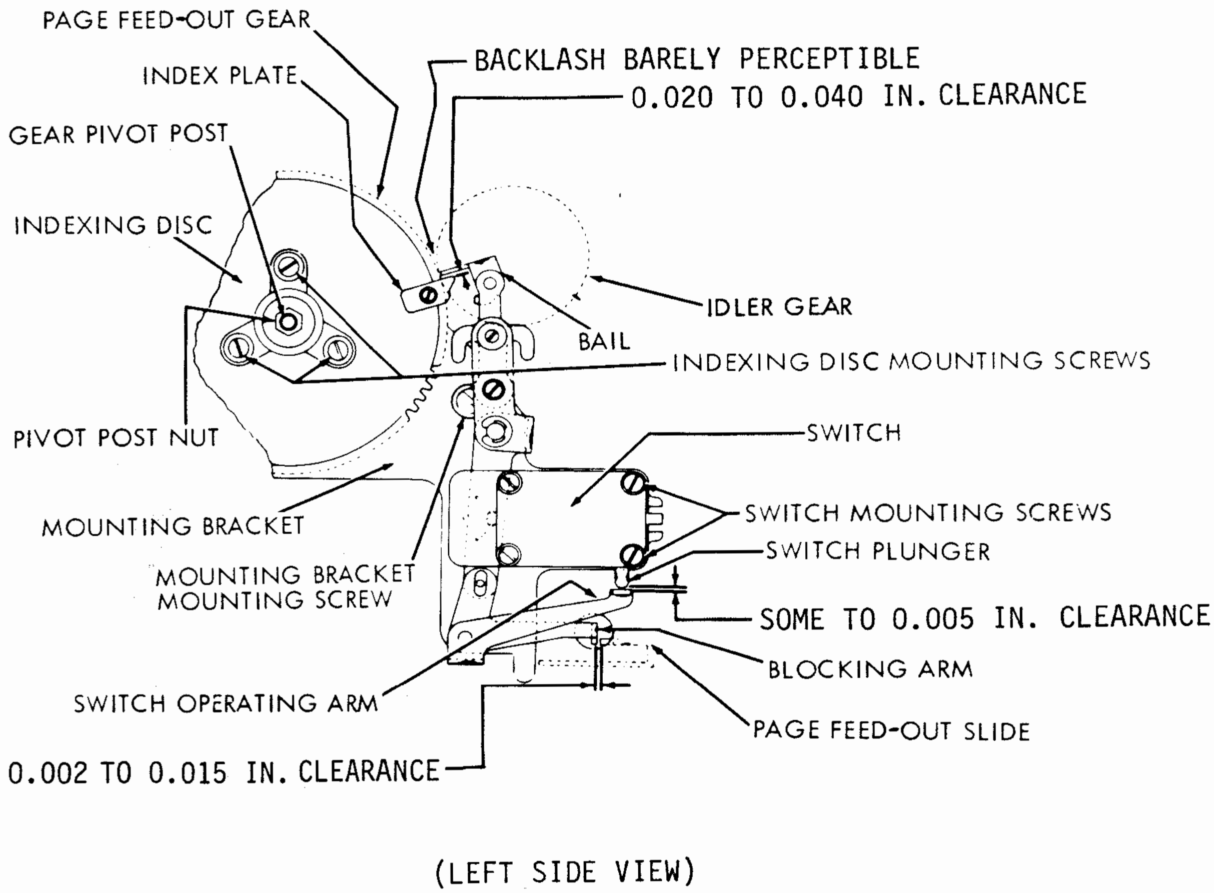



Figure 6-195. Page Feed-Out Gear Play, Mounting Bracket, Indexing Disc, and Switch Operating Arm (Transmitter Control)

(b) Ensure page feed-out gear backlash is barely perceptible.

(c) If backlash is excessive, loosen nut on gear pivot post.

(d) Position gear pivot post to reduce backlash to point where it is barely perceptible.

(e) Tighten nut on gear pivot post.

(5) Mounting Bracket. Adjust mounting bracket as follows:

(a) Refer to figure 6-195.

(b) Disengage select feed-out sequence code bar clutch.

(c) Take up play in blocking arm and feed-out slide to make clearance minimum.

(d) Measure clearance between blocking arm and page feed-out slide. Clearance should be between 0.002 and 0.015 inch.

(e) If clearance exceeds specified limits, loosen mounting screws.

(f) Position lower part of blocking arm to obtain specified clearance between blocking arm and page feed-out slide.

(g) Tighten mounting screws.

(6) Indexing Disc. Adjust indexing disc as follows:

(a) Refer to figure 6-195.

(b) Disengage line feed clutch.

(c) Position index plate adjacent to bail.

(d) Take up play between gears to minimize clearance.

(e) Measure clearance between highest numbered index plate and bail. Clearance should be between 0.020 and 0.040 inch.

(f) If clearance exceeds specified limits, disengage gear from idler.

(g) Turn handwheel clockwise until index plate just operates bail.

(h) Engage first tooth on idler.

NOTE

If page feed-out gear has uneven number of teeth, rotate platen until screw head in platen spur gear is up and platen is detented. Then proceed with adjustment.

(i) Loosen three mounting screws.

(j) Position indexing disc to obtain specified clearance between highest numbered index plate and bail.

(k) Tighten three mounting screws.

(7) Switch Operating Arm (Transmitter Control). Adjust as follows:

(a) Refer to figure 6-195.

(b) Place blocking arm in position to block slide.

(c) Measure clearance between switch operating arm and switch plunger. There should be some clearance not exceeding 0.005 inch.

(d) If clearance exceeds specified limits, loosen two mounting screws.

(e) Position switch to obtain specified clearance between switch operating arm and switch plunger.

(f) Tighten two mounting screws.

j. Paper Jam Alarm (Sprocket Feed) Adjustments. Perform paper jam alarm (sprocket feed) adjustments in accordance with the following paragraphs.

(1) Bail Spring. Adjust bail spring as follows:

(a) Refer to figure 6-196.

(b) Attach spring scale hook to center of wire bail and pull vertically.

(c) Force required to lift wire bail high enough to release operating lever and operate switches should be betweeen 1/2 and 1-1/2 ounces.

(d) If scale reading exceeds specified limits, install new spring.

(2) Wire Bail. Adjust wire bail as follows:

(a) Refer to figure 6-197.

NOTE

Before proceeding with adjustment of wire bail, loosen switch plate mounting screws and rotate both switch and latch to a position where they do not interfere with bail. Position spring post by means of set collar so spring has some initial tension. Spring post should be approximately 30 degrees from vertical as indexed in figure 6-198.

(b) Ensure wire bail rests on paper fingers approximately in radius of fingers. Wire bail should touch at least one finger with not more than 0.015 inch clearance between other finger and wire bail.

(c) If clearance exceeds specified limit, bend wire bail to meet requirement specified in step (b).

NOTE

Ensure there is no bind in bail after making adjustment.

(3) Switch Position. Adjust switch position as follows:

(a) Refer to figure 6-198.

(b) Hold wire bail against paper fingers and operating lever latched behind operating bail.

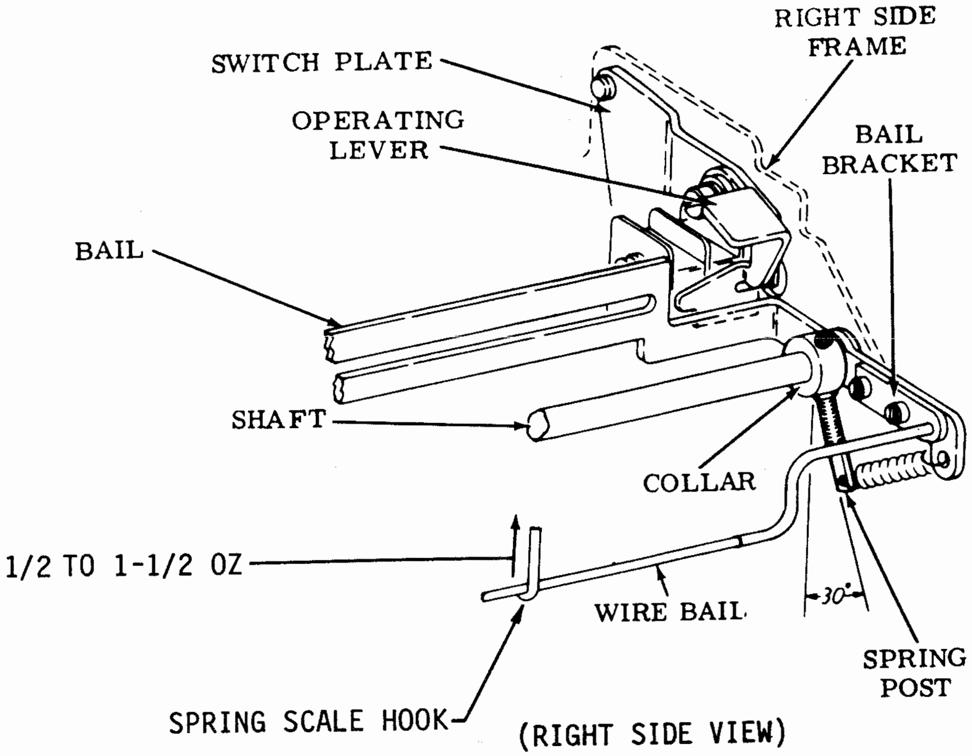



Figure 6-196. Bail Spring

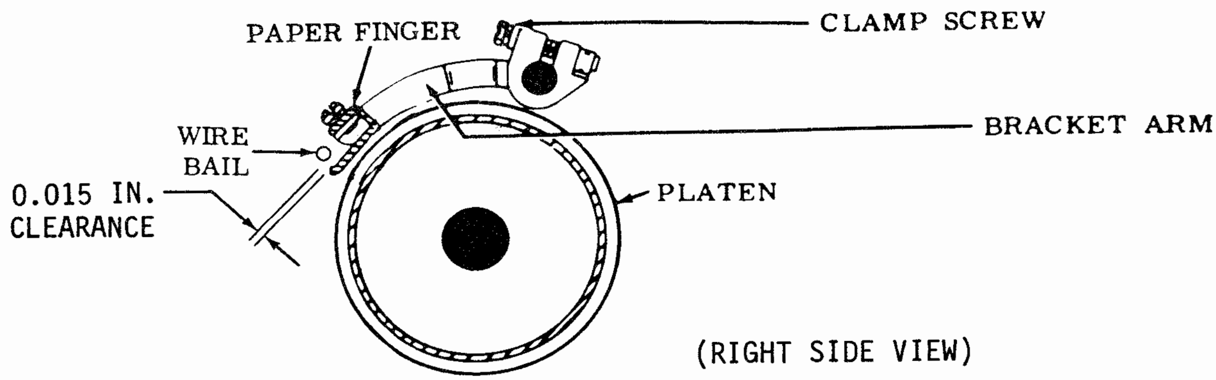



Figure 6-197. Wire Bail

(c) Measure clearance between top of bail and bottom of step in lever. Clearance should be between 0.035 and 0.065 inch and lever should depress switch plungers sufficiently to operate switches.

(d) If clearance is not within specified limits or lever does not depress plungers sufficiently to operate switches, loosen screws.

(e) Position switch plate to obtain specified clearance between top of bail and bottom of step in lever and ensure that lever depresses switch plungers sufficiently to operate switches.

(f) Tighten screws.

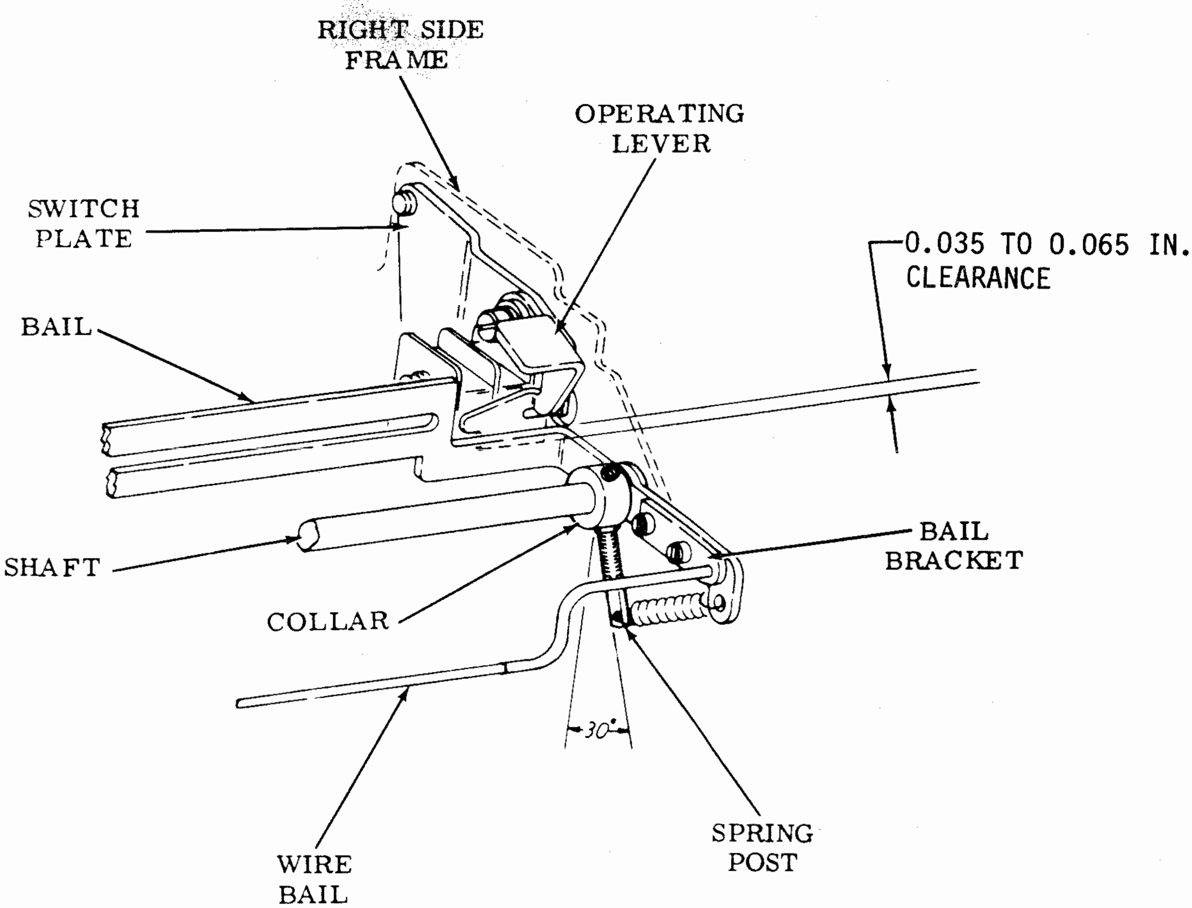
k. Paper-Out Alarm Mechanism Adjustments. Perform paper-out alarm mechanism adjustments in accordance with the following paragraphs.

(1) Switch Position. Adjust switch position as follows:

(a) Refer to figure 6-199.

(b) Move switch toward upper limit of its travel in mounting holes.

(c) Ensure horizontal axis of switch lies in a plane parallel to switch bracket.




(RIGHT FRONT VIEW)

Figure 6-198. Switch Position

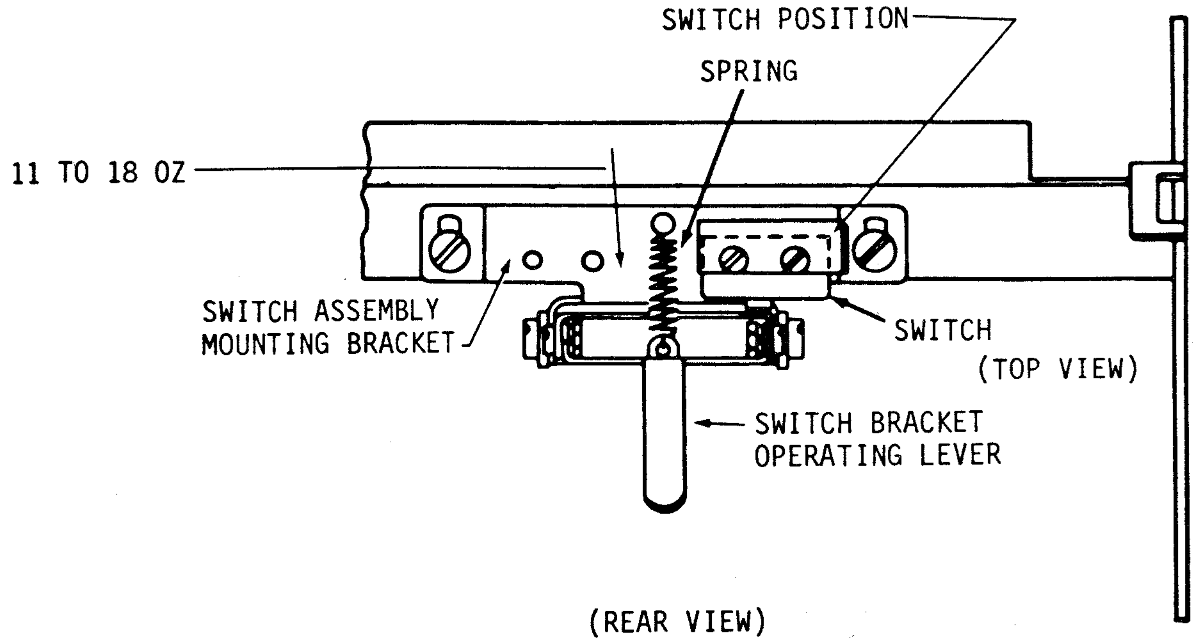



Figure 6-199. Switch Position and Switch Bracket Spring

(d) If not, loosen two mounting screws.

(e) Position and align switch so its horizontal axis is parallel to swtich bracket.

(f) Tighten two mounting screws.

(2) Switch Bracket Spring. Adjust switch bracket spring as follows:

(a) Refer to figure 6-199.

(b) Apply spring scale pushrod to top of switch bracket operating lever near spring.

(c) Force required to move switch bracket clear of switch plunger should be between 11 and 18 ounces.

(d) If scale reading exceeds specified limits, install new spring.

(3) Switch Operating Lever. Adjust switch operating lever as follows:

(a) Refer to figure 6-200.

(b) Remove paper roll.

(c) Ensure upper surface lies in a place parallel with underside of hexagonal paper spindle and resets approximately 1/4 inch from spindle.

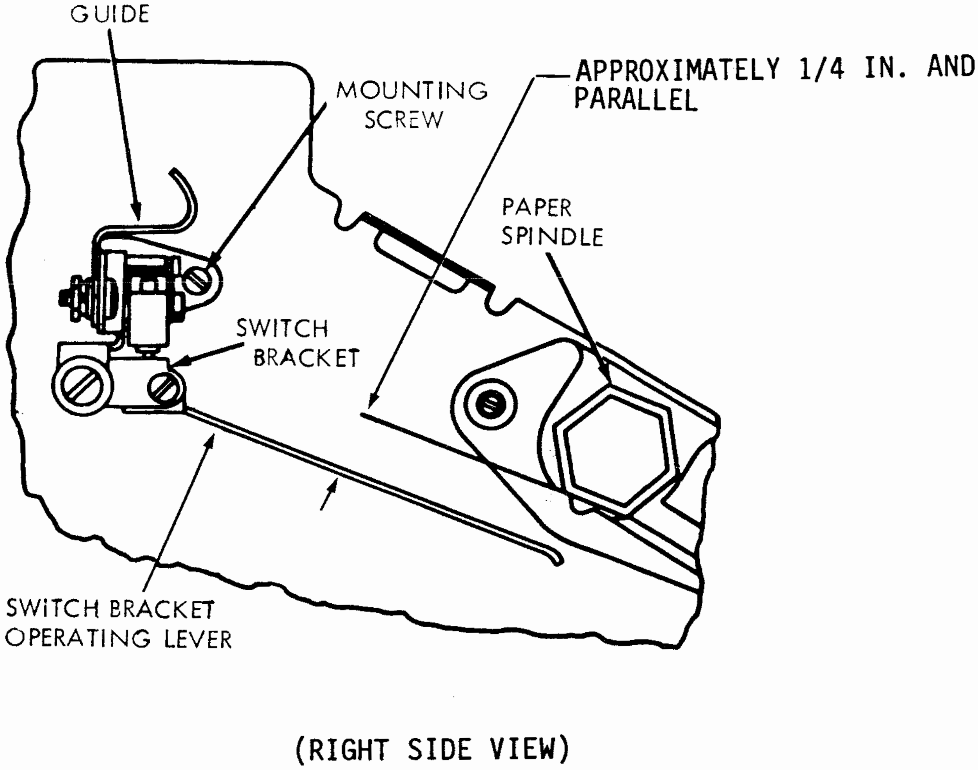



Figure 6-200. Switch Operating Lever

(d) If not, loosen switch assembly mounting screws.

(e) Position switch assembly upward or downward to obtain parallelism and specified distance between upper surface of switch bracket operating lever and underside of hexagonal paper spindle.

(f) Tighten switch assembly mounting screw.

l. <u>Print Suppression Mechanism Adjustments</u>. Perform print suppression mechanism adjustments in accordance with the following paragraphs.

(1) <u>Suppression Code Bar Mechanism</u>. Adjust suppression code bar mechanism as follows:

(a) Refer to figure 6-201.

(b) Place function bars in rear position.

(c) Hook call-directing function pawl over its function bar and strip it.

(d) Ensure notch in suppression code bar lines up vertically with notches in 4, 1, 5, 2, 3, code bars although it may be out of alignment 0.010 inch maximum in marking direction.

(e) Measure clearance between guide plate extension and slide. Clearance should be 0.002 inch maximum.

(f) If clearance exceeds specified limits, loosen guide plate clamp nuts and position guide plate by its lower adjusting slot to obtain specified clearance.

(g) Alternately hook line feed function pawl and call directing function pawl over their respective function bars.

(h) Ensure there is some clearance between rear end of function bar and face of notch on funtion pawl.

(i) If not, refine adjustments made in steps (d) and (c).

(2) <u>Zero Code Bar Shift Mechanism</u>. Adjust zero code bar shift mechanism as follows:

(a) Refer to figure 6-201.

(b) Rotate function clutch until function bars are in extreme rear position.

(c) Hook line feed function pawl over its function bar and strip it.

(d) Notch in zero code bar should line up vertically with notches in 4, 1, 5, 2, 3 code bars, although it may be out of alignment 0.010 inch maximum in marking direction.

m. <u>Print Suppression and Off-Line Stunt Shift Control Mechanism Adjustments</u>. Perform print suppression and off-line stunt shift control mechanism adjustments in accordance with the following paragraphs.

(1) <u>Suppression Code Bar Position</u>. Adjust suppression code bar position as follows:

(a) Refer to figure 6-202.

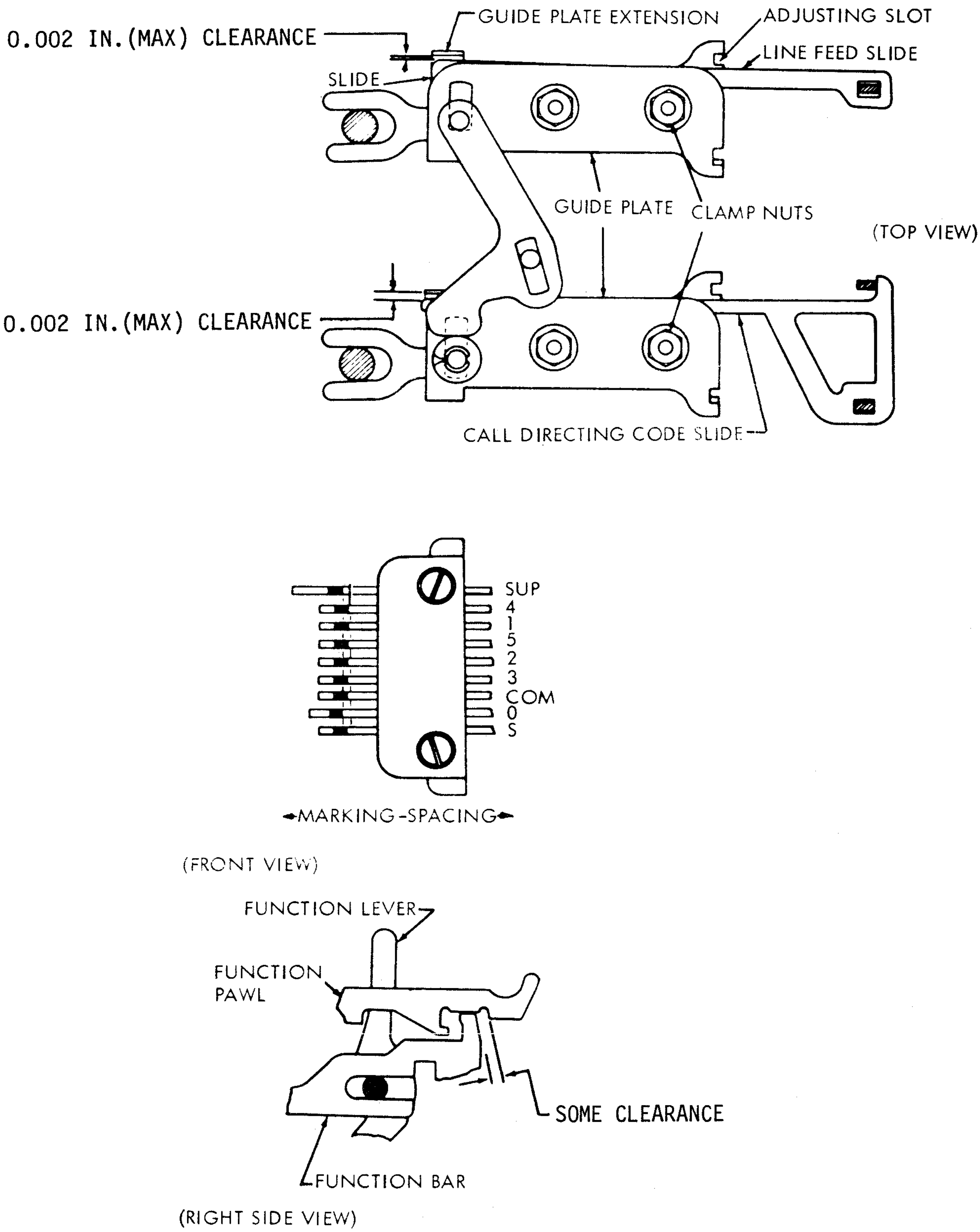



Figure 6-201. Suppression Code Bar Mechanism and Zero Code Bar Shift Mechanism

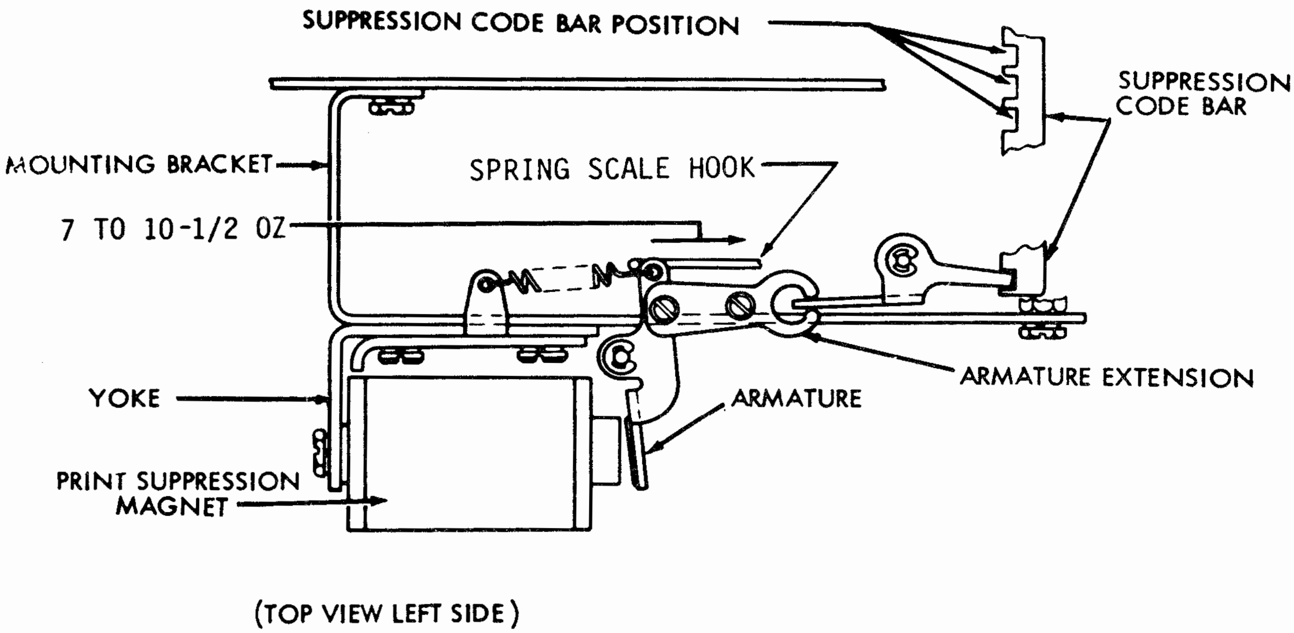



Figure 6-202. Suppression Code Bar Position and Suppression Magnet Armature Return Spring

(b) Energize print suppression magnet and place all code bars in spacing position.

(c) Viewing from rear of unit above stunt box, ensure notches in suppression code bar align with notches in other code bars.

(d) If notches do not align properly, loosen mounting screws.

(e) Operate magnet armature either manually or electrically.

(f) Place all code bars in spacing position.

(g) Pivot armature extension in its elongated mounting hole to obtain alignment of notches.

(h) Tighten mounting screws.

(2) <u>Print Suppression Magnet Armature Return Spring</u>. Adjust print suppression magnet armture spring as follows:

(a) Refer to figure 6-202.

(b) Deenergize print suppression magnet.

(c) Attach spring scale hook to armature at point of return spring attachment.

(d) Force required to start armature

moving toward magnet core should be between 7 and 10-1/2 ounces.

(e) If scale reading exceeds specified limits, install new spring.

(3) Type Box Clutch Trip Lever. Adjust type box clutch trip lever as follows:

(a) Refer to figure 6-36.

(b) Position trip shaft cam follower roller on lowest surface of cam (located on code bar clutch).

(c) Measure clearance between inner face of type box clutch trip lever and clutch disc stop lug. Clearance should be between 0.040 and 0.055 inch.

(d) If clearance exceeds specified limits, loosen clamp screw and position stop to obtain specified clearance.

n. Reverse Line Feed Mechanism Adjustments. Perform reverse line feed mechanism adjustments in accordance with the following paragraphs.

(1) Line Feed Bar Bell Crank Spring. Adjust line feed bar bell crank spring as follows:

(a) Refer to figure 6-203.

(b) Place line feed bar in rear position with line feed bar springs in place.

(c) Place slide link in unoperated position.

(d) Attach spring scale hook to top end of line feed bar.

(e) Force required to start line feed bar moving should be between 19 and 24 ounces.

(f) If scale reading exceeds specified limits install new spring.

(2) Line Feed Bar Release Lever Spring. Adjust line feed bar release lever spring as follows:

(a) Refer to figure 6-204.

(b) Apply spring scale pushrod to top end of line feed bar release lever.

(c) Force required to start lever moving should be between 3 and 8 ounces.

(d) If scale reading exceeds specified limits, install new spring.

(3) Platen Detent Bail Spring. Adjust platen detent bail spring as follows:

(a) Refer to figure 6-204.

(b) Seat detent between two teeth on line feed spur gear.

(c) Attach spring scale hook to platen detent bail at detent stud.

(d) Force required to start detent moving should be between 16 and 32 ounces.

(e) If scale reading exceeds specified limits, install new spring.

(4) Line Feed Spur Gear Detent Eccentric. Adjust

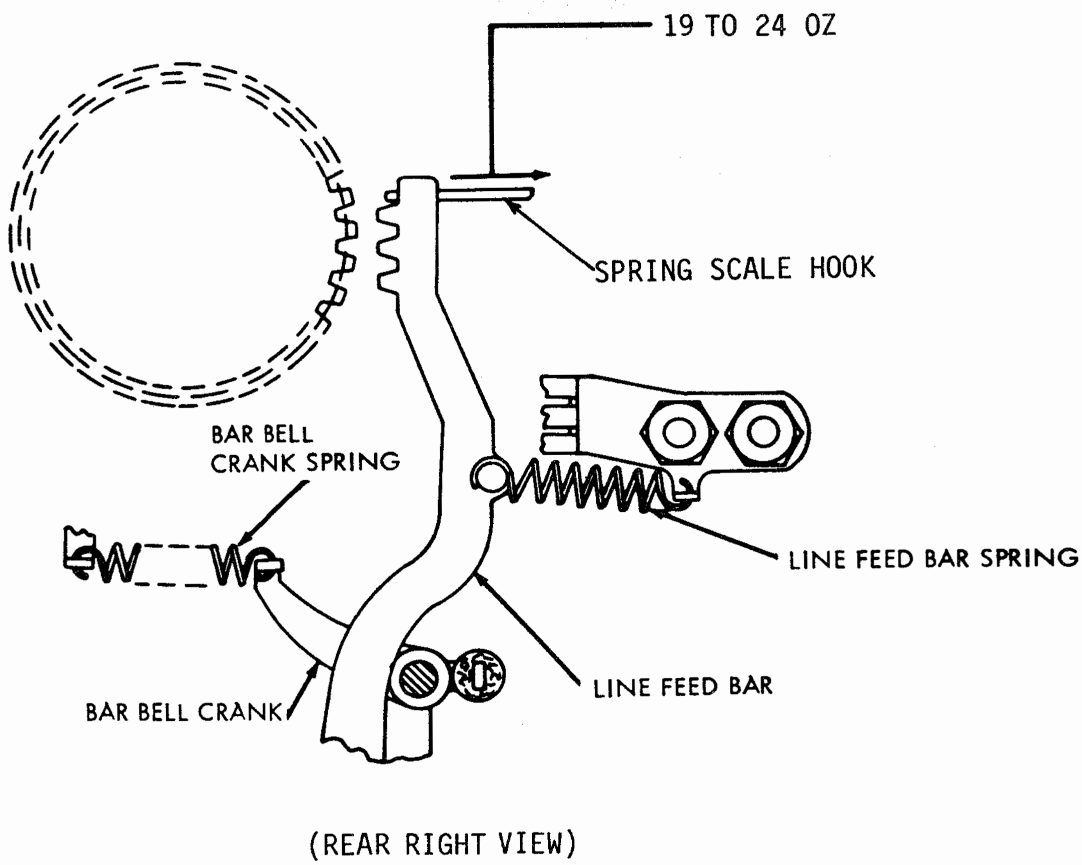



Figure 6-203. Line Feed Bar Bell Crank Spring

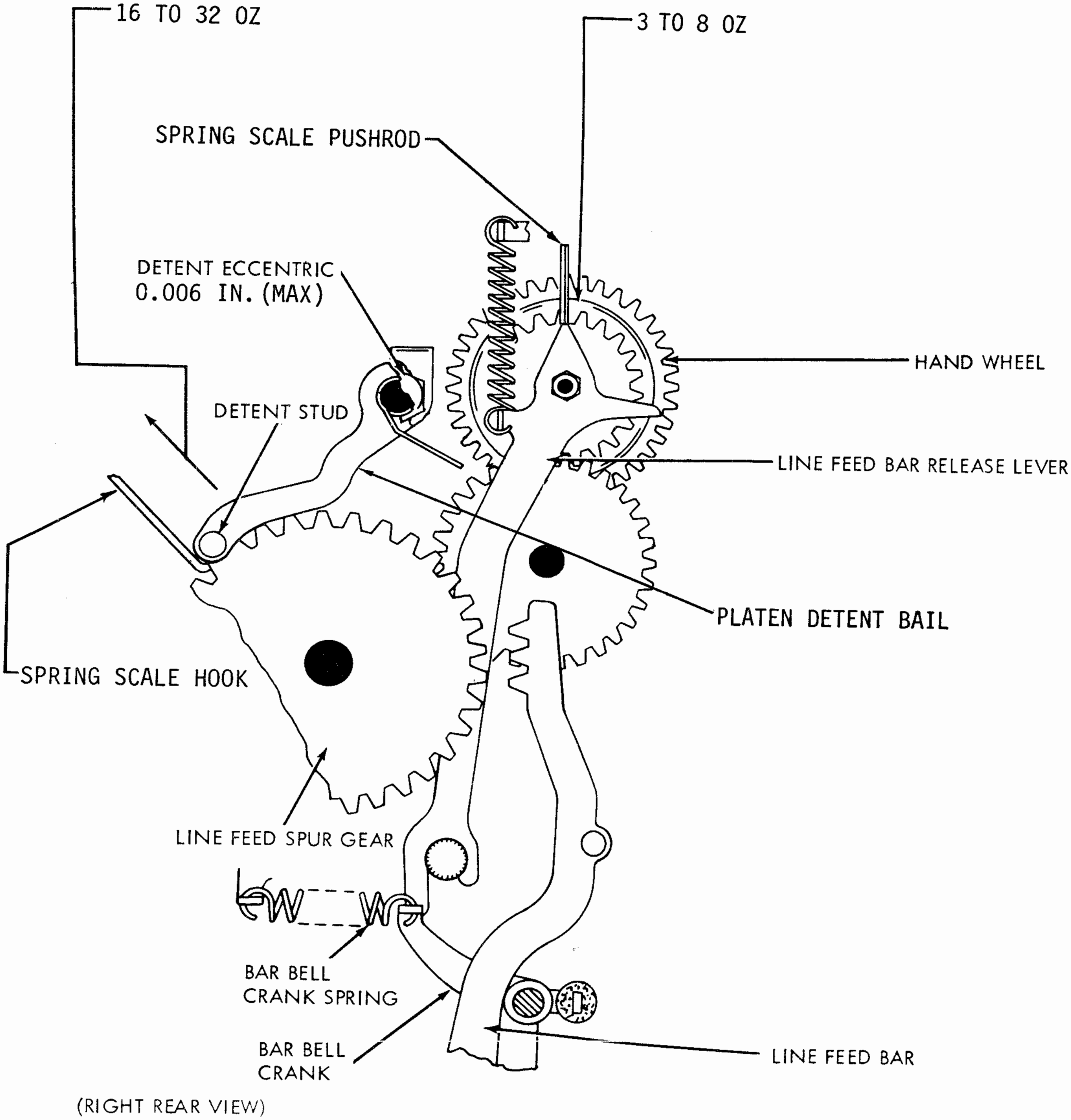



Figure 6-204. Line Feed Bar Release Lever Spring and Platen Detent Bail Spring, and Line Feed Spur Gear Detent Eccentric

line feed spur gear detent eccentric as follows:

(a) Refer to figure 6-204.

(b) Disengage line feed clutch.

(c) Rotate platen until detent stud is seated between two teeth on line feed spur gear.

(d) With handwheel released, manually set teeth on feed bars into engagement with teeth on line feed spur gear.

(e) Ensure detent stud contacts one gear tooth and is not more than 0.006 inch from other tooth.

(f) If not, loosen detent eccentric mounting screws.

(g) Keeping high part of eccentric upward, rotate detent eccentric to obtain specified spacing of detent stud and gear teeth.

(h) Tighten detent stud mounting screws.

(5) Line Feed Bar Springs. Adjust line feed bar springs as follows:

(a) Refer to figure 6-205.

(b) Engage line feed bar with platen gear.

(c) Unhook both springs at end opposite from line feed bars.

(d) Attach spring scale hook to free end of either spring.

(e) Force required to extend spring to installed length should be between 2-1/2 and 5 ounces.

(f) If scale reading exceeds specified limits, install new spring. Otherwise reconnect free end of spring.

(g) Attach spring scale hook to free end of remaining spring.

(h) Repeat steps (d), (e), and (f).

(6) Line Feed Clutch Spur Gear. Adjust line feed clutch spur gear as follows:

(a) Refer to figure 6-206.

(b) Disengage line feed clutch.

(c) Raise slide link upward so as to fully engage end of lower line feed bar, slide held forward by its spring.

(d) Measure clearance between slide link and lower line feed bar. Clearance should be between 0.005 and 0.040 inch.

(e) If clearance exceeds specified limits, set line feed clutch spur gear at center of adjusting range.

(f) Disengage line feed clutch.

(g) Loosen eccentric assembly bearing post.

(h) Mesh the two gears so forward edge of lower ends of line feed bars are

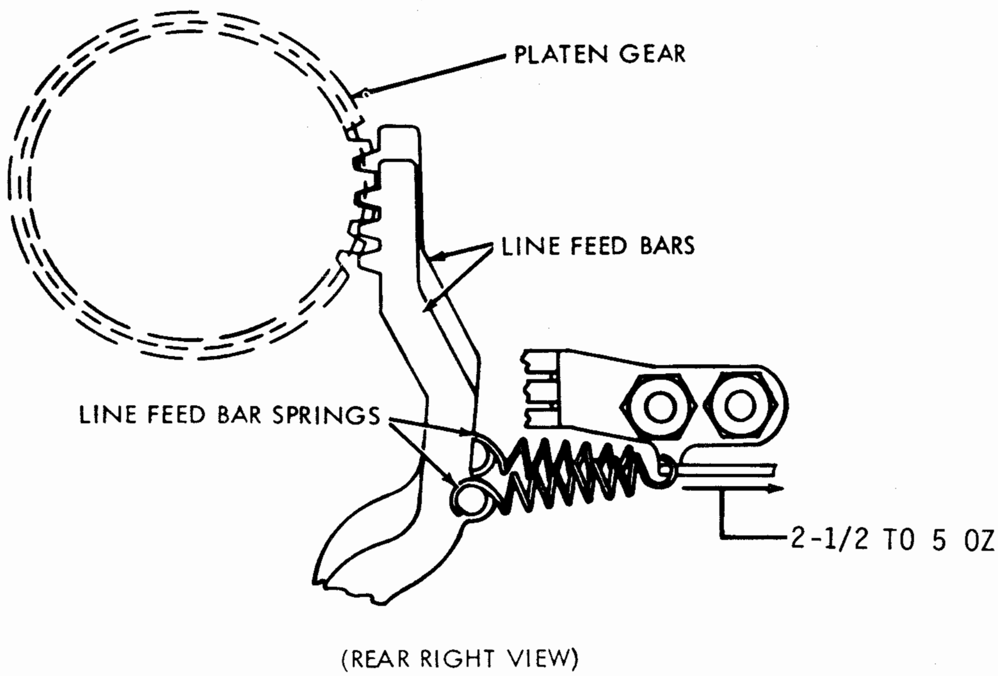



Figure 6-205. Line Feed Bar Springs

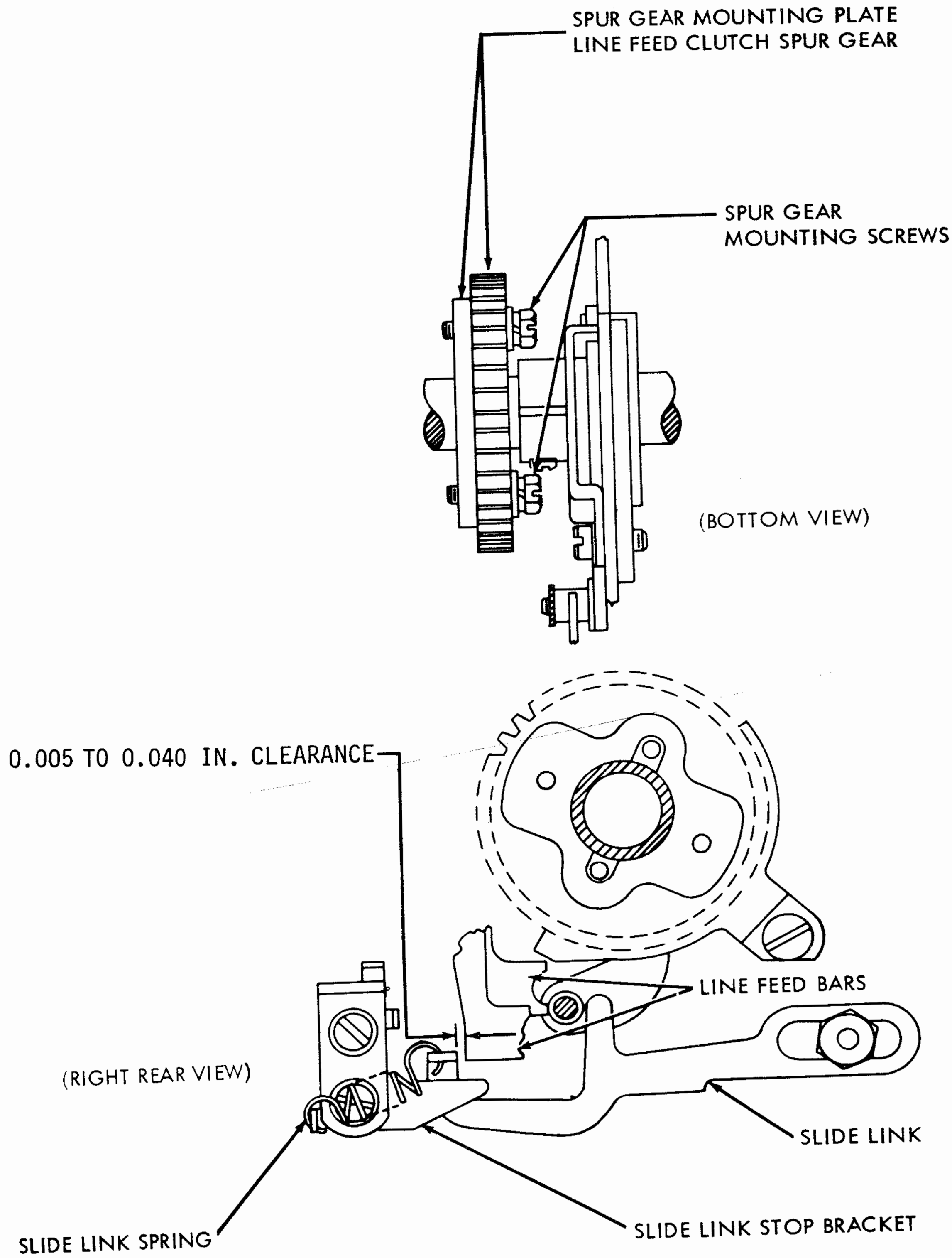



Figure 6-206. Line Feed Clutch Spur Gear

aligned with each other within 0.040 inch.

(i) Loosen spur gear mounting screws.

(j) Rotate line feed clutch spur gear relative to its mounting plate.

(k) At each adjust clearance for both line feed bars to obtain specified clearance.

(l) Tighten spur gear mounting screws.

(7) <u>Reverse Line Feed Slide Link Spring</u>. Adjust reverse line feed slide link spring as follows:

(a) Refer to figure 6-207.

(b) Position slide link so it rests on its stop bracket.

(c) Disengage line feed clutch.

(d) Unhook end of spring farthest from slide link.

(e) Attach spring scale hook to free end of spring.

(f) Force required to extend spring to its installed length should be between 1-1/2 and 3-1/2 ounces.

(g) If scale reading exceeds specified limits, install new spring. Otherwise, reconnect free end of spring.

(8) <u>Reverse Line Feed Slide Link Stop Bracket</u>. Adjust reverse line feed slide link stop bracket as follows:

(a) Refer to figure 6-207.

(b) Operate forward line feed to position line feed bar near as possible to slide link stop bracket.

(c) Measure clearance between top surface of slide link and lower edge of closest line feed bar. Clearance should be 0.045 inch minimum.

(d) If clearance is less than specified minimum value, loosen slide link stop bracket screws and position bracket.

(e) Tighten mounting screws.

o. <u>Selective Calling Mechanism Adjustments</u>. Perform selective calling mechanism adjustments in accordance with the following paragraphs.

(1) <u>Automatic Carriage Return-Line Feed Blocking Slide Spring</u>. Adjust spring as follows:

(a) Refer to figure 6-208.

(b) Unhook spring end opposite from condition code shift fork.

(c) Attach spring scale hook to free end of spring.

(d) Force required to extend spring to its between 1 and 3 ounces.

(e) If scale reading exceeds specified

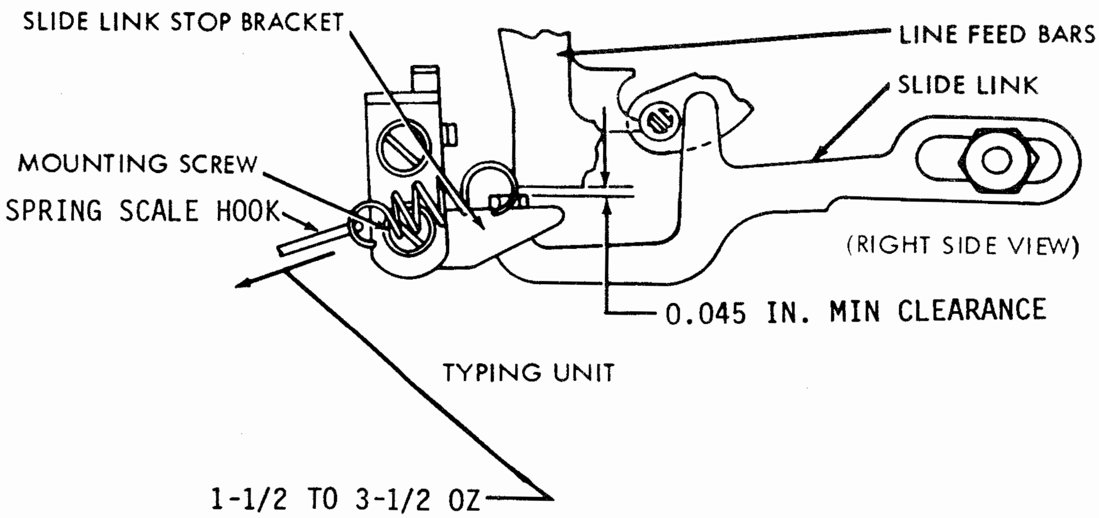



Figure 6-207. Reverse Line Feed Slide Link Spring and Reverse Line Feed Slide Link Stop Bracket

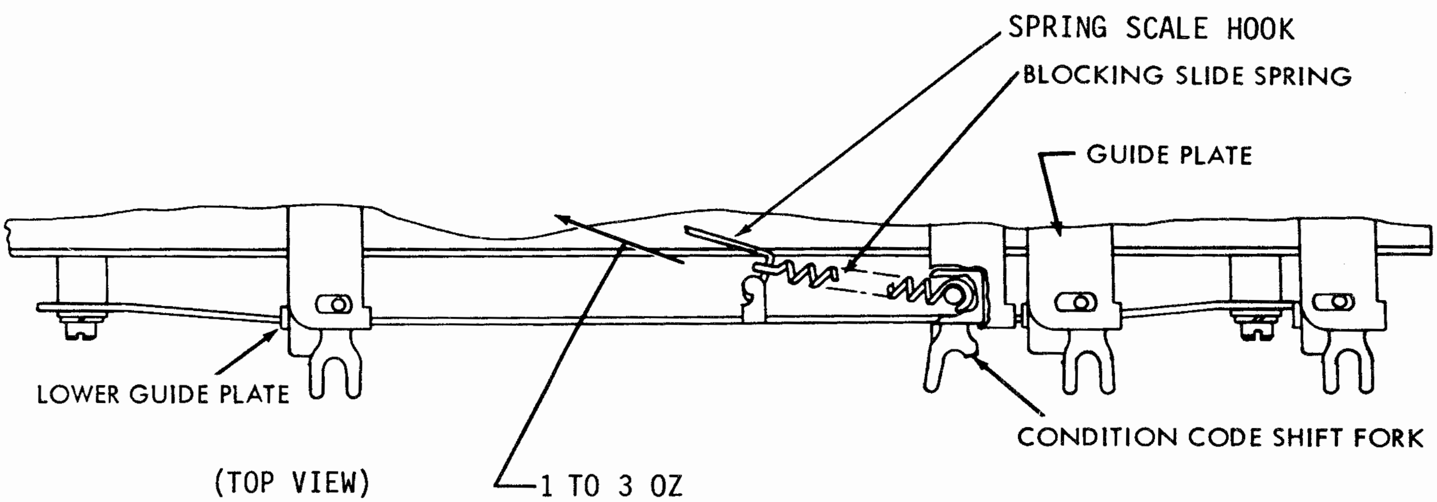



Figure 6-208. Automatic Carriage Return-Line Feed Blocking Slide Spring

limits, install new spring. Otherwise, reconnect free end of spring.

(2) Condition Code Shift Fork Spring. Adjust condition code shift fork spring as follows:

(a) Refer to figure 6-209.

(b) Unhook one end of spring.

(c) Attach spring scale hook to free end of spring.

(d) Force required to extend spring to its installed length should be between 1 and 3 ounces.

(e) If scale reading exceeds specified limits, install new spring. Otherwise, reconnect free end ofspring.

(3) Blocking Bail. Adjust blocking bail as follows:

(a) Refer to figure 6-210.

(b) Latch function lever of any stunt case code bar shift mechanism and rotate main shaft until lower surface of suppression arm is in approximate alignment with bottom surface of blocking bail extension.

(c) Measure clearance between suppression arm and blocking bail extension with play taken up to produce minimum clearance. Clearance should be between 0.008 and 0.055 inch.

(d) If clearance exceeds specified limits, loosen mounting screw.

(e) Position extension to obtain specified clearance.

(f) Tighten mounting screw.

(g) Refine adjustment if necessary and recheck each shift mechanism.

(h) Refine stunt case code bar shift mechanism adjustment of any shift mechanism that does not meet the above requirements.

(4) Off-Line Stunt Shift Solenoid Spring. Adjust off-line stunt shift solenoid spring as follows:

(a) Refer to figure 6-210.

(b) Place solenoid in unoperated position.

(c) Unhook one end of spring.

(d) Attach spring scale hook to free end of spring.

(e) Force required to extend spring to its installed length should be between 2 and 4-1/2 ounces.

(f) If scale reading exceeds specified limits, install new springs. Otherwise, reconnect free end of spring.

(5) Type Box Clutch Suppression Arm. Adjust type box clutch suppression arm as follows:

(a) Refer to figure 6-210.

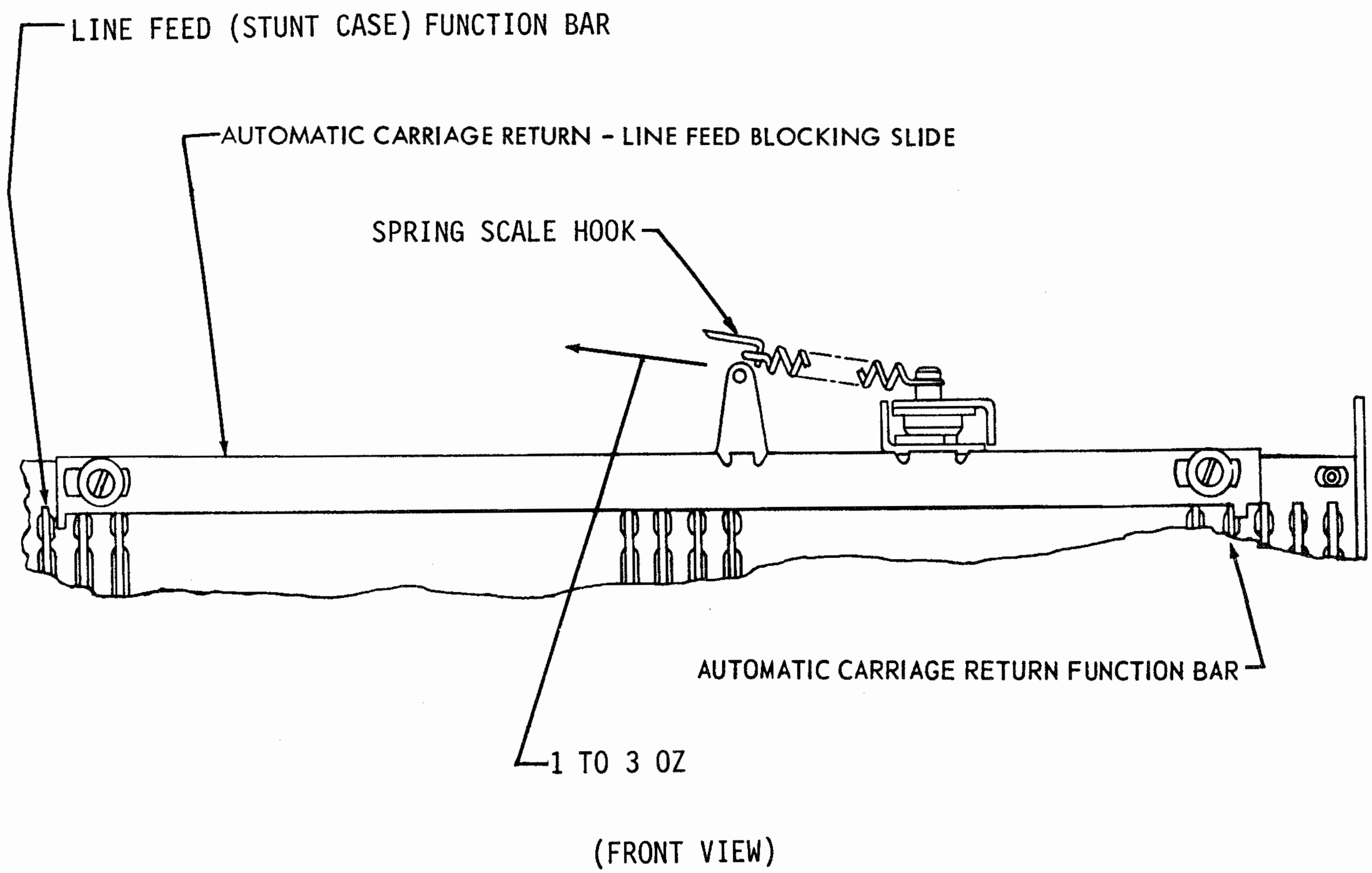



Figure 6-209. Condition Code Shift Fork Spring

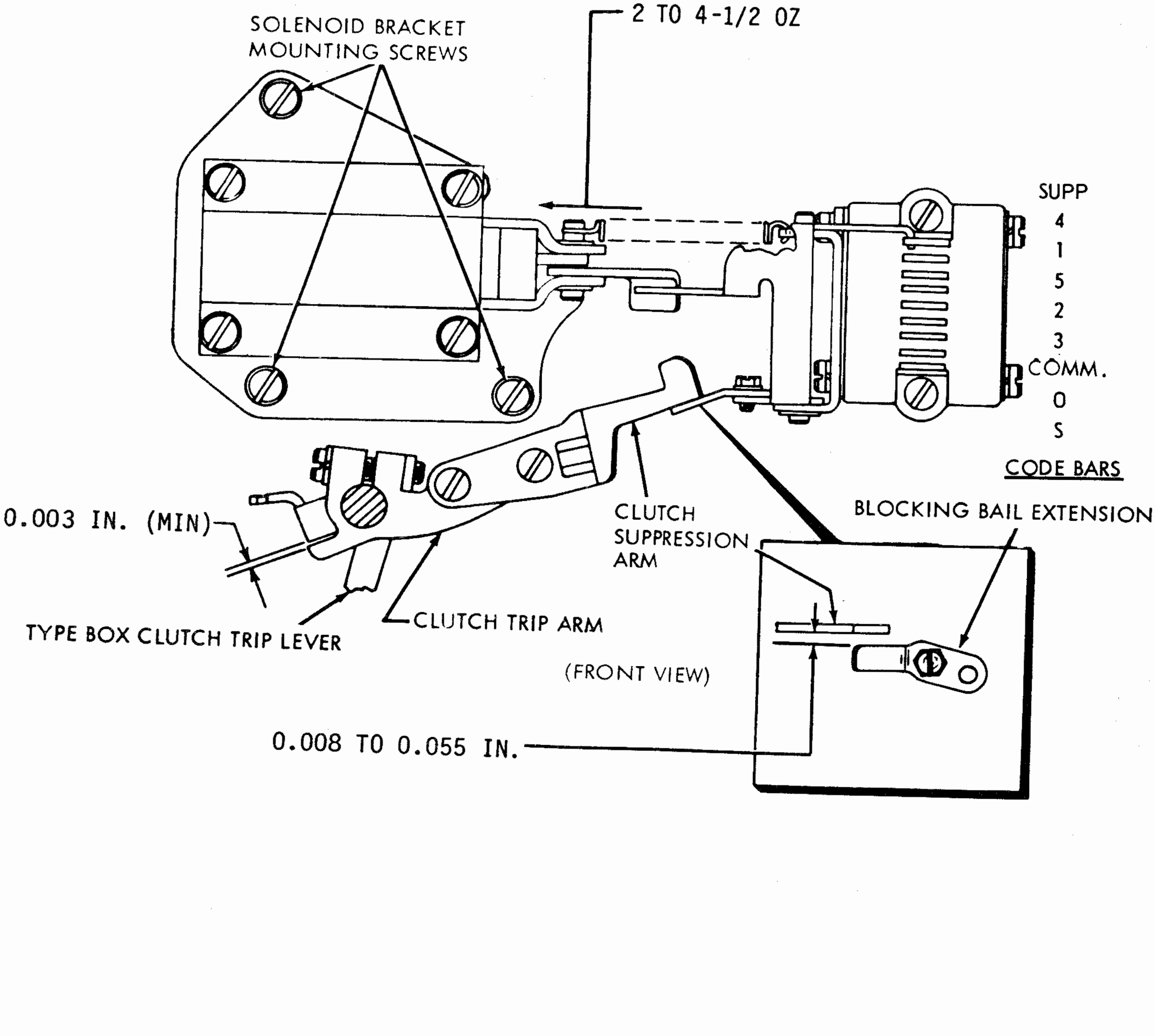



Figure 6-210. Blocking Bail, Off-Line Stunt Shift Solenoid Spring, and Type Box Clutch Suppression Arm

(b) Place suppression arm in blocking position.

(c) Rotate shaft until function clutch shoe lever is opposite function clutch trip lever.

(d) Measure clearance between trip arm extension and clutch trip lever. Clearance should be 0.006 inch minimum.

(e) Measure clearance between function clutch shoe lever and fucntion clutch trip lever. Clearance should be 0.006 inch minimum.

(f) If clearance in either step (d) or step (e) exceeds specified limit, loosen suppression arm mounting screw.

(g) Position suppression arm to obtain specified clearances.

(h) Tighten mounting screw.

(6) Type Box Clutch Trip Lever (Selective Calling Units With or Without Off-Line Shift Solenoid). Adjust type box clutch trip lever as follows:

(a) Refer to figure 6-211.

(b) Position trip shaft cam follower roller on lowest surface of cam (located on code bar clutch).

(c) Measure clearance between inner face of type box clutch trip lever and clutch disc stop lug. Clearance should be between 0.025 and 0.045 inch.

(d) If clearance exceeds specified limits, loosen clamp screw and position stop to obtain specified clearance.

(7) Print Suppressor Code Bar Spring. Adjust print suppressor code bar spring as follows:

(a) Refer to figure 6-212.

(b) Move suppressor code bar to left.

(c) Apply spring scale pushrod to code bar.

(d) Force required to start code bar moving should be between 4-1/2 and 7-1/2 ounces.

(e) If scale reading exceeds specified limits, install new spring.

(8) Code Bar Shift Mechanism. Adjust code bar shift mechanism as follows:

(a) Refer to figure 6-213.

(b) Place function clutch in stop position.

(c) Latch function lever (shift mechanism) on its lower releasing latch.

(d) Shift all code bars to right.

(e) Ensure notch in suppressor code bar should be in alignment with notches in other code bars.

(f) If suppressor code bar is not in alignment with all other code

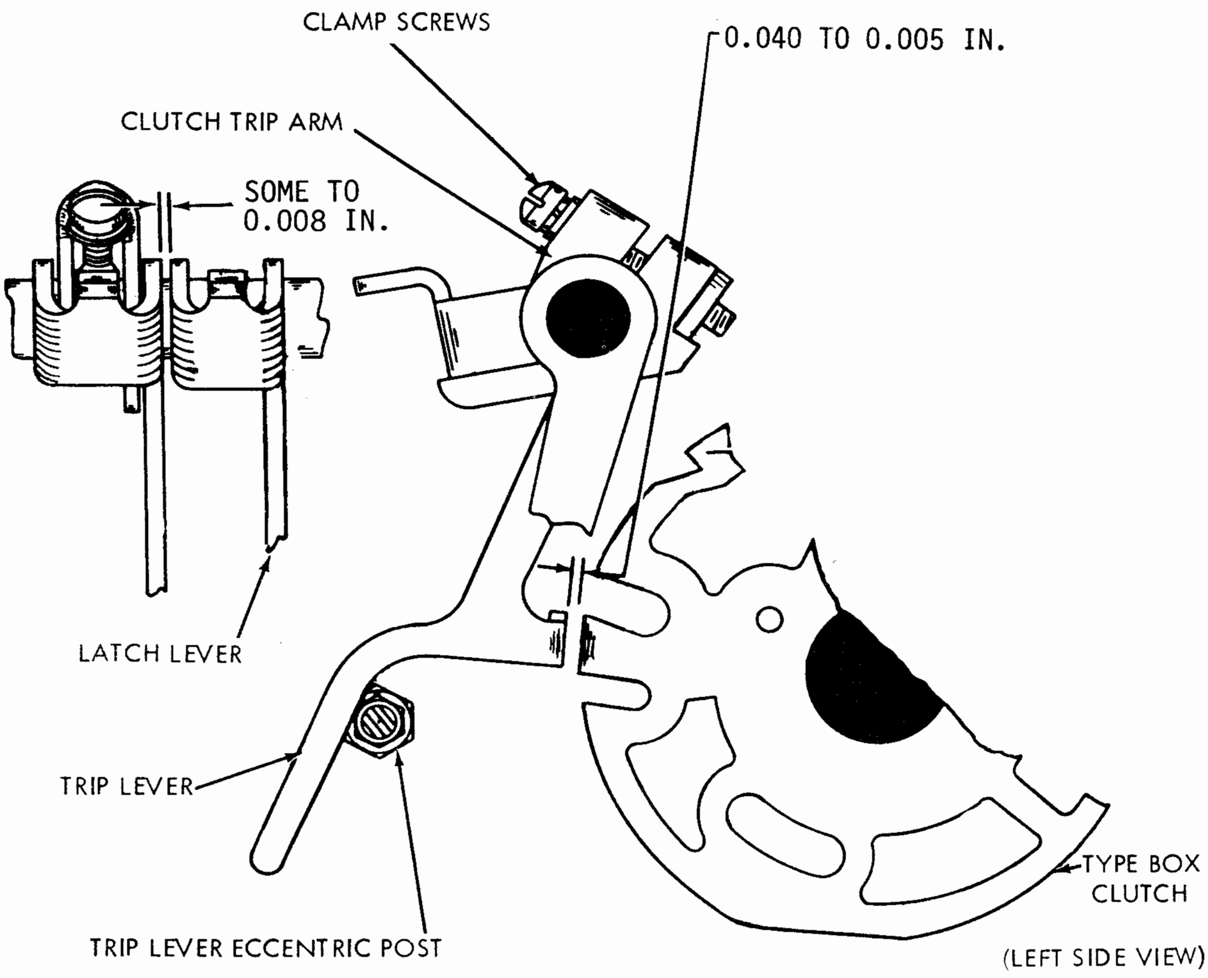



Figure 6-211. Type Box Clutch Trip Lever
(Selective Calling Units)

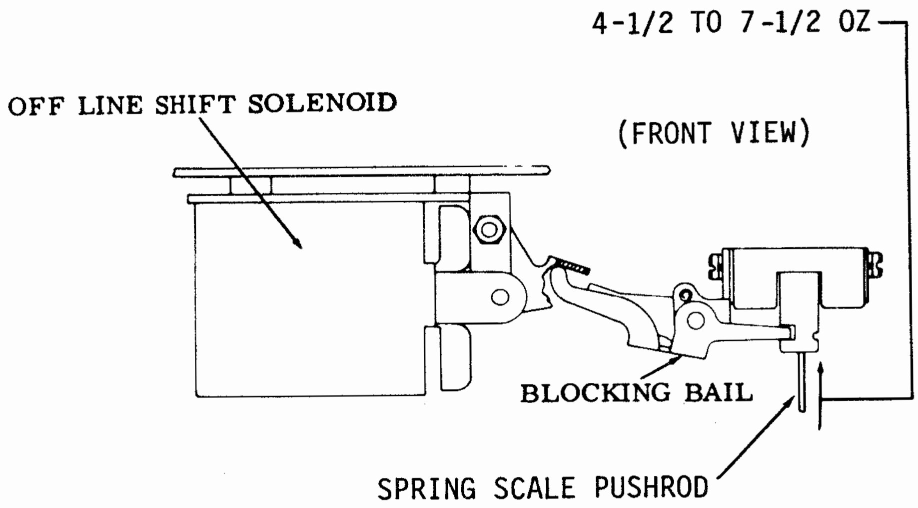



Figure 6-212. Print Suppressor Code Bar Spring

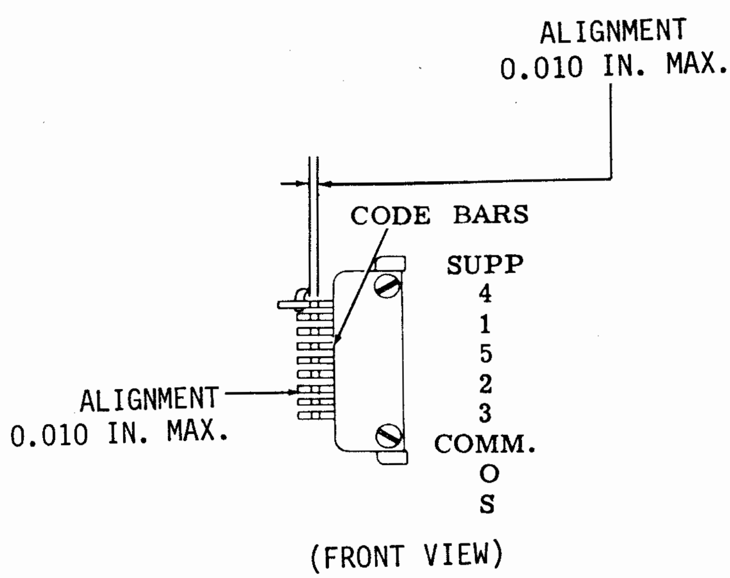



Figure 6-213. Code Bar Shift Mechanism, Condition Code (Zero) Code Bar Shift Mechanism, and Off-Line Shift Solenoid Bracket Assembly

bars, loosen guide plate clamp nuts.

(g) Position upper or lower guideplate to align notches. Position guide plate so movement of fork is not restricted within range of adjustment.

(h) Tighten clamp nuts.

(i) Repeat steps (d) through (g) for each stunt.

(9) Condition Code (Zero) Code Bar Shift Mechanism. Adjust condition code (zero) code bar shift mechanism as follows:

(a) Refer to figure 6-213.

(b) Place function clutch in stop position.

(c) Latch function lever (shift mechanism).

(d) Shift all code bars to right.

(e) Ensure notch in suppressor code bar should be in alignment with notches in other code bars within 0.010 inch maximum.

(f) If suppressor code bar is not in alignment with all other code bars, loosen guide plate clamp nuts.

(g) Position upper or lower guide plate to align notches. Position associated guide plate so movement of fork is not restricted.

(h) Tighten clamp nuts.

(i) Repeat steps (d) through (g) for each stunt case code bar shift mechanism.

(10) Off-Line Shift Solenoid Bracket Assembly (Off-Line Only). Adjust off-line shift solenoid bracket assembly as follows:

(a) Refer to figure 6-213.

(b) Ensure notch in suppression code bars are in alignment with notches in other code bars when code bars are shifted to right.

(c) If alignment of notches is not as specified, loosen mounting screws.

(d) Position solenoid bracket to align notch in suppression code bar with notches in other side bars when code bars are shifted to right.

(e) Tighten mounting screws.

p. Two-Color Ribbon Mechanism Adjustments. Perform two-color ribbon mechanism adjustments in accordance with the following paragraph.

(1) Armature Spring, Left and Right. Adjust armature spring as follows:

(a) Refer to figure 6-214.

(b) Attach spring scale hook as shown.

(c) Force required to seat armature

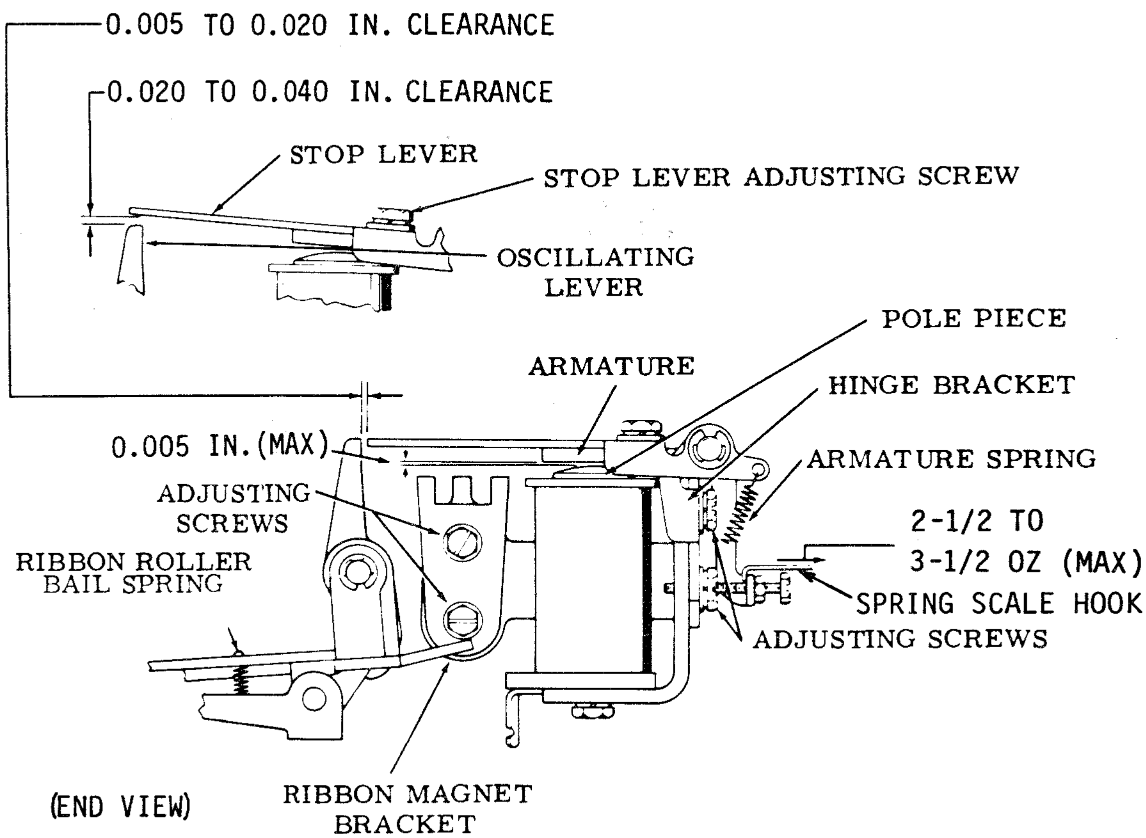



Figure 6-214. Armature Spring, Left and Right; Ribbon Magnet Hinge Bracket, Left and Right (Preliminary); Ribbon Magnet Hinge Bracket, Left and Right (Final); Ribbon Magnet Bracket, Left and Right (Preliminary); Operational Requirement for Ribbon Magnet Bracket (Final)

against pole piece should be between 2-1/2 and 3-1/2 ounces.

(d) If scale reading exceeds specified limits, install new spring.

(2) <u>Ribbon Magnet Hinge Bracket, Left and Right (Preliminary)</u>. Adjust ribbon magnet hinge bracket as follows:

(a) Refer to figure 6-214.

(b) Position armature against pole piece in energized position.

(c) Measure clearance between armature and pole piece. Clearance should be not more than 0.005 inch.

(d) If clearance exceeds specified limit, loosen mounting screws.

(e) Position hinge bracket to obtain specified clearance.

(3) <u>Ribbon Magnet Hinge Bracket, Left and Right (Final)</u>. Adjust ribbon magnet hinge bracket as follows:

(a) Refer to figure 6-214.

(b) Position armature in deenergized position.

(c) Rotate main shaft until oscillating lever is fully under stop lever.

(d) Measure clearance between oscillating lever and stop lever. Clearance should be between 0.020 and 0.040 inch.

(e) If clearance exceeds specified limits loosen locknut and use stop lever adjusting screw to obtain specified clearance.

(f) Tighten locknut.

(4) <u>Ribbon Magnet Bracket, Left and Right (Preliminary)</u>. Adjust ribbon magnet bracket as follows:

(a) Refer to figure 6-214.

(b) Set adjusting screw to lowest position.

(c) Disengage all clutches.

(d) Hold magnet armature stop lever against magnet core.

(e) Lever should be parallel to oscillating lever top surface and engage oscillating lever by at least half of stop lever thickness as gauged by eye.

(f) Hold stop lever against magnet core.

(g) Measure clearance between stop lever and oscillating lever. Clearance should be between 0.005 and 0.020 inch.

(h) If clearance exceeds specified limits, loosen ribbon magnet bracket adjusting screws.

(i) Position ribbon magnet bracket to obtain specified clearance.

(j) Tighten ribbon magnet bracket adjusting screws.

(5) Operational Requirement for Ribbon Magnet Bracket (Final). Adjust ribbon magnet bracket as follows:

(a) Refer to figure 6-214.

(b) Operate printer at 60, 75, or 100 word per minute while printing a test message.

(c) Energize ribbon magnets.

(d) Printer should print in red color.

(e) If printer prints in black color, turn left and right ribbon bracket roller bail adjusting screws one-half turn up. Refine ribbon and ribbon hinge bracket adjustments.

(f) Repeat steps (b) through (e) if black is printed.

(6) Ribbon Guide Lever Spring, Left and Right. Adjust as follows:

(a) Refer to figure 6-215.

(b) Attach spring scale hook to ribbon guide lever.

(c) Force required to start lever moving should be between 1 and 2 ounces.

(d) If scale reading exceeds specified limits, install new spring.

(7) Ribbon Reversing Lever Spring, Right and Left. Adjust ribbon reversing lever spring as follows:

(a) Refer to figure 6-215.

(b) Attach spring scale hook to ribbon reversing lever as shown.

(c) Force required to start ribbon reversing lever moving should be between 1/2 and 1-1/2 ounces.

(d) If scale reading exceeds specified limits install new spring.

(8) Ribbon Roller Bail Spring, Left and Right. Adjust ribbon roller bail spring as follows:

(a) Refer to figure 6-215.

(b) Disengage all clutches.

(c) Set adjusting screw in lowest position.

(d) Attach spring scale hook as shown.

(e) Force required to start lifter bail moving should be between 4 and 6 ounces.

(f) If scale reading exceeds specified limits, install new spring.

q. Universal Contact (Selector) Mechanism Adjustments. Adjust universal contact (selector mechanism in accordance with the following paragraphs.

(1) Contact Mounting Bracket. Adjust contact mounting bracket as follows:

(a) Refer to figure 6-216.

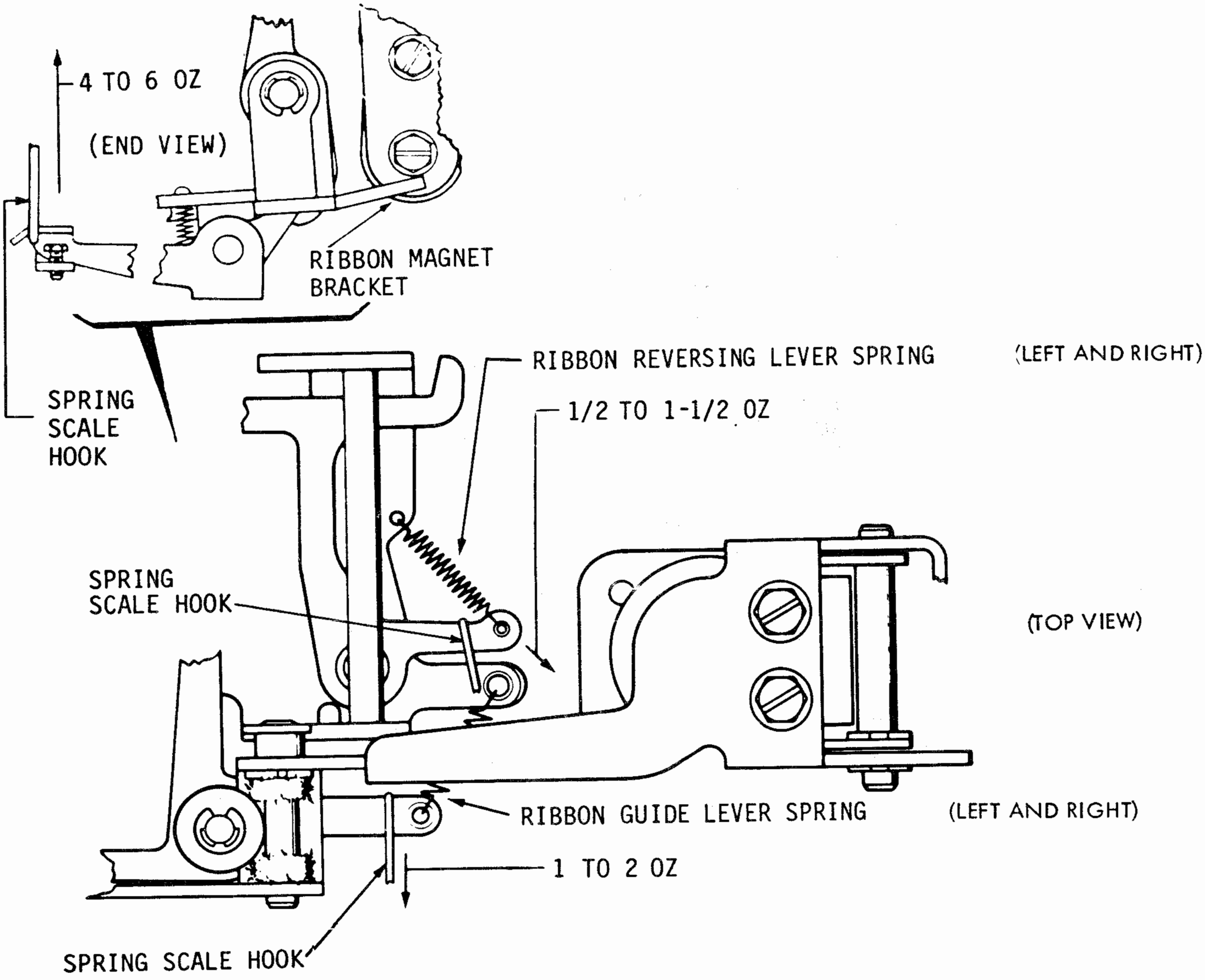



Figure 6-215. Ribbon Guided Lever Spring, Left and Right; Ribbon Reversing Lever Spring, Left and Right; and Ribbon Roller Bail Spring, Left and Right

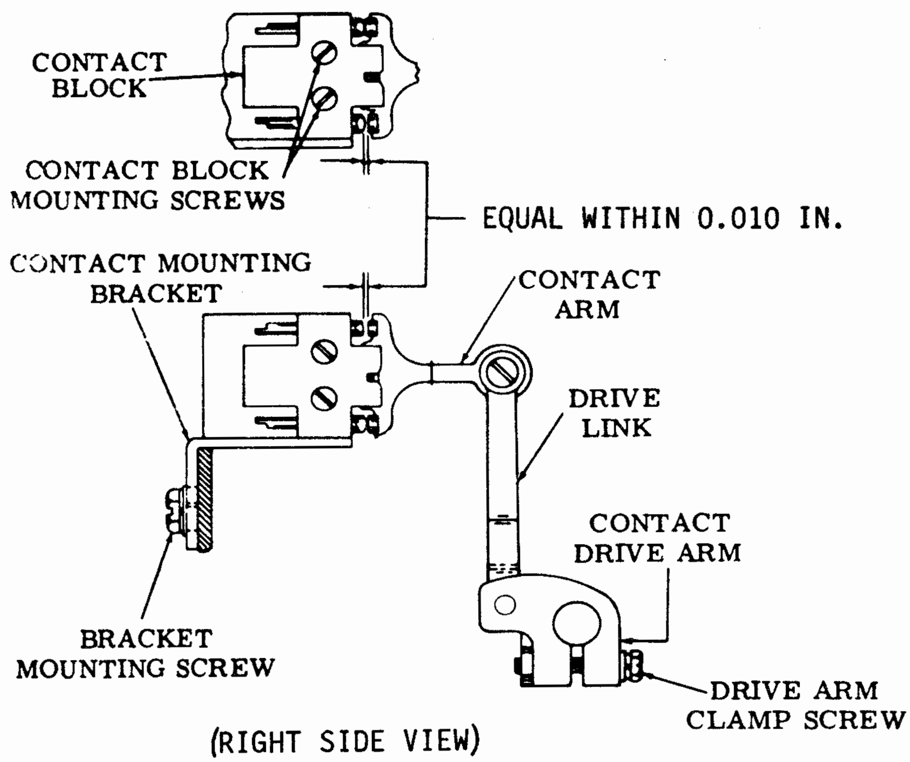



Figure 6-216. Contact Mounting Bracket, Contact Block, and Contact Drive Arm Position

(b) Ensure drive arm linkage is vertically aligned.

(c) If linkage is not vertically aligned, loosen contact mounting bracket mounting screws and position bracket to align drive arm linkage.

(d) Tighten mounting screws.

(2) Contact Block. Adjust contact block as follows:

(a) Refer to figure 6-216.

(b) Ensure contact faces are in a vertical straight line.

(c) If contact faces are not vertically aligned, loosen two contact mounting screws and press contact block toward rear of typing unit firmly against screws.

(d) Tighten mounting screws.

(3) Contact Drive Arm Position. Adjust contact drive arm position as follows:

(a) Refer to figure 6-216.

(b) Rotate code bar clutch until it is disengaged and latched in stop position.

(c) Measure upper contact gap and note measurement.

(d) Trip code bar clutch. Rotate clutch 180 degrees or until lower contacts reach maximum opening.

(e) Measure lower contact gap and note measurement.

(f) Upper and lower contact gaps should be equal within 0.010 inch.

(g) If contact gaps are not equal within specified limits, loosen contact drive arm clamp screw.

(h) Position contact drive arm to equalize upper and lower contact gaps within specified limits.

(4) Contact Arm Spring. Adjust contact arm spring as follows:

(a) Refer to figure 6-217.

(b) Remove shoulder screw connecting ocntact arm to drive link.

(c) Attach spring scale hook to contact arm as shown.

(d) Force required to open contact either by pulling upward or pushing downward should be between 2 and 5 ounces.

(e) If scale reading exceeds specified limit in either upward or downward directon, install new spring.

r. Universal Contact (Stunt Box) Mechanism Adjustments. Perform universal contact (stunt box) mechanism adjustments in accordance with the following paragraphs.

(1) Contact. Adjust contact as follows:

(a) Refer to figure 6-218.

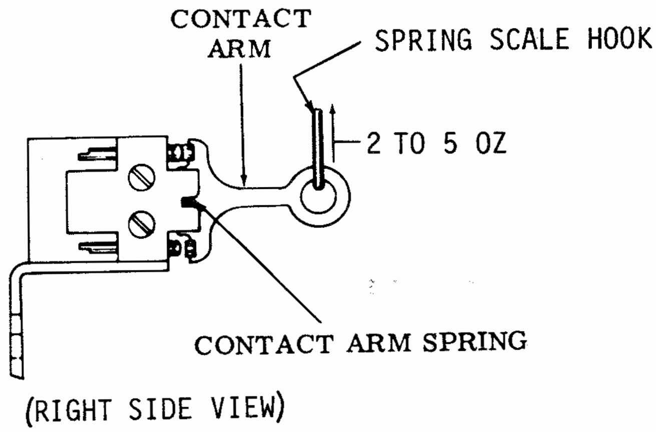



Figure 6-217. Contact Arm Spring

(b) Remove contact bracket assembly.

(c) Ensure contact springs and stiffeners are mounted vertically and contant prints are aligned as gauged by eye.

(d) If contact points are misaligned, loosen assembly screws and position contact springs and stiffeners.

(e) Tighten screws.

(f) Ensure stiffeners are parallel with contact brackets. If not, form stiffeners.

CAUTION

Use care in forming stiffeners to avoid damage to contact springs.

(g) Reinstall contact bracket assembly.

(2) Normally Open Contact Gap. Adjust normally open contact gap as follows:

(a) Refer to figre 6-218.

(b) Remove contact bracket assembly.

(c) Close normally closed contacts.

(d) Measure normally open contact gap. Gaps

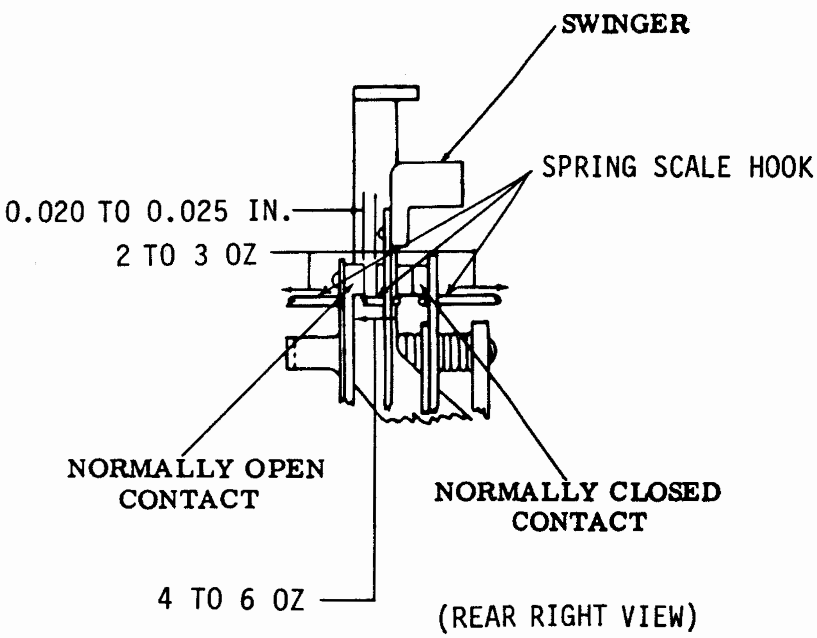



Figure 6-218. Contact, Normally Open Contact Gap, Contact Spring, and Swinger Spring

should be between 0.020 and 0.025 inch.

(e) If contact gap exceeds specified limits, bend stiffener to obtain specified contact gap.

CAUTION

Use care in forming stiffener to avoid damage to contact spring.

(f) Reinstall contact bracket assembly.

(3) Contact Springs (Two Springs). Adjust contact springs as follows:

(a) Refer to figure 6-218.

(b) Remove contact bracket assembly.

(c) Apply spring hook to either contact spring.

(d) With swinger held away, force required to move contact spring away from its stiffener should be between 2 and 3 ounces.

(e) Repeat steps (c) and (d) for remaining contact spring.

(f) If scale reading for either contact spring exceeds specified limits, remove and reform contact springs.

(g) Repeat adjustment at 6-5.r(1) and (2).

(h) Reinstall contact bracket assembly.

(4) Swinger Spring. Adjust swinger spring as follows:

(a) Refer to figure 6-218.

(b) Remove contact bracket assembly.

(c) Attach spring scale hook to swinger.

(d) Force required to move swinger from normally closed contact should be between 4 and 6 ounces.

(e) If scale reading exceeds specified limits bend swinger to obtain specified scale reading.

(f) Reinstall contact bracket assembly.

(5) Contact Bracket and Drive Cam. Adjust contact bracket and drive cam as follows:

(a) Refer to figure 6-219.

NOTE

Make the contact bracket and drive cam adjustment with contact assembly installed on stunt box.

(b) Place drive link in its uppermost position.

(c) Measure clearance between top of latchlever and latch cam. Clearance should be between 0.003 and 0.008 inch.

(d) Rotate main shaft until latch lever rests firmly on latch cam.

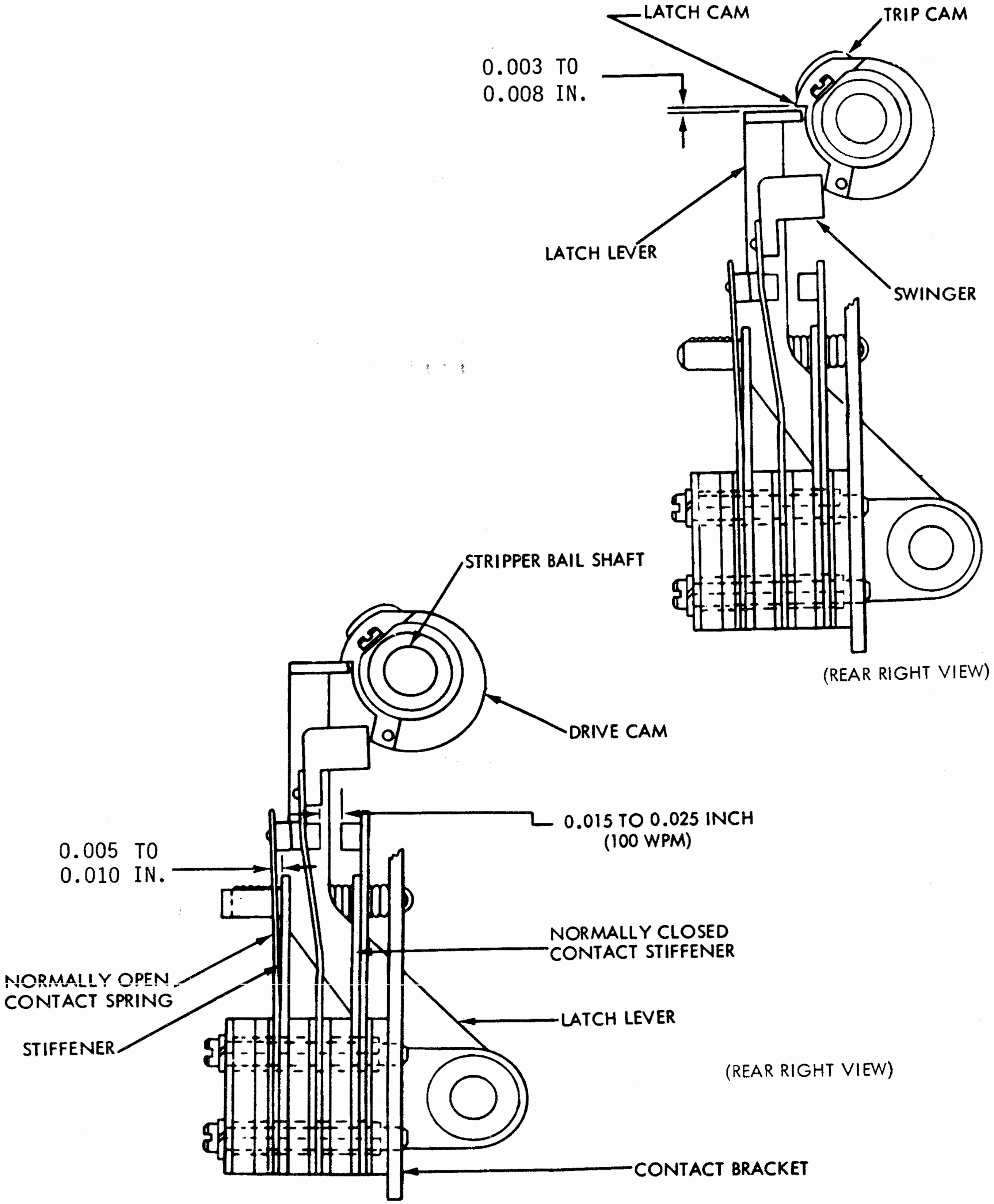



Figure 6-219. Contact Bracket and Drive Cam Position

(e) Measure clearance between normally open contact spring and upper end of its stiffener. Clearance should be between 0.005 and 0.010.

(f) If clearance exceeds specified limits in either step (c) or step (e), loosen screws and reposition contact bracket and, if necessary, drive cam.

(g) Tighten screws.

(6) Latch Lever Spring. Adjust latch lever spring as follows:

(a) Refer to figure 6-220.

(b) Rotate stripper bail shaft until latch lever rests on high part of trip cam.

(c) Attach spring scale hook to latch lever as shown.

(d) Force required to move latch lever away from trip cam should be between 1/2 and 2 ounces.

(e) If scale reading exceeds specified limits, install new latch lever spring.

(7) Trip Cam. Adjust trip cam as follows:

(a) Refer to figure 6-220.

(b) Rotate stripper bail shaft to locate drive link at its lowest point.

(c) Measure clearance between latchlever and latch cam. Clearance should be not less than 0.003 inch.

(d) If clearance exceeds specified limit, loosen trip cam mounting screws.

(e) Rotate trip cam to obtain specified clearance between latchlever and latch cam.

NOTE

As a check to ensure trip cam is not installed 180 degrees out of place, rotate main shaft so that stripper shaft drive link moves downward.

(f) Tighten trip cam mounting screws.

(8) Contact Bracket and Drive Cam Position. The following adjustment should be used for general application final timing using distortion test set or similar equipment.

(a) Refer to figure 6-219.

(b) The normally open universal contacts should close within plus or minus 5 milliseconds of closure of normally open stunt box contact.

(c) To adjust, refine drive cam adjustment and, if necessary, contact bracket adjustment of 6-5.1r(5) by rotating drive cam within specified limits.

(9) Trip Cam Position. The following adjustment should be used for general application final timing using distortion test set or similar equipment.

(a) Refer to figure 6-220.

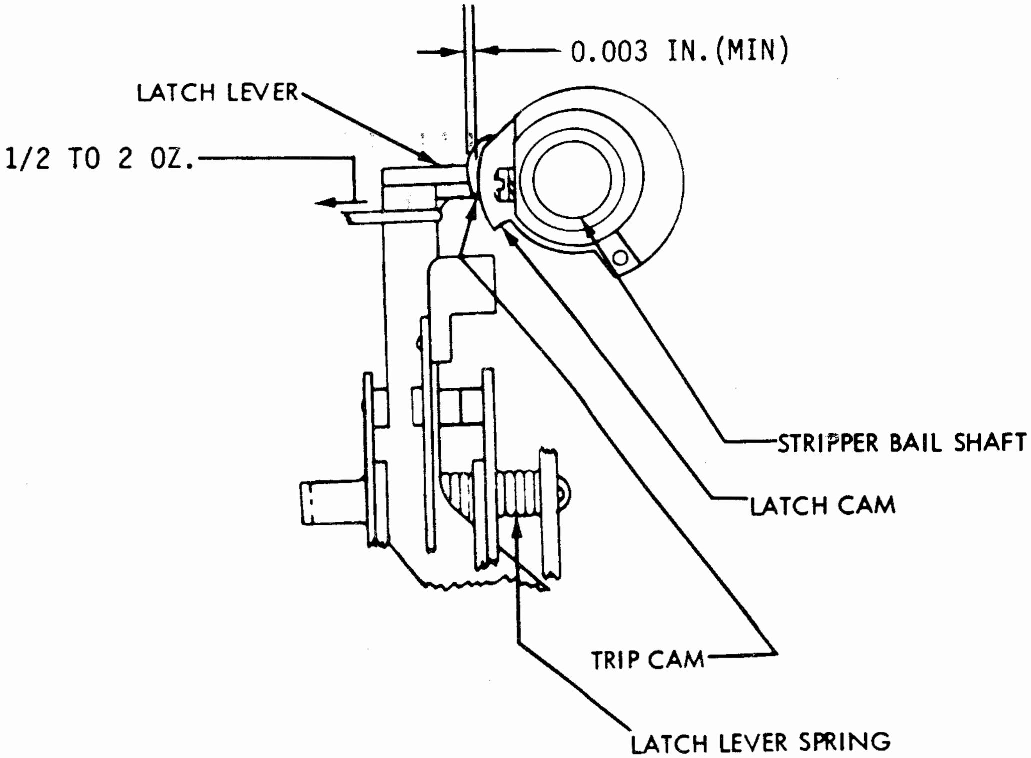



Figure 6-220. Latch Lever Spring and Trip Cam

(b) Normally open universal contacts should open between -5 and +0 milliseconds before the opening of normally open stunt box contact.

(c) To adjust, refine trip cam adjustment of 6-5.r(7) by rotating trip cam on its shaft within specified limits.

(10) Normally Closed Contact (100 WPM for 83B2 Switching System). The following adjustment should be used for special application timing using distortion test set or similar equipment.

(a) Refer to figure 6-219.

(b) Normally closed contacts should close within 50 to 80 divisions after start of stop pulse.

(c) Normally open contact should close prior to end of number 3 pulse.

(d) Normally open contact should remain closed for at least 238 divisons (100 words per minute DXD with 742 scale divisions).

s. Vertical Tabulation and Transmitter-Distributor Control Mechanism Adjustments. Perform vertical tabulation and transmitter-distributor control mechanism adjustments in accordance with the following paragraphs.

(1) Blocking Lever. Adjust blocking lever as follows:

(a) Refer to figure 6-221.

(b) Position index plate so pawl is at peak of index plate.

(c) Measure clearance between bottom of blocking lever and top of slide. Clearance should be between 0.005 and 0.045 inch.

(d) If clearance exceeds specified limits, loosen mounting screws.

(e) Position adjustable arm to obtain specified clearance between bottom of blocking lever and top of slide.

(f) Tighten mounting screws.

(g) Repeat for each remaining blocking lever.

(2) Pointer. Adjust pointer as follows:

(a) Refer to figure 6-221.

(b) Disengage line feed clutch.

(c) Move index plate adjacent to pawl.

(d) Ensure pointer is aligned with notch in indexing disc and clears all index plates by 1/16 inch.

(e) If clearance is insufficient, loosen mounting screw.

(f) Position pointer on side frame to obtain specified clearance.

(g) Tighten mounting screws.

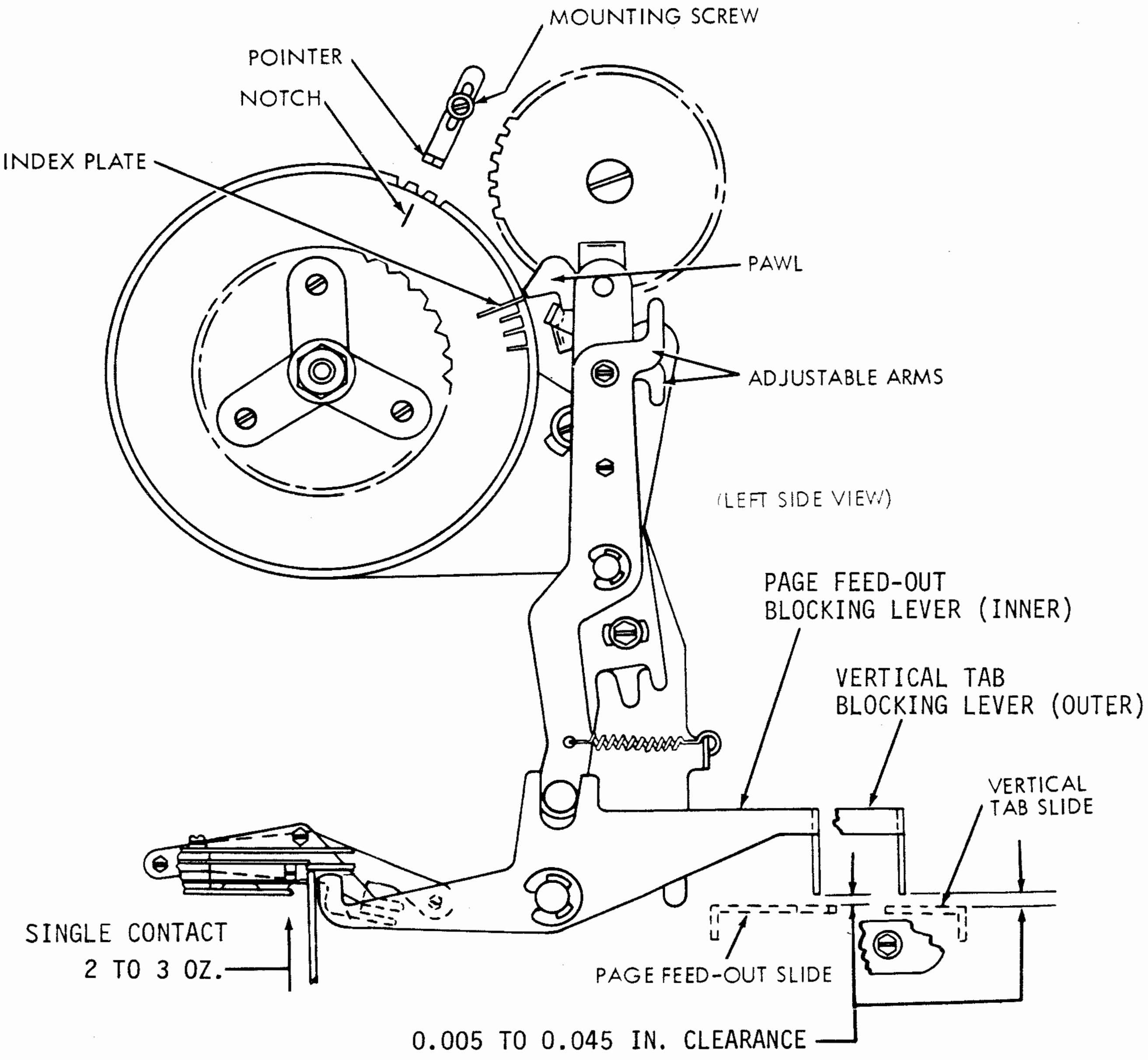



Figure 6-221. Blocking Lever, Pointer, and Switch Contact Pressure

(3) Switch Contact Pressure (Transmitter Control Only). Adjust switch contact pressure as follows:

(a) Refer to figure 6-221.

(b) With contacts closed, apply spring scale pushrod to contact swinger.

(c) Force required to move contact swinger away from its mating contact should be between 2 and 3 ounces.

(d) If scale reading exceeds specified limits, bend swinger to obtain proper contact pressure.

(4) Transmitter Control Switch for Single-Contact Type Control (Transmitter Control Only). Adjust transmitter control switch as follows:

(a) Refer to figure 6-222.

(b) Rotate main shaft until feed-out and vertical tabulation blocking levers are resting on top of slides.

(c) With transmitter control contacts closed, there should be some clearance between insulated extension of swinger and lobe of feed-out and vertical tabulator blocking levers.

(d) If there is no clearance, loosen contact assembly mounting screws.

(e) Position contact assembly to obtain some clearance and tighten mounting screws.

(f) Select feed-out code combination.

(g) Rotate main shaft until feed-out slide is in its extreme forward position and feed-out blocking lever drops behind its slide to open contacts.

(h) Clearance between switch contacts should be between 0.010 and 0.020 inch.

(i) If clearance exceeds specified limits, refine adjustment of steps (b) through (d).

(j) Select vertical tabulator code combination.

(k) Rotate main shaft until vertical tabulator slide is in its extreme forward positon and vertical tabulator blocking lever drops behind its slide to open contacts.

(l) Clearance between switch contacts should be between 0.010 and 0.020 inch.

(m) If clearance exceeds specified limits, refine adjustment of steps (b) through (d).

(5) Tabulation Index Plate Position. Adjust tabulation index plate position as follows:

(a) Refer to figure 6-222.

(b) Rotate main shaft until feed-out and vertical tabulation blocking levers are resting on top of slides.

(c) With transmitter control contacts closed, there should be some

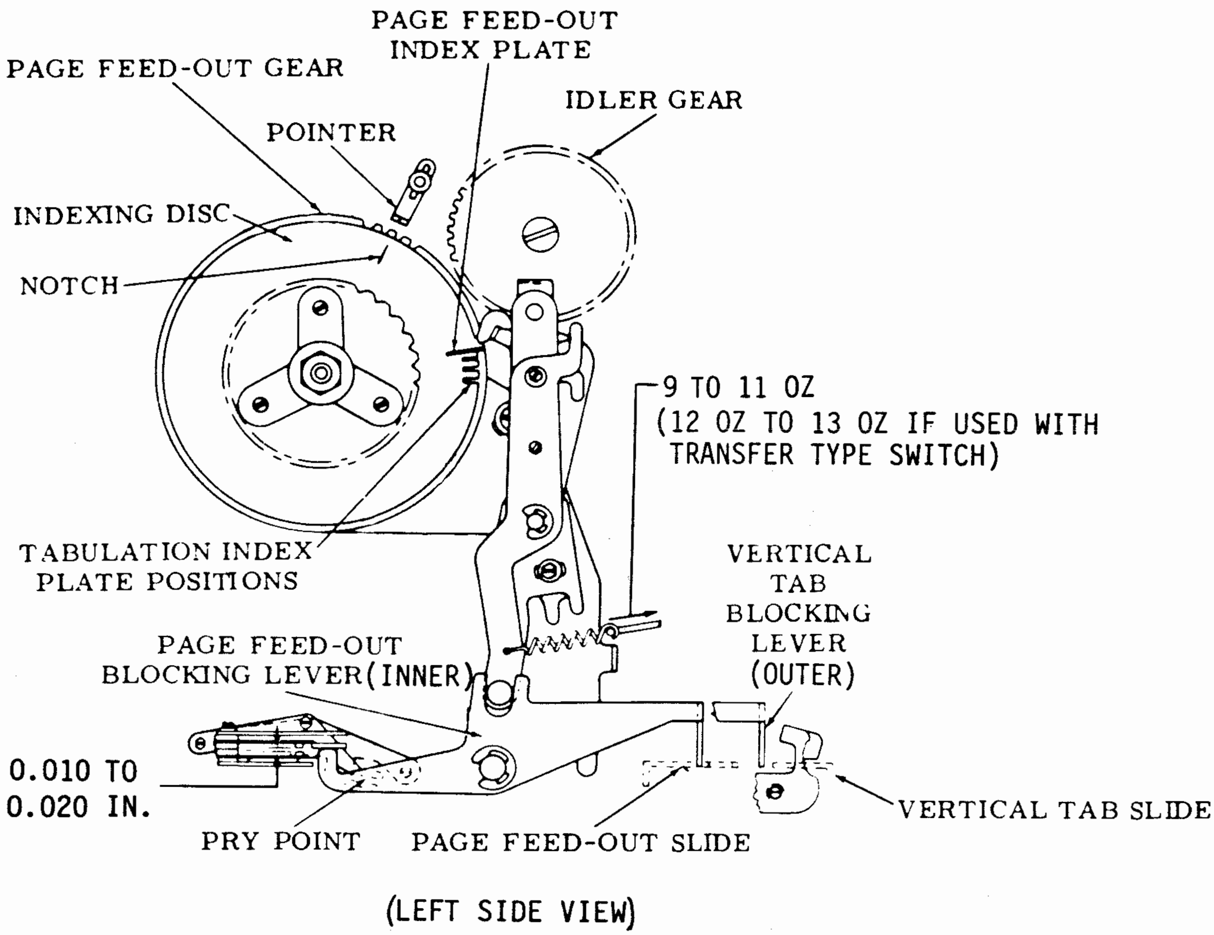



Figure 6-222. Transmitter Control Switch for Signal-Contact Type Control, Tabulation Index Plate Position, and Blocking Lever Spring

clearance between insulated extension of swinger and lobe of feed-out and vertical tabulator blocking levers.

(d) If there is no clearance, loosen contact assembly mounting screws.

(e) Position contact assembly to obtain some clearance and tighten mounting screws.

(f) Line-feed platen to desired first line of printing in that form.

(g) Place tabulation index plate in alignment with pointer on side of printer.

(h) Install additional tab index plates of succeeding desired printing lines within the form.

(i) When tabulation at a given point is not needed rotate tabulation index plates one-quarter turn on their sides.

(6) <u>Blocking Lever Spring</u>. Adjust blocking lever as follows:

(a) Refer to figure 6-222.

(b) Unhook blocking lever spring at end opposite from blocking lever.

(c) Position blocking lever on top of slide.

(d) Attach spring scale hook to free end of spring.

(e) Force required to extend spring to position length should be between 9 and 11 ounces. If blocking lever spring is used with transfer type switch, force required to extend spring should be between 12 and 13-1/2 ounces.

(f) If scale reading exceeds specified lmits, install new spring. Otherwise, reconnect free end of spring.

(7) <u>Form-Out Pawl Spring</u>. Adjust form-out pawl spring as follows:

(a) Refer to figure 6-223.

(b) Attach spring scale hook to form-out pawl as shown in figure.

(c) Force required to pull pawl away from its backstop lever should be between 3 and 8 ounces.

(d) If scale reading exceeds specified limits, install new spring.

(8) <u>Tabulator Bail Spring</u>. Adjust tabulator bail spring as follows:

(a) Refer to figure 6-224.

(b) Attach spring scale hook to tabulator bail as shown in figure.

(c) Force required to pull bail away from its backstop lever should be between 3 and 8 ounces.

(d) If scale reading exceeds specified limits, install new spring.

(9) <u>Line Feed Clutch Trip Lever Spring</u>. Adjust line feed clutch trip lever spring as follows:

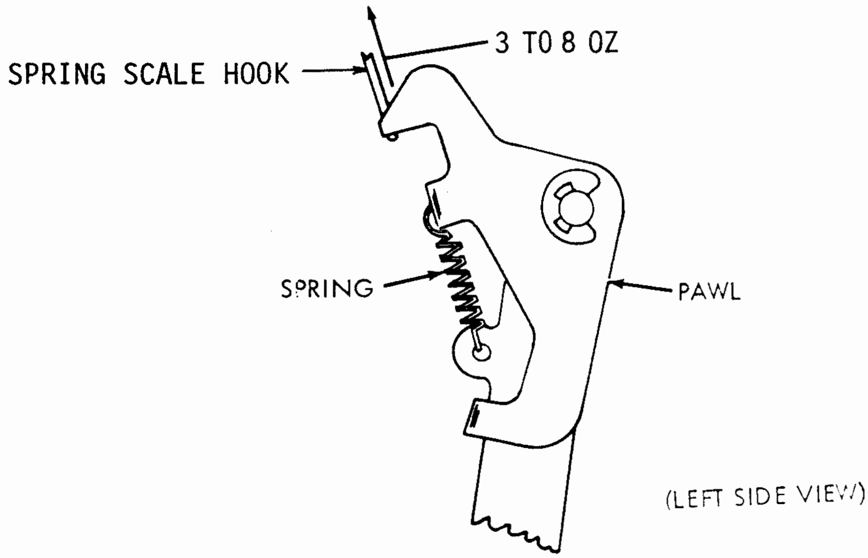



Figure 6-223. Form-Out Pawl Spring

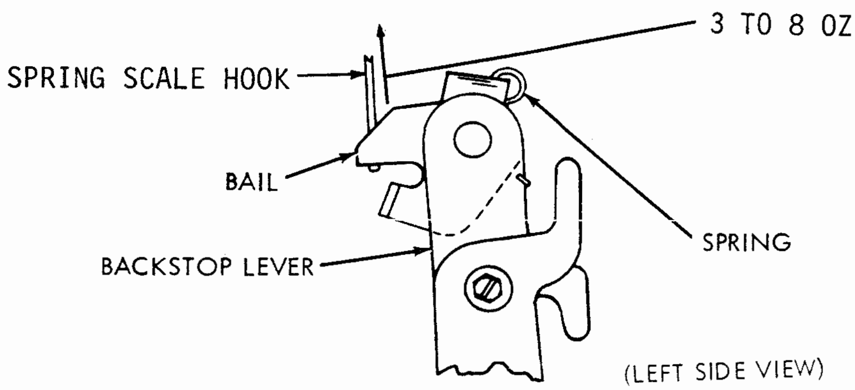



Figure 6-224. Tabulator Bail Spring

(a) Refer to figure 6-37.

(b) Engage and rotate clutch until trip lever rests on stop lug.

(c) Apply spring scale hook to trip lever.

(d) Force required to move lever away from stop lug should be between 9 and 12 ounces.

(e) If scale reading exceeds specified limits, install new spring.

(10) <u>Stunt Box Switch Spring</u>. Adjust stunt box switch spring as follows:

(a) Refer to figure 6-225.

(b) Close switch contacts.

(c) Attach spring scale hook to contact arm. The force required to open switch contact should be between 1 and 2 ounces. If the required force exceeds the limits, replace spring.

(d) If switch is removed from stunt box, perform the following adjustments:

1. Measure clearange between contact arm and vertical portion of contact slip. Clearance should be 0.006 inch minimum. If switch has contacts both front and rear the same limit is applicable. If clearance is less than 0.006 inch, loosen contact plate screws, and position contact plate. Then tighten contact plate screws. Contact must be made before function lever touches top plate.

2. On switches with front and rear, check gap between formed-over end of front contact clip and bottom of contact arm when rear contact is closed. Gap should be between 0.008 and 0.028 inch.

(11) <u>Page Feed-Out Gear Play</u>. Adjust page feed-out gear play as follows:

(a) Refer to figure 6-226.

(b) Ensure backlash between idler gear and feed-out gear is barely perceptible.

(c) If backlash appears excessive, loosen nut.

(d) Position gear pviot post to reduce backlash to barely perceptible level.

(e) Tighten nut.

(f) Ensure gears mesh accurately when checked at three equal distances around circumference of gear.

(12) <u>Mounting Bracket</u>. Adjust as follows:

(a) Refer to figure 6-226.

(b) Select upper case letter Z.

(c) Hold stripper blade and rotate main shaft until page feed-out slide is in its most forward position.

(d) Take up play in page feed-out blocking to minimize clearance.

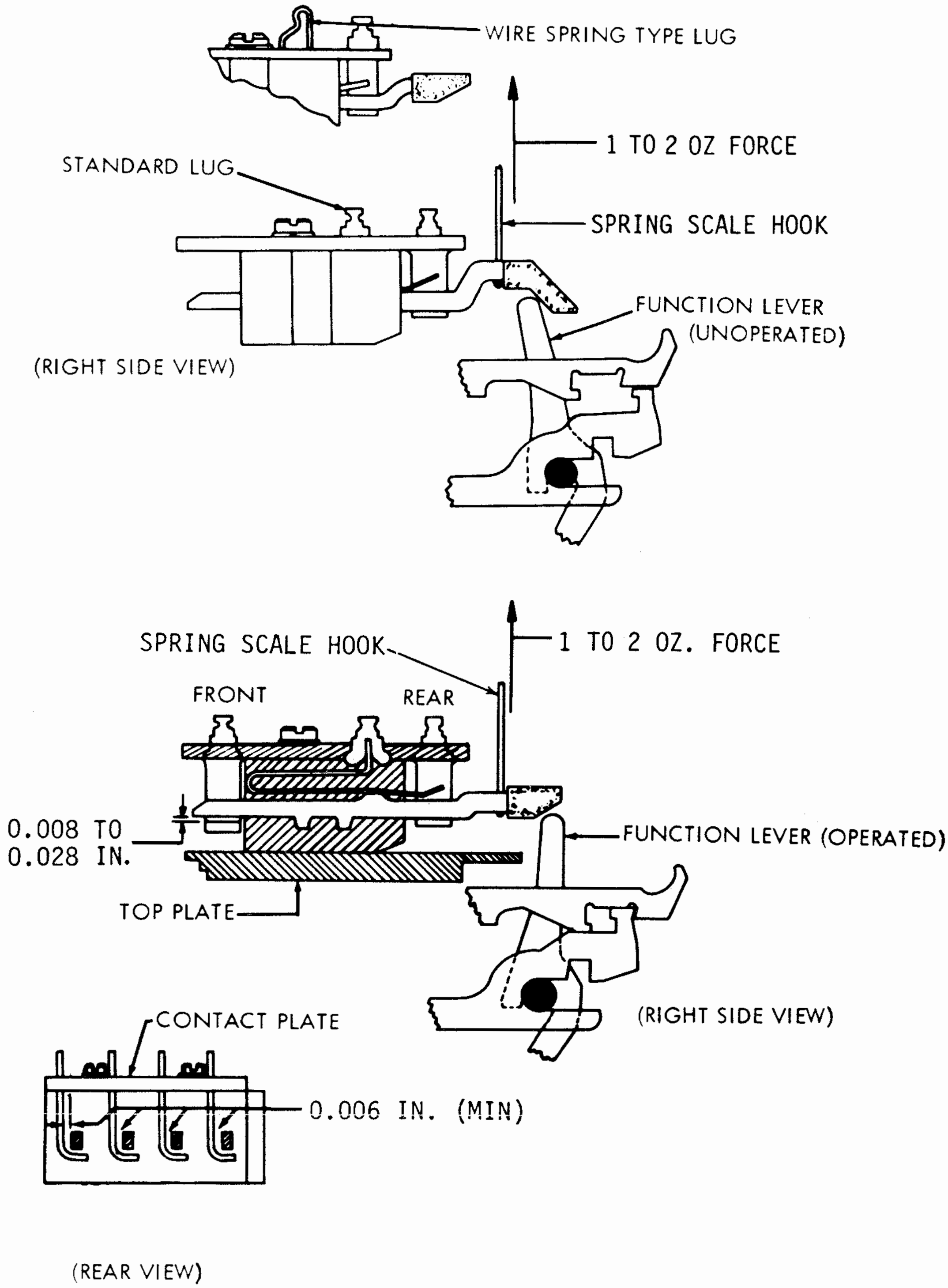



Figure 6-225. Stunt Box Switch Spring

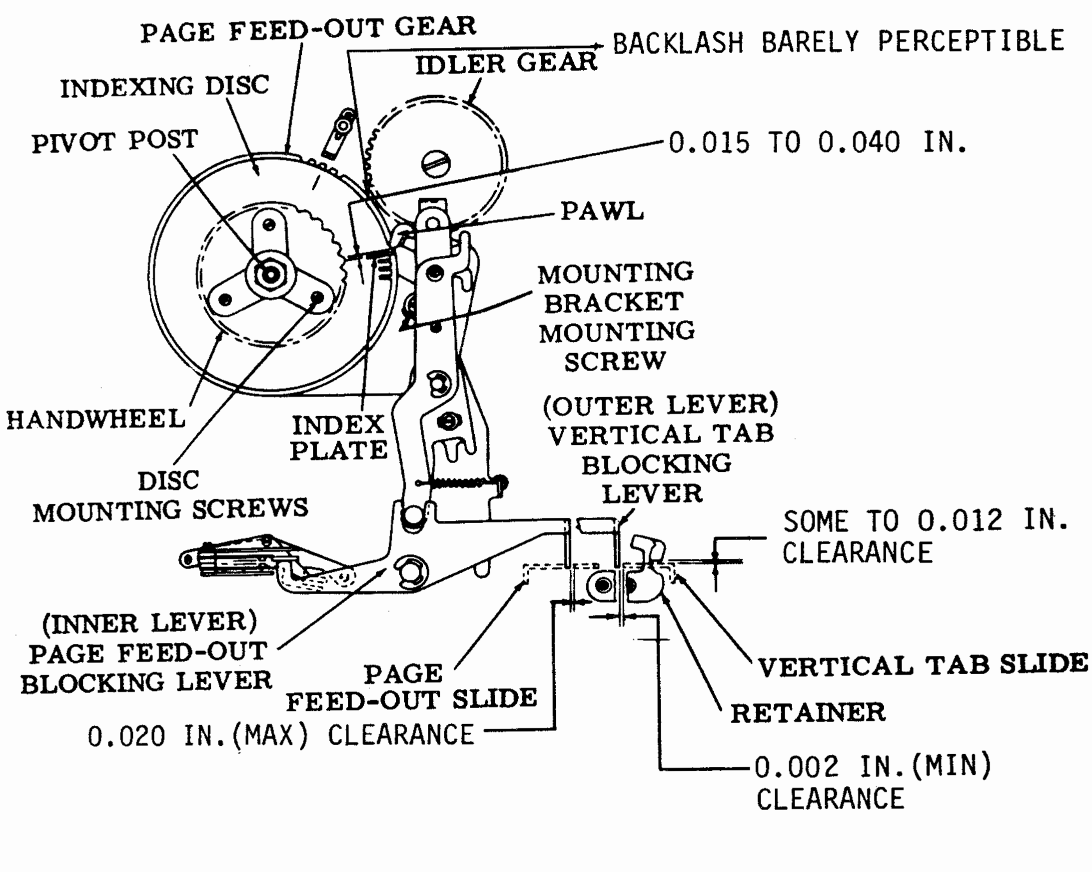



Figure 6-226. Page Feed-Out Gear Play, Mounting Bracket, Indexing Disc, Page Feed-Out Index Plate Position, and Vertical Tabulator Slide Retainer

(e) Measure clearance between vertical tab slide and vertical tab blocking lever (outer lever). There should be some clearance not to exceed 0.020 inch.

(f) Select upper case letter J and rotate main shaft until vertical tab slide is in its most forward position.

(g) Take up play in vertical tab blocking lever to minimize clearance.

(h) Measure clearance between vertical tab slide and vertical tab blocking lever (outer lever). Clearance should be not less than 0.002 inch.

(i) If clearance in either step (e) or step (h) exceeds specified limits, loosen bracket mounting screws.

(j) Position lower portion of mounting bracket to obtain specified clearance.

(k) Tighten mounting screws.

(13) Indexing Disc. Adjust indexing disc as follows:

(a) Refer to figure 6-226.

(b) Disengage line feed clutch.

(c) Position index plate adjacent to pawl.

(d) Take up slack in gears to minimize gap.

(e) Measure clearance between index plate and pawl. Clearance should be 0.015 and 0.040 inch.

(f) If clearance exceeds specified limits, pull feed-out gear out of engagement with idler gear.

(g) Turn feed-out gear handwheel clockwise until index plate just operates pawl, then engage first tooth on idler.

(h) Loosen three index disc mounting screws and position disc to obtain specified clearance.

(i) Tighten three mounting screws.

(14) Page Feed-Out Index Plate Position. Adjust page feed-out index plate position as follows:

(a) Refer to figure 6-226.

(b) Place an index plate in numbered slots on disc corresponding to length of page form to be used.

(c) Synchronize page feed-out with a form by positioning form so typing unit will print in first typing line of form.

(d) When typing unit is in stop position, top of ribbon guide should be in alignment with bottom of printing lines.

(e) If top of ribbon guide is not in alignment with bottom of printing line, place page form in desired position and disengage page feed-out gear from its idler gear.

(f) Rotate feed-out gear until notch in indexing disc is in alignment with pointer on side of printer.

(g) Reengage page feed-out gear with its idler gear.

(15) Vertical Tabulator Slide Retainer. Adjust vertical tabulator slide retainer as follows:

(a) Refer to figure 6-226.

(b) Measure clearance between vertical tabulator slide and retaining edge of retainer. There should be some clearance not exceeding 0.012 inch.

(c) If clearance exceeds limit, loosen mounting screws.

(d) Position retainer forward and locate it up or down to obtain specified clearance.

(e) Tighten mounting screw.

(16) Switch Contacts for Transfer Type Control Switch (Transmitter Control Only). Adjust switch contacts as follows:

(a) Refer to figure 6-227.

(b) Close normally closed (lower) contacts.

(c) Lift swinger free of mating contact with gram scale.

(d) Force required to move lower contact spring away from its stiffener should be not less than 30 grams.

(e) If scale reading is less than specified limits, form lower contact to increase scale reading.

(f) With lower contact closed, move swinger away from its mating contacts with gram scale.

(g) Force required should be between 30 and 45 grams.

(h) If scale reading exceeds specified limits, form swinger by bending.

(i) With lower contact closed, measure gap between upper contact and mating contact of swinger. Gap should be between 0.008 and 0.015 inch.

(j) If gap exceeds specified lmits, position stiffener of normally closed contact to obtain specified gap.

(k) Pull upper contact away from its stiffener with gram scale.

(l) Force required should be between 25 and 35 grams.

(m) If scale reading exceeds specified limits, form upper contact by bending and repeat steps (i) and (j).

(17) Transmitter Control Switch for Transfer Type Contacts (Transmitter Control Only). Adjust transmitter control switch as follows:

(a) Refer to figure 6-228.

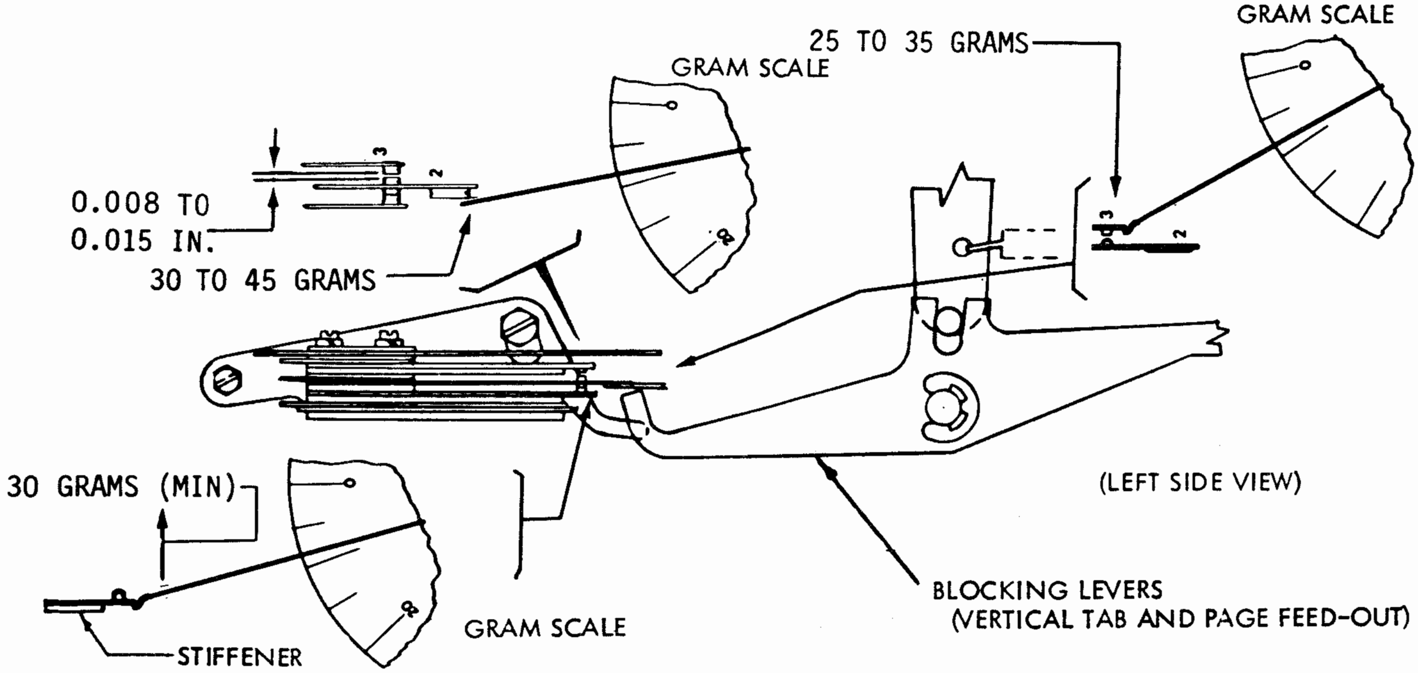



Figure 6-227. Switch Contacts for Transfer Type Control Switch (Transmitter Control Only)

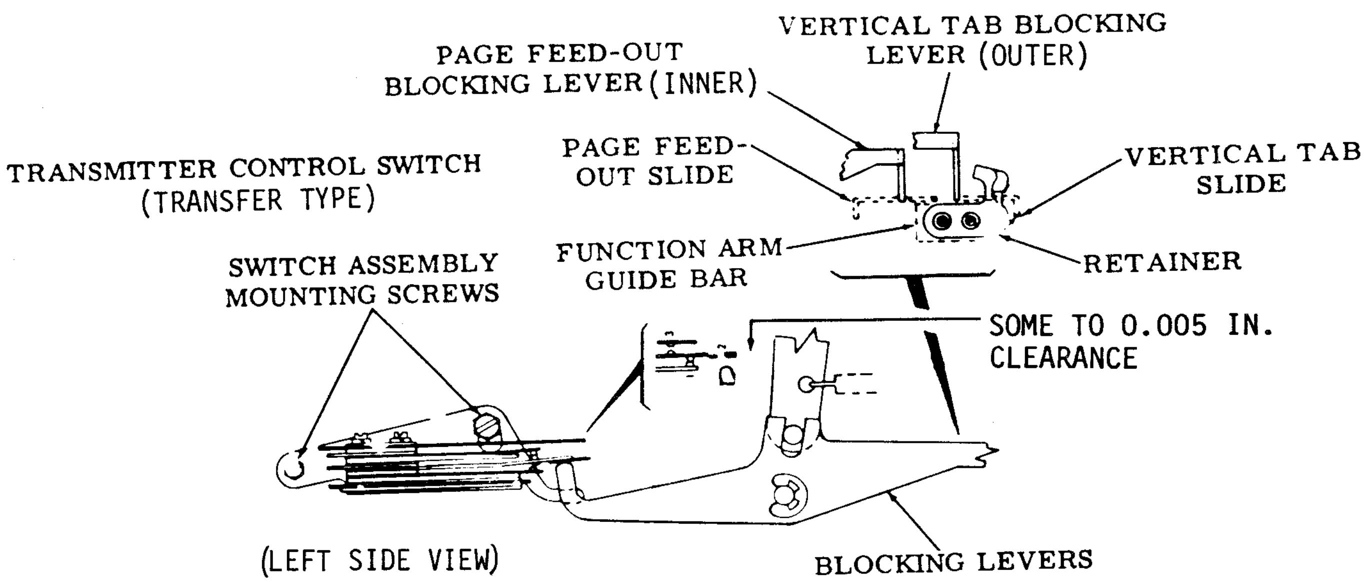



Figure 6-228. Transmitter Control Switch for Transfer Type Contacts (Transmitter Control Only)

(b) Rotate main shaft until feed-out and vertical tabulator blocking levers are unoperated (blocking levers resting on slides).

(c) Close normally closed (lower) contacts.

(d) Measure clearance between insulated extension of swinger and lobes of feed-out and vertical tabulator blocking levers. There should be some clearance not exceeding 0.005 inch.

(e) If clearance exceeds specified limit, loosen transmitter control switch mounting screws.

(f) Position contact assembly to obtain specified clearance.

(g) Tighten mounting screws.

(h) Select feed-out code combination.

(i) Rotate main shaft until feed-out slide is in its extreme forward position and feed-out blocking lever drops behind its slide to close normally opened contacts.

(j) Ensure lobe of feed-out blocking lever (inner lever) fully engages insulated extension of contact swinger.

(k) Ensure feed-out blocking lever rests firmly on function arm guide bar. Check by lifting lever lightly at contact end.

(l) Ensure feed-out blocking lever separates normally open contact spring from its stiffener as upper contact closes.

(m) To adjust, loosen contact pile-up mounting screws and position assembly.

(n) Tighten contact pile-up mounting screws.

(o) Select vertical tabulator combination. Rotate main shaft until feed-out slide is in its extreme forward position and feed-out blocking lever drops behind its slide to close normally opened contacts.

(p) Ensure lobe of vertical tabulator blocking lever (outer) fully engages insulated extension of swinger.

(q) Ensure vertical tabulator blocking lever rests firmly on function arm guide bar. Check by lifting lever lightly at contact end.

(r) Ensure vertical tabulator blocking lever separates normally open contact spring from its stiffener as upper contact closes.

(s) To adjust, loosen contact pile-up mounting screws and positon assembly.

(t) Tighten mounting screws.

6-6. KEYBOARD UNIT ADJUSTMENTS (VARIABLE FEATURES). There are no keyboard unit variable features.

## SECTION III - ADJUSTMENTS (EARLIER DESIGN BASIC UNITS)

### 6-7. TYPING UNIT.

#### 6-7.1 TYPING UNIT (HIGH-LEVEL).

a. Code Bar Mechanism Adjustments. Perform code bar mechanism adjustments in accordance with the following paragraphs.

(1) Code Bar Shift Lever Drive Arm. Adjust code bar shift lever drive arm as follows:

(a) Refer to figure 6-229.

(b) Place code bar shift lever link in uppermost position.

(c) Measure clearance between tops of rollers and tops of cam slots in code box shift levers. There should be some clearance not exceeding 0.025 inch on the close lever.

(d) If clearance exceed specified limit, loosen clamp screw.

(e) Position code bar shift lever drive arm on its shaft to obtain specified clearance and to provide some end play not exceeding 0.006 inch.

(f) Tighten clamp screw.

(2) Code Bar Shift Lever Link Guide Bracket. Adjust Code Bar Shift Lever Link Guide Bracket as follows.

(a) Refer to figure 6-230.

(b) Select blank combination.

(c) Rotate main shaft until code bar shift lever link reaches highest travel. Then take up play to maximize clearance.

(d) Measure clearance between front code bar shift lever and shoulder on nearest code bar shift bar. Clearance should be between 0.002 and 0.025 inch.

(e) If clearance exceeds specified limits, loosen three code bar shift lever link guide bracket mounting screws.

(f) Select letters combination.

(g) Rotate main shaft until code bar shift lever link reaches highest travel. Then take up play to maximize clearance.

(h) Measure clearance between rear code bar shift lever and shoulder of code bar shift bar. Clearance should be between 0.002 and 0.025 inch.

(i) If clearance exceeds specified limits, loosen three code bar shift lever link guide bracket mounting screws.

(j) Position guide bracket to obtain specified clearance and tighten three mounting screws.

b. Function Mechanism Adjustments. Perform function mechanism adjustments in accordance with the following paragraphs.

(1) Bell or Motor Stop Function Contact. Adjust bell or motor stop function contact as follows:

(a) Refer to figure 6-231.

(b) Position function lever so normally closed contacts are open.

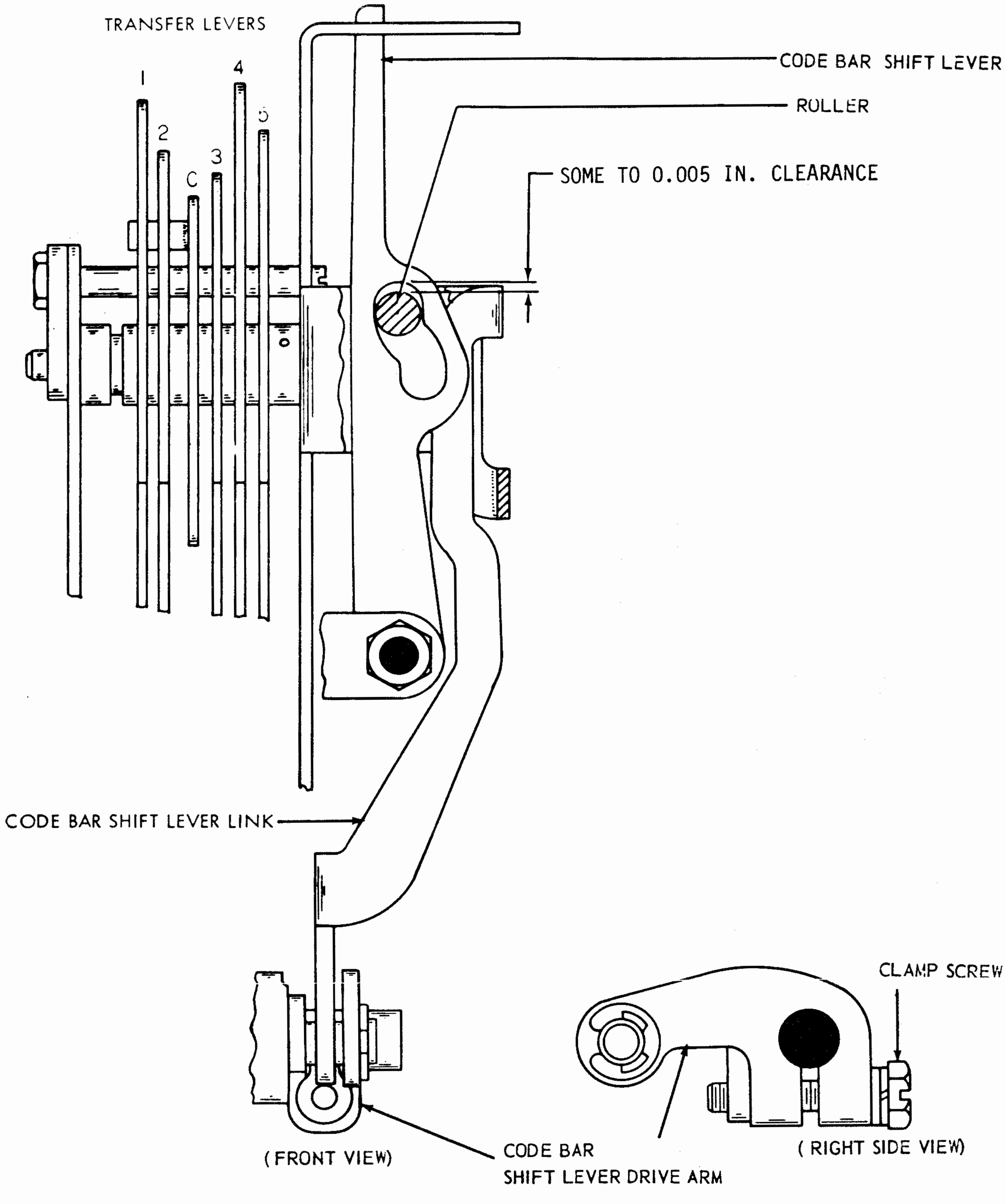



Figure 6-229. Code Bar Shift Lever Drive Arm

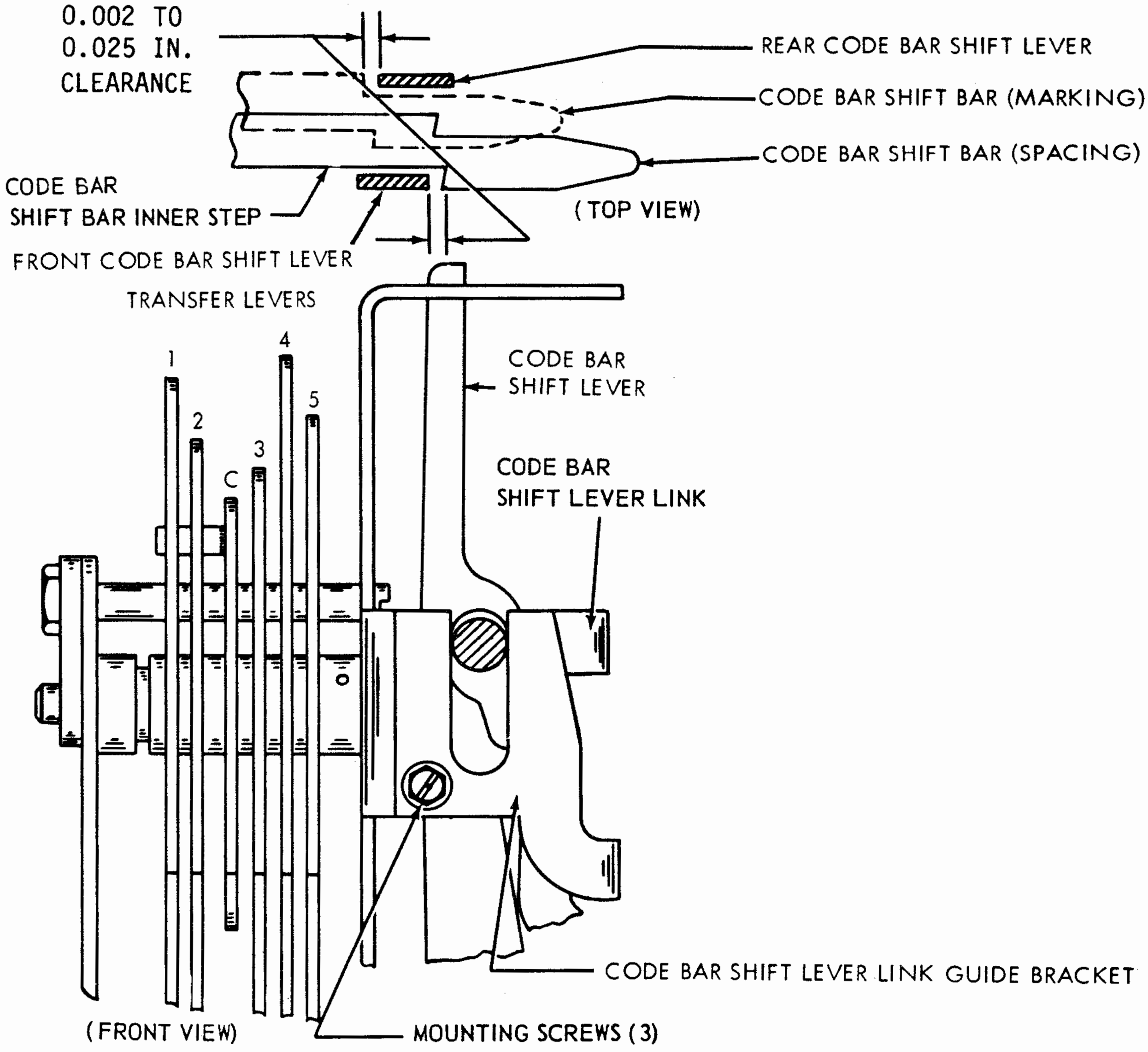



Figure 6-230. Code Bar Shift Lever Link Guide Bracket

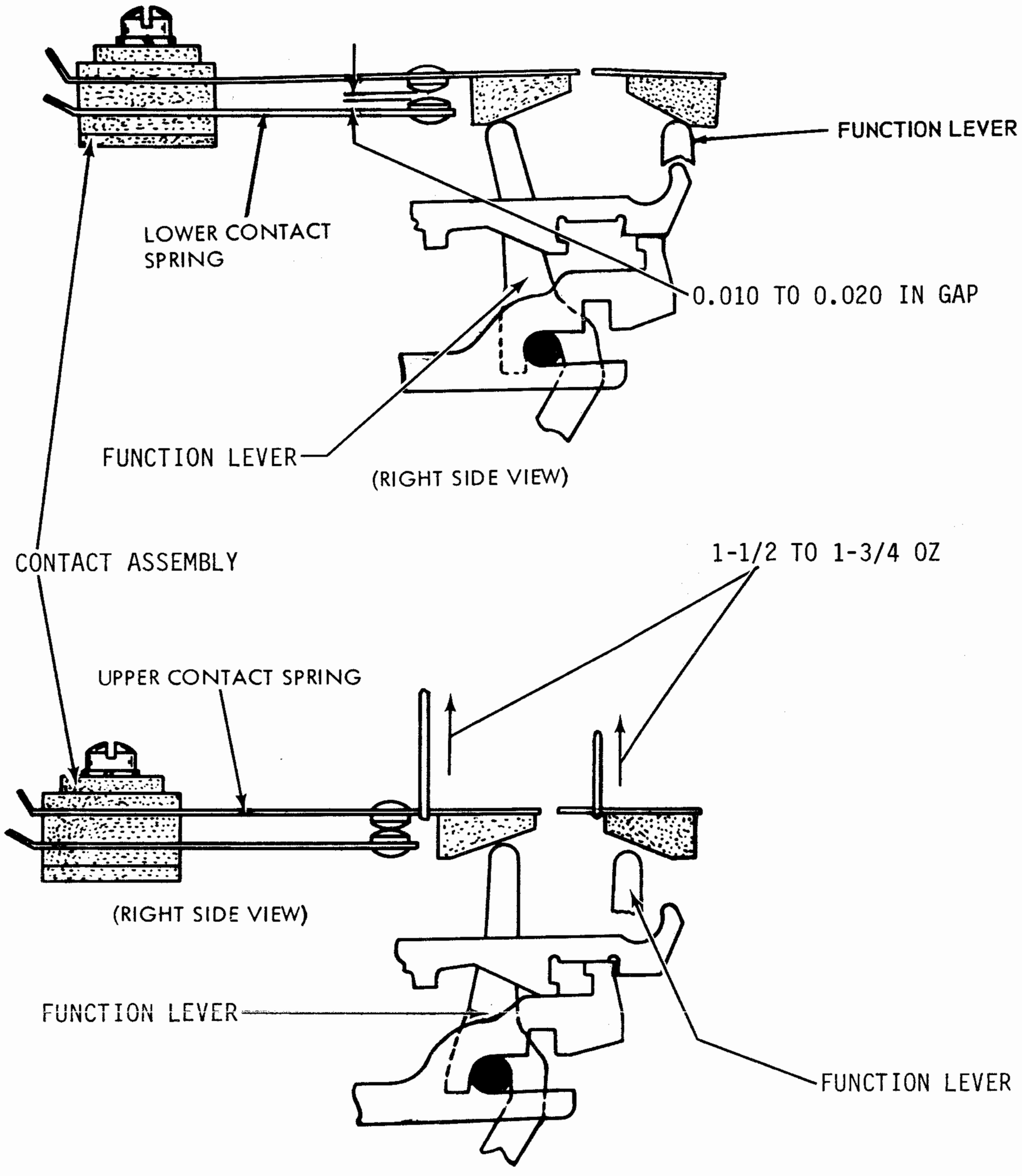



Figure 6-231. Bell or Motor Stop Function Contact

(c) Measure contact gap. Gap should be between 0.010 and 0.020 inch.

(d) If gap exceeds specified limits, bend lower contact spring to obtain specified contact gap.

(e) Position function lever so normally closed contacts are closed.

(f) Attach spring scale hook to upper contact spring as shown in figure.

(g) Force required to open contacts should be between 1 1/2 and 1 3/4 ounces.

(h) If scale reading exceeds specified limits bend upper contact spring to obtain specified scale reading and repeat steps (b) through (d)

(2) Figures-Letters Shift Code Bar Operating Mechanism. Adjust figures-letters shift code bar operating mechanism with two-stop function clutch as follows:

(a) Refer to figure 6-232

(b) Disengage function clutch at position giving least clearence.

(c) Potate type box clutch 1/2 revolution.

(d) Hold figures function lever in rearward position with tension of 32 ounces.

(e) Take up play in pawl to maximize clearance and measure clearance between function pawl shoulder and face of function bar. Clearance should be between 0.002 and 0.015 inch.

(f) If clearance exceeds specified limits, loosen elements.

(g) Position shift assembly to obtain specified clearance. Take up play in mounting holes to rear.

(h) Tighten clamp nuts.

(i) Disengage figures function pawl.

(j) Repeat steps (d) through (h) for letters function pawl.

(3) Function Contact Spring. Adjust function contact spring as follows:

(a) Refer to figure 6-233.

(b) Close contacts.

(c) Attach spring scale hook as shown in figure.

(d) Force required to open switch contact should be between 1 and 2 ounces.

(e) If the required force exceeds the specified limits, replace spring.

CAUTION

When soldering to contact springs, exercise care to prevent excessive heating to avoid annealing the springs.

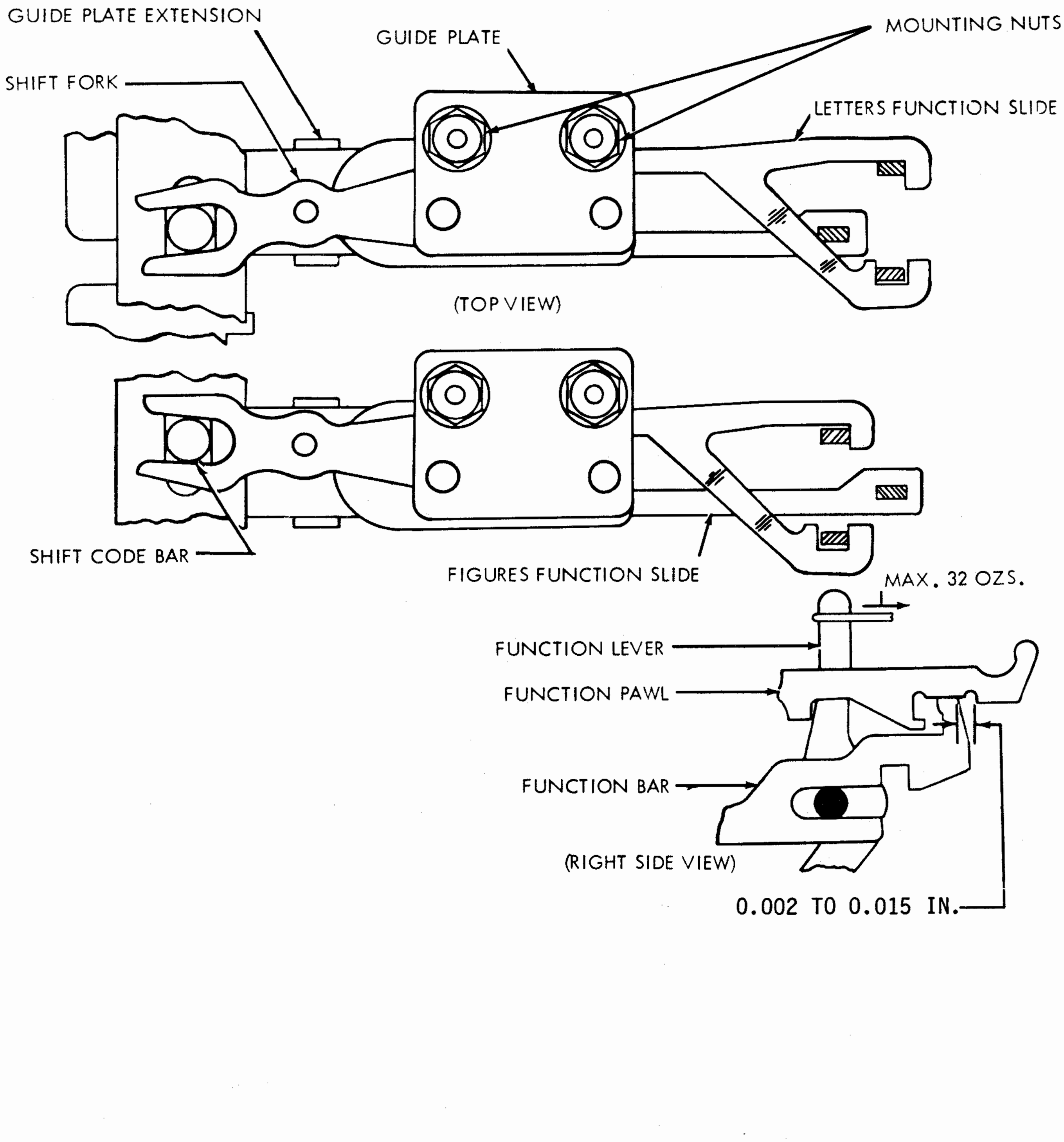
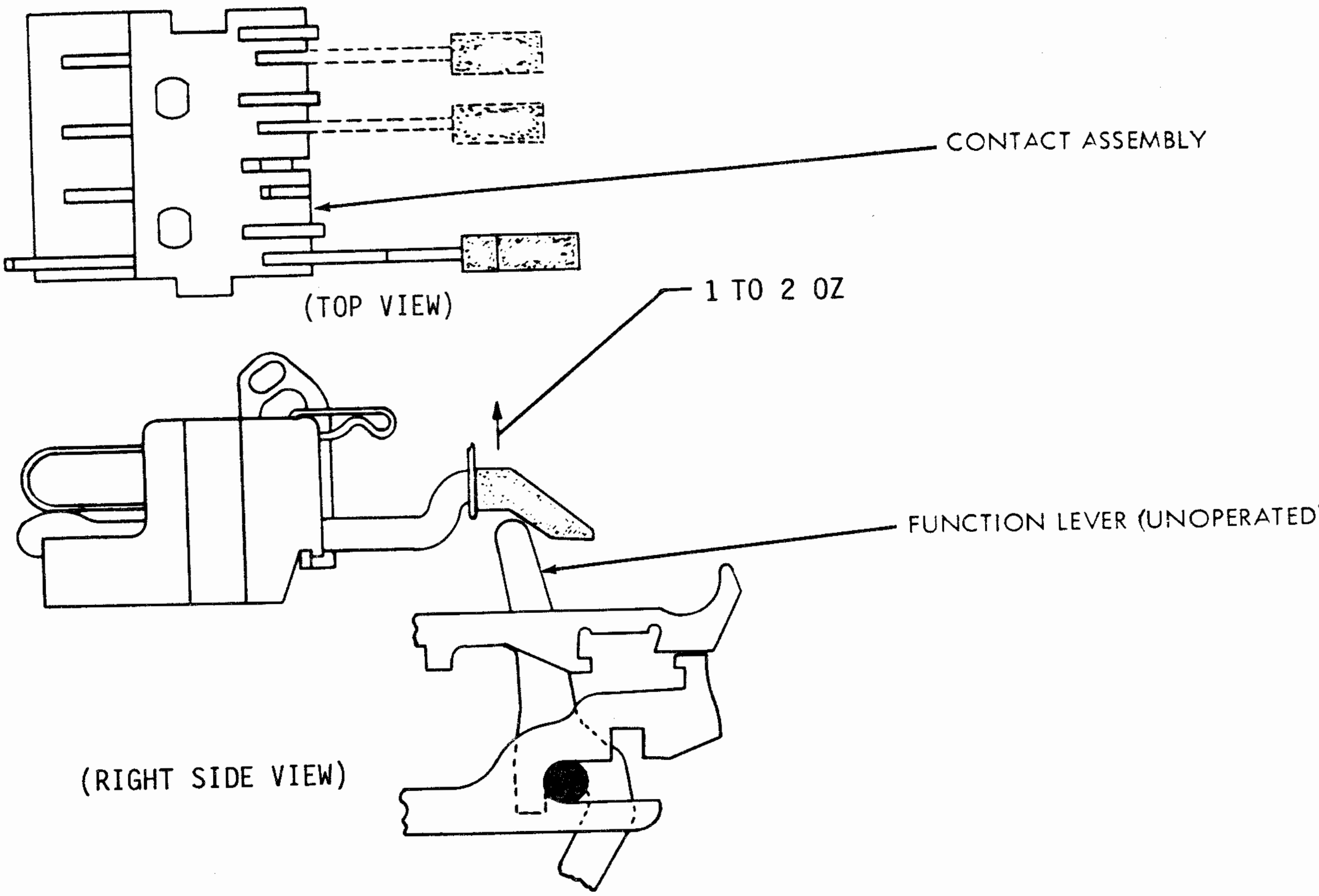



Figure 6-232. Figures-Letters Shift Code Bar Operating Mechanism



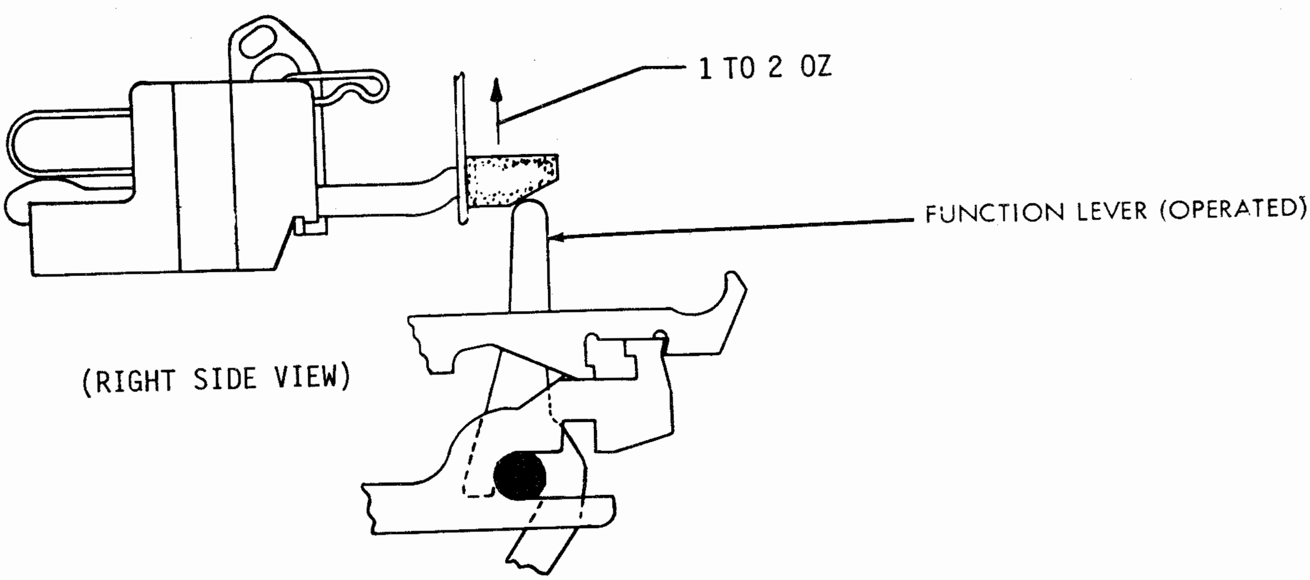




Figure 6-233. Function Contact Spring

(4) Function Reset Bail Blade. Adjust function reset bail blade as follows:

(a) Refer to figure 6-234.

NOTE

This adjustment applies only to units with a two-step function clutch. If unit has a one-stop function clutch, refer to 6-3.1 b. (b)

(b) Disengage function clutch at stop position which yields least clearance.

(c) Disengage type box clutch.

(d) Unlatch all function pawls from their function bars.

(e) Holding each function bar in maximum rearward position, measure clearance between bars located in stunt box slot 1, 4, 11, 18, 28, 33, 38 and 41, and reset bail blade.

NOTE

If there is no bar in a designated slot use nearest bar. If there is a bar on each side of a designated vacant slot, use bar in higher numbered slot. Slots are numbered from left to right facing rear of unit.

Clearance between each function bar and reset bail blade should be between 0.018 and 0.035 inch.

(f) If clearance exceeds specified limits, loosen reset bail blade mounting screw so they are friction tight.

(g) Position blade on reset bail to obtain specified clearance.

(h) Tighten mounting screws.

(i) Rotate type box clutch and function revolution.

(j) Hold each function lever on at a time in rearmost position with a maximum of 2 pounds tension. Latch associated pawl.

(k) Attach spring scale hook to function pawl and apply 32 ounces tension. The function pawl should overtravel its bar a minimum of 0.002 inch.

(l) If overtravel is less than specified amount, refine the adjustment performed in steps (b) thourgh (h).

(5) Function Stripper Blade Arms. Adjust function stripper blade arms as follows:

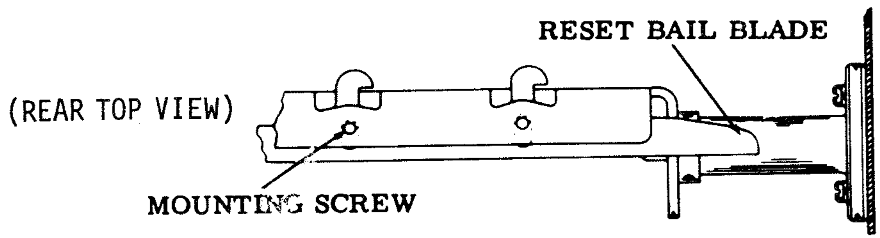
(a) Refer to figure 6-235.

(b) Place single-double line feed lever in double line feed position.

(c) Disengage type box clutch one-half clutch.

(d) Hold left line feed function pawl in its rear position resting on upper edge of stripper blade.

(e) Measure clearance between upper edge of



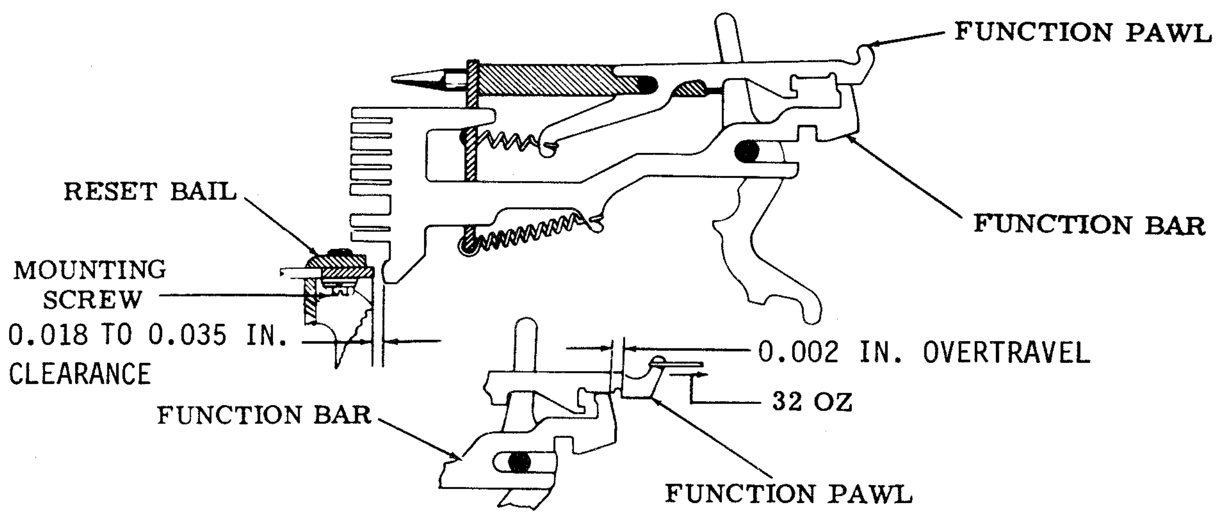




Figure 6-234. Function Reset Bail Blade

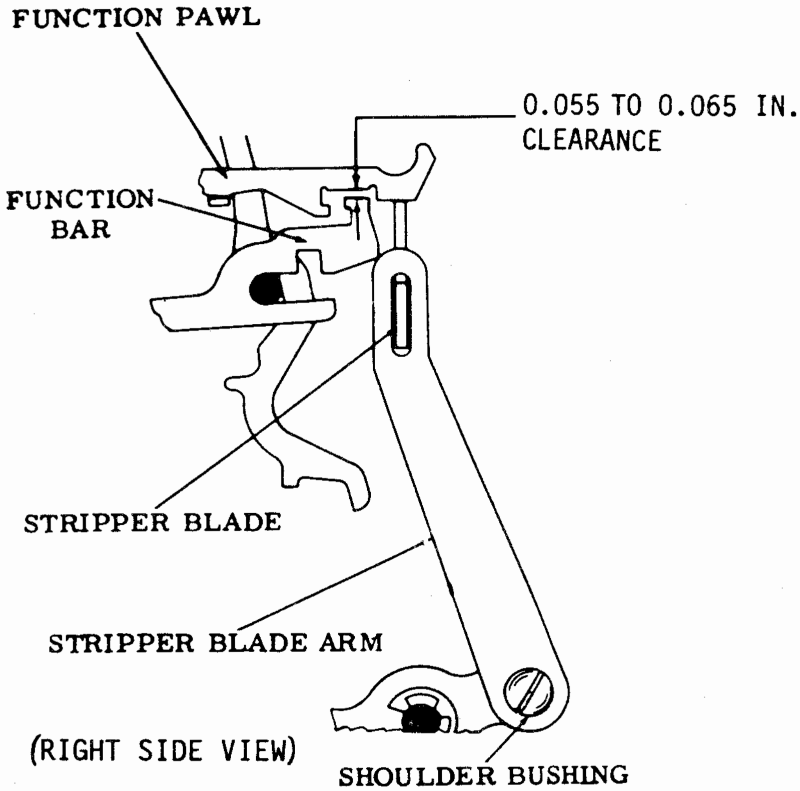



Figure 6-235. Function Stripper Blade Arms

function bar and lower surface of notched section of function pawl. Clearance should be between 0.005 and 0.065 inch.

(f) Measure clearance for letters function pawl near opposite end of stripper blade. Clearance should be between 0.055 and 0.065 inch.

(g) If either clearance measured in (e) or (f) exceeds specified limits, loosen locknut.

(h) Position shoulder bushing at lower end at right and left stripper blade arm to obtain specified clearance.

(i) Tighten locknut.

c. Line Feed Mechanism and Platen Mechanism Adjustments. Perform line feed and platen mechanisms adjustments in accordance with the following paragraphs.

(1) Single-Double Line Feed Lever. Adjust single-double line feed lever as follows:

(a) Refer to figure 6-236.

NOTE

This adjustment applies only to units with a two-step function clutch.

(b) Place single-double line feed lever in single line feed position.

(c) Set up line feed combination.

(d) Roate main shaft until line feed function pawl stopper is in contact with line feed function pawl.

(e) When play is taken up in a direction to make overlap a minimum, pawl should overlap stripper by at least one-half the pawl thickness.

(f) If adjustment is necessary to obtain specified overlap, loosen locking nut and turn the lever adjusting screw.

(g) Tighten locking nut.

(2) Line Feed Stripper Bail Spring. Adjust line feed stripper bail spring as follows:

(a) Refer to figure 6-237.

(b) Disengage line feed clutch.

(c) Attach spring scale hook to end at line feed stripper bail.

(d) Force required to start stripper bail moving upward should be between 1/2 and 2 ounces.

(e) If scale reading exceeds specified limits, install new spring.

d. Main Shaft and Trip Shaft Mechanisms Adjustments. Perform main shaft and trip shaft mechanisms adjustments in accordance with the following paragraphs.

(1) Antideflection Plates. Adjust antideflection plate as follows:

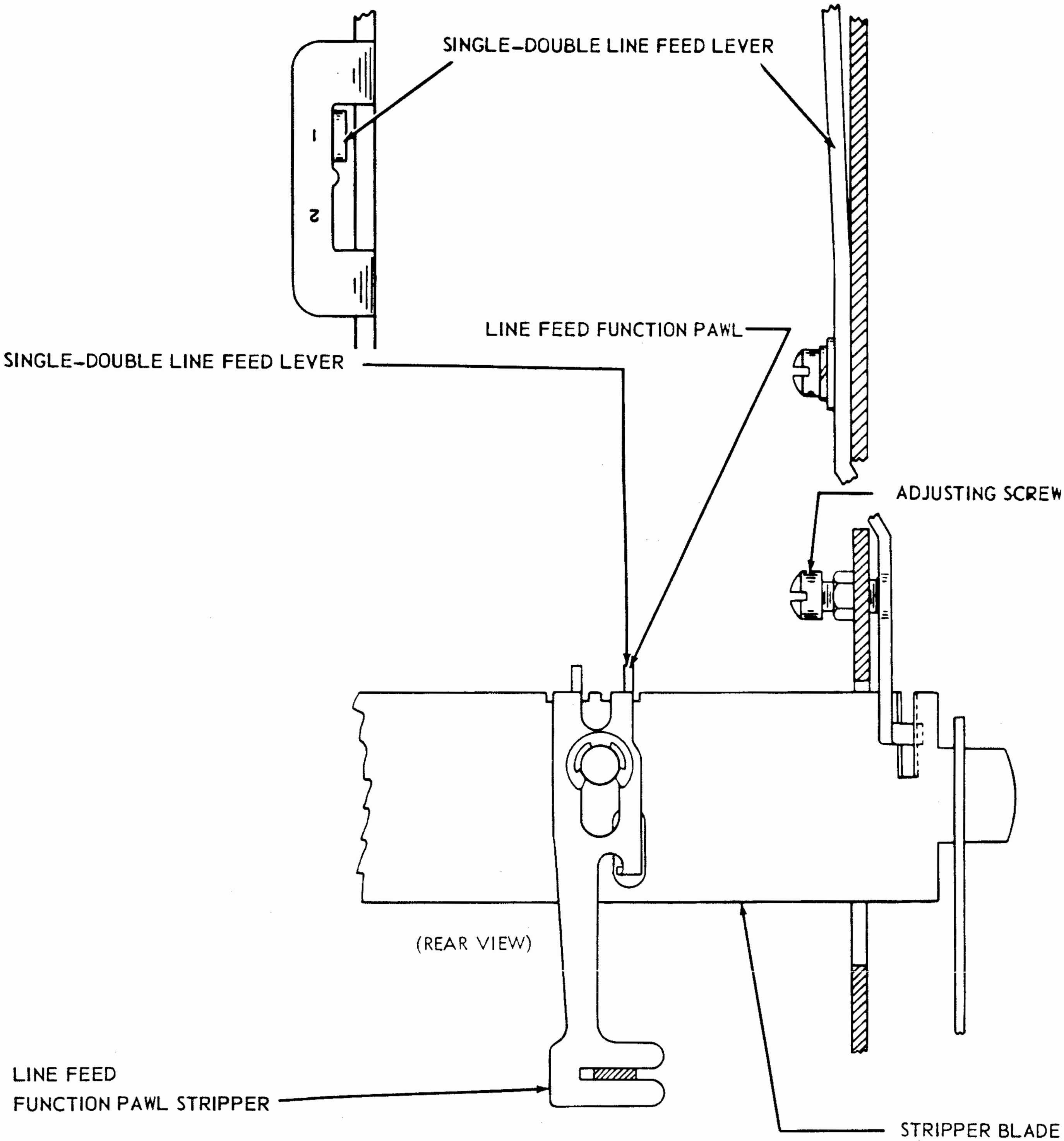



Figure 6-236. Single-Double Line Feed Lever

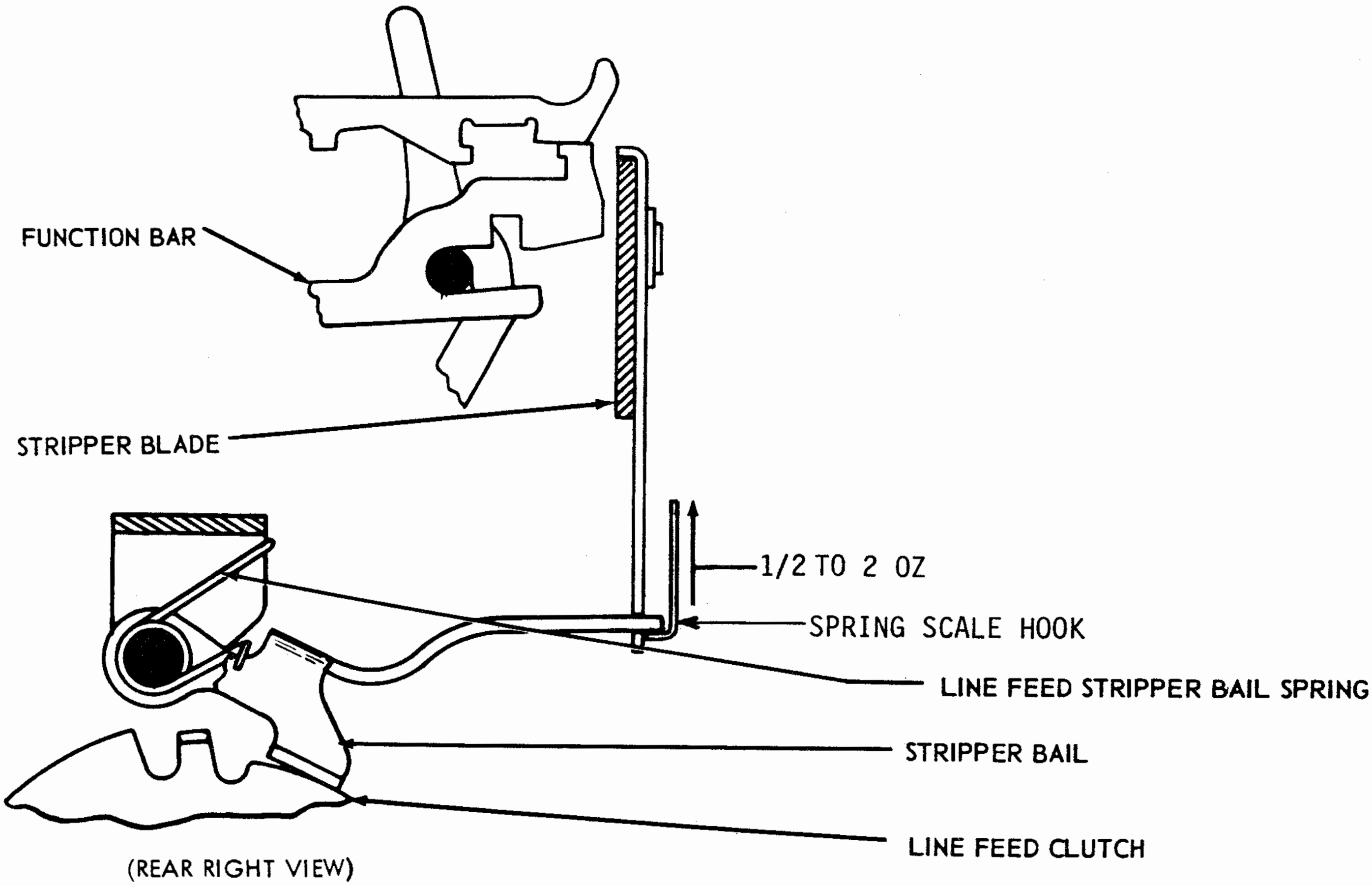



Figure 6-237. Line Feed Stripper Bail Spring

(a) Refer to figure 6-238.

(b) Place typing unit upside down on bench.

(c) Latch function, spacing, line feed, and type box clutch disengaged.

(d) Attach spring scale hook to trip shaft as shown in figure.

(e) Force required to pull trip shaft away from antideflection plate should be between 1 and 5 pounds.

(f) If scale reading exceeds specified limits, loosen antideflection plate mounting screws.

(g) Position plate to obtain specified scale reading.

(2) Clutch Trip Shaft Set Collars. Adjust clutch trip shaft set collars as follows:

(a) Refer to figure 6-239.

(b) Measure spacing clutch latchlever side play. There should be some side play not exceeding 0.008 inches.

(c) If side play exceeds specified limit, loosen set screw in set collar.

(d) Position spacing clutch latchlever set collar to obtain specified side play.

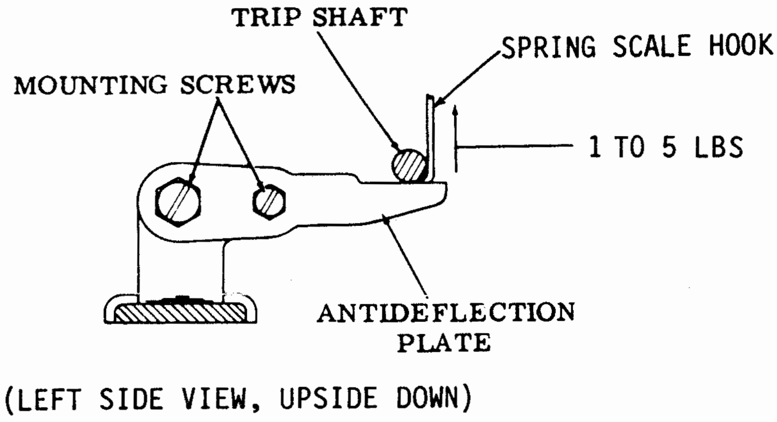



Figure 6-238. Antideflection Plate

(e) Tighten set screw.

(f) Ensure approximate alignment of right end of stop extension on trip lever with right end of stop extension on shoe lever.

(g) If adjustment is necessary, loosen set screw in line feed clutch trip lever set collar.

(h) Position set collar to align stop extension ends.

(i) Tighten set screw.

(j) Measure line feed clutch latchlever side play.

(k) There should be some side play not exceeding 0.008 inch.

(l) If side play exceeds specified limit, loosen set screw in line feed clutch latchlever set collar.

(m) Position set collar to obtain specified side play.

(n) Tighten set screw.

(3) <u>Clutch Trip Lever Spring</u>. Adjust clutch trip lever spring as follows:

(a) Refer to figure 6-240.

(b) Engage and rotate clutch until trip lever rests on stop lug.

(c) Attach spring scale hook as shown in figure.

(d) Force required to move lever away from stop lug shall be as follows:

For spacing clutch spring, between 11 and 16 ounces.

For line feed clutch spring, between 5 and 7-1/4 ounces.

(e) If scale reading exceeds specified limits, install new spring.

(4) <u>Spacing Clutch Trip Lever</u>.

(a) Refer to figure 6-241.

(b) Disengage spacing and type box clutches

(c) Place trip lever arm in upward position.

(d) If unit does not have U-shaped line feed clutch trip lever, spacing clutch trip lever should be flush or underflush by one-half thickness of shoe lever with outer surface of shoe lever. Check at stop lug with least bite.

(e) If unit does have U-shaped line feed clutch trip lever, spacing clutch trip lever should engage shoe lever by full thickness of shoe lever. Check at stop lug with least bite.

(f) Loosen adjusting screw locking nut and turn adjusting screw to position spacing clutch trip arm.

(g) Tighten locking nut.

e. <u>Positioning Mechanism Adjustments</u>. Perform positioning mechanism

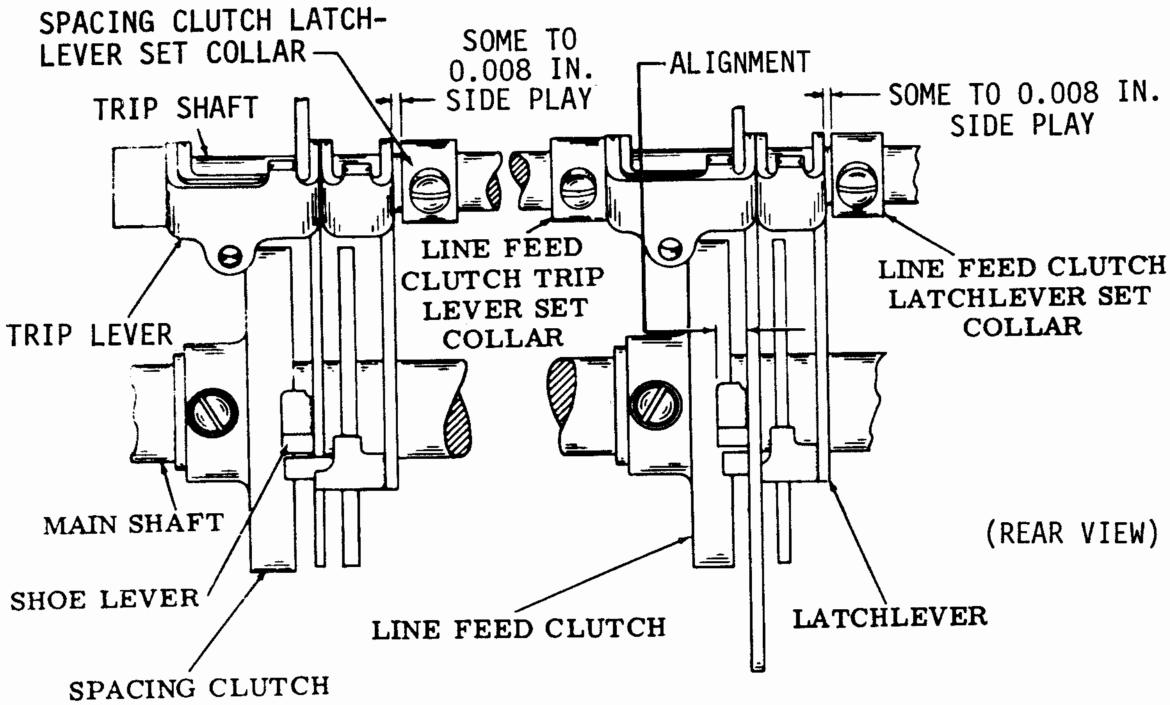



Figure 6-239. Clutch Trip Shaft Set Collars

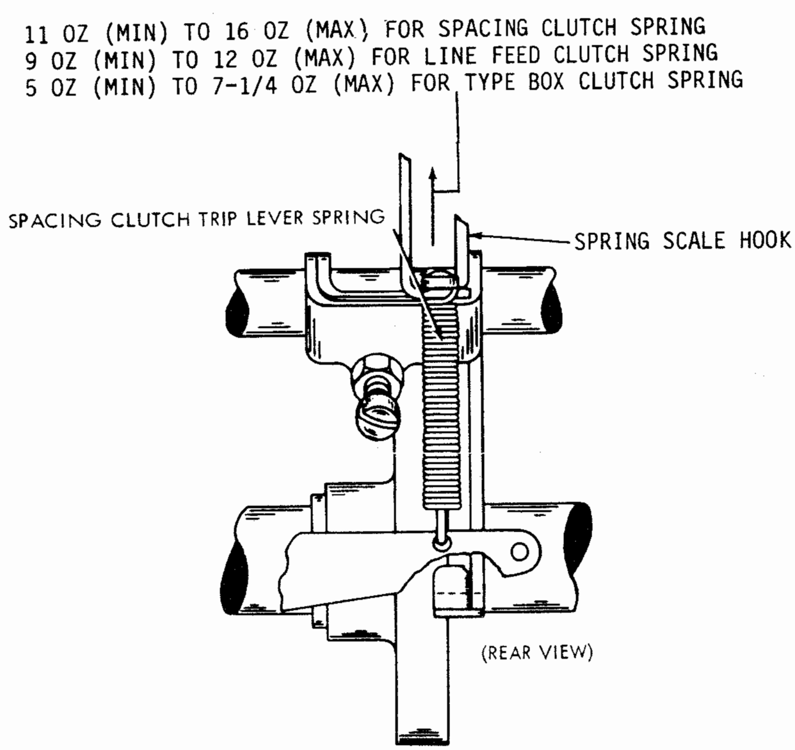



Figure 6-240. Clutch Trip Lever Spring

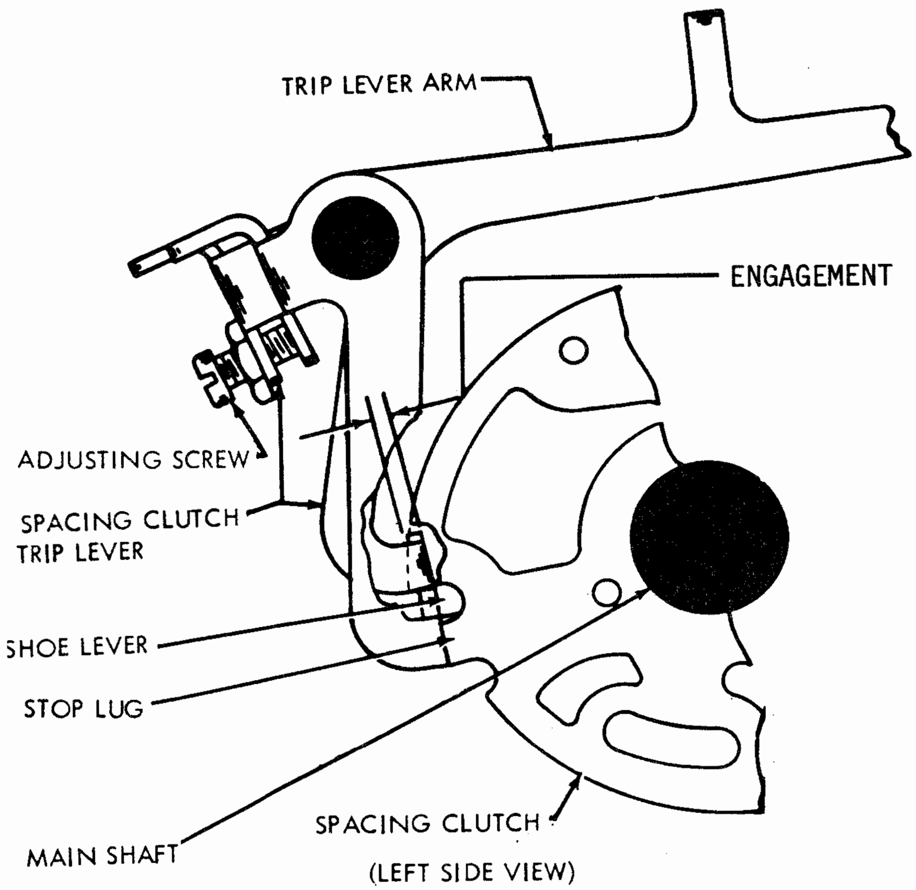



Figure 6-241. Spacing Clutch Trip Lever

adjustments in accordance with the following paragraphs.

(1) Horizontal Positioning Drive Linkage with Earlier Design Drive Linkage and Tension Springs. Adjust horizontal positioning drive linkage as follows:

(a) Refer to figure 6-242.

(b) Disengage type box clutch.

(c) Position code bars 4 and 5 for spacing (right).

(d) Measure clearance between each side of center horizontal stop slide and decelerating slides on side where knee link is straight. Both clearances should be between 0.015 and 0.040 inch and they should be equal within 0.005 inch.

(e) If clearances exceed specified limits, loosen bearing stud screws and strip mounting screws until they are friction tight.

(f) Position one or both bearing studs on connecting strip to provide from 0.025 to 0.035 inch clearance between center horizontal slide and decelerating slide on side where linkage is not buckled. Tighten two inner mounting screws.

(g) Check linkage for freeness throughout a complete cycle.

(h) Type box clutch disc should have some movement in normal direction of rotation in stop position.

(2) Horizontal Positioning Drive Linkage Spring (Tension Spring). Adjust horizontal positioning drive linkage spring (tension spring) as follows.

(a) Refer to figure 6-242.

(b) Unhook spring from its post.

(c) Place linkage in its unbuckled position.

(d) Attach spring scale hook to free end of spring.

(e) Force required to extend spring to its installed length should be between 14 and 15 ounces.

(f) If scale reading exceeds specified limits, install new spring. Otherwise, hook free end of spring to its post.

(3) Horizontal Positioning Drive Linkage with Earlier Design Drive Linkage and Torsion Springs. Adjust horizontal positioning drive linkage as follows:

(a) Refer to figure 6-243.

(b) Disengage type box clutch.

(c) Position code bars 4 and 5 for spacing (right).

(d) Measure clearance between each side of center horizontal stop slide and decelerating slides on side where knee link is straight. Both clearances should be between 0.015 and 0.040 inch and

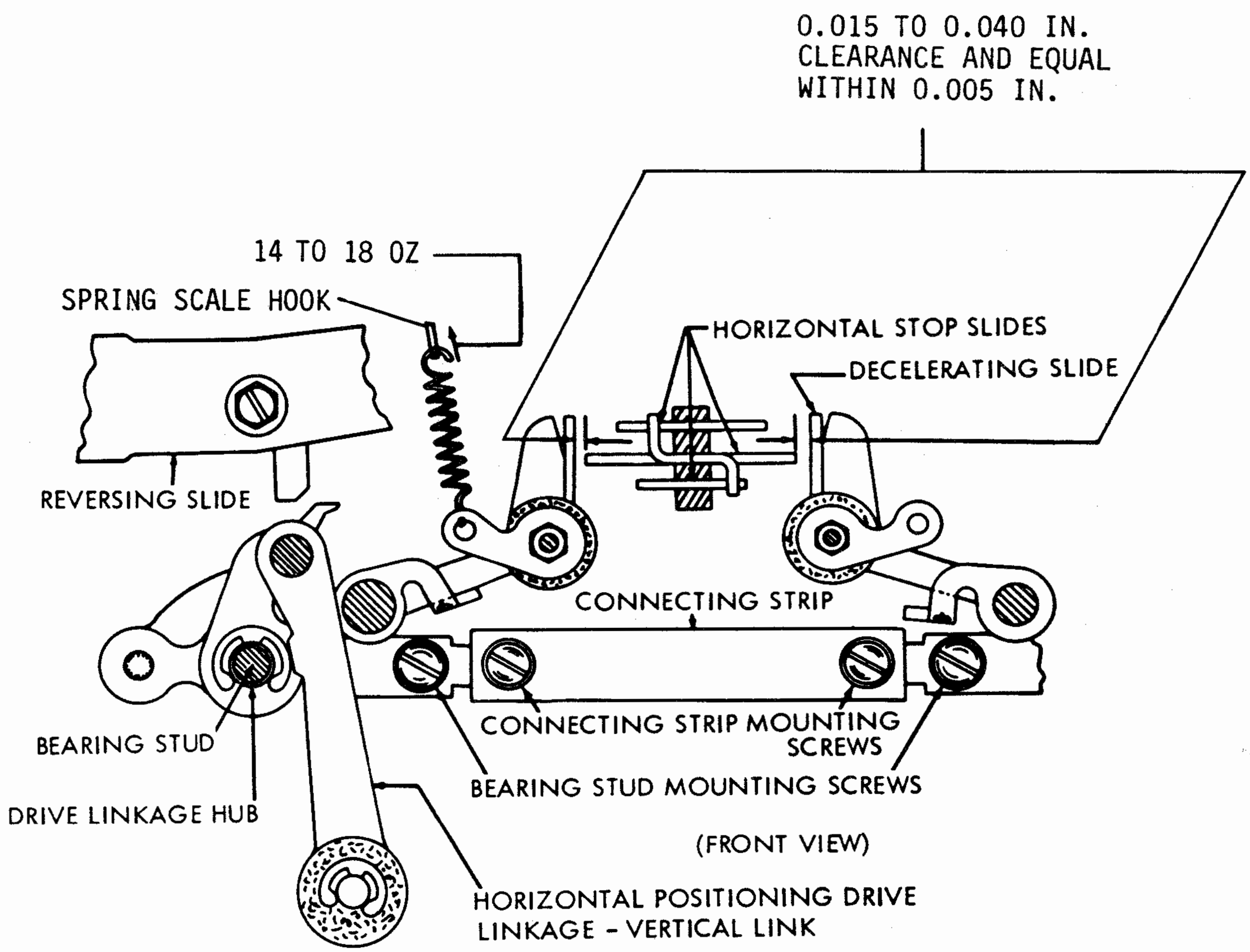



Figure 6-242. Horizontal Positioning Drive Linkage With Earlier Design Drive Linkage and Tension Springs, and Horizontal Positioning Drive Linkage Spring (Tension Spring)

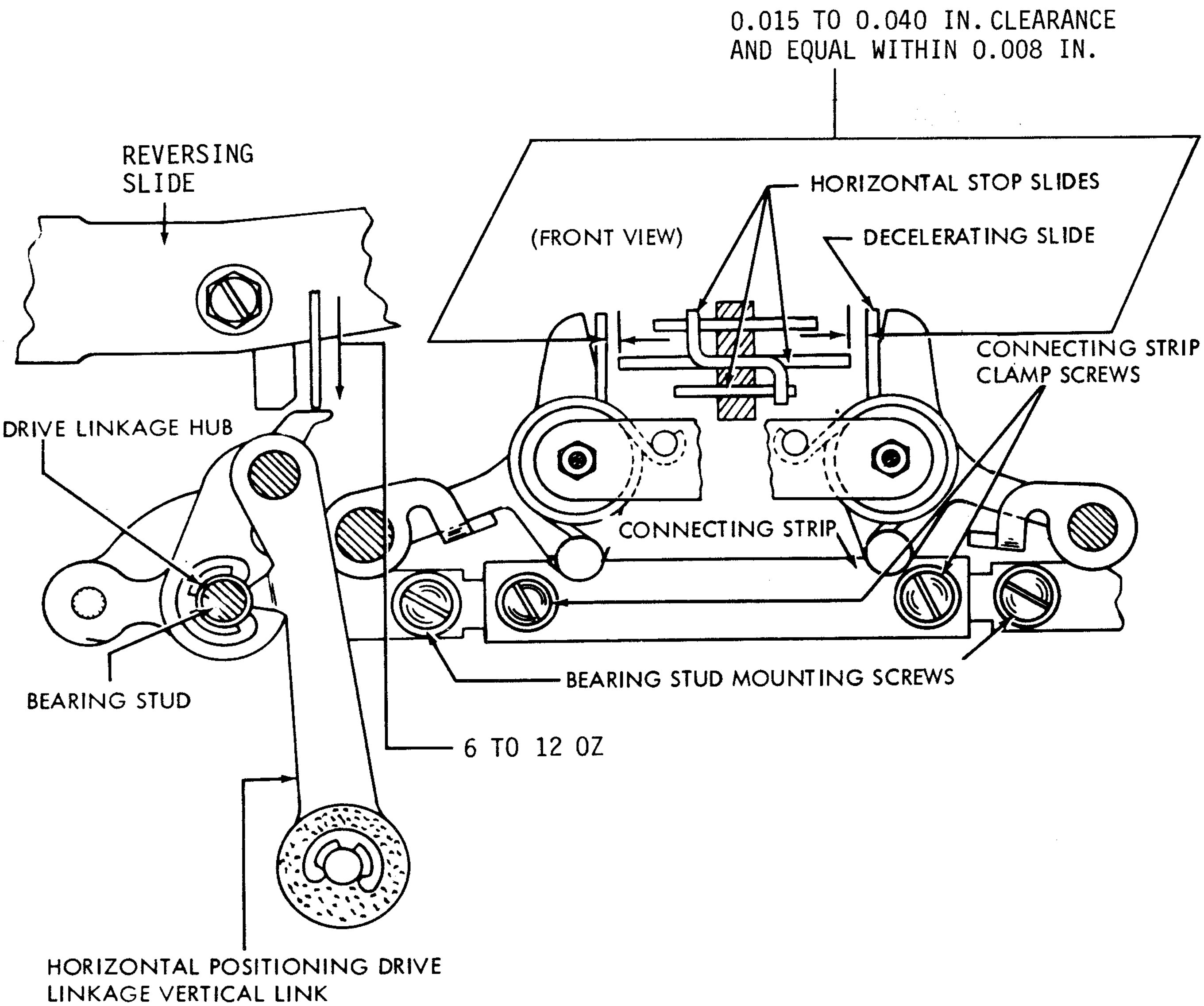



Figure 6-243. Horizontal Positioning Drive Linkage With Earlier Design Drive Linkage and Torsion Springs, and Horizontal Positioning Drive Linkage (Torsion Spring)

they should be equal within 0.008 inch.

(e) If clearances exceed specified limits, loosen bearing stud screws and strip mounting screws until they are friction tight.

(f) Position one or both bearing studs on connecting strip to provide from 0.025 to 0.035 inch clearance between center horizontal slide and decelerating slide on side where linkage is not buckled. Tighten two inner mounting screws.

(g) Change position of reversing slide and check opposite clearance. Equalize by shifting both studs and connecting strip as a unit.

(h) Hold drive linkage hub against lower vertical link of the drive linkage.

(i) Tighten two outer bearing stud mounting screws.

(j) Check linkage for freeness throughout a complete cycle.

(k) Type box clutch disc should have some movement in normal direction of rotation in stop position.

(4) <u>Horizontal Positioning Drive Linkage Spring (Torsion Spring)</u>. Adjust horizontal positioning drive linkage spring (torsion spring) as follows:

(a) Refer to figure 6-243.

(b) Place linkage in unbuckled position.

(c) Apply spring scale push rod near end of upper extension.

(d) Force required to start link buckling should be between 6 and 12 ounces.

(e) If scale reading exceeds specified limits install new spring.

(5) <u>Shift Linkage Spring</u>. Adjust shift linkage spring as follows:

(a) Refer to figure 6-244.

(b) Place link in straight position.

(c) Apply spring scale hook to linkage as shown in figure 6-244.

(d) Force required to start each link moving should be between 7 and 16 ounces.

(e) If scale reading exceeds specified limits, install new spring.

NOTE

This adjustment is for torsion type shift linkage springs.

f. <u>Printing Mechanism Adjustments</u>. Perform printing mechanism adjustments in accordance with the following paragraphs.

(1) <u>Type Box Carriage Roller</u>. Adjust as follows:

(a) Refer to figure 6-245.

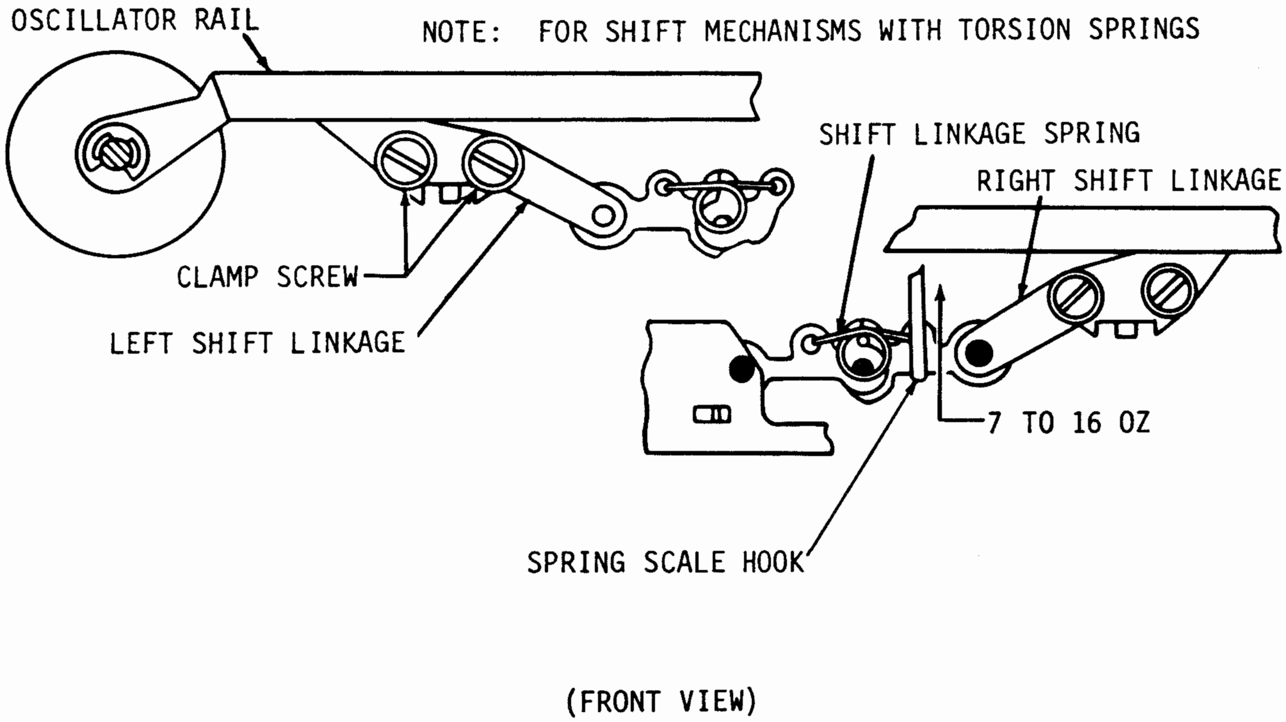



Figure 6-244. Shift Linkage Spring

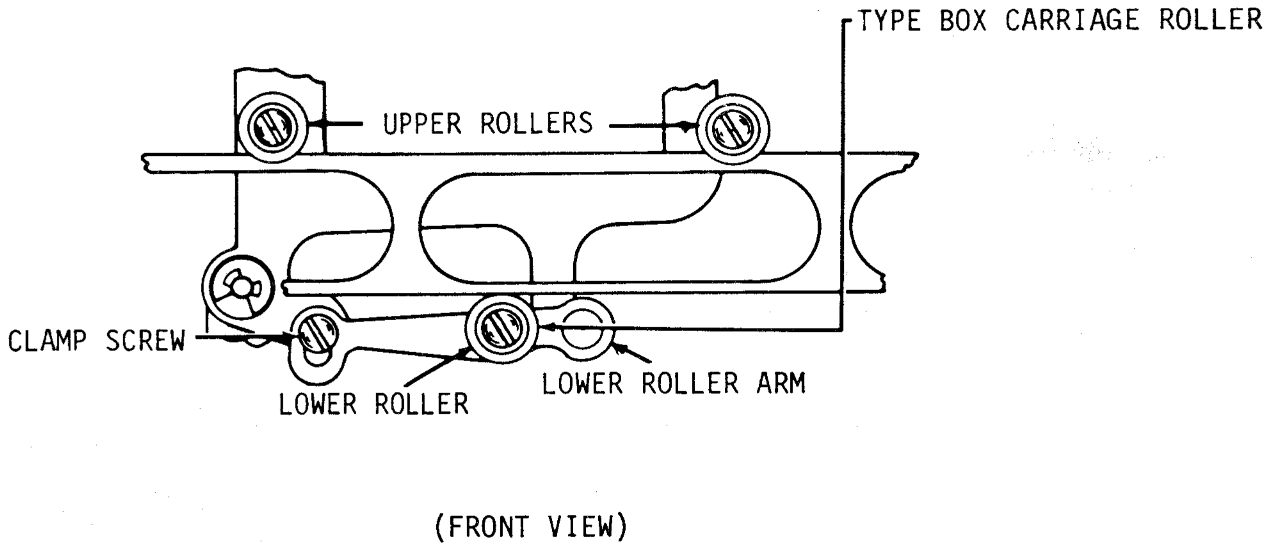



Figure 6-245. Type Box Carriage Roller

(b) Move carriage to right end of track. Place in upper position.

(c) Remove drive link.

(d) Throughout entire travel of carriage, there should be minimum vertical play without binding.

(e) If play is excessive or carriage binds, loosen clamp screw.

(f) Position lower roller arm to relieve binding or reduce play.

(g) Tighten clamp screw.

(2) <u>Printing Hammer Stop Bracket (for Thick Type Box with Dummy Pallets)</u>. Adjust printing hammer stop bracket as follows:

(a) Refer to figure 6-246.

(b) Place type box in blank or carriage return position (whichever does not print) and near center of platen.

(c) Place printing track in its downward position.

(d) Hold printing hammer against its stop with a force of 8 ounces.

(e) Measure clearance between printing hammer and dummy type pallet.

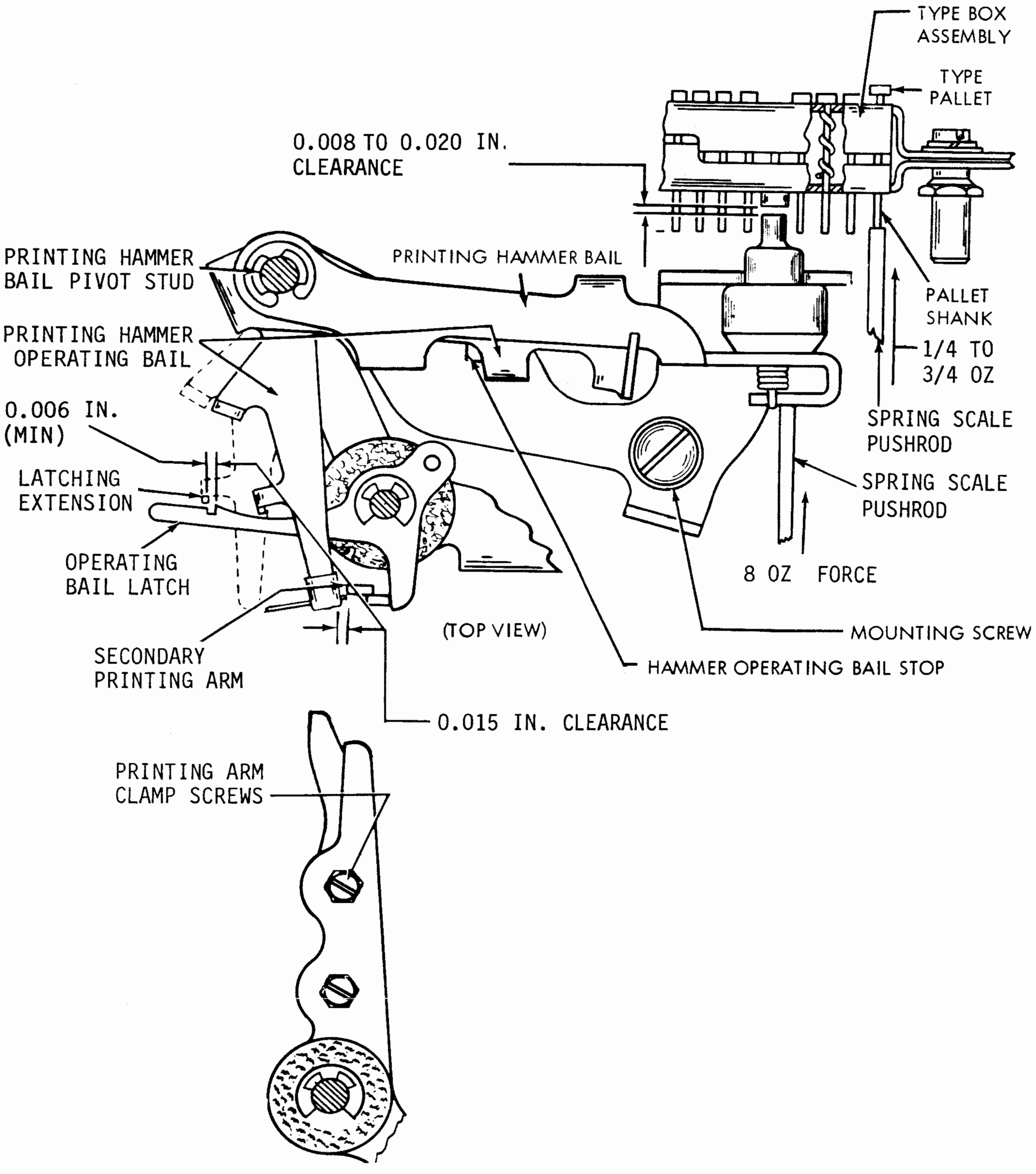



Figure 6-246. Printing Hammer Stop Bracket, Printing Arm, and Type Pallet Spring

Clearance should be between 0.008 and 0.020 inch.

(f) If clearance exceeds specified limits, loosen mounting screw and the hammer bail pivot stud.

(g) Position stop bracket to obtain specified clearance.

(h) Tighten screw and nut.

(3) Printing Arm. Adjust printing arm as follows:

(a) Refer to figure 6-246.

(b) Place printing track in maximum downward position.

(c) Position printing hammer operating bail against its stop.

(d) When printing arm slide is held downward over each printing track mounting screw to maximize clearance, there should be some clearance, not exceeding 0.015 inch between secondary printing arm and forward extension of hammer operating bail.

(e) Place printing track in uppermost position.

(f) Latching extension of printing hammer operating bail should overtravel latching surface of operating bail latch by not less than 0.006 inch. Check right and left positions.

(g) If clearance in step (d) or overtravel in step (f) exceeds specified values, loosen clamp screws.

(h) Position secondary printing arm to obtain specified clearance or overtravel.

(i) Tighten clamp screws.

NOTE

The printing arm adjustment should always be made with the printing hammer operating bail spring bracket in the number 1 position.

(4) Type Pallet Spring. Adjust type pallet spring as follows:

(a) Refer to figure 6-246.

(b) Remove type box from unit.

(c) Apply spring scale pushrod to end of pallet shank.

(d) Force required to start pallet moving should be between 1/4 and 3/4 ounce.

(e) If scale reading exceeds specified limits, install new spring.

(5) Ribbon Reverse Spur Gear. Adjust ribbon reverse spur gear as follows:

(a) Refer to figure 6-247.

(b) Place right reversing lever in maximum downward paosition. Left reversing lever should be in its maximum upward position.

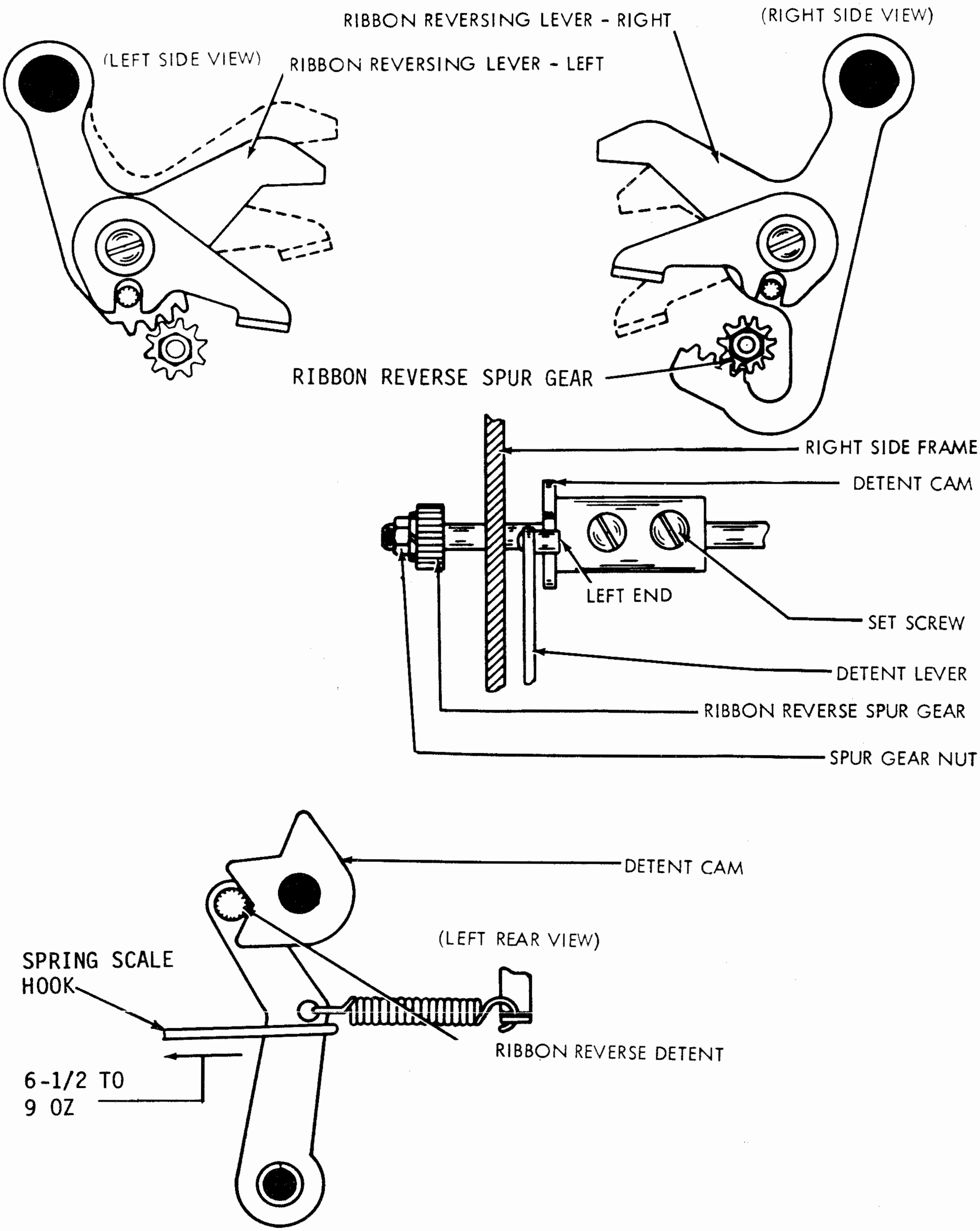



Figure 6-247. Ribbon Reverse Spur Gear, Ribbon Reverse Detent, and Ribbon Reverse Detent Lever Spring

(c) If left reversing lever is not in its maximum upward position, loosen detent cam set screws and left spur gear nut.

(d) Securely tighten right spur gear nut.

(e) Move right reversing lever to its maximum downward position and hold left reversing lever in its maximum upward position.

(f) Tighten left spur gear nut.

(g) Tighten detent cam set screws.

(6) Ribbon Reverse Detent. Adjust ribbon reverse detent as follows:

(a) Refer to figure 6-247.

(b) Ensure detent seats approximately equally in upper and lower portions of detent cam.

(c) Loosen set screws.

(d) Position cam on shaft.

(e) Allow left end of detent stud to be approximately flush with left face of cam (take up play in detent to right of printer).

(f) Tighten screws.

(7) Ribbon Reverse Detent Lever Spring. Adjust ribbon reverse detent lever spring as follows:

(a) Refer to figure 6-247.

(b) Seat detent in notch of cam.

(c) Hold right ribbon reversing lever downward.

(d) Attach spring scale hook to detent lever.

(e) Force required to start detent lever moving should be between 6-1/2 and 9 ounces.

(f) If scale reading exceeds specified limits, install new spring.

g. Selector Mechanism Adjustments. Perform selector mechanism adjustments in accordance with the following paragraphs.

(1) Bail Lever Guide. Adjust bail lever guide as follows:

NOTE

This adjustment applies only to units equipped with adjustable guides.

(a) Refer to figure 6-248.

(b) Ensure there is some clearance each side of guide fork and of start lever throughout its travel.

(c) If clearance is insufficent, loosen mounting nut and position bail lever guide.

(d) Tighten mounting nut.

(2) Start Lever Spring. Adjust start lever spring as follows:

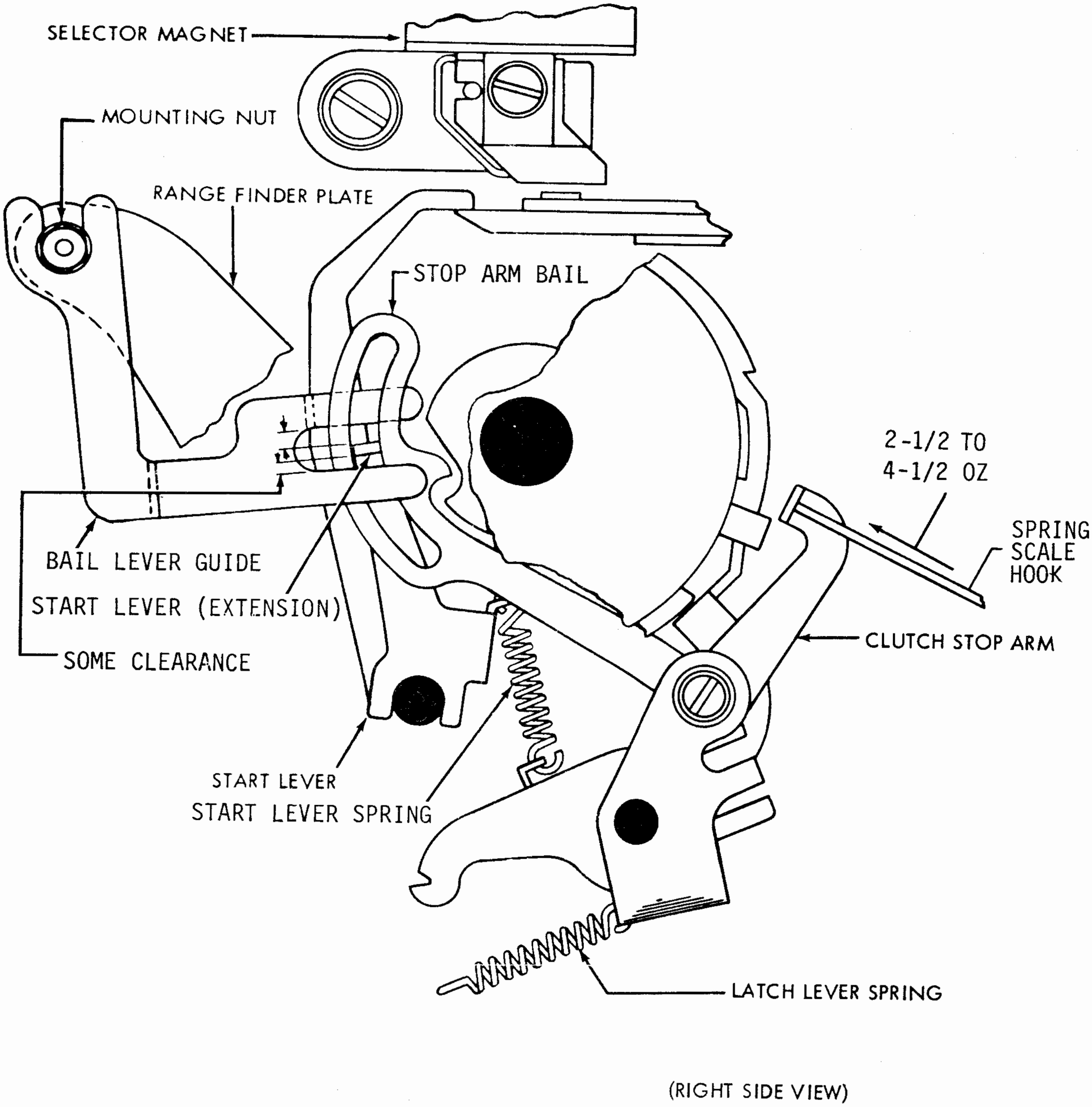



Figure 6-248. Bail Lever Guide and Start Lever Spring

(a) Refer to figure 6-248.

(b) Unhook end of latch lever spring.

(c) Position stop arm bail in indent of its cam.

(d) Set range scale at 60.

(e) Apply spring scale pushrod to clutch stop arm.

(f) Force required to start stop arm moving should be between 2 1/2 and 4-1/2 ounces.

(g) If scale reading exceeds specified limits, install new start lever spring.

(3) Armature Clamp Stop. Adjust armature clamp strip as follows:

NOTE

This adjustment need not be made if selector magnet bracket and receiving margin adjustments have been made. If necessary to make this adjustment, remove range finder and selector magnet assemblies. To insure better operation, put a piece of KS bond paper between armature and pole pieces to remove any oil or foreign matter that may be present. Ensure no lint or pieces of paper remain between pole pieces and armature.

(a) Refer to figure 6-249.

(b) Measure clearance between armature clamp strip and casting at their closest point. Clearance should be 0.010 inch minimum.

(c) If clearance is less than specified minimum, loosen mounting screws.

(d) Position armature spring firmly against pivot edge of casting. To obtain specified clearance between armature clamp strip and casting.

(e) Tighten mounting screws.

(4) Armature Alignment. Adjust armature alignment as follows:

NOTE

This adjustment need not be made if selector magnet bracket and receiving margin adjustments have been made. If necessary to make this adjustment, remove range finder and selector magnet assemblies. To insure better operation, put a piece of KS bond paper between armature and pole pieces to remove any oil or foreign matter that may be present. Ensure no lint or pieces of paper remain between pole pieces and armature.

(a) Refer to figure 6-249.

(b) Ensure outer edge of armature is flush with outer edge of both pole pieces within 0.015 inch.

(c) If not, loosen mounting screws and position armature spring

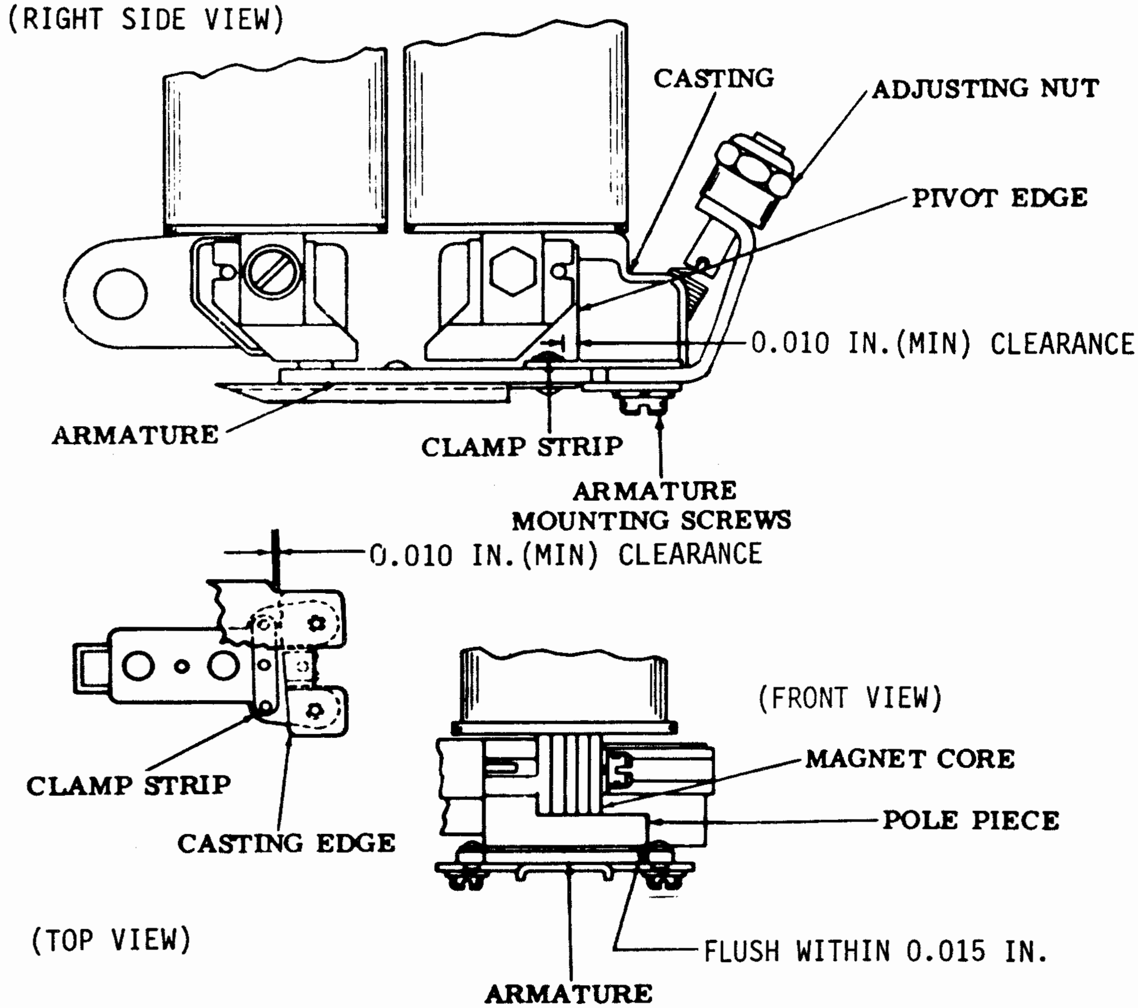



Figure 6-249. Armature Clamp Strip and Armature Alignment

adjusting nut to hold armature firmly against edge of casting.

(d) Tighten mounting screws.

(5) <u>Armature Backstop Alignment (TP152424 Only)</u>. Adjust armature backstop alignment as follows:

NOTE

This adjustment need not be made if selector magnet bracket and receiving margin adjustments have been made.

(a) Refer to figure 6-250.

(b) Measure clearance between sides of backstop and sides of armature extension. Clearance should be 0.010 inch minimum.

(c) If clearance is less than specified minimum, loosen mounting screws.

(d) Position armature spring adjusting nut to hold armature firmly against pivot edge of casting.

(e) Position armature and backstop.

(f) Tighten mounting screws.

h. <u>Spacing Mechanism Adjustments</u>. Perform spacing mechanism adjustments in accordance with the following paragraphs.

(1) <u>Printing Carriage Position</u>. Adjust printing carriage position as follows:

NOTE

If this adjustment is made, check the following related adjustments:

6-7.1h.(9)
6-3.1h.(8)
6-3.1h.(5)
6-3.1h.(6)
6-7.1h.(6)

(a) Refer to figure 6-251.

(b) Place type box in letters position.

(c) Select "M" type pallet.

(d) Place type box in printing position.

(e) "M" type pallet should be approximately in center of printing hammer when hammer is just touching "M" type pallet.

(f) Take up play in type box carriage in each direction and set hammer in center of play.

(g) If adjustment is required, loosen clamp screws and position printing carriage on wire rope.

(h) Tighten clamp screws.

(2) <u>Left Margin</u>. Adjust left margin as follows:

NOTE

The following adjustments are for a 72-character line. For other lengths of lines, ranging from 65 to 85 characters, the margin can be varied as desired.

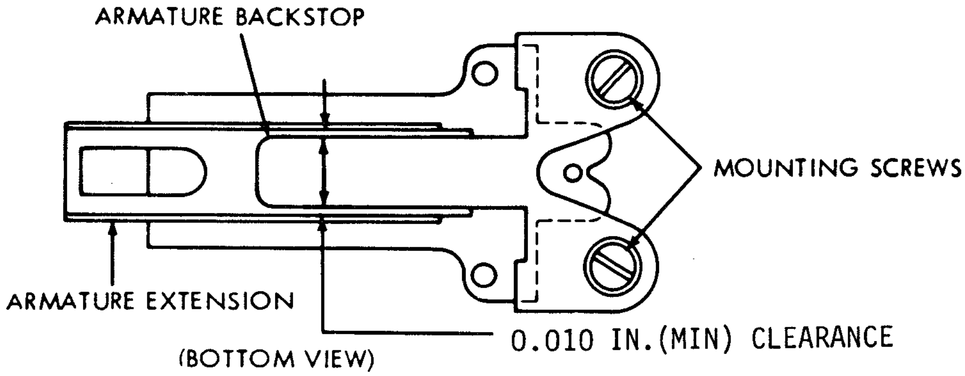



Figure 6-250. Armature Backstop Alignment

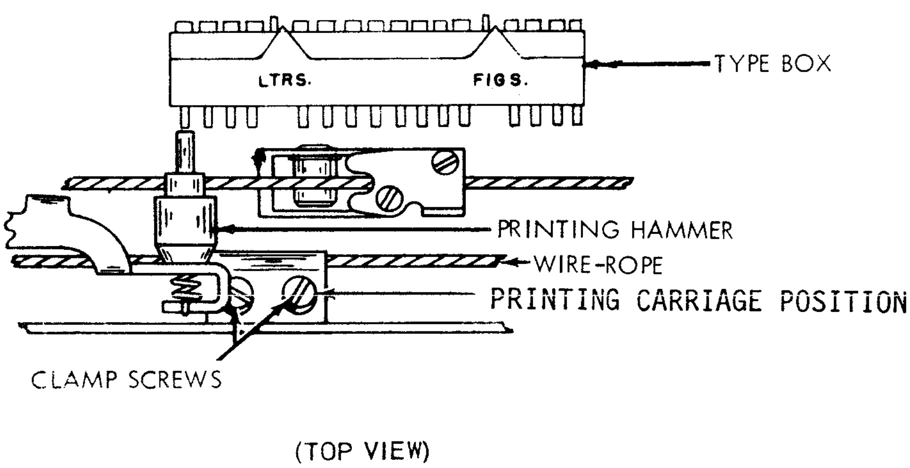



Figure 6-251. Printing Carriage Position

(a) Refer to figure 6-252.

(b) Disengage type box.

(c) Place spacing drum in returned position.

(d) Shift type box to letters position.

(e) Center of LRTS print indicator on type box should be between 15/16 and 1-1/16 inch from left edge of platen.

(f) Disengage spacing clutch.

(g) Place front spacing feed pawl in farthest advanced position.

(h) Take up play in spacing shaft gear in clockwise direction.

(i) Measure clearance between pawl and shoulder of ratchet wheel tooth immediately ahead. Clearance should be between 0.002 and 0.015 inch.

(j) Place rear pawl in farthest advanced position.

(k) Ensure rear pawl rests at bottom of indentation between ratchet wheel teeth.

(l) If clearance in step (e) exceeds specified limits or rear pawl does not rest between ratchet teeth as specified in step (k), loosen mounting screws.

(m) Position stop arm on spacing drum to obtain specified clearance or pawl position.

(n) Tighten mounting screws.

NOTE

If the above adjustment is made, check the following adjustment:

6-7.1h.(9)
6-7.1h.(6)
6-3.1f.(6)

(3) <u>Automatic Carriage Return-Line Feed Bell Crank Spring</u>. Adjust automatic carriage return-line feed bell crank spring as follows:

(a) Refer to figure 6-252.

(b) Disengage function clutch.

(c) Attach spring scale hook to bell crank.

(d) Force required to move bell crank should be between 6-1/2 ounces and 1 ounce.

(e) If scale reading exceeds specified limits, install new spring.

(4) <u>Automatic Carriage Return and Line Feed Arm</u>. Adjust automatic carriage return and line feed arm as follows:

(a) Refer to figure 6-253.

(b) Place carriage in position (operating on base) to print two spaces before last desired characters.

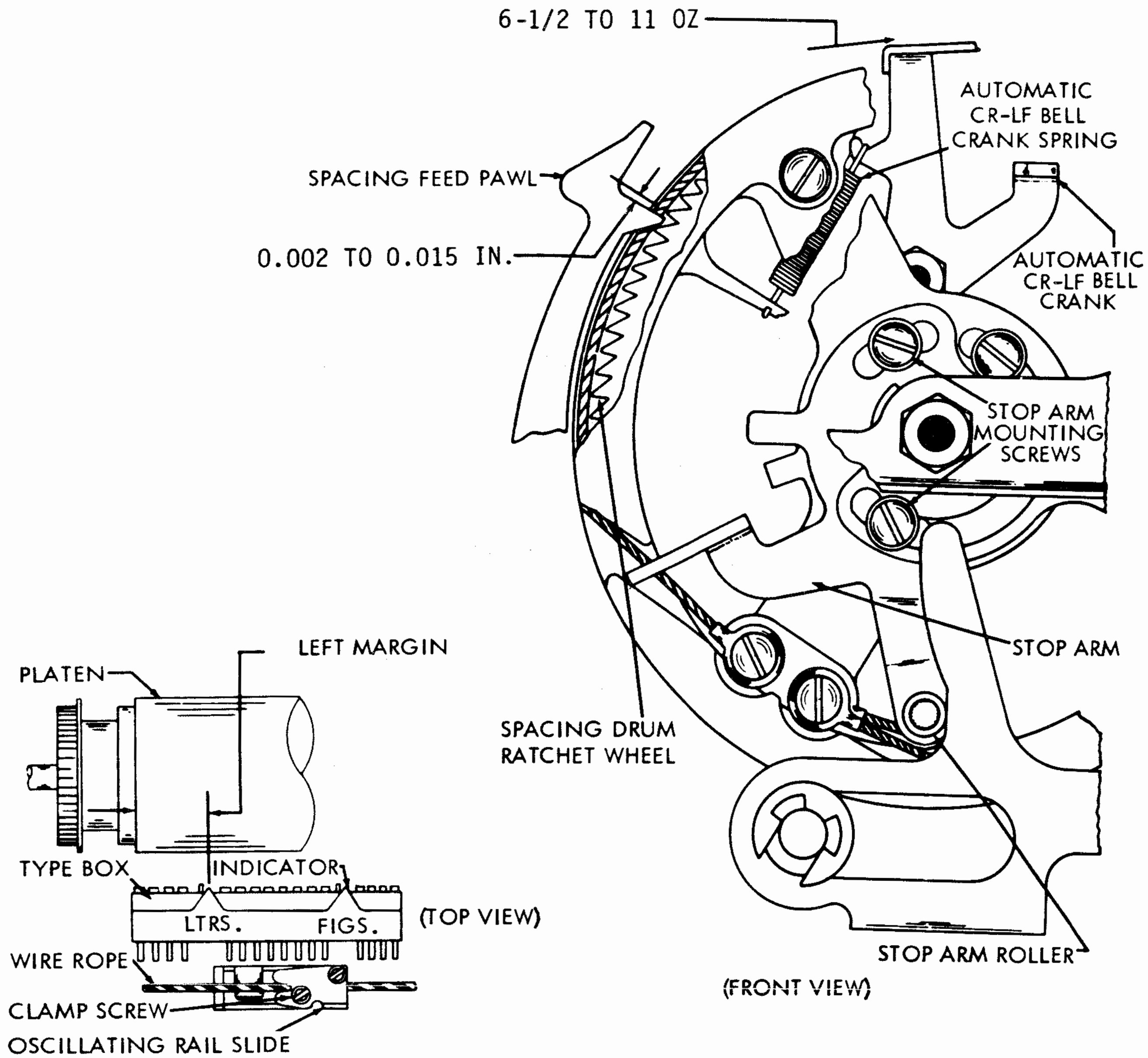



Figure 6-252. Left Margin and Automatic Carriage Return-Line Feed Bail Crank Spring

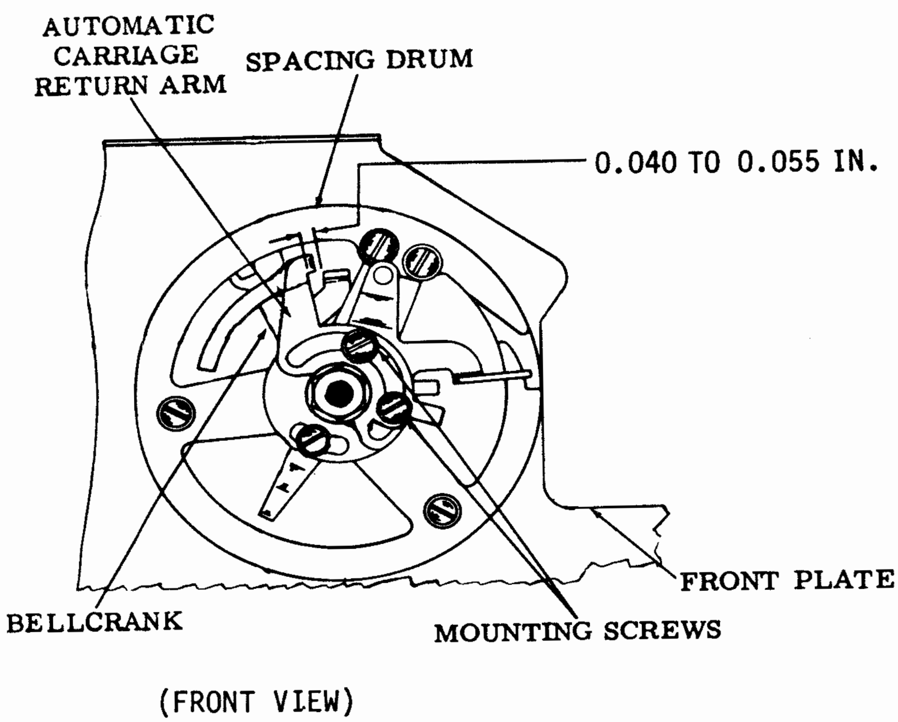



Figure 6-253. Automatic Carriage Return and Line Feed Arm

(c) Place front spacing pawl in farthest advanced position.

(d) Measure clearance between leading end of automatic carriage return arm and bellcrank. Clearance should be between 0.040 inch and 0.055.

(e) If clearance exceeds specified limits, loosen mounting screws.

(f) Position automatic return arm to obtain specified clearance.

(g) Tighten mounting screws.

NOTE

Range of adjustment is from 65th to 85th character. For units equipped with universal spacing drum, see 6-3.1h(16).

(5) Decelerating Slide Bell Crank Spring. Adjust decelerating slide bell crank spring as follows:

(a) Refer to figure 6-254.

(b) Attach spring scale hook to right decelerating slide bell crank spring.

(c) Force required to start bell crank moving should be between 3/4 and 1-3/4 ounces.

(d) If scale reading exceeds specified limits, install new spring.

(e) Repeat steps (b) through (d) for left decelerating slide bell crank spring.

(6) Spacing Cutout Transfer Bail Spring. Adjust spacing cutout transfer bail spring as follows:

(a) Refer to figure 6-255.

(b) Apply spring scale pushrod to spacing extent transfer bail.

(c) Force required to start bail moving should be between 1 and 3-1/2 ounces.

(d) If spring scale reading exceeds specified limits, install new spring.

(7) Right Margin. Adjust right margin as follows:

(a) Refer to figure 6-255.

(b) Place type box carriage in position (operating on base) to print character on which spacing cutout is desired.

(c) Place front facing pawl in farthest advanced position.

(d) Hold spacing cutout transfer bail in its uppermost position and measure clearance between upper edge of spacing cutout lever and cutout transfer bail. Clearance should be between 0.006 and 0.025 inch.

(e) If clearance exceeds specified limits, loosen cutout lever clamp screw.

(f) Position cutout lever to obtain specified clearance.

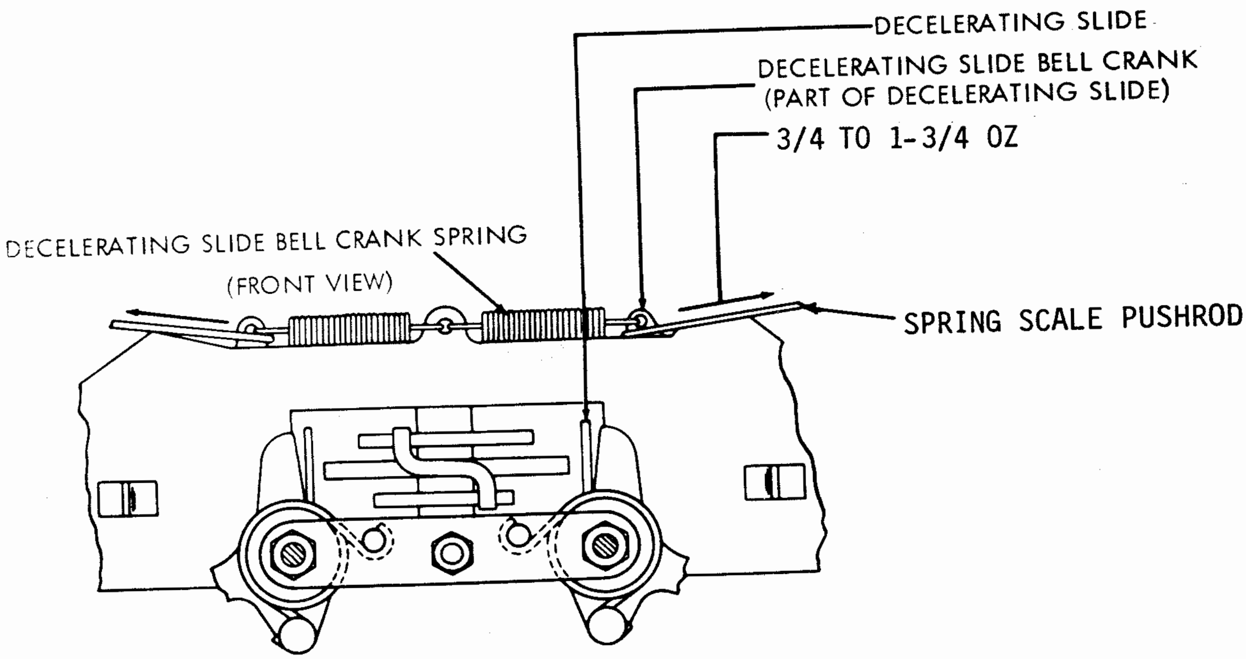



Figure 6-254. Decelerating Slide Bell Crank Spring

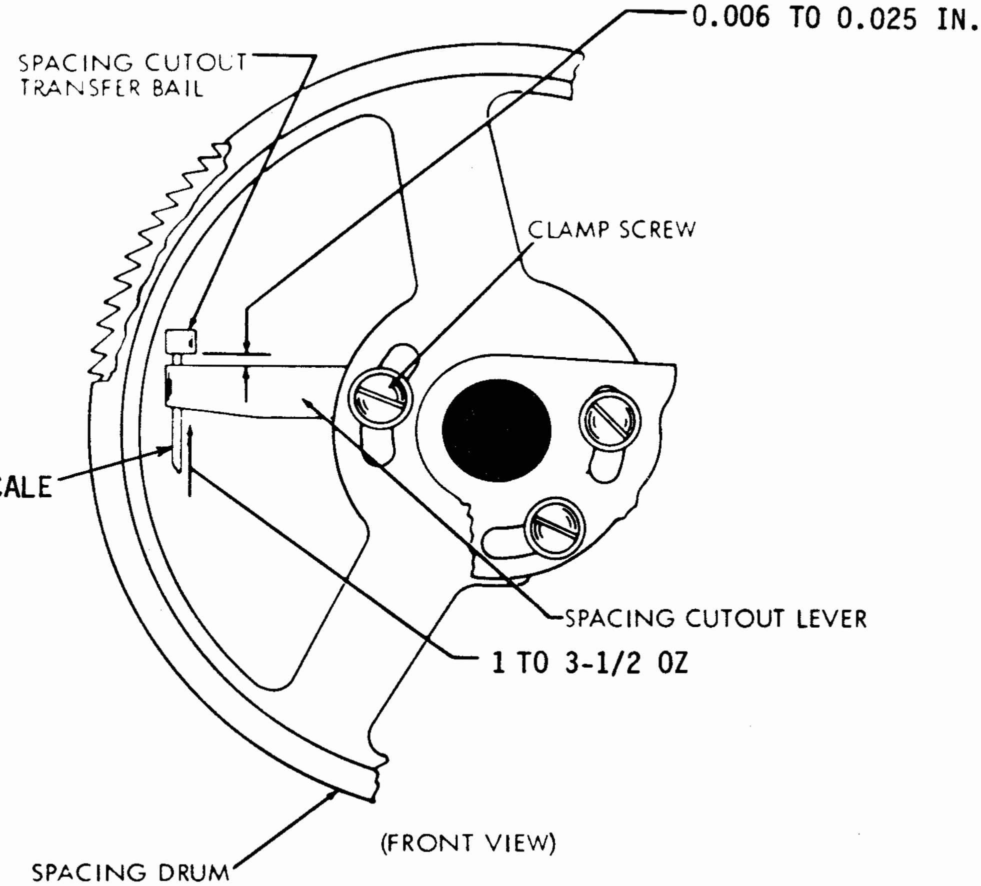



Figure 6-255. Spacing Cutout Transfer Bail Spring and Right Margin

(g) Tighten clamp screw.

NOTE

If this adjustment is made, check the following related adjustments:

6-7.1h.(9)
6-3.1h.(8)
6-3.1h.(5)
6-3.1f.(6)
6-3.1f(7)

(8) Margin Indicator Lamp. Adjust margin indicator lamp as follows:

(a) Refer to figure 6-256.

(b) Operate unit under power.

(c) Margin indicator lamp should become illuminated on desired character.

(d) If lamp does not become illuminated on desired character, loosen three cam disc mounting screws.

(e) Set type box to print desired character.

(f) Position cam disc counterclockwise on spring drum so switch just opens. If a line shorter than 72 characters is required and range of rotation in one slot is not sufficient, it may be necessary to remove cam disc mounting screws and insert them in adjacent slots of disc.

(g) Tighten mounting screws.

(9) Oscillating Rail Slide Position.

(a) Refer to figure 6-257.

(b) Place spacing cutout lever and automatic carriage return-line feed arm in maximum counterclockwise position on spacing drum.

(c) Disengage spacing clutch.

(d) Position farthest advanced spacing pawl so it is engaged with tooth just above cutaway section in ratchet wheel.

(e) Measure clearance between right end of oscillating rail slide and pulley. Clearance should be between 0.025 and 0.050 inch.

(f) If clearance exceeds specified limits, loosen clamp screws.

(g) Position slide on wire rope to obtain specified clearance.

(h) Tighten screws.

NOTE

If adjustment of steps (f), (g), and (b) was made, check the following related adjustments:

6-7.1h(1)
6-7.1h(6)
6-3.1f(6)

(10) Spacing Feed Pawl Spring. Adjust spacing feed pawl spring as follows:

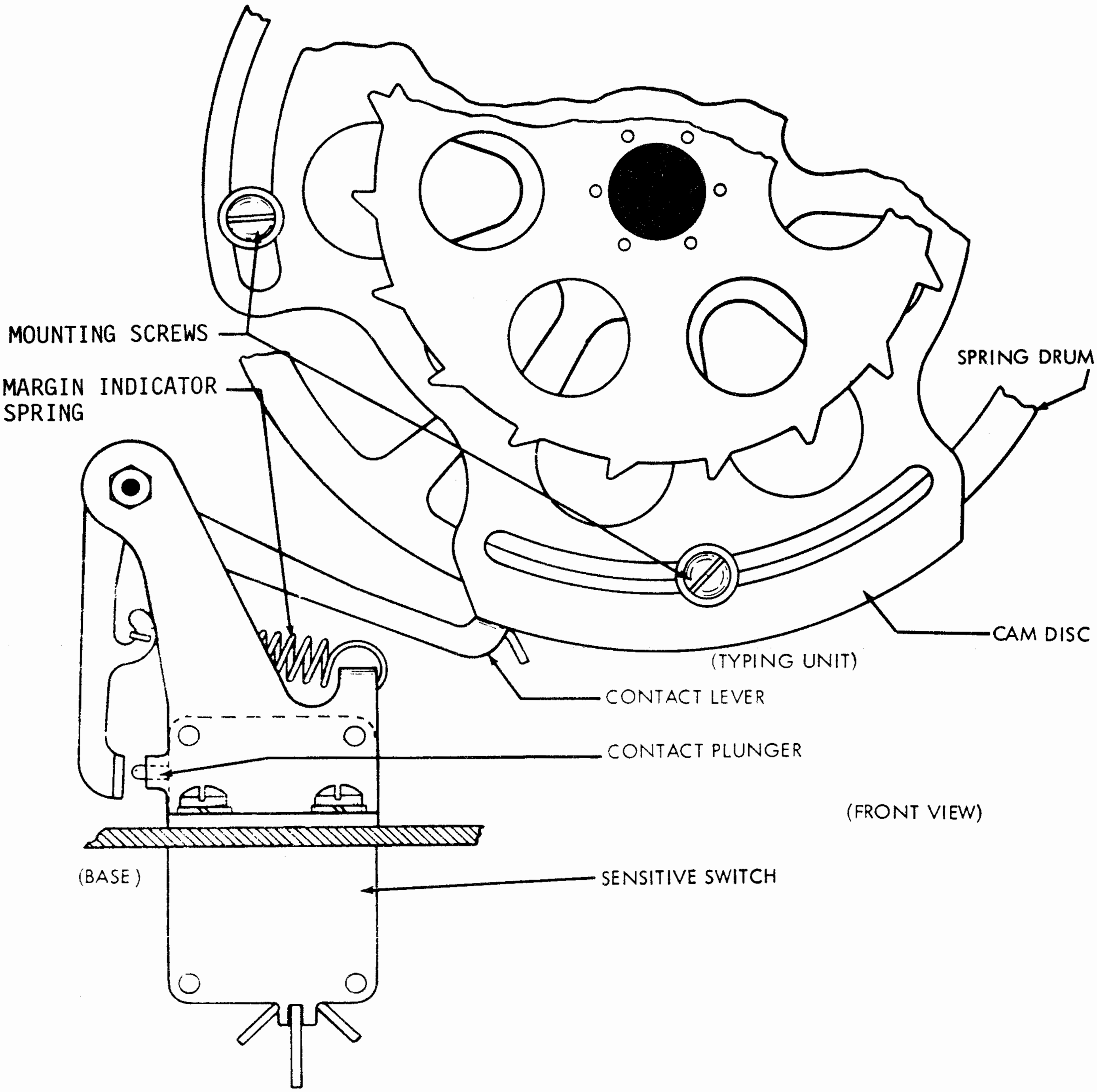



Figure 6-256. Margin Indicator Lamp

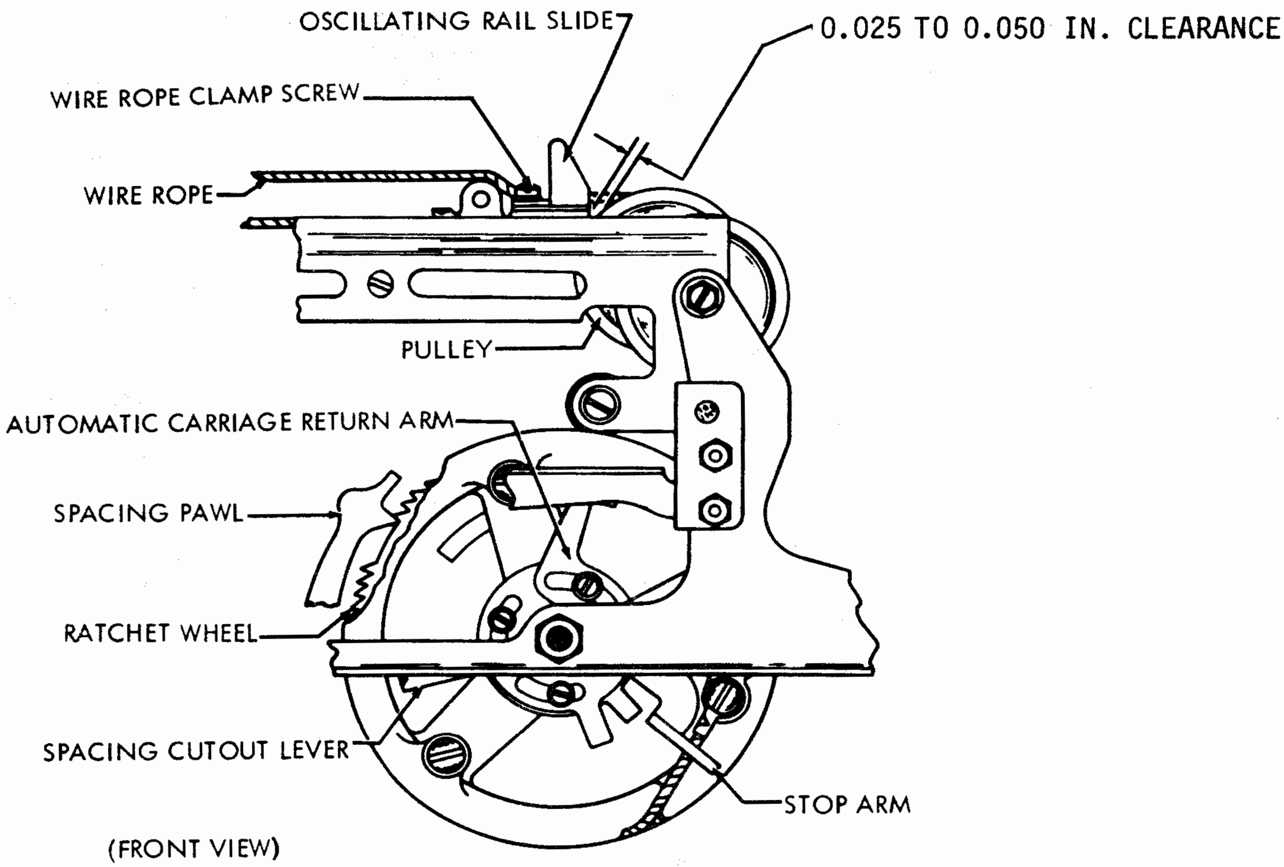



Figure 6-257. Oscillating Rail Slide Position

(a) Refer to figure 6-258.

(b) Place each spacing pawl in least advanced position, resting against ratchet wheel.

(c) Unhook each spring from its bracket.

(d) Attach spring scale hook to free end of each spring in turn.

(e) Force required to extend each spring to its installed length should be between 2-1/2 and 4 ounces. On units equipped for 6 spaces per inch, the force should be 8 to 10 ounces.

(f) If scale reading for any spring exceeds specified limits, install new spring.

6-8. KEYBOARD UNIT. The following paragraphs describe keyboard unit adjustments, Variable Features of basic CPP Teletypewriter Sets. (Low-level adjustments apply only to Basic Units).

6-8.1 KEYBOARD UNIT (HIGH-LEVEL). Perform time delay mechanism adjustments in accordance with the following paragraphs.

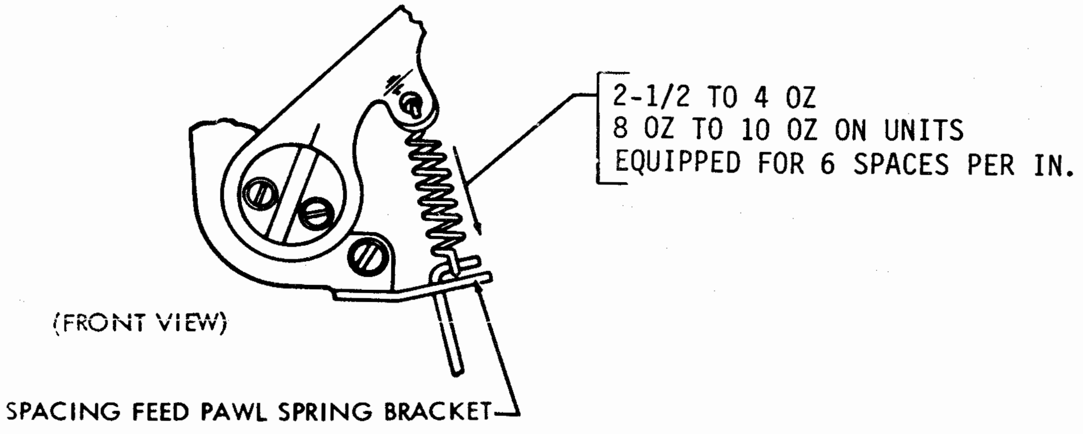



Figure 6-258. Spacing Feed Pawl Spring

NOTE

Time delay mechanism must be used with an external relay.

a. Ratchet Wheel Tension. Adjust ratchet wheel tension as follows:

(1) Refer to figure 6-259.

(2) With all pawls held away, use spring scale to measure force required to move ratchet wheel. This should require from 2 ounces (minimum) to 8 ounces (maximum).

(3) To adjust, remove and bend friction springs.

b. Time Delay Switch Position. Adjust time delay switch position as follows:

(1) Refer to figure 6-260.

(2) Position contact pawl on high part of ratchet wheel, disengage latchlever; take up play (upward) in ratchet wheel.

(3) Place a 0.020 inch feeler gauge between contact pawl and switch plunger. Contact should not close.

(4) Place a 0.035 inch feeler gauge between contact pawl and switch plunger. Contacts should close.

(5) To adjust, loosen two mounting screws, and position switch.

(6) Tighten mounting screws.

c. Latch Pawl Spring. Adjust latch pawl spring as follows:

(1) Refer to figure 6-261.

(2) Unhook latch pawl spring; hold latch pawl down.

(3) Use spring scale to measure force required to extend spring to full length: force should be from 12 ounces (minimum) to 15 ounces (maximum).

(4) If force does not meet requirements, replace spring.

d. Feed Pawl Spring. Adjust feed pawl spring as follows:

(1) Refer to figure 6-262.

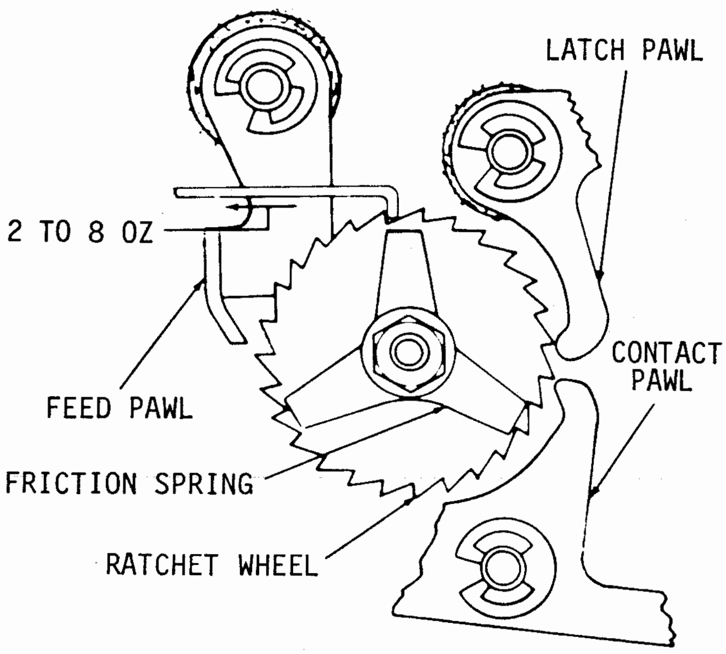
(2) Use spring scale to measure force necessary to move feed pawl from ratchet wheel: this should be from one ounce (minimum) to 2 ounces (maximum).

(3) If force required does not meet specifications, replace spring.

e. Contact Pawl Spring. Adjust contact pawl spring as follows:

(1) Refer to figure 6-263.

(2) With contact pawl latched on end of latch-lever, use spring scale to measure force needed to start pawl moving: this should require from 5 ounces (minimum) to 6 ounces (maximum).




(RIGHT SIDE VIEW)

Figure 6-259. Ratchet Wheel Tension

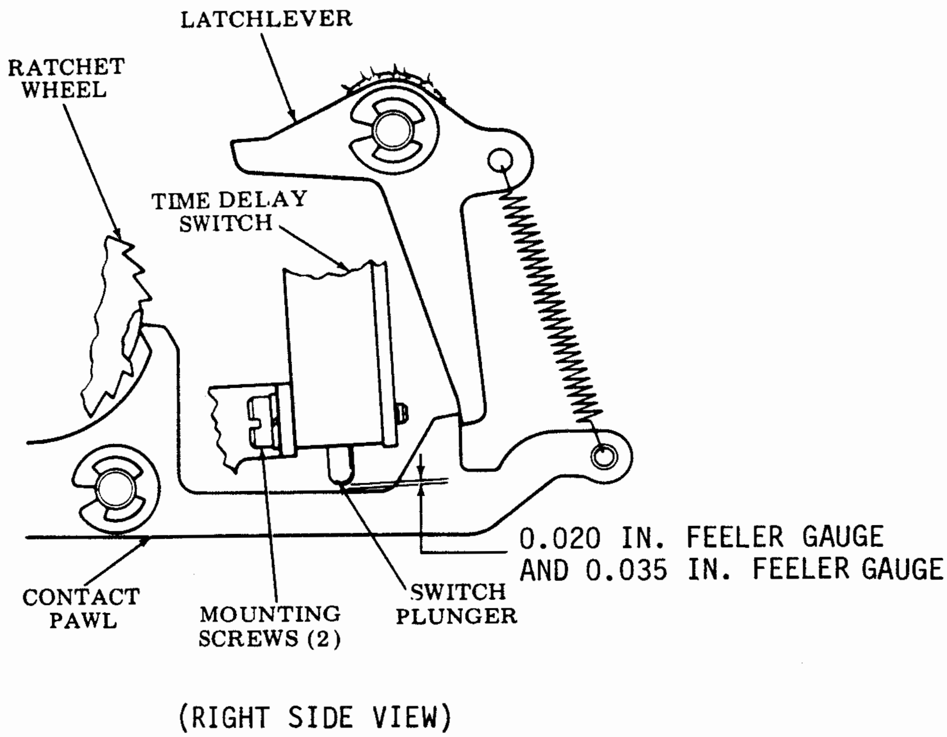



Figure 6-260. Time Delay Switch Position

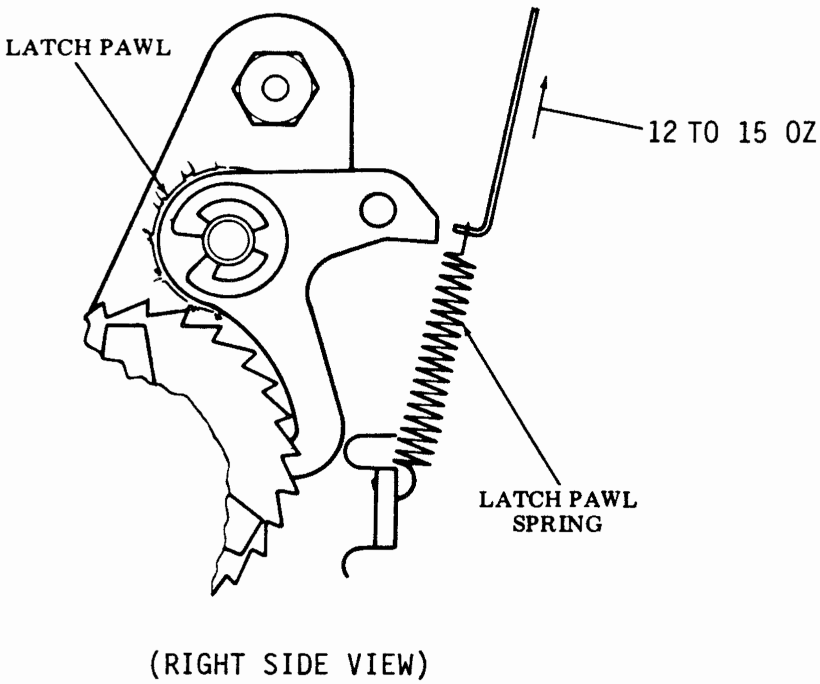



Figure 6-261. Latch Pawl Spring

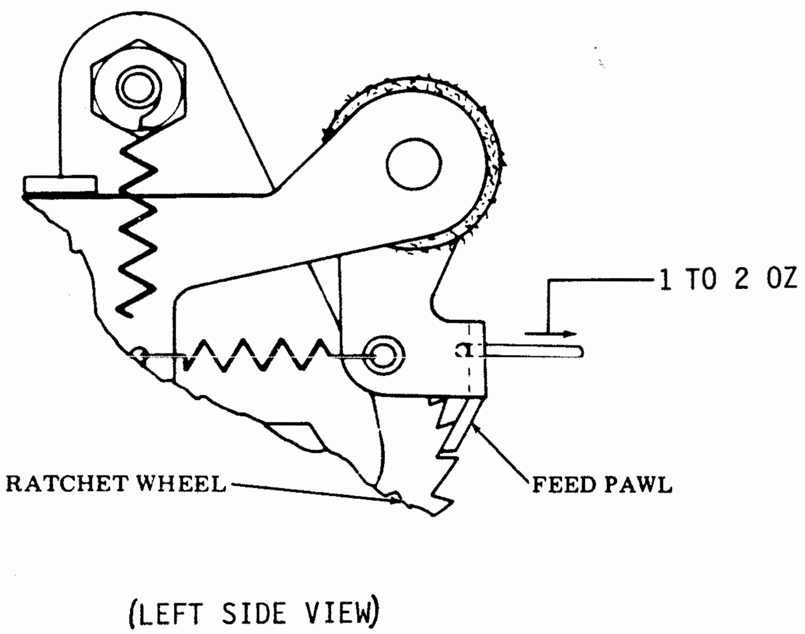



Figure 6-262. Feed Pawl Spring

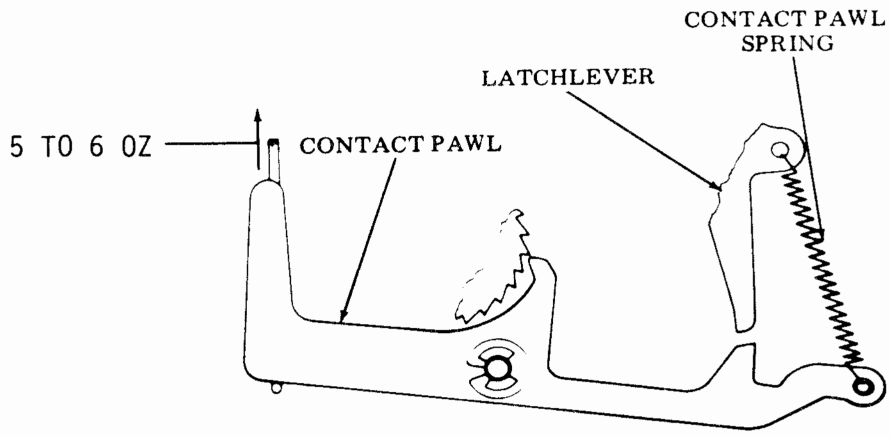



Figure 6-263. Contact Pawl Spring

(3) If force does not meet requirements, replace spring.

f. Disabling Device. Adjust disabling device as follows:

(1) Refer to figure 6-264.

(2) To disable, loosen two mounting screws on the upstop bracket and lower bracket to its bottom position.

(3) To enable, carry out procedure in (b), but raise bracket to upper position.

(4) Tighten screws.

g. Cam Follower Lever Spring. Adjust cam follower lever spring as follows:

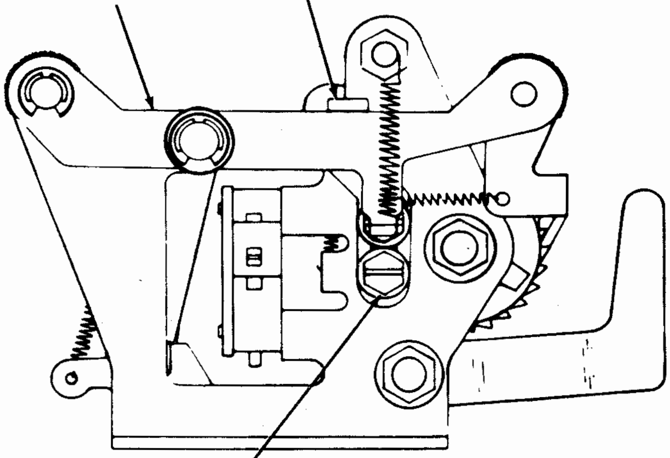
(1) Refer to figure 6-265.

(2) Place upstop bracket in lowest position, and unhook upper end of cam follower lever spring.

(3) Use spring scale to extend spring to installed length: this should require 9 ounces (minimum) to 11 ounces (maximum).

(4) If force required exceeds specifications, replace spring.

(5) Restore upstop bracket to original condition.




(LEFT SIDE VIEW)

Figure 6-264. Disabling Device

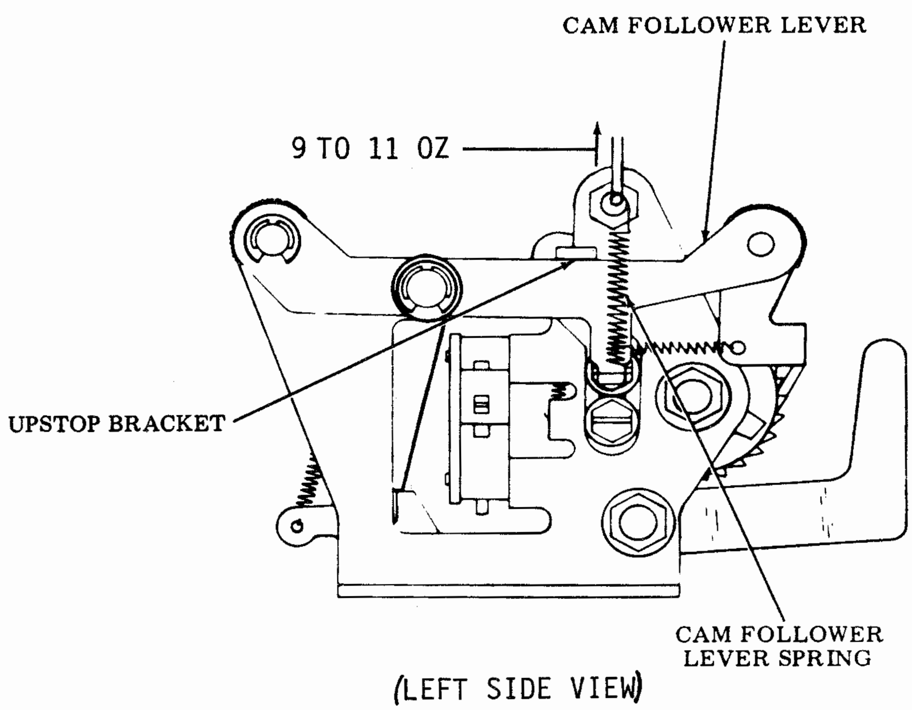



Figure 6-265. Cam Follower Lever Spring

h. Time Delay Mechanism Downstop. Adjust time delay mechanism position as follows:

(1) Refer to figure 6-266.

(2) Mount typing unit on base; place main drive bracket in rearmost position.

(3) Measure clearance between contact panel and latching lever: it should be between 0.030 inch (minimum) and 0.060 inch (maximum).

(4) To adjust, loosen adjusting screws friction tight: position mechanism to correct clearance.

(5) Tighten screws.

## SECTION IV - ADJUSTMENTS (EARLIER DESIGN VARIABLE FEATURES)

### 6-9. TYPING UNIT.

### 6-9.11 TYPING UNIT (HIGH-LEVEL).

a. Horizontal Tabulator Mechanism Adjustment.

(1) Operating Lever Slide Arm. Adjust as follows:

NOTE

Prior to making this adjustment, check function reset bail blade adjustment in paragraph 6-7.1b(4).

(a) Refer to figure 6-267.

(b) If unit has two-stop function clutches, disengage function clutch. Rotate type box clutch one-half revolution past stop function If unit has one-stop-function clutch, rotate clutch until function pawl stripper blade is in its lower position and function reset bail roller is on high part of cam.

(c) Pull horizontal tabulator function pawl to rear and latch it over function bar.

(d) Measure clearance between blocking arm and operating lever slide arm. Clearance should be between 0.015 and 0.035 inch.

(e) If clearance exceeds specified limits, loosen mounting stud to point of friction tightness.

(f) Position slide arm on operating lever to obtain specified clearance.

(g) Tighten mounting stud.

(2) Operating Lever Extension Link Spring. Adjust operating lever extension link spring as follows:

(a) Refer to figure 6-267.

(b) Unhook trip arm latch bail spring.

(c) Place operating lever in operated position.

(d) Place operating lever slide arm against blocking link.

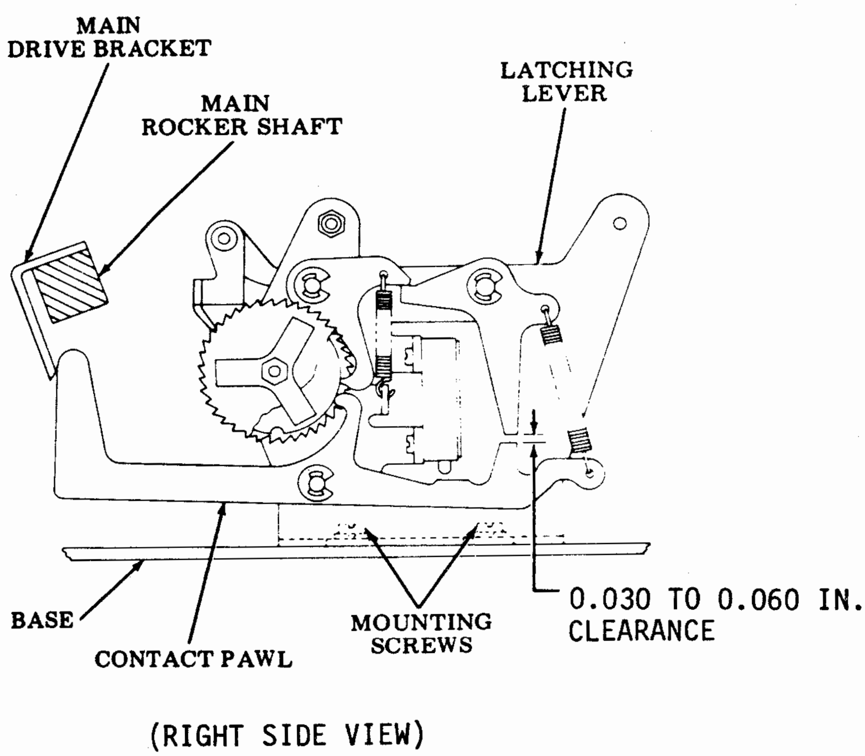



Figure 6-266. Time Delay Mechanism Position

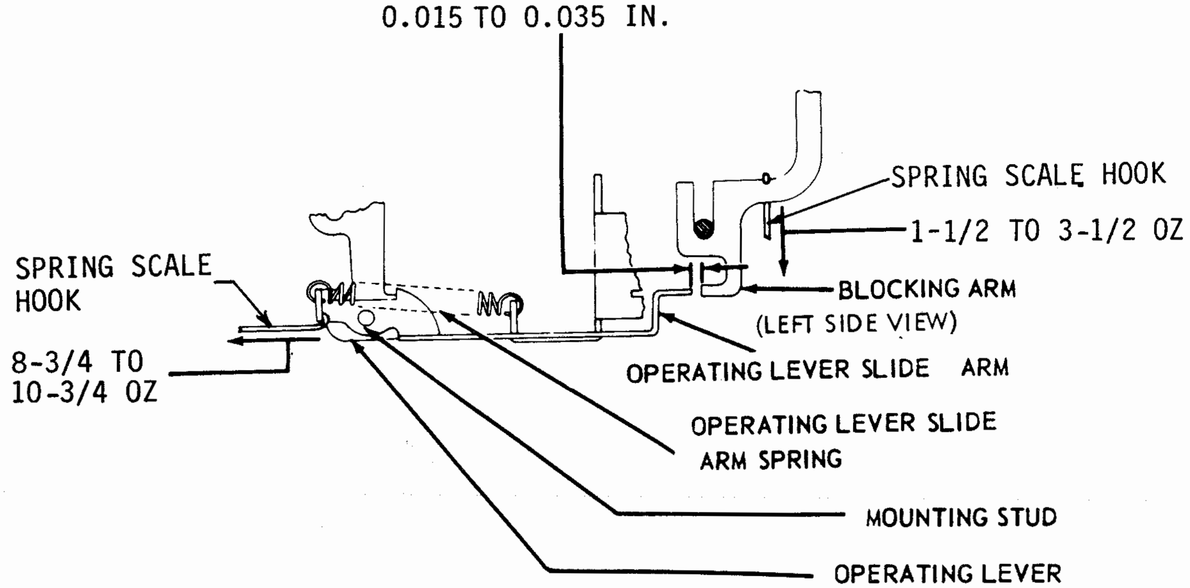



Figure 6-267. Operating Lever Slide Arm, Operating Lever Extension Link Spring, and Tabulator Shaft Spring (Torsion)

(e) Apply spring scale hook as shown in figure 6-267.

(f) Force required to start link moving should be between 8-3/4 and 10-3/4 ounces.

(g) If scale reading exceeds specified limit, install new spring.

(h) Reconnect trip arm latch bail spring.

(3) Tabulator Shaft Spring (Torsion). Adjust tabulator shaft spring as follows:

(a) Refer to figure 6-267.

(b) Place operating lever in unoperated position (as in figure 6-268).

(c) Attach spring scale hook to blocking arm as shown in figure 6-268.

(d) Force required to start slide arm moving should be between 1-1/2 and 3-1/2 ounces.

(e) If scale reading exceeds specified limits, install new spring.

(4) Operating Lever Adjusting Plate. Adjust operating lever adjusting plate as follows:

(a) Refer to figure 6-268.

(b) Place operating lever in unoperated position.

(c) Measure clearance between blocking arm and operating lever slide arm as shown in figure. Clearance should be between 0.020 and 0.085 inch.

(d) If clearance exceeds specified limits, loosen mounting screws.

(e) Position adjusting plate on bracket to obtain specified clearance.

(f) Tighten mounting screws.

(5) Trip Arm Latch Bail. Adjust trip arm latch bail as follows:

(a) Refer to figure 6-269.

(b) Place operating lever in unoperated position.

(c) Position spacing trip arm up.

(d) Measure clearance as shown in figure. Clearance should be between 0.020 and 0.040 inch.

(e) If clearance exceeds specified limits, loosen lock nuts.

(f) Position latch bail adjusting screw to obtain specified clearance.

(g) Tighten locknut.

(6) Trip Arm Latch Bail Spring. Adjust trip arm latch bail spring as follows:

(a) Refer to figure 6-269.

(b) Place operating lever in unoperated position.

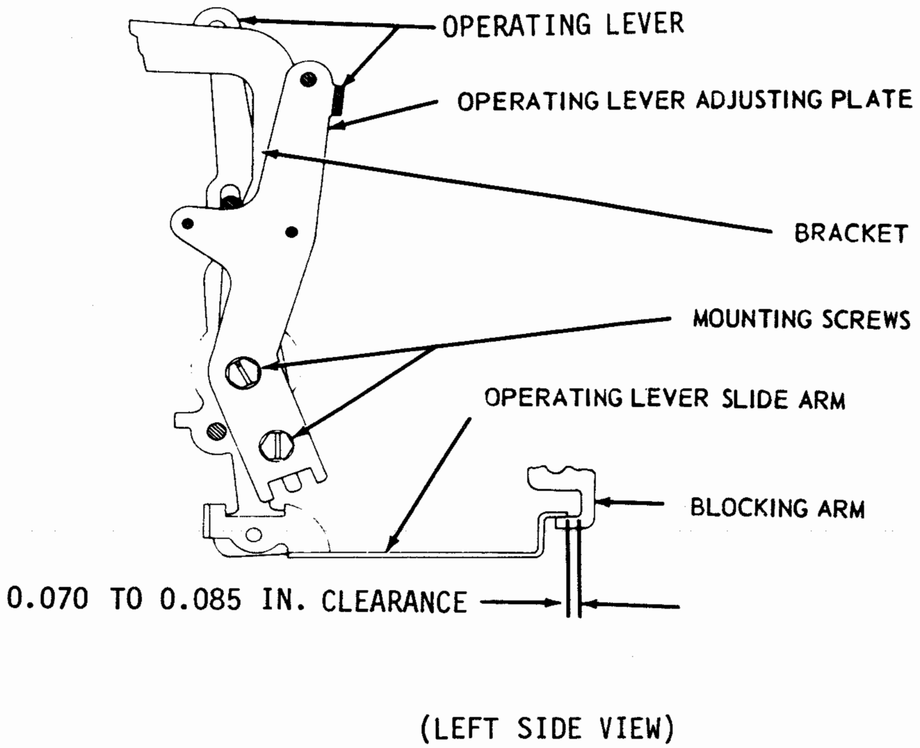



Figure 6-268. Operating Lever Adjusting Plate

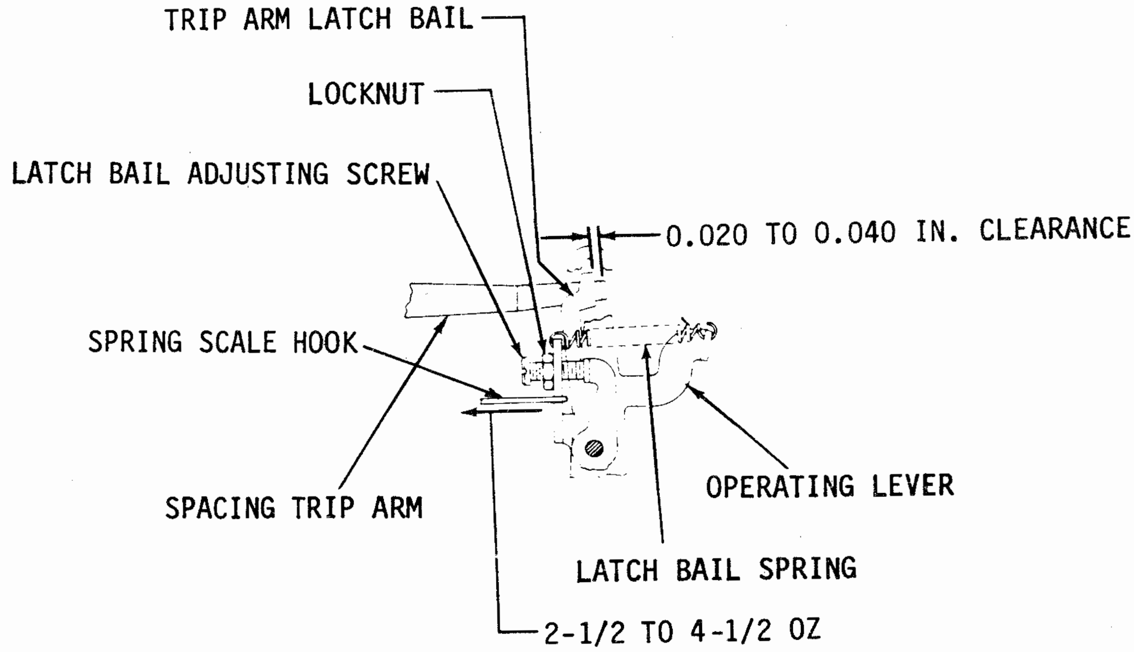



Figure 6-269. Trip Arm Latch Bail and Trip Arm Latch Bail Spring

(c) Attach spring scale hook as shown in figure.

(d) Force required to start trip arm latch bail moving should be between 2-1/2 and 4-1/2 ounces.

(e) If scale reading exceeds specified limits, install new spring.

(7) Trip Arm Latch Bail Adjusting Plate. Adjust trip arm latch bail adjusting plate as follows:

(a) Refer to figure 6-270.

(b) Disengage spacing clutch and type box clutch.

(c) Place operating lever slide arm to rear and latch it on blocking arm.

(d) Place latch bail in fully latched position.

(e) Position spacing trip arm down and bearing up against latching surface of latch bail.

(f) Measure clearance between spacing trip arm and spacing trip lever as shown in figure. There should be some clearance not exceeding 0.008 inch.

(g) If clearance exceeds specified limits, loosen mounting screw to point of friction tightness.

(h) Position latch bail adjusting plate to obtain specified clearance.

(i) Tighten mounting screw.

(8) Spacing Cutout Transfer Bail Set Collar. Adjust spacing cutout transfer bail set collar as follows:

(a) Refer to figure 6-271.

(b) Measure transfer bail end play. There should be some end play not exceeding 0.008 inch.

(c) If end play exceeds specified limit, loosen set collar adjusting screw.

(d) Position set collar to obtain specified end play.

(e) Tighten set collar adjusting screw.

(9) Cam Plate Stripper Bail. Adjust cam plate stripper bail as follows:

(a) Refer to figure 6-272.

(b) Place operating lever and tabulator slide arm in their unoperated position.

(c) Rotate spacing clutch until high part of spacing cam is opposite cam arm.

(d) Measure clearance between cam arm follower bail and high part of spacing cam. Clearance should be between 0.010 and 0.025 inch.

(e) If clearance exceeds specified limits, loosen stripper bail arm screw to point of friction tightness.

(f) Position stripper bail arm on cam arm

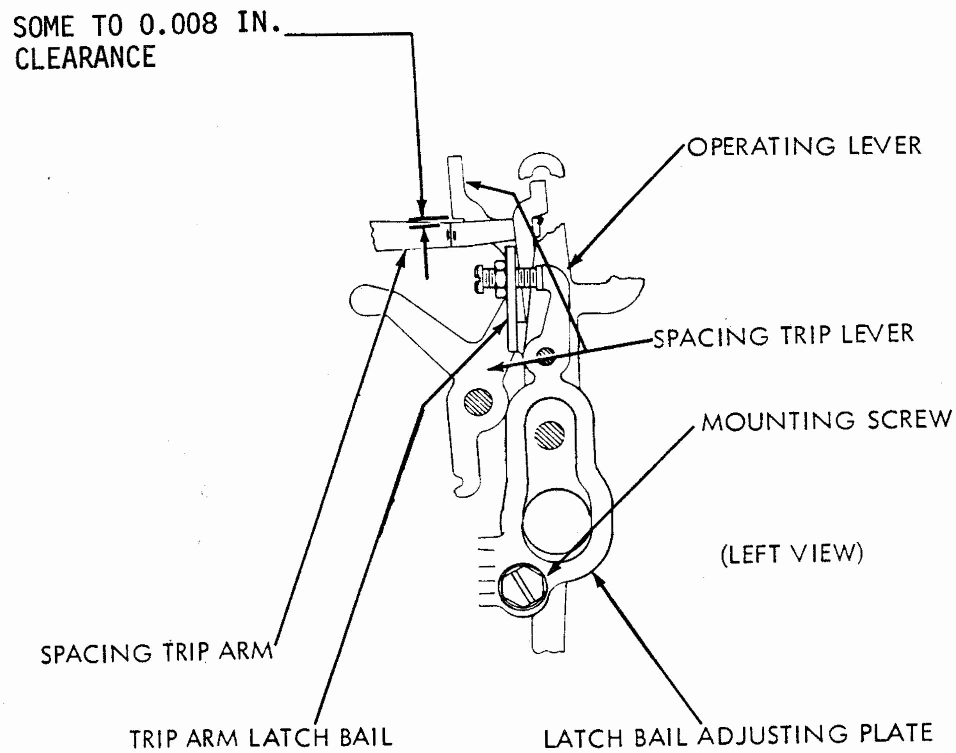



Figure 6-270. Trip Arm Latch Bail Adjusting Plate

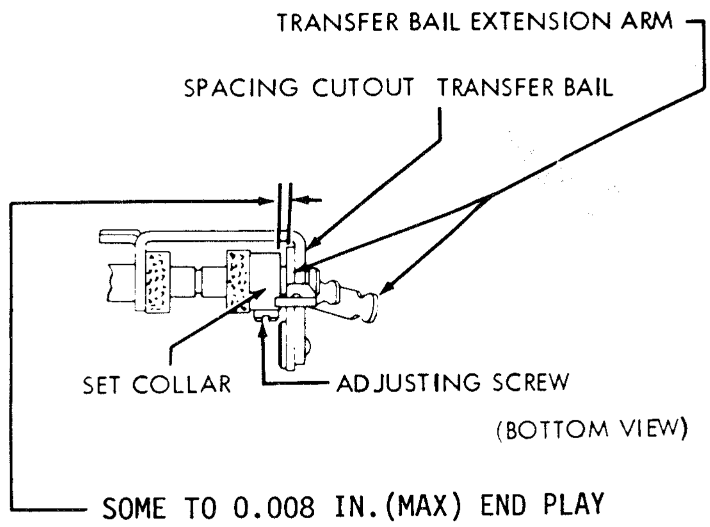



Figure 6-271. Spacing Cutout Transfer Bail Set Collar

follower bail to obtain specified clearance.

(g) Tighten screw.

(10) Horizontal Tabulator Slide Arm Spring. Adjust horizontal tabulator slide arm spring as follows:

(a) Refer to figure 6-272.

(b) Place operating lever in operated position.

(c) Place slide arm in unoperated position.

(d) Apply spring scale pushrod to horizontal tabulator slide arm as shown in figure.

(e) Force required to start slide arm moving should be between 1 and 4 ounces.

(f) If scale reading exceeds specified limits, install new spring.

(11) Operating Lever Cam Plate Spring. Adjust operating lever cam plate spring as follows:

(a) Refer to figure 6-272.

(b) Place operating lever in unoperated position.

(c) Unlatch horizontal tabulator function pawl.

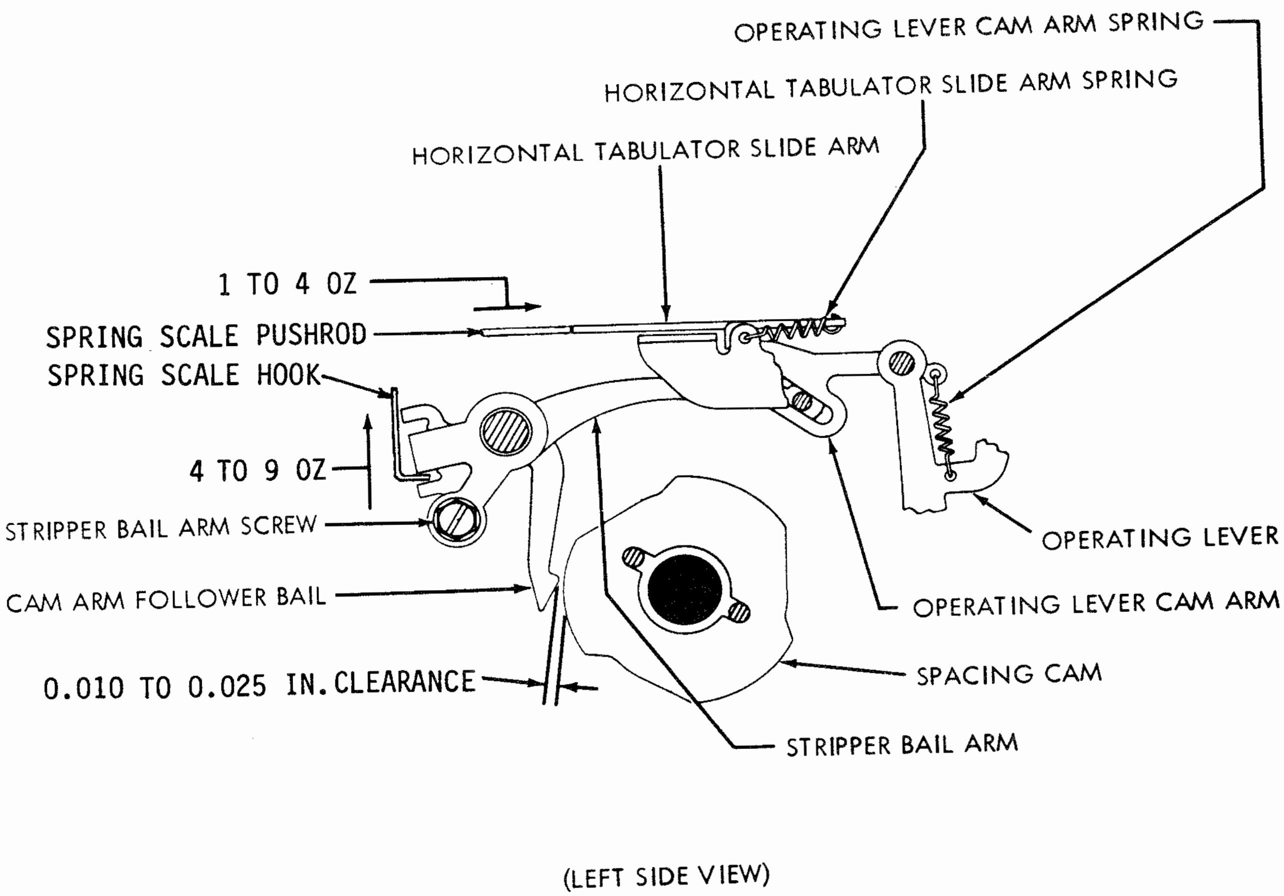



Figure 6-272. Cam Plate Stripper Bail, Horizontal Tabulator Slide Arm Spring, and Operating Lever Cam Plate Spring

(d) Attach spring scale hook to stripper bail arm as shown in figure.

(e) Force required to start stripper bail arm moving should be between 4 and 9 ounces.

(f) If scale reading exceeds specified limits, install new spring.

(12) Right Margin. Adjust right margin as follows:

(a) Refer to figure 6-273.

(b) Place type box in position to print character on which spacing cutout is desired.

(c) Pull forward on part of transfer bail extending below mounting shaft until bail is in fully operated position.

(d) Measure clearance between bail extension arm and spacing cutout lever on spacing drum. Clearance should be between 0.006 and 0.025 inch.

(e) If clearance exceeds specified limits loosen clamp screws.

(f) Position cutout lever to obtain specified clearance.

(g) Tighten clamp screws.

(13) Space Suppression Bypass Spring. Adjust

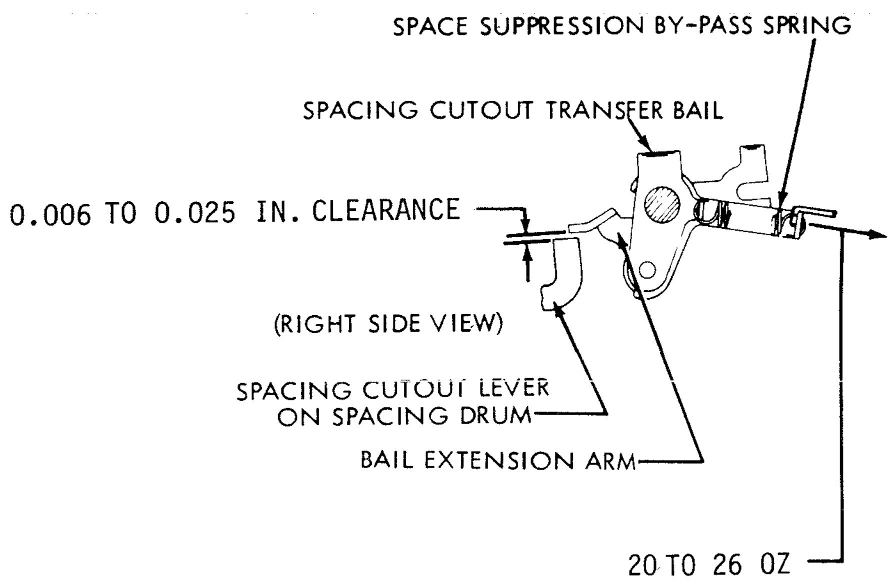



Figure 6-273. Right Margin and Space Suppression Bypass Spring

space suppression bypass spring as follows:

(a) Refer to figure 6-273.

(b) Attach spring scale hook to space suppression bypass lug as shown in figure.

(c) Force required to start bail extension arm moving should be between 20 and 26 ounces.

(d) If scale reading exceeds specified limits, install new spring.

(14) Tabulator Shaft Mounting Bracket. Adjust tabulator shaft mounting bracket as follows:

(a) Refer to figure 6-274.

(b) Move lever slide arm to rear so blocking arm and tabulator stop are in extreme upper position.

(c) Measure clearance near left and right ends of tabulator shaft as shown in figure. Clearances should be between 0.050 and 0.065 inch and should be equal within 0.007 inch.

(d) If clearances exceed specified limits or they are not equal within specified limit, loosen mounting screws.

(e) Position mounting bracket to obtain specified clearance and

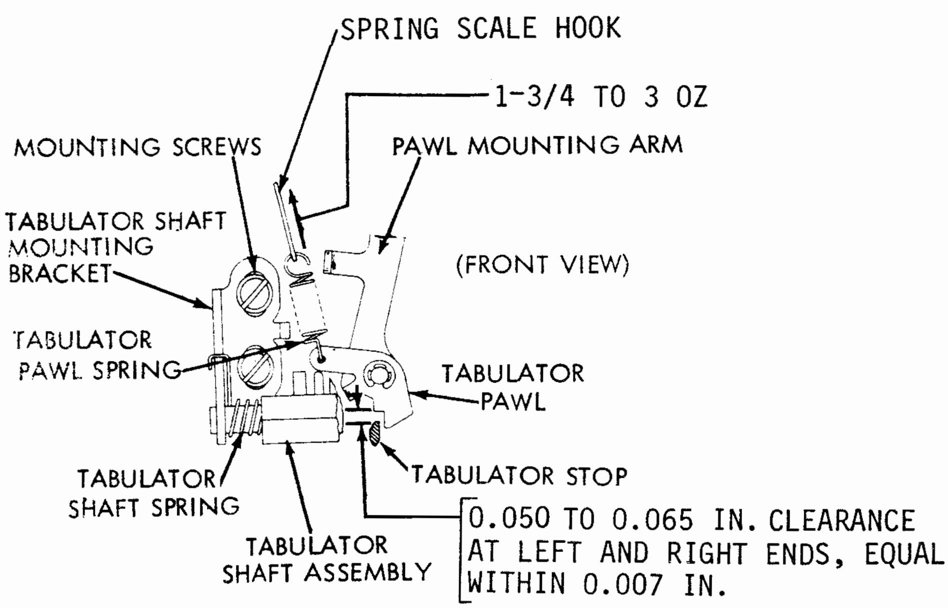



Figure 6-274. Tabular Shaft Mounting Bracket and Tabulator Pawl Springs

equality. Ensure shaft is free of binds.

(f) Tighten mounting screws.

(15) <u>Tabulator Pawl Springs</u>. Adjust tabulator pawl springs as follows:

(a) Refer to figure 6-274.

(b) Attach spring scale hook to tabulator pawl spring as shown in figure.

(c) Force required to extend spring to its installed length should be between 1-3/4 and 3 ounces.

(d) If scale reading exceeds specified limits, install new spring.

(16) <u>Pawl Mounting Arm Operating Range (Preliminary)</u>. Adjust pawl mounting arm operating range as follows:

NOTE

Check the requirements in the following adjustments:

Oscillating Rail Slide 6-3.1h(13)

Printing Carriage Position 6-3.1f(6)

Printing Carriage Lower Roller 6-3.1f(4)

(a) Refer to figure 6-275.

(b) If unit has sprocket feed platen, position high part of eccentric toward lower roller mounting screw. If unit has friction feed platen, perform following operations:

1. Disengage spacing clutch.

2. Ensure farthest advanced spacing pawl engages tooth immediately above cutaway section of ratchet.

3. Ensure tabulator pawl rides up on fixed stop and high part of eccentric is toward fork of pawl mounting arm.

(c) Measure clearance between tabulator pawl and fixed tabulator stop near right end of shaft as shown in figure. Clearance should be between 0.070 and 0.090 inch.

(d) If clearance exceeds specified limits, loosen nut.

(e) Position eccentric to obtain specified clearance.

(f) Tighten nut.

(17) <u>Pawl Mounting Arm Operating Range (Final)</u>. Adjust pawl mounting arm operating range as follows:

(a) Refer to figure 6-276.

(b) Determine maximum limit of operating range as follows:

1. Set five tabulator stops as shown in figure.

2. Position pawl immediately to right of stop number 1.

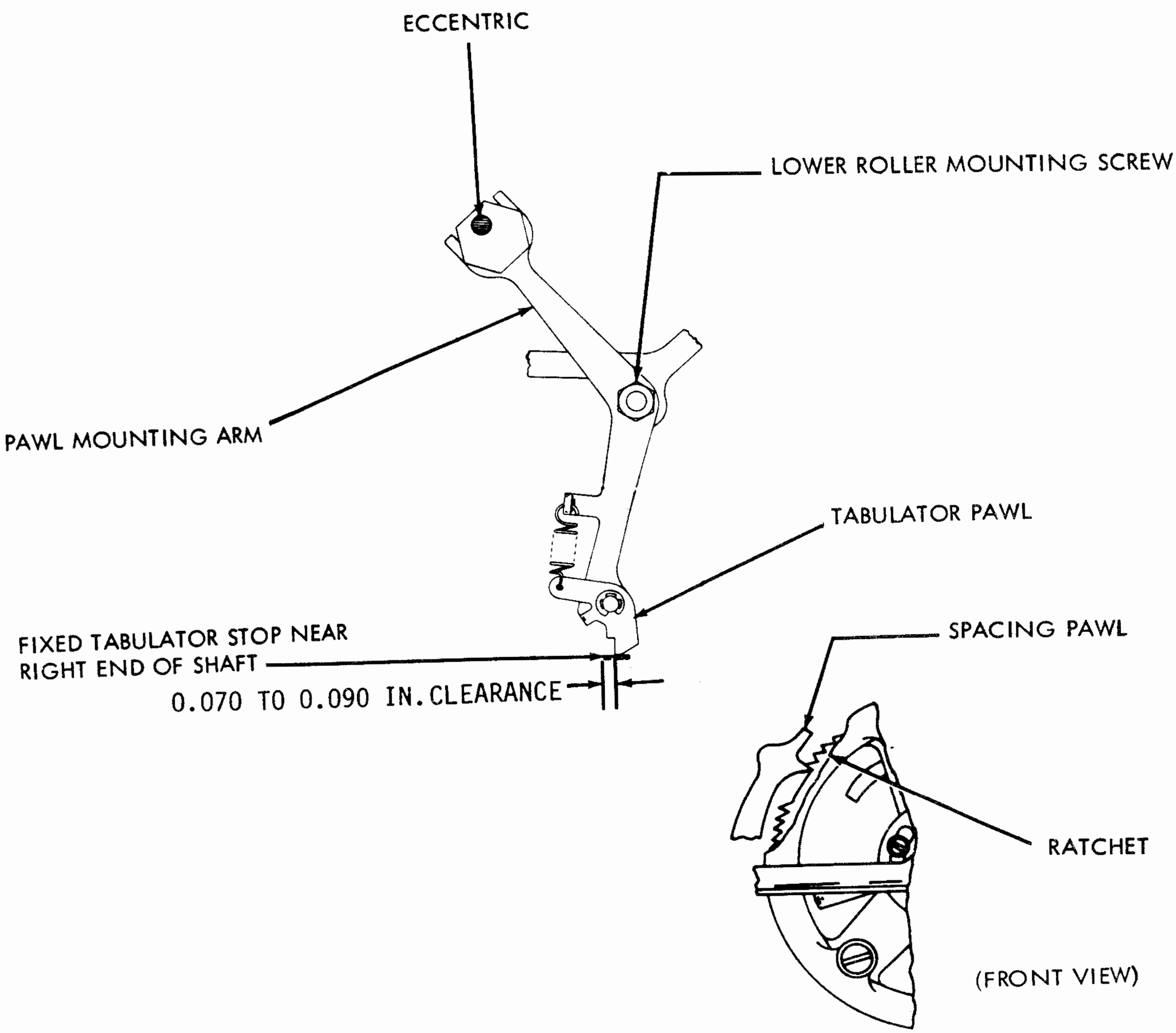



Figure 6-275. Pawl Mounting Arm Operating Range
(Preliminary)

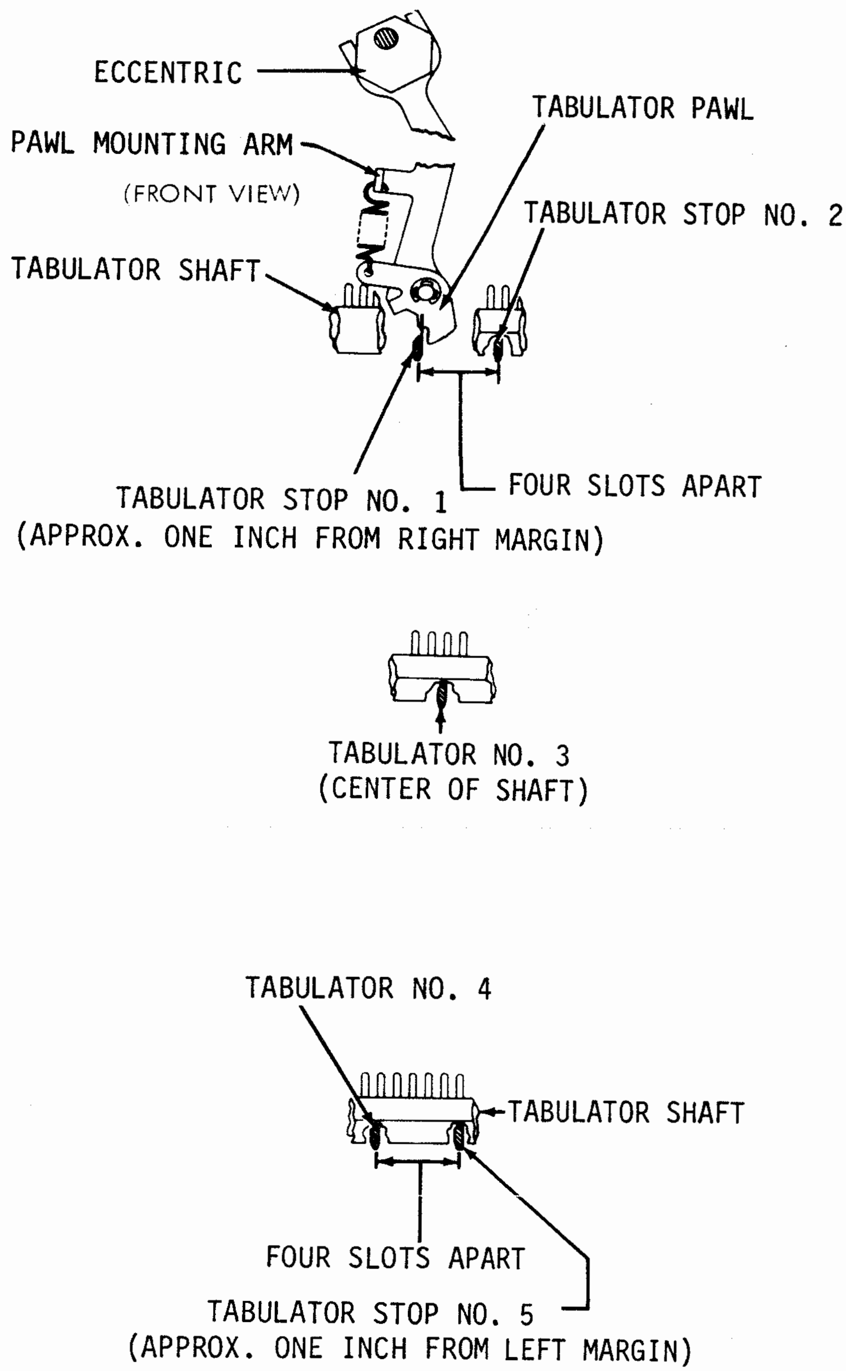



Figure 6-276. Pawl Mounting Arm Operating Range (Final), Columnar Tabulator Stops, and Tabulator Stop Setting-Right Margin Tabulator Stop

3. Position eccentric to set clearance at approximately 0.030 inch.

NOTE

Prior to this adjustment, Measure all clearances at stop number 1 with play taken up in carriage to minimize gap.

4. Mark column location by printing a character on paper.

5. Position pawl immediately to right of step number 2 and mark column location as in step 4 above.

6. Repeat step 5 for remaining three steps.

7. Gradually increase clearance until carriage stops one space before any column while receiving figures G letters X from transmitter distributor.

NOTE

If unit is not equipped with transmitter distributor control, put fill-in characters of letters or figures in tape to delay printing until carriage completes travel.

8. Decrease clearance until ten lines of tabulator operation can be made without error.

9. Gauge clearances and record values.

(c) Determine minimum limit of operating range as follows:

1. Place front feed pawl in farthest advanced position.

2. Repeat steps 1 and 2 in (b) above.

3. Gradually decrease clearance until carriage stops one space after any column.

4. Increase clearance until ten lines of tabular operation can be made without error.

5. Gauge clearances and record values.

(d) If adjustment is necessary, determine midpoint of range as follows:

1. If minimum limit is positive, add it to maximum limit and divide the sum by two. Use quotient as midpoint of range.

2. If minimum limit is zero or negative, use one-half the maximum limit as midpoint of range. The difference between limits is normally not less than 0.045 inch.

3. Tighten nut.

(18) <u>Columnar Tabulator Stops</u>. Adjust columnar tabulator stops as follows:

(a) Refer to figure 6-276.

(b) Place carriage in position to print first character to column.

(c) Insert stop in slot immediately to left of tabulator pawl.

(d) Store extra stops in slots beyond printing line of either end of shaft.

NOTE

When printing forms, check stop settings with relation to columns. Corresponding stops on all machines connected in the same circuit must be the same number of spacing operations from left margin.

(19) Tabulator Stop Setting-Right Margin Tabulator Stop (with Wide Shelf). Adjust right margin tabulator stop as follows:

NOTE

Prior to this adjustment, check the requirements in the following adjustments.

Right Margin 6-9.1a(12)

Pawl Mounting Arm Operating Range (Preliminary) 6-9.1a(16)

Pawl Mounting Arm Operating Range (Final) 6-9.1a(17)

(a) Refer to figure 6-276.

(b) Position printing carriage at right margin (spacing cutout operated).

(c) Insert stop with wide shelf in slot immediately to left of tabulator pawl.

b. Paper-Out Alarm Mechanism Adjustment.

(1) Bell Crank Follower. Adjust bell crank follower as follows:

(a) Refer to figure 6-277.

(b) Measure clearance between a flat side of paper spindle and bell crank follower. Clearance should be approximately 1/4 inch.

(c) To adjust, loosen mounting screws.

(d) Position switch to obtain specified clearance.

(e) Tighten mounting screws.

(2) Bell Crank Follower Spring. Adjust bell crank follower spring as follows:

(a) Refer to figure 6-277.

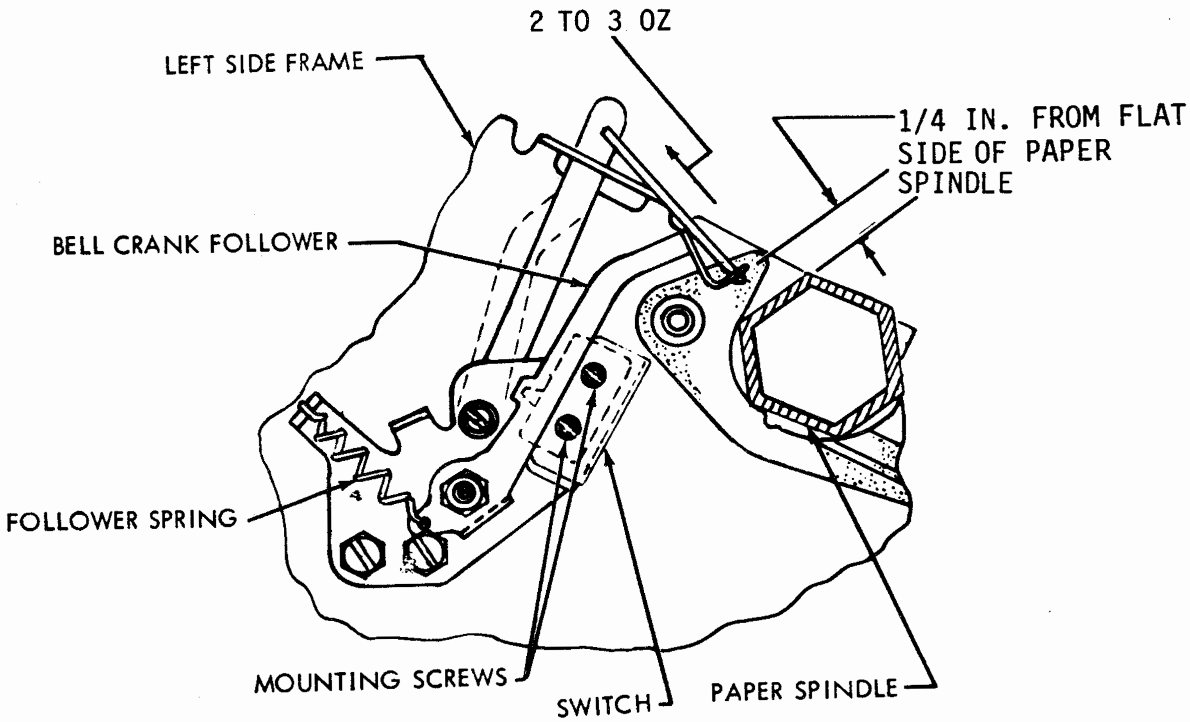
(b) Attach spring scale hook to bell crank follower at point of contact with paper roll.

(c) Force required to start bell crank moving should be between 2 and 3 ounces.

(d) If scale reading exceeds specified limits, install new spring.

6-10. KEYBOARD UNIT ADJUSTMENTS (EARLIER DESIGN VARIABLE FEATURES).

6-10.1 (There are no earlier design variable feature keyboard adjustments.)




(REAR LEFT VIEW)

Figure 6-277. Bell Crank Follower and Bell Crank Follower Spring

SECTION V - REPAIR

6-11. GENERAL. After a fault has been isolated to a specific mechanical function, and the trouble cannot be corrected by performing an adjustment, a defective mechanical part is indicated. Repair action will then consist of removal and replacement of the defective component.

6-12. DISASSEMBLY AND REASSEMBLY PROCEDURES. The following procedures are provided to enable the technician to disassemble the teletypewriter set to gain access to a defective component and to reassemble the set after a defective component has been replaced. The procedures are also provided to aid the technician when disassembly is required for inspection, cleaning, and lubrication.

a. Removing Cover. To remove cover (figure 7-57), proceed as follows:

(1) Depress plungers (198556) on both sides of dome.

(2) Open window door by lifting in rear.

(3) Disconnect copy light plug.

(4) Push latches on sides of cover toward rear and lift cover from base.

b. Removing Typing Unit. To remove typing unit, proceed as follows:

(1) Disconnect P103 from J103.

(2) Spread spring clips which hold R plug by pushing clips together at bottom; remove R plug from mounting unit.

(3) Remove four mounting screws which hold typing unit to base.

(4) Place left hand under rear of left frame and right hand under right side at front plate above dash pot; lift typing unit from base.

c. Removing Keyboard Transmitter. To remove keyboard transmitter, proceed as follows:

(1) Rotate LA plug clamp nut (low level only) counterclockwise and withdraw plug.

(2) Disconnect wires from P 2, P-4, K-1, S-4 (low-level only), and S-3.

(3) Remove screw which holds ground strap to base.

(4) Remove four screws which hold keyboard transmitter to pan.

(5) Retract reset lever H-bar and lift keyboard transmitter from pan.

d. Removing Distributor Mechanism. To remove distributor mechanism, proceed as follows (figures 7-47, 7-50, and 7-51):

(1) Remove four screws (151631) which hold distributor to base.

(2) Disconnect wires from P-6, P-5, H-1, H-2, H-3, and H-4.

(3) Remove two screws whcih hold L plug mounting bracket (low-level) to base.

(4) Rotate U plug clamp-nut (low-level only) counterclockwise and withdraw plug.

(5) Retract reset lever and lift distributor mechanism from base.

e. Removing Motor. To remove motor, proceed as follows (figure 7-55):

(1) Disconnect power leads from terminal block on gear shift assembly.

(2) Remove four screws which hold motor to base.

(3) Lift motor from base.

f. Removing Base from Pan. To remove base from pan, proceed as follows (figure 7-34 through 7-37).:

(1) Remove four shock mounting screws (99082).

(2) Loosen two set screws (107256) in speed selector knob and remove knob.

(3) Remove three cover guide screws.

(4) Remove ground strap screw from pan.

(5) Loosen two screws which hold power switch mounting bracket to pan and remove bracket.

(6) Lift base from pan.

(7) Remove all wiring clamps.

(8) On RO only, remove two screws from fuseholder mounting bracket (figure 7-36) and remove bracket.

(9) Remove wiring harness.

g. Removing Gear Assembly. To remove gear assembly, proceed as follows (figure 7-46):

(1) Remove retainer ring which holds shift link to speed selector shaft and disconnect link from shaft.

(2) Remove two screws which hold terminal block mounting bracket to gear shift assembly and remove bracket.

(3) Remove clamp nut from front adjusting screw.

(4) Remove two screws which hold gear assembly rear adjusting mechanism to base (access from bottom).

(5) Lift gear assembly from base.

h. Disassembling Gear Assembly. To disassemble gear assembly, proceed as follows (figure 7-46);

(1) Remove screw which holds distributor drive gear to shaft.

(2) Remove three screws which retain idler shaft right bearing.

(3) Remove screw which clamps idler gear to shaft.

(4) Remove bearing.

(5) Slide idler shaft out left side.

(6) Slide collar off shaft. Ensure pin and spring are retained.

(7) Remove three right bearing screws.

(8) Remove screw which holds variable-speed shaft gear to shaft.

(9) Slide variable-speed shaft out left side.

(10) Remove felts.

(11) Remove screw which holds assembly driven gear to assembly drive shaft.

i. Disassembling Motor Unit. To disassemble motor unit, proceed as follows (figure 7-56):

(1) Remove set screw which holds fan to shaft.

(2) Remove two screws which hold motor pinion to shaft and remove pinion.

(3) Loosen two resilient mount clamp screws and remove clamps.

(4) Lift motor from mount.

(5) Remove two nut-and-bolt sets which secure end shields to stator.

(6) Remove end shields, springs, and washers.

(7) Remove rotor from stator.

j. Disassembling Distributor Mechanism. To disassemble distributor mechanism, proceed as follows (figures 7-47 through 7-53):

(1) Remove screw (151659) which holds distributor shaft driven gear to shaft, and remove gear.

(2) Remove four screws from distributor drum cover plate (low-level only) and remove cover plate.

(3) Remove wires from H-1 and H-4.

(4) Remove three screws from photocell mounting bracket (low-level only) on left frame and remove mechanism.

(5) Remove two screws from clutch magnet bracket on right frame and remove bracket.

(6) Remove two screws, two washers, and two spacers from left bearing retainer.

(7) Remove screw from bearing retainer on right frame and remove retainer.

(8) Remove nut which holds left bearing to shaft and remove bearing.

(9) Remove screw from clutch drum.

(10) Slide shaft through right side of frame.

(11) Remove clutch and distributor drum.

(12) Disassemble clutch.

(13) Remove distributor shaft idler gear shaft by rotating clockwise.

CAUTION

Distributor shaft idler shaft has a left-hand thread.

k. Disassembling Keyboard Transmitter. To disassemble keyboard transmitter, proceed as follows (figure 7-40):

(1) Loosen Allen screw which holds power switch control knob (148157) to shaft.

(2) Remove nut (178839) which fastens power switch to top plate. Push switch out of top plate.

(3) Remove two retainer rings (119652) which hold top plate to side frames.

(4) Spread side frames and lift top plate.

(5) Unsolder three wires from fuseholder (116783).

(6) Remove retainers which hold wiring harness to top plate.

(7) Disconnect two photocell leads and withdraw cells.

l. Disassembling Typing Unit. The following paragraphs describe the procedure for disassembling the typing unit.

(1) Removing Paper. To remove paper, proceed as follows:

(a) Push paper release to rear.

(b) Push paper spindle holders to rear.

(c) Remove paper.

(2) Removing Ribbon. To remove ribbon, proceed as follows (figures 7-25 and 7-26):

(a) Move ribbon spool clips to upward position.

(b) Lift ribbon spools from machine.

(3) Removing Type Box. To remove type box, proceed as follows (figure 7-33):

(a) Trip type box latch to right.

(b) Lift right end of type box upwards approximately 45 degrees and pull toward right to disengage it from left-hand bearing stud.

(4) Disassembling Type Box. To disassemble the type box for replacing type pallet or spring, proceed as follows:

(a) Remove both screws and nuts that secure the front plate to the rear plate assembly. Separate the two plates.

(b) Remove the spring from the pallet by compressing it slightly and pulling the formed end out of the slot in the pallet.

NOTE

This spring should be discarded once it has been removed from its assembly.

(c) When installing the new spring, make certain that the formed end extends through the slot in the pallet.

(5) Disconnecting Type Box Carriage Link from Carriage. To disconnect type box link from carriage, proceed as follows (figure 7-11):

(a) Set up letters combination.

(b) Engage and rotate type box clutch 180 degrees.

(c) Move type box carriage to extreme right.

(d) Remove retainer ring from type box carriage link.

(6) Removing Front Plate. To remove front plate, proceed as follows (figures 7-16, 7-17 and 7-18):

(a) Remove two screws which hold main bail drive bracket to main rocker shaft.

(b) Remove screw which holds spacing shaft helical driven gear to spacing shaft and remove gear.

(c) Remove four screws (151723) which hold front plate assembly to left and right side frame and lift front plate.

(d) Set front plate aside to be disassembled later.

(7) Removing Code Bar Shift Bars. To remove code bar shift bars, proceed as follows (figure 7-29):

(a) Remove two screws (151152) from retaining plate and remove plate.

(b) Remove and discard three code bar shift bar springs (152257).

(c) Pull left end shift bars forward and work right end out of guide.

(8) Removing Code Bar Basket. To remove code bar basket, proceed as follows (figure 7-29):

(a) Remove four mounting screws which hold basket to righ and left side frames.

(b) Pull code bar basket forward and remove.

(9) Removing Selector Clutch and Cam Sleeve Assembly. To remove selector clutch and cam sleeve assembly, proceed as follows (figure 7-13):

(a) Remove selector clutch drum clamp screw (151642) and locknut (3598).

(b) Lock push lever reset bail in raised position by lifting and pushing in.

(c) Pull marking lock lever toward machine front.

(d) Insert straightened paper clip in hole forward of guide plate.

(e) Rotate clutch cam disk counterclockwise and pull gently outward, using caution to clear the following items:

Selector clutch stop arm

Selector clutch latch lever

Stop arm bail

Push lever reset bail

Trip shaft lever

CAUTION

Use no more force than necessary.

(f) Remove drum from clutch.

(10) Removing Selector Mechanism. To remove selector mechanism, proceed as follows (figures 7-20, 7-22, and 7-23):

(a) Remove four nuts and lock washers which hold J103 receptacle to its mount. (low-level only.)

(b) Unhook common transfer lever spring at spring basket.

(c) Remove four selector unit assembly back plate mounting screws and remove assembly.

(11) Removing Type Box Clutch. To remove type box clutch, proceed as follows (figure 7-12):

(a) Remove retainer plate.

(b) Withdraw type box clutch drive link.

(c) Remove and discard trip and latch lever springs.

(d) Remove screw which holds clutch drum to main shaft.

(e) Pull clutch cam disk gently outward.

(12) Removing Main Shaft. To remove main shaft, proceed as follows (figures 7-12 and 7-13):

(a) Set the typing unit upside down.

(b) Return the carriage to its left hand position.

(c) Remove the screw that secures the spacing shaft in the spacing collar.

(d) Remove the spacing shaft with gear.

(e) Remove the screw that secures the collar and the clamp to the right end of the main shaft.

(f) Remove the TP152573 main shaft right hand bearing retainer plate.

(g) Remove the TP150010 retainer plate at the TP150046 clutch bearing and remove the TP150244 link.

(h) Remove the two screws from the TP152537 main shaft left hand bearing clamp.

(i) Unhook the springs from the trip levers and latch levers associated with all clutches. Position the code bar clutch so that the low part of the clutch cam clears the spring arm on the cam follower. Unhook the code bar clutch cam follower spring.

(j) Remove the TP153300 function clutch arm by removing two screws and retainer ring if present.

(k) Unhook the spring from the TP153573 function bar reset bail.

(l) Move the main shaft assembly toward the left to disengage the code bar clutch and function clutch links from their connecting pins.

(m) Lift the left end of the shaft assembly out of the side frame. Position the shaft so that the function clutch link passes the suppression assembly bracket, then remove the shaft assembly from the typing unit.

(13) Disassembling Main Shaft. To disassemble main shaft, proceed as follows (figures 7-12 and 7-13):

NOTE

Disassembly of the main shaft and clutch assemblies can be accomplished by referring to the exploded views contained in the applicable parts location diagram. It should be noted that, when assembling clutches having cams and discs marked "0" for identification, the marked side of the parts should face away from the clutch side of the assembly. Function and code bar clutches should have their driving links assembled so that the longer end of the hub faces away from the clutch side of the assembly.

(a) Remove all clutch and gear mounting screws.

(b) Slide clutches and gears from main shaft.

(c) Remove drums from clutches.

(14) Removing B-Plug Mounting Bracket, Signal Bell, and Signal Bell Contacts. To remove B-plug mounting bracket, signal bell and signal bell contacts, proceed as follows (figures 7-3, 7-21 and 7-24):

(a) Remove two screws from signal bell contacts.

(b) Remove contact assembly.

(c) Remove two screws from signal bell mount.

(d) Remove signal bell mount.

(e) Remove two screws from B-plug receptacle mounting bracket and remove bracket.

(f) Remove two screws which hold copy light transformer (low-level only) to left frame and remove transformer. Transformer is mounted in cover on high level equipment.

(15) Removing Stunt Box. To remove the stunt box, proceed as follows (figures 7-31 and 7-32):

(a) Remove the TP151627 rear tie bar from the typing unit side frames.

(b) Remove the line feed function pawl stripper from the stripper blade.

(c) Remove the single-double line feed lever screw and disengage the lever from the notch in the stripper blade.

(d) The stripper blade is either removed or disengaged from the typing unit, depending on the design.

1. For earlier design: hold the stripper blade toward the right side of the typing unit and unhook the stripper blade left hand arm from the blade. Pull the stripper blade toward the left side of the typing unit to disengage the stripper blade from the right hand arm. Remove the stripper blade from the typing unit.

2. For later design: loosen the screw and remove the retaining ring from the TP153291 camshaft drive arm. Slide the drive arm out of engagement with the stripper blade drive arm.

3. Remove the screws which secure the stunt box assembly in the typing unit.

4. Lift the stunt box assembly upward to disengage it from its locating brackets and pull toward the rear to disengage all code bar forks from the code bars. Remove, if present, the contact assembly and cable clamp from the stunt box. Remove the stunt box.

(16) Removing Platen (Friction Feed). To remove platen (friction feed) proceed as follows (figure 7-9):

(a) Remove the line feed spur gear.

(b) Remove the TP150719 and TP150720 platen bearing retainers.

(c) Remove the TP152832 paper straghtener shaft.

(d) Hold off the detent and lift the platen out of the side frame.

(e) Insert the TP153673 shaft tool into the hub and fasten it with the TP151346 screw. Remove the TP157286 clamp and TP153699 cam from the assembly.

(f) Insert the hub into the TP153797 retaining tool.

NOTE

These tools must be used when disassembling the TP153700 platen hub in order to hold the spring loaded pins in place when the feed cam is replaced.

(17) Removing Code Bar Positioning Mechanism. To remove code bar positioning mechanism, proceed as follows (figure 7-19):

(a) Loosen clamp screw on shift lever drive arm.

(b) Remove two screws which hold mechanism and remove mechanism.

(18) Removing Left and Right Ribbon Feeding Mechanisms. To remove left and right ribbon feeding mechanisms, proceed as follows (figures 7-25 and 7-26):

(a) Remove retainer ring from mounting shaft.

(b) Remove lower retainer ring from drive link.

(c) Remove ribbon ratchet lever spring.

(d) Slide ribbon feed mechanism off shaft.

(e) Repeat steps (a) through (d) on remaining mechanism.

(19) Removing Trip Shaft. To remove trip shaft, proceed as follows (figure 7-14):

(a) Remove retainer ring which holds type box clutch latch lever on shaft.

(b) Loosen clamp screw from type box clutch trip arm.

(c) Remove trip lever, latch lever, and trip arm.

(d) Loosen three sets of collar clamp screws.

(e) Loosen three sets of collar clamp screws.

(f) Loosen function clutch trip lever clamp screw.

(g) Remove clamp nut from code bar clutch follower arm.

(h) Remove follower arm.

(i) Pull trip shaft to left and remove.

(20) Removing Vertical Positioning Levers and Type Box Carriage Track. To remove vertical positioning levers and type box carriage track, proceed as follows (figure 7-11):

(a) Slide type box carriage off track.

(b) Remove four nuts and screws which hold type box carriage track to vertical positioning levers and remove track.

(c) Remove three nuts and guide screws from each lever.

(d) Remove and discard one vertical positioning lever spring from each lever.

(e) Disconnect levers from main side levers.

(f) Remove vertical positioning levers.

CAUTION

Do not use excessive force.

(g) Check levers for excessive play. If either lever is loose, replace both levers.

(21) Removing Main Rocker Shaft. To remove main rocker shaft, proceed as follows (figures 7-10 and 7-11):

(a) Remove retainer ring from left main rocker shaft and remove bracket.

(b) Remove mounting screws from right main rocker shaft bracket.

(c) Remove two screws from left bearing retainer and remove retainer.

(d) Pull shaft out to left.

CAUTION

Right bearing contains needle bearings which may fall out.

(e) Remove two screws from right bearing and remove bearing.

(22) Removing Spacing Suppression Mechanism. To remove spacing suppression mechanism, proceed as follows (figure 7-5):

(a) Remove screw (151657) from right end of shaft.

(b) Remove screw (151692) which holds bracket to crossbar.

(c) Work mechanism out gently.

CAUTION

Do not use excessive force.

(d) Use diagonal wire cutters to remove all felt washers from mechanism. Discard felt washers.

(23) Removing and Disassembling Code Bar Clutch Trip Shaft. To remove and disassemble code bar clutch trip shaft, proceed as follows (figure 7-14):

(a) Remove retainer ring from left end of shaft.

(b) Loosen code bar clutch trip lever clamp screw.

(c) Slide shaft out to right.

(24) Disassembling Selector Mechanism. To disassemble selector mechanism, proceed as follows (figures 7-20 through 7-24):

(a) Remove two mounting screws and two nuts from range finder.

(b) Lift off range finder.

(c) Remove range finder knob clamp nut.

(d) Remove knob, detent, and spring.

(e) Remove retainer ring from stop arm bail shaft.

(f) Remove shaft.

(g) Remove two retainer rings from rack.

(h) Remove rack.

(i) Remove two retainer rings, leaf springs, and four flat washers holding dust cover over magnets.

(j) Remove cover.

(25) Disassembling Front Plate. To disassemble front plate, proceed as follows (figures 7-15, 7-16, 7-17, and 7-18):

(a) Loosen clamp screws which hold printing carriage to upper draw-wire rope.

(b) Move carriage to left extremity, and disengage it from its track and draw-wire rope.

(c) Loosen carriage return spring drum lock nut 1-1/2 turns.

(d) Operate ratchet escapement lever to

unwind carriage return spring drum spring until all tension is released.

(e) Unhook tension roller spring.

(f) Unhook transfer slide spring.

(g) Remove screw which holds upper draw-wire rope to spacing drum.

(h) Loosen clamp screw which holds upper draw-wire rope to carriage return spring drum.

(i) Loosen rear clamp screw on oscillating rail slide.

(j) Remove front clamp screw on oscillating rail slide.

(k) Remove upper draw-wire rope.

(l) Remove screw on spacing drum securing lower draw-wire.

(m) Remove screw on carriage return spring drum which secures lower draw wire rope.

(n) Remove lower draw-wire rope.

(o) Remove tension pulley shaft mounting screw (on back).

(p) Remove pulley bracket and shaft.

(q) Remove two mounting screws from printing track and remove printing track.

(r) Remove one mounting screw from each front upper draw-wire roller and remove rollers.

(s) Remove spacing drum clamp nut.

(t) Remove carriage return spring drum clamp nut.

(u) Lift off plate (150554).

(v) Remove three dashpot mounting screws (on back).

(w) Slide dashpot off transfer slide.

(x) Remove carriage return latch bail spring.

(y) Remove nut which screws transfer slide mounting post to front plate (on back).

(z) Remove transfer slide and spacer post.

(aa) Unhook two feed pawl springs.

(ab) Remove set screw from feed pawl eccentric.

(ac) Remove spacing shaft from rear.

(ad) Remove feed pawls.

(ae) Lift off spacing drum.

(af) Lift off carriage return spring drum.

(ag) Remove horizontal positioning lock lever spring.

(ah) Remove six printing carriage track mounting screws.

(ai) Lift and disengage printing carriage track from horizontal positioning lock lever.

(aj) Remove retainer ring which holds horizontal positioning lock lever.

(ak) Remove lock lever.

(al) Remove two oscillating rail shift link springs.

(am) Remove two guide arm clamp screws (on back).

(an) Remove two retainer rings from oscillating rail shift links (on back).

(ao) Lift off oscillating rail and guides.

(ap) Unhook two shift slide drive link springs.

(aq) Remove two plate mounting nuts from plate (153335) and remove plate.

(ar) Remove four shift slide drive link retainer rings (two on each link).

(as) Lift off links.

(at) Remove four screws from reversing slide mounting brackets.

(au) Remove brackets, reversing slide, and oscillating rail shift slide.

(av) Remove two top retainer rings from main bail drive links.

(aw) Remove main bail.

(ax) Remove two nuts from shift link breaker slide posts.

(ay) Lift off shift slide and breaker slides.

(az) Remove two connecting strip mounting screws and lift off strip.

(ba) Remove two bearing stud mounting screws and lift off studs.

(bb) Use diagonal wire cutters to remove remaining felt washers.

(26) <u>Disassembling Stunt Box</u>. To disassemble stunt box, proceed as follows (figures 7-31 and 7-32):

(a) Remove two retainer rings from stripper blade cam shaft.

(b) Remove two screws from stripper blade cams.

(c) Remove screw from stripper blade cam shaft drive arm.

(d) Slide shaft out through stunt box side frame.

(27) <u>Disassembling Code Bar Detent Mechanism</u>. To disassemble code bar detent mechanism, proceed as follows (figure 7-29):

(a) Remove two screws from front code bar detent plate.

(b) Remove plate and suppression code bar latch.

(c) Note all holes in detent have springs and balls (except top outside and bottom inside).

(d) Remove detent springs and balls.

(e) Remove two screws from rear code bar detent plate.

(f) Remove plate.

(g) Note all holes in detent have springs and balls (except top outside and bottom inside).

(h) Remove seven springs and balls.

m. Reassembling Gear Assembly. To reassemble gear assembly, proceed as follows (figure 7-46):

(1) Pack bearings.

(2) Position assembly driven gear; secure with lock washer and screw.

(3) Slide variable speed shaft in from left while mounting gears, felts, spacers, and bearings; secure with three flat washers, lock washers, and screws.

(4) Secure variable speed shaft gear to shaft with flat washer, lock washer, and screw.

(5) Position pin, spring, key, and collar on variable speed shaft.

(6) Install idler shaft from left side while mounting idler gear.

(7) Secure gear to idler shaft with lock washer end screw.

(8) Install right bearing and secure with three retaining mechanisms.

(9) Install distributor drive gear secure with lock washer and screw.

n. Mounting Gear Assembly on Base. To mount gear assembly on base, proceed as follows (figure 7-46):

(1) Position gear assembly on three adjusting mechanisms; secure with one flat washer, three lock washers, and three nuts.

(2) Connect shift link to speed selector shaft and secure with retainer ring.

o. Mounting Base on Pan. To mount base on pan, proceed as follows:

(1) Position base on pan; secure with four lock washers and screws.

(2) Install five pan mounting bolts (for shipping).

(3) Position ground on pan, secure with lock washer and screw.

(4) Replace three cover guide screws and rollers.

(5) Position speed selector knob and secure with two set screws.

(6) Grease and lubricate local carriage return and line feed mechanisms.

p. Reassembling Type Box. To reassemble type box after replacing type pallet or spring, proceed as follows:

(1) Line up the front plate with the rear plate assembly and draw the two plates together until the head of the pallet leaves the rear plate by approximately 1.16 inch.

NOTE

This may be accomplished by using two 6-40 screws (at least 11/32 inch long) and nuts in place of the two screws and nuts removed when disassembling, and tighten them only enough to hold the the pallets as specified above. Do not clamp the plates together until all pallets have been moved into their correct position.

(2) Manipulate the pallets until they fall into their respective openings in the front plate. Press the plates together.

(3) Replace the screw and nuts used in Note with screws and nuts removed in disassembly procedures (paragraph 6-121(4)).

q. Reassembling Motor Unit. To reassemble motor unit, proceed as follows:

(1) Replace two bearings on rotor shaft.

(2) Replace stator on rotor.

(3) Replace end shields, springs, and washer.

(4) Secure end shields to stator with two nuts and two bolts.

(5) Place motor on mounts.

(6) Replace clamps.

(7) Replace two resilient mount clamp screws.

(8) Replace two screws which hold motor pinion to shaft.

(9) Replace fan on shaft.

(10) Replace set screw which holds fan to shaft.

(11) Remove two screws which hold relay clamp to its bracket; lift clamp and relay off.

(12) Remove screw which holds relay cover to relay, and lift cover off.

(13) Inspect relay for cleanliness and burned contacts.

(14) Replace cover on relay, secure with lock washer and screw.

(15) Position relay and clamp, secure with two lock washers and two screws.

r. Mounting Motor on Base. To mount motor on base, proceed as follows:

(1) Position motor; secure with four lock washers and four screws.

(2) Mount typing unit on base.

(3) Adjust gear assembly backlash as described in paragraph 6-4.1c(5).

(4) Remove typing unit.

s. <u>Reassembling Distributor Mechanism</u>. To reassemble distributor mechanism, proceed as follows:

(1) Lubricate and reassemble clutch.

(2) Replace felt and two springs.

(3) Clean and unpack bearings.

(4) Position clutch and distributor drum.

(5) Insert shaft from right side.

(6) Replace spacer collar on left end of shaft.

(7) Replace left bearing on shaft and secure with lock washer and nut.

(8) Position clutch drum and secure with lock washer and screw.

(9) Secure left bearing with two retaining assemblies.

(10) Position right bearing retainer and secure with lock washer and screw.

(11) Position clutch magnet bracket, secure with flat washer, two lock washers, and two screws.

(12) Position distributor shaft driven gear, secure with lock washer and screw.

(13) Position photocell and mounting bracket; secure with three lock washers and screws.

(14) Route and connect two photocell wires as follows:

Black wire to H-4
White wire to H-1

(15) Position cover plate over distributor drum; secure to side frames with flat washer, four lock washers, and four screws. Use left rear screw to hold wire clamp.

(16) Position distributor shaft idler gear on its shaft.

NOTE

Shaft has left-hand thread. Secure shaft to right side frame by screwing in counter-clockwise direction.

(17) Perform the following adjustment:

(a) Adjust clutch drum as described in paragraph 6-4.2n(1) (low-level only).

(b) Adjust clutch shoe lever as described in paragraph 6-4.1b(5), low-level - 6-4.2b(2).

(c) Adjust trip lever as described in paragraph 6-4.1b(2) (low-level - 6-4.2b(3)).

(d) Adjust magnet plate as described in paragraph 6-4.2b(4) (low-level only).

t. Mounting Distributor on Base. To mount distributor on base, proceed as follows:

(1) Position distributor mechanism on base.

(2) Connect UA plug and tighten clamp.

(3) Position circuit card mounting bracket and L plug mounting bracket and secure with two screws. Position L plug.

(4) Connect wires to terminal blocks H and P in accordance with applicable wiring diagram provided in Chapter 5.

(5) Adjust distributor gear backlash as described in paragraph 6-4.1c(5).

(6) Secure mounting bracket to base with four flat washers, four lock washers, and four screws.

u. Reassembling Keyboard Transmitter. To reassemble keyboard transmitter, proceed as follows:

(1) Position photocells. Plug in two leads.

(2) Position REPT key and its spring.

(3) Position wiring harness on top plate, secure with retainers.

(4) Solder three wires to fuseholder as shown in figure 5-8, Wiring Diagram.

(5) Position top plate, push side frames in, and secure with two retainer rings.

(6) Position power switch on top plate and secure with nut.

(7) Tighten Allen screw which holds power switch control knob on shaft.

v. Mounting Keyboard Transmitter. To mount keyboard transmitter, proceed as follows:

(1) Position keyboard transmitter on pan and secure with four screws.

(2) Position ground strap on base and secure with screws.

(3) Connect wires to terminal blocks S, K, and P in accordance with Applicable wiring diagram provided in Chapter 5.

(4) Connect L plug to LA plug.

(5) Adjust reset lever clearance as described in paragraph 6-4.2b(6), (low-level only).

(6) Adjust latch bail clearance as described in paragraph 6-4.2b(7), (low-level only).

w. Reassembling Typing Unit. The following paragraphs describe the procedure for reassembling the typing unit.

(1) Replacing Felts and Parts Attached to Side Plates. To replace eleven felts in side plates and parts still attached to side plates, proceed as follows (figures 7-1 and 7-2):

(a) Remove lock nut from stud which holds follower arm to function rocker shaft.

(b) Remove stud.

(c) Remove lock nut from one rocker shaft bushing.

(d) Unscrew bushing until rocker shaft can be removed.

(e) Remove retainer ring which holds follower arm to roller.

(f) Remove follower arm.

(g) Remove retainer ring which holds roller guide arm to bracket.

(h) Remove guide arm.

(i) Install new felt washers while reassembling by reversing procedures in steps (1) through (8).

(j) Remove screws holding each pivot shaft in reset bail pivot studs.

(k) Push shafts back into studs.

(l) Install felt washers.

(m) Push shafts back into place.

(n) Replace screws.

(o) Remove lock nut from shoulder screw which holds left side of spacing suppression bail.

(p) Remove screw, install felt, and replace screw.

(q) Replace lock washer and nut.

(r) Remove lock nut from guide post on right side of spacing suppression bail.

(s) Remove guide post, install felt, and replace post.

(t) Replace lock washer and nut.

(u) Remove retainer rings from rear of each main side lever.

(v) Pull rear of lever out.

(w) Install two felts, reposition, and secure with retainer rings.

(2) Replacing Eight Felts on Space Suppression Mechanism. To replace eight felts on space suppression mechanism, proceed as follows (figure 7-5):

(a) Remove retainer ring which holds carriage return bail on shaft.

(b) Install felts; replace bail and retainer ring.

(c) Remove spacing cutout transfer bail spring.

(d) Remove spacing cutout bail spring.

(e) Remove retainer ring which holds spacing cutout transfer bail.

(f) Loosen clamp screws in set collar.

(g) Remove transfer bail, install two felts, and replace transfer bail.

(h) Position set collar and tighten screw.

(i) Replace retainer ring.

(j) Remove retainer ring which holds spacing cut-out bail on shaft.

(k) Remove bail, install felt, and replace bail. Ensure top of bail is to rear of tab on spacing suppression slide.

(l) Replace retainer ring.

(m) Replace two bail springs.

(n) Remove spacing trip lever bail spring.

(o) Remove retainer ring which holds spacing trip lever to bail.

(p) Remove trip lever from bail, install felt, replace lever on bail, and replace retainer ring.

(q) Remove retainer ring which holds spacing trip lever to bail shaft.

(r) Remover lever; install felt; replace lever and retainer ring.

(s) Replace bail springs.

(t) Install felt on front of plate.

(3) <u>Installing Space Suppression Mechanism on Typing Unit</u>. To install space suppression mechanism on typing unit, proceed as follows (figure 7-5):

CAUTION

Do not use excessive force when positioning space suppression mechanism on crossbar.

(a) Gently position space suppression mechanism on crossbar. Ensure carriage return bail is in slot in slide arm and spacing suppression bail is on bracket.

(b) Secure bracket to crossbar with screw and lock washer.

(c) Secure right end of shaft to side frame with screw and lock washer.

(4) <u>Installing Code Bar Clutch Trip Shaft</u>. To install code bar clutch trip shaft, proceed as follows (figure 7-14):

(a) Insert shaft through bushing in right side frame.

(b) Mount parts on shaft.

(c) Secure with retainer ring.

(5) <u>Installing Trip Shaft Mechanism</u>. To install trip shaft mechanism, proceed as follows (figure 7-14):

(a) Push shaft through bushing on left side frame while mounting parts between bushing and right shaft mounting bracket. Ensure line feed function stripper bail arm is above shaft.

(b) Mount code bar clutch cam follower arm on right end of shaft, secure with flat washer, lock washer, and locknut.

(c) Position and secure set collars.

(d) Install parts on left end of shaft and secure with retainer ring.

(6) <u>Reassembling Main Shaft</u>. To reassemble main shaft, proceed as follows (figures 7-12 and 7-13):

NOTE

Prior to mounting any clutch on main shaft, perform the following:

1. Replace all springs and felts.
2. Inspect clutch drums, shoe levers, clutch shoes, bearings and cams, gear or eccentric assemblies, and replace as necessary.
3. Grease and lubricate all clutches during assembly.
4. Clutches having cams and disks marked 0 for identification should have marked side of parts face away from the clutch side of assembly.
5. Check clutch shoe spring adjustment as described in paragraph 6-3.1d(3) and clutch shoe lever spring adjustment as described in paragraph 6-3.1d(2).
6. While mounting each clutch (except selector clutch) on main shaft, perform clutch drum end play adjustment as described in paragraph 6-3.1d(1).

(a) Pack left bearing.

(b) Position left bearing on shaft; secure with screw and lock washer.

(c) Mount line feed clutch drum on clutch.

(d) Lubricate fiber gear.

(e) Position clutch on shaft from right end; secure with screw and lock washer.

(f) Position time delay mechanism drive cam on shaft from right end; secure with screw and lock washer.

(g) Position main shaft drive gear on shaft from right end; secure with three screws and lock washers.

(h) Position collar on shaft from right end; secure with screw and lock washer.

(i) Remove two screws which hold spacing gear to clutch cam disk.

(j) Remove gear and check for wear.

(k) Replace gear, secure with two lock washers and two screws.

(l) Lubricate fiber gear.

(m) Mount spacing clutch drum on clutch.

(n) Position clutch on shaft from right end; secure with screw and lock washer.

(o) Place spacer (153323) on main shaft from right end.

(p) Check function clutch eccentric and its follower for wear; replace as necessary.

(q) Mount function clutch drum on clutch.

(r) Position clutch on shaft from right end; secure with screw and lock washer.

(s) Check code bar clutch eccentric and its follower for wear; replace as necessary.

(t) Mount code bar clutch drum on clutch.

(u) Position clutch on shaft from right end; secure with screw and lock washer.

(v) Pack right bearing.

(w) Position bearing on shaft from right end.

(x) Position driving link on function clutch eccentric, secure friction tight with two flat washers, two lock washers, and two screws.

(7) <u>Installing Main Shaft</u>. To install main shaft, proceed as follows (figures 7-12 and 7-13):

(a) Rotate function rocker shaft top to rear. Ensure all clutch trip and latch levers are to rear.

(b) Insert main shaft with right bearing slightly to left of right side frame and left bearing slightly to left side of left side frame.

(c) Align bearings with their holes in side frames. Position high part of function clutch eccentric follower towards bottom of unit.

(d) Slide main shaft to right to its proper position.

<u>CAUTION</u>

Do not use excessive force. Ensure that code bar clutch eccentric follower seats properly on its stud.

(e) Install right bearing retainer; secure with screw and lock washer.

(f) Install left bearing retainer; secure with two screws and two lock washers.

(g) Install two function reset bail springs.

(h) Position right bearing retainer; secure with screw and lock washer.

(8) <u>Installing Vertical Positioning Levers and Type Box Carriage Track</u>. To install vertical positioning levers and type box carriage track, proceed as follows (figures 7-10 and 7-11):

(a) Position levers; secure each with one retainer ring, two guide mechanisms, three lock washers, and three screws.

NOTE

Ensure wider spacers are on right side.

(b) Position type box carriage track; secure with four screws and nuts.

(9) Reassembling Code Bar Detent Mechanism. To reassemble code bar detent mechanism, proceed as follows (figure 7-29):

(a) Replace seven balls and seven springs in holes in rear of detent mechanism (top outside and bottom inside holes should be empty).

(b) Lubricate each spring with one drop of oil.

(c) Replace and secure retaining plate with two screws and two lock washers.

(d) Repeat steps (a) through (i) on front detent mechanism.

(e) Lubricate code bar basket.

(10) Installing Code Bar Basket. To install code bar basket, proceed as follows (figure 7-29):

(a) Position basket between side frames.

(b) Secure with four mounting screws and four lock washers.

(11) Installing Main Rocker Shaft. To install main rocker shaft, proceed as follows (figures 7-10 and 7-11):

(a) Pack both bearings.

(b) Slide right end of main rocker shaft through left side frame.

(c) Install right bearing on shaft.

(d) Position shaft.

(e) Install left bearing.

(f) Secure right bearing with two lock washers and two screws.

(g) Position three left bearing retainers; secure with two lock washers and two screws.

(h) Position right rocker shaft bracket; secure with two flat washers, two lock washers, and two screws.

(i) Position left rocker shaft bracket, secure with two flat washers, two lock washers, two screws, and one retainer ring.

(j) Install vertical positioning lever springs.

(12) Installing Type Box Clutch. To install type box clutch, proceed as follows (figure 7-12):

(a) Mount clutch drum on clutch.

(b) Mount clutch on main shaft.

(c) Install type box clutch drive link.

(d) Position and secure retainer plate with lock washer and screws.

(13) Installing Ribbon Feed Mechanism. To install ribbon feed mechanism, proceed as follows (figures 7-25 and 7-26):

(a) Remove two retainer rings from bottom of ribbon spool shaft, to disassemble mechanism.

(b) Replace felt.

(c) Install 42661 Spring.

(d) Remove retainer ring from ribbon guide roller.

(e) Remove roller,, clean shaft, install roller and secure with retainer ring. Replace felt on ribbon drive link lower mounting post on main side lever and mount inner retainer ring.

(f) Slide ribbon feed mechanism on shaft. At the same time ensure ratchet lever is in proper engagement with detent lever, install two felt washers on shaft, and ensure bottom of ribbon drive link engages mounting post on main side lever.

(g) Secure feed mechanism with retainer ring.

(h) Secure drive link with retainer ring.

(i) Install ratchet feed lever spring.

(j) Repeat steps (a) through (i) on remaining feed mechanism.

(14) Installing Code Bar Positioning Mechanism. To install code bar positioning mechanism, proceed as follows (figure 7-19):

(a) Install two main side lever follower arm springs.

(b) Grease and lubricate positioning mechanism.

(c) Position mechanism; secure with two lock washers and two screws.

(d) Connect shift lever link to shift lever drive arm and secure with retainer ring.

(15) Installing Code Bar Shift Bars. To install code bar shift bars, proceed as follows (figure 7-29):

(a) Place right end of bars in guides and engage left end with code bars.

(b) Install three springs with long ends attached to code bar shift bars.

(c) Position retaining plate; secure with two lock washers and two screws.

(16) Reassembling Selector Mechanism. To reassembly selector mechanism, proceed as follows: (figures 7-20, 7-22, and 7-23):

NOTE

Visually inspect selector, marking and spacing lock levers, armature and associated springs for excessive wear. If excessive wear is apparent, replace the worn part.

(a) Check armature down stop bracket as described in paragraph 6-3.1g(12). perform procedure described in paragraph 6-

(b) Position dust cover, secure with four flat washers, two spring washers, and two retainer rings.

(c) Position rack on range finder; secure with four flat washers, two spring washers, and two retainer rings.

(d) Position stop arm bail mechanism; secure with retainer ring.

(e) Mount range finder knob, spring, and detent; secure with lock washer and nut.

(f) Position range finder mechanism on selector mechanism; secure with three lock washers, one flat washer, two screws, and one nut.

(g) Install range finder knob.

(h) Perform range finder knob phasing adjustment described in paragraph 6-3.1g(6).

(17) Installing Selector Mechanism. To install selector mechanism, proceed as follows (figures 7-20, 7-22, and 7-23):

(a) Position selector mechanism on right side frame; secure friction tight with one flat washer, three lock washers, and three screws.

(b) Position wick holder; secure with flat washer, lock washer, and screw.

(c) Install wick in holder.

(d) Securely tighten screws left friction tight in step (a).

(e) Connect common transfer lever spring to spring bracket.

(18) Installing Selector Clutch and Cam Sleeve Assembly. To install selector clutch and cam sleeve assembly, proceed as follows (figure 7-13):

(a) Mount clutch drum on clutch.

(b) Position cam assembly on main shaft by rotating counterclockwise, pushing gently inward, using caution to clear the following items:

Selector clutch stop arm
Selector clutch latch lever
Stop arm bail
Push lever reset bail
Code bar clutch trip shaft lever.

(c) Ensure clutch drum is aligned with main shaft to prevent its becoming disengaged from clutch.

(d) Perform selector clutch drum end play adjustment as described in paragraph 6-3.1g(17).

(e) Secure drum to main shaft with screw, nut, and two lock washers.

(f) Release marking lock lever.

(g) Release push lever reset bail.

(19) Installing Control Springs for Main Shaft. To install control springs for main shaft, proceed as follows (figure 7-13):

(a) Install code bar clutch cam follower arm spring.

(b) Install code bar clutch trip shaft lever spring.

(c) Install clutch trip, stop, and latch lever springs.

(20) Performing Typing Unit Adjustments. Perform typing unit adjustments described in the following paragraphs:

(a) Selector Clutch Stop Arm, 6-3.1g(7).

(b) Armature Extension and Spacing Locklever, 6-3.2c, (low-level only).

(c) Code Bar Clutch Trip Lever, 6-3.1d(5).

(d) Function Cltuch Trip Lever, 6-3.1d(13), (variable feature - 6-5b(4).

(e) Spacing Clutch Trip Lever, 6-3.1d(10), (earlier design - 6-7.1d(4).

(f) Clutch Trip Shaft Set Collars, 6-3.1d(11), (earlier design - 6-7.1d(2).

(g) Line Feed Clutch Trip Lever Eccentric Post, 6-3.1d(15)

(h) Line Feed Clutch Trip Lever Adjsuting Screw, 6-3.1d(16)

(i) Type Box Clutch Trip Lever Eccentric Post, 6-3.1d(14)

(j) Type Box Clutch Trip Lever, 6-3.1d(8), (variable feature - 6-5c(4).

(k) Line Feed Clutch Phasing, 6-3.1c(8).

(l) Clutch Shoe Levers, 6-3.1d(7)

(21) Reassembling Cover Unit Components. To install component (B-plug receptacle, printer connector mounting bracket, signal bell mounting bracket, and copy light transformer), proceed as follows (figure 7-39):

(a) Position B-Plug Receptacle; secure with two flat washers, two lock washers and two screws.

(b) Position signal bell mounting bracket; secure with two flat washers, two lock washers, and two screws.

(c) Position printer connector mounting bracket; secure with two lock washers and two screws.

(d) Position terminal end of ground strap; secure with screw, flat washer, lock washer, and nut.

(e) Position copy light transformer, secure with two flat washers, two lock washers and two screws.

(22) Installing Platen. To install platen, proceed as follows (figure 7-6):

(a) Hold detent up and position platen in side frames.

(b) Install paper guides and shaft.

(c) Position right retainer; secure with one spacer, one flat washer, two lock washers, and two set screws.

(d) Position left retainer; secure with two lock washers and two screws.

(e) Install paper guide spring.

(f) Position platen spur gear on shaft; secure with lock washer and screw.

(23) Reassembling Stunt Box. To reassemble stunt box, proceed as follows (figures 7-31 and 7-32):

(a) Slide shaft through stunt box side frames while mounting parts on shaft.

(b) Secure shaft and stripper blade cams with two screws and two lock washers.

(c) Position three felt washers around each cam; secure with retainer rings.

(d) Lubricate stunt box.

(24) Installing Signal Bell Contacts on Stunt Box. To install signal bell contacts on stunt box proceed as follows (figures 7-31 and 7-32):

(a) Assemble contact mechanism.

(b) Position contact mechanism over slot 28 in function box, secure with two flat washers, two lock washers, and two screws.

(25) Installing Stunt Box. To install stunt box, proceed as follows (figures 7-31 and 7-32):

(a) Using guides, slide stunt box into rear of typing unit.

(b) Apply slight pressure to ensure proper seating.

(c) Strip off all function pawls.

(d) Ensure carriage return and line feed slide arms are free.

(e) Ensure stripper bail is in slot of line feed function pawl stripper.

(f) Secure stunt box with two screws and two lock washers.

(g) Position cam shaft driving arm in engagement with driving link, secure with retainer ring, lock washer and screw.

(26) Reassembling Front Plate. To reassemble front plate, proceed as follows (figures 7-15, 7-16, 7-17, and 7-18):

(a) Unhook code bar bell crank springs.

(b) Remove retainer ring and bell cranks.

(c) Install new felt.

(d) Replace bell cranks; secure with retainer ring.

(e) Connect springs.

(f) Position left shift slide drive link mounting plate; secure friction tight with flat washer, lock washer, and screw.

(g) Position right shift slide drive link mounting plate; secure friction tight with flat washer, lock washer, and screw.

(h) Position connecting strip; secure friction tight wtih two flat washers, two lock washers, and two screws.

(i) Position shift link breaker slides, two springs, two spacers, and shift slide on their post.

(j) Secure breaker slides with two flat washers, two lock washers, and two locknuts (151880):

(k) Position bail (170062) and spacers; secure with two lock washers and two screws.

(l) Position main bail; secure with two retainer rings.

(m) Position studs through oscillating rail shift slide.

(n) Mount shift slide drive link mechanisms on oscillating rail shift slide.

(o) Position plate (153335), secure with two lock washers and two nuts.

(p) Position two reversing slide mounting brackets, reversing slide, oscillating rail shift slide, two shift slide drive links; secure with four lock washers and four screws. Ensure parts are positioned on their mounting posts.

(q) Install four shift slide drive link felts; secure drive links to main bail and guide posts with four retainer rings.

(r) Position tension pulley shaft, bracket, and horizontal positioning lock lever arm; secure with lock washer and screw (from back).

(s) Install tension pulley spring.

(t) Install spacing shaft from rear.

(u) Install spacing feed pawls and eccentric on spacing shaft; secure with set screw and lock washer.

(v) Unhook automatic carriage return/line feed bell crank spring.

(w) Remove shoulder nut holding bell crank.

(x) Remove mounting shaft holding reversing slide shift lever.

(y) Replace two felts on shaft and reassemble by reversing procedures in steps (w) through (y).

(z) Secure oscillating rail shift links to oscillating rail shift slide with two retainer rings (on back).

(aa) Secure guide arms with two clamp screws and lock washers (on back).

(ab) Install and position carriage return spring drum.

(ac) Install and position spacing drum and bushing.

(ad) Install two feed pawl springs.

(ae) Remove two nuts holding printing track guide; lift off front guide and remove felt wick.

(af) Install new wick; reassemble and secure.

(ag) Repeat steps ae and af on other guide.

(ah) Install plate (150554); secure with two lock washers and two nuts.

(ai) Position horizontal positioning lock lever; secure with retainer ring.

(aj) Position printing carriage track, two spacers, and two pulleys; secure with six lock washers and six screws. Ensure track is in proper engagement with horizontal positioning lock lever.

(ak) Install horizontal positioning lock lever spring.

(al) Install oscillating rail shift link springs.

(am) Connect shift slide drive link springs.

(an) Position center of upper draw-wire rope on clamp screw on carriage return spring drum; secure screw friction tight.

(ao) Position rope; secure both ends to spacing drum with lock washer and screw.

(ap) Secure one end of lower draw-wire rope to spacing drum with lock washer and screw.

(aq) Position rope; secure other end of carriage return spring drum with lock washer and screw.

(ar) Install transfer slide and mounting post; secure with lock washer and nut.

(as) Install carriage return latch bail spring.

(at) Position dashpot on transfer slide; secure with three clamp screws and three lock washers.

(au) Install transfer slide spring.

(av) Position printing track; secure friction tight with two flat washers, two lock washers, and two screws.

(aw) Replace eight felts on printing mechanism.

(ax) Position printing mechanism on its track; secure friction tight.

(ay) Position and secure oscillating rail slide with type box carriage link friction tight to upper draw-wire rope, with two locknuts and two screws.

(27) <u>Installing Front Plate</u>. To install front plate, proceed as follows (figures 7-16, 7-17, and 7-18):

(a) Mount type box carriage on its track.

(b) Position front plate while ensuring the following are in their proper connections:

Number three code bar projection.

Numbers four and five code bar bell cranks seated in notches in their code bars.

Projection on automatic carriage return-line feed bell crank engaged with notch on 0 code bar.

Carriage return lever positioned to left of carriage return latch bail.

Main bail drive bracket on top of rocker shaft.

Type box carriage link in type box carriage.

Space suppression frame in slot in front plate.

(c) Secure front plate with four lock washers and four screws.

(d) Secure type box carriage to its link with retainer ring.

(e) Secure main bail drive bracket to main rocker shaft with two lock washers and two screws.

(f) Mount spacing shaft helical driven gear on spacing shaft.

(g) Perform spacing gear clearance and phasing adjustment procedures as described in paragraphs 6-3.1h(18) and 6-3.1h(19).

(28) Installing Type Box. To install type box proceed as follows (figure 7-33):

(a) Hold type box left end down at approximately a 45-degree angle; then insert left end on bearing stud and lower right end into place.

(b) Latch type box into place.

CAUTION

To avoid springing the type box latch, the type box should be firmly seated on the bearing stud and the point of the latch should be placed in the notch of the type box plate before moving the latch to its locked position.

(29) Installing Ribbon. To install ribbon, proceed as follows (figure 7-25 and 7-26):

(a) Install new ribbon on either feed mechanism.

(b) Thread ribbon across front of unit and attach end to empty spool.

(c) Install spool on remaining feed mechanism.

(d) Lock spools in place with their slips.

x. Reinstalling Typing Unit.

(1) With left hand under rear of side frame and right hand uner right side of front plate above dashpot, lift

typing unit from work bench and place on base.

(2) Install four mounting screws which hold typing unit to base.

(3) Connect B plug to typing unit.

(4) Connect P103 to J103.

# CHAPTER 7
# PARTS LIST

7-1. SCOPE. This chapter provides a list of maintenance parts and parts location diagrams for Model 28 Compact Page Printer KSR and RO Teletypewriter Sets.

7-2. MAINTENANCE PARTS LIST. Maintenance parts are listed by major units, in tables 7-1 through 7-5. The parts are listed for each unit in numerical part number sequence. Reference to the applicable parts location diagram is included for each part listed.

7-3. LIST OF MANUFACTURERS. Model 28 CPP Teletypewriter Sets are manufactured by Teletype Corporation, Skokie, Illinois.

7-4. PARTS LOCATION DIAGRAMS. Figures 7-1 through 7-68 show location of all parts listed in tables 7-1 through 7-5. The parts location diagrams are used to locate and identify a particular part which is indexed by part number. The user then refers to the part number in the applicable table to obtain a description of the part to be ordered.

7-5. LIST OF ABBREVIATIONS. Table 7-6 contains the explanations of a list of abbreviations used throughout the parts list.

Table 7-1. Typing Unit

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 243M | 7-27,-28 | Coil, Magnet | |
| 254M | 7-21 | Coil, Magnet | |
| 298M | 7-23 | Coil, Magnet | |
| 1036 | 7-1,-5 | Nut, 6-40 Hex | |
| 1214 | 7-17 | Setscrew, 10-32 | |
| 1293 | 7-26 | Screw, 4-40 x 1/8 Fil | |
| 2034 | 7-20 | Washer, Flat | |
| 2191 | 7-1 thru -6, -9 thru -32 | Lockwasher | |
| 2201 | 7-1 | Nut, 5/16-32 Hex | |
| 2438 | 7-21 | Washer, Flat | |
| 2539 | 7-6,-14 | Nut, 3/8-32 Hex | |
| 2669 | 7-2,-3,-5,-6, -10,-11,-15, -17,-20,-22 | Lockwasher | |
| 3598 | 7-1,-3 thru -6, -9 thru -14, -16 thru -20, -22,-31,-32 | Nut, 6-40 Hex | |
| 3599 | 7-1,-4,-14,-16, -17,-18,-20, -21,-24,-26 thru -28,-31, -32 | Nut, 4-40 Hex | |
| 3603 | 7-23 | Nut, 1/4-32 Hex | |
| 3606 | 7-18,-31,-32 | Nut, 6-40 Hex | |
| 3640 | 7-5,-12,-16, -17,-27,-28 | Lockwasher | |
| 3646 | 7-1 | Lockwasher | |
| 3649 | 7-19 | Washer, Flat | |

Table 7-1. Typing Unit – Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 4586 | 7-5 | Washer, Felt | |
| 4703 | 7-31,-32 | Spring | |
| 5599 | 7-1 | Nut, 8-32 Hex | |
| 5740 | 7-32 | Screw, 2-56 x 1/4 Fil | |
| 6800 | 7-14 | Screw, 6-40 Shoulder | |
| 7002 | 7-2,-3,-4,-10, -11,-13 thru -20,-22,-23, -25 thru -28, -30 | Washer, Flat | |
| 7036 | 7-5 | Collar, Locking | |
| 7603 | 7-14,-16 | Spring | |
| 7655 | 7-5 | Spring | |
| 7835 | 7-26 | Ribbon w/Spool, Black | |
| 8330 | 7-14,-19,-20, -22,-27,-28, -30 | Washer, Flat | |
| 8449 | 7-14,-26 | Spacer, 0.094" Thk | |
| 22015 | 7-26 | Spring | |
| 27425 | 7-11 | Screw, 2-56 x 5/32 Fil | |
| 31636 | 7-29 | Spring | |
| 33038 | 7-5 | Spring | |
| 33828 | 7-10,-11,-18 | Spring | |
| 36273 | 7-1,-18,-22 | Washer, Flat | |
| 41382 | 7-20,-22 | Spring | |
| 42661 | 7-16,-25 thru -28,-32 | Spring | |
| 42823 | 7-12,-13 | Washer, Flat | |

Table 7-1. Typing Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 42827 | 7-29 | Screw, 3-48 x 1/4 Fil | |
| 45024 | 7-27,-28 | Spring | |
| 45027 | 7-17 | Spring | |
| 49420 | 7-30 | Spring | |
| 55669 | 7-27,-28 | Spring | |
| 70388 | 7-14 | Spring | |
| 71681 | 7-25 | Spool, Ribbon | |
| 72468 | 7-4 | Spring | |
| 72522 | 7-31,-32 | Wick, Felt | |
| 72579 | 7-1 | Washer, Flat | |
| 73175 | 7-6,-14 | Lockwasher | |
| 73520 | 7-17 | Wick, Felt | |
| 74283 | 7-20,-22 | Washer, Spring | |
| 74536 | 7-5 | Setscrew, 6-40 | |
| 74547 | 7-14 | Collar | |
| 74553 | 7-11 | Wick, Felt | |
| 74701 | 7-4,-14 | Spring | |
| 74722 | 7-5,-9 | Washer, Flat | |
| 74755 | 7-15 | Washer, Felt | |
| 74785 | 7-14 | Roller | |
| 74882 | 7-11 | Spring | |
| 76081 | 7-21 | Washer, Flat | |
| 76099 | 7-21 | Washer, Flat | |
| 76461 | 7-16 | Washer, Flat | |
| 78533 | 7-20,-22 | Spring | |

Table 7-1. Typing Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 79012 | 7-21 | Insulator | |
| 80342 | 7-31,-32 | Screw, 6-40 x 23/64 Hex | |
| 80581 | 7-5,-17 | Spring | |
| 81731 | 7-17 | Spring | |
| 81778 | 7-21 | Screw, 4-40 x 3/16 Fil | |
| 82442 | 7-5 | Spring | |
| 82463 | 7-5,-25,-26 | Spring | |
| 84575 | 7-5 | Spring | |
| 85407 | 7-7 | Spring, Compression | |
| 85816 | 7-16 | Wick, Felt | |
| 86304 | 7-5 | Spring | |
| 86835 | 7-18,-21,-24 | Spring | |
| 89096 | 7-16 | Washer, Felt | |
| 89897 | 7-17 | Nut, 10-32 Hex | |
| 90361 | 7-5,-10,-11, -25,-28 | Washer, Felt | |
| 90490 | 7-5 | Shim, 0.005" Thk | |
| 90504 | 7-16,-31,-32 | Washer, Felt | |
| 90517 | 7-31,-32 | Spring | |
| 90599 | 7-30 | Shim, 0.008" Thk | |
| 90679 | 7-5 | Washer, Felt | |
| 90791 | 7-11 | Lockwasher | |
| 90819 | 7-6,-14 | Washer, Felt | |
| 91198 | 7-10,-11 | Wick, Felt | |
| 92682 | 7-19 | Nut, 4-40 Spl | |

Table 7-1. Typing Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 93117 | 7-27,-28 | Lockwasher | |
| 93356 | 7-6,-11,-12, -14,-18,-30 | Washer, Felt | |
| 93507 | 7-31,-32 | Screw, 4-40 x 3/4 Hex | |
| 93758 | 7-5,-14 | Washer, Felt | |
| 93879 | 7-5 | Oiler, Felt | |
| 93899 | 7-27,-28 | Spring | |
| 94674 | 7-22,-23,-30 | Washer, Cup | |
| 95030 | 7-7 | Nut, 6-40 Shoulder | |
| 95428 | 7-32 | Spring | |
| 95827 | 7-17 | Bushing | |
| 96717 | 7-20 | Screw, 4-40 Shoulder | |
| 97117 | 7-28 | Ribbon w/Spool Red/Black | |
| 97481 | 7-6 | Wick, Felt | |
| 101386 | 7-1 | Spring | |
| 101796 | 7-5,-11,-17,-30 | Washer, Felt | |
| 103863 | 7-31,-32 | Spacer, 0.055" Thk | |
| 104807 | 7-24 | Washer, Flat | |
| 104824 | 7-21 | Spring | |
| 105028 | 7-18 | Wick, Felt | |
| 107116 | 7-2,-12 | Lockwasher | |
| 108199 | 7-14,-18,-30 | Wick, Felt | |
| 110434 | 7-2,-8,-12,-16, -17,-20,-22, -29,-33 | Screw, 4-40 x 3/16 Fil | |

Table 7-1. Typing Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 110435 | 7-19 | Nut, 4-40 Hex | |
| 110437 | 7-14 | Spring | |
| 110743 | 7-1,-2,-4,-6, -8 thru -13, -15 thru -33 | Lockwasher | |
| 110872 | 7-17 | Spring, Compression | |
| 111355 | 7-5 | Spring, Compression | |
| 112626 | 7-2,-5,-10,-11, -15,-17,-20, -22 | Nut, 10-32 Hex | |
| 112627 | 7-27,-28 | Nut, 2-56 Hex | |
| 112634 | 7-25,-26 | Spring | |
| 114215 | 7-1 | Post, Spring | |
| 115122 | 7-10,-11 | Washer, Felt | |
| 119648 | 7-11,-18,-20, -22,-27,-28 | Ring, Retaining | |
| 119649 | 7-5,-16,-17, -25 thru -28 | Ring, Retaining | |
| 119651 | 7-4,-5,-10,-11, -16,-18,-22, -23,-25 thru -28,-30,-31,-32 | | |
| 119652 | 7-5,-6,-10, -11,-13,-14, -16 thru -20, -25 thru -28, -30 | Ring, Retaining | |
| 119653 | 7-5,-9,-17,-18, -25 thru -28, -31,-32 | Ring, Retaining | |
| 119935 | 7-1 | Lockwasher | |
| 120824 | 7-13 | Washer, Felt | |

Table 7-1. Typing Unit- Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 121243 | 7-21,-24,-31, -32 | Clamp, 3/16 ID Cable | |
| 121245 | 7-27 | Clamp, 5/16 ID Cable | |
| 124177 | 7-22,-23 | Lockwasher | |
| 124681 | 7-4 | Setscrew, 6-40 | |
| 125011 | 7-1,-4,-5,-6,-9, -10,-11,-13,-15, -16,-17,-20, -22,-23,-27, -28,-30 thru -33 | Washer, Flat | |
| 125015 | 7-1,-5,-6,-11, -21,-27,-31, -32 | Washer, Flat | |
| 125238 | 7-17 | Spring | |
| 125802 | 7-9,-17 | Washer, Flat | |
| 126241 | 7-23 | Lockwasher | |
| 126815 | 7-27,-28 | Screw, 2-56 x 15/64 Hex | |
| 130667 | 7-23 | Lockwasher | |
| 130683 | 7-22 | Lockwasher | |
| 135563 | 7-3 | Jumper, 2-3/4" Green | |
| 135716 | 7-14 | Spring | |
| 139555 | 7-17 | Spring | |
| 150000 | 7-12,-13 | Drum, Clutch | |
| 150001 | 7-13 | Drum, Clutch | |
| 150004 | 7-13 | Cam, Code Bar Clutch | |
| 150010 | 7-12 | Plate, Retaining | |
| 150013 | 7-12,-13 | Disc, Adjusting | |
| 150014 | 7-12 | Disc, Adjusting | |

Table 7-1. Typing Unit - Continued

| Part Number | Figure Number (s) | Description | Notes |
|---|---|---|---|
| 150021 | 7-13 | Clutch Assembly, Code Bar | |
| 150025 | 7-12 | Clutch Assembly, Type Box | |
| 150026 | 7-12,-13 | Lever, Shoe Release | |
| 150027 | 7-12 | Lever, Shoe Release | |
| 150029 | 7-12,-13 | Wick, Felt | |
| 150030 | 7-30 | Roller, Bearing | |
| 150033 | 7-12 | Disc, 3-Stop | |
| 150035 | 7-12 | Disc, 3-Stop | |
| 150038 | 7-30 | Latch | |
| 150039 | 7-30 | Slide, Printing Arm | |
| 150040 | 7-14,-28 | Screw, 6-40 x 5/8 Fil | |
| 150043 | 7-12,-13 | Shoe, Secondary Clutch | |
| 150044 | 7-12,-13 | Shoe, Primary Clutch | |
| 150045 | 7-12 | Bearing, Clutch S[illegible]e | |
| 150046 | 7-12 | Bearing, Type Box Clutch | |
| 150047 | 7-13 | Bearing, Code Bar Clutch | |
| 150048 | 7-20,-22 | Spring | |
| 150050 | 7-13 | Spacer, Clutch | |
| 150051 | 7-13 | Cam, Eccentric | |
| 150053 | 7-30 | Bracket | |
| 150054 | 7-30 | Bail w/Roller | |
| 150056 | 7-13 | Arm | |
| 150059 | 7-30 | Bail | |
| 150064 | 7-30 | Stud | |

Table 7-1. Typing Unit- Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 150065 | 7-30 | Bracket, Stop | |
| 150068 | 7-30 | Arm | |
| 150078 | 7-33 | Nut, 4-40 Shoulder Hex | |
| 150079 | 7-33 | Stud | |
| 150089 | 7-17,-21,-27, -28 | Screw 4-40 x 1/2 Fil | |
| 150091 | 7-12 | Gear, 27T | |
| 150096 | 7-4 | Roller Arm, Pressure | |
| 150175 | 7-18 | Stud | |
| 150184 | 7-17 | Link | |
| 150193 | 7-17 | Hub | |
| 150194 | 7-17 | Plate | |
| 150196 | 7-17 | Bail | |
| 150197 | 7-15 | Stud | |
| 150202 | 7-17 | Gear, 18T | |
| 150203 | 7-17 | Retainer | |
| 150206 | 7-15 | Spacer, 0.412" | |
| 150208 | 7-18 | Bail, Left | |
| 150214 | 7-5 | Stud, Bearing | |
| 150215 | 7-18 | Block, Guide | |
| 150218 | 7-18 | Bushing | |
| 150219 | 7-16 | Screw, 4-40 x 1/2 Sq | |
| 150224 | 7-16 | Pulley | |
| 150225 | 7-15 | Rope, Draw Wire | |
| 150228 | 7-17 | Spacer, 0.035" Thk | |

Table 7-1. Typing Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 150229 | 7-17 | Retainer | |
| 150230 | 7-30 | Plate | |
| 150232 | 7-18 | Retainer, Oil | |
| 150233 | 7-17 | Roller | |
| 150234 | 7-17 | Roller | |
| 150235 | 7-17 | Slide, Transfer | |
| 150237 | 7-16 | Lever, Escapement | |
| 150241 | 7-12,-13 | Spring | |
| 150244 | 7-12 | Link | |
| 150245 | 7-18 | Bracket | |
| 150247 | 7-18 | Link | |
| 150251 | 7-15 | Wheel, Ratchet | |
| 150255 | 7-16 | Bushing | |
| 150263 | 7-18 | Bail | |
| 150265 | 7-4 | Shaft | |
| 150266 | 7-4 | Lever, Guide | |
| 150267 | 7-4 | Clamp | |
| 150269 | 7-4 | Roller, Pressure | |
| 150270 | 7-4 | Link | |
| 150271 | 7-4 | Arm, Release | |
| 150274 | 7-4 | Bracket, Clamp | |
| 150288 | 7-29 | Bracket | |
| 150289 | 7-29 | Stud | |
| 150293 | 7-29 | Plate, Retaining | |
| 150301 | 7-29 | Plate, Retaining | |

Table 7-1. Typing Unit- Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 150302 | 7-29 | Shim, 0.006" Thk | |
| 150304 | 7-29 | Bracket, Guide | |
| 150310 | 7-26 | Lever, Ribbon | |
| 150311 | 7-25 | Lever, Ribbon | |
| 150318 | 7-9 | Stud | |
| 150335 | 7-26 | Gear, 12T | |
| 150336 | 7-17,-25 thru -28 | Bushing | |
| 150341 | 7-2 | Post, Spring | |
| 150342 | 7-9 | Screw, 6-40 Shoulder | |
| 150343 | 7-26 | Lever | |
| 150344 | 7-25 | Lever | |
| 150348 | 7-14 | Shaft | |
| 150349 | 7-14 | Arm, Follower | |
| 150350 | 7-14 | Shaft | |
| 150351 | 7-2 | Stud, Eccentric | |
| 150352 | 7-14 | Bushing | |
| 150353 | 7-2 | Stud | |
| 150355 | 7-14 | Lever, Latch | |
| 150356 | 7-14 | Lever, Trip | |
| 150358 | 7-14 | Lever, Trip | |
| 150361 | 7-14 | Spacer, 0.277" Thk | |
| 150363 | 7-10 | Plate | |
| 150364 | 7-12 | Stud, Eccentric | |
| 150365 | 7-10 | Shaft, Rocker | |

Table 7-1. Typing Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 150366 | 7-10 | Bracket | |
| 150367 | 7-11 | Bracket | |
| 150369 | 7-10 | Link, Left | |
| 150370 | 7-11 | Link, Right | |
| 150377 | 7-5 | Arm | |
| 150380 | 7-11 | Stud | |
| 150382 | 7-10,-11 | Block, Guide | |
| 150383 | 7-10 | Spacer, 0.149" Thk | |
| 150384 | 7-11 | Spacer, 0.245" Thk | |
| 150386 | 7-10,-28 | Link, Left Ribbon Drive | |
| 150387 | 7-11,-27 | Link, Right Ribbon Drive | |
| 150392 | 7-5 | Bail | |
| 150395 | 7-10,-11 | Screw, 6-40 Shoulder | |
| 150396 | 7-10 | Lever, Left | |
| 150397 | 7-11 | Lever, Right | |
| 150398 | 7-6 | Stud, Pivot | |
| 150399 | 7-5 | Shaft | |
| 150401 | 7-10 | Clamp | |
| 150410 | 7-10 | Stud | |
| 150411 | 7-11 | Washer, Flat | |
| 150412 | 7-10 | Arm, Left Follower | |
| 150413 | 7-11 | Arm, Right Follower | |
| 150414 | 7-6 | Bushing | |
| 150419 | 7-6 | Shaft | |

Table 7-1. Typing Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 150420 | 7-11 | Lever, Right | |
| 150423 | 7-6 | Stud, Pivot | |
| 150425 | 7-10,-11 | Lever, Lock | |
| 150428 | 7-10 | Lever, Left | |
| 150429 | 7-10,-11 | Stud, Eccentric | |
| 150431 | 7-14 | Lever, Trip | |
| 150432 | 7-28 | Washer, Flat | |
| 150436 | 7-1,-17,-26 | Bushing | |
| 150444 | 7-14 | Lever, Trip Shaft | |
| 150447 | 7-19 | Arm, Shift Lever Drive | |
| 150450 | 7-19 | Arm, Intermediate | |
| 150452 | 7-19 | Bearing | |
| 150471 | 7-19 | Stud | |
| 150479 | 7-20,-22 | Stud | |
| 150481 | 7-19 | Shaft | |
| 150482 | 7-19 | Plate | |
| 150507 | 7-19 | Spring | |
| 150535 | 7-29 | Spring, Compression | |
| 150536 | 7-17 | Spring | |
| 150537 | 7-17,-29 | Ball, Bearing | |
| 150538 | 7-17 | Cylinder, Dashpot | |
| 150543 | 7-31,-32 | Screw, 3-48 x 13/32 Fil | |
| 150544 | 7-31,-32 | Handle | |
| 150545 | 7-2 | Bracket, Right | |
| 150546 | 7-2 | Bracket, Left | |

Table 7-1. Typing Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 150547 | 7-31,-32 | Shaft | |
| 150549 | 7-12 | Collar | |
| 150554 | 7-16 | Plate | |
| 150558 | 7-18 | Spring, Torsion | |
| 150559 | 7-18 | Spring, Torsion | |
| 150561 | 7-5 | Arm | |
| 150563 | 7-17 | Spring | |
| 150585 | 7-9 | Bar, Line Feed | |
| 150598 | 7-18 | Track, Printing | |
| 150642 | 7-9 | Bellcrank | |
| 150646 | 7-9 | Screw | |
| 150647 | 7-9 | Eccentric | |
| 150648 | 7-9 | Eccentric | |
| 150649 | 7-9 | Washer, Spacing | |
| 150650 | 7-9 | Bushing | |
| 150651 | 7-9 | Gear, 28T | |
| 150652 | 7-9 | Screw, 4-40 x 37/64 Fil | |
| 150654 | 7-1 | Guide | |
| 150666 | 7-9 | Gear, 28T | |
| 150668 | 7-17 | Collar, Spacing | |
| 150669 | 7-17 | Shim, 0.002" Thk | |
| 150670 | 7-17 | Shim, 0.004" Thk | |
| 150672 | 7-17 | Bearing | |
| 150673 | 7-17 | Shaft, Spacing | |

Table 7-1. Typing Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 150677 | 7-17 | Pawl, Feed | |
| 150678 | 7-17 | Pawl, Feed | |
| 150685 | 7-4 | Plate | |
| 150687 | 7-20,-22 | Stud | |
| 150689 | 7-31,-32 | Block, Guide | |
| 150694 | 7-17 | Slide, Breaker | |
| 150705 | 7-16 | Bushing | |
| 150709 | 7-16 | Spacer | |
| 150710 | 7-16 | Screw, 6-40 x 1-1/4 Fil | |
| 150712 | 7-15 | Rope, Draw Wire | |
| 150714 | 7-9 | Bearing, Sleeve | |
| 150715 | 7-9 | Gear, 32T | |
| 150718 | 7-9 | Platen | |
| 150719 | 7-9 | Retainer | |
| 150720 | 7-9 | Retainer | |
| 150721 | 7-16 | Arm | |
| 150722 | 7-16 | Arm | |
| 150728 | 7-16 | Rail | |
| 150731 | 7-17 | Slide | |
| 150732 | 7-17 | Slide, Bottom | |
| 150733 | 7-17 | Slide, Top | |
| 150738 | 7-17 | Guide | |
| 150746 | 7-17 | Bushing | |
| 150748 | 7-18 | Stud | |
| 150750 | 7-16 | Plate | |

Table 7-1. Typing Unit- Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 150751 | 7-16 | Block, Guide | |
| 150752 | 7-18 | Stud | |
| 150753 | 7-18 | Roller | |
| 150754 | 7-18 | Roller | |
| 150755 | 7-18 | Stud | |
| 150758 | 7-18 | Pulley | |
| 150770 | 7-17 | Bellcrank | |
| 150771 | 7-17 | Bellcrank | |
| 150776 | 7-18 | Lever, Lock | |
| 150777 | 7-18 | Bail, Right | |
| 150781 | 7-5 | Stud | |
| 150796 | 7-15 | Disc | |
| 150798 | 7-15 | Ratchet | |
| 150800 | 7-16 | Stud | |
| 150803 | 7-4 | Spring, Flat | |
| 150804 | 7-4 | Guide, Right Paper | |
| 150805 | 7-16 | Shim, 0.012" Thk | |
| 150806 | 7-16 | Plate | |
| 150807 | 7-16 | Oiler, Felt | |
| 150809 | 7-9 | Gear, 32T | |
| 150811 | 7-11 | Stud | |
| 150815 | 7-4 | Bushing | |
| 150816 | 7-4 | Lever | |
| 150821 | 7-25 | Spacer, 0.156" Thk | |

Table 7-1. Typing Unit — Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 150824 | 7-11 | Track | |
| 150826 | 7-4 | Guide, Left Paper | |
| 150827 | 7-15 | Drum, Spring | |
| 150830 | 7-12 | Bushing, Shoulder | |
| 150831 | 7-12 | Ring, Retaining | |
| 150833 | 7-9 | Platen Assembly | |
| 150838 | 7-15 | Ring, Retaining | |
| 150841 | 7-12 | Bearing | |
| 150842 | 7-15 | Drum Assembly, Spring | |
| 150843 | 7-15 | Plate, Hook | |
| 150891 | 7-11 | Block | |
| 150895 | 7-14 | Arm, Trip | |
| 150903 | 7-6 | Block, Left Paper Spindle | |
| 150904 | 7-6 | Block, Right Paper Spindle | |
| 150907 | 7-6 | Spindle, Paper | |
| 150909 | 7-16 | Screw, 6-40 Shoulder | |
| 150910 | 7-7 | Latch, Right | |
| 150923 | 7-14,-18,-30 | Washer, Felt | |
| 150926 | 7-16 | Washer, Felt | |
| 150927 | 7-16 | Oiler, Felt | |
| 150929 | 7-16 | Oiler, Felt | |
| 150930 | 7-5 | Washer, Felt | |
| 150932 | 7-25,-26 | Bushing, Shoulder | |
| 150935 | 7-7 | Latch, Left | |
| 150937 | 7-26 | Lever | |

Table 7-1. Typing Unit- Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 150961 | 7-1 | Bushing, Eccentric | |
| 150970 | 7-12 | Bearing, Ball | |
| 150975 | 7-17 | Cup, Dashpot | |
| 150978 | 7-19,-21 | Screw, 6-50 x 1-1/8 Fil | |
| 150986 | 7-17 | Pawl Assembly, Spacing | |
| 150987 | 7-17 | Spacer, 0.090" Thk | |
| 150990 | 7-6,-19 | Washer, Felt | |
| 150992 | 7-4 | Stud | |
| 150998 | 7-9 | Spacer, 0.020" Thk | |
| 151073 | 7-9 | Screw, 4-40 x 5/32 Fil | |
| 151103 | 7-20,-22 | Spring | |
| 151152 | 7-16,-19,-27 thru -30 | Screw, 4-40 x 3/16 Hex | |
| 151222 | 7-17,-31,-32 | Washer, Felt | |
| 151336 | 7-22 | Oiler | |
| 151346 | 7-5,-6,-9,-12, -15,-17,-25 | Screw, 6-40 x 3/8 Fil | |
| 151442 | 7-10 | Screw, 6-40 x 1/2 Hex | |
| 151443 | 7-30 | Eccentric | |
| 151453 | 7-3 | Nut, 10-32 Hex | |
| 151602 | 7-10,-11 | Plate | |
| 151603 | 7-11,-21 | Spacer | |
| 151604 | 7-10,-11 | Block, Guide | |
| 151606 | 7-17 | Screw, 10-32 x 1/4 Hex | |
| 151610 | 7-3,-12,-30 | Washer, Flat | |

Table 7-1. Typing Unit - Continued

| Part Number | Figure Number (s) | Description | Notes |
|---|---|---|---|
| 151611 | 7-30 | Bushing | |
| 151612 | 7-30 | Spacer | |
| 151618 | 7-15,-29 | Screw, 6-40 x 7/16 Fil | |
| 151619 | 7-15 | Bushing | |
| 151625 | 7-18 | Strip | |
| 151627 | 7-6 | Rod | |
| 151629 | 7-14,-19 | Nut, 6-40 Lug | |
| 151630 | 7-1,-2,-3,-5,-6, -11,-12,-13, -16 thru -20, -22,-25,-28, -29,-30 | Screw, 6-40 x 1/4 Hex | |
| 151631 | 7-3,-15,-19,-21, -24,-27,-28 | Screw, 6-40 x 5/16 Hex | |
| 151632 | 7-10,-11,-12, -16 | Screw, 6-40 x 3/8 Hex | |
| 151637 | 7-2,-6,-9, -10,-15,-17, -25 thru -28, -31,-32 | Screw, 4-40 x 1/4 Fil | |
| 151640 | 7-13 | Lever, Shoe Release | |
| 151642 | 7-12,-13 | Screw, 6-40 x 3/4 Fil | |
| 151657 | 7-1,-2,-4,-5,-9, -11,-16,-17,-19, -20,-22,-25, -26,-29,-31, -32 | Screw, 6-40 x 1/4 Fil | |
| 151658 | 7-1,-6,-10,-15, -17,-19,-21, -24,-26,-27, -28,-31,-32 | Screw, 6-40 x 5/16 Fil | |
| 151659 | 7-2,-26 | Screw, 6-40 x 1/2 Fil | |
| 151661 | 7-17 | Screw, 6-40 x 1 Fil | |

Table 7-1. Typing Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 151668 | 7-19 | Roller | |
| 151683 | 7-33 | Type Box Assembly, RE | |
| 151685 | 7-6,-11,-12,-14, -15,-17 | Screw, 6-40 x 5/16 Fil | |
| 151686 | 7-4,-17,-21 | Screw, 4-40 x 3/8 Fil | |
| 151687 | 7-23 | Screw, 4-40 x 7/16 Fil | |
| 151688 | 7-12,-21,-32 | Screw, 4-40 x 5/8 Fil | |
| 151689 | 7-4,-13,-31,-32 | Screw, 4-40 x 3/4 Fil | |
| 151690 | 7-12 | Screw, 10-32 x 5/16 Fil | |
| 151692 | 7-2,-4,-5,-6, -14,-16,-17, -25,-30,-31, -32 | Screw, 6-40 x 3/16 Fil | |
| 151693 | 7-26 | Screw, 6-40 x 9/16 Fil | |
| 151695 | 7-30 | Screw, 6-40 x 5/8 Fil | |
| 151700 | 7-18 | Screw, 6-40 Shoulder | |
| 151701 | 7-20,-22 | Spring, Torsion | |
| 151702 | 7-31,-32 | Nut, 4-40 Hex | |
| 151703 | 7-4 | Pin | |
| 151709 | 7-30 | Arm | |
| 151714 | 7-20,-22 | Spring | |
| 151721 | 7-6,-19 | Screw, 6-40 x 3/4 Hex | |
| 151722 | 7-14,-16,-21, -24,-27 | Screw, 6-40 x 3/16 Hex | |
| 151723 | 7-17 | Screw, 10-32 x 3/8 Hex | |
| 151728 | 7-13 | Spring | |
| 151732 | 7-12,-23 | Screw, 4-40 x 11/32 Fil | |

Table 7-1. Typing Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 151734 | 7-11 | Screw, 4-40 x 3/8 Hex | |
| 151735 | 7-24 | Screw, 4-40 x 5/16 Hex | |
| 151736 | 7-12 | Spring | |
| 151737 | 7-12,-13 | Screw, 4-40 x 11/64 Hex | |
| 151738 | 7-33 | Screw, Identification | |
| 151739 | 7-31,-32 | Screw, Identification | |
| 151794 | 7-12 | Washer, Spring | |
| 151799 | 7-7 | Modification Kit | |
| 151880 | 7-11,-17 | Nut, 4-40 Hex | |
| 151938 | 7-33 | Type Box Assembly, RN | |
| 152089 | 7-32 | Latch | |
| 152121 | 7-32 | Lever, Function | |
| 152129 | 7-30 | Spring | |
| 152140 | 7-5 | Bail | |
| 152147 | 7-11 | Bearing, Ball | |
| 152255 | 7-29 | Bar w/Retainer | |
| 152256 | 7-29 | Code Bar | |
| 152257 | 7-29 | Spring | |
| 152298 | 7-32 | Lever, Function | |
| 152357 | 7-32 | Stud | |
| 152359 | 7-5 | Arm | |
| 152400 | 7-20 | Plate, Selector Mounting | |
| 152401 | 7-20,-22 | Guide | |
| 152402 | 7-20,-22 | Guide, Selector Lever | |

Table 7-1. Typing Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 152403 | 7-20 | Bracket, Guide | |
| 152404 | 7-20,-22 | Bracket, Guide | |
| 152406 | 7-20,-22 | Bracket, Spring | |
| 152407 | 7-20,-22 | Lever, Spacing Lock | |
| 152409 | 7-20,-22 | Lever, Selecting | |
| 152410 | 7-20,-22 | Bail, Reset | |
| 152411 | 7-20,-22 | Lever, Push | |
| 152412 | 7-20 | Link | |
| 152415 | 7-21 | Stud, Adjusting | |
| 152420 | 7-21 | Lamination, Magnet | |
| 152421 | 7-21 | Bracket, Shield Mounting | |
| 152423 | 7-21 | Bracket, Armature Stop Mounting | |
| 152425 | 7-21 | Post, Spring | |
| 152426 | 7-21 | Nut, 6-40 Self-Locking | |
| 152427 | 7-20,-22 | Latch w/Hub | |
| 152429 | 7-20,-22 | Rack, Sector | |
| 152430 | 7-20,-22 | Plate Assembly, Range Finder | |
| 152432 | 7-20,-22 | Arm, Stop | |
| 152436 | 7-20,-22 | Knob, Range Scale | |
| 152438 | 7-20,-22 | Bail, Stop Arm | |
| 152441 | 7-20,-22 | Washer, Flat | |
| 152445 | 7-20,-22 | Spring, Compression | |
| 152450 | 7-13 | Cam, Selector | |
| 152453 | 7-13 | Clutch Assembly, Selector | |

Table 7-1. Typing Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| | | Cam | |
| 152456 | 7-19 | Holder, Wick | |
| 152457 | 7-19 | Wick, Felt | |
| 152458 | 7-21 | Shield, Terminal | |
| 152461 | 7-21,-24,-31, -32 | Bracket | |
| 152462 | 7-21,-24,-31, -32 | Latch, Right | |
| 152463 | 7-21,-24 | Latch, Left | |
| 152464 | 7-21,-24 | Insulator, 0.062" Thk | |
| 152467 | 7-31,-32 | Connector, 20 Pt Rcpt | |
| 152468 | 7-31,-32 | Cable w/Terminals | |
| 152505 | 7-16 | Stud | |
| 152507 | 7-16 | Roller, Detent | |
| 152508 | 7-16 | Bracket, Right | |
| 152509 | 7-16 | Bracket, Left | |
| 152510 | 7-16 | Lever, Detent | |
| 152511 | 7-16 | Guide | |
| 152514 | 7-5 | Bail | |
| 152515 | 7-5 | Lever, Space Trip | |
| 152516 | 7-5 | Slide | |
| 152518 | 7-5 | Bail | |
| 152523 | 7-25 thru -28 | Spring, Washer | |
| 152524 | 7-25 thru -28 | Bracket | |
| 152525 | 7-25 thru -28 | Hub | |
| 152526 | 7-25,-27 | Plate, Right | |

Table 7-1. Typing Unit — Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 152527 | 7-26,-28 | Plate, Left | |
| 152528 | 7-26,-28 | Ratchet, Left Ribbon | |
| 152529 | 7-25,-27 | Ratchet, Right Ribbon | |
| 152536 | 7-18 | Bail | |
| 152537 | 7-12 | Clamp | |
| 152538 | 7-17 | Plate, Front | |
| 152539 | 7-4 | Guide | |
| 152545 | 7-5 | Lever | |
| 152547 | 7-31,-32 | Shaft | |
| 152548 | 7-29 | Bar, Shift | |
| 152550 | 7-10 | Clamp | |
| 152551 | 7-29 | Code Bar, No. 4 & No. 5 | |
| 152552 | 7-29 | Code Bar, No. 3 | |
| 152563 | 7-5 | Bracket | |
| 152571 | 7-26 | Spacer | |
| 152572 | 7-29 | Bracket | |
| 152573 | 7-13 | Retainer | |
| 152574 | 7-29 | Plate | |
| 152575 | 7-29 | Bracket | |
| 152576 | 7-29 | Bracket | |
| 152579 | 7-16 | Track | |
| 152582 | 7-26 | Shaft | |
| 152583 | 7-19 | Bearing, Sleeve | |
| 152584 | 7-19 | Lever | |

Table 7-1. Typing Unit – Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 152585 | 7-19 | Lever | |
| 152586 | 7-17 | Bracket | |
| 152589 | 7-10 | Clamp | |
| 152592 | 7-16 | Guide | |
| 152593 | 7-11 | Housing, Bearing | |
| 152594 | 7-15 | Terminal | |
| 152595 | 7-16 | Slide | |
| 152596 | 7-17 | Slide, Shift | |
| 152603 | 7-11 | Carriage Assembly | |
| 152606 | 7-16 | Rail Assembly, Oscillating | |
| 152614 | 7-16 | Track Assembly | |
| 152629 | 7-25 thru -28 | Washer, Friction | |
| 152634 | 7-17 | Washer, Flat | |
| 152635 | 7-19 | Lever, No. 1 Transfer | |
| 152636 | 7-19 | Lever, No. 2 Transfer | |
| 152637 | 7-19 | Lever, No. 3 Transfer | |
| 152638 | 7-19 | Lever, No. 4 Transfer | |
| 152639 | 7-19 | Lever, No. 5 Transfer | |
| 152640 | 7-19 | Lever, No. 6 Transfer | |
| 152641 | 7-31,-32 | Lever, Function | |
| 152642 | 7-31,-32 | Lever, Function | |
| 152644 | 7-26 | Bracket | |
| 152646 | 7-26 | Lever, Left Reversing | |
| 152647 | 7-25,-27 | Lever, Right Reversing | |
| 152648 | 7-25 | Stud | |

Table 7-1. Typing Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 152651 | 7-31,-32 | Plate, Guide | |
| 152652 | 7-31,-32 | Bar, Guide | |
| 152653 | 7-31,-32 | Pawl, Function | |
| 152659 | 7-31,-32 | Lever, Function | |
| 152660 | 7-31,-32 | Plate, Spring | |
| 152662 | 7-19 | Shaft | |
| 152663 | 7-19 | Guide | |
| 152665 | 7-31,-32 | Bar, Function | |
| 152666 | 7-31,-32 | Bar, Function | |
| 152667 | 7-31,-32 | Bar, Function | |
| 152668 | 7-31,-32 | Bar, Function | |
| 152669 | 7-31,-32 | Bar, Function | |
| 152671 | 7-31,-32 | Bar, Function | |
| 152675 | 7-32 | Bar, Function | |
| 152704 | 7-32 | Bar, Function | |
| 152723 | 7-4 | Spring | |
| 152725 | 7-4 | Spring | |
| 152726 | 7-14 | Bushing | |
| 152818 | 7-26 | Lever, Left Detent | |
| 152819 | 7-25 | Lever, Right Detent | |
| 152820 | 7-26,-28 | Lever, Left Feed | |
| 152821 | 7-25 | Lever, Right Feed | |
| 152823 | 7-26 | Bracket, Left | |
| 152824 | 7-25 | Bracket, Right | |

Table 7-1. Typing Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 152826 | 7-25 thru -28 | Pin, Detent | |
| 152827 | 7-26 | Bracket, Left Spool | |
| 152828 | 7-25,-26 | Bracket Right Spool | |
| 152831 | 7-2 | Clip | |
| 152832 | 7-4 | Shaft, Paper Straightener | |
| 152834 | 7-25,-26 | Spring, Torsion | |
| 152871 | 7-9 | Spring | |
| 152887 | 7-12,-13 | Screw, 4-40 x 1/2 Hex | |
| 152889 | 7-31,-32 | Plate, Retaining | |
| 152890 | 7-17,-23 | Washer, Flat | |
| 152891 | 7-20,-22 | Spring | |
| 152893 | 7-5,-10,-20, -22,-27,-28 | Screw, 4-40 x 1/4 Hex | |
| 153172 | 7-16 | Spring | |
| 153173 | 7-16 | Plate, Clamp | |
| 153174 | 7-16 | Link, Left | |
| 153175 | 7-16 | Link, Right | |
| 153180 | 7-16 | Link, Right | |
| 153181 | 7-16 | Link, Left | |
| 153183 | 7-16 | Slide | |
| 153184 | 7-21 | Post | |
| 153235 | 7-12 | Plate | |
| 153236 | 7-12 | Gear, 42T | |
| 153255 | 7-5 | Bail | |
| 153256 | 7-17 | Bracket | |

Table 7-1. Typing Unit- Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 153291 | 7-31,-32 | Arm | |
| 153292 | 7-13 | Plate | |
| 153293 | 7-13 | Spacer, Clutch | |
| 153294 | 7-31,-32 | Cam | |
| 153295 | 7-31,-32 | Shaft | |
| 153296 | 7-13 | Eccentric | |
| 153298 | 7-31,-32 | Bracket, Right | |
| 153299 | 7-31,-32 | Bracket, Left | |
| 153300 | 7-13 | Arm | |
| 153301 | 7-31,-32 | Arm | |
| 153302 | 7-32 | Blade, Stripper | |
| 153303 | 7-32 | Slide, Stripper | |
| 153304 | 7-2 | Bushing, Shoulder | |
| 153305 | 7-5 | Spring, Torsion | |
| 153310 | 7-5 | Bail | |
| 153311 | 7-5 | Arm | |
| 153312 | 7-2 | Lever | |
| 153314 | 7-5 | Bracket | |
| 153315 | 7-29 | Bracket | |
| 153319 | 7-29 | Code Bar | |
| 153321 | 7-29 | Bracket, Tie | |
| 153322 | 7-31,-32 | Guide | |
| 153323 | 7-13 | Ring, Spacer | |
| 153335 | 7-18 | Plate | |
| 153337 | 7-18 | Bushing | |

Table 7-1. Typing Unit—Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 153340 | 7-18 | Spring, Left Torsion | |
| 153341 | 7-18 | Spring, Right Torsion | |
| 153367 | 7-14 | Arm | |
| 153368 | 7-14 | Bail, Follower | |
| 153382 | 7-5 | Bail, Transfer | |
| 153383 | 7-5 | Arm, Bail Extension | |
| 153435 | 7-31 | Bar, Function | |
| 153437 | 7-31,-32 | Bar, Function | |
| 153442 | 7-6 | Screw, 10-32 x 7/16 Hex | |
| 153489 | 7-20,-22 | Detent | |
| 153530 | 7-11 | Plate | |
| 153531 | 7-11 | Plate, Adjusting | |
| 153532 | 7-11 | Screw | |
| 153534 | 7-1 | Washer, Flat | |
| 153538 | 7-27 | Screw, 6-40 x 7/16 Hex | |
| 153550 | 7-6 | Link | |
| 153553 | 7-6 | Roller | |
| 153558 | 7-6 | Link | |
| 153569 | 7-14 | Arm, Trip | |
| 153573 | 7-6 | Bail | |
| 153576 | 7-13 | Cam, Function | |
| 153577 | 7-6 | Washer, Felt | |
| 153581 | 7-31,-32 | Handle | |
| 153582 | 7-5 | Screw | |

Table 7-1. Typing Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 153583 | 7-14 | Lever, Trip | |
| 153584 | 7-14 | Lever, Latch | |
| 153586 | 7-2 | Guide | |
| 153587 | 7-2 | Guide | |
| 153598 | 7-32 | Pawl, Function | |
| 153600 | 7-29 | Bracket, Spring | |
| 153601 | 7-32 | Bushing, Shoulder | |
| 153602 | 7-32 | Plate | |
| 153604 | 7-32 | Pawl, Funtion | |
| 153609 | 7-31,-32 | Roller | |
| 153631 | 7-27,-28 | Network, Spark Suppression | |
| 153634 | 7-4 | Collar | |
| 153644 | 7-31,-32 | Stud | |
| 153670 | 7-32 | Lever, Function | |
| 153799 | 7-12,-23 | Screw, 4-40 x 21/64 Hex | |
| 153806 | 7-14 | Spring | |
| 153810 | 7-11 | Guide, Ribbon | |
| 153815 | 7-13 | Clutch Assembly, Function | |
| 153817 | 7-16,-17 | Screw, 4-40 x 3/8 Hex | |
| 153819 | 7-29 | Lockwasher | |
| 153820 | 7-30 | Frame, Printing Carriage | |
| 153823 | 7-13 | Collar | |
| 153824 | 7-13 | Clamp | |
| 153839 | 7-6,-11,-14, -21,-24 | Screw, 6-40 x 3/8 Hex | |

Table 7-1. Typing Unit- Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 153841 | 7-10 | Screw, 6-40 x 9/16 Hex | |
| 153944 | 7-15 | Drum Assembly, Universal Spacing | |
| 154127 | 7-1 | Nut, 6-40 Hex | |
| 154253 | 7-17 | Stud | |
| 154310 | 7-15 | Spring | |
| 154332 | 7-25,-26 | Shaft | |
| 154333 | 7-25,-26 | Roller | |
| 154354 | 7-16 | Slide | |
| 154356 | 7-11 | Bail | |
| 154380 | 7-29 | Bracket w/Post | |
| 154389 | 7-17 | Cam, Eccentric | |
| 154613 | 7-31,-32 | Latch | |
| 154614 | 7-12 | Cam, Spacing | |
| 154620 | 7-20,-22 | Wick, Leather | |
| 154621 | 7-20,-22 | Retainer, Wick | |
| 154622 | 7-20,-22 | Lubricator | |
| 154623 | 7-15 | Ring, Retaining | |
| 154624 | 7-15 | Ring w/Roller | |
| 154626 | 7-15 | Ring | |
| 154627 | 7-15 | Drum, Spacing | |
| 154638 | 7-30 | Spring | |
| 154645 | 7-6 | Spacer | |
| 154650 | 7-29 | Clip | |
| 154688 | 7-6 | Spring | |

Table 7-1. Typing Unit- Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 154694 | 7-12,-13 | Disc, Clutch Cam | |
| 154872 | 7-2 | Bracket | |
| 154971 | 7-31 | Stunt Box Assembly, AY | |
| 155044 | 7-13 | Spacer | |
| 155047 | 7-13 | Disc | |
| 155066 | 7-31,-32 | Cable | |
| 155081 | 7-17 | Post, Spring | |
| 155090 | 7-20,-22 | Lubricator Assembly | |
| 155096 | 7-20,-22 | Plate, Range Finder Mounting | |
| 155099 | 7-31,-32 | Screw, 6-40 Shoulder | |
| 155129 | 7-31,-32 | Bar, Function | |
| 155586 | 7-19 | Bracket | |
| 155587 | 7-19 | Link w/Stud, Shift Lever | |
| 155589 | 7-19 | Plate w/Stud | |
| 155701 | 7-33 | Type Box Assembly, WY | |
| 155751 | 7-2,-28,-31 -32 | Sleeve, 1/8 ID x 1" Lg Insulating | |
| 155753 | 7-24,-31,-32 | Sleeve, 1/8 ID x 1/2" Lg Insulating | |
| 155755 | 7-2 | Sleeve, 11/64 ID x 5/8" Lg Insulating | |
| 155796 | 7-19 | Shaft | |
| 155864 | 7-6 | Shaft, Cam | |
| 155865 | 7-6 | Stud | |
| 155933 | 7-31,-32 | Plate, Guide | |
| 155934 | 7-31,-32 | Plate | |

Table 7-1. Typing Unit– Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 155935 | 7-31,-32 | Fork w/Post | |
| 155938 | 7-31,-32 | Slide | |
| 155939 | 7-31,-32 | Slide | |
| 156093 | 7-9 | Washer, Felt | |
| 156536 | 7-20,-22 | Screw, 4-40 x 1/8 Fil | |
| 156558 | 7-27,-28 | Washer, Felt | |
| 156572 | 7-30 | Washer, Felt | |
| 156574 | 7-1 | Post, Spring | |
| 156632 | 7-15 | Screw, 6-40 x 13/32 Hex | |
| 156880 | 7-2 | Jumper, 2-3/8" Black | |
| 156881 | 7-2 | Jumper, 1-1/2" Black | |
| 157194 | 7-21 | Retainer, Spring | |
| 157237 | 7-21 | Shield, Terminal | |
| 157238 | 7-33 | Spring | |
| 157240 | 7-31,-32 | Spring | |
| 157241 | 7-6 | Bracket, Roller | |
| 157261 | 7-20,-22 | Shaft, Stop Arm | |
| 157274 | 7-32 | Clip | |
| 157289 | 7-4 | Bar, Cross | |
| 157290 | 7-4 | Bail, Pressure | |
| 157291 | 7-4 | Guide, Rear Paper | |
| 157506 | 7-12 | Clutch Assembly, Line Feed | |
| 157512 | 7-29 | Bracket Assembly, Detent | |
| 157514 | 7-8 | Modification Kit | |

Table 7-1. Typing Unit— Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 157600 thru 157649 | 7-33 | Pallet, Type | |
| 157659 | 7-33 | Pallet, Type | |
| 157663 thru 157675 | 7-33 | Pallet, Type | |
| 157887 | 7-31,-32 | Arm, No Contact | |
| 157972 | 7-17 | Bellcrank | |
| 157973 | 7-8 | Extension, Transfer | |
| 157979 | 7-26 | Link, Toggle | |
| 157990 | 7-5 | Bracket w/Bearing | |
| 157991 | 7-5 | Stud | |
| 158286 | 7-3 | Transformer | |
| 158335 | 7-17 | Stud | |
| 158352 | 7-14 | Bail, Trip | |
| 158353 | 7-14 | Bail, Stop | |
| 158354 | 7-14 | Arm, Extension | |
| 158365 | 7-6 | Blade, Reset | |
| 158777 | 7-23 | Holder, Screw | |
| 159341 | 7-10,-13 | Bearing, Ball | |
| 159611 | 7-2,-3 | Bell | |
| 160182 | 7-21 | Bracket w/Button | |
| 160184 | 7-21 | Plate, Stop | |
| 160186 | 7-21 | Bushing, Shoulder | |
| 160576 | 7-31 | Slide, Stripper | |

Table 7-1. Typing Unit – Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 160577 | 7-31 | Blade, Stripper | |
| 160843 | 7-14 | Spring | |
| 160944 | 7-18 | Washer, Felt | |
| 161342 | 7-20,-22 | Lever, Start | |
| 161346 | 7-25 thru -28 | Washer, Felt | |
| 161347 | 7-6,-17,-18 | Washer, Felt | |
| 162059 | 7-31,-32 | Lever, Function | |
| 162573 | 7-12 | Retainer | |
| 162728 | 7-5 | Arm | |
| 162729 | 7-5 | Bar, Guide | |
| 162765 | 7-22 | Bracket | |
| 163590 | 7-12 | Gear, 60T | |
| 163776 | 7-1 | Stop | |
| 163778 | 7-1 | Stud | |
| 163783 | 7-1 | Lever w/Stud | |
| 163787 | 7-1 | Bail, Detent | |
| 163788 | 7-4 | Bracket, Guide | |
| 163790 | 7-1,-2,-22 | Frame, Right | |
| 163791 | 7-1,-2 | Frame, Left | |
| 163948 | 7-1 | Gear, 28T | |
| 163949 | 7-1 | Bushing | |
| 163951 | 7-1 | Gear w/Shaft, 28T | |
| 163954 | 7-1 | Handwheel | |
| 163958 | 7-1 | Washer, Flat | |
| 163960 | 7-1 | Bushing | |

Table 7-1. Typing Unit – Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 164219 | 7-1 | Arm w/Hub | |
| 164220 | 7-1 | Spring, Torsion | |
| 164221 | 7-1 | Handwheel Assembly | |
| 164313 | 7-30 | Bracket | |
| 164316 | 7-16 | Plate, Clamp | |
| 164386 | 7-21 | Bracket, Magnet Mounting | |
| 164598 | 7-23 | Screw, 4-40 x 1/2 Hex | |
| 164611 | 7-1 | Guard | |
| 170062 | 7-17 | Bail | |
| 170063 | 7-17 | Lever | |
| 170066 | 7-29 | Code Bar | |
| 170067 | 7-13 | Washer, Spacing | |
| 170078 | 7-18 | Arm Assembly, Locklever | |
| 170079 | 7-18 | Arm w/Hub | |
| 170118 | 7-19 | Bracket | |
| 170123 | 7-19 | Bracket, Retaining | |
| 171954 | 7-23 | Shielding, Connector Blue | |
| 172502 | 7-31,-32 | Switch Assembly | |
| 172591 | 7-31,-32 | Spring, Contact Arm | |
| 172593 | 7-31,-32 | Plate, Contact | |
| 172597 | 7-31.-32 | Block, Contact | |
| 179396 | 7-33 | Plate, Front Type Box | |
| 179397 | 7-33 | Plate, Rear Type Box | |
| 179451 | 7-18 | Plate, Right | |

Table 7-1. Typing Unit – Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 179452 | 7-18 | Plate, Left | |
| 179675 | 7-28 | Bracket | |
| 179676 | 7-28 | Lever, Left Guide | |
| 179677 | 7-27,-28 | Shaft, Ribbon Spool | |
| 179678 | 7-27,-28 | Lever | |
| 179680 | 7-28 | Bail, Left Lifter | |
| 179681 | 7-27,-28 | Post | |
| 179682 | 7-28 | Bail, Left Roller | |
| 179684 | 7-27,-28 | Lever | |
| 179686 | 7-27 | Bracket, Right | |
| 179687 | 7-27 | Lever, Right Guide | |
| 179689 | 7-28 | Bracket, Left | |
| 179690 | 7-28 | Plate | |
| 179691 | 7-28 | Bracket, Left | |
| 179692 | 7-27,-28 | Spacer | |
| 179693 | 7-27 | Bail, Right Lifter | |
| 179694 | 7-27 | Bail, Right Roller | |
| 179695 | 7-28 | Bracket, Left Magnet | |
| 179696 | 7-28 | Bracket, Left Hinge | |
| 179697 | 7-28 | Lever, Left Stop | |
| 179698 | 7-27,-28 | Armature | |
| 179699 | 7-27,-28 | Shaft | |
| 179700 | 7-27 | Bracket, Right Hinge | |
| 179701 | 7-27 | Lever, Right Stop | |
| 179702 | 7-27 | Bracket, Right Magnet | |

Table 7-1. Typing Unit – Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 179703 | 7-27 | Bracket | |
| 179704 | 7-27 | Shaft, Right | |
| 179708 | 7-27 | Plate, Adjusting | |
| 179718 | 7-28 | Cable | |
| 179724 | 7-1,-27,-28 | Modification Kit | |
| 179999 | 7-25 thru -28 | Bail Spring | |
| 181284 | 7-12,-13 | Spring | |
| 183104 | 7-10,-11 | Spring | |
| 192518 | 7-29 | Codebar, Suppression | |
| 192567 | 7-18 | Link, Right Drive | |
| 192997 | 7-28 | Bracket | |
| 193936 | 7-32 | Modification Kit | |
| 193937 | 7-32 | Plate, Shift | |
| 193938 | 7-32 | Slide, Blocking | |
| 194144 | 7-12 | Clutch ASsembly, Spacing | |
| 194152 | 7-12 | Plate, Clamp | |
| 195150 | 7-28 | Lever, Reversing | |
| 195251 | 7-21 | Armature, Selector | |
| 195351 | 7-13 | Shaft, Main | |
| 195352 | 7-2 | Bracket, Signal Bell | |
| 195353 | 7-2 | Cable | |
| 195354 | 7-12 | Cam, Eccentric | |
| 195593 | 7-1 | Lever | |
| 195594 | 7-1 | Lever | |

Table 7-1. Typing Unit – Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 197844 | 7-32 | Stunt Box Assembly, AJF | |
| 197845 | 7-32 | Stunt Box Assembly, AJG | |
| 197996 | 7-27,-28 | Roller, Front | |
| 198584 | 7-2,-3 | Insulator, Bell | |
| 199410 | 7-18 | Arm | |
| 199437 | 7-12 | Cam | |
| 199438 | 7-12 | Hub | |
| 199439 | 7-12 | Bearing | |
| 199440 | 7-12,-13 | Screw, 6-40 x 5/8 Fil | |
| 199823 | 7-32 | Plate, Identification | |
| 304396 | 7-1 | Plate, Stop | |
| 304740 | 7-30 | Head, Print Hammer | |
| 305031 | 7-1 | Gear w/Shaft, 28T | |
| 305033 | 7-1 | Handwheel | |
| 305034 | 7-1 | Arm w/Hub | |
| 305050 | 7-1 | Handwheel Assembly | |
| 306755 | 7-20,-22 | Lever, Marking Lock | |
| 311691 | 7-23 | Bushing, Shoulder | |
| 311718 | 7-23 | Bushing, Shoulder | |
| 319200 | 7-24 | Set of Parts | |
| 319202 | 7-23 | Insulator | |
| 319204 | 7-22,-23 | Selector Assembly | |
| 319207 | 7-23 | Cover | |
| 319208 | 7-23 | Post | |
| 319209 | 7-23 | Plate, Nut | |

Table 7-1. Typing Unit — Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 319211 | 7-23 | Bracket, Coil Mounting | |
| 319212 | 7-23 | Bracket w/Button | |
| 319213 | 7-23 | Bushing | |
| 319214 | 7-23 | Screw, 6-40 Spl | |
| 319215 | 7-23 | Anchor, Spring | |
| 319216 | 7-23 | Wedge | |
| 319217 | 7-23 | Screw, Adjusting | |
| 319219 | 7-23 | Base w/Bushing | |
| 319220 | 7-23 | Armature | |
| 319221 | 7-23 | Spring | |
| 319223 | 7-23 | Lamination, Magnet | |
| 319225 | 7-22,-23 | Plate, Selector Mounting | |
| 319226 | 7-22 | Link | |
| 319227 | 7-22 | Link | |
| 319228 | 7-22 | Post | |
| 319229 | 7-22 | Screw, 4-40 Shoulder | |
| 319230 | 7-23 | Magnet Assembly | |
| 319231 | 7-24 | Post | |
| 319238 | 7-23 | Nut, 12-32 Hex | |
| 319240 | 7-23,-24 | Cable Assembly | |
| 319241 | 7-22 | Washer, Captive | |
| 319242 | 7-23 | Bushing, Slotted | |
| 319243 | 7-23 | Strip, 5" Shielded | |
| 319246 | 7-23 | Bushing | |

Table 7-1. Typing Unit – Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 319248 | 7-23 | Strap | |
| 320408 | 7-2,-31,-32 | Terminal, Spade Type | |
| 320418 | 7-3 | Terminal, Ring Type | |
| 321234 | 7-24 | Bracket, Connector Mounting | |
| 321235 | 7-23 | Connector, 3 Pt Plug | |
| 321236 | 7-23 | Coupling, Connector | |
| 321237 | 7-23 | Nut, 3/8-32 Spl | |
| 321238 | 7-23 | Sleeve | |
| 324142 | 7-23 | Connector, 3 Pt Rcpt | |
| 324498 | 7-3 | Bracket, Signal Bell | |
| 330530 | 7-3 | Bracket | |
| 330977 | 7-1 | Handwheel Assembly | |
| 330978 | 7-1 | Handwheel | |
| 333118 | 7-3 | Jumper | |
| 333132 | 7-3 | Plate | |
| 343938 | 7-5 | Arm, Slide | |
| 343939 | 7-5 | Bracket, Spring | |
| 344287 | 7-5 | Set of Parts | |
| 344958 | 7-30 | Spring | |

Table 7-2. Keyboard (KSR)/Base (RO) Unit

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 259M | 7-49 | Coil, Magnet | |
| 278M | 7-52 | Coil, Magnet | |
| 1028 | 7-49 | Screw, 4-40 x 1/4 Fil | |
| 1157 | 7-34,-37 | Screw, 8-32 x 1/2 Fil | |
| 1178 | 7-39 | Screw, 2-56 x 7/16 Fil | |
| 1210 | 7-35 | Screw, 2-56 x 5/8 Fil | |
| 2034 | 7-49 | Washer, Flat | |
| 2191 | 7-35,-36,-39, -42,-44,-46 thru -49,-50, -51,-52,-55 | Lockwasher | |
| 2422 | 7-44 | Lockwasher | |
| 2539 | 7-48 | Nut, 3/8-32 Hex | |
| 2669 | 7 -34,-35,-36 -51 | Lockwasher | |
| 3438 | 7-35,-36 | Washer, Flat | |
| 3595 | 7-51 | Nut, 1/4-32 Hex | |
| 3598 | 7-35,-36,-44, -46 -47 | Nut, 6-40 Hex | |
| 3599 | 7-35,-39,-50, -55 | Nut, 4-40 Hex | |
| 3640 | 7-35,-36,-42, -48,-49,-52 | Lockwasher | |
| 3646 | 7-35 thru -37 | Lockwasher | |
| 3650 | 7-49 | Washer, Flat | |
| 3870 | 7-49 | Spring | |
| 4703 | 7-51,-52 | Spring | |
| 6970 | 7-46 | Nut, 3/8-32 Hex | |

Table 7-2. Keyboard (KSR)/Base (RO) Unit- Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 7002 | 7-35,-36,-39, -42,-43,-44, -46,-47,-49, -50,-51 | Washer, Flat | |
| 7603 | 7-52 | Spring | |
| 7634 | 7-49 | Spring | |
| 7965 | 7-35,-36 | Spring | |
| 8330 | 7-42 | Washer, Flat | |
| 8449 | 7-35,-36 | Spacer, 0.094" Thk | |
| 27425 | 7-54 | Screw, 2-56 x 5/32 Fil | |
| 31636 | 7-39 | Spring | |
| 41663 | 7-40 | Washer, Flat | |
| 42823 | 7-48,-53 | Washer, Flat | |
| 45815 | 7-37,-43 | Lockwasher | |
| 49514 | 7-38 | Nut, 8-32 Hex | |
| 55669 | 7-35 | Spring | |
| 60669 | 7-42 | Spring | |
| 70072 | 7-36 | Lockwasher | |
| 71073 | 7-39,-50 | Washer, Flat | |
| 73175 | 7-34,-48 | Lockwasher | |
| 76099 | 7-46 | Washer, Flat | |
| 76474 | 7-34 | Nut, 10-32 Hex | |
| 78533 | 7-39 | Spring | |
| 78824 | 7-39 | Spring | |
| 80581 | 7-40 | Spring | |
| 82392 | 7-52 | Shim, 0.004" Thk | |

Table 7-2. Keyboard (KSR)/Base (RO) Unit – Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 84575 | 7-45,-47 | Spring | |
| 86079 | 7-49 | Washer, Felt | |
| 86774 | 7-46 | Screw, 6-40 Shoulder | |
| 90573 | 7-39 | Spring | |
| 90790 | 7-46,-49 | Washer, Flat | |
| 90951 | 7-39 | Lockwasher | |
| 91228 | 7-35,-36 | Strap, 2-1/2" Braided | |
| 92260 | 7-36,-37 | Lockwasher | |
| 92527 | 7-38 | Lockwasher | |
| 93117 | 7-35,-36,-42, -53 | Lockwasher | |
| 93118 | 7-50 | Lockwasher | |
| 93356 | 7-49 | Washer, Felt | |
| 94660 | 7-38 | Connector | |
| 97394 | 7-35,-36 | Screw, 6-40 Shoulder | |
| 98601 | 7-35 | Spacer, 0.312" Thk | |
| 98726 | 7-47 | Screw, 3-48 x 1/4 Fil | |
| 98832 | 7-47 | Screw, 4-40 x 11/16 Fil | |
| 99082 | 7-35,-36 | Screw, 8-32 x 11/16 Hex | |
| 99222 | 7-44 | Spring, Compression | |
| 101633 | 7-47,-51 | Washer, Flat | |
| 101796 | 7-42,-43 | Washer, Felt | |
| 102057 | 7-35,-36 | Screw, 4-40 Shoulder | |
| 105028 | 7-49 | Wick, Felt | |
| 107256 | 7-35,-36 | Setscrew, 4-40 | |

Table 7-2. Keyboard (KSR)/Base (RO) Unit- Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 110435 | 7-35,-36 | Nut, 4-40 Hex | |
| 110743 | 7-39,-42,-47, -48,-50,-52, -53, -55 | Lockwasher | |
| 111017 | 7-46,-47,-50 | Screw, 6-40 x 5/16 Fil | |
| 112626 | 7-35,-36 | Nut, 10-32 Hex | |
| 112627 | 7-44 | Nut, 2-56 Hex | |
| 114858 | 7-36,-37,-47, -55 | Connector, 6 Pt Receptacle | |
| 115122 | 7-39 | Washer, Felt | |
| 115358 | 7-40,-42 | Fuse, 1 Amp | |
| 116549 | 7-53 | Pin | |
| 116783 | 7-36,-40,-42 | Holder, Fuse | |
| 117608 | 7-40 | Nut, Speed | |
| 119648 | 7-42,-47 | Ring, Retaining | |
| 119649 | 7-44,-49 | Ring, Retaining | |
| 119651 | 7-35,-36,-39 -44 | Ring, Retaining | |
| 119652 | 7-35,-36,-40, -46 | Ring, Retaining | |
| 119653 | 7-45,-49,-52, -54 | Ring, Retaining | |
| 119655 | 7-46 | Ring, Retaining | |
| 120824 | 7-48 | Washer, Felt | |
| 121125 | 7-49 | Washer, Spring | |
| 121242 | 7-50,-55 | Clamp, 1/8 ID Cable | |
| 121243 | 7-46 | Clamp, 3/16 ID Cable | |
| 121244 | 7-49,-51,-55 | Clamp, 1/4 ID Cable | |

Table 7-2. Keyboard (KSR)/Base (RO) Unit — Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 121247 | 7-47 | Clamp, 7/16 ID Cable | |
| 121248 | 7-47 | Clamp, 1/2 ID Cable | |
| 121584 | 7-42 | Screw, 6-40 Shoulder | |
| 124220 | 7-37,-55 | Pin, Drive | |
| 124516 | 7-34 | Grommet, Rubber | |
| 125011 | 7-39,-44,-47, -49,-52 | Washer, Flat | |
| 125015 | 7-49,-51,-52 | Washer, Flat | |
| 125112 | 7-50 | Screw, 2-56 x 1/8 Fil | |
| 125126 | 7-44 | Screw, 2-56 x 9/32 Fil | |
| 125170 | 7-38 | Screw, 8-32 x 5/16 Fil | |
| 125178 | 7-43 | Screw, 6-40 Shoulder | |
| 125181 | 7-35,-36,-42 | Screw, 2-56 x 3/8 Fil | |
| 125268 | 7-35,-36 | Spring | |
| 125802 | 7-47 | Washer, Flat | |
| 126241 | 7-50 | Lockwasher | |
| 128357 | 7-42,-44 | Ring, Retaining | |
| 129290 | 7-53 | Disc, Adjusting | |
| 129292 | 7-53 | Lever, Clutch Shoe | |
| 129661 | 7-47,-51 | Hub | |
| 129919 | 7-36,-40,-42 | Fuse, SL-BL 4 Amp | |
| 130130 | 7-35,-36 | Screw, 4-40 Shoulder | |
| 130499 | 7-46,-51 | Bearing, Ball | |
| 130667 | 7-51 | Lockwasher | |
| 135563 | 7-55 | Jumper, 2-3/4" Green | |

Table 7-2. Keyboard (KSR)/Base (RO) Unit -Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 142379 | 7-46 | Pin, Roll | |
| 142898 | 7-42 | Connector, 24 Pt Plug | |
| 142899 | 7-47 | Connector, 24 Pt Rcpt | |
| 143097 | 7-53 | Ring, Retaining | |
| 145313 | 7-46 | Washer, Felt | |
| 145321 | 7-42 | Tie, Cable | |
| 145365 | 7-46 | Pinion, 20T | |
| 145366 | 7-46 | Gear, 56T | |
| 145367 | 7-46 | Shaft, Drive | |
| 145368 | 7-46 | Gear, 27T | |
| 145370 | 7-46 | Gear, 42T | |
| 145372 | 7-46 | Shaft | |
| 145373 | 7-46 | Gear, 66T | |
| 145375 | 7-46 | Gear, 63T | |
| 145376 | 7-46 | Gear, 48T | |
| 145381 | 7-46 | Washer, Thrust | |
| 145383 | 7-46 | Key | |
| 145384 | 7-46 | Pin, Guide | |
| 145385 | 7-46 | Spring, Compression | |
| 145386 | 7-46 | Sleeve | |
| 145389 | 7-46 | Shaft, Idler | |
| 145390 | 7-46 | Pinion, 25T | |
| 145393 | 7-46 | Bushing | |
| 148157 | 7-40 | Knob, Gray | |

Table 7-2. Keyboard (KSR)/Base (RO) Unit—Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 150000 | 7-53 | Drum, Clutch | |
| 150013 | 7-48 | Disc, Adjusting | |
| 150026 | 7-48 | Lever, Shoe Release | |
| 150029 | 7-48,-53 | Wick, Felt | |
| 150040 | 7-48 | Screw, 6-40 x 5/8 Fil | |
| 150043 | 7-48,-53 | Shoe, Secondary Clutch | |
| 150044 | 7-48,-53 | Shoe, Primary Clutch | |
| 150241 | 7-48,-53 | Spring | |
| 150351 | 7-51 | Stud, Eccentric | |
| 150507 | 7-42 | Spring | |
| 150966 | 7-46,-47,-50 | Insulator, Terminal | |
| 151080 | 7-35 | Washer, Flat | |
| 151113 | 7-35,-36 | Strip, Mounting | |
| 151146 | 7-35,-36 | Strap, Mounting | |
| 151152 | 7-39,-42,-47, -49, -52 | Screw, 4-40 x 3/16 Hex | |
| 151234 | 7-39 | Ratchet, 27T | |
| 151235 | 7-39 | Ratchet, 28T | |
| 151236 | 7-39 | Hub | |
| 151237 | 7-39 | Spring, Flat | |
| 151240 | 7-39 | Pawl, Latch | |
| 151241 | 7-39 | Lever, Latching | |
| 151245 | 7-46 | Washer, Felt | |
| 151249 | 7-41 | Keytop | |
| 151250 | 7-41 | Keytop | |

Table 7-2. Keyboard (KSR)/Base (RO) Unit– Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 151329 | 7-39 | Switch, Sensitive | |
| 151335 | 7-46,-47 | Stud | |
| 151398 | 7-42 | Spring | |
| 151415 | 7-46,-47,-50 | Block Terminal | |
| 151416 | 7-46,-47,-50 | Nut, 6-40 Hex | |
| 151572 | 7-47,-51 | Lockwasher | |
| 151574 | 7-42,-43 | Grommet, Rubber | |
| 151606 | 7-51 | Screw, 10-32 x 1/4 Hex | |
| 151610 | 7-46,-51 | Washer, Flat | |
| 151629 | 7-42 | Nut, 6-40 Lug | |
| 151630 | 7-35,-36,-46 -48 thru -52 | Screw, 6-40 x 1/4 Hex | |
| 151631 | 7-46,-47,-48, -50,-51,-52 | Screw, 6-40 x 5/16 Hex | |
| 151632 | 7-44,-46,-49, -51 | Screw, 6-40 x 3/8 Hex | |
| 151637 | 7-35,-36 | Screw, 4-40 x 1/4 Fil | |
| 151657 | 7-47,-51 | Screw, 6-40 x 1/4 Fil | |
| 151658 | 7-46 | Screw, 6-40 x 5/16 Fil | |
| 151659 | 7-47,-51 | Screw, 6-40 x 1/2 Fil | |
| 151694 | 7-46 | Screw, 6-40 x 11/32 Fil | |
| 151721 | 7-47 | Screw, 6-40 x 3/4 Hex | |
| 151722 | 7-35,-36,-37, -49,-50 | Screw, 6-40 x 3/16 Hex | |
| 151723 | 7-35,-36,-37 | Screw, 10-32 x 3/8 Hex | |
| 151728 | 7-53 | Spring | |
| 151737 | 7-48,-49,-53 | Screw, 4-40 x 11/64 Hex | |

Table 7-2. Keyboard (KSR)/Base (RO) Unit- Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 151827 | 7-46,-47 | Strap, Terminal | |
| 151879 | 7-39 | Stud | |
| 151880 | 7-47 | Nut, 4-40 Hex | |
| 151885 | 7-39 | Plate, Nut | |
| 151886 | 7-39 | Stud | |
| 151988 | 7-49 | Modification Kit | |
| 151989 | 7-38 | Suppressor, Elec Noise | |
| 152466 | 7-35,-36,-37, -55 | Connector, 20 Pt Plug | |
| 152887 | 7-53 | Screw, 4-40 x 1/2 Hex | |
| 152891 | 7-52 | Spring | |
| 152893 | 7-47,-49 | Screw, 4-40 x 1/4 Hex | |
| 153304 | 7-51 | Bushing, Shoulder | |
| 153539 | 7-42 | Screw, 6-40 x 11/16 Hex | |
| 153577 | 7-46 | Washer, Felt | |
| 153631 | 7-47 | Network, Spark Suppression | |
| 153819 | 7-47 | Lockwasher | |
| 153841 | 7-47 | Screw, 6-40 x 9/16 Hex | |
| 154047 | 7-51 | Post, Spring | |
| 154084 | 7-39 | Bearing, Needle | |
| 154208 | 7-35 | Bracket, Switch | |
| 154694 | 7-48 | Disc, Clutch Cam | |
| 155099 | 7-36 | Screw, 6-40 Shoulder | |
| 155750 | 7-35,-36,-37, -42,-47,-55 | Sleeve, 3/32 ID x 1/2" Lg Insulating | |

Table 7-2. Keyboard (KSR)/Base (RO) Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 155753 | 7-36,-42,-55 | Sleeve, 1/8 ID x 1/2" Lg Insulating | |
| 155755 | 7-36,-42,-55 | Sleeve, 11/64 ID x 5/8" Lg Insulating | |
| 155859 | 7-37,-55 | Screw, 4-40 Spl | |
| 155861 | 7-37,-55 | Lockwasher | |
| 156532 | 7-49 | Core | |
| 156740 | 7-51 | Screw, 6-40 x 7/32 Hex | |
| 157184 | 7-42,-51 | Washer, Felt | |
| 157195 | 7-50 | Stud | |
| 157987 | 7-43 | Washer, Insulating | |
| 158163 | 7-35 | Switch, Sensitive | |
| 158164 | 7-35 | Lever w/Hub | |
| 158250 | 7-46 | Block, Terminal | |
| 158252 | 7-46 | Insulator, Terminal Block | |
| 158745 | 7-46,-48,-51 | Clamp, Bearing | |
| 158751 | 7-49 | Plate, Clutch Trip | |
| 158757 | 7-49 | Hinge, Mounting | |
| 158758 | 7-49 | Shaft | |
| 158760 | 7-49 | Post, Spring | |
| 158761 | 7-49 | Bail, Armature | |
| 158766 | 7-47 | Screw, 6-40 Contact | |
| 158767 | 7-47 | Guide, Lever | |
| 158768 | 7-47 | Terminal | |
| 158770 | 7-47 | Terminal, Spring Holder | |
| 158777 | 7-47 | Holder, Screw | |

Table 7-2. Keyboard (KSR)/Base (RO) Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 158778 | 7-47 | Post, Spring | |
| 158779 | 7-47 | Lever, Cam Follower | |
| 158780 | 7-47 | Guide | |
| 158781 | 7-47 | Rocker, Contact | |
| 158788 | 7-48 | Clamp, Bearing | |
| 158797 | 7-48 | Drum, Clutch | |
| 158807 | 7-36 | Screw, 3-48 x 11/64 Fil | |
| 158850 | 7-48 | Bearing, Sleeve | |
| 158883 | 7-47 | Spring, Compression | |
| 158895 | 7-48 | Clip | |
| 158896 | 7-49 | Lever, Latch | |
| 158926 | 7-48 | Screw, 4-40 x 7/32 Hex | |
| 159003 | 7-52 | Core | |
| 159287 | 7-46 | Retainer, Pinion | |
| 159341 | 7-46,-48 | Bearing, Ball | |
| 159800 | 7-47 | Spring | |
| 159805 | 7-36 | Washer, Flat | |
| 159980 | 7-39 | Post, Spring | |
| 160087 | 7-52 | Post, Spring | |
| 160455 | 7-49 | Spring | |
| 161301 | 7-46 | Post | |
| 161347 | 7-39 | Washer, Felt | |
| 161440 | 7-52 | Spring | |
| 161837 | 7-49 | Bracket | |

Table 7-2. Keyboard (KSR)/Base (RO) Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 161912 | 7-40 | Switch, SP-ST | |
| 161922 | 7-46 | Post | |
| 162333 | 7-35,-36 | Stud, Locating | |
| 162659 | 7-46 | Retainer | |
| 162886 | 7-44 | Screw, 4-40 x 7/32 Hex | |
| 163327 | 7-45,-54 | Ring, Retaining | |
| 164974 | 7-48 | Plate, Retaining | |
| 164975 | 7-48 | Shaft w/Bearing | |
| 164976 | 7-47 | Plate | |
| 164977 | 7-47 | Shaft, Lever | |
| 164981 | 7-49 | Lever, Trip | |
| 164982 | 7-49 | Lever, Trip | |
| 164984 | 7-47 | Block Assembly | |
| 165082 | 7-46 | Clamp, Cable | |
| 165083 | 7-46 | Keeper, Clamp | |
| 172760 | 7-49 | Armature | |
| 172961 | 7-36 | Screw, 6-40 Stop | |
| 174250 | 7-46 | Pin, Roll | |
| 174452 | 7-51 | Spacer, 0.085" Thk | |
| 174506 | 7-47 | Block, Contact | |
| 174570 | 7-36 | Switch | |
| 174588 | 7-36 | Actuator, Switch | |
| 176326 | 7-47,-51 | Screw, 10-32 Shoulder | |
| 176722 | 7-47,-49 | Plate, Mounting | |
| 178332 | 7-47 | Bracket | |

Table 7-2. Keyboard (KSR)/Base (RO) Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 178535 | 7-47 | Network, Spark Suppression | |
| 178707 | 7-42 | Bumper, Rubber | |
| 178839 | 7-40 | Nut, 11/32-32 Hex | |
| 179782 | 7-47 | Screw, 6-40 x 7/8 Hex | |
| 180000 | 7-42,-45 | Frame, Keyboard | |
| 180002 | 7-45 | Code Bar, No. 1 Rear | |
| 180003 | 7-45 | Code Bar, No. 1 Front | |
| 180004 | 7-45 | Code Bar, No. 2 Rear | |
| 180005 | 7-45 | Code Bar, No. 2 Front | |
| 180006 | 7-45 | Code Bar, No. 3 Rear | |
| 180007 | 7-45 | Code Bar, No. 3 Front | |
| 180008 | 7-45 | Code Bar, No. 4 Rear | |
| 180009 | 7-45 | Code Bar, No. 4 Front | |
| 180010 | 7-45 | Code Bar, No. 5 Rear | |
| 180011 | 7-45 | Code Bar, No. 5 Front | |
| 180028 | 7-45 | Lever | |
| 180029 | 7-45 | Lever | |
| 180030 | 7-45,-54 | Lever, Latch | |
| 180031 | 7-42 | Spring, Compression | |
| 180032 | 7-54 | Lever, Non-Repeat | |
| 180033 | 7-45,-54 | Shaft | |
| 180036 | 7-45 | Code Bar, Universal | |
| 180040 | 7-42 | Block, Contact | |
| 180041 | 7-42 | Spring | |

Table 7-2. Keyboard (KSR)/Base (RO) Unit- Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 180043 | 7-42 | Wire, Contact | |
| 180044 | 7-42 | Terminal, Tab Type | |
| 180046 | 7-42 | Bail, Contact Reset | |
| 180048 | 7-40 | Keylever | |
| 180049 | 7-40 | Keylever | |
| 180050 | 7-40 | Keylever | |
| 180054 | 7-40 | Keylever, Space Bar | |
| 180055 | 7-45 | Keylever, Space | |
| 180056 | 7-45 | Link, Space | |
| 180057 | 7-40 | Bar, Space | |
| 180061 | 7-41 | Keytop | |
| 180064 | 7-40 | Keylever, Repeat | |
| 180069 | 7-40 | Keylever, Line Break | |
| 180072 | 7-40 | Keylever, Line Break | |
| 180077 | 7-45 | Link | |
| 180078 | 7-40,-45 | Spring, Compression | |
| 180081 | 7-42 | Bracket, Right Keyboard | |
| 180082 | 7-42 | Bracket, Left Keyboard | |
| 180083 | 7-45 | Spring | |
| 180088 | 7-40 | Spring, Compression | |
| 180094 | 7-42 | Insulator | |
| 180096 | 7-45 | Link | |
| 180099 | 7-42 | Fastener | |
| 180100 | 7-45 | Guide | |
| 180101 | 7-42 | Wire, Contact | |

Table 7-2. Keyboard (KSR)/Base (RO) Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 180160 thru 180203 | 7-41 | Keytop | |
| 180205 thru 180208 | 7-41 | Keytop | |
| 180210 | 7-41 | Keytop | |
| 180211 | 7-41 | Keytop | |
| 180213 thru 180250 | 7-41 | Keytop | |
| 180257 | 7-41 | Keytop | |
| 180273 thru 180277 | 7-41 | Keytop | |
| 180299 | 7-41 | Keytop | |
| 180342 | 7-41 | Keytop | |
| 180343 | 7-41 | Keytop | |
| 180389 | 7-41 | Keytop | |
| 180390 | 7-41 | Keytop | |
| 180586 | 7-42 | Sleeve, 5/32 ID x 21/32" Lg Insulating | |
| 181241 | 7-42 | Screw w/Lockwasher 6-40 x 1/4 | |
| 181253 | 7-41 | Keytop | |
| 181284 | 7-48 | Spring | |
| 181310 | 7-45 | Lever | |
| 181891 | 7-36 | Sleeve, 3/16 ID x 1" Lg Insulating | |
| 182285 | 7-34 | Bumper, Rubber | |

Table 7-2. Keyboard (KSR)/Base (RO) Unit- Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 182726 | 7-42,-43 | Terminal, Receptacle Type | |
| 183951 | 7-42 | Spring, Contact | |
| 184105 | 7-42 | Block, Contact | |
| 185229 thru 185241 | 7-41 | Keytop | |
| 185798 | 7-45,-54 | Spring | |
| 186253 | 7-43 | Lever, w/Hub | |
| 186314 | 7-42 | Spring | |
| 186342 | 7-45 | Code Bar, Universal | |
| 186436 | 7-42 | Guideplate | |
| 192025 | 7-46 | Washer, Flat | |
| 192538 | 7-40 | Plug, Button | |
| 193567 | 7-49 | Post, Spring | |
| 195158 | 7-46 | Bracket w/Bearings | |
| 195160 | 7-46 | Pinion, 20T | |
| 195263 | 7-46 | Gear, 22T | |
| 195264 | 7-46 | Gear, 49T | |
| 195284 | 7-50 | O-Ring | |
| 195300 | 7-35,-36 | Plate, Mounting | |
| 195301 | 7-35,-36 | Mount, Vibration | |
| 195303 | 7-40 | Cover, Keyboard | |
| 195304 | 7-40 | Keylever | |
| 195305 | 7-42 | Terminal, Common | |
| 195308 | 7-45 | Spring | |

Table 7-2. Keyboard (KSR)/Base (RO) Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 195309 | 7-45 | Lever, Nonrepeat | |
| 195310 | 7-42 | Terminal, Clutch Trip | |
| 195311 | 7-42 | Cable Assembly | |
| 195312 | 7-42 | Lever, Reset | |
| 195315 | 7-42 | Solenoid w/Plunger | |
| 195317 | 7-42 | Pin | |
| 195320 | 7-42 | Plate, Mounting | |
| 195321 | 7-42 | Bracket, Switch | |
| 195322 | 7-42 | Switch | |
| 195324 | 7-35 | Cable Assembly | |
| 195327 | 7-46 | Bracket, Terminal Block | |
| 195325 | 7-34,-42 | Pan w/Bracket | |
| 195329 | 7-35 | Plate, Distributor Mtg | |
| 195331 | 7-35 | Screw w/Lockwasher, 1/4-32 Hex | |
| 195334 | 7-35,-36 | Plate, Nut | |
| 195335 | 7-35,-36 | Shaft, Gear Shift | |
| 195336 | 7-35,-36 | Clamp | |
| 195337 | 7-35,-36 | Plate, Stop | |
| 195338 | 7-35,-36 | Link, Gear Shift | |
| 195339 | 7-35,-36 | Bracket | |
| 195340 | 7-35 | Bail, Function | |
| 195341 | 7-35,-36 | Bracket, Guide | |
| 195343 | 7-35,-36 | Bail w/Stud | |
| 195344 | 7-35 | Bail w/Stud | |

Table 7-2. Keyboard (KSR)/Base (RO) Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 195345 | 7-35,-36 | Link, LOC LF Function | |
| 195346 | 7-35,-36 | Link, LOC CR Function | |
| 195347 | 7-35,-36 | Guide, Function Link | |
| 195348 | 7-35,-36 | Bracket, LOC CR | |
| 195349 | 7-35,-36 | Knob, Speed Selector | |
| 195350 | 7-35 | Bracket, Connector | |
| 195364 | 7-46 | Shaft, Drive | |
| 195367 | 7-47 | Gear, 81T | |
| 195369 | 7-47,-48 | Casting | |
| 195370 | 7-47 | Bracket, Terminal Strap | |
| 195375 | 7-35,-36 | Plate | |
| 195378 | 7-47 | Bracket, Left Mounting | |
| 195379 | 7-47 | Bracket, Right Mounting | |
| 195550 | 7-47 | Cable Assembly | |
| 195551 | 7-47 | Insulator | |
| 195552 | 7-35,-36 | Cable Assembly | |
| 195553 | 7-39 | Stop Assembly, Motor | |
| 195554 | 7-39 | Cable Assembly | |
| 195555 | 7-39 | Bracket | |
| 195556 | 7-39 | Pawl, Contact | |
| 195557 | 7-39 | Stop | |
| 195558 | 7-39 | Lever w/Bushing | |
| 195562 | 7-39 | Lever, Pawl | |
| 198566 | 7-36 | Switch, Rocker Type | |
| 198572 | 7-36 | Bail, LOC LF Function | |

Table 7-2. Keyboard (KSR)/Base (RO) Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 198574 | 7-36 | Bracket, Fuse Holder | |
| 198576 | 7-47,-51 | Gear, 40T | |
| 198577 | 7-47,-51 | Gear, 72T | |
| 198579 | 7-48 | Camsleeve | |
| 198580 | 7-46 | Gear, 21T | |
| 198581 | 7-34,-36 | Pan w/Bracket | |
| 198582 | 7-36 | Bail w/Stud | |
| 198583 | 7-36 | Bracket, Switch | |
| 198670 | 7-43,-44 | Screw, w/Lockwasher 6-40 x 5/16 Hex | |
| 198679 | 7-35,-36 | Bracket, Bolt Retaining | |
| 198680 | 7-35,-36 | Screw, 10-32 Spl | |
| 199248 | 7-36 | Cable Assembly | |
| 304668 | 7-46 | Gear, 49T | |
| 304669 | 7-46 | Pinion, 21T | |
| 305051 | 7-34 | Stud | |
| 305545 | 7-47,-49 | Insulator | |
| 305706 | 7-42 | Shaft w/Link | |
| 305707 | 7-42 | Arm, Reset | |
| 305708 | 7-42 | Bracket, Solenoid | |
| 307544 | 7-55 | Jumper, 6" Green | |
| 307545 | 7-55 | Jumper, 2" Green | |
| 317208 | 7-47 | Terminal | |
| 318987 | 7-43 | Strap, 3-1/2" Braided | |
| 319238 | 7-50 | Nut, 12-32 Hex | |

Table 7-2. Keyboard (KSR)/Base (RO) Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 320410 | 7-39,-50,-52 -55 | Terminal, Spade Type | |
| 320418 | 7-35 thru -38, -42,-47,-52 -55 | Terminal, Ring Type | |
| 320419 | 7-35,-36 | Terminal, Ring Type | |
| 320420 | 7-43 | Terminal, Ring Type | |
| 320421 | 7-35,-36 | Terminal, Ring Type | |
| 323118 | 7-50 thru -53 | Distributor Assembly | |
| 324497 | 7-37 | Cable Assembly | |
| 324523 | 7-37 | Cable Assembly | |
| 324527 | 7-37 | Bracket | |
| 325970 | 7-36,-47,-55 | Pin | |
| 326632 | 7-36 | Lever, Slide | |
| 326633 | 7-36 | Bail w/Stud | |
| 326634 | 7-36 | Bracket, Switch | |
| 327326 | 7-35 | Jumper, 2-3/4" Green | |
| 329266 | 7-43,-50 | Lamp, Incandescent | |
| 329267 | 7-43,-50 | Mount, Shock | |
| 329268 | 7-43 | Lamp Assembly | |
| 329269 | 7-50 | Lamp Assembly | |
| 329271 | 7-44 | Shaft Assembly, Trip | |
| 329272 | 7-55 | Diode w/Terminals | |
| 329274 | 7-55 | Cable Assembly | |
| 330861 | 7-34,-37 | Nut, 8-32 Shoulder | |
| 333028 | 7-55 | Connector, 6 Pt Rcpt | |

Table 7-2. Keyboard (KSR)/Base (RO) Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 333029 | 7-55 | Connector, 6 Pt Plug | |
| 333057 | 7-43 | Plate | |
| 333058 | 7-43 | Guide, Shutter | |
| 333059 | 7-43 | Shutter | |
| 333060 | 7-43 | Plate | |
| 333066 | 7-43 | Bracket, Left, Keyboard | |
| 333067 | 7-43 | Bracket, Right, Keyboard | |
| 333068 | 7-53 | Roller | |
| 333078 | 7-55 | Cable Assembly | |
| 333079 | 7-55 | Cable Assembly | |
| 333081 | 7-52 | Plate, Adjusting | |
| 333085 | 7-50 | Bracket | |
| 333086 | 7-52 | Plate | |
| 333087 | 7-52 | Bracket, Magnet | |
| 333088 | 7-50 | Plate | |
| 333089 | 7-51 | O-Ring | |
| 333091 | 7-51 | Drum | |
| 333092 | 7-50,-51,-52 | Bracket | |
| 333093 | 7-53 | Bearing | |
| 333094 | 7-43 | Photo Cell | |
| 333096 | 7-51 | Spacer, 0.435" Thk | |
| 333098 | 7-50,-51 | Bracket | |
| 333099 | 7-51 | Lever | |
| 333100 | 7-53 | Spacer, 0.289" Thk | |

Table 7-2. Keyboard (KSR)/Base (RO) Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 333101 | 7-54 | Plate, Stop | |
| 333103 | 7-53 | Disc | |
| 333105 | 7-44 | Plate | |
| 333106 | 7-44 | Guide w/Post | |
| 333108 | 7-44 | Bail, Function | |
| 333109 | 7-44 | Shaft w/Lever | |
| 333110 | 7-44 | Bracket | |
| 333111 | 7-44 | Link | |
| 333112 | 7-44 | Link | |
| 333113 | 7-44 | Spacer, 0.060" Thk | |
| 333116 | 7-50 | Cover | |
| 333117 | 7-53 | Arm, Drive | |
| 333119 | 7-52 | Armature | |
| 333120 | 7-52 | Lever | |
| 333121 | 7-52 | Bail, Latch | |
| 333122 | 7-44,-52 | Bail, Reset | |
| 333123 | 7-52 | Lever, Latch | |
| 333124 | 7-52 | Lever, Trip | |
| 333126 | 7-54 | Lever | |
| 333127 | 7-55 | Cable Assembly | |
| 333133 | 7-55 | Bracket | |
| 333136 | 7-55 | Connector | |
| 333138 | 7-53 | Bushing | |
| 333148 | 7-50 | Photo Cell | |
| 333149 | 7-55 | Cable Assembly | |

Table 7-2. Keyboard (KSR)/Base (RO) Unit- Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 333150 | 7-50 | Pick-up Assembly, Photo | |
| 333151 | 7-52 | Cable Assembly | |
| 333152 | 7-52 | Trip Assembly, Clutch | |
| 333153 | 7-51 | Shaft | |
| 333154 | 7-55 | Cable Assembly | |
| 333155 | 7-53 | Clutch Assembly, Distr | |
| 334443 | 7-55 | Capacitor w/Terminals | |

Table 7-3. Motor Unit, LMU37 and LMU51

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 2191 | 7-56 | Lockwasher | |
| 2263 | 7-56 | Nut, 8-32 Hex | |
| 3640 | 7-56 | Lockwasher | |
| 71999 | 7-56 | Spring, Motor Thrust | |
| 87334 | 7-56 | Washer, Insulating | |
| 96264R | 7-56 | Jumper, 5" Red | |
| 102203 | 7-56 | Bushing | |
| 103160 | 7-56 | Strap, Ground, Green | |
| 122201 | 7-56 | Bearing, Ball | |
| 122207 | 7-56 | Strap Assembly, Motor Mtg | |
| 122211 | 7-56 | Washer, Pull | |
| 122220 | 7-56 | Oiler, Ball | |
| 122229 | 7-56 | Bolt, 8-32 x 4-11/16 Fil | |
| 122245 | 7-56 | Capacitor, Fixed, 43 to 48 MFD | |
| 122249 | 7-56 | Switch, Thermostatic | |
| 122251 | 7-56 | Stator, Motor | |
| 122252 | 7-56 | Shield Assembly, End | |
| 123769 | 7-56 | Fan, Motor (Early Design) | |
| 125011 | 7-56 | Washer, Flat | |
| 128874 | 7-56 | Rotor, Motor | |
| 150040 | 7-56 | Screw, 6-40 x 5/8 Fil | |
| 151620 | 7-56 | Strap, Motor Mounting | |
| 151621 | 7-56 | Screw, 6-32 x 3/4 Rd | |
| 151622 | 7-56 | Nut, 6-32 Sq | |

Table 7-3. Motor Unit, LMU37 and LMU51 - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 151637 | 7-56 | Screw, 4-40 x 1/4 Fil | |
| 151642 | 7-56 | Screw, 6-40 x 3/4 Fil | |
| 151687 | 7-56 | Screw, 4-40 x 7/16 Fil | |
| 151795 | 7-56 | Motor Assembly, Std, CCW, AC Synchronous, 1/2 HP, 115 V, 50/60 Hz, 3000/3600 RPM | |
| 151922 | 7-56 | Clamp, Capacitor | |
| 151923 | 7-56 | Relay, Motor Starting | |
| 151925 | 7-56 | Clamp, Capacitor | |
| 152297 | 7-56 | Washer, Bearing | |
| 153030 | 7-56 | Mount, Vibration | |
| 153049 | 7-56 | Washer, Insulating | |
| 194897 | 7-56 | Bracket w/Cradle, Motor | |
| 194899 | 7-56 | Cable w/Terminals | |
| 199721 | 7-56 | Bolt, 8-32 x 5-13/16 Fil | |
| 310341 | 7-56 | Insulator, Relay | |
| 332865 | 7-56 | Fan, Motor | |
| 334877 | 7-56 | Switch (50 Hz) | |

Table 7-4. Cover Unit

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 2034 | 7-57 | Washer, Flat | |
| 2191 | 7-57 | Lockwasher | |
| 3598 | 7-57 | Nut, 6-40 Hex | |
| 3599 | 7-57 | Nut, 4-40 Hex | |
| 3639 | 7-57 | Lockwasher | |
| 3640 | 7-57 | Lockwasher | |
| 7002 | 7-57,-58 | Washer, Flat | |
| 34432 | 7-57 | Washer, Flat | |
| 36463 | 7-57 | Spring | |
| 70314 | 7-57 | Washer, Flat | |
| 72254 | 7-57 | Washer, Flat | |
| 80531 | 7-57 | Washer, Flat | |
| 86457 | 7-57 | Screw, 10-32 Shoulder | |
| 90790 | 7-57 | Washer, Flat | |
| 92260 | 7-57,-58 | Lockwasher | |
| 102751 | 7-57 | Nut, 10-32 Shoulder Hex | |
| 107116 | 7-57 | Lockwasher | |
| 110434 | 7-57 | Screw, 4-40 x 3/16 Fil | |
| 110743 | 7-57 | Lockwasher | |
| 111345 | 7-57 | Bolt | |
| 111346 | 7-57 | Spring, Compression | |
| 112626 | 7-57 | Nut, 10-32 Hex | |
| 115241 | 7-57 | Bushing, Eccentric | |
| 115535 | 7-57 | Connector, 6 Pt Plug | |
| 117883 | 7-57 | Spacer | |

Table 7-4. Cover Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 119652 | 7-57 | Ring, Retaining | |
| 121244 | 7-57 | Clamp, 1/4 ID Cable | |
| 121246 | 7-57 | Clamp, 3/8 ID Cable | |
| 125015 | 7-57 | Washer, Flat | |
| 125229 | 7-57,-58 | Nut, 6-32 Hex | |
| 145466 | 7-58 | Spring, Compression | |
| 151152 | 7-57 | Screw, 4-40 x 3/16 Hex | |
| 151540 | 7-57 | Lampholder | |
| 151576 | 7-57 | Arm, Stop | |
| 151722 | 7-57 | Screw, 6-40 x 3/16 Hex | |
| 151731 | 7-57 | Screw, 4-40 x 7/8 Fil | |
| 151982 | 7-57 | Lamp, 6 V Incandescent | |
| 152893 | 7-57 | Screw, 4-40 x 1/4 Hex | |
| 153020 | 7-57 | Guide, Line | |
| 153021 | 7-57 | Spring, Torsion | |
| 153022 | 7-57 | Bushing, Guide Line | |
| 153042 | 7-57 | Window, Plastic | |
| 154433 | 7-57 | Clamp | |
| 155755 | 7-57 | Sleeve, 11/16 ID x 5/8" Lg Insulating | |
| 158286 | 7-57 | Transformer | |
| 160341 | 7-57 | Hinge, Left | |
| 160349 | 7-57 | Hinge, Right | |
| 164856 | 7-57 | Indicator, Red Neon | |
| 178707 | 7-57 | Bumper, Rubber | |

Table 7-4. Cover Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 179378 | 7-58 | Retainer, Keylever | |
| 192191 | 7-57 | Knob, Guide Line | |
| 195570 | 7-58 | Keylever Assembly, Break | |
| 195572 | 7-57 | Guide Assembly, Line | |
| 195575 | 7-57 | Bracket, Guide Line | |
| 195576 | 7-57 | Shaft, Guide Line | |
| 195577 | 7-57 | Frame, Window | |
| 195578 | 7-57 | Latch, Right | |
| 195579 | 7-57 | Latch, Left | |
| 198550 | 7-57 | Cover | |
| 198551 | 7-57 | Dome | |
| 198554 | 7-57 | Bracket, Right Latch | |
| 198555 | 7-57 | Bracket, Left Latch | |
| 198556 | 7-57 | Plunger | |
| 198557 | 7-57 | Bracket, Stop Arm | |
| 198558 | 7-57 | Spring, Torsion | |
| 198559 | 7-57 | Bracket, Right | |
| 198560 | 7-57 | Bracket, Left | |
| 198561 | 7-57 | Bracket, Transformer | |
| 198562 | 7-57 | Cable Assembly | |
| 198563 | 7-57 | Hood, Send-Receive | |
| 198565 | 7-58 | Hood, Receive-Only | |
| 198567 | 7-58 | Keylever Assembly, LOC LF | |
| 198568 | 7-58 | Keylever Assembly, LOC CR | |

Table 7-4. Cover Unit - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 198569 | 7-58 | Hood Assembly | |
| 198570 | 7-58 | Bracket, Keylever | |
| 199268 | 7-57 | Nameplate (Teletype) | |
| 199280 | 7-57 | Nameplate (WU) | |
| 320268 | 7-57 | Guide, Paper | |
| 320418 | 7-57 | Terminal, Ring Type | |
| 324148 | 7-57 | Label, CAUTION | |
| 325971 | 7-57 | Bracket, Connector | |
| 326629 | 7-58 | Keylever Assembly, LOC LF | |
| 326630 | 7-58 | Keylever Assembly, LOC CR | |
| 326631 | 7-58 | Keylever Assembly, Break | |
| 327911 | 7-57 | Plate, Identification | |
| 329266 | 7-57 | Lamp, Incandescent (Spare) | |
| 333140 | 7-57 | Holder, Spare Lamps | |

Table 7-5. Electrical Service Assemblies

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 1272 | 7-64 | Screw, 6-40 x 11/16 Fil | |
| 2191 | 7-59 thru -64 | Lockwasher | |
| 3598 | 7-60,-62,-64 | Nut, 6-40 Hex | |
| 3599 | 7-65 | Nut, 4-40 Hex | |
| 3650 | 7-67 | Washer, Flat | |
| 7001 | 7-60,-62,-64 | Washer, Flat | |
| 7002 | 7-59 thru 7-64 | Washer, Flat | |
| 7096 | 7-67 | Bushing, Insulating | |
| 39603RM | 7-67 | Strap, 5/8" Lg | |
| 55219 | 7-59,-63 | Screw, 8-32 x 3/8 Fil | |
| 60340RM | 7-68 | Sleeve, 1" Lg Insulating | |
| 83885 | 7-60,-64 | Nut, 6-32 Hex | |
| 92260 | 7-60,-64 | Lockwasher | |
| 92527 | 7-59,-61,-63 | Lockwasher | |
| 104807 | 7-67 | Washer, Flat | |
| 107116 | 7-59,-61,-63,-64 | Lockwasher | |
| 110743 | 7-60,-62,-64, -65,-67 | Lockwasher | |
| 111017 | 7-59 thru -64 | Screw, 6-40 x 5/16 Fil | |
| 116783 | 7-59,-61,-63 | Holder, Fuse | |
| 118146 | 7-66,-67,-68 | Resistor, 4700 Ohm | |
| 118147 | 7-68 | Resistor, 6800 Ohm | |
| 118149 | 7-68 | Resistor, 12,000 Ohm | |
| 118154 | 7-66 | Resistor, 47,000 Ohm | |
| 118177 | 7-66 | Resistor, 22,000 Ohm | |

Table 7-5. Electrical Service Assemblies - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 118179 | 7-68 | Resistor, 330,000 Ohm | |
| 118659 | 7-59,-61,-63 | Switch, Toggle | |
| 118720 | 7-66,-67 | Resistor, 100K Ohm | |
| 120175 | 7-59,-61,-63 | Plate, ON-OFF | |
| 120424 | 7-66 | Resistor, 4,300 Ohm | |
| 124611 | 7-61 | Screw, 8-32 x 3/8 Hex | |
| 125011 | 7-61,-63,-65 | Washer, Flat | |
| 129850 | 7-66,-67 | Resistor, 680 Ohm | |
| 129854 | 7-66,-67 | Resistor, 10,000 Ohm | |
| 131807 | 7-65 | Fuse, 0.5 Amp | |
| 135563 | 7-60,-64 | Jumper, 2-3/4" Green | |
| 137438 | 7-68 | Resistor, 100 Ohm | |
| 137442 | 7-66,-67 | Resistor, 1500 Ohm | |
| 137471 | 7-67 | Terminal, Lug | |
| 137604 | 7-66,-67 | Resistor, 620 Ohm | |
| 139143 | 7-67 | Resistor, 43,000 Ohm | |
| 144495 | 7-66,-67 | Pad, Transistor Mounting | |
| 144835 | 7-67 | Bushing, Spring | |
| 145781 | 7-59,-61,-63 | Grommet | |
| 145822 | 7-59,-61,-63 | Stud, Oval Head | |
| 150040 | 7-60,-62,-64 | Srew, 6-40 x 5/8 Fil | |
| 150089 | 7-65 | Screw, 6-40 x 5/8 Fil | |
| 151335 | 7-59 thru -64 | Stud | |
| 151416 | 7-59 thru -64 | Nut, 6-40 Hex | |
| 151629 | 7-60,-62,-64 | Nut, 6-40 Lug | |

Table 7-5. Electrical Service Assemblies - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 151630 | 7-59 thru -64 | Screw, 6-40 x 1/4" Hex | |
| 151631 | 7-59 thru -64 | Screw, 6-40 x 5/16 Hex | |
| 151637 | 7-60,-62,-64,-65, | Screw, 4-40 x 1/4 Fil | |
| 151659 | 7-60,-62,-64 | Screw, 6-40 x 1/2 Fil | |
| 151685 | 7-67 | Screw, 4-40 x 5/16 Fil | |
| 151687 | 7-60,-62 | Screw, 4-40 x 7/16 Fil | |
| 151693 | 7-67 | Screw, 6-40 x 9/16 Fil | |
| 151722 | 7-59,-61,-63 | Screw, 6-40 x 3/16 Hex | |
| 151723 | 7-59,-61,-63 | Screw, 10-32 x 3/8 Hex | |
| 151880 | 7-67 | Nut, 4-40 Hex | |
| 152035 | 7-59,-61,-63 | Plug | |
| 152888 | 7-67 | Screw, 4-40 x 6/16 Hex | |
| 155753 | 7-59 thru -64 | Sleeve, 1/8 ID x 1/2" Lg | |
| 158250 | 7-59 thru -64 | Block, Terminal | |
| 158252 | 7-59 thru -64 | Insulator, Terminal Block | |
| 162360 | 7-59,-61,-63 | Fuse, SL-BL 0.8 Amp | |
| 165178 | 7-67 | Resistor, 3600 Ohm | |
| 171533 | 7-65 | Resistor, 4 Ohm | |
| 171583 | 7-67 | Capacitor, 0.003 MFD | |
| 171585 | 7-65 | Capacitor, 0.22 MFD | |
| 171587 | 7-67 | Capacitor, 0.25 MFD | |
| 171829 | 7-66,-67 | Capacitor, 0.15 MFD | |
| 171831 | 7-65 | Capacitor, 10 MFD | |
| 171954 | 7-60,-64 | Shielding, Connector Blue | |

Table 7-5. Electrical Service Assemblies - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 172726 | 7-60,-62,-64 | Resistor, 250 Ohm | |
| 177108 | 7-68 | Diode, D-2 | |
| 177113 | 7-65,-67 | Insulator | |
| 178844 | 7-65,-66,-67 | Varistor, 100A | |
| 178860 | 7-65,-66,-67 | Capacitor, 0.022 MFD | |
| 178864 | 7-66 | Resistor, 3900 Ohm | |
| 181266 | 7-65 | Bushing, Insulating | |
| 181618 | 7-68 | Capacitor, 0.01 MFD | |
| 181667 | 7-66,-67 | Diode, 1N750A | |
| 181675 | 7-67 | Transistor, Power | |
| 181999 | 7-60,-62,-64 | Insulator | |
| 182066 | 7-63 | Plate, Identification | |
| 182180 | 7-65 | Resistor, 200 Ohm | |
| 182284 | 7-60,-62,-64 | Insulator, 0.015" Thk | |
| 182520 | 7-65 | Diode, 1N4383 | |
| 182523 | 7-60,-62,-64 | Clamp, 1-3/8" ID Mounting | |
| 182773 | 7-67 | Potentiometer, 3 Ohm | |
| 185688 | 7-59 | Plate, Identification | |
| 195180 | 7-60,-64 | Bumper, Rubber | |
| 195245 | 7-59,-61,-63 | Sleeve, 1/2 ID x 1-1/2" Lg Insulating | |
| 197464 | 7-67 | Diode, 1N914 | |
| 198937 | 7-65 | Resistor, 2700 Ohm | |
| 300116 | 7-66 | Cover, Insulating | |
| 305298 | 7-65 | Resistor, 3300 Ohm | |

Table 7-5. Electrical Service Assemblies - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 305821 | 7-68 | Capacitor, 0.1 MFD | |
| 309868 | 7-66 | Resistor, 1300 Ohm | |
| 311664 | 7-65 | Resistor, 2500 Ohm | |
| 312284 | 7-65 | Capacitor, 1.5 MFD | |
| 312341 | 7-67 | Diode | |
| 312385 | 7-65 | Capacitor, 0.1 MFD | |
| 315976 | 7-68 | Capacitor, 470 PF | |
| 318835 | 7-65 | Transistor | |
| 320038 | 7-65 | Jack, Red Test | |
| 320039 | 7-65 | Jack, Black Test | |
| 320040 | 7-65 | Jack, Orange Test | |
| 320041 | 7-65 | Jack, Green Test | |
| 320042 | 7-65 | Jack, Slate Test | |
| 320048 | 7-68 | Capacitor, 0.5 MFD | |
| 320049 | 7-68 | Capacitor, 0.15 MFD | |
| 320056 | 7-59,-61,-63 | Bracket | |
| 320057 | 7-60,-64 | Cover, Top | |
| 320058 | 7-60,-64 | Cover, Bottom | |
| 320410 | 7-59,-60,-62,-64 | Terminal, Spade Type | |
| 320418 | 7-59 thru -64 | Terminal, Ring Type | |
| 321128 | 7-59,-61,-63 | Transformer, Power | |
| 321129 | 7-60,-62,-64 | Capacitor, 750 MFD | |
| 321130 | 7-65 | Circuit Card Assembly | |
| 321133 | 7-59,-61,-63 | Inductor | |
| 321145 | 7-65 | Transistor, 2N2270 | |

Table 7-5. Electrical Service Assemblies - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 321148 | 7-67 | Sink, Heat | |
| 321149 | 7-67 | Diode, Zener | |
| 321153 | 7-67 | Spacer | |
| 321154 | 7-66 | Diode, 1N457A | |
| 321155 | 7-67 | Resistor, 2000 Ohm | |
| 321156 | 7-66,-67 | Diode, 1N482A | |
| 321157 | 7-66,-67 | Capacitor, 500 PF | |
| 321158 | 7-64,-67 | Capacitor, 0.1 MFD | |
| 321159 | 7-65,-67 | Choke | |
| 321160 | 7-67,-68 | Potentiometer, 5 Megohm | |
| 321161 | 7-66,-67 | Diode, 1N748A | |
| 321165 | 7-66,-67 | Transistor, 2N3638A | |
| 321166 | 7-66,-67 | Transistor, 2N1893 | |
| 321167 | 7-67 | Jumper, 2-7/8" Yellow | |
| 321168 | 7-67 | Jumper, 2-7/8" Blue | |
| 321169 | 7-67 | Jumper, 2-7/8" Orange | |
| 321170 | 7-67 | Jumper, 2-7/8" Red | |
| 321205 | 7-59,-61,-63 | Filter Assembly | |
| 321207 | 7-59,-61,-63 | Strip, Terminal | |
| 321208 | 7-59,-61,-63 | Plate, Mounting | |
| 321231 | 7-59,-60 | Electrical Service Assembly | |
| 321237 | 7-60,-64 | Nut, 3/8-32 Spl | |
| 321238 | 7-60,-64 | Sleeve | |
| 321246 | 7-60,-64 | Cable Assembly | |

Table 7-5. Electrical Service Assemblies - Continued

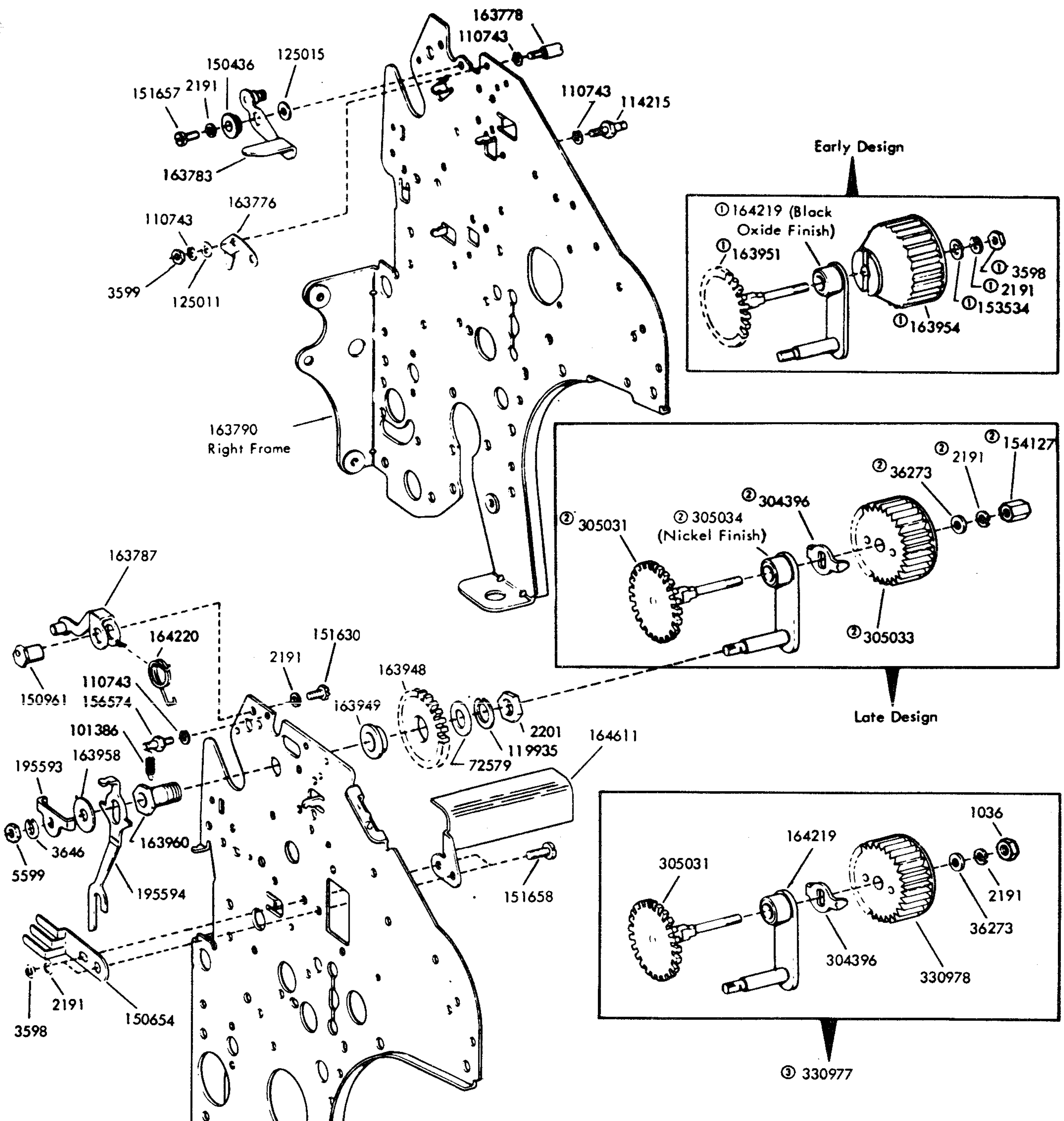
| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 321258 | 7-67 | Resistor, 20,000 Ohm | |
| 321259 | 7-67 | Resistor, 15 Ohm | |
| 321260 | 7-66 | Capacitor, 1 MFD | |
| 321261 | 7-66,-67 | Transistor, 2N4036 | |
| 321262 | 7-68 | Capacitor, 1 MFD | |
| 321264 | 7-67 | Capacitor, 2.7 MFD | |
| 321276 | 7-60,-64 | Bushing | |
| 321277 | 7-60,-64 | Clamp | |
| 321285 | 7-59,-61,-63 | Bracket, Mounting | |
| 321286 | 7-65 | Diode, 1N4749A | |
| 321288 | 7-65 | Sink, Heat | |
| 321290 | 7-65 | Circuit Card Assembly, PS | |
| 321292 | 7-67 | Resistor, 1300 Ohm | |
| 321299 | 7-67 | Circuit Board, Etched | |
| 321975 | 7-66 | Resistor, 33 Ohm | |
| 321995 | 7-59 thru -64 | Container, Outer | |
| 321996 | 7-59,-61,-63 | Cover | |
| 321997 | 7-59 thru -64 | Bracket | |
| 321998 | 7-60,-64 | Container | |
| 321999 | 7-60,-62,-64 | Bracket, Connector Mounting | |
| 323120 | 7-61,-62 | Electrical Service Assembly | |
| 323121 | 7-63,-64 | Electrical Service Assembly | |
| 323130 | 7-68 | Circuit Card Assembly, LLK | |
| 323147 | 7-68 | Resistor, 36,000 Ohm | |
| 323810 | 7-66 | Circuit Card Assembly, SMD | |

Table 7-5. Electrical Service Assemblies - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 323835 | 7-66 | Circuit Card, Etched | |
| 323841 | 7-66 | Resistor, 300 Ohm | |
| 323842 | 7-66 | Resistor, 21 Ohm | |
| 323843 | 7-66 | Resistor, 590 Ohm | |
| 323844 | 7-66 | Transistor, 2N3053 | |
| 323845 | 7-66 | Transistor, 40319 | |
| 323846 | 7-66 | Pad, Transistor Mounting | |
| 323847 | 7-66 | Sink, Heat | |
| 323934 | 7-68 | Transistor, 2N3565 | |
| 323964 | 7-66 | Potentiometer, 500,000 Ohm | |
| 323971 | 7-62 | Cable Assembly | |
| 324135 | 7-64 | Cable, 10" Long | |
| 324137 | 7-60,-64 | Cable, 8.5" Long | |
| 324138 | 7-62,-64 | Cable, 12.5" Long | |
| 324139 | 7-62 | Cable, 13.5" Long | |
| 324141 | 7-60,-64 | Connector, 3 Pt Plug | |
| 324144 | 7-66,-67,-68 | Transistor, 2N4121 | |
| 324147 | 7-66,-67,-68 | Pad, Transistor Mounting | |
| 324154 | 7-59,-61,-63 | Cable | |
| 324696 | 7-60,-64 | Coupling, Connector | |
| 324698 | 7-59,-61,-63 | Nut, No. 10 Speed | |
| 326270 | 7-60,-62,-64 | Connector, 15 Pt Circuit Card | |
| 326351 | 7-59,-61,-63 | Transformer Assembly | |
| 326352 | 7-59,-61,-63 | Cable Assembly, 10" Lg | |

Table 7-5. Electrical Service Assemblies - Continued

| Part Number | Figure Number(s) | Description | Notes |
|---|---|---|---|
| 326353 | 7-59,-61,-63 | Cable Assembly, 9" Lg | |
| 326369 | 7-60,-62,-64 | Cable, 8.0" Long | |
| 326374 | 7-64 | Label (P101) | |
| 326376 | 7-60,-64 | Label (P103) | |
| 326382 | 7-59,-61,-63 | Label | |
| 326390 | 7-60,-64 | Jumper w/Terminal, 9" Red | |
| 326776 | 7-66 | Capacitor, 0.47 MFD | |
| 327382 | 7-60,-64 | Spacer | |
| 327444 | 7-59,-61,-63 | Capacitor, 2 MFD | |
| 327783 | 7-59 | Label (321231) | |
| 327794 | 7-65 | Diode, Zener | |
| 329273 | 7-67 | Resistor, 470 Ohm | |
| 329275 | 7-67 | Resistor, 35 Ohm | |
| 333069 | 7-67 | Circuit Card Assembly, CMD | |
| 333074 | 7-68 | Circuit Board, Etched | |
| 333130 | 7-61 | Label (323120) | |
| 333131 | 7-63 | Label (323121) | |
| 333135 | 7-64 | Connector, 6 Pt Plug | |
| 333137 | 7-64 | Cable Assembly | |
| 333142 | 7-67 | Circuit Card Assembly (CMD) | |
| 343619 | 7-68 | Choke, Ferrite Bead | |




① 164221 Handwheel Assembly
② 305050 Handwheel Assembly
③ The 330977 Set of Parts must be ordered if the Typing Unit is equipped with the early design 164221 Handwheel Assembly and the 179724 Modification Kit (to provide two color, ribbon printing) is desired. See Figs. 7-27 & 7-28

Figure 7-1. Left and Right Side Frame (Sheet 1 of 3)

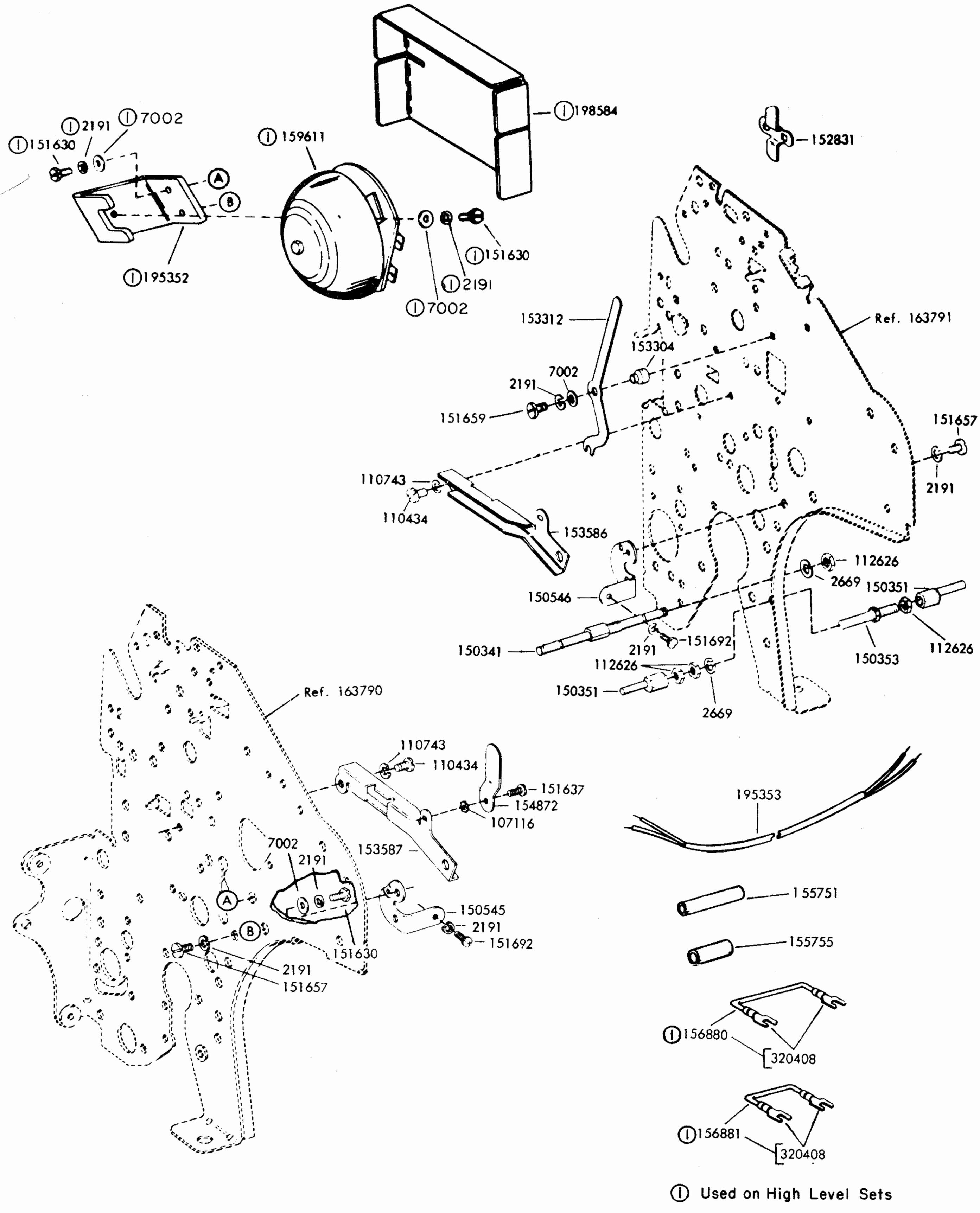



Figure 7-2. Left and Right Side Frame (Sheet 2 of 3)

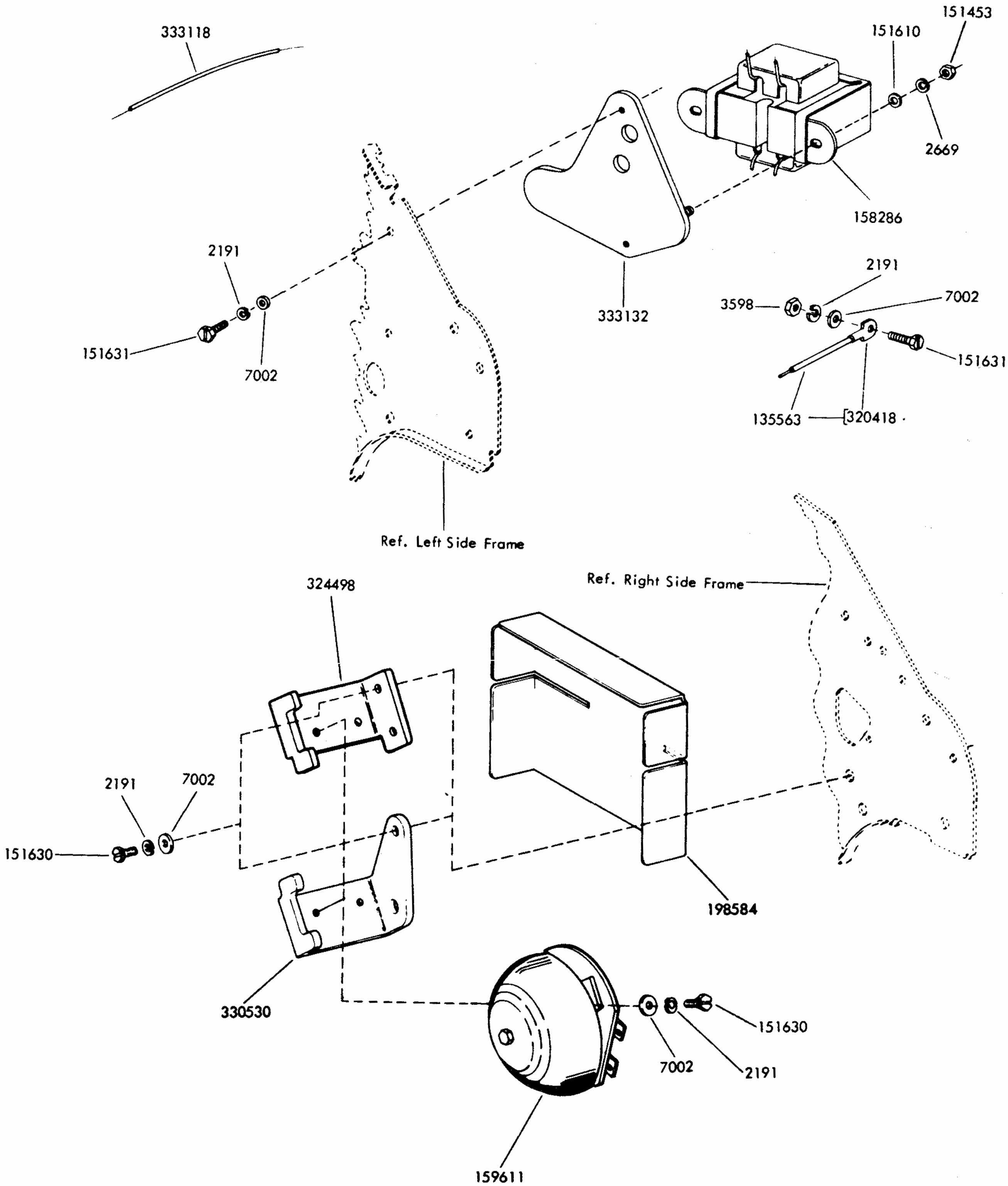



Figure 7-3. Left and Right Side Frame (Sheet 3 of 3) Modification Parts for Low-Level Sets

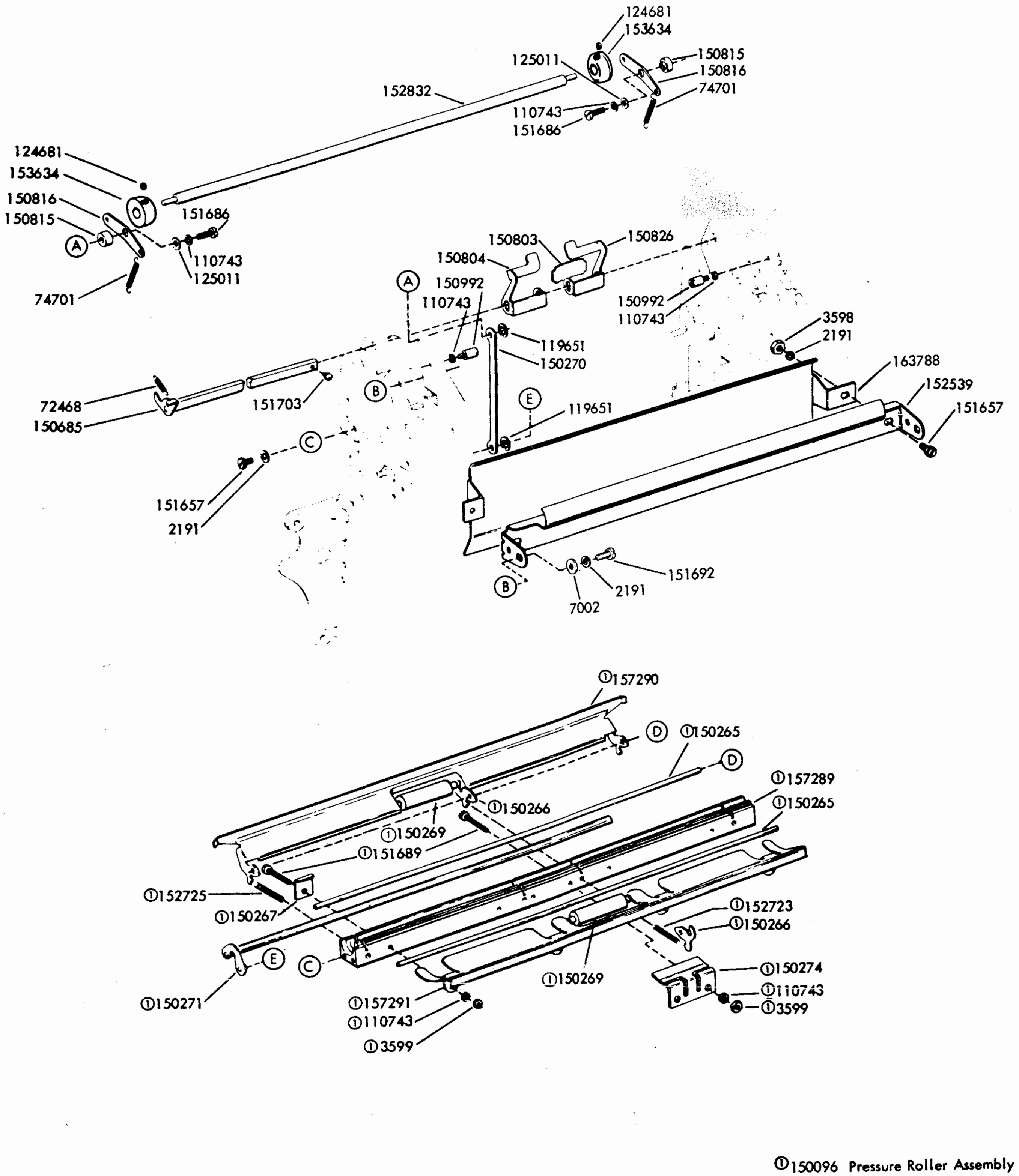



Figure 7-4. Pressure Roller Mechanism

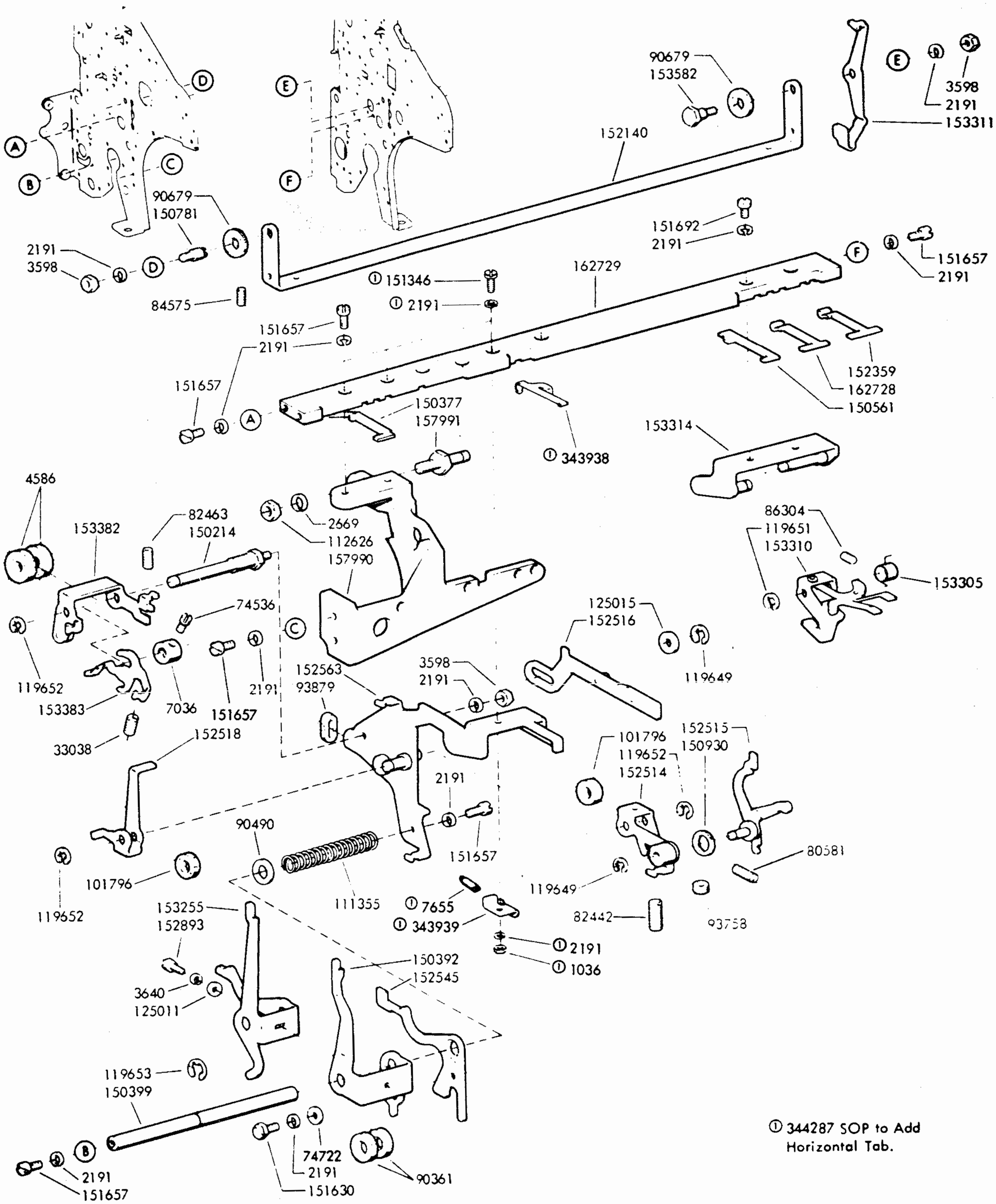



Figure 7-5. Space Suppression Mechanism

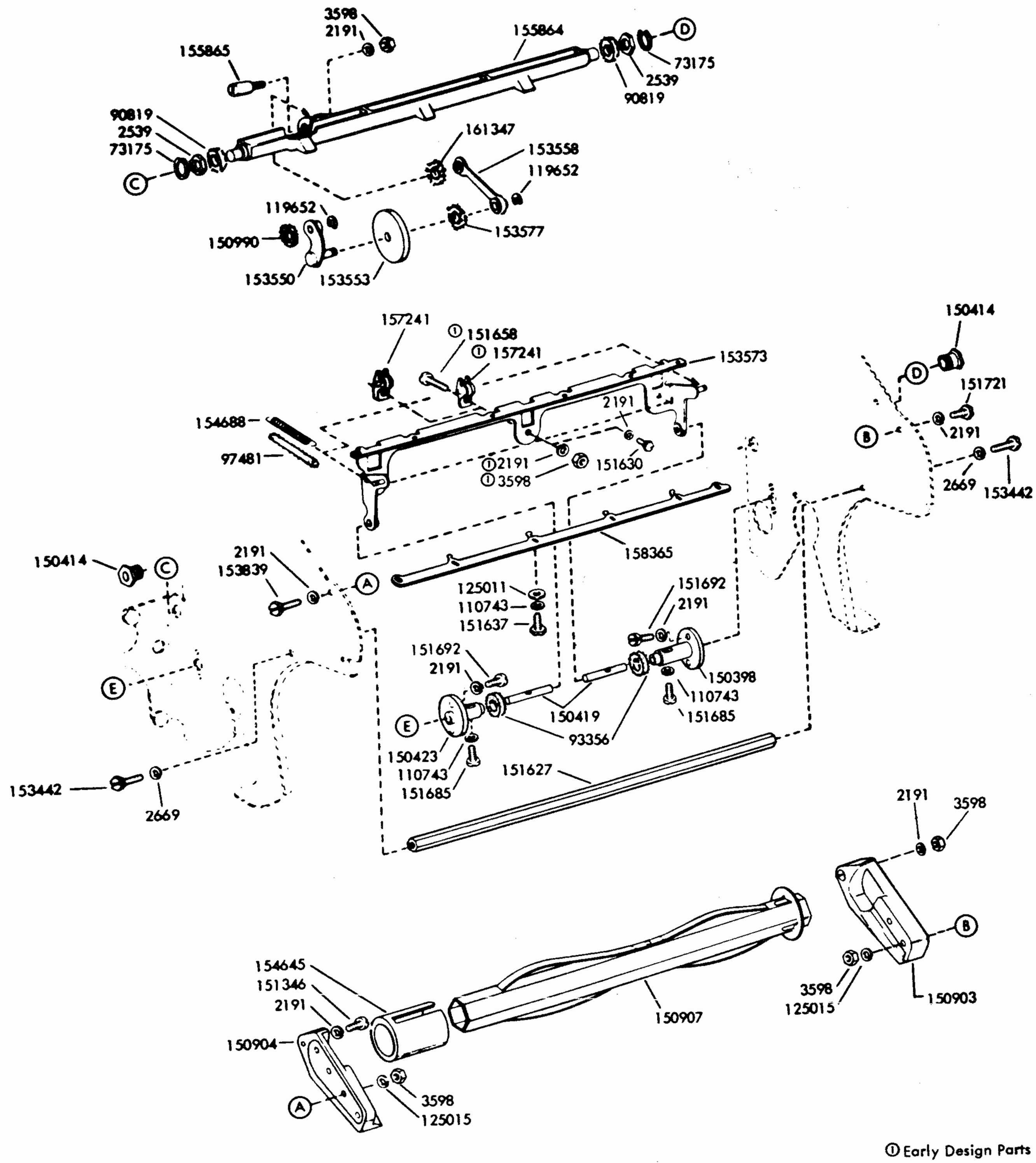



Figure 7-6. Paper Spindle and Reset Bail Mechanism

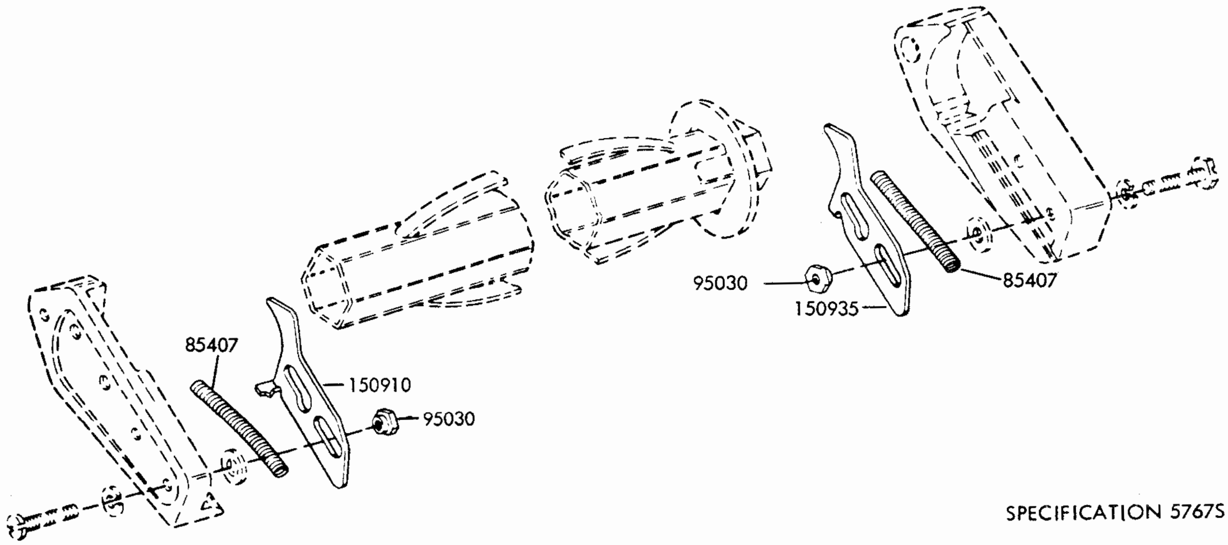



Figure 7-7. 151799 Modification Kit to Provide Latches for Paper Spindle

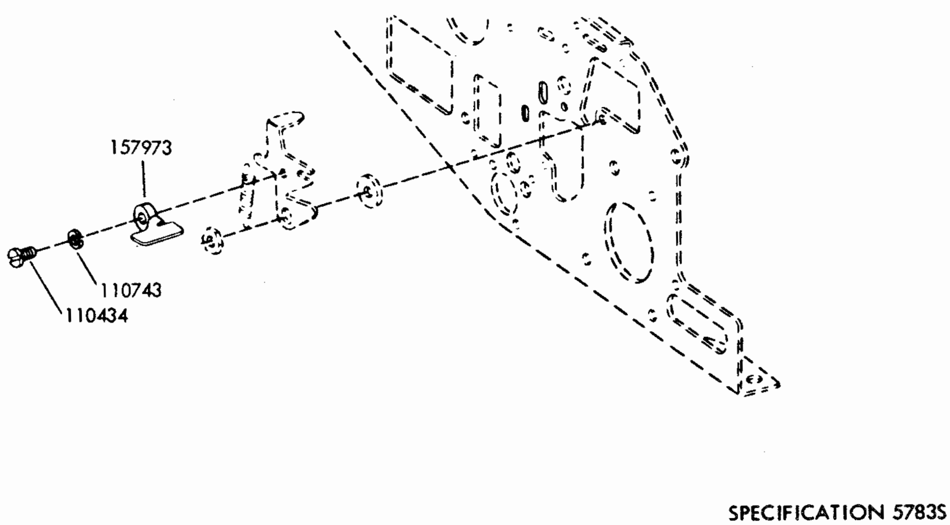



Figure 7-8. 157514 Modification Kit to Provide Automatic Carriage Return and Line Feed

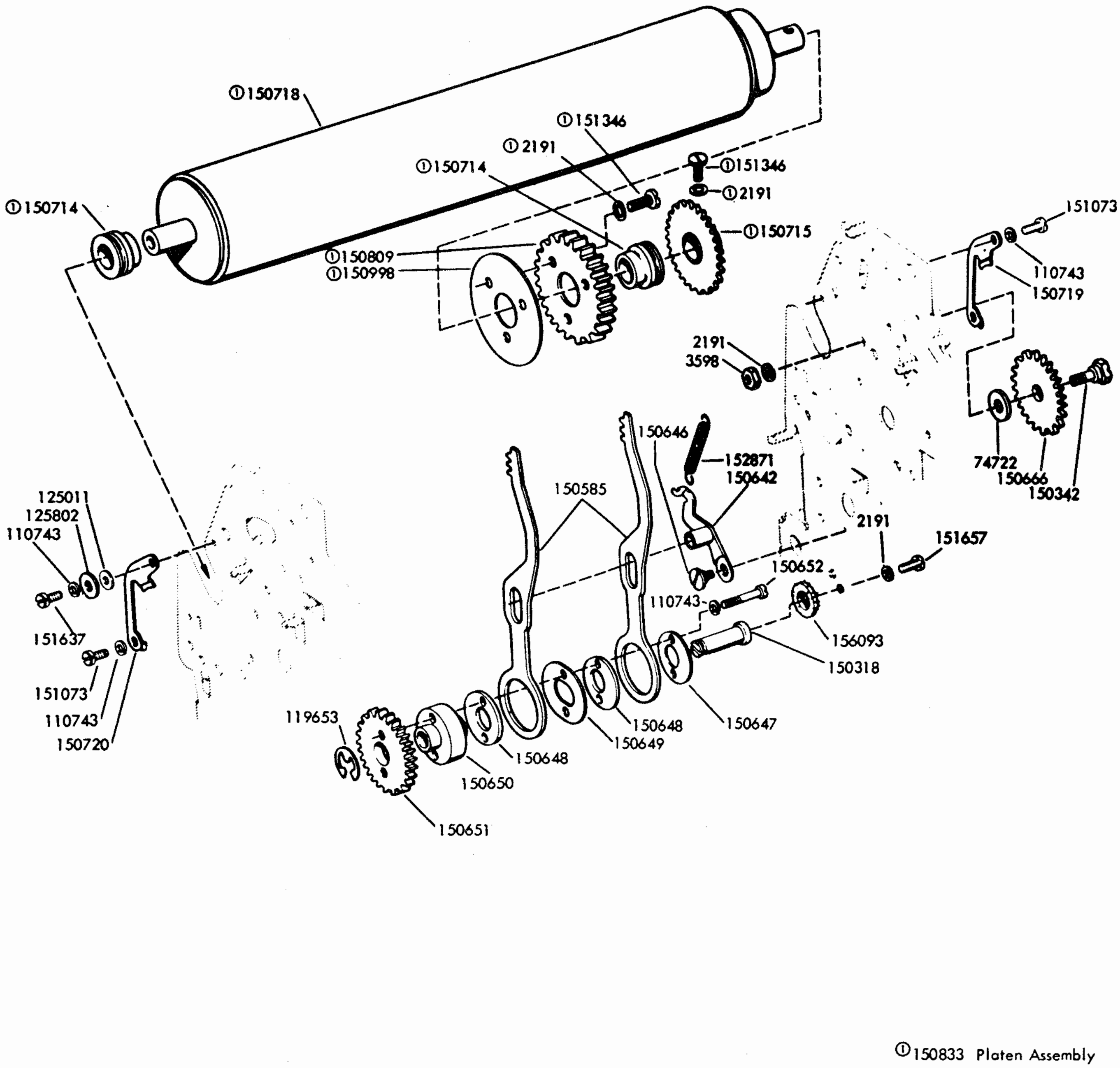



Figure 7-9. Line Feed and Platen Mechanism

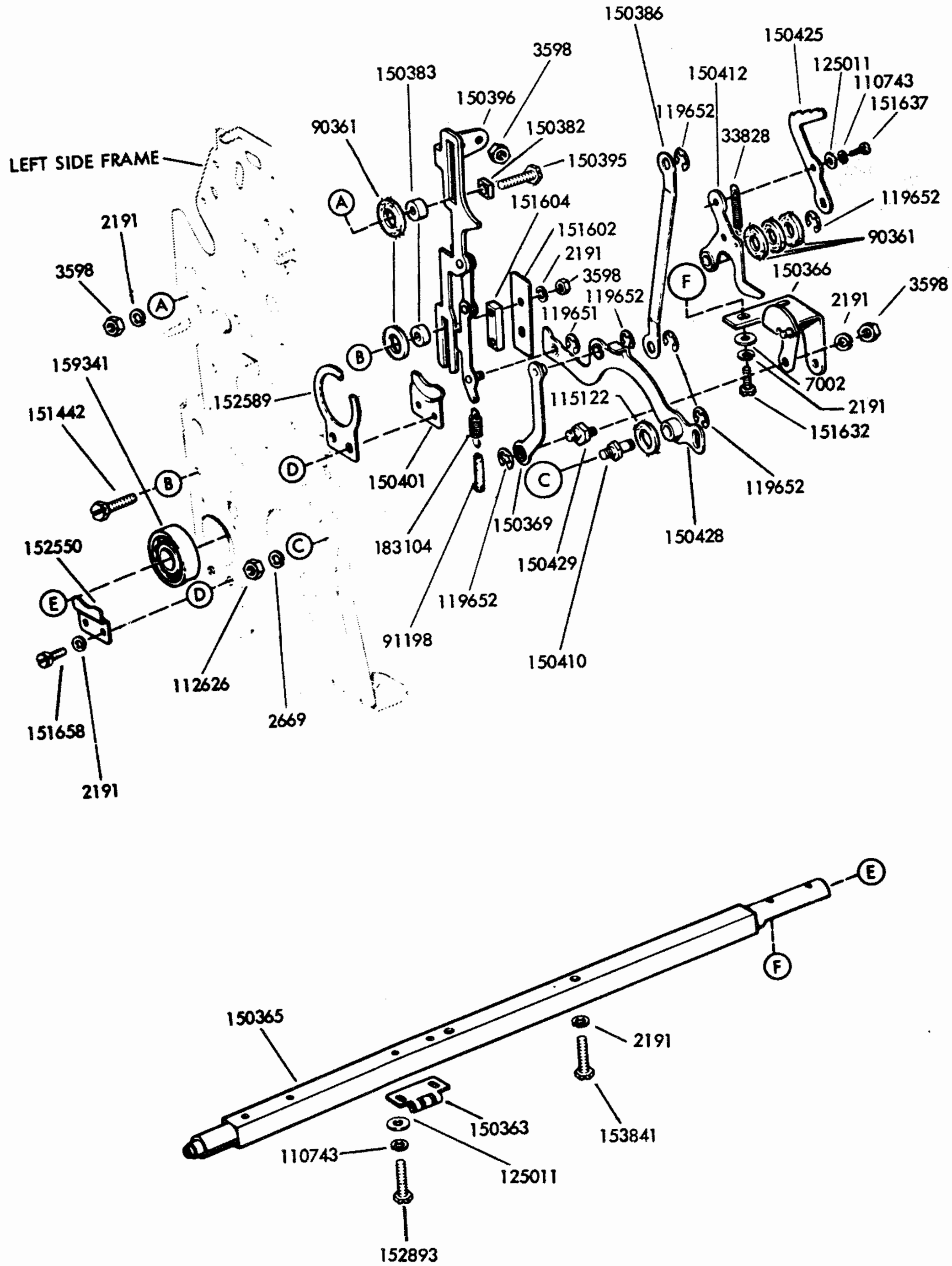



Figure 7-10. Left Side Linkage and Rocker Shaft

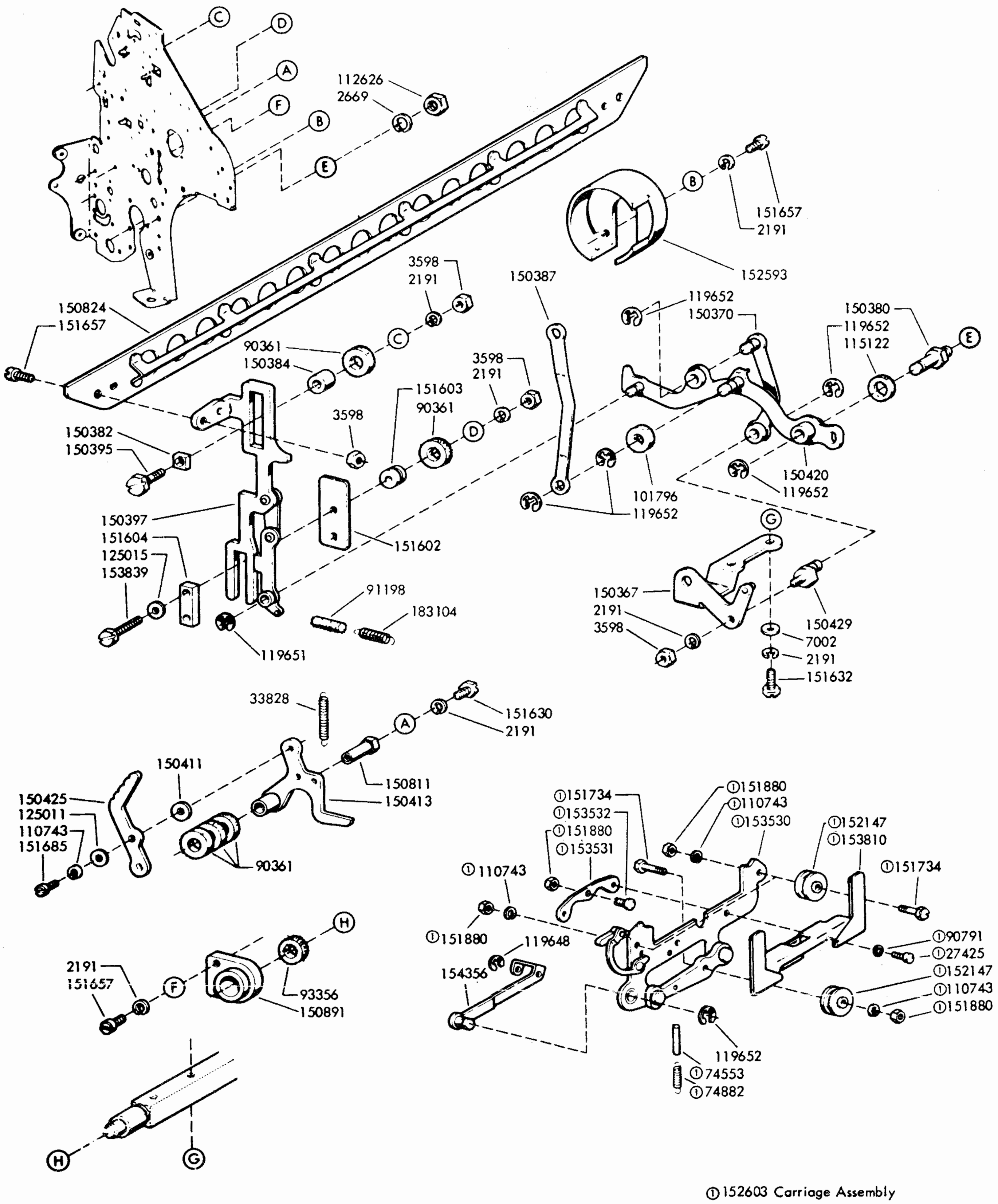
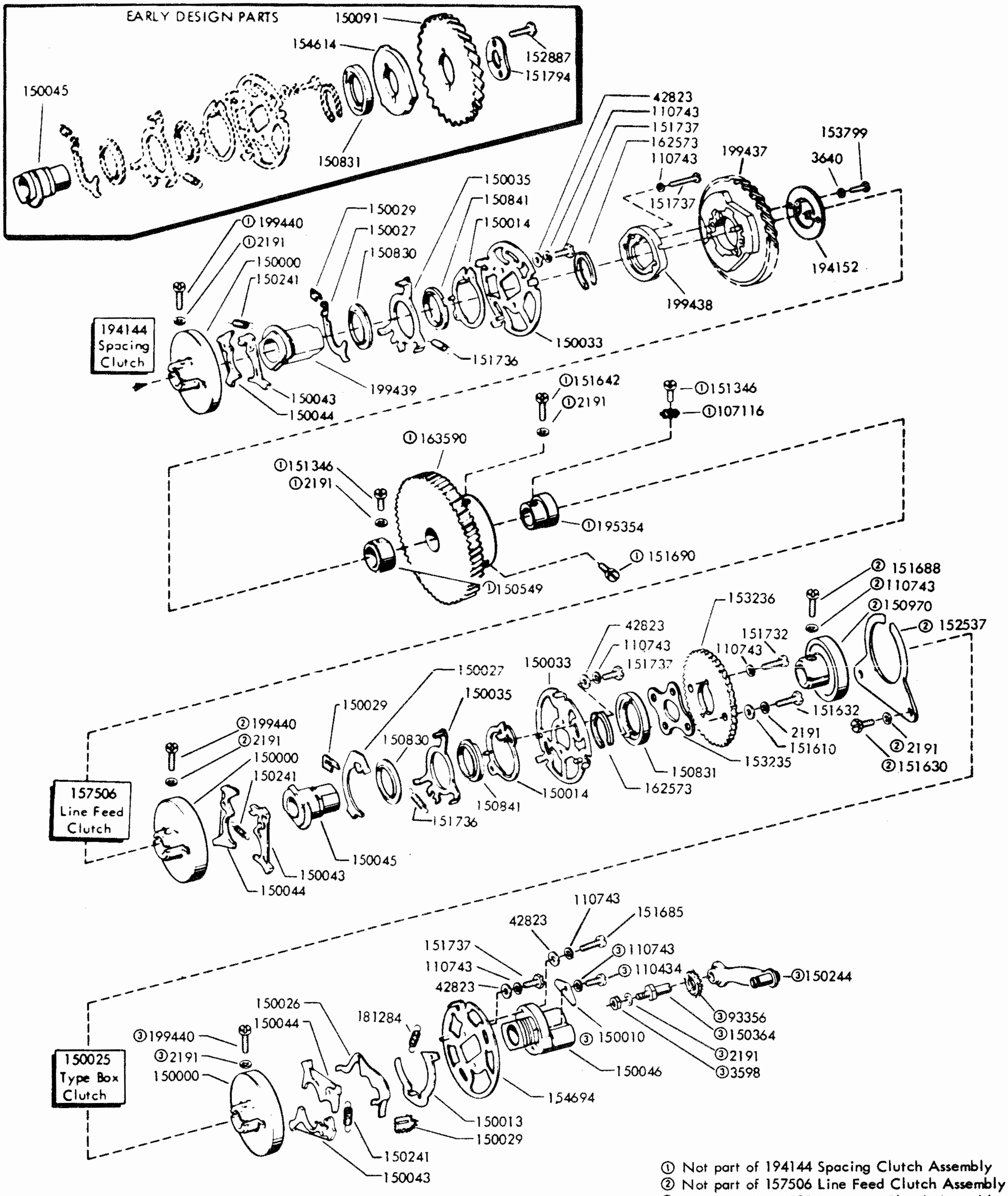



Figure 7-11. Right Side Linkage and Type Box Carriage Mechanism




① Not part of 194144 Spacing Clutch Assembly
② Not part of 157506 Line Feed Clutch Assembly
③ Not part of 150025 Type Box Clutch Assembly

Figure 7-12. Main Shaft (Sheet 1 of 2)

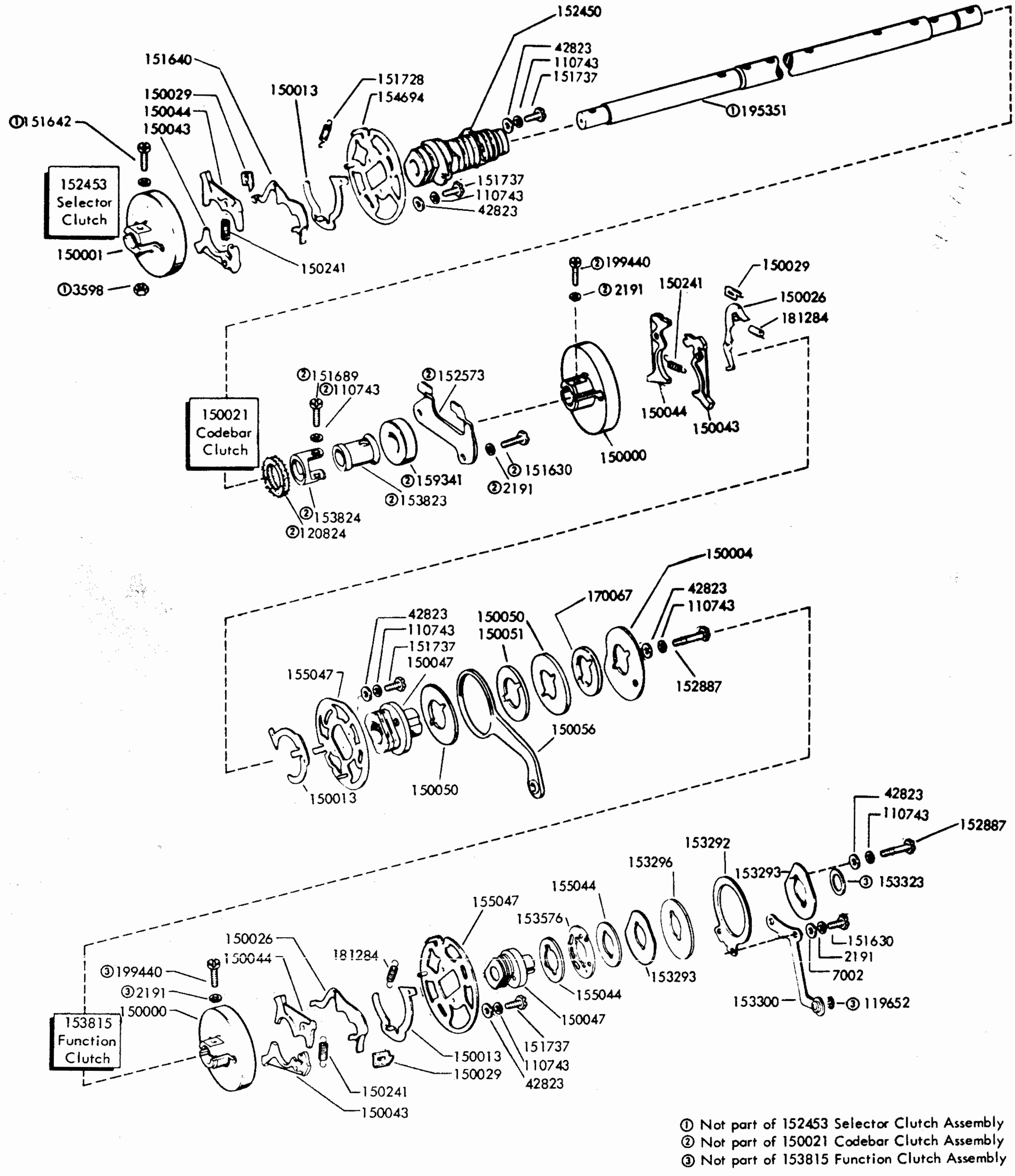



Figure 7-13. Main Shaft (Sheet 2 of 2)

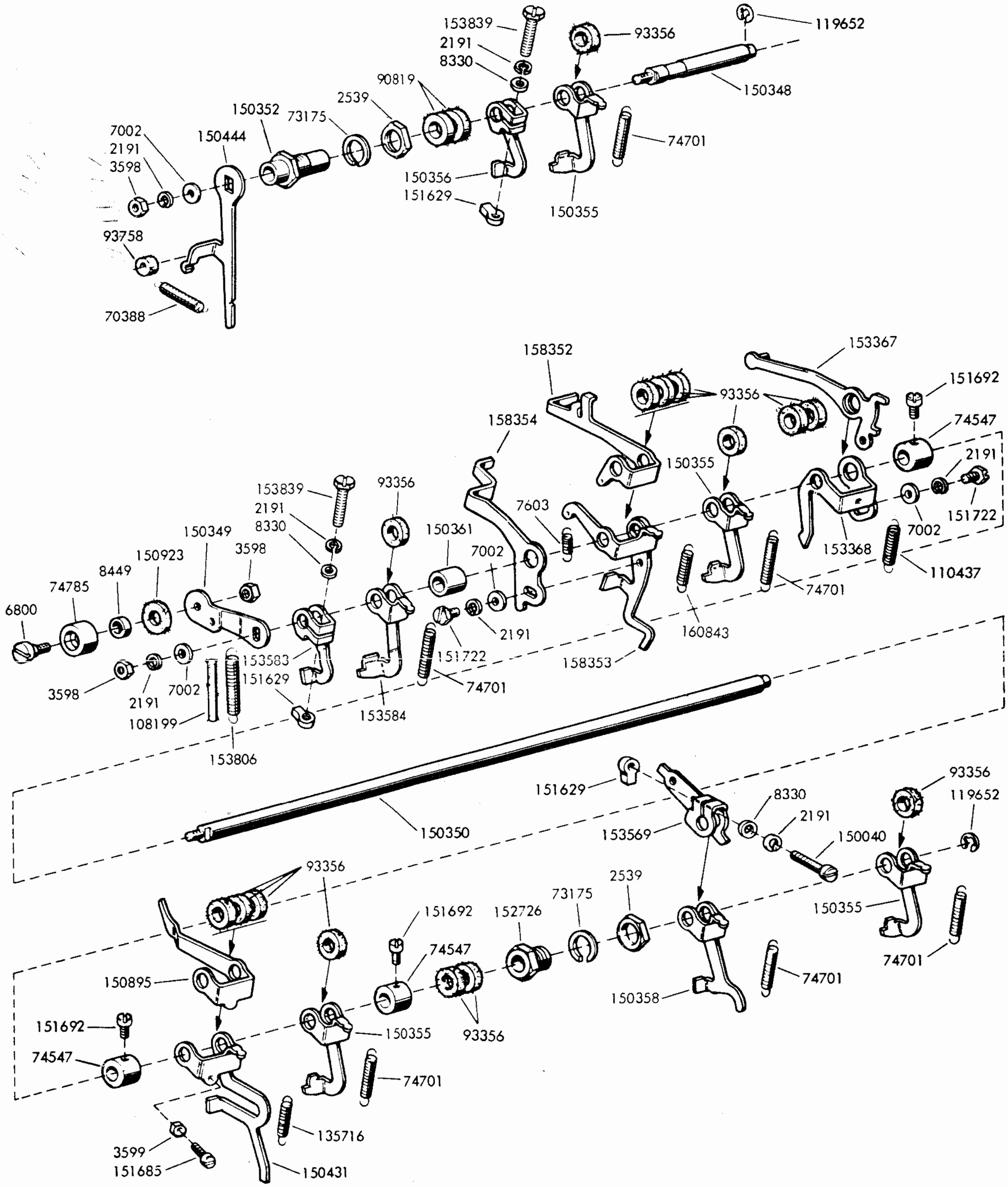
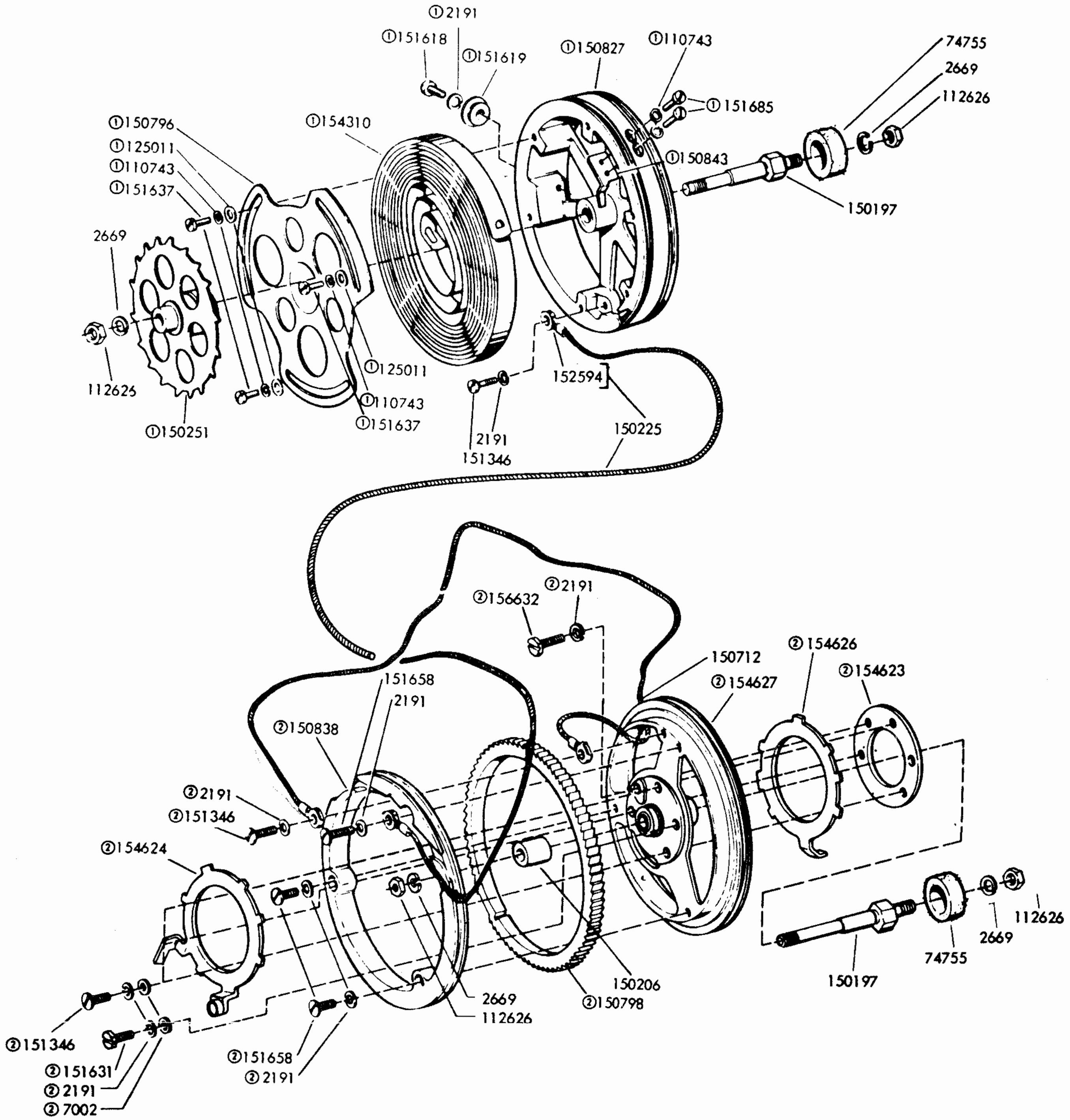
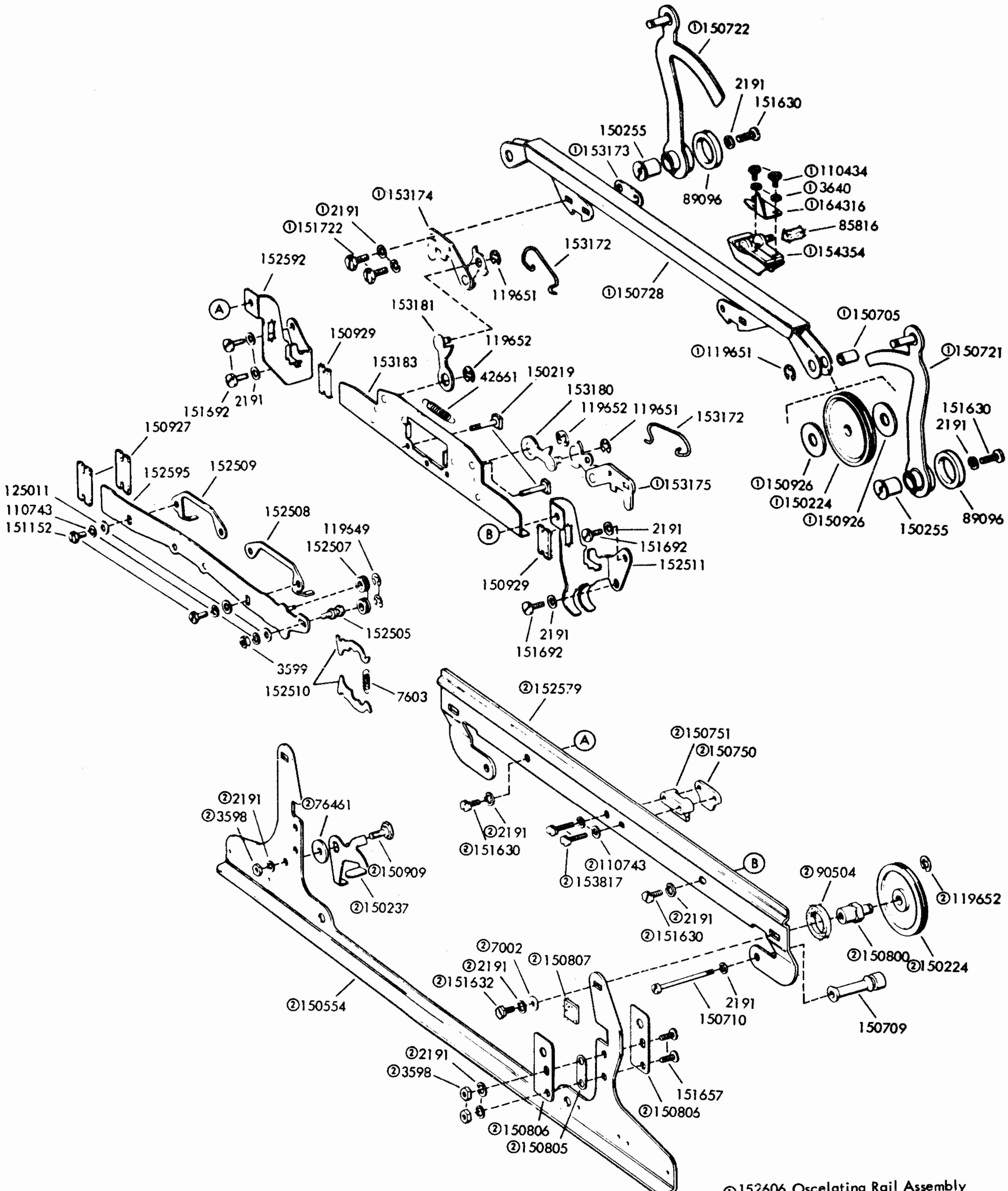



Figure 7-14. Trip Shaft Mechanism




① 150842 Spring Drum Assembly
② 153944 Universal Spacing Drum Assembly

Figure 7-15. Carriage Return and Spacing Drum Mechanism




①152606 Oscelating Rail Assembly
② 152614 Print Carriage Track Assembly

Figure 7-16. Front Plate Mechanism (Sheet 1 of 3)

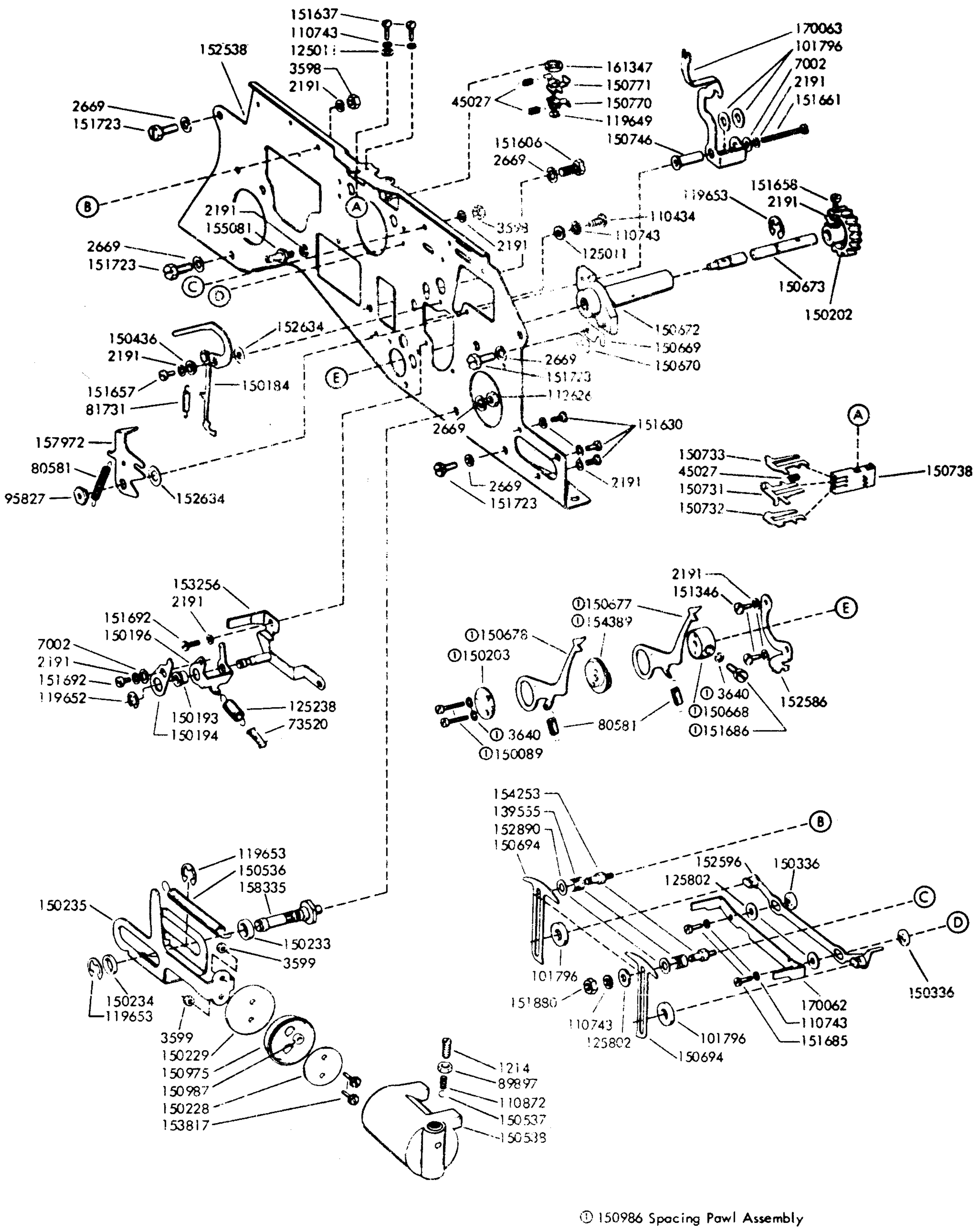



Figure 7-17. Front Plate Mechanism (Sheet 2 of 3)

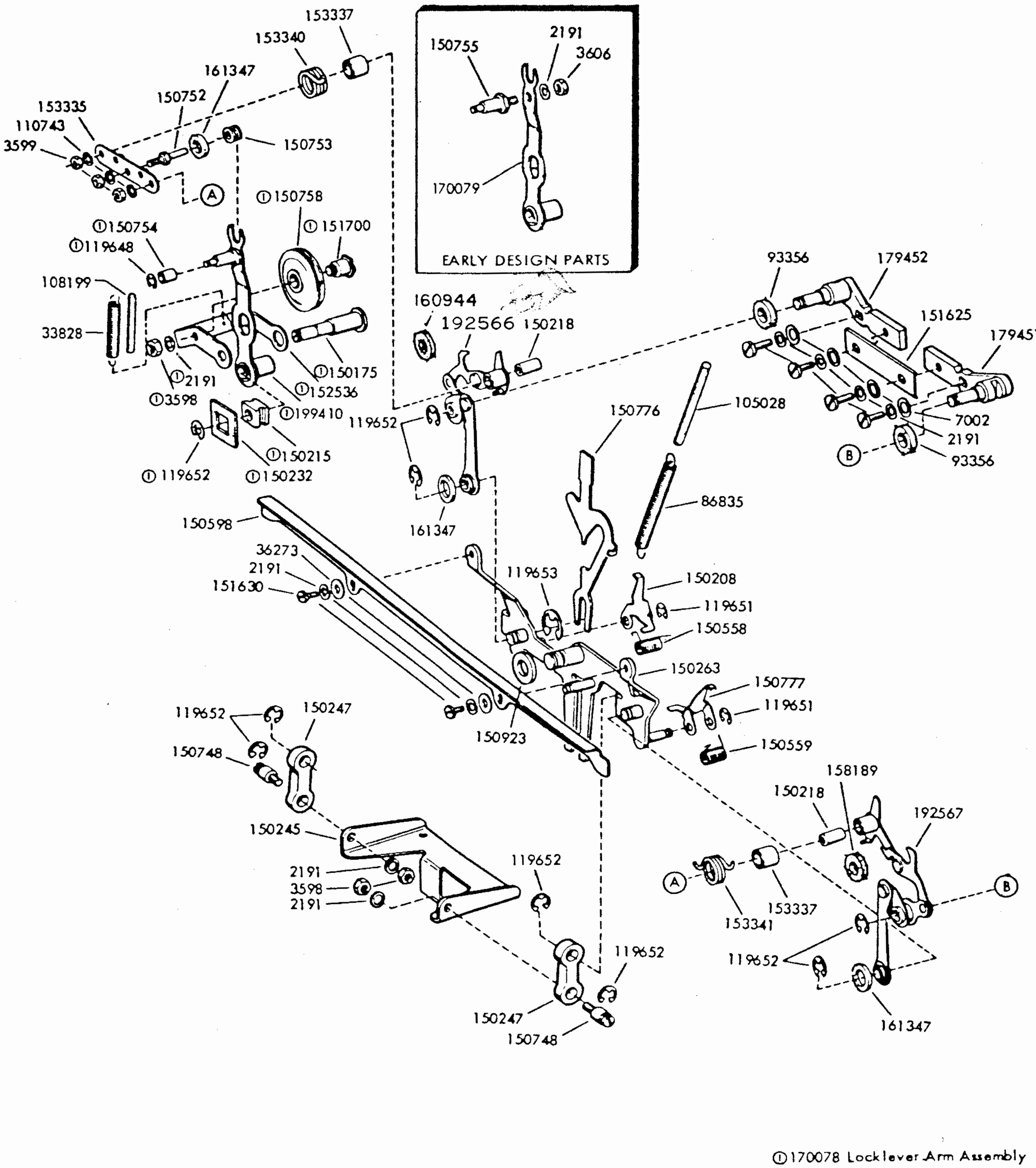



Figure 7-18. Front Plate Mechanism (Sheet 3 of 3)

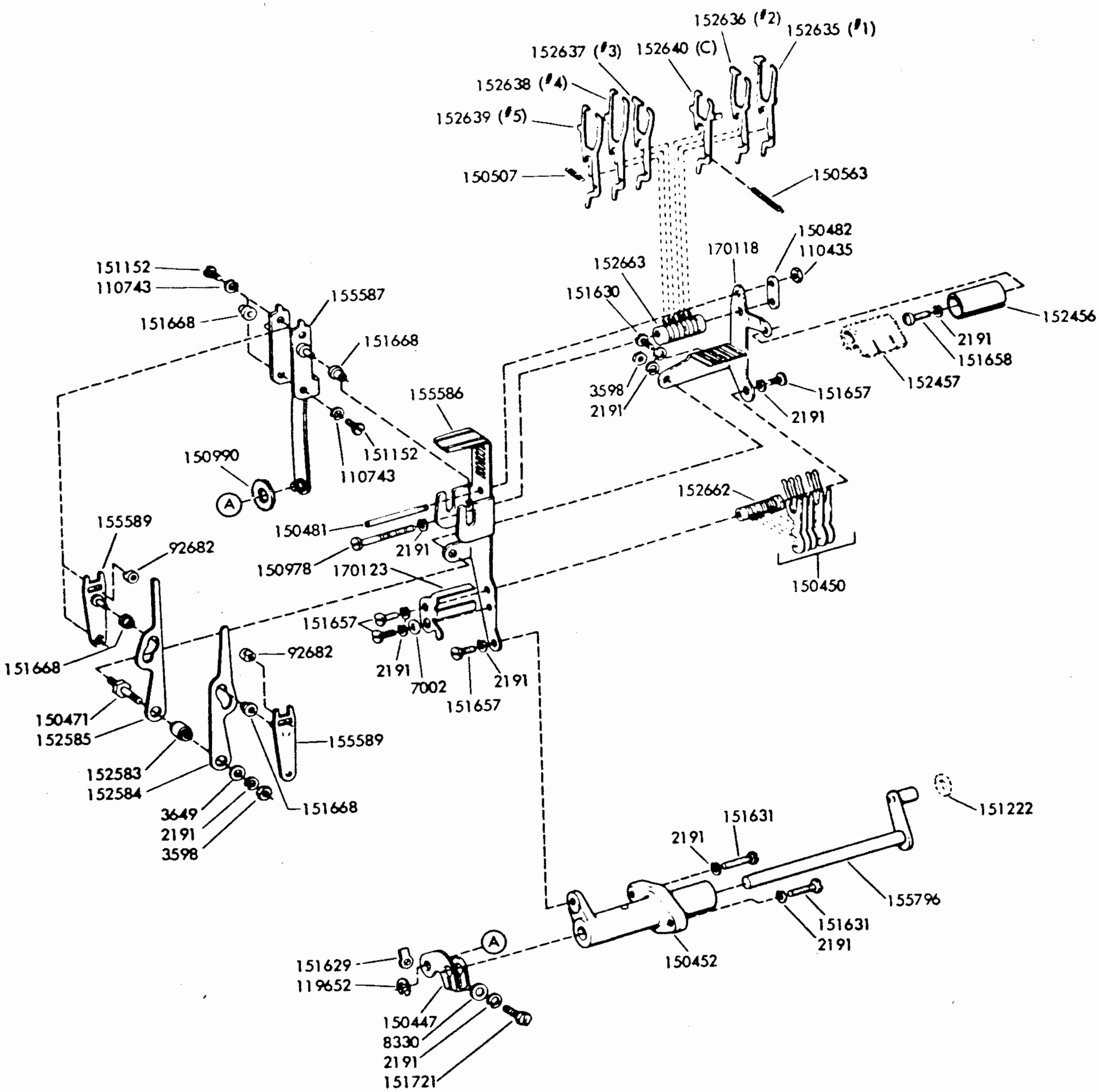



Figure 7-19. Code Bar Positioning Mechanism

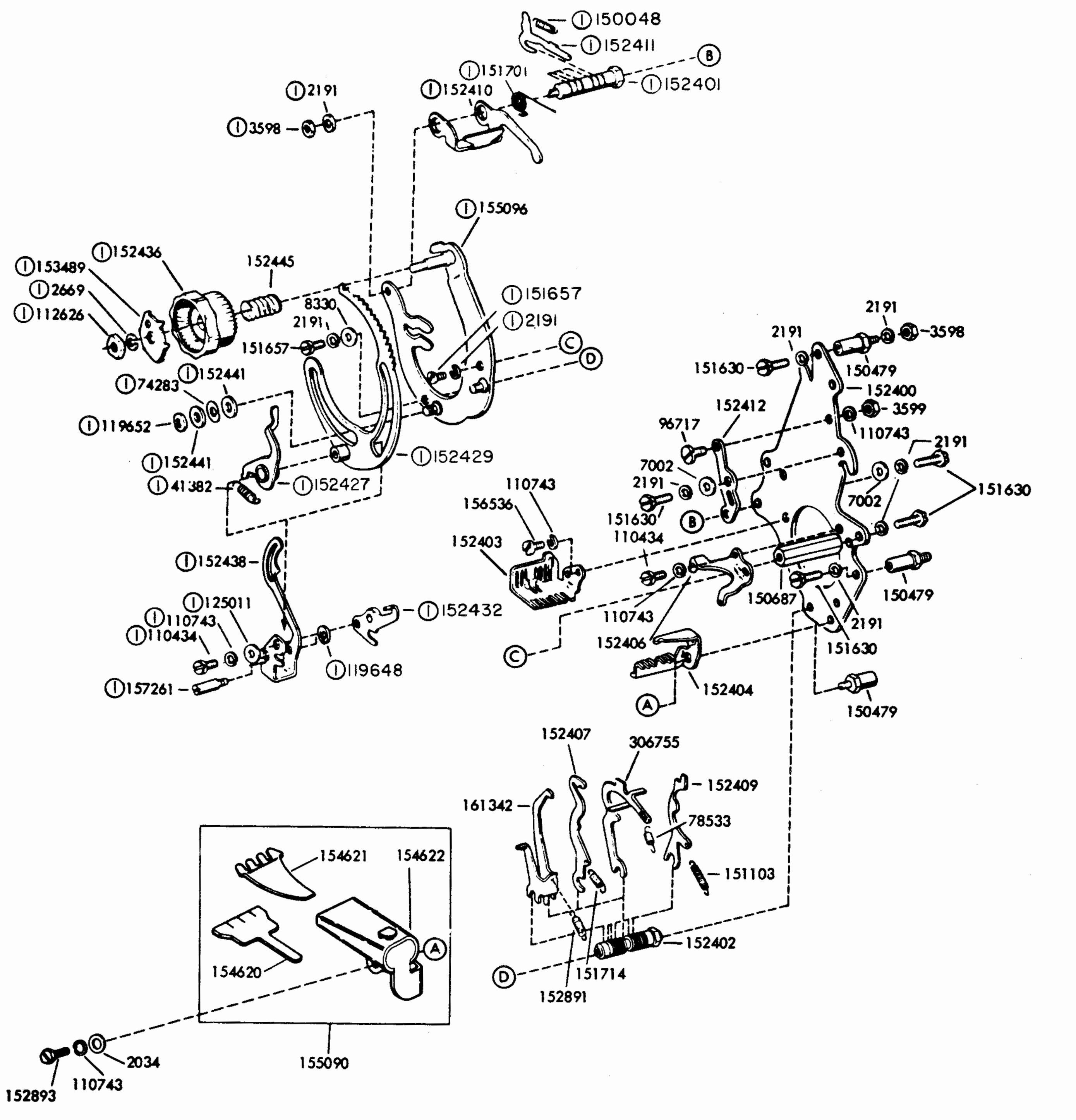



Figure 7-20. Selector Mechanism - Used on High-Level Sets

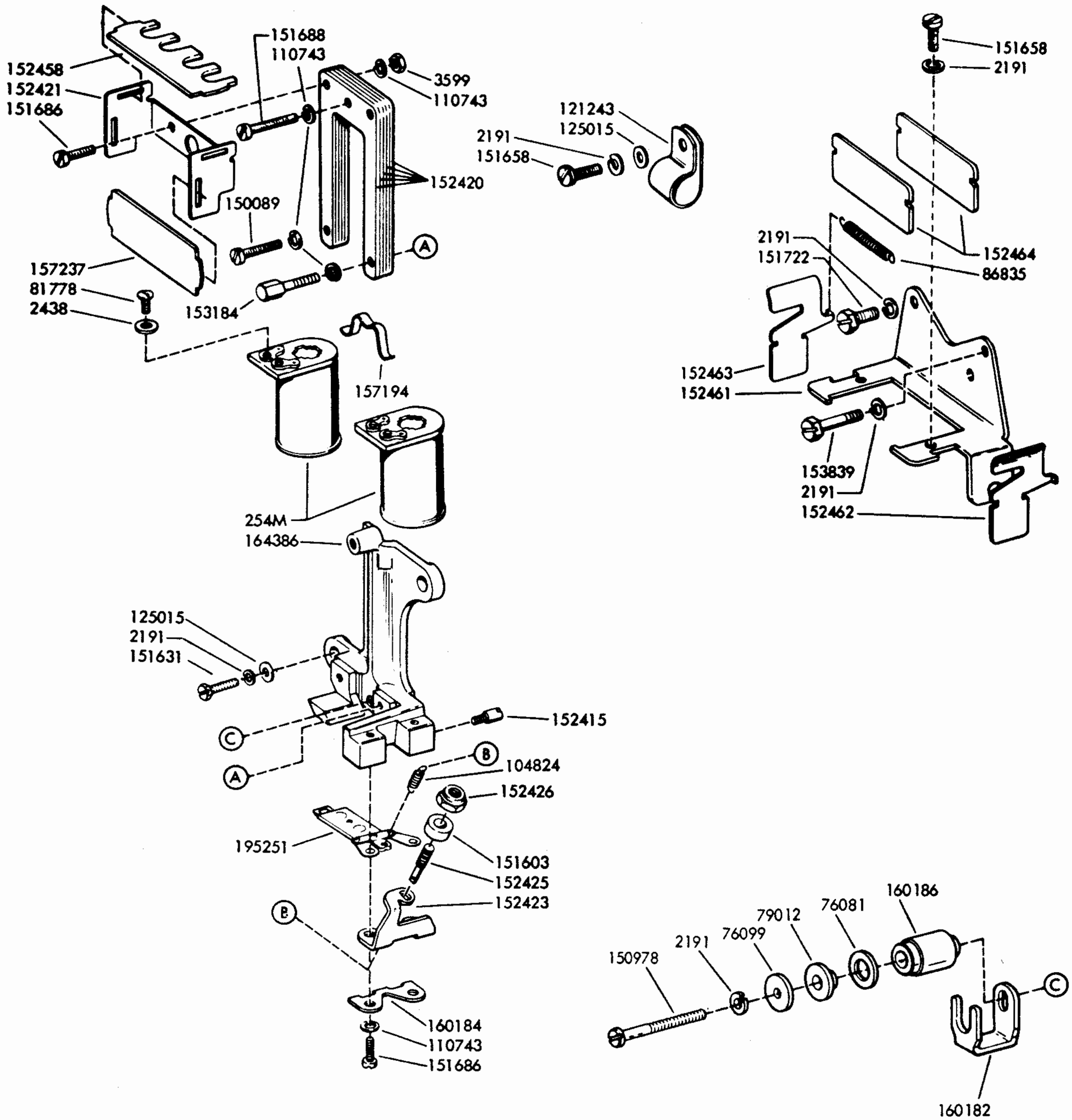



Figure 7-21. Selector Magnet Mechanism - Used on High-Level Sets

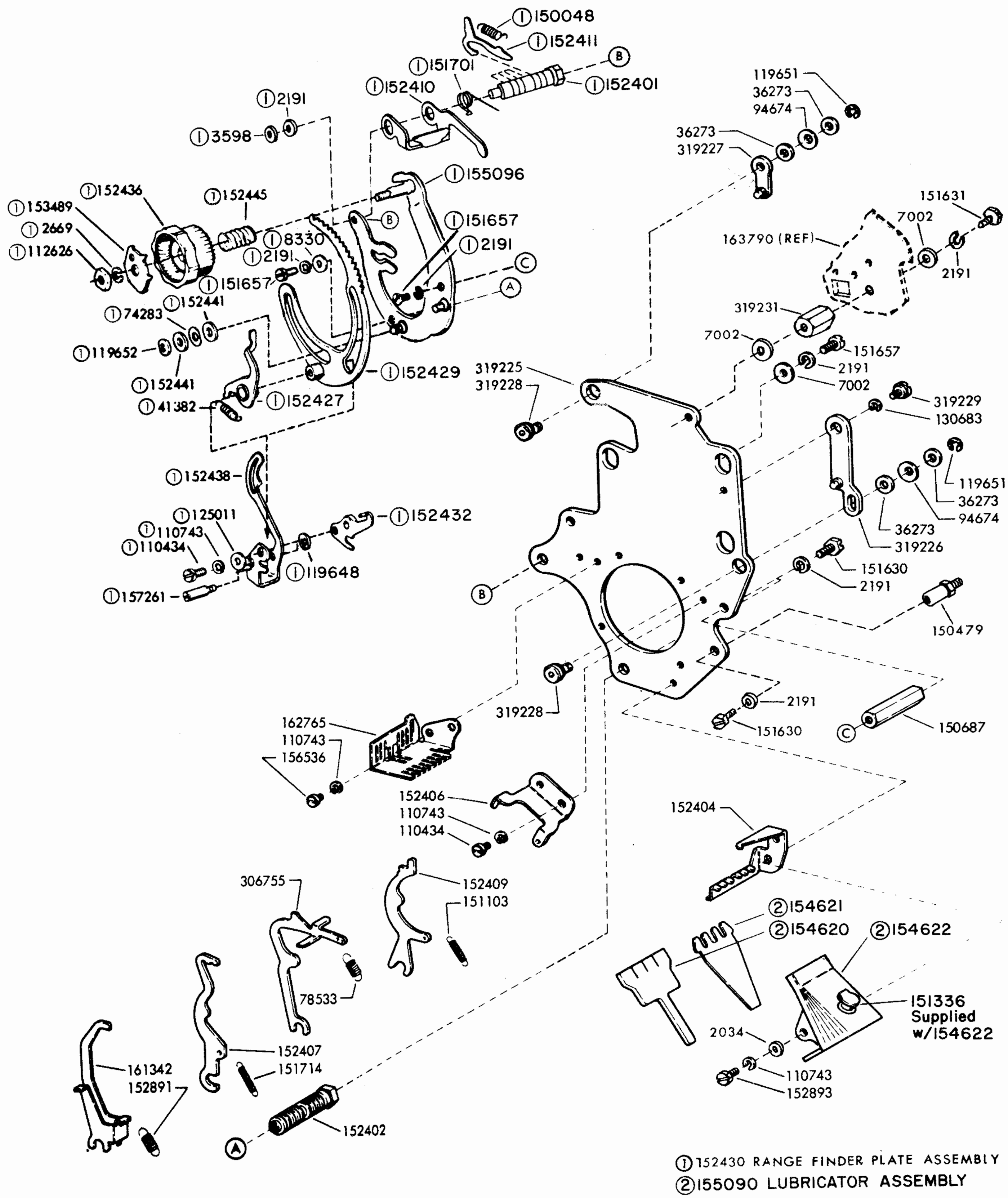



Figure 7-22. 319204 Selector Mecahsnim - Used on Low-Level Sets (Sheet 1 of 2)

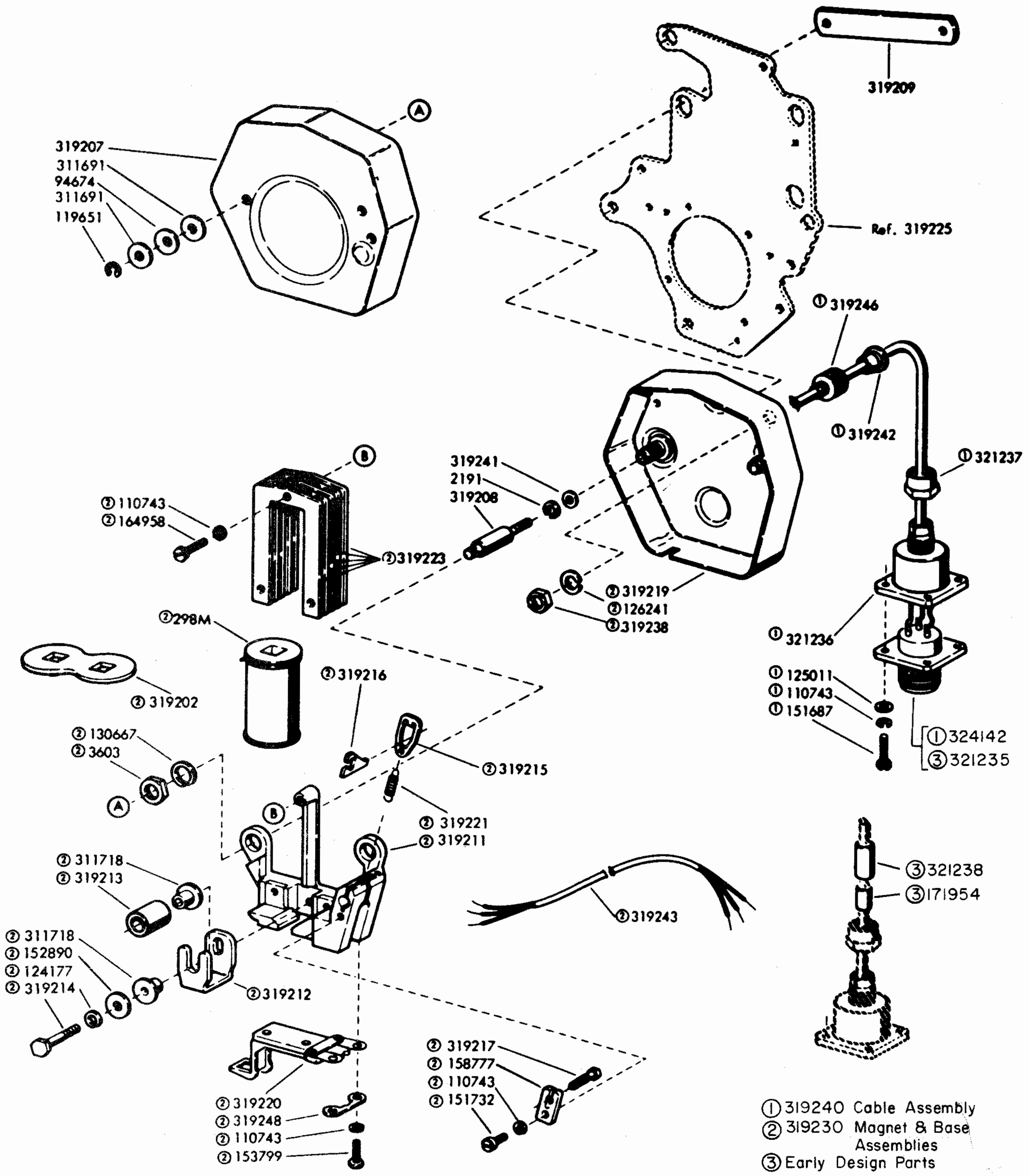



Figure 7-23. 319204 Selector Mechanism - Used on Low-Level Sets (Sheet 2 of 2)

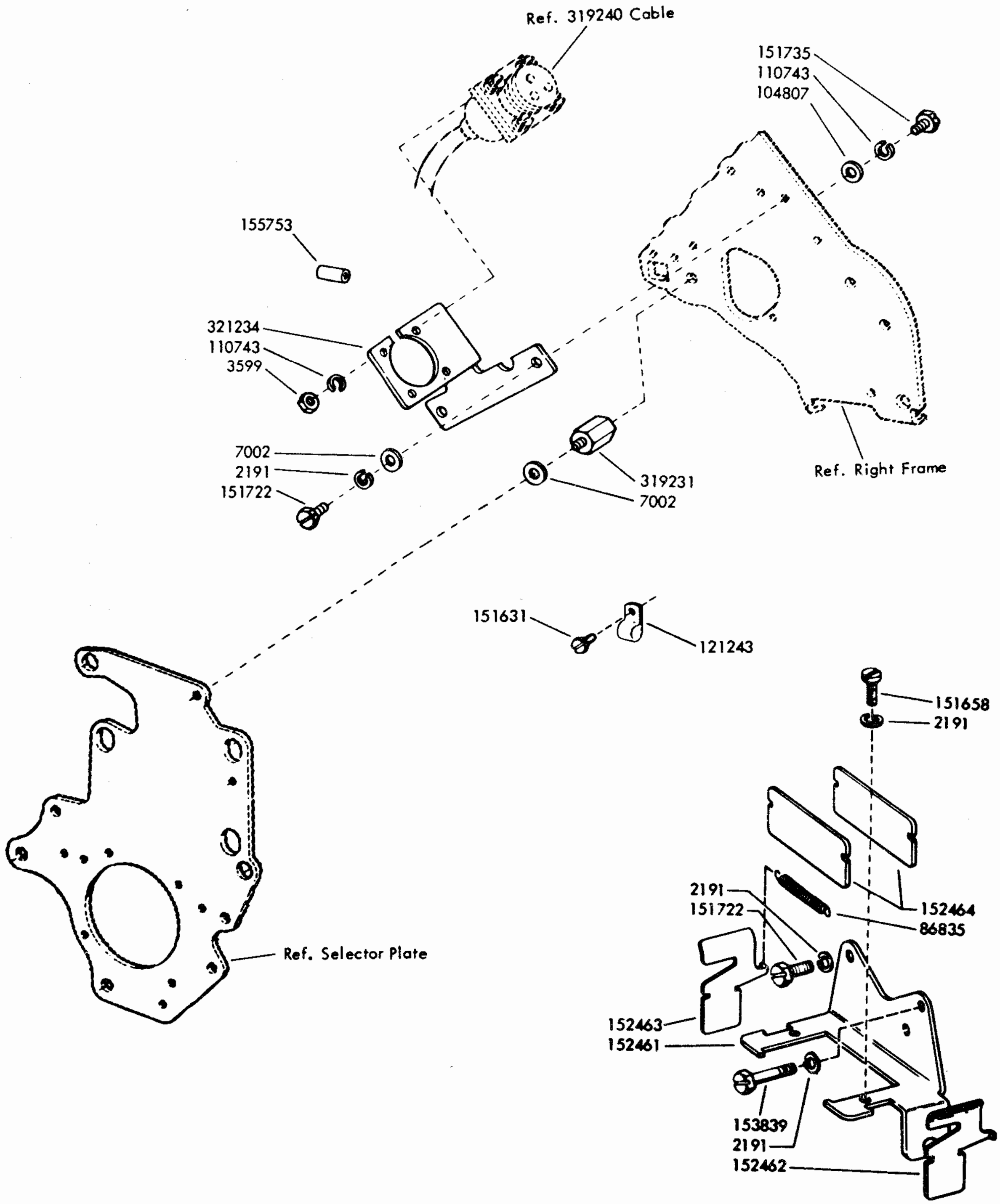



Figure 7-24. 319200 Selector and Print Connector Mounting Parts - Used on Low-Level Sets

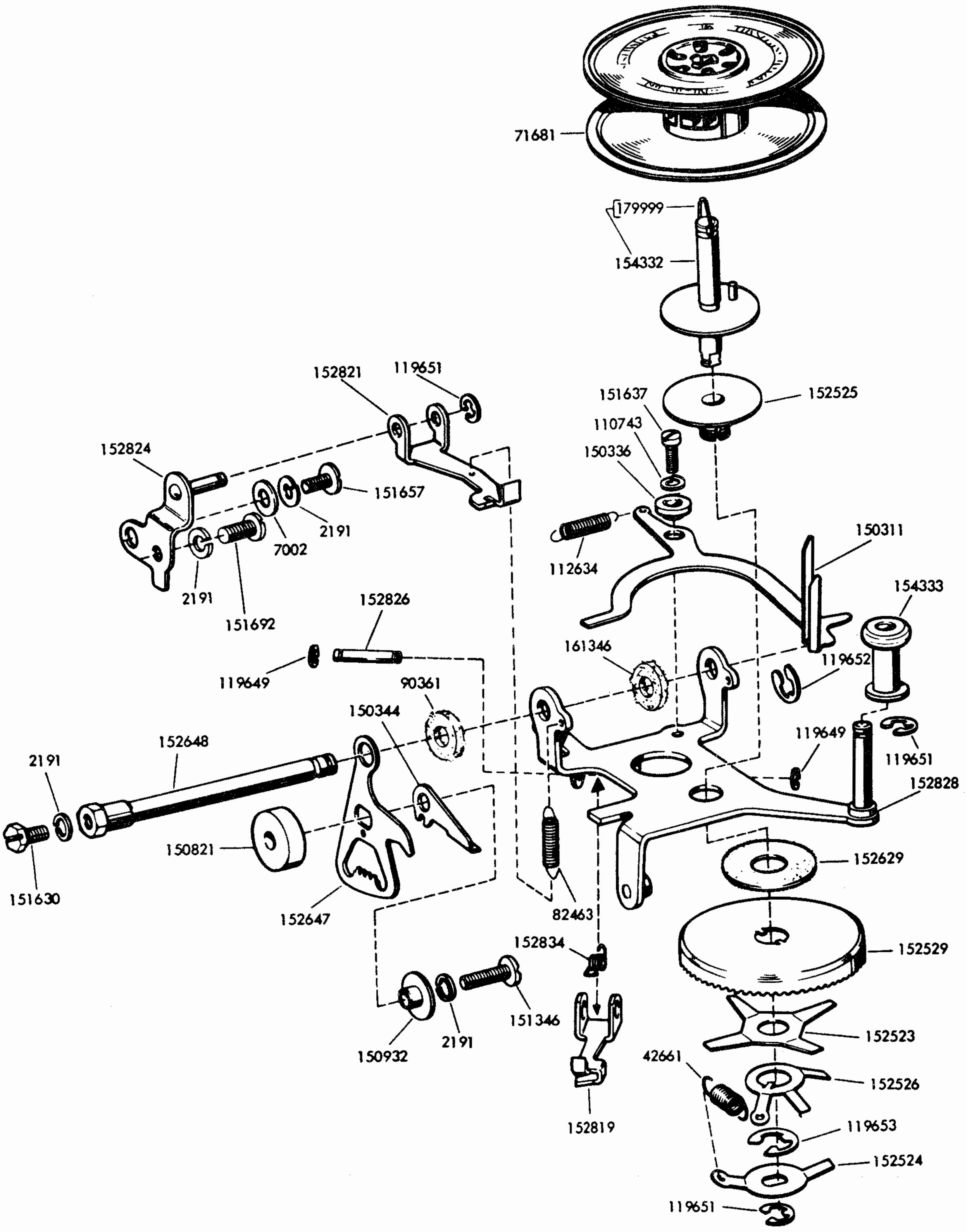



Figure 7-25. Right Ribbon Feed Mechanism

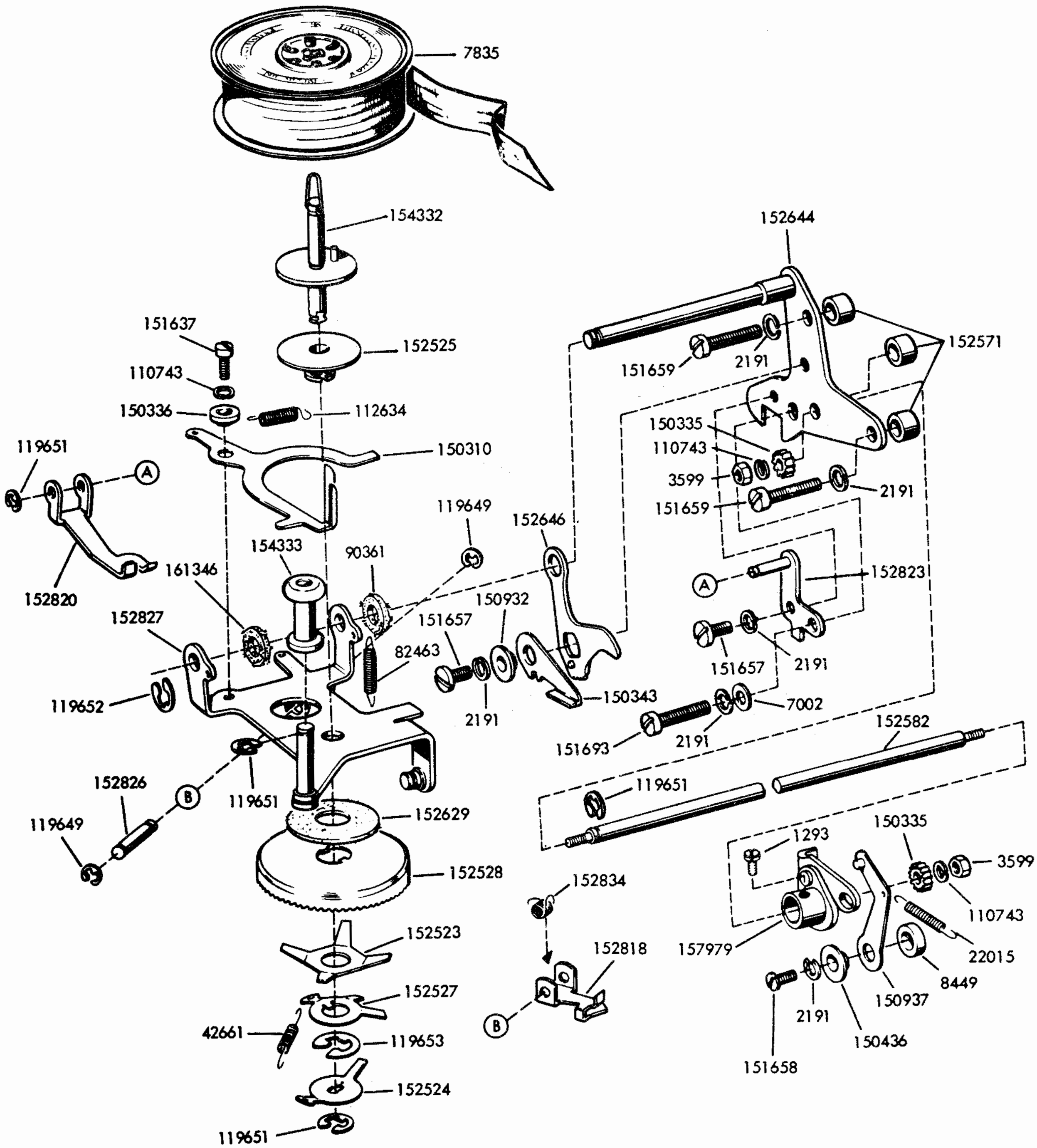



Figure 7-26. Left Ribbon Feed Mechanism

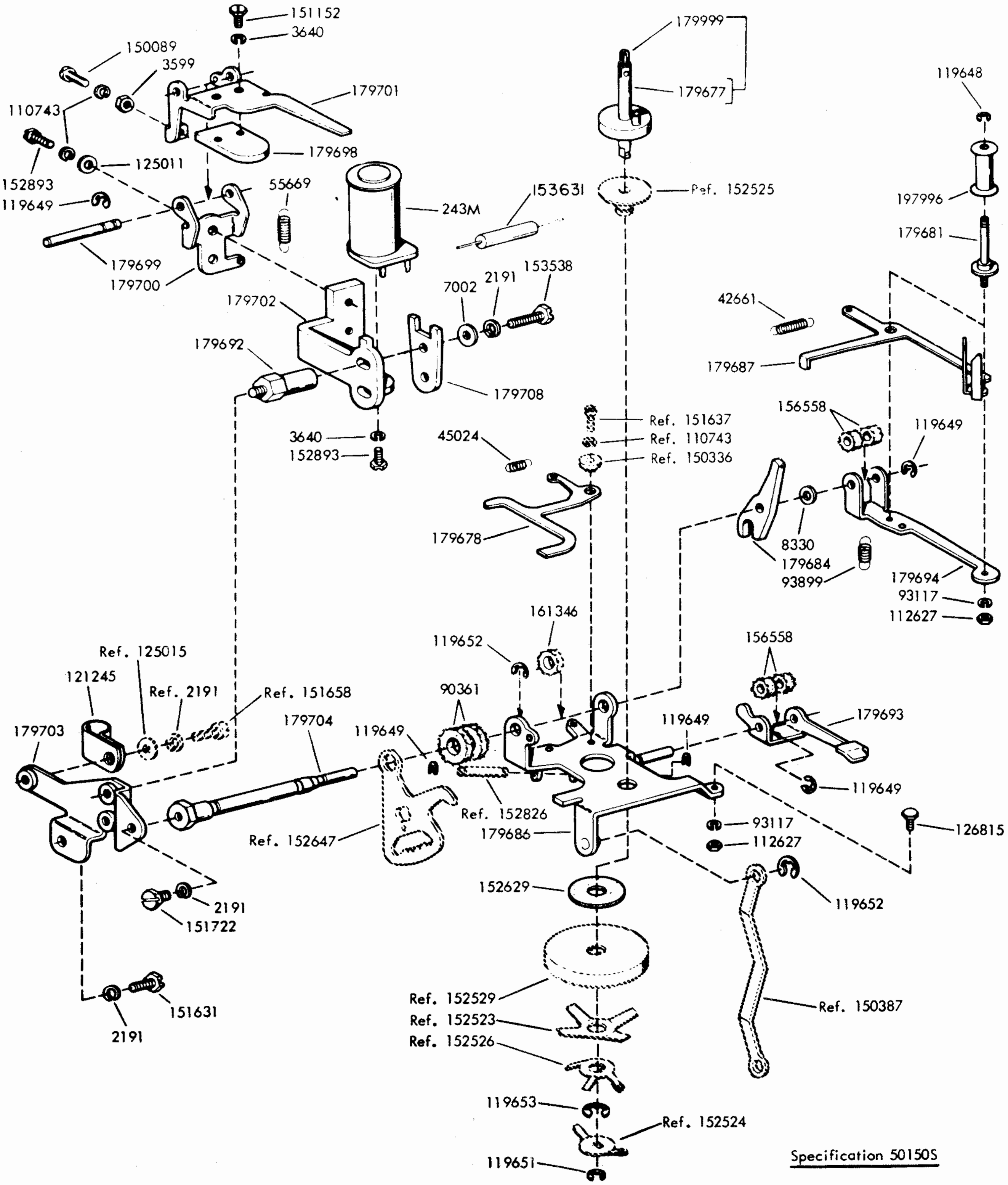



Figure 7-27. 179724 Modification Kit to Provide Two-Color Ribbon Printing - Right Side

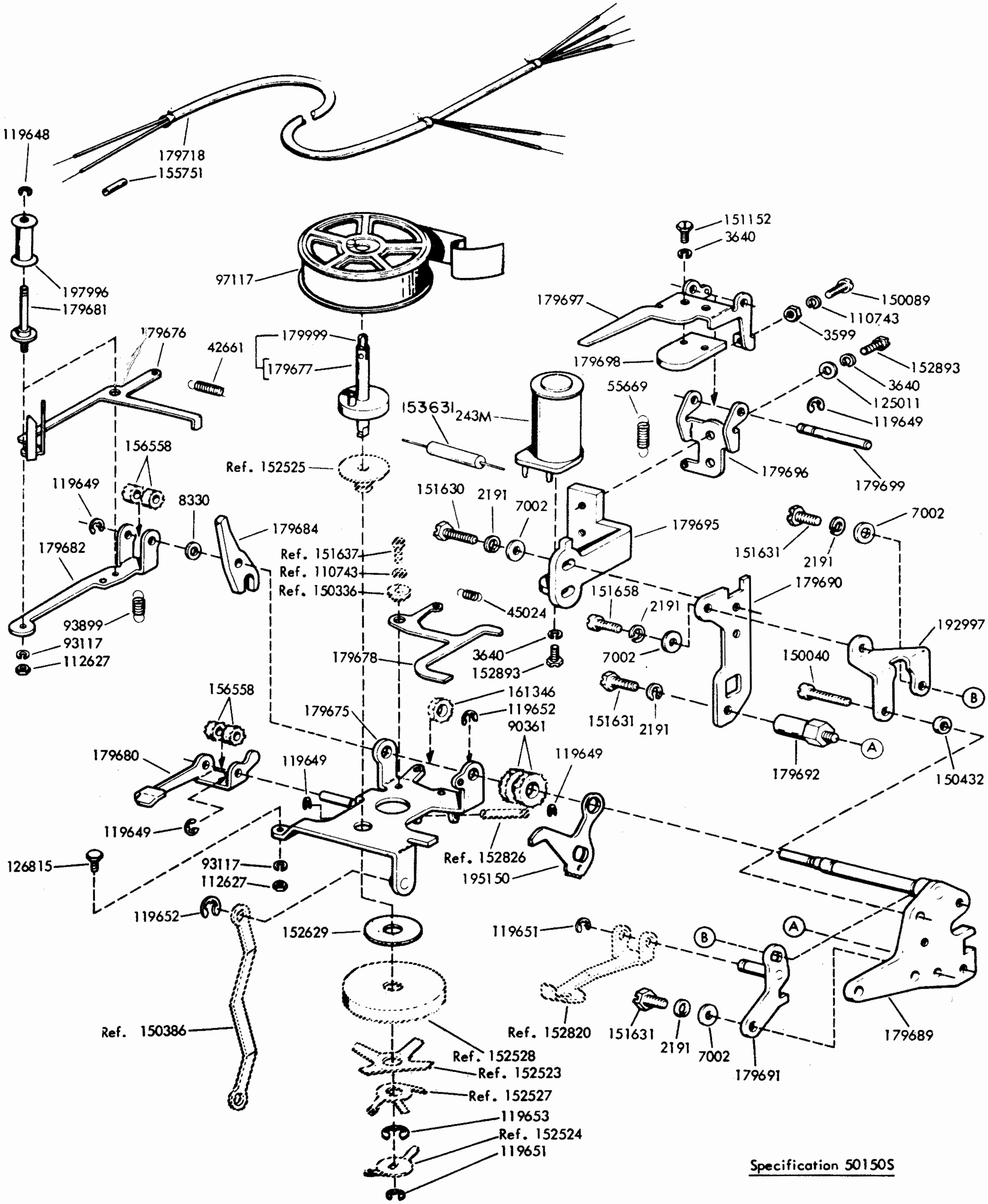



Figure 7-28. 179724 Modification Kit to Provide Two-Color Ribbon Printing - Left Side

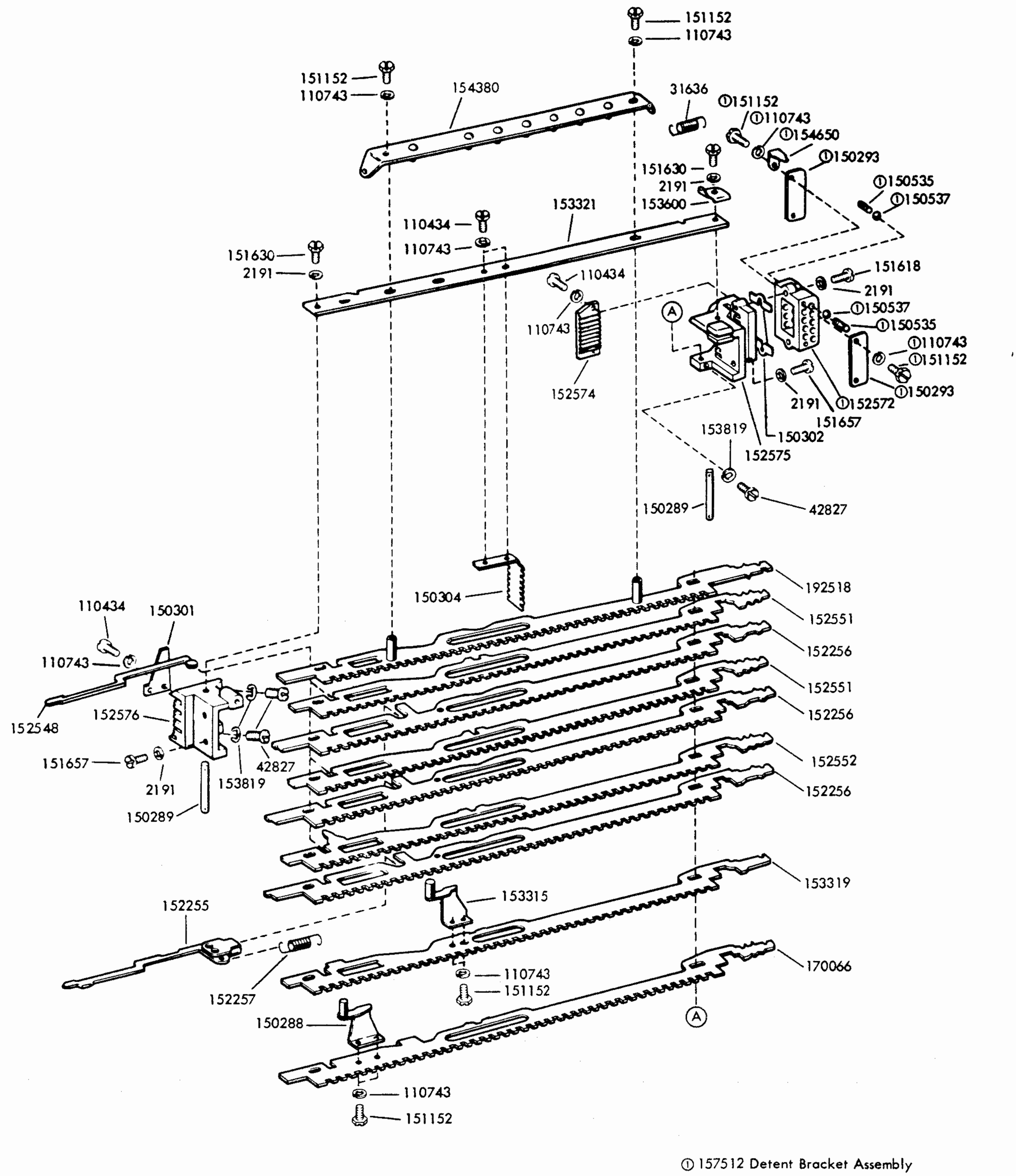



Figure 7-29. Code Bar Mechanism

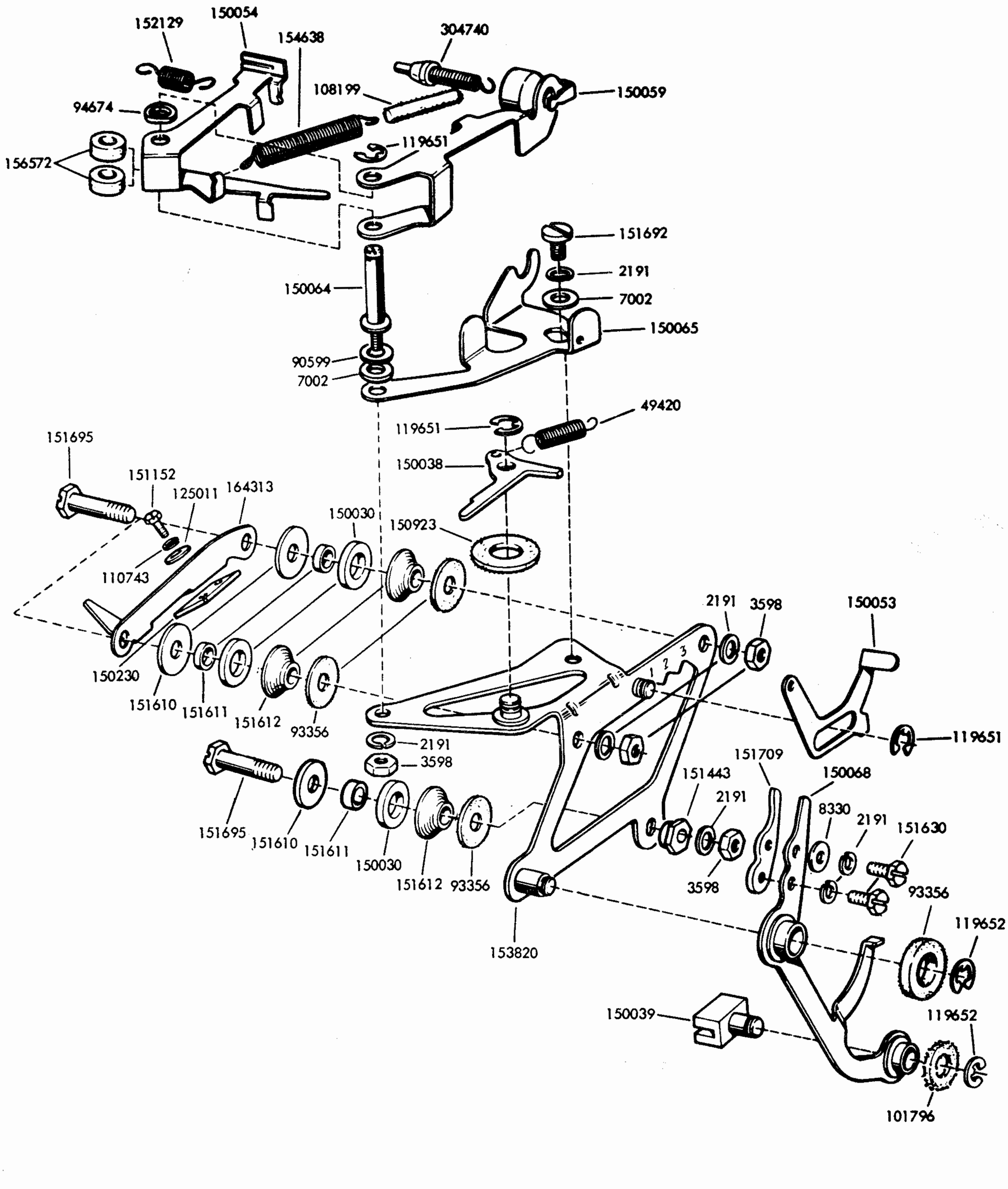



Figure 7-30. Printing Carriage Mechanism

| BAR NO. | FUNCTION | SLOT |
|---|---|---|
| 155129 | SP | 1 |
| 152666 | FIG | 2 |
| 152665 | LTR | 3 |
| 152671 | ACR-LF | 4,39 |
| 152667 | CR | 5 |
| 153437 | UC "S" S.C. | 28 |
| 152669 | BL | 35,36 |
| 152668 | LF | 38 |
| 153435 | LF-SC | 40 |

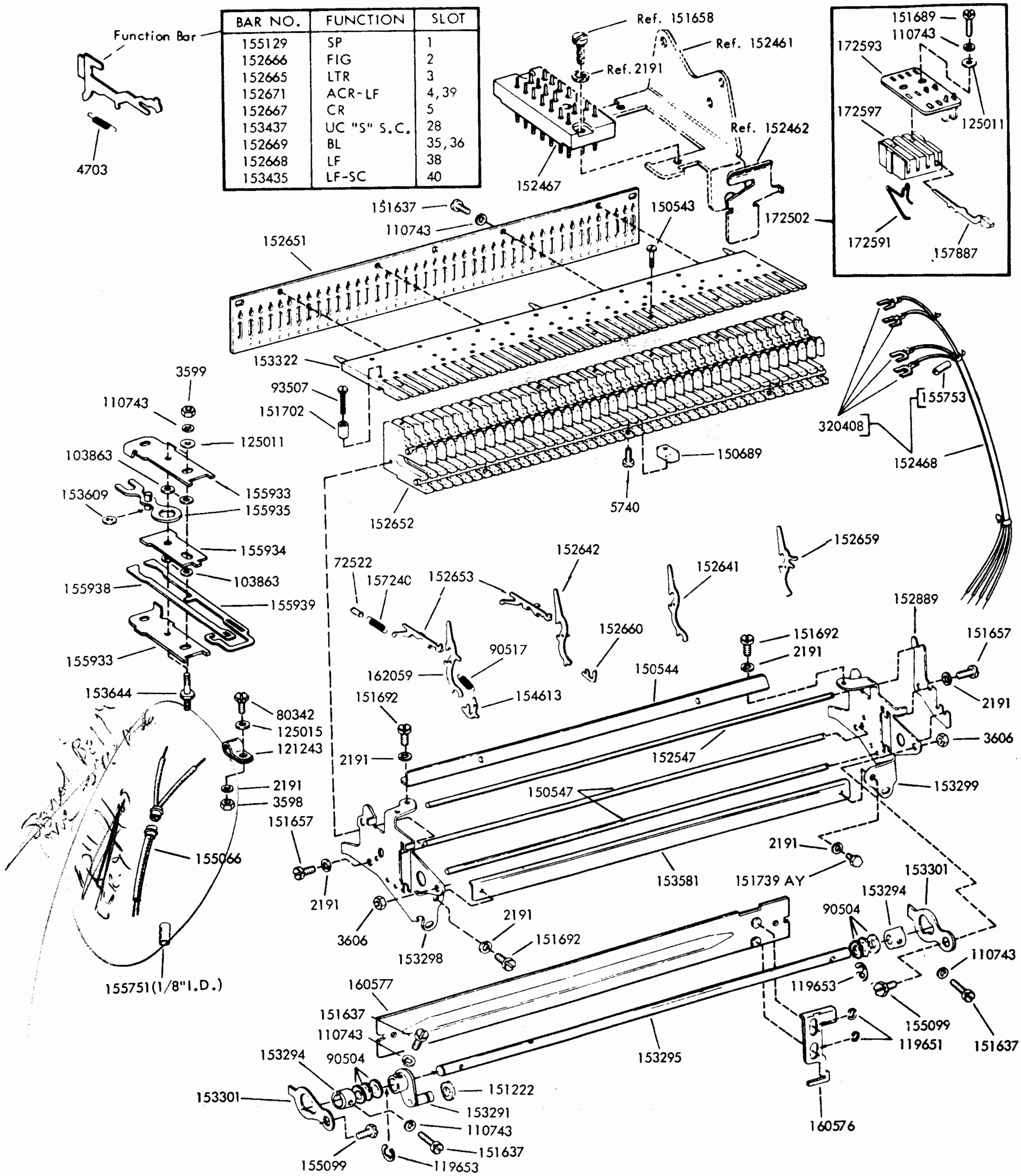
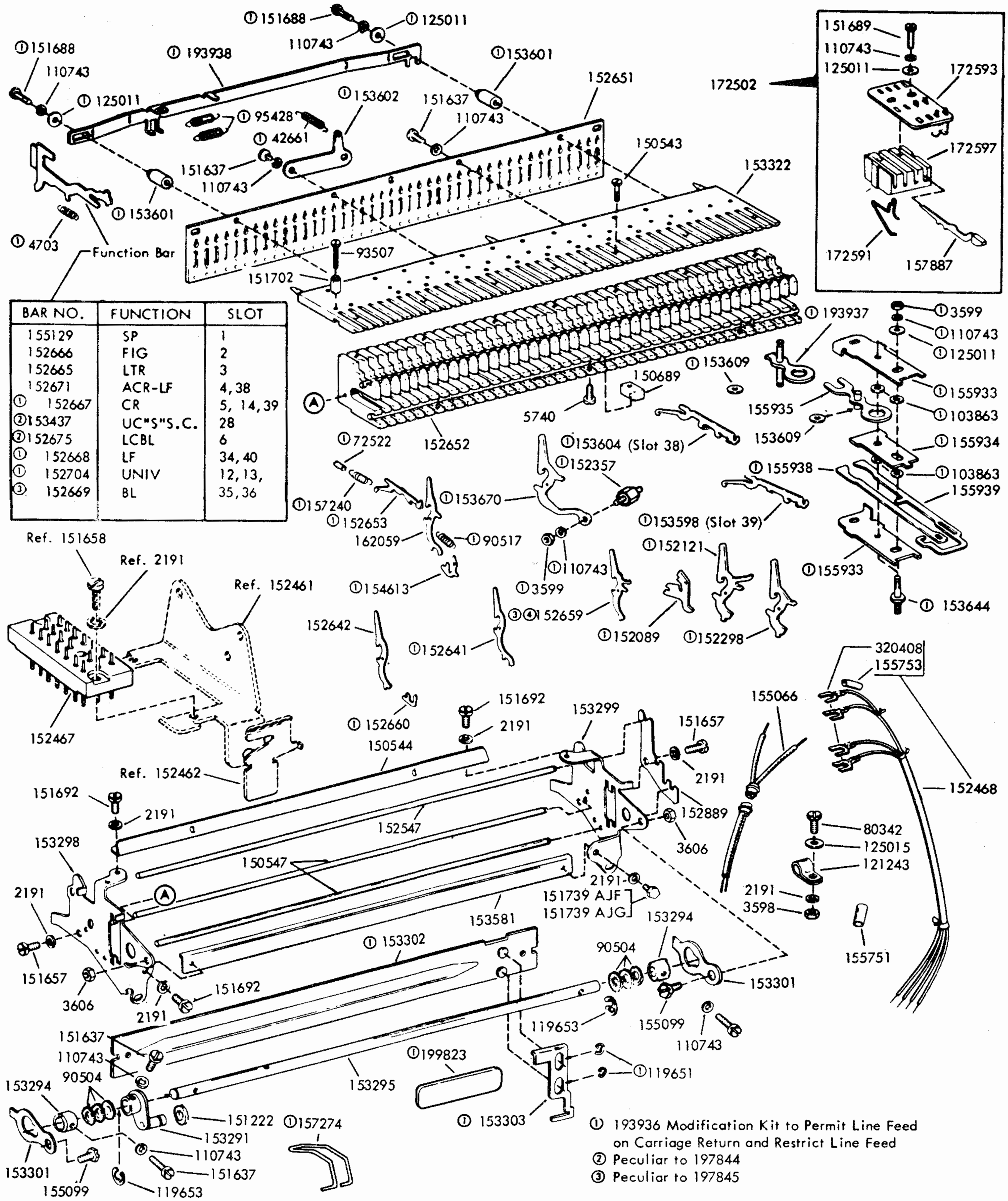


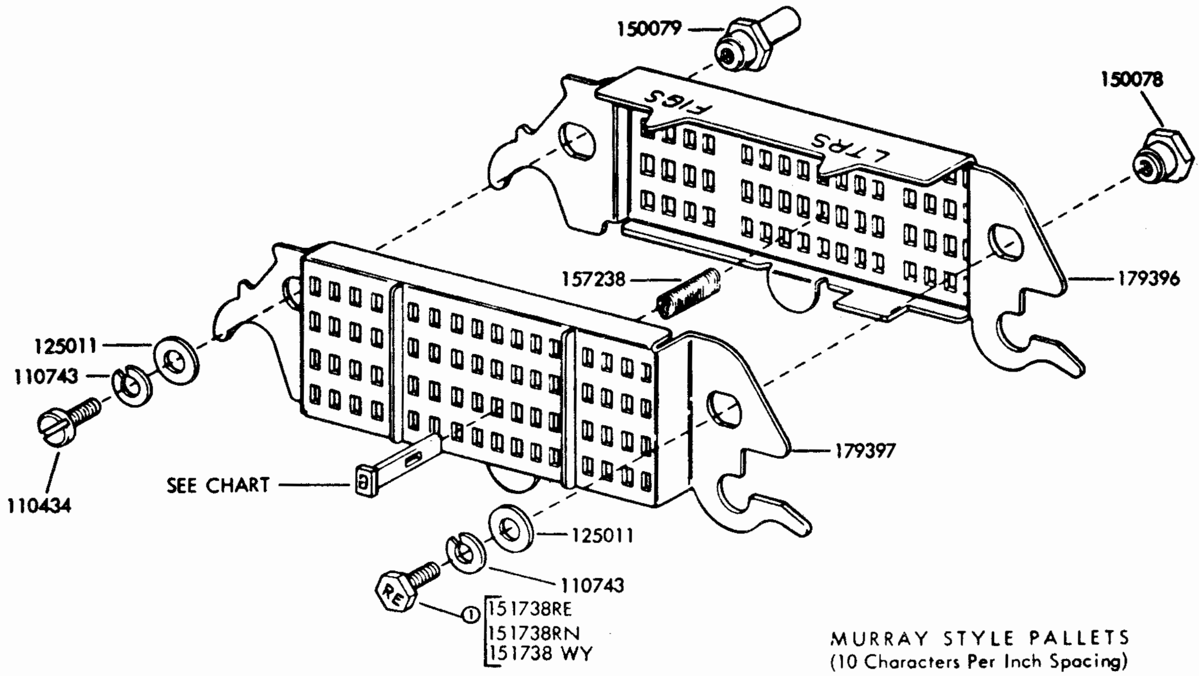

Figure 7-31. 154971 "AY" Stunt Box Assembly




| BAR NO. | FUNCTION | SLOT |
|---|---|---|
| 155129 | SP | 1 |
| 152666 | FIG | 2 |
| 152665 | LTR | 3 |
| 152671 | ACR-LF | 4, 38 |
| ① 152667 | CR | 5, 14, 39 |
| ②153437 | UC"S"S.C. | 28 |
| ③152675 | LCBL | 6 |
| ① 152668 | LF | 34, 40 |
| ① 152704 | UNIV | 12, 13, |
| ③ 152669 | BL | 35, 36 |

① 193936 Modification Kit to Permit Line Feed on Carriage Return and Restrict Line Feed
② Peculiar to 197844
③ Peculiar to 197845

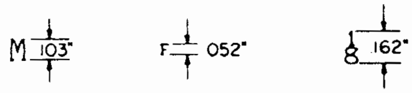
Figure 7-32. 197844 "AJF" and 197845 "AJG" Stunt Box Assemblies




① The two letter suffix indicates a specific type pallet arrangement.

MURRAY STYLE PALLETS
(10 Characters Per Inch Spacing)

CAPS | SMALL CAPS | FRACTIONS




MURRAY STYLE PALLETS

| PALLET | NUMBER | PALLET | NUMBER |
|---|---|---|---|
| A | 157600 | S | 157618 |
| B | 157601 | T | 157619 |
| C | 157602 | U | 157620 |
| D | 157603 | V | 157621 |
| E | 157604 | W | 157622 |
| F | 157605 | X | 157623 |
| G | 157606 | Y | 157624 |
| H | 157607 | Z | 157625 |
| I | 157608 | 1 | 157626 |
| J | 157609 | 2 | 157627 |
| K | 157610 | 3 | 157628 |
| L | 157611 | 4 | 157629 |
| M | 157612 | 5 | 157630 |
| N | 157613 | 6 | 157631 |
| O | 157614 | 7 | 157632 |
| P | 157615 | 8 | 157633 |
| Q | 157616 | 9 | 157634 |
| R | 157617 | - | 157642 |

The Above Pallets are Common to all Murray Style Arrangements

TYPEBOX ARRANGEMENTS
(Murray Style Pallets)

| PALLET | NUMBER | 151683 "RE" | 151938 "RN" | 155701 "WY" |
|---|---|---|---|---|
| Ø | 157635 | X | X | X |
| . | 157636 | X | X | X |
| , | 157637 | | X | X |
| " | 157638 | | X | X |
| ' | 157639 | | X | X |
| ; | 157640 | | X | X |
| : | 157641 | | X | X |
| / | 157643 | X | X | X |
| ? | 157644 | | X | X |
| ) | 157645 | | X | X |
| ( | 157646 | | X | X |
| ! | 157647 | | X | X |
| $ | 157648 | | X | X |
| & | 157649 | | X | X |

| PALLET | NUMBER | 151683 "RE" | 155701 "WY" |
|---|---|---|---|
| # | 157659 | | X |
| ← | 157663 | X | |
| → | 157664 | X | |
| ↓ | 157665 | X | |
| ↑ | 157666 | X | |
| ↖ | 157667 | X | |
| ↗ | 157668 | X | |
| ↘ | 157669 | X | |
| ↙ | 157670 | X | |
| + | 157671 | X | |
| ○ | 157672 | X | |
| ⊕ | 157673 | X | |
| ⊕ | 157674 | X | |
| ⊕ | 157675 | X | |

Figure 7-33. Type Box and Pallets

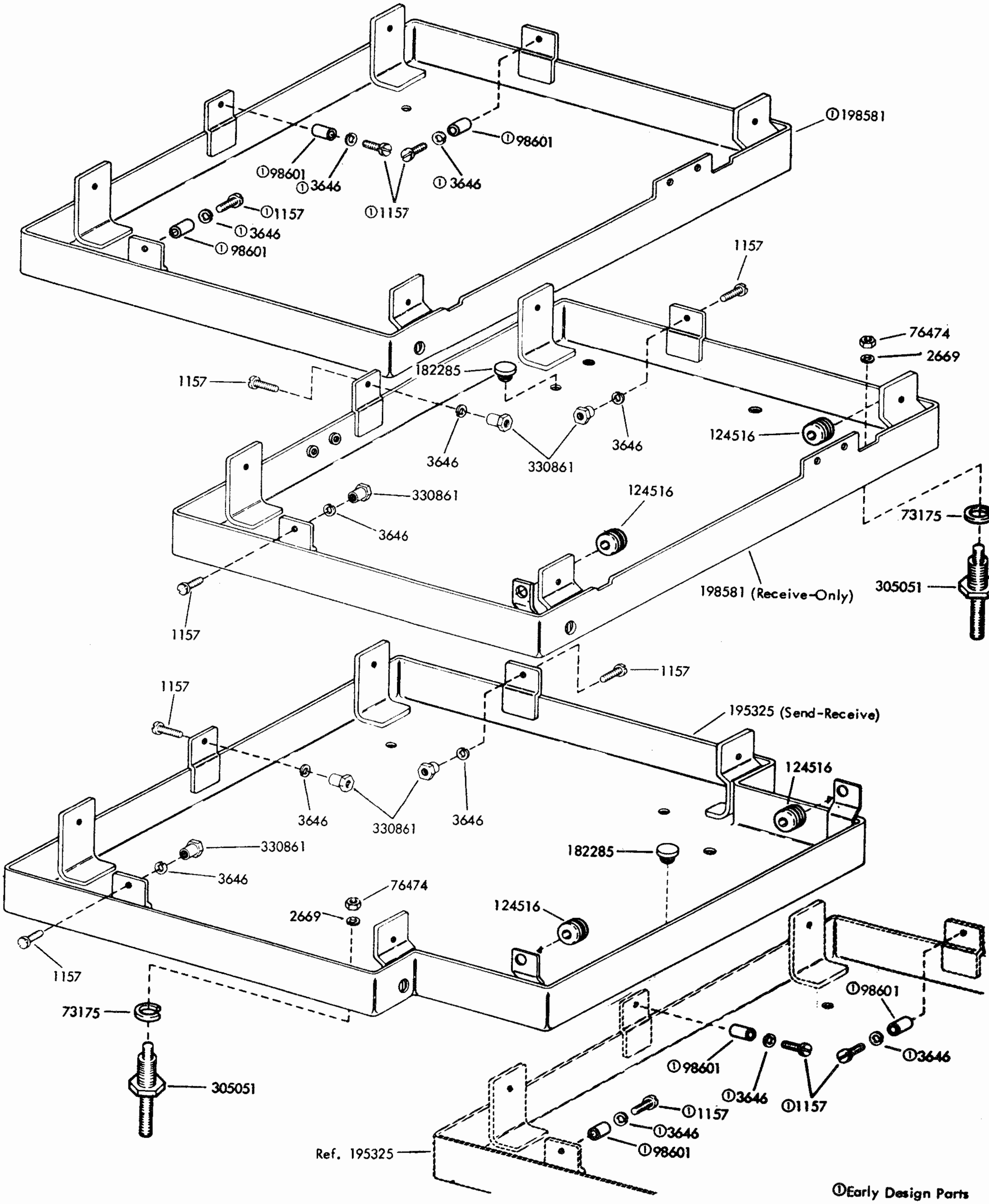
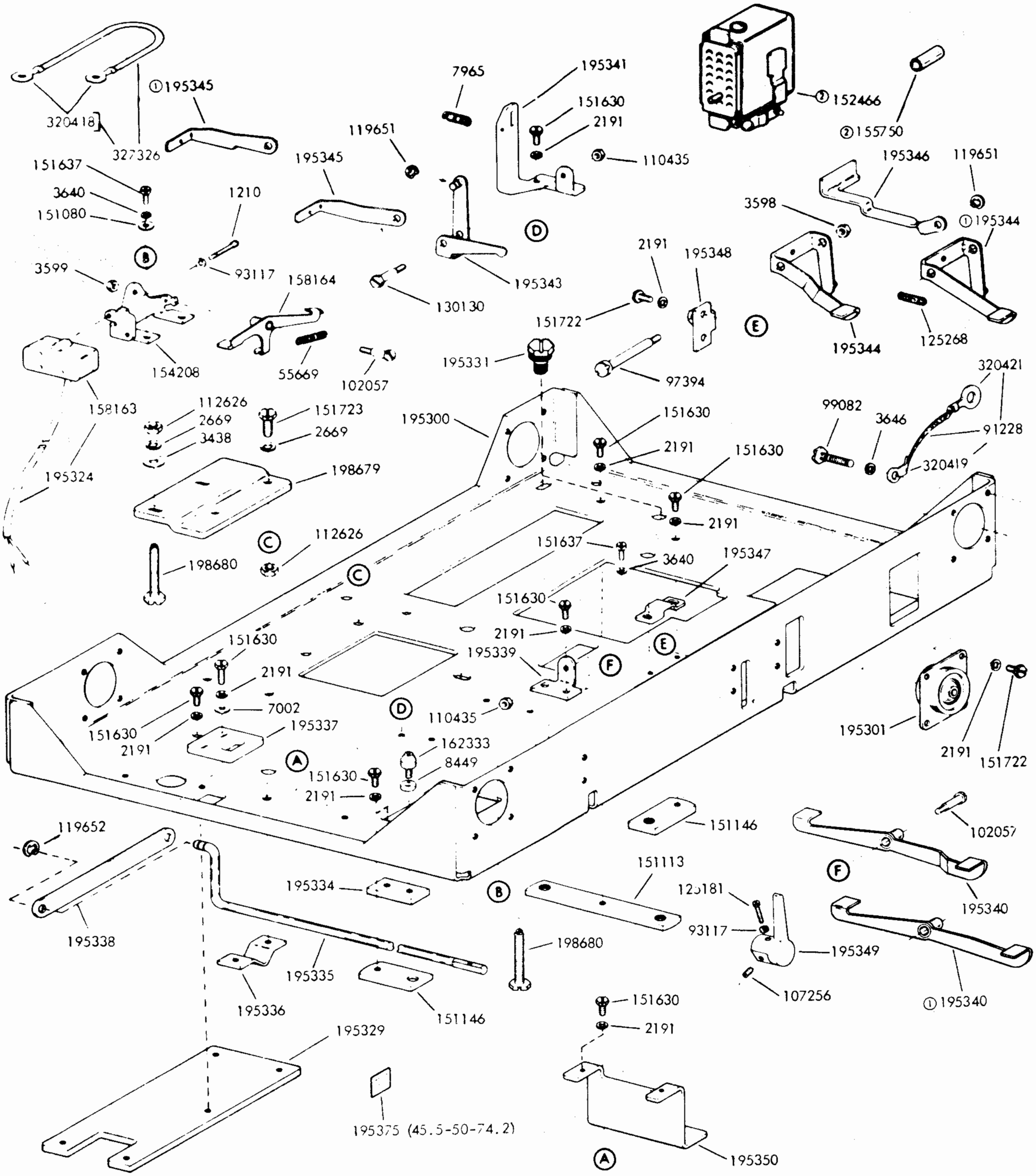



Figure 7-34. Mounting Pans




① Early Design Parts

② 195552 Cable Assembly—Used on High-Level Sets

Figure 7-35. Send-Receive Mounting Base and Components

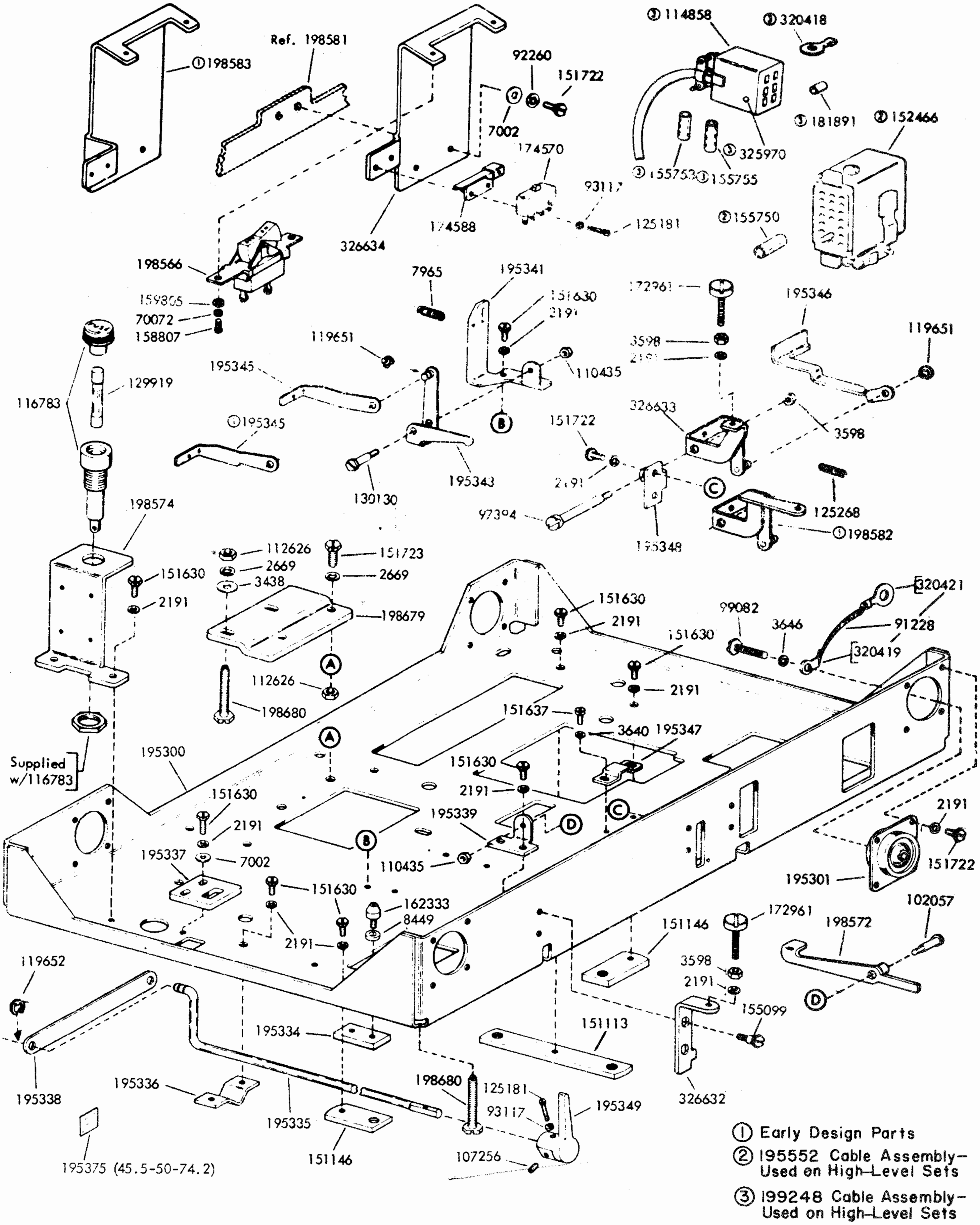



Figure 7-36. Receive-Only Mounting Base and Components

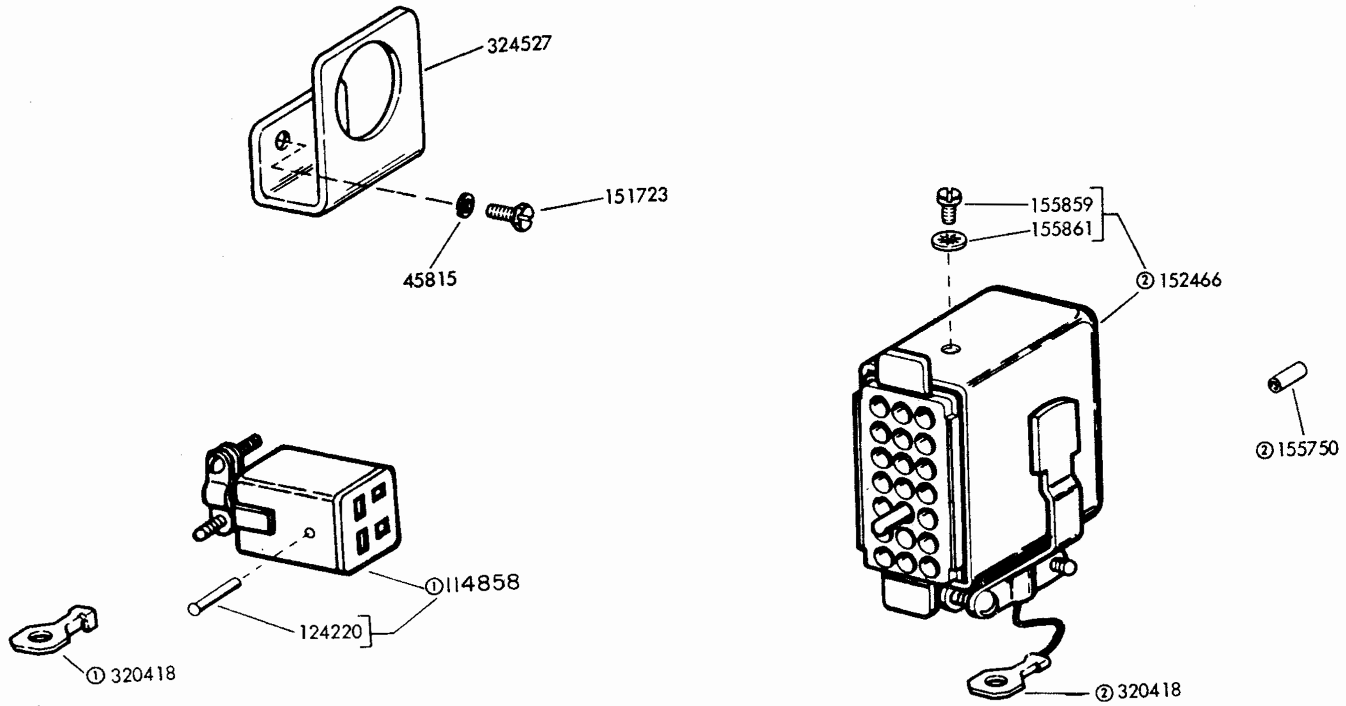



Figure 7-37. Cables for Receive-Only Base - Modification Parts for Low-Level Sets

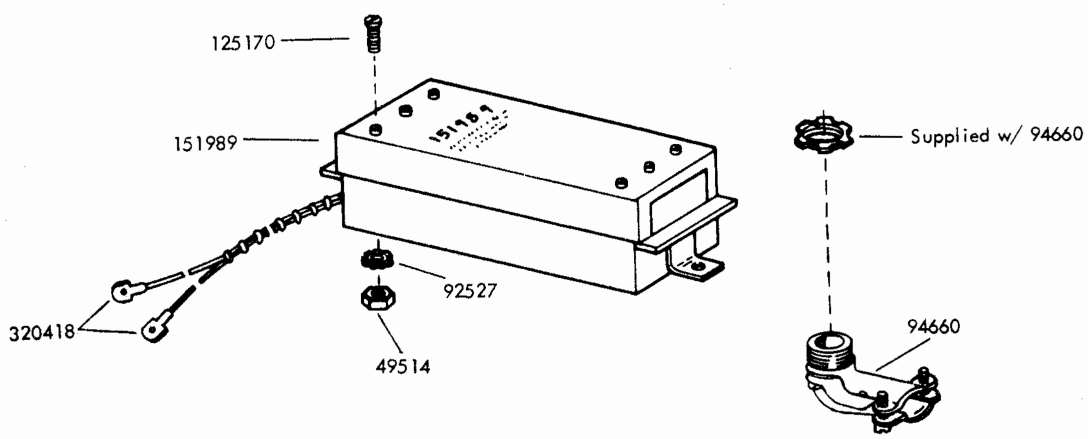
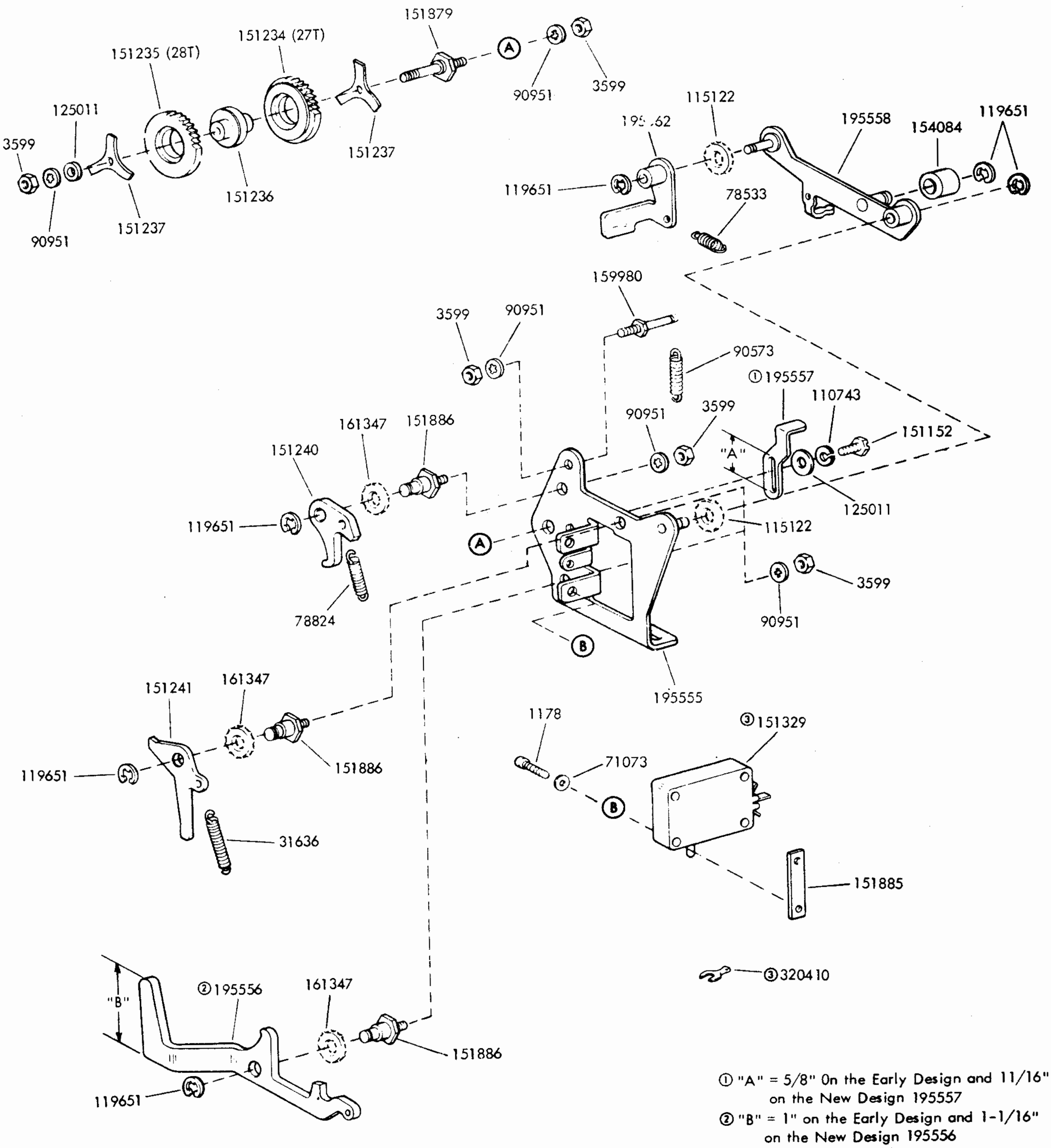



Figure 7-38. 151988 Modification Kit to Add Power Line Electrical Noise Suppressor




① "A" = 5/8" On the Early Design and 11/16" on the New Design 195557

② "B" = 1" on the Early Design and 1-1/16" on the New Design 195556

③ 195554 Cable Assembly

Figure 7-39. 195553 Time Delay Motor Stop Assembly - Used on High-Level Sets

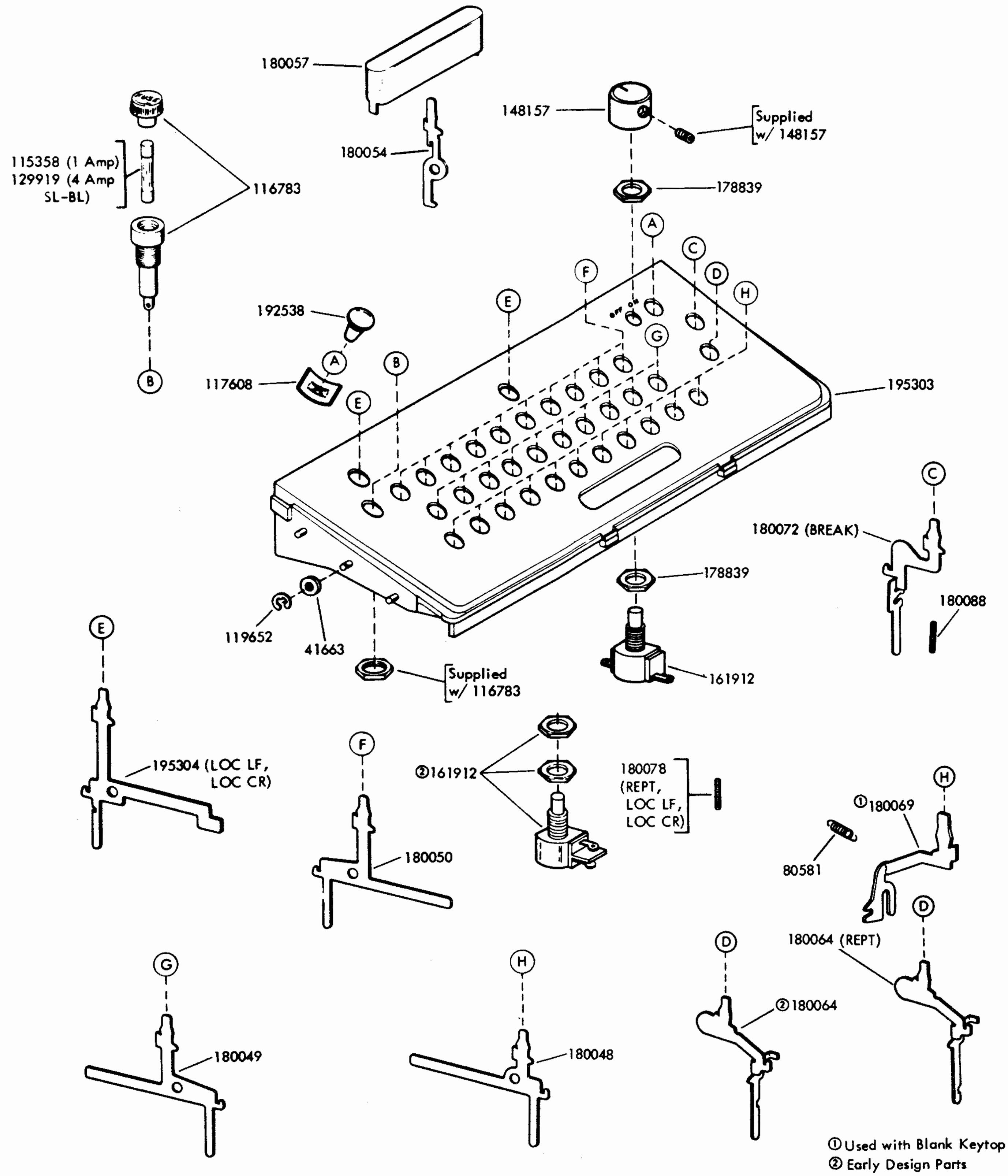



Figure 7-40. Keyboard Cover and Keylever Arrangements


| Keytop Description Lower Case | Keytop Description Upper Case | Part Number | Keytop Description Lower Case | Keytop Description Upper Case | Part Number | Keytop Description Lower Case | Keytop Description Upper Case | Part Number |
|---|---|---|---|---|---|---|---|---|
| LOC LF | | ①151249 | G | &L | 180227 | T | 5 | 180217 |
| LOC CR | | ①151250 | G | ↘ | 185233 | U | | 180177 |
| 1 | ! | 180160 | H | | 180186 | U | 7 | 180219 |
| 2 | " | 180161 | H | #L | 180228 | V | | 180193 |
| 3 | # | 180162 | H | ↓ | 185234 | V | = | 180276 |
| 4 | $ | 180163 | I | 8 | 180220 | V | ;L= | 180235 |
| 5 | % | 180164 | I | TAB | 180178 | V | 3/8 | 180248 |
| 6 | & | 180165 | J | | 180187 | V | ; | 180342 |
| 7 | ' | 180166 | J | BELL | 180229 | V | ⦶ | 185239 |
| 8 | ( | 180167 | J | , | 180243 | W | | 180172 |
| 9 | ) | 180168 | J | ' | 180390 | W | 2 | 180214 |
| 0 | | 180169 | J | ↙ | 185235 | X | | 180191 |
| A | | 180181 | K | VT | 180188 | X | / | 180233 |
| A | - | 180223 | K | 1/2 | 180244 | Y | | 180176 |
| A | ↑ | 185230 | K | ( | 180230 | Y | 6 | 180218 |
| B | | 180194 | K | ← | 185236 | Z | | 180190 |
| B | 5/8 | 180249 | L | FORM | 180189 | Z | + | 180275 |
| B | ? | 180236 | L | 3/4 | 180245 | Z | "L± | 180232 |
| B | ⊕ | 185240 | L | ) | 180231 | Z | " | 180246 |
| C | | 180192 | L | ↖ | 185237 | SHIFT | | 180061 |
| C | WRU | 180247 | M | | 180196 | RUB OUT | | 180201 |
| C | : | 180234 | M | | 180238 | RETURN | | 180202 |
| C | O | 185238 | N | | 180250 | LINE FEED | | 180203 |
| D | EOT | 180183 | N | , | 180237 | HERE IS | | 180206 |
| D | + | 180225 | N | ↑ | 180195 | BREAK | | 180207 |
| D | $ | 180240 | N | ⦶ | 185241 | REPT | | 180208 |
| D | WRU | 180277 | O | ← | 180179 | FIGS | | 180210 |
| D | ↗ | 185231 | O | 9 | 180221 | LTRS | | 180211 |
| E | WRU | 180173 | P | @ | 180180 | ALT MODE | | 180257 |
| E | 3 | 180215 | P | 0 | 180222 | (No Symbol) | | 180299 |
| F | | 180273 | P | Ø | 180389 | CTRL | | 181253 |
| F | RU | 180184 | Q | | 180171 | - | = | 180170 |
| F | 1 4 | 180241 | Q | 1 | 180213 | , | < | 180197 |
| F | sL | 180226 | R | TAPE | 180174 | . | > | 180198 |
| F | → | 185232 | R | 4 | 180216 | ; | + | 180199 |
| F | ! | 180343 | S | BELL | 180239 | / | ? | 180200 |
| G | | 180274 | S | X OFF | 180182 | : | * | 180205 |
| G | BELL | 180185 | S | ' | 180224 | | − | 185229 |
| G | & | 180242 | T | ~~TAPE~~ | 180175 | | | |

① Red Keytops with white characters

Figure 7-41. Keytops

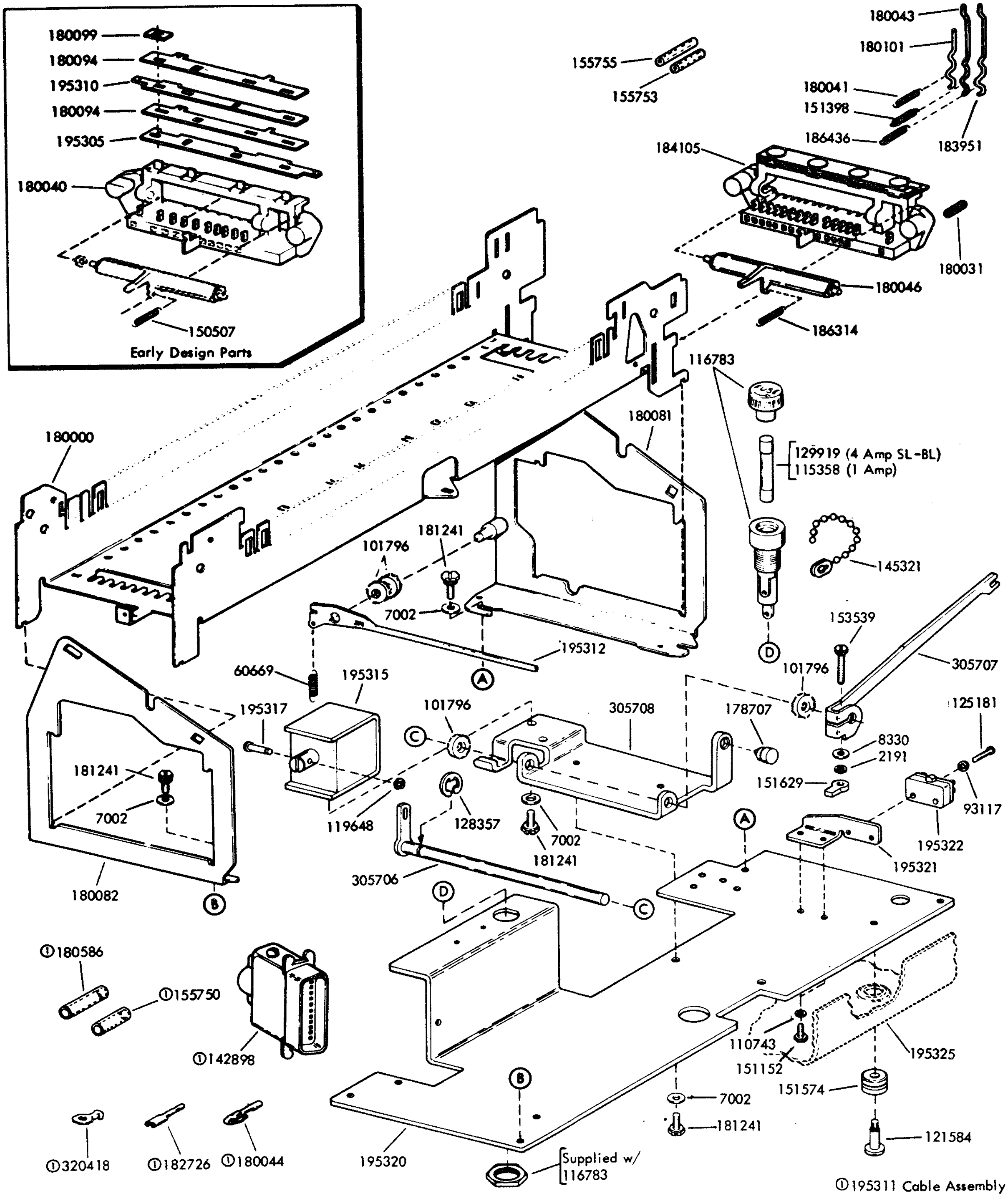



Figure 7-42. Keyboard Frame and Reset Mechanism Used on High-Level Sets

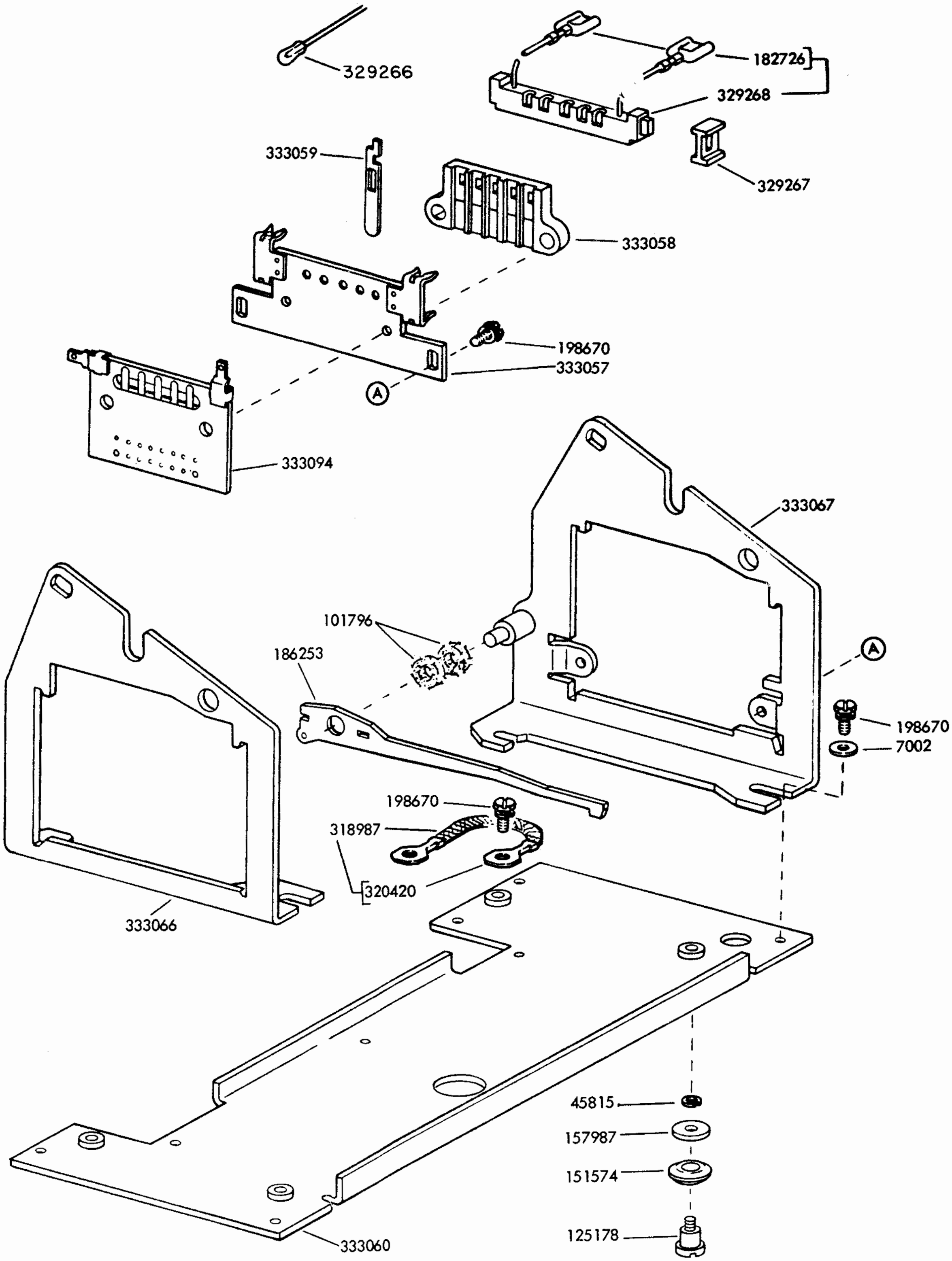



Figure 7-43. Keyboard Assembly - Used on Low-Level Sets

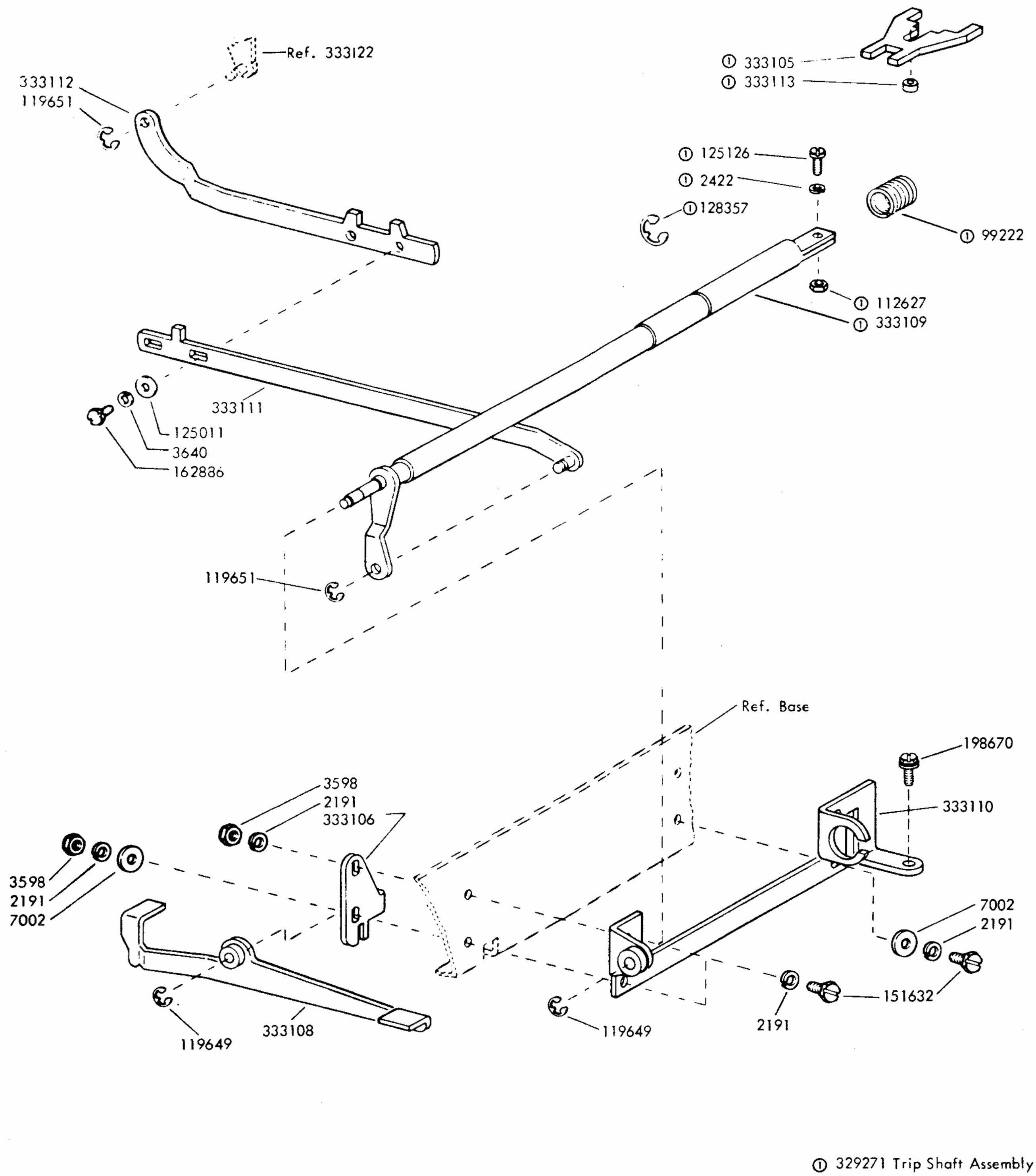



Figure 7-44. Trip Shaft Mechanism - Used on Low-Level Sets

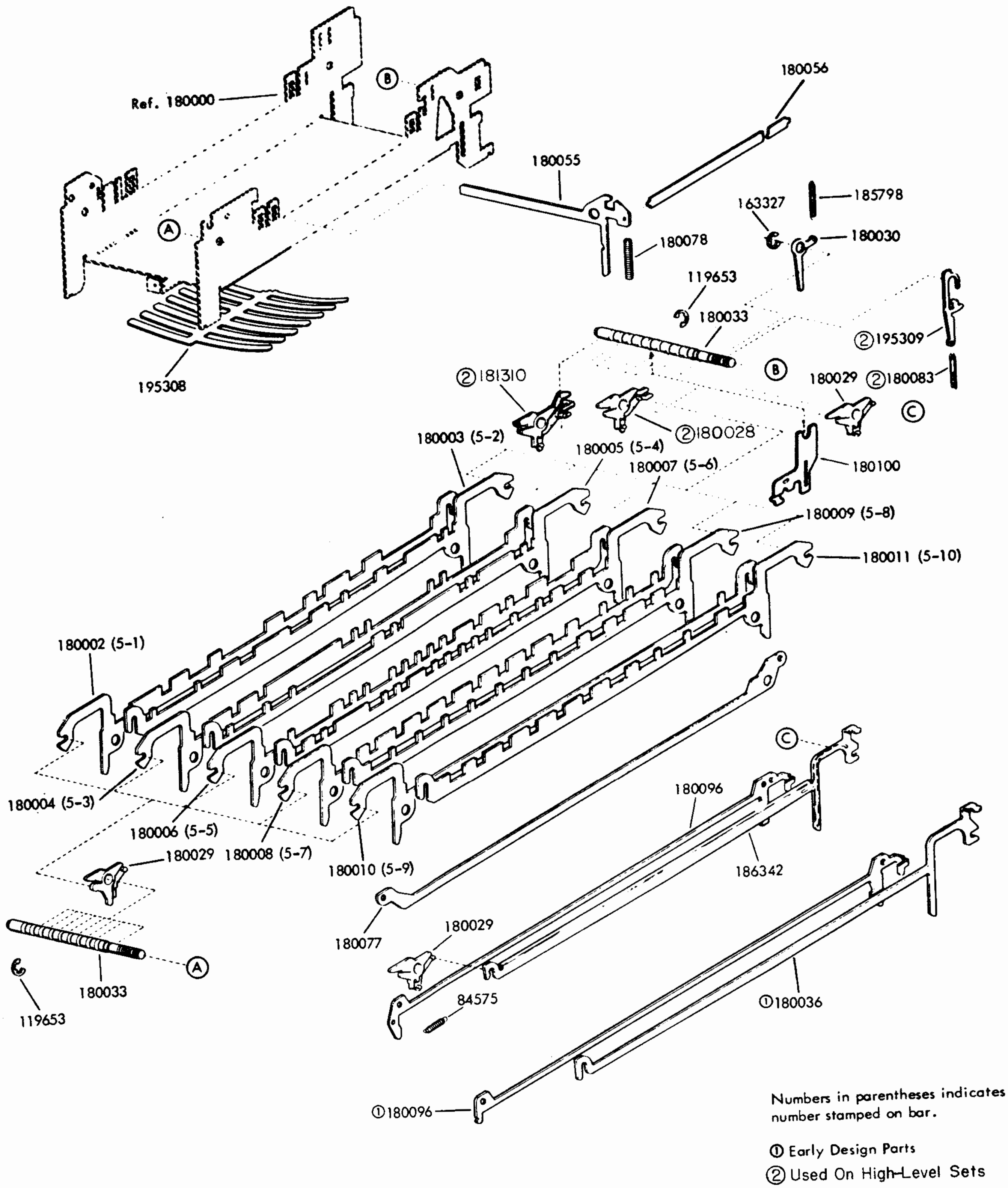



Figure 7-45. Keyboard Code Bar Mechanism

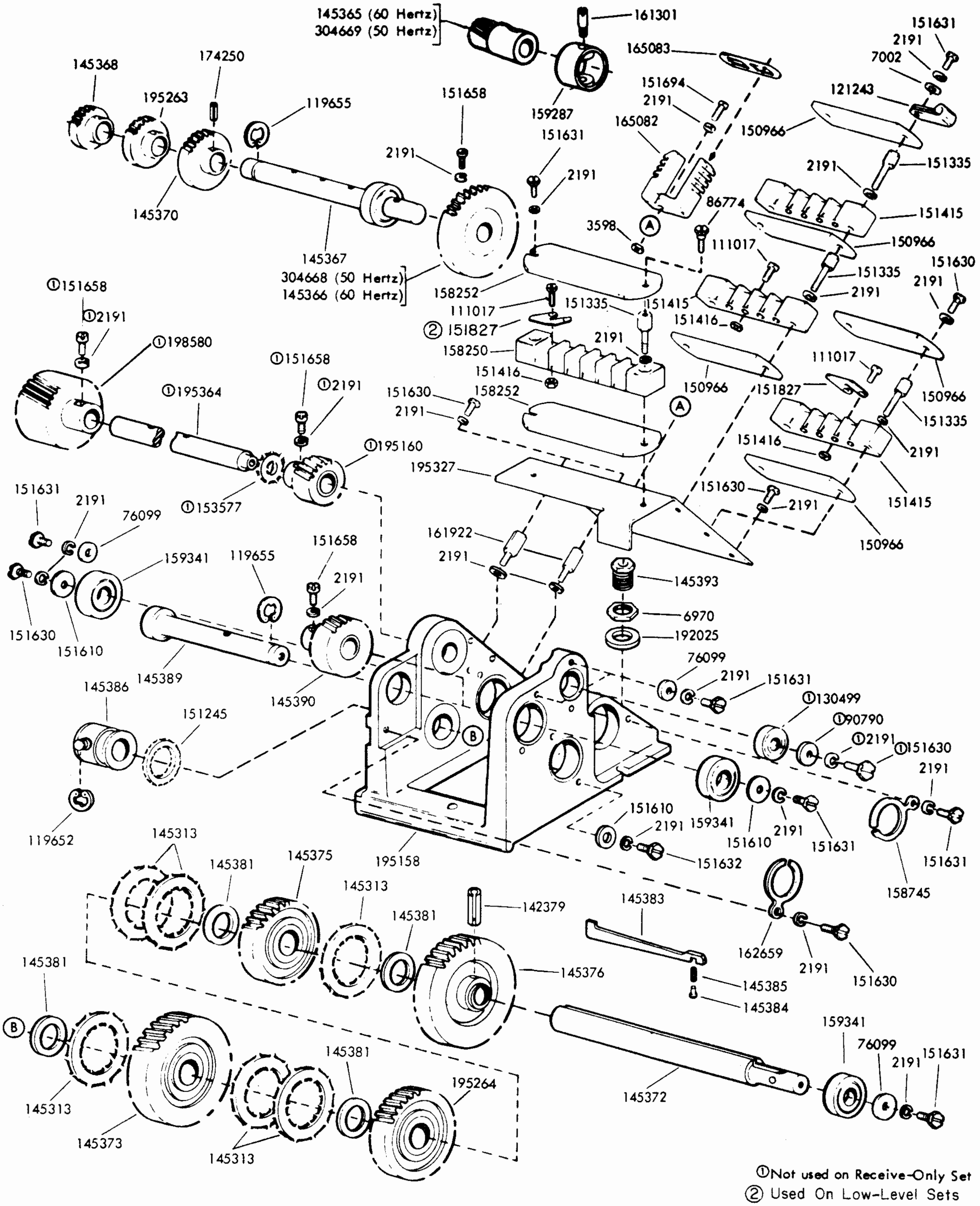



Figure 7-46. Gear Shift Mechanism (Send-Receive and Receive-Only)

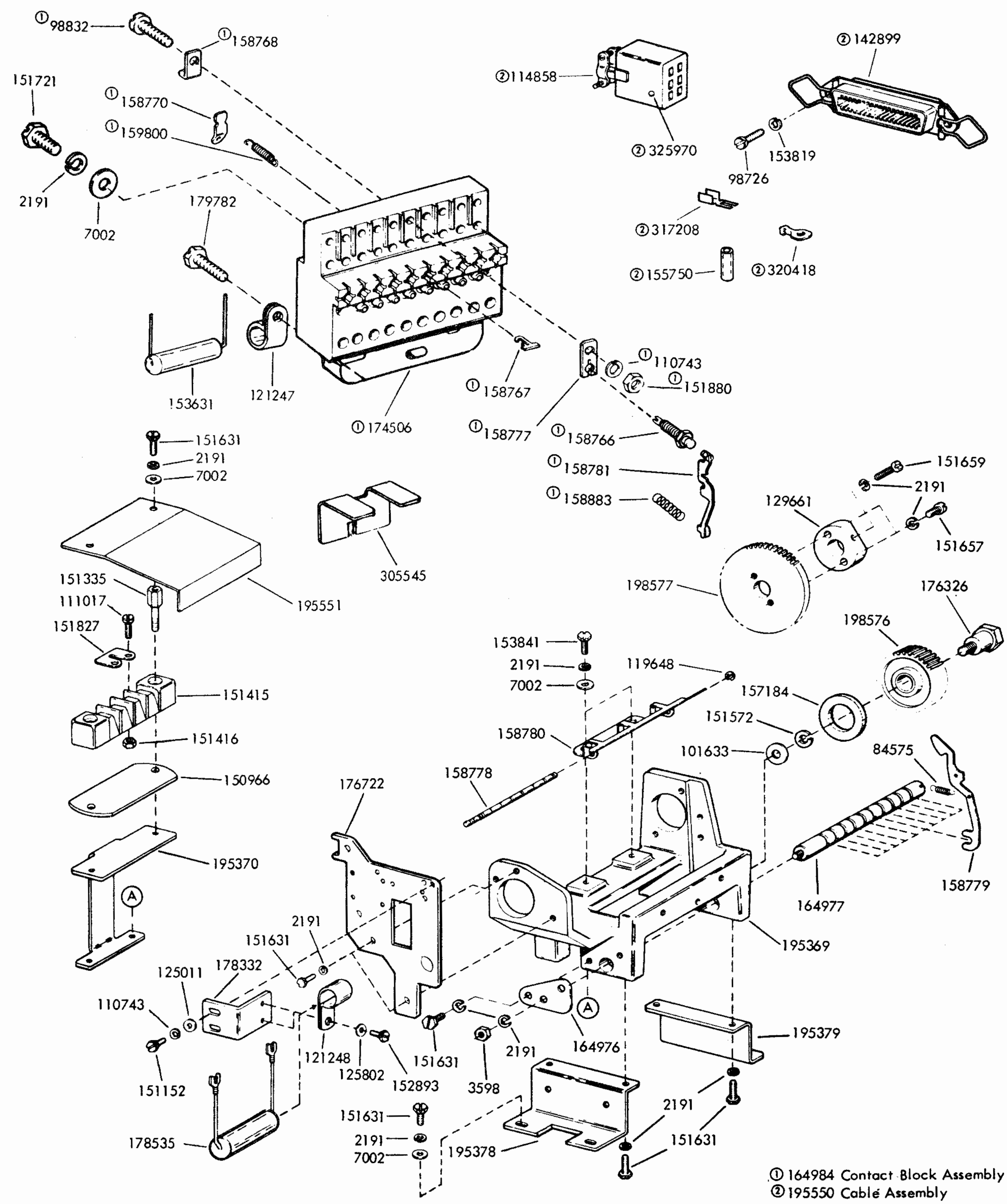



Figure 7-47. Distributor Components - Used on High-Level Sets

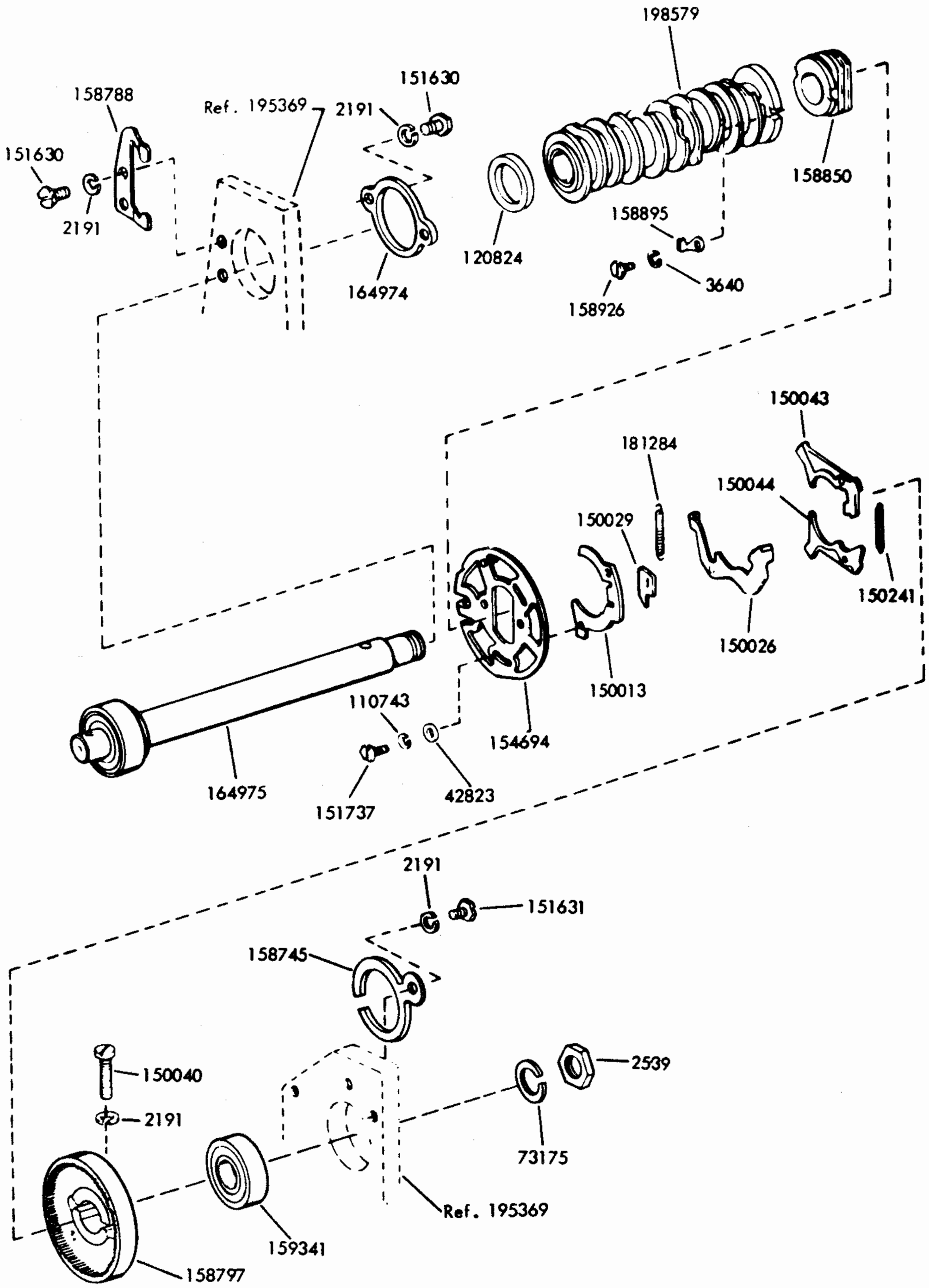



Figure 7-48. Distributor Clutch Mechanism - Used on High-Level Sets

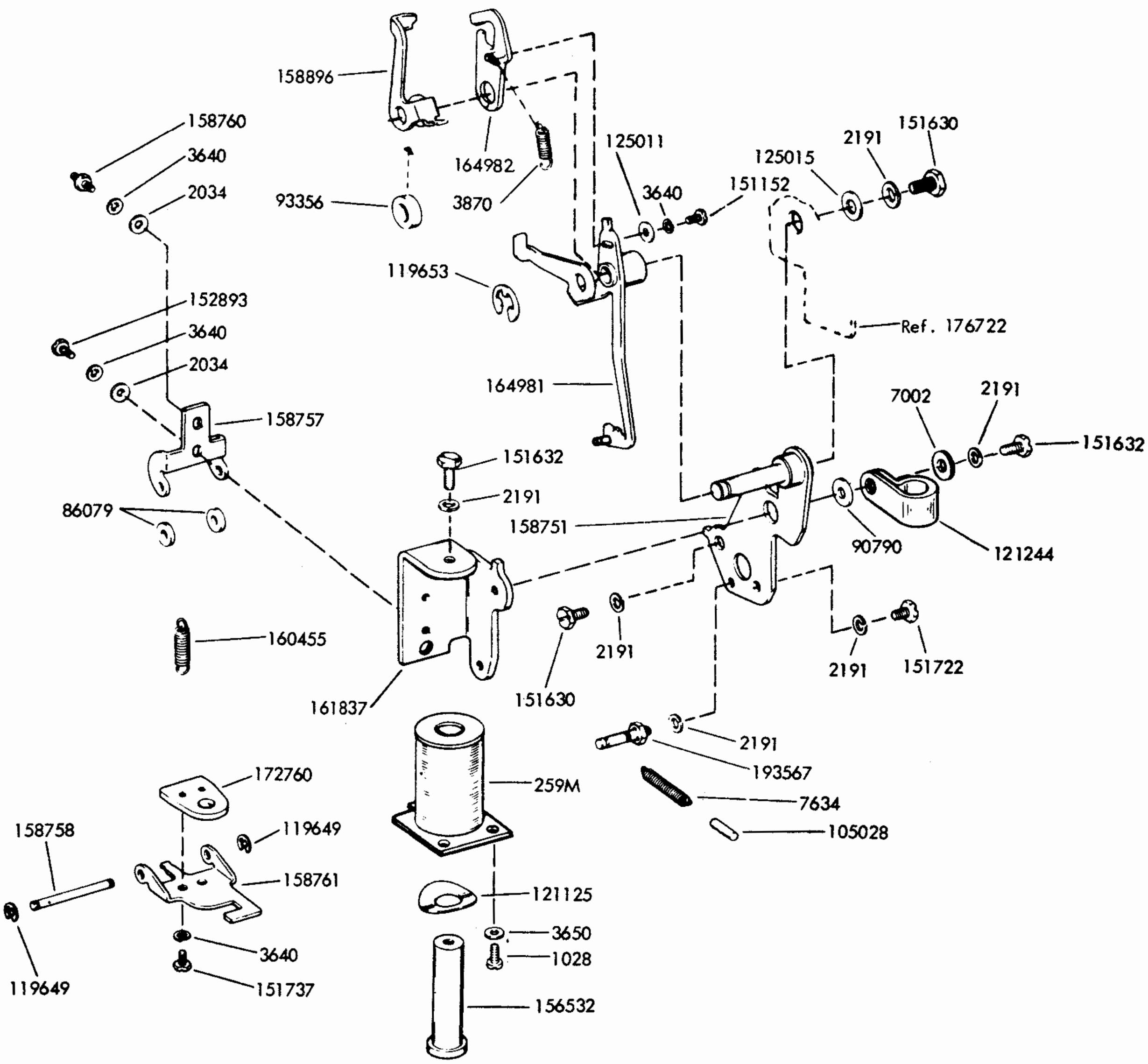



Figure 7-49. Distributor Clutch Trip Mechanism -
Used on High-Level Sets

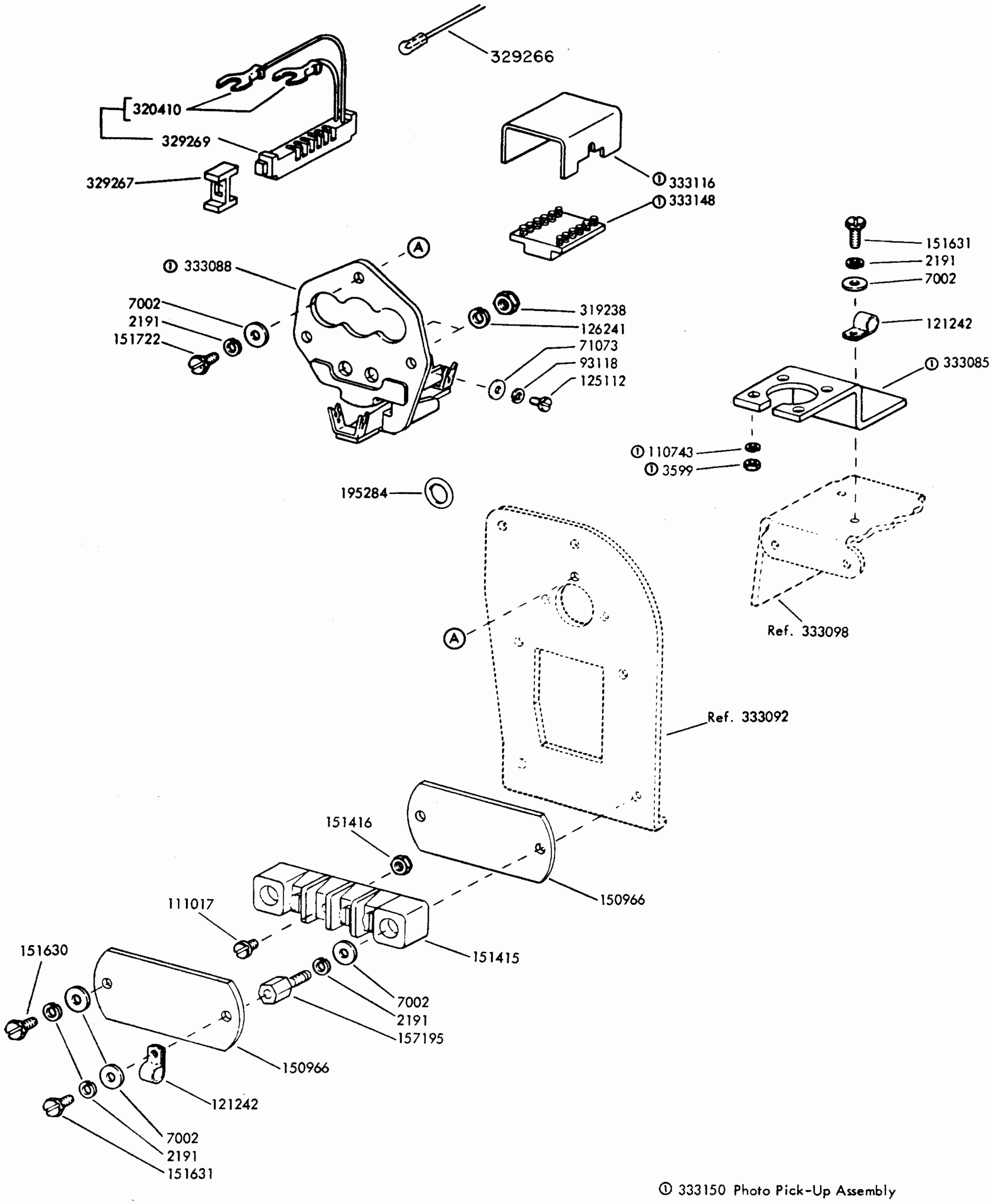



Figure 7-50. 323118 Distributor Mechanism - Used on Low-Level Sets (Sheet 1 of 2)

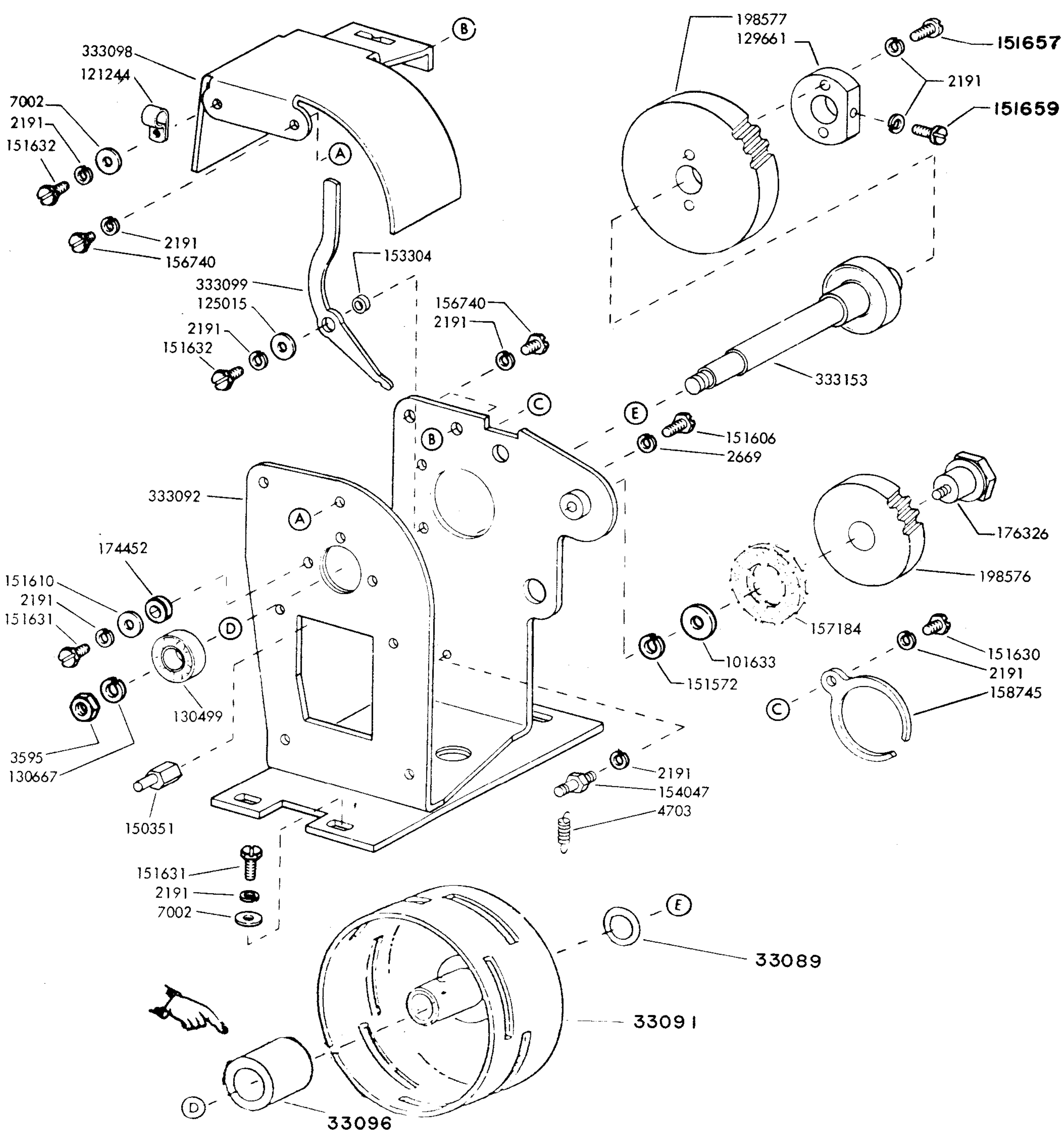



Figure 7-51. 323118 Distributor Mechanism - Used on Low-Level Sets (Sheet 2 of 2)

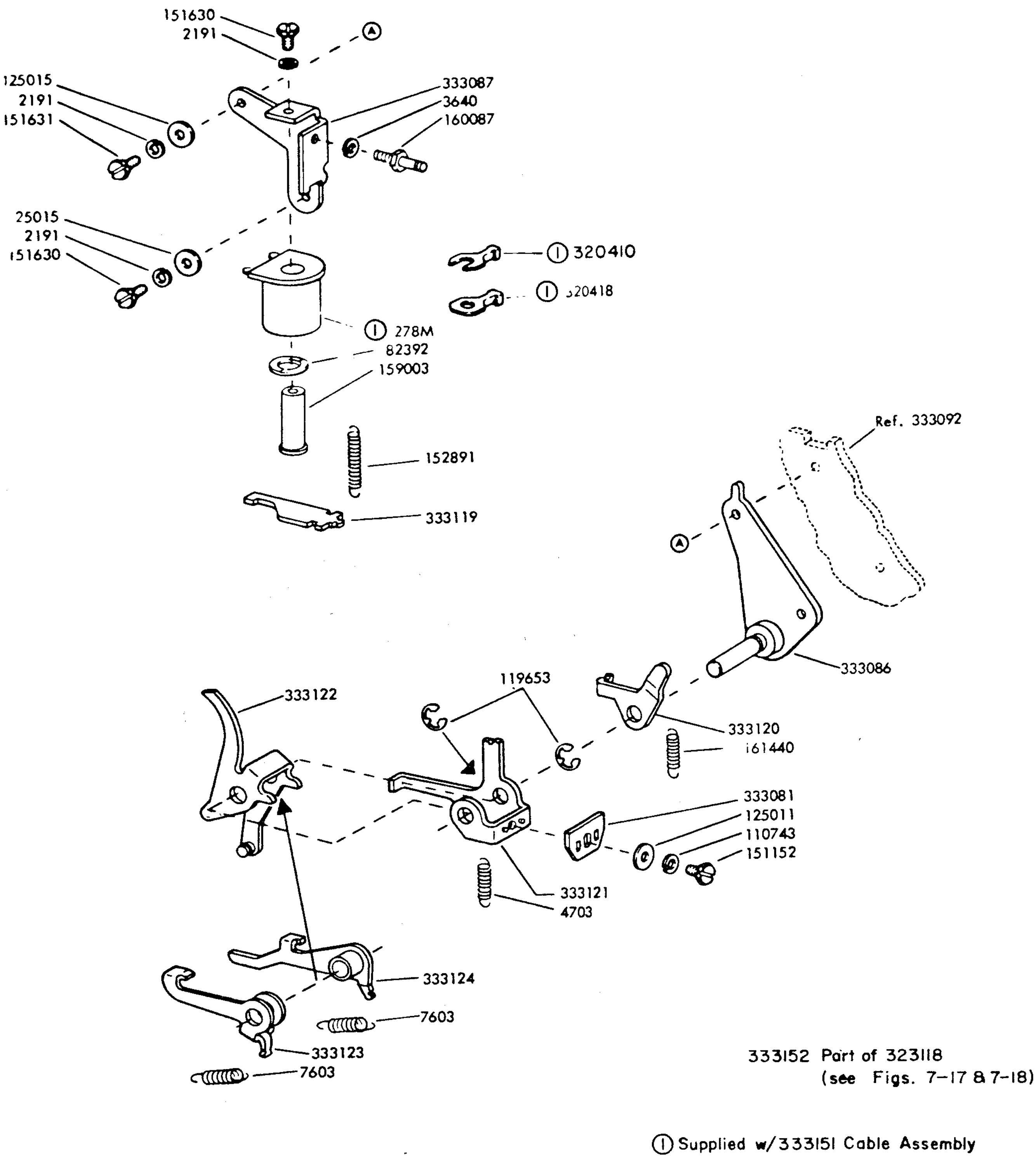



Figure 7-52. 333152 Distributor Clutch Trip Assembly - Used on Low-Level Sets

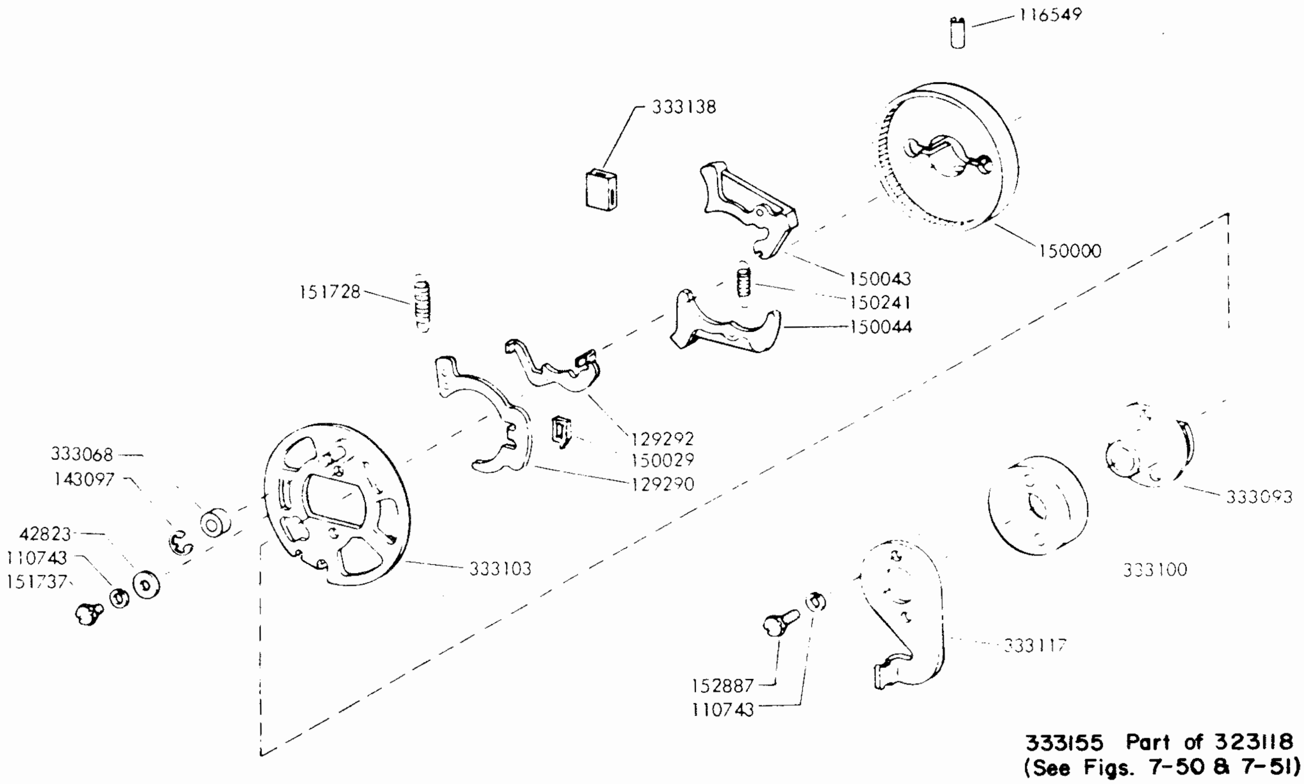



Figure 7-53. 333155 Distributor Clutch Assembly - Used on Low-Level Sets

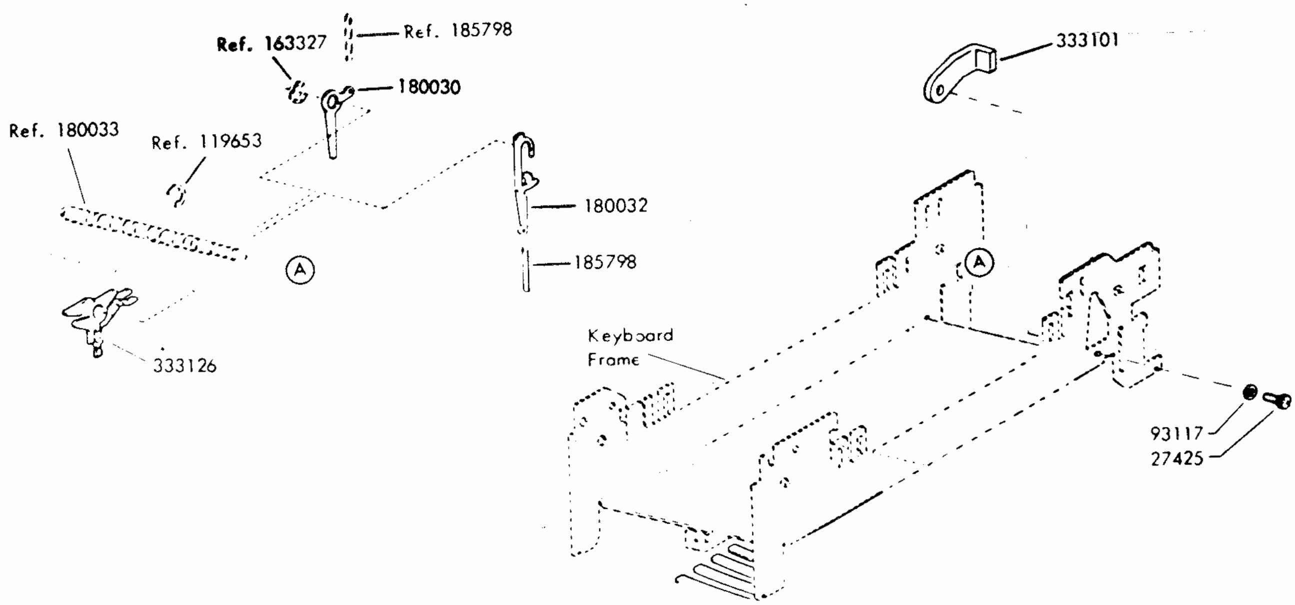
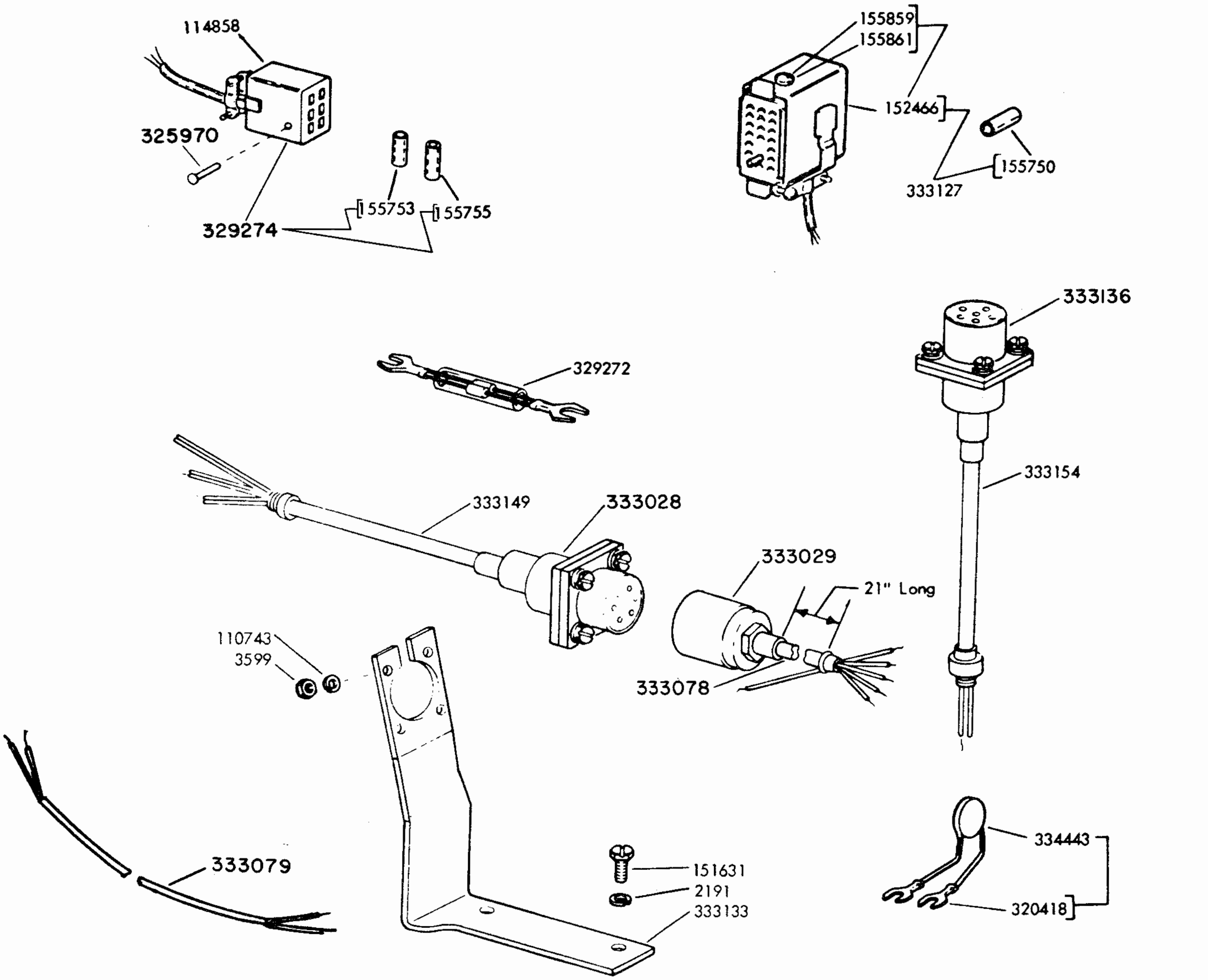
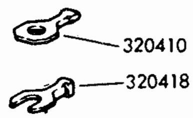



Figure 7-54. Code Bar Mechanism Modification Parts - Used on Low-Level Sets





| Cable Clamp | Dim. A |
|---|---|
| 121242 | 5/16" |
| 121244 | 13/32" |

| Jumper | Length | Color | Terminal |
|---|---|---|---|
| 135563 | 2-3/4" | Green | 320410 (One) |
| 307544 | 6" | Green | 320410 (Two) |
| 307545 | 2" | Green | 320410 (Two) |

Figure 7-55. Cabling - Used on Send-Receive Low-Level Sets

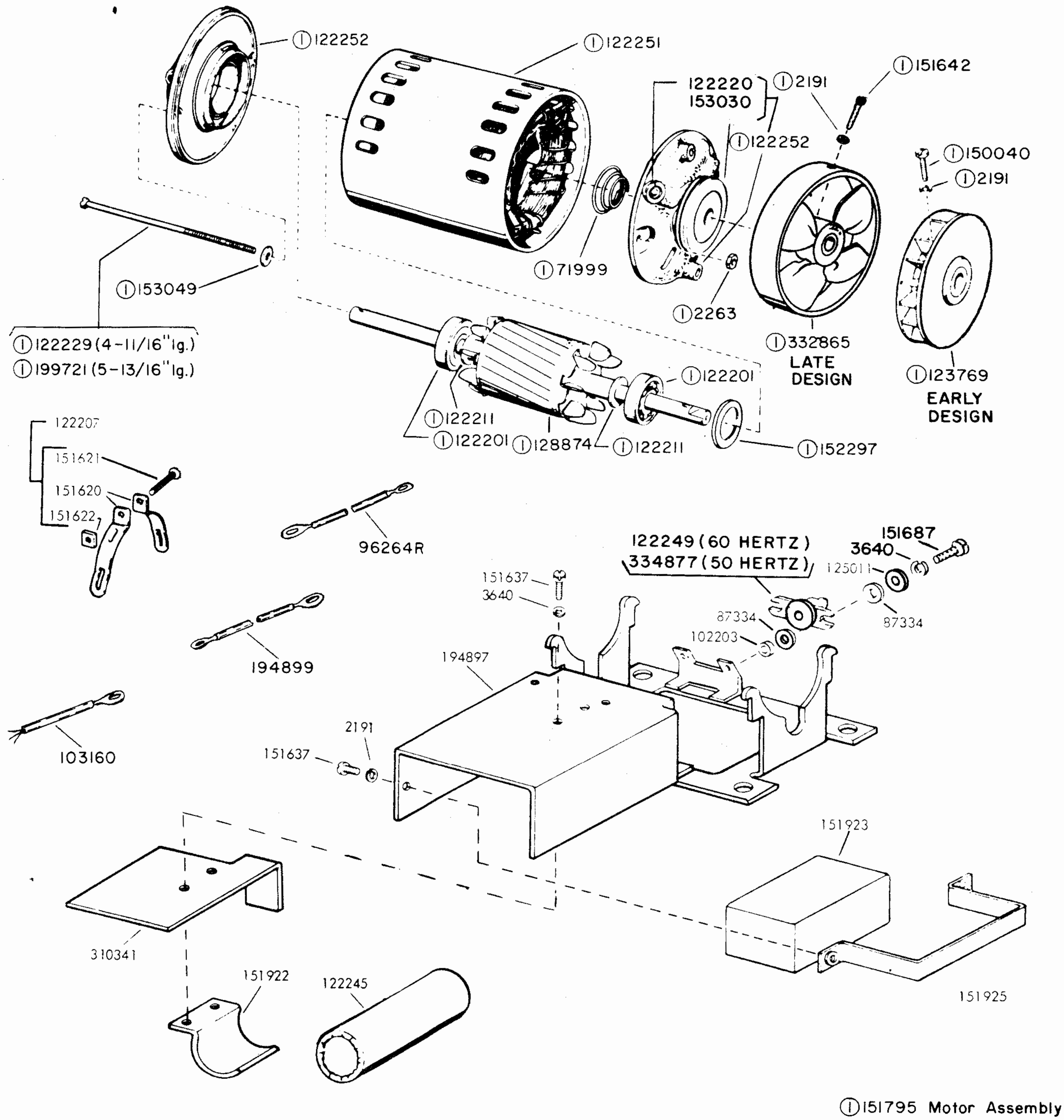
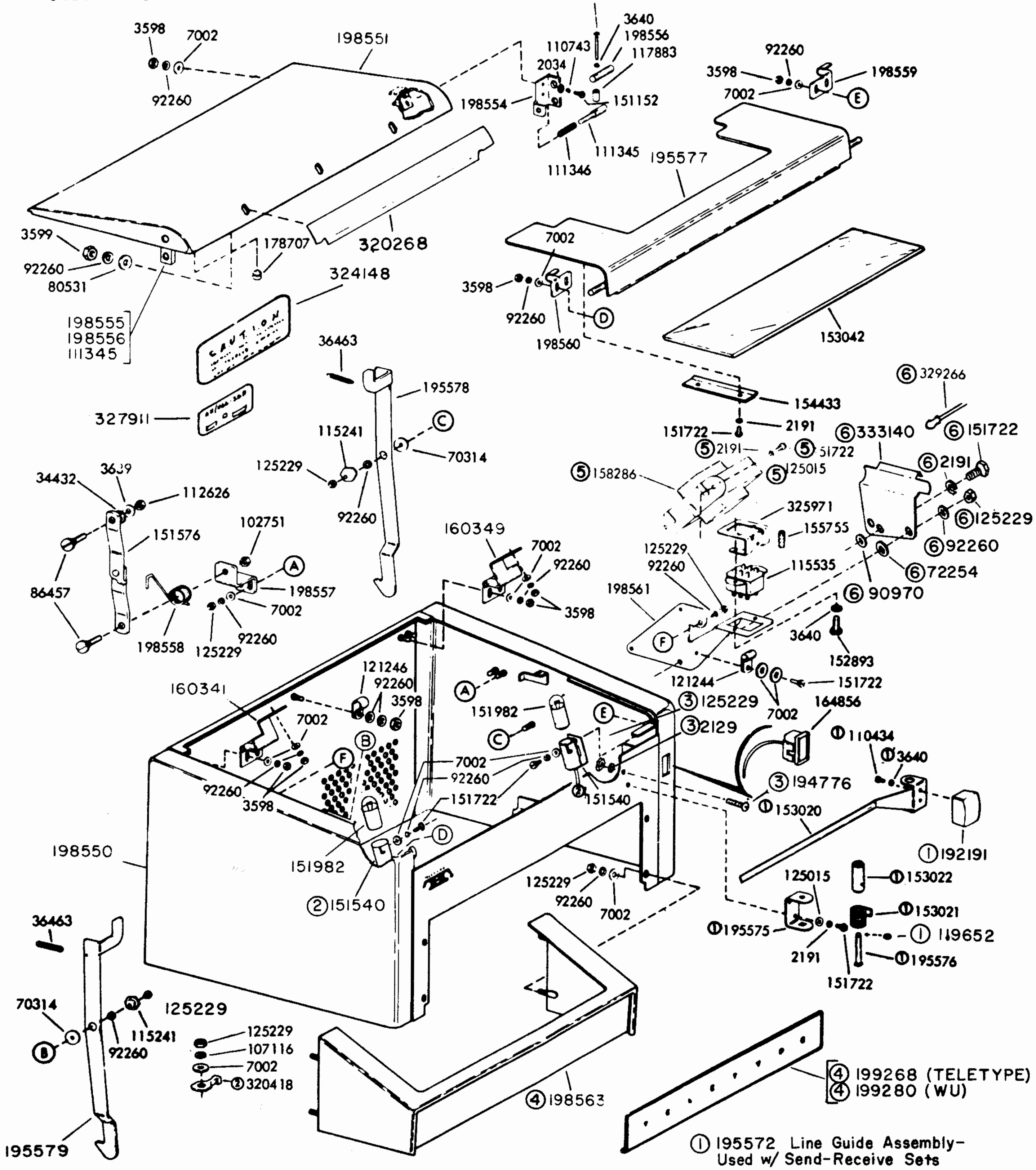



Figure 7-56. Motor Assembly and Relay/Capacitor Mounting




(1) 195572 Line Guide Assembly-Used w/ Send-Receive Sets
(2) Part of 198562 Cable Assembly
(3) Used w/ ReceiveOnly Set
(4) Used w/ Send-Receive Sets
(5) Used w/ High-Level Sets
(6) Used w/ Low-Level Sets

Figure 7-57. Cover and Component

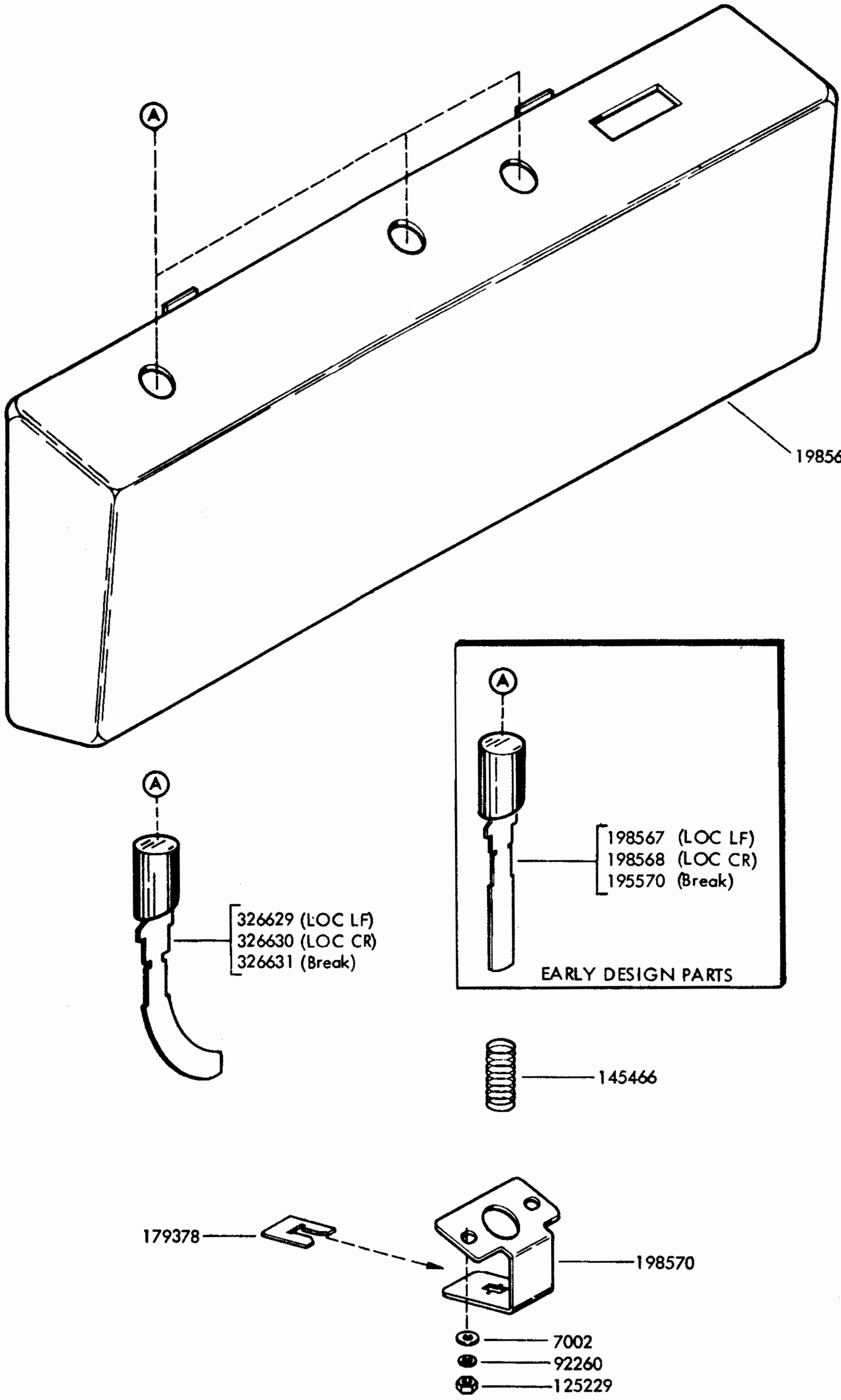



Figure 7-58. 198569 Keyboard Hood Assembly - Receive-Only

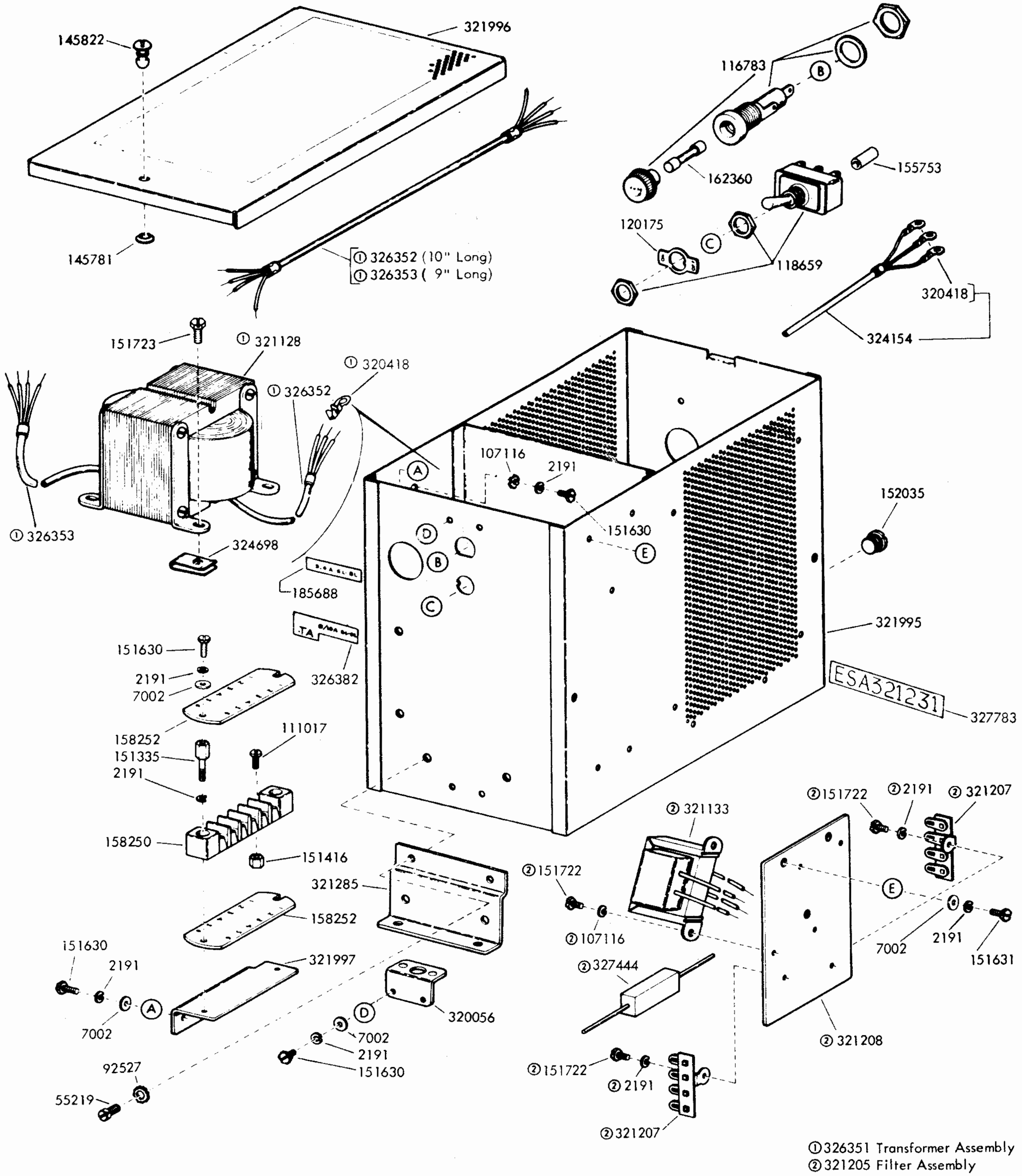



Figure 7-59. 321231 Electrical Service Assembly - Used with RO Sets (Sheet 1 of 2)

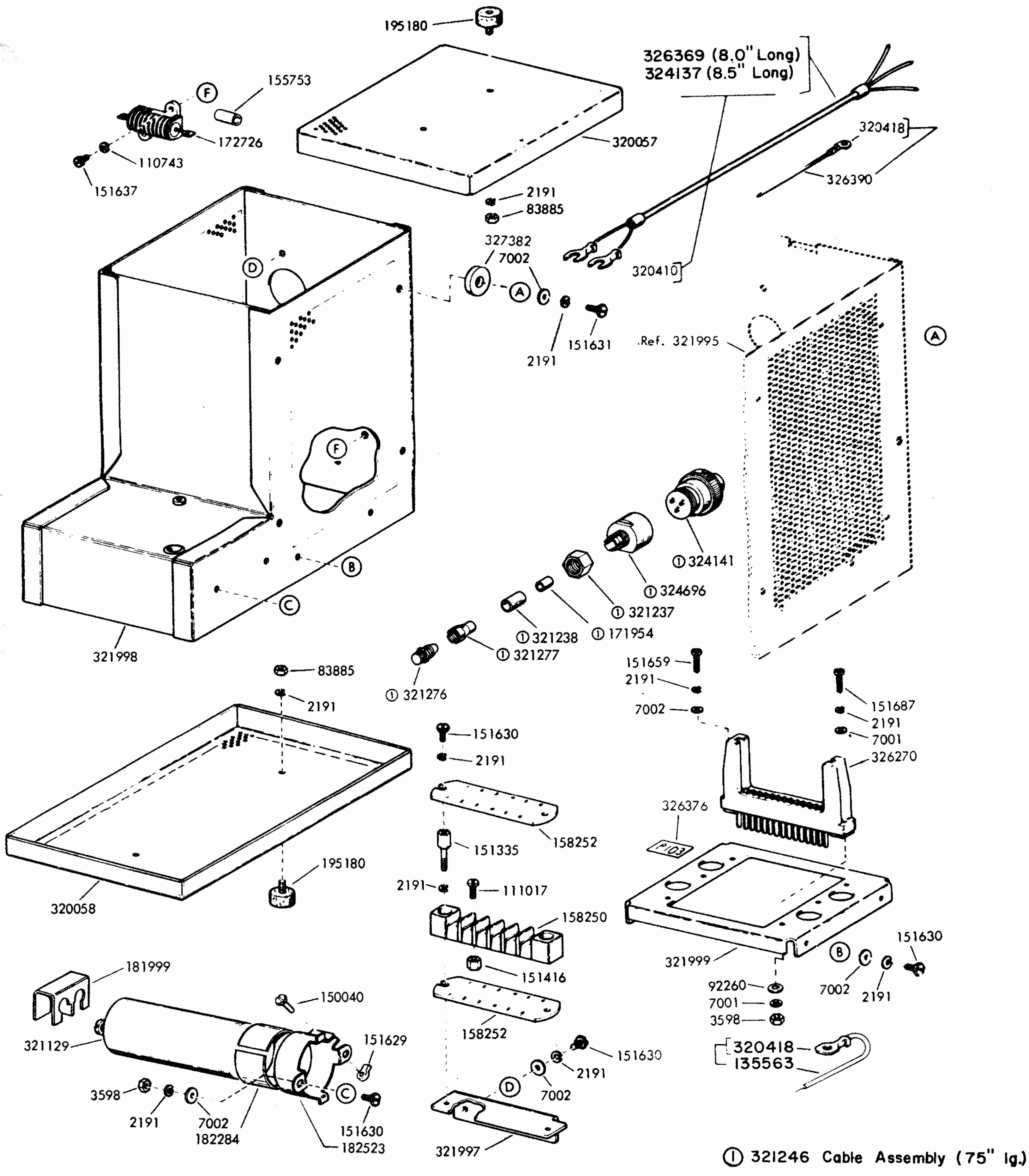



Figure 7-60. 321231 Electrical Service Assembly - Used with RO Sets (Sheet 2 of 2)

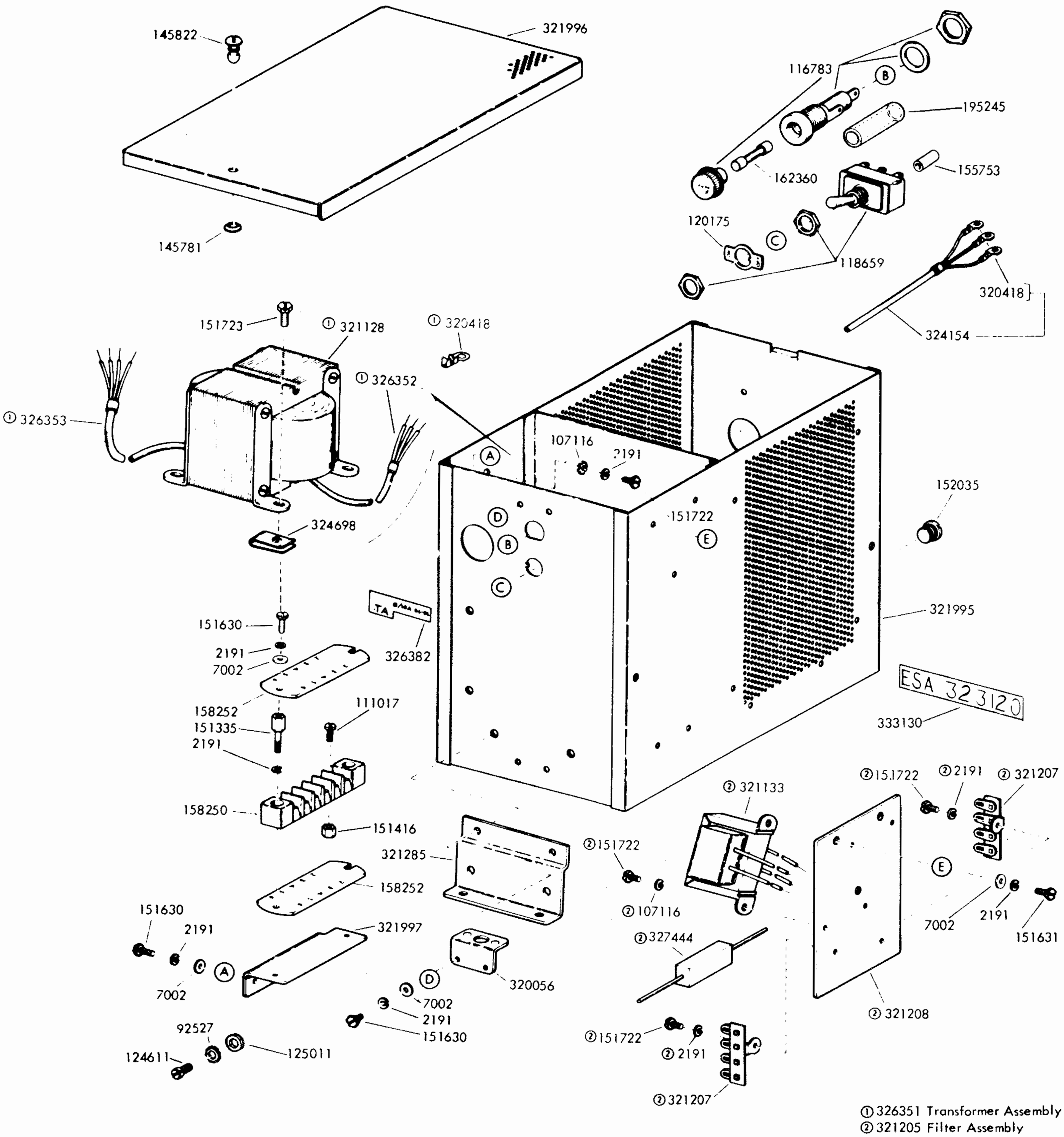



Figure 7-61. 323120 Electrical Service Assembly - Used with KSR Sets (Sheet 1 of 2)

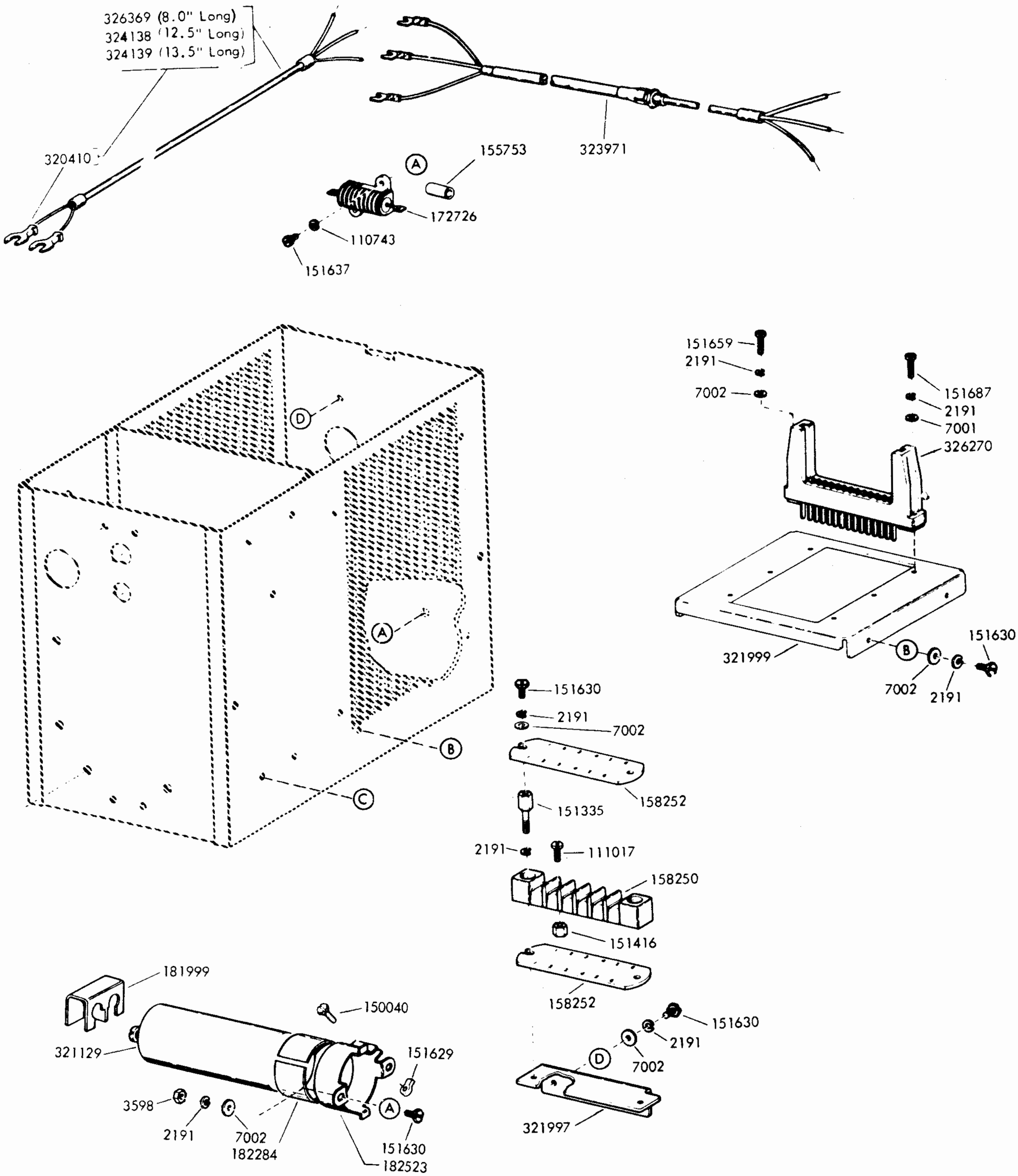



Figure 7-62. 323120 Electrical Service Assembly - Used with KSR Sets (Sheet 2 of 2)

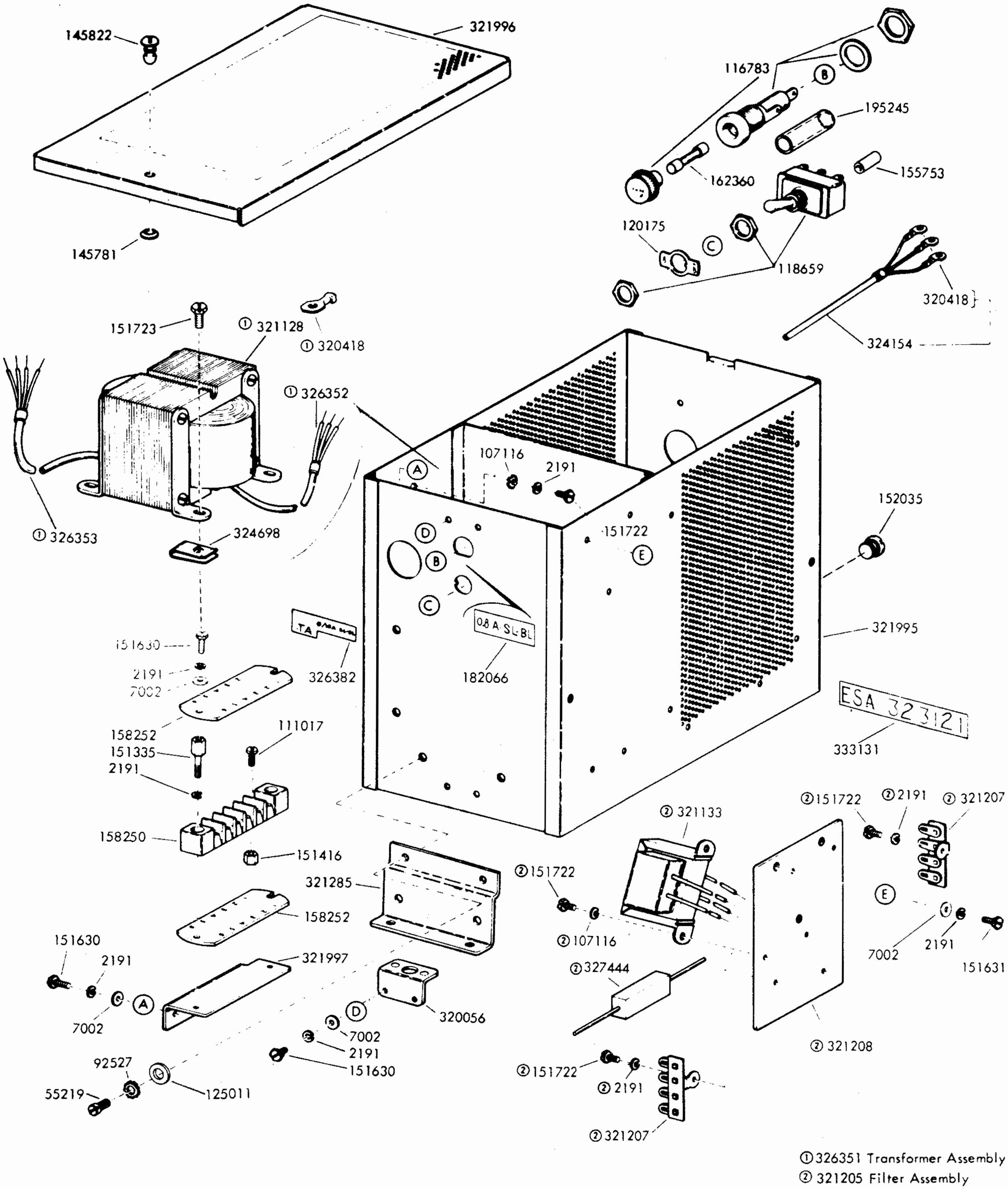



Figure 7-63. 323121 Electrical Service Assembly - Used with KSR Sets (Sheet 1 of 2)

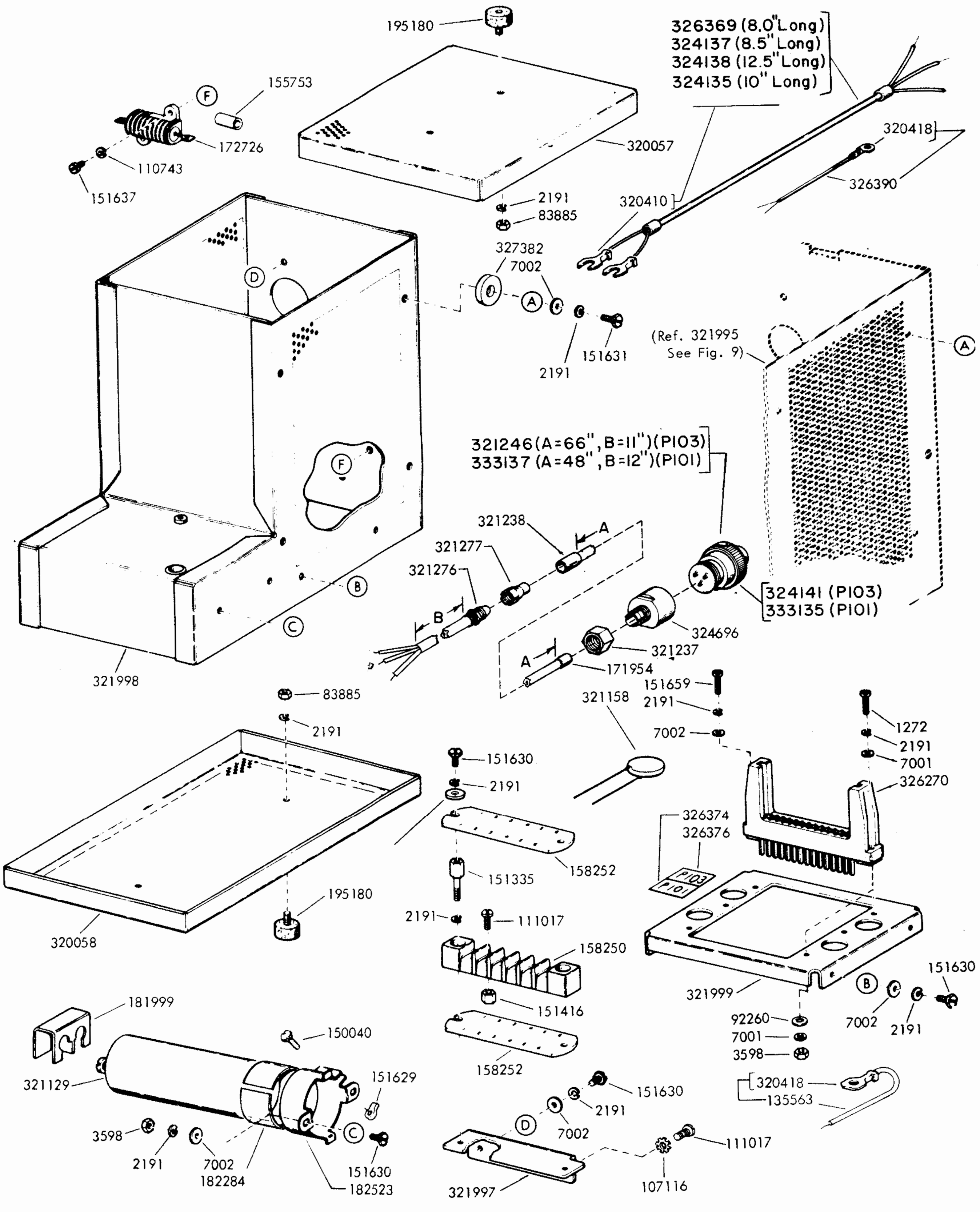
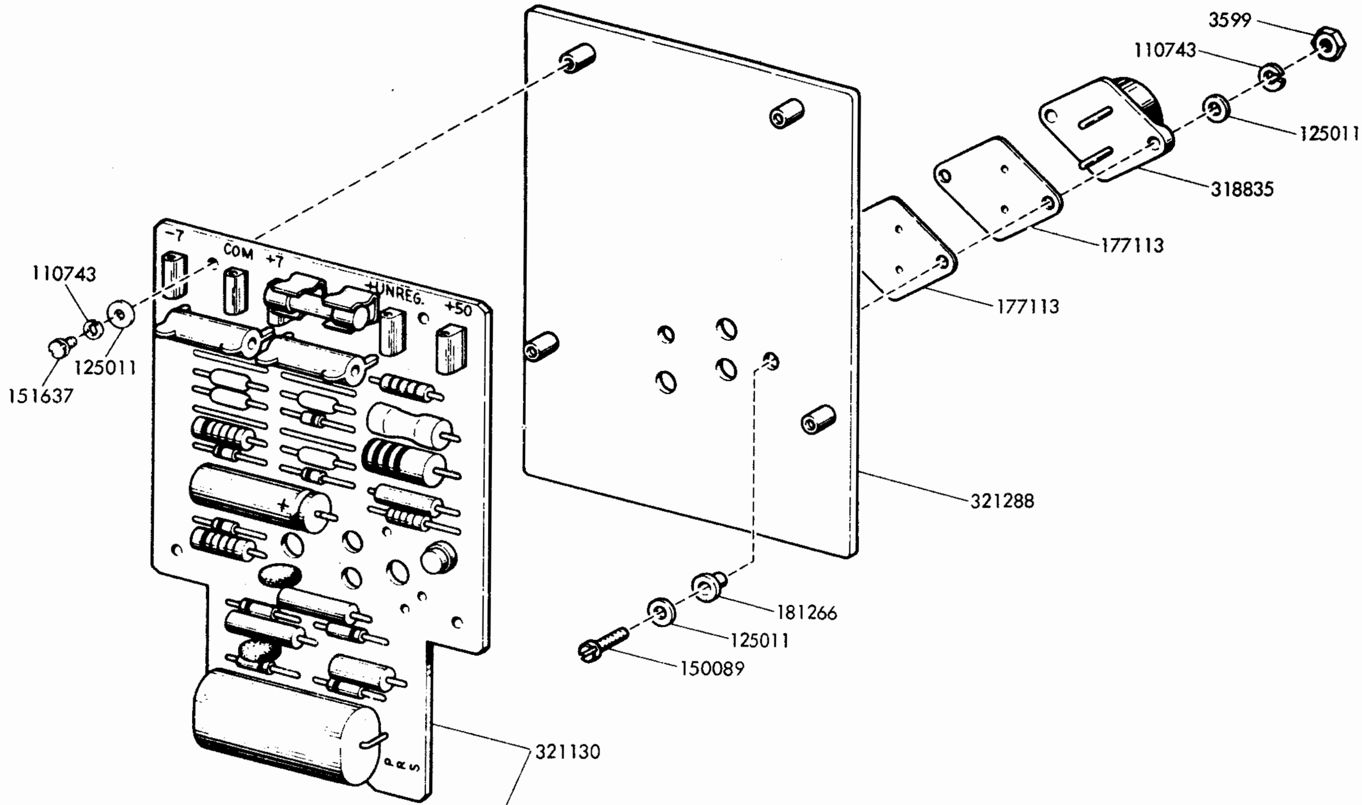
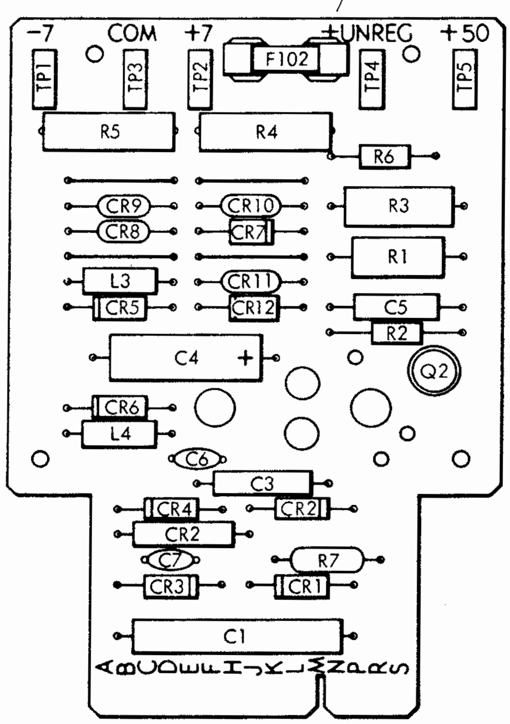


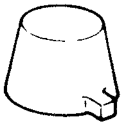

Figure 7-64. 323121 Electrical Service Assembly - Used with KSR Sets (Sheet 2 of 2)



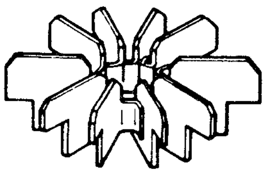




| Reference Designation | Part No. | Description |
|---|---|---|
| C1 | 312284 | Capacitor, 1.5 MFD |
| C2, 3 | 171585 | Capacitor, .22 MFD |
| C4 | 171831 | Capacitor, 10 MFD |
| C5 | 178860 | Capacitor, .022 MFD |
| C6, 7 | 312385 | Capacitor, .1 MFD |
| R1 | 198937 | Resistor, 2700 Ohm |
| R2, 6 | 182180 | Resistor, 200 Ohm |
| R3 | 171533 | Resistor, 4 Ohm |
| R4, 5 | 311664 | Resistor, 2500 Ohm |
| R7 | 305298 | Resistor, 3300 Ohm |
| CR1,2,3,4 | 182520 | Diode, IN4383 |
| CR5, 6 | 327794 | Diode, Zener (7.2V) |
| CR7, 12 | 321286 | Diode, IN4749A |
| CR8,9,10,11 | 178844 | Varistor, 100A |
| L3, 4 | 321159 | Choke |
| Q2 | 321145 | Transistor, 2N2270 |
| TP1 | 320042 | Jack, Test (Slate) |
| TP2 | 320041 | Jack, Test (Green) |
| TP3 | 320039 | Jack, Test (Black) |
| TP4 | 320040 | Jack, Test (Orange) |
| TP5 | 320038 | Jack, Test (Red) |
| F102 | 131807 | Fuse, .5 Amp |

Figure 7-65. 321290 Power Supply Circuit Card - Used with RO and KSR Sets



300116

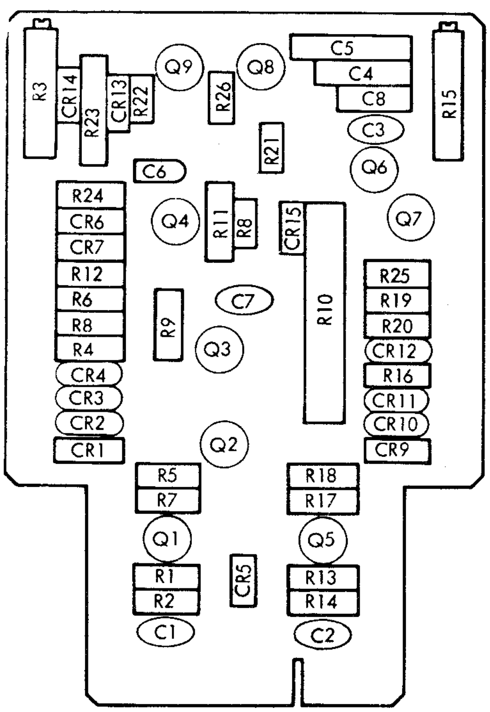


323847

144495 (Q1,4,5,8 & 9)

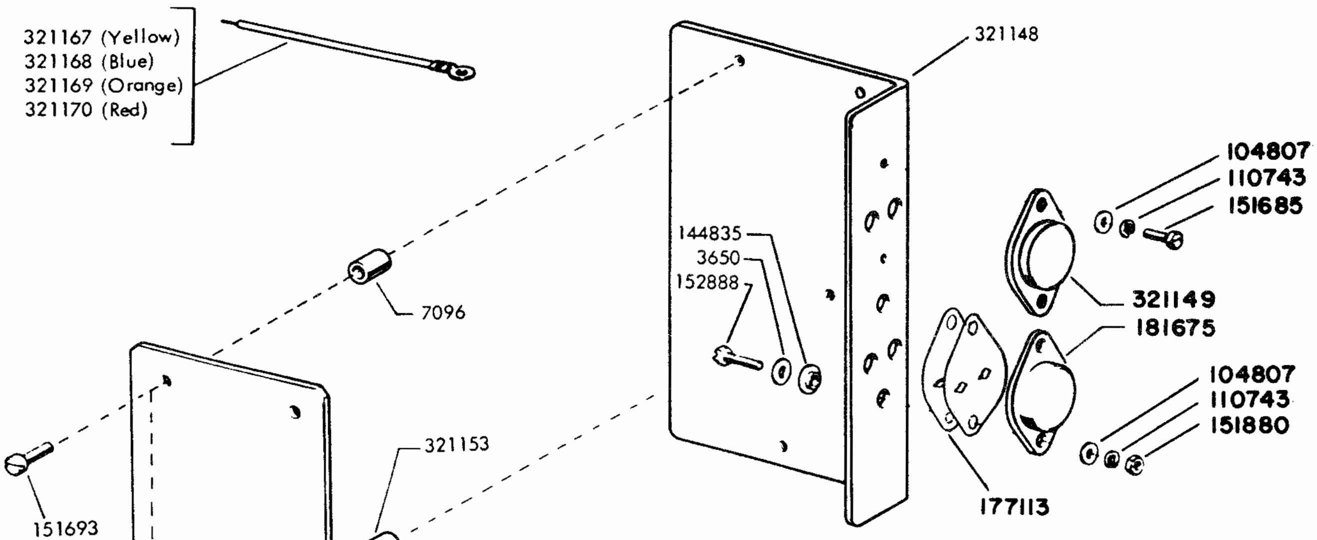
324147 (Q6 & 7)

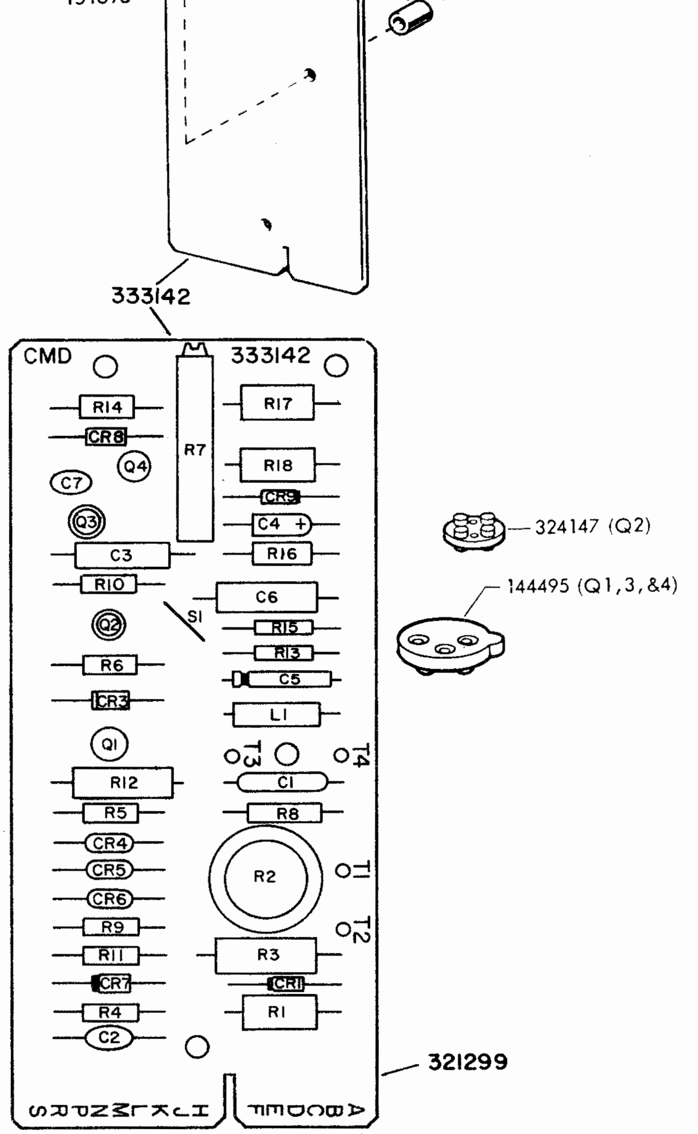
323846 (Q3)




| Reference Designation | Part No. | Description |
|---|---|---|
| C1, C2, C3, C7 | 321157 | Capacitor, 500 PF |
| C4 | 171829 | Capacitor, .15 MFD |
| C5 | 326776 | Capacitor, .47 MFD |
| C6 | 321260 | Capacitor, 1 MFD |
| C8 | 178860 | Capacitor, .022 MFD |
| R1, R2, R13, R14 | 118720 | Resistor, 100,000 Ohm |
| R3, R15 | 323964 | Potentiometer, 500,000 Ohm |
| R4, R16 | 129854 | Resistor, 10,000 Ohm |
| R5, R17, R22 | 118177 | Resistor, 22,000 Ohm |
| R6, R19 | 137604 | Resistor, 620 Ohm |
| R7, R18 | 118146 | Resistor, 4,700 Ohm |
| R8, R20 | 129850 | Resistor, 680 Ohm |
| R9 | 309868 | Resistor, 1,300 Ohm |
| R10 | 323841 | Resistor, 300 Ohm |
| R11 | 323842 | Resistor, 21 Ohm |
| R12 | 178864 | Resistor, 3,900 Ohm |
| R21 | 321975 | Resistor, 33 Ohm |
| R23 | 323843 | Resistor, 590 Ohm |
| R24 | 137442 | Resistor, 1,500 Ohm |
| R25 | 118154 | Resistor, 47,000 Ohm |
| R26 | 120424 | Resistor, 4,300 Ohm |
| CRI, CR9, CRI4 | 321154 | Diode, IN457A |
| CR2, CR3, CR4, CR10, CR11, CR12 | 178844 | Varistor, 100A |
| CR5 | 181667 | Diode, IN750A |
| CR6, CR7, CR13, CR15 | 321156 | Diode, IN482A |
| CR8 | 321161 | Diode, IN748A |
| Q1, Q5 | 321166 | Transistor, 2N1893 |
| Q2 | 323844 | Transistor, 2N3053 |
| Q3, Q9 | 321261 | Transistor, 2N4036 |
| Q4 | 323845 | Transistor, 40319 |
| Q6, Q7 | 324144 | Transistor, 2N4121 |
| Q8 | 321165 | Transistor, 2N3638A |
| | 324147 | Pad, Transistor Mounting |
| | 144495 | Pad, Transistor Mounting |
| | 323846 | Pad, Transistor Mounting |
| | 323847 | Sink, Heat |
| | 300116 | Cover, Insulating |
| | 323835 | CIRCUIT CARD, ETCHED |

Figure 7-66. 323810 Selector Magnet Driver Circuit Card - Used with RO and KSR Sets

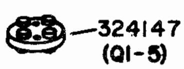


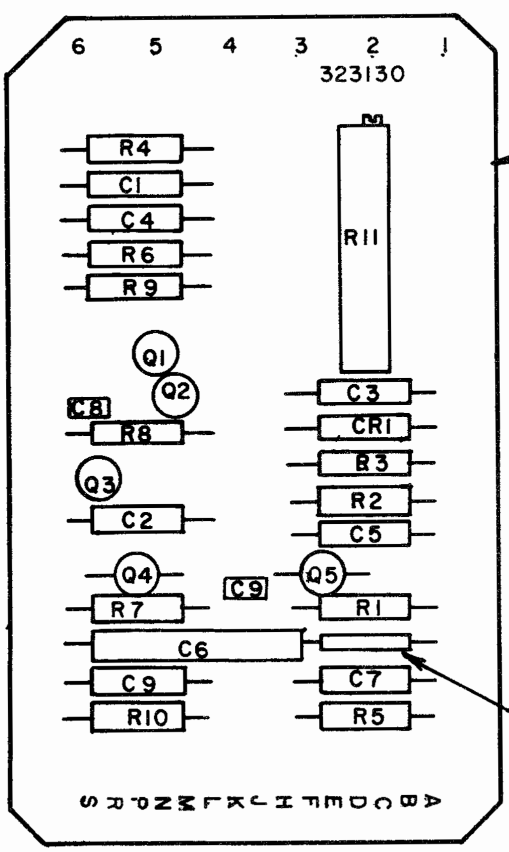




| Reference Designation | Part No. | Description |
|---|---|---|
| R1 | 329275 | Resistor, 35 Ohm |
| R2 | 182773 | Potentiometer, 3 Ohm |
| R3 | 321155 | Resistor, 2000 Ohm |
| R4, 5 | 118720 | Resistor, 100,000 Ohm |
| R6 | 129854 | Resistor, 10,000 Ohm |
| R7 | 321160 | Potentiometer |
| R8 | 118146 | Resistor, 4700 Ohm |
| R9 | 129850 | Resistor, 680 Ohm |
| R10, 18 | 321258 | Resistor, 20,000 Ohm |
| R11 | 137604 | Resistor, 620 Ohm |
| R12 | 321292 | Resistor, 1300 Ohm |
| R13 | 139143 | Resistor, 43,000 Ohm |
| R14 | 321259 | Resistor, 15 Ohm |
| R15 | 165178 | Resistor, 3600 Ohm |
| R16 | 137442 | Resistor, 1500 Ohm |
| R17 | 329273 | Resistor, 470 Ohm |
| C1 | 321158 | Capacitor, .1 MFD |
| C2 | 321157 | Capacitor, 500 PF |
| C3 | 171829 | Capacitor, .15 MFD |
| C4 | 321264 | Capacitor, 2.7 MFD |
| C5 | 178860 | Capacitor, .022 MFD |
| C6 | 171587 | Capacitor, .25 MFD |
| C7 | 171583 | Capacitor, .003 MFD |
| L1 | 321159 | Choke |
| CR1 | 321161 | Diode, IN748A |
| CR3, 9 | 197464 | Diode, IN914 |
| CR4, 5, 6 | 178844 | Varistor, 100A |
| CR7 | 181667 | Diode, IN750A |
| CR8 | 312341 | Diode |
| Q1 | 321166 | Transistor, 2N1893 |
| Q2 | 324144 | Transistor, 2N4121 |
| Q3 | 321165 | Transistor, 2N3638A |
| Q4 | 321261 | Transistor, 2N4036 |
| S1 | 39603RM | Strap, 5/8" Long |
| T1, 2, 3, 4 | 137471 | Terminal, Lug |

Figure 7-67. 333069 Clutch Magnet Driver Circuit Card - Used with KSR Sets

| REF. DESIGN. | PART NO. | NAME AND DESCRIPTION |
|---|---|---|
| C1,2 | 320048 | CAPACITOR, .5 MFD |
| C 8,9 | 315976 | CAPACITOR, 470PF |
| C 3 | 320049 | CAPACITOR, .15 MFD |
| C 4 | 181618 | CAPACITOR, .01 MFD |
| C 6,7 | 321262 | CAPACITOR, 1.0 MFD |
| R 1 | 323147 | RESISTOR, 3600 OHM |
| R 2,3 | 118146 | RESISTOR, 4700 OHM |
| R 4,5 | 118149 | RESISTOR, 12,000 OHM |
| R 6,7,8 | 118147 | RESISTOR, 6800 OHM |
| R 9 | 118179 | RESISTOR, 330,000 OHM |
| R 10 | 137438 | RESISTOR, 100 OHM |
| R 11 | 321160 | POTENTIOMETER, 5 MEGOHM |
| Q 1,3,5 | 323934 | TRANSISTOR, 2N3565 |
| Q 2,4 | 324144 | TRANSISTOR, 2N4121 |
| | | |
| CR1 | 177108 | DIODE, D2 |
| | | |
| C 5 | 305821 | CAPACITOR, .1 MFD |
| L 1 | 343619 | CHOKE, FERRITE BEAD |




NOTE:

1. DUE TO VARIATIONS OF TRANSISTOR CHARACTERISTICS, "L1" WAS ADDED TO PROVIDE AN ACCEPTABLE RESPONSE TIME. "L1" SHOULD BE ADDED IF Q2 IS REPLACED.

Figure 7-68. 323130 Low-Level Keyer Circuit Card - Used with KSR Sets

Table 7-6. List of Abbreviations

| | | | |
|---|---|---|---|
| " | Inch | MFD | microfarad |
| & | and | Mtg | mounting |
| x | by | | |
| | | No. | Number |
| A | ampere (comb form) | | |
| AC | alternating current | PF | picofarad |
| Amp | ampere | PS | Power Supply |
| | | Pt | point |
| CCW | counterclockwise | | |
| CMD | Clutch Magnet Driver | Rcpt | receptacle |
| comb | combination | Rd | round |
| | | RPM | revolutions per minute |
| Dim | dimension | | |
| Distr | distributor | SL-BL | slow-blow |
| | | SMD | Selector Magnet Driver |
| Elec | electrical | SP-ST | Single-pole single-throw |
| | | Spl | special |
| Fig. | figure | Sq | square |
| Fil | fillister | Std | standard |
| Hex | Hexagon | T | teeth |
| HP | horsepower | Thk | thick |
| Hz | hertz | Thru | through |
| ID | inside diameter | V | voltage |
| Lg | length, long | w/ | with (comb form) |
| LLK | Low-Level Keyer | | |

# CHAPTER 8
# INSTALLATION

8-1. INTRODUCTION. This chapter provides instructions for installation and checkout of Model 28 Compact Page Printer (CPP) KSR and RO teletypewriter sets. Tools required for installation, other than standard shop tools, are provided in Teletype Repair Kit TK-188/U.

8-2. UNPACKING. Each teletypewriter set is shipped completely assembled in a single container. As shown in figure 8-1, the keyboard (KSR) or base (RO) is attached to a wooden pallet, with shipping studs and nuts, in such a manner as to disable the vibration mounts during shipment. Exercise care when unpacking. To remove set from container, proceed as follows:

a. Cut tape sealing upper flaps of outer carton.

b. Remove styrofoam blocks from upper corners.

c. Remove inner lining from top of set.

d. Remove set by lifting wooden pallet out of carton.

e. Remove all packing tape from cover.

8-3. SPACE REQUIREMENTS. The overall dimensions of the KSR set are approximately: Depth, 16 inches; Width, 16-1/2 inches; Height, 10 inches. The overall dimensions of the RO set are approximately: Depth, 12 inches; Width, 16-1/2 inches; Height, 10 inches. Detailed dimensions and location of shipping stud holes are shown in figure 8-2 for the KSR set and in figure 8-3 for the RO set. Shipping studs must be removed for normal installation and use. If special vibration isolation is desired, the studs may be left in place and special shock mounts fastened to the 1/4-20 threads.

8-4. INSTALLATION PROCEDURES. Installation procedures for the high-level CPP equipment are provided in paragraph 8-4.1 Information pertinent to low-level CPP equipment installation is covered in paragraph 8-4.2.

8-4.1 INSTALLATION PROCEDURES (HIGH-LEVEL). The following paragraphs provide information for mounting, connecting power and signal lines, and generally preparing the teletypewriter set for use.

NOTE

There are four sets of nuts, lockwashers, and flat washers to remove from the RO set, and five sets from the KSR set.

a. <u>Normal Mounting</u>. The teletypewriter set is normally mounted as follows: (See figure 8-1.)

(1) Remove cover to gain access to upper ends of shipping studs.

(2) Remove nuts and lockwashers from upper ends of shipping studs.

(3) With wooden pallet raised, remove nuts, lockwashers, and flat washers

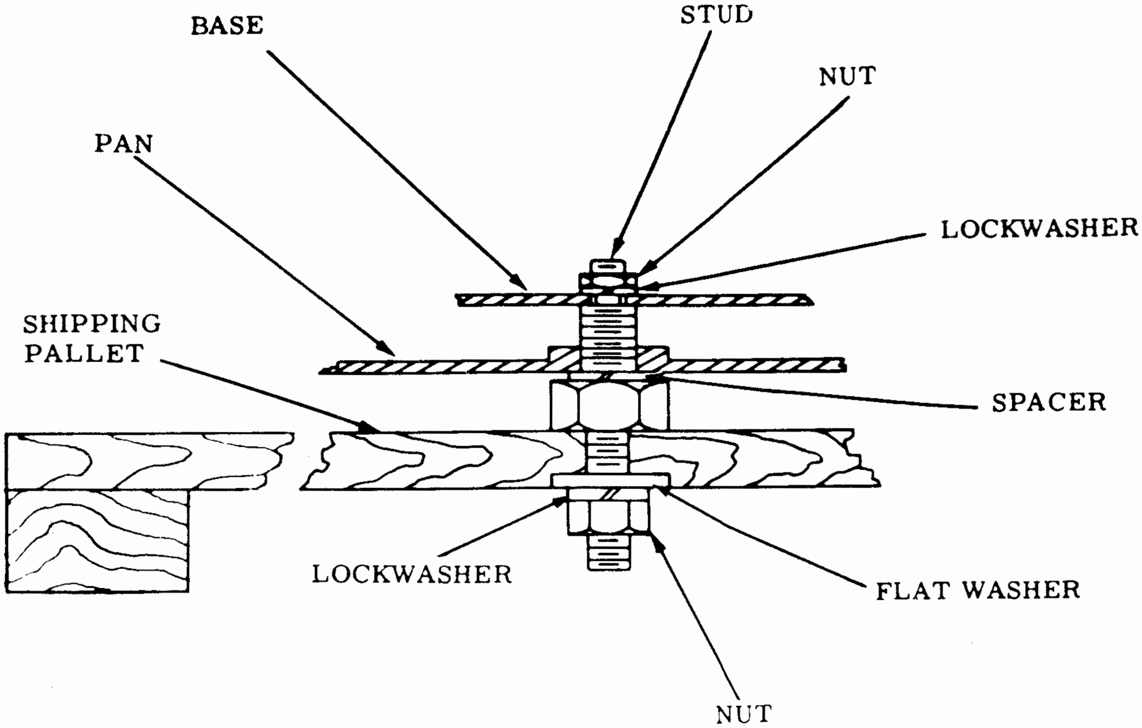



Figure 8-1. Shipping Stud Details

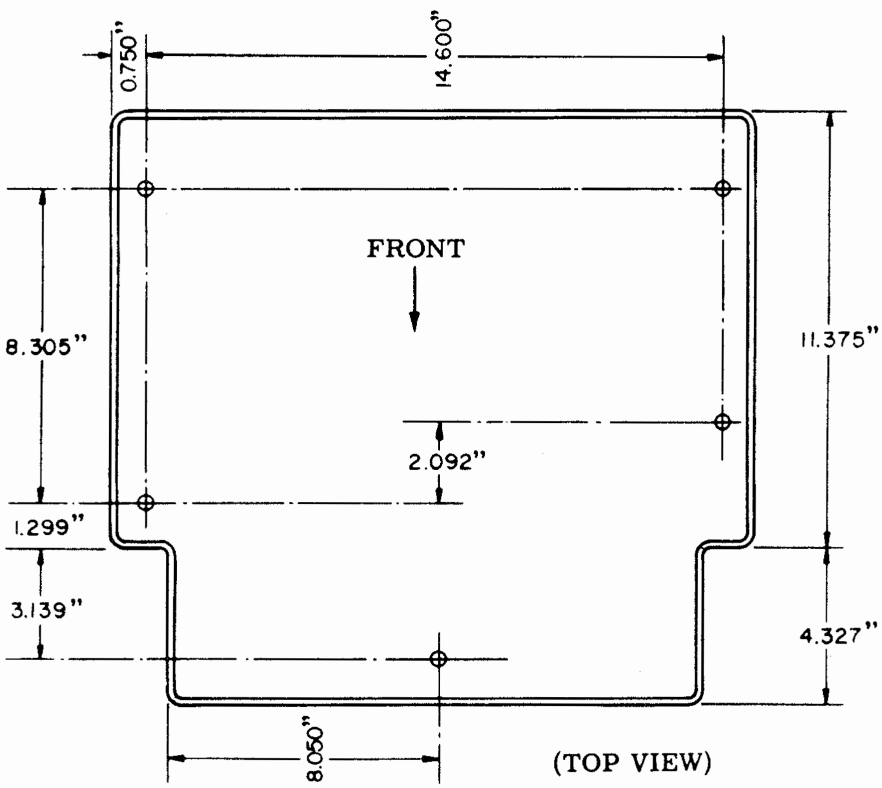



Figure 8-2. CPP (KSR) Dimensions and Shipping Stud Locations

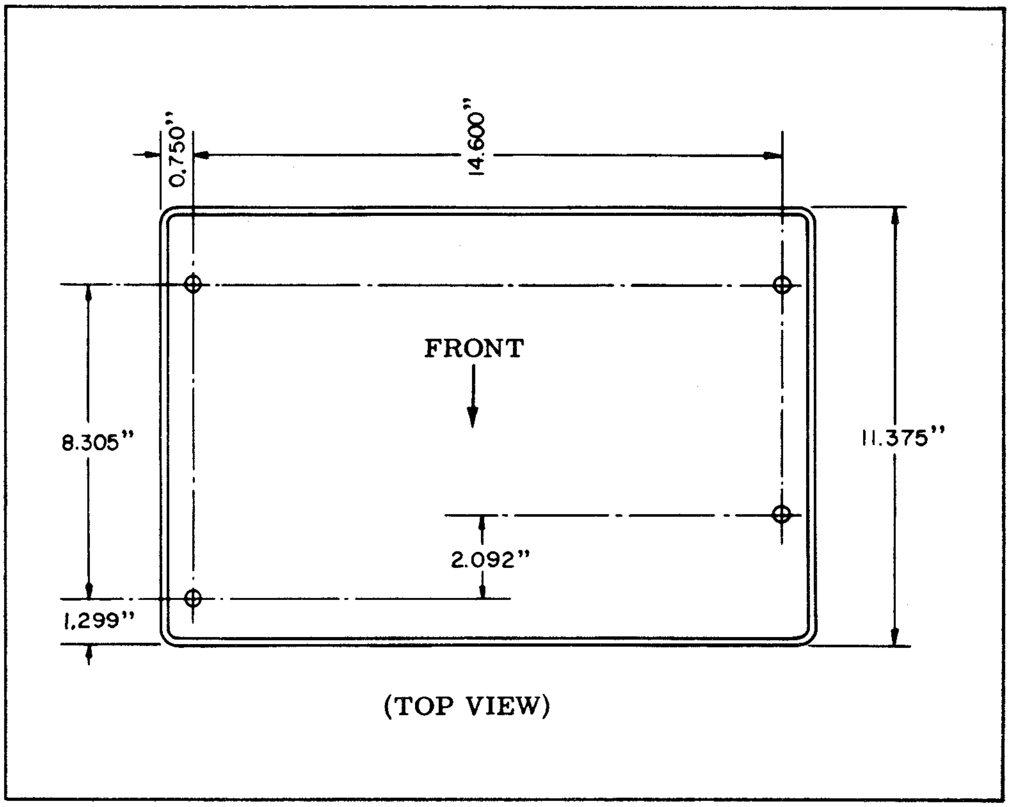



Figure 8-3. CPP (RO) Dimensions and Shipping Stud Locations

from bottom ends of shipping studs.

(4) With pallet flat, lift each end of set and unscrew shipping studs from pan.

NOTE

The teletypewriter set can now be mounted on a table or any other flat surface. Shock mount action is provided by rubber bumpers inserted between the base and the pan.

b. Special Shock Mounting. The teletypewriter set can be mounted using special shock mounts. The wooden pallet can serve as a temporary fixture for supporting the set and protecting the studs until the special shock mounts are attached. Proceed as follows: (See figure 8-1.)

(1) With pallet raised, remove nuts, lockwasher, and flat washer from bottom ends of shipping studs.

NOTE

Shipping studs will accept a 1/4-20 thread.

(2) With pallet flat, lift each end of set and fasten special shock mounts to exposed studs.

c. Attaching Speed Indicator Plate. In certain cases, the speed indicator plate has not been installed on the cover. If not installed, the speed indicator plate will be enclosed in a bag attached to the base or keyboard and should be installed as shown in figure 8-4.

d. Enabling Time Delay Mechanism. If the set is equipped with a time delay mechanism, the upstop bracket (figure 8-5) must be raised before the mechanism will function properly. Instructions for disabling and enabling time delay mechanism are as follows:

(1) Remove cover and typing unit.

(2) To disable: loosen two mounting screws on upstop bracket; lower upstop bracket to its bottom position; tighten mounting screws.

(3) To enable: loosen two mounting screws on upstop bracket; raise upstop bracket to its upper position; tighten mounting screws.

(4) Replace typing unit and cover.

e. Electrical Connections. AC electrical power and signal line connections are made to terminals on terminal blocks located at the rear of the set. Connections are indicated in high-level CPP schematic and wiring diagrams included in Chapter 5.

8-4.2 INSTALLATION PROCEDURES (LOW-LEVEL). Procedures in paragraph 8-4.1 are also applicable to low-level CPP equipment. The following paragraphs provide additional information applicable only to low-level sets.

a. Electrical Service Assembly (KSR) Installation. A table-mounted electrical service assembly is used with low-level

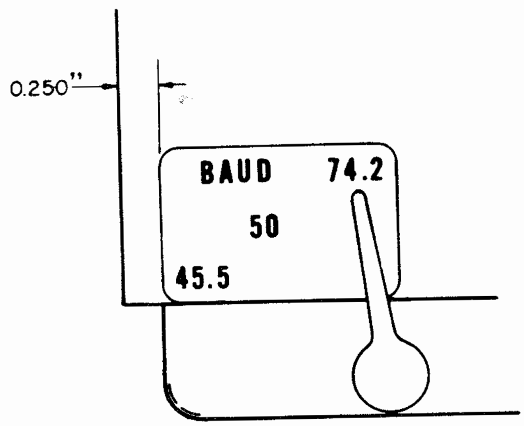



Figure 8-4. Speed Indicator Plate

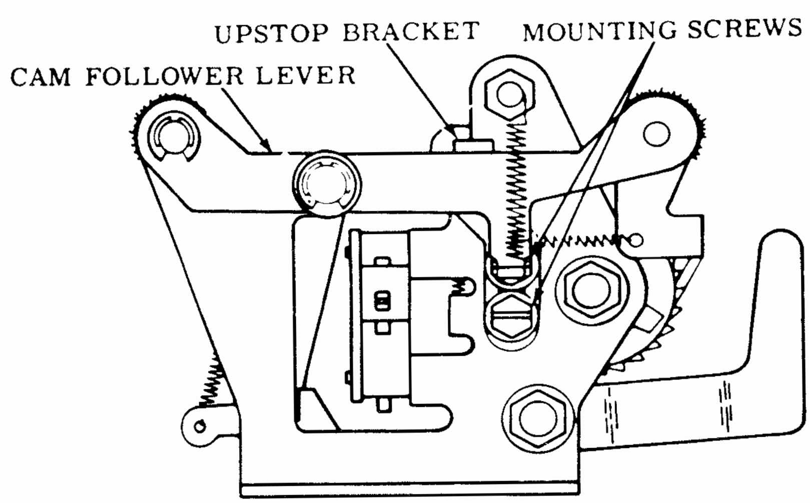



Figure 8-5. Time Delay Mechanism

CPP KSR equipment. Install the ESA as follows:

(1) Mount the electrical service assemblies (ESA) in space available anywhere near the set within the limit of the signal cables. Mounting brackets for the ESA are supplied; however, the user must supply the hardware to fasten these brackets to a table.

(2) Route the signal line conduit or cabling to the keyer selector magnet driver of the ESA. Route the signal line to the opposite side of the fuse and attach by means of a conduit fitting. The ESA container has two 7/8-inch diameter knockouts for 1/2-inch conduit fittings.

(3) Route the synchronous pulse control conduit or cable to the ESA opposite the side of the fuse and attach by means of conduit fittings.

(4) Route the power line conduit or cable to both ESA containers. Connect the power line to the side on which the fuse and power switch are located. Attach by means of a conduit fitting.

(5) Route the clutch magnet driver output cable and signal cables through the notch in the rear of the cover. Route the cables through the nylon clamp on the base and connect to the appropriate terminal block and connector.

b. <u>Electrical Service Assembly (RO) Installation</u>. A table-mounted ESA is also used with low-level CPP RO equipment. Figure 8-6 shows an ESA connected to a RO set. The ESA is connected to a KSR set in the same manner. Install the ESA as follows:

(1) Mount the ESA in space available anywhere near the set within the limit of the signal cable. Mounting brackets for the ESA are supplied, however, the user must supply the hardware to fasten these brackets to a table.

(2) Route the signal line conduit or cable to the ESA container (the side opposite the fuse) and attach by means of a conduit fitting. The container has two 7/8-inch diameter knockouts for 1/2-inch conduit fittings.

(3) Route the power line conduit or cable to the ESA container (the side with the fuse and power switch) and attach by means of a conduit fitting. The container has a 7/8-inch diameter knockout for 1/2-inch conduit fitting. A separate power cable should be brought into the base for the motor.

(4) Route the signal cable from the ESA to the apparatus through the notch in the rear of the cover, through the nylon cable clamp at the rear of the base, and along the left side of the set to the selector magnet assembly connector. Tie the cable to the motor mounting post at the base to keep it clear of the fan.

c. <u>ESA Circuit Card Hold-Down Installation</u>. The circuit card hold-down installation provides the means to secure circuit cards into connectors of CPP low-level ESAs. This provides protection against shock, vibration, and loosening of circuit cards. The installation material consists of strips of Neoprene rubber

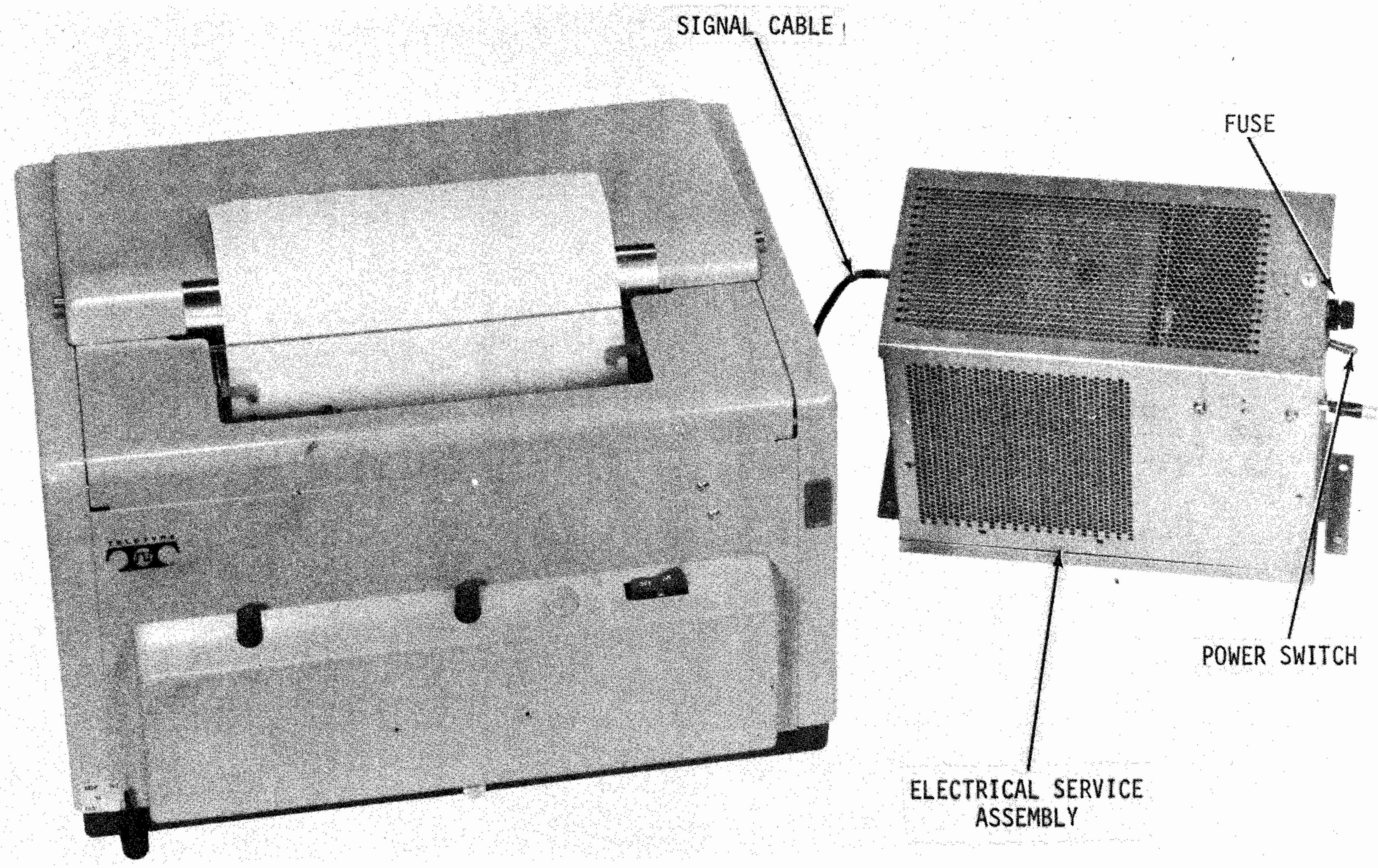



Figure 8-6. Typical ESA Installation

foam. Installation procedures vary for different ESAs. The following information covers ESAs used with low-level CPP equipment.

(1) <u>ESA 323120</u>. Install Neoprene rubber foam circuit card hold-downs as follows: (See figure 8-7)

(a) Turn locking screw to remove and retain TP321996 cover w/stud.

(b) Measure and mark location for TP343731 foam card holder.

(c) Peel paper from foam and place adhesive side to inside of TP321996 cover in area shown in figure 8-7.

(d) Press foam down to obtain maximum adhesion.

(e) Replace TP321996 cover w/stud and lock into position.

(2) <u>ESA 321231 and 323121</u>. Install Neoprene rubber foam circuit card hold-downs as follows: (See figure 8-8)

(a) Turn the locking screw to remove and retain the TP321996 cover w/stud.

(b) Remove and retain the TP320057 inner cover.

(c) Measure and mark the central locations for the placement of the two TP343732 foam card holders, at the inside edge of the perforations, inside the TP320057 cover.

(d) Peel the paper backing from each TP343732 foam card holder and place adhesive sides to the inside of the TP320057 inner cover in area shown on figure 8-8. Press foams to obtain maximum adhesion.

(e) Replace the modified TP320057 inner cover.

(f) Replace the TP321996 cover w/stud and lock into position.

d. <u>Electrical Connections (Low-Level)</u>. AC power and signal line connections are made to low-level CPP equipment through the ESA. Connections are indicated in low-level CPP schematic and wiring diagrams included in Chapter 5.

8-5. INSTALLATION CHECKOUT. Installation checkout consists of performing reference standards tests and performance tests.

a. <u>Reference Standards Test</u>. After installation is satisfactorily completed, perform the following procedures to determine that the teletypewriter set is properly assembled to meet specified reference standards.

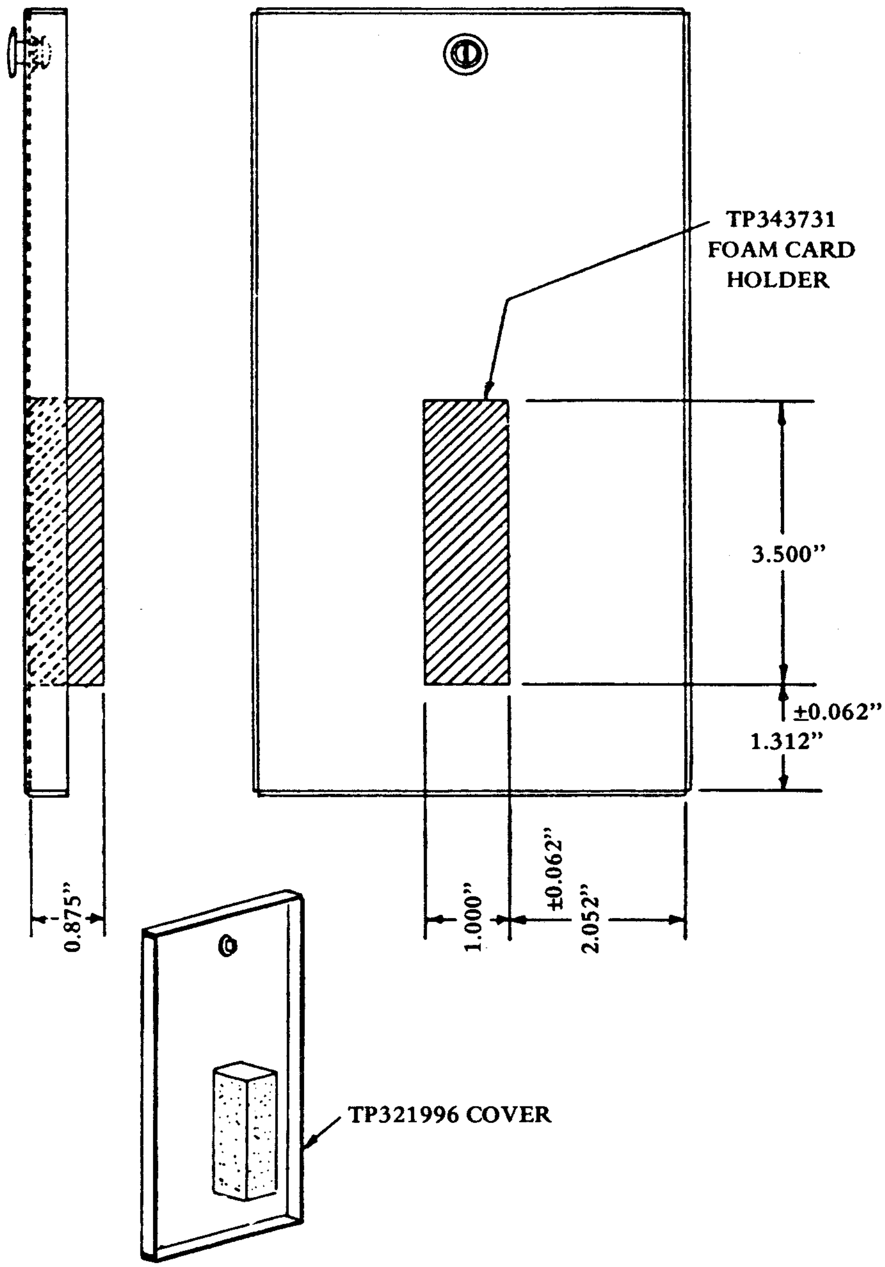
(1) Check printing carriage position as follows:

(a) With type box in printing position, select "M" type pallet.

(b) Observe to make sure that "M" type pallet is in center of printing hammer when touching.

(2) Check printing hammer stud as follows:

(a) Move box to midpoint of platen in position to print period.




Note: Figure is not to scale, use dimensions.

Figure 8-7. Circuit Card Hold-Down Installation for ESA 323120

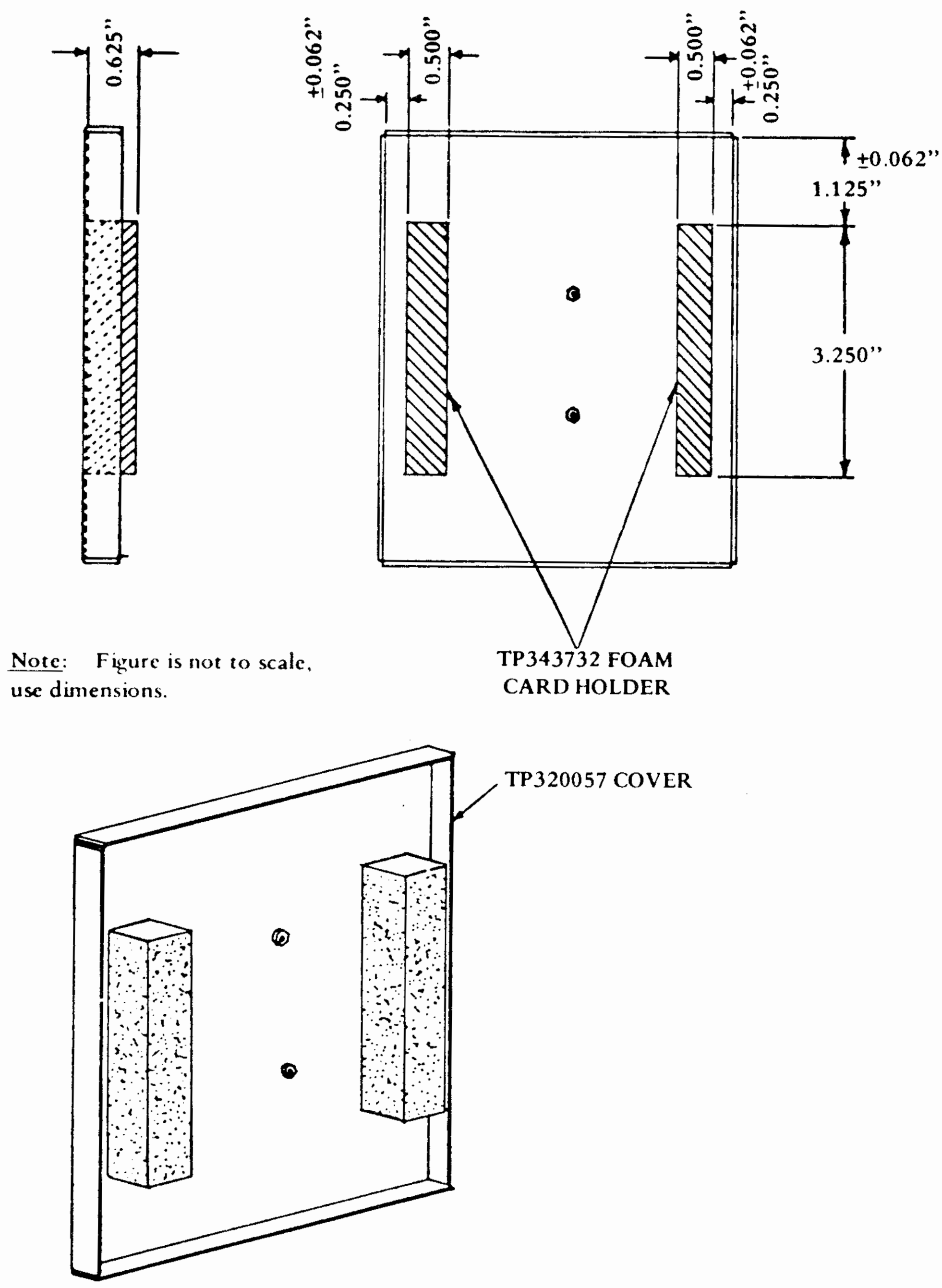



Figure 8-8. Circuit Card Hold-Down Installation for ESAs 321231 and 323121

(b) Place printing hammer in contact with type pallet and pressed down to bearing post.

(c) Observe hammer face to make sure it is positioned on end of type pallet.

(3) Record draw-wire rope clearances as follows: (Use feeler gauge.)

(a) Measure clearance between carriage return latch bail post and lower wire rope. Record clearance. Standard: 0.006 inch minimum.

(b) With horizontal positioning mechanism in lowest position, measure clearance between lower wire rope and left horizontal positioning drive linkage. Record clearance. Standard: 0.30 inch minimum.

(4) Record printing arm clearance as follows: (Use feeler gauge.)

(a) Place printing hammer track at maximum downward; printing hammer operating bail against its stop.

(b) Measure clearance between secondary printing arm and forward extension of hammer operating bail. Standard: some clearance; not to exceed 0.15 inch.

(c) With printing track in uppermost position, latching extensions of printing hammer operating bail should over-travel surface of operating bail latch. Check and record clearance, both sides. Standard: 0.006 inch minimum.

(5) Record printing hammer stop bracket clearance as follows: (Use feeler gauge).

(a) Move type box to "M" position; position printing track to maximum downward.

(b) Press (8 ounces) printing hammer stop bracket toward platen.

(c) At end of pallet with least clearance, measure clearance between printing hammer and "M" pallet.

(6) Record rocker shaft eccentric stud clearance as follows: (Use feeler gauge.)

(a) Disengage type box clutch.

(b) Move locking arm toward front.

(c) Measure clearance between lower side lock lever roller and top edge of horizontal positioning lock lever shoulder. Standard: 0.55 inch minimum to 0.90 inch maximum.

NOTE

If adjustments are required and made, re-check adjustments (see Chapter 4) to following items:

Horizontal positioning drive linkage.

Right vertical positioning lever eccentric stud.

Left vertical positioning lever eccentric stud.

Vertical positioning lock lever.

Ribbon feed lever bracket.

Function stripper blade arms.

Spacing trip lever bail cam plate.

Reversing slide brackets.

Ribbon reverse space gear.

Printing track.

Printing arm.

(7) Measure clutch shoe lever clearance as follows: (Use feeler gauge).

(a) Trip clutch. Rotate until clutch shoe lever is toward bottom of unit.

(b) Align clutch drum mounting screw head with stop lug.

(c) Compress shoe lever against stop lug, allowing to snap apart.

(d) Measure and record gap with clutch thus engaged.

(e) Measure and record gap with clutch disengaged.

NOTE

Step f reading (differential between engaged and disengaged clutch) must be 0.75 inch for 100 WPM operation.

(f) Compare two readings in steps (d) and (e). The difference between the two must fall within 0.055 and 0.085 inches.

(8) Check dash-pot vent screw as follows:

(a) Set POWER switch to ON.

(b) With letter "M" depressed, operate printer on local loop.

(c) First character should print in same location as in slow manual operation.

(d) Type box carriage should return without bouncing.

(9) Record keyboard contact wire clearances as follows:

(a) Place keyboard in reset condition.

(b) Set T-levers in marking positions.

(c) Using feeler gauge, check clearance between contact wires and terminal is from 0.010 inch (minimum) to 0.025 inch (maximum).

(d) Set T-levers in spacing condition.

(e) Check clearance between contact wires and terminal is from 0.020 inch (minimum) to 0.040 inch (maximum).

(10) Check distributor code level contacts as follows:

(a) Place cam follower lever on high part of cam by tripping clutch manually and rotating distributor shaft.

(b) Using feeler gauge, check first six

contact gaps from clutch end of shaft. Gaps should be from 0.020 inch (minimum) to 0.030 inch (maximum).

(11) Check distributor solenoid contact gap as follows: (Use feeler gauge).

(a) With distributor clutch in latched or stop position, check and record solenoid contact gap. Standard: 0.025 inch minimum to 0.030 inch maximum.

(12) Record DC line current as follows:

(a) Attach meter to appropriate patch panel.

(b) Turn patch panel selector switch to desired position and record reading.

b. Performance Tests. After reference standards tests have been satisfactorily accomplished, conduct performance tests described in Chapter 4, paragraph 4-8.

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