TM-03315-15

U. S. MARINE CORPS TECHNICAL MANUAL

TELETYPEWRITER SETS AN/TGC-14 (V) AND AN/TGC-14A (V)

OPERATION AND MAINTENANCE

APRIL 1966

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DEPARTMENT OF THE NAVY
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1. This publication is effective upon receipt and supersedes TM-03315-15 dated September 1964.

2. The Technical Manual contains installation, operation, and maintenance instructions for Teletypewriter Set AN/TGC-14(V) and Teletypewriter Set AN/TGC-14A(V).

3. Notices of discrepancies and suggested changes should be forwarded to the Commandant of the Marine Corps (Code CSY-3).

BY DIRECTION OF THE COMMANDANT OF THE MARINE CORPS

OFFICIAL

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TABLE OF CONTENTS

SECTION 1 - GENERAL INFORMATION

SECTION 2 - INSTALLATION

SECTION 3 - OPERATION

SECTION 3 - OPERATION (Cont)

SECTION 4 - TROUBLE SHOOTING

SECTION 4 - TROUBLE SHOOTING (Cont)

SECTION 5 - MAINTENANCE

SECTION 5 - MAINTENANCE (Cont)

SECTION 5 - MAINTENANCE (Cont)

LIST OF ILLUSTRATIONS

SECTION 1 - GENERAL INFORMATION

SECTION 2 - INSTALLATION

SECTION 2 - INSTALLATION (Cont)

SECTION 3 - OPERATION

SECTION 4 - TROUBLE SHOOTING

SECTION 4 - TROUBLE SHOOTING

SECTION 5 - MAINTENANCE

SECTION 5 - MAINTENANCE (Cont)

SECTION 5 - MAINTENANCE (Cont)

SECTION 5 - MAINTENANCE (Cont)

LIST OF TABLES

SECTION 1 - GENERAL INFORMATION

SECTION 2 - INSTALLATION

SECTION 3 - OPERATION

SECTION 4 - TROUBLE SHOOTING

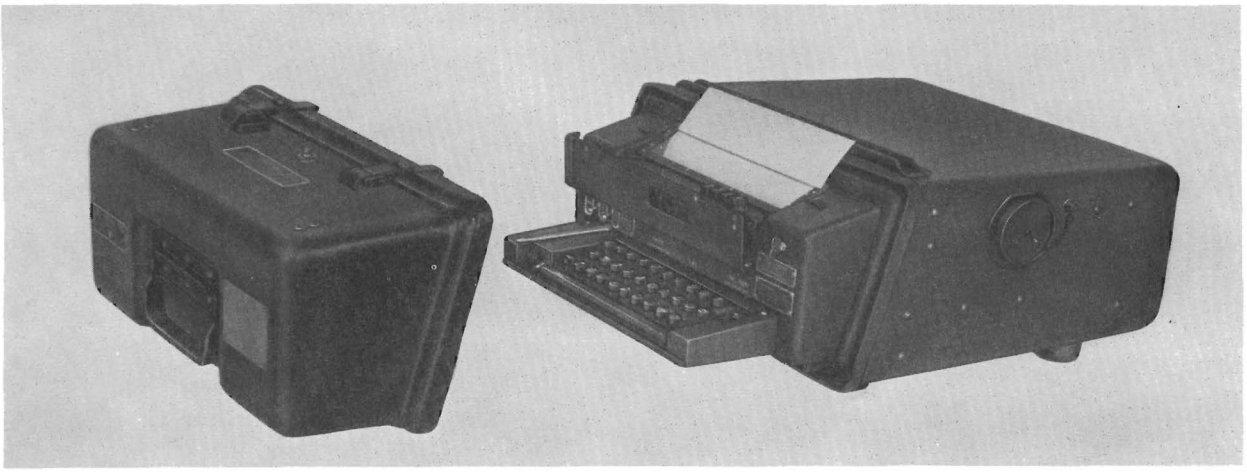
SECTION 4 - TROUBLE SHOOTING (Cont)

SECTION 5 - MAINTENANCE

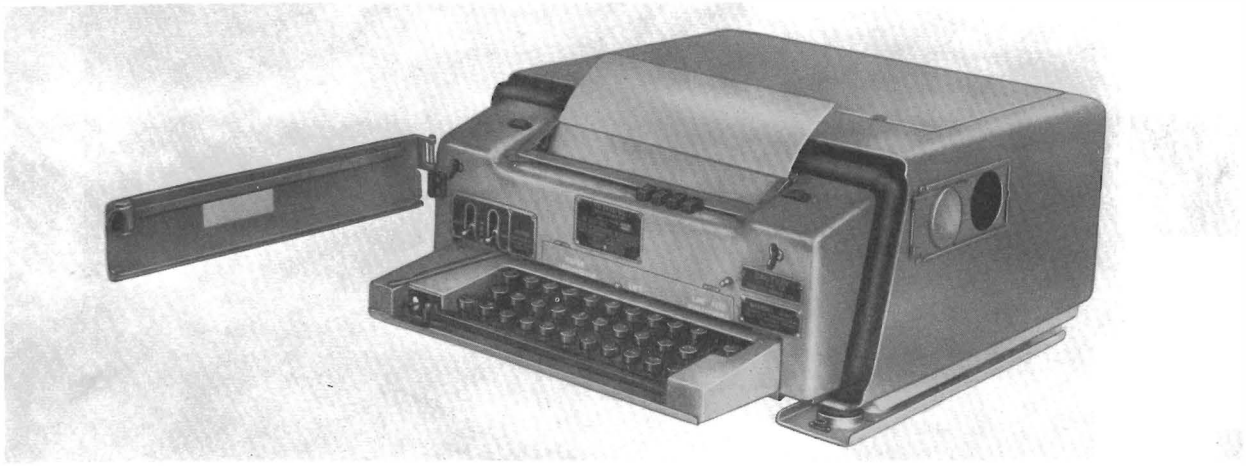
WARNING

Dangerous voltages exist in this equipment. Do not take chances when adjusting or repairing the equipment. Contact with high-voltage circuits may result in serious injury or death.

A. Installed in Shock-Mounted Tactical Case CY-2976/PG



B. Typical Installation in Tactical Case CY-2976/PG (Case not shock-mounted; copy holder closed.)



C. Installed in Shock-Mounted Non-Tactical Case CY-2977A/UG

Figure 1-1. Teletypewriter Sets AN/TGC-14(V) and AN/TGC-14A(V)

SECTION I

GENERAL INFORMATION

1-1. SCOPE.

This Technical Manual contains installation, operation, and maintenance instructions for Teletypewriter Set AN/TGC-14(V) and Teletypewriter Set AN/TGC--14A(V). The teletypewriter sets (figure 1-1) are manufactured by Mite Corporation, New Haven, Connecticut. This Technical Manual is in effect upon receipt and supersedes MARCORPS TM-03315-15, 14 September 1964. Extracts from this publication may be made to facilitate the preparation of other Department of Defense publications.

1-2. GENERAL DESCRIPTION.

a. PURPOSE OF EQUIPMENT. - Teletypewriter Sets AN/TGC-14(V) and AN/TGC-14A(V) are ruggedized, light-weight, miniature, alphanumeric-printing telegraph equipments for general service use under a wide range of operating conditions. The teletypewriter sets are fully compatible with other commercial and military teletypewriter equipments employing the standard Baudot code and can be integrated into existing land-line and radio-link communications systems. By appropriate signal patching, the equipment can be operated in either half-duplex (simplex) or full-duplex on-line and off-line circuits. Patching facilities are also provided to allow off-line local operation as an electric typewriter or for local testing. As figure 1-1 illustrates, the teletypewriter sets are furnished in either of two cases; the tactical case for use in field and mobile installations, or the non-tactical case for use in fixed-station and aircraft installations.

b. OPERATING OPTIONS. - Teletypewriter Sets AN/TGC-14(V) and AN/TGC-14A(V) consist of a basic group of components supplemented by other components which are selected to fit the requirements of a given installation. Hence the designations Teletypewriter Sets AN/TGC-14(V) and AN/TGC-14A(V) effectively cover not one but rather a series of teletypewriter sets. The basic teletypewriter set consists of a keyboard, a printer, and an electrical chassis. To this is added a power supply kit which contains a signal line power supply, line sensor, service cable, heating element, and fuses. The motor must be selected separately. An hysterisis-synchronous alternating-current motor is available for 115-volt, 60-cycles per second operation, and an additional 115-volt motor is available for 400-cycles per second, single-phase operation. For housing these components, either a tactical or a non-tactical case is selected. Optional shock mounts, available for either case, are used for installation sites in which the equipment will be subjected to severe shock or vibration. The versatility of the teletypewriter sets is further extended by the patching options which allow half-duplex (simplex), full-duplex, or off-line local operation. In addition, by proper patching, the teletypewriter sets will supply signal line current up to 100 milliamperes at 28 volts direct current. Operational speed can be varied; speed-change gears for 60, 75, and 100 words per minute are supplied with the AN/TGC-14(V); the AN/TGC-14A(V) is supplied with speed change gears for 45.45, 50, and 75 baud. Baud rate of 45.45 is compatible with 60 words per minute; baud rate of 50 is compatible with 66 words per minute; baud rate of 75 is compatible with 100 words per minute.

c. PRINCIPLES OF OPERATION. - Essentially, the teletypewriter sets provide the means of transmitting and receiving printed intelligence comprising the 26 letters of the alphabet, the digits Ø through 9, and a basic group of punctuation signs and other symbols. In addition to the printing of these characters, certain necessary mechanical operations are provided; spacing between words, letters-figures shifting, line feed, and carriage return. Other operating features include a bell function for signaling the remote station; provisions for stopping and starting the motors of both the local and remote machines; and a repeat key, which when depressed causes the last transmitted character to be continuously repeated until the key is released.

To effect the transmission of a character or mechanical operation, the operator depresses the applicable key on the keyboard. This action causes a coded series of pulses to be generated and transmitted over the line. (Signal line current can be supplied either externally or by the internal signal line power supply.) At the other end of the line, the train of pulses is received and decoded by the line sensor in the remote teletypewriter set and translated into the required mechanical action by the printer, resulting in either the printing of a character or the performance of a mechanical operation. For reception, the roles of the local and remote teletypewriter set are simply reversed. For off-line local operation, the keyboard, signal line power supply, line sensor, and printer of a single teletypewriter set are connected in a closed loop.

The signal code developed by the keyboard when a key is depressed is the standard five-level (7.42-unit for AN/TGC-14(V); 7.0-unit for AN/TGC-14A(V)) Baudot serial teletypewriter code. In this code, each keyboard function is represented by a discrete combination of mark pulses (current) and space pulses (no-current). Each pulse group contains five of these intelligence pulses: the letter J, for example, is represented by mark-mark-space-mark-space. In addition to the five intelligence pulses, each pulse group begins with a start pulse (spacing) and ends with a stop pulse (marking). The stop pulse is 1.42 (AN/TGC-14(V)) or 1.0 (AN/TGC-14A(V)) times as long as any of the other six pulses, each of which may be considered as one time-unit long. The entire pulse

group consisting of a start pulse, five intelligence pulses, and stop pulse is therefore 7.42 (AN/TGC-14(V)) or 7.0 (AN/TGC-14A(V)) units in length. The actual time duration of a pulse group is dependent upon operational speed. At 60 words per minute, each unit is 22 milliseconds in length and each pulse group is 163 milliseconds in length (7.42 times 22 milliseconds). At 45.45 baud, the length of 22 milliseconds for each unit may be calculated by dividing 1000 milliseconds by the baud rate of 45.45. The length of each pulse group is 22 times 7.0 or 154 milliseconds. The difference in length of pulse group (163 milliseconds for 7.42 unit code and 154 milliseconds for 7.0-unit code) is due to the different length of the stop pulses. The complete Baudot code is illustrated in figure 1-2.

Although the keyboard operates on a 7.42-unit or 7.0-unit basis, the receiving printer operates on a 6.7-unit basis. This feature increases both the reliability and the versatility of the teletypewriter set, allowing it to correct for slight speed differences between machines as well as to operate on any code between 7 and 8 units.

d. OPERATING FEATURES. - The teletypewriter sets employ a standard teletypewriter keyboard which, when the set is in the transport condition, may be stowed in a recess in the electrical chassis beneath the printer. Figure 1-3 shows the equipment with the keyboard extended and locked in the operating position. The 32 keys are arranged in three rows which are banked for operator comfort. Each of the keys on the keyboard (except FIGS, LTRS, LINE FEED, CAR RET, and blank keys and the space bar which normally do not cause printing) serves a dual purpose. When the teletypewriter set is in the figures condition, the symbol shown on the upper portion of the depressed key will be printed. When the teletypewriter set is in the letters condition, the letter shown on the lower portion of the depressed key will be printed. The blank key at the lower right is one of the 32 available characters, but normally does not cause printing to take place. The group of four buttons below the copy window control mechanically operated local off-line functions of line feed, figure shift, letters shift, and carriage return. These functions are purely local and have no effect on the signal line. The operating controls are grouped at the lower left side of the keyboard. Behind the LIFT panel are the PAPER pressure release lever and the LINE FEED shift arm. The AN/TGC-14(V) is equipped with a figure H motor stop feature which when actuated shuts off power to the motors of all teletypewriter sets in the circuit but maintains their heaters, line sensors, and signal line power supplies in a standby condition. The motor is reactivated upon receipt of the first start pulse or a break in the signal line. The AN/TGC-14A(V) is equipped with a time delay motor stop which turns off the motor and places the heater, line sensor, and signal line power supply in a standby condition when no mark-to-space transition is received for 90 seconds (45.45 baud) or 60 seconds (75 baud). Receipt of the first mark-to-space transition automatically restarts the motor. Transmitting figures H from an AN/TGC-14A(V) to another AN/TGC-14A(V) on the signal line will not stop either of the teletypewriters: however, any AN/TGC-14(V) on the same signal line will be stopped.

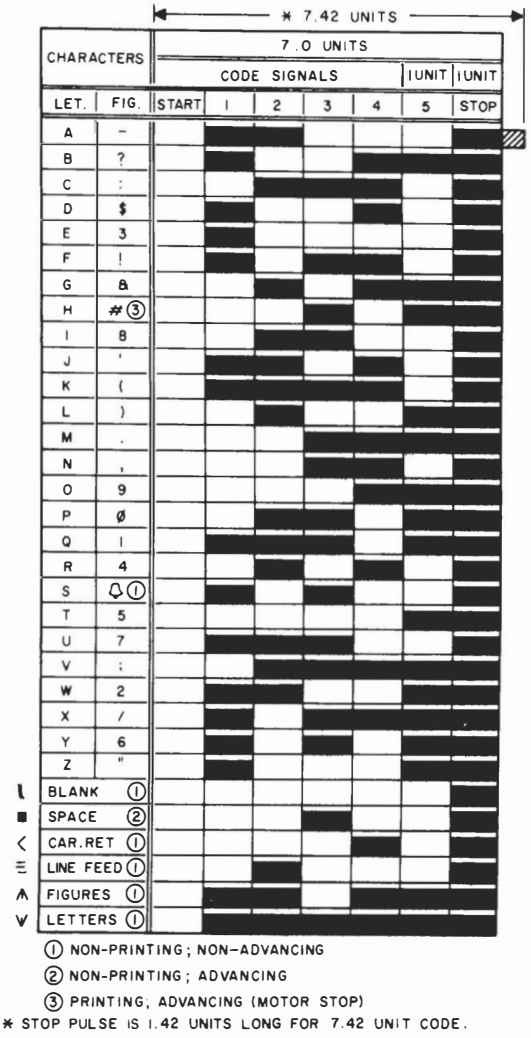


Figure 1-2. Five-Level Baudot Code

The AN/TGC-14(V) uses standard single or multiply rolls of copy paper 8-1/2 inches wide and of any diameter up to 5 inches, with a 1-inch hollow core. The paper supply roll is stored in the electrical chassis (figure 1-4). The AN/TGC-14A(V) uses either the same copy paper stored in the electrical chassis or fan-fold, sprocket-feed, multi-ply copy paper stored externally and fed into a slot in the rear of Non-Tactical Case CY-2977A/UG. Tactical Case CY-2976A/PG does not have this provision.

The electrical chassis (figure 1-5) accommodates the printer and the copy paper. The printer prints six lines to the inch when set for single line feed and three lines to the inch when set for double line feed. Automatic carriage return and line feed occur when either 72 or 76 characters (depending on the adjustment of the carriage return mechanism) have been printed on a line and a carriage return signal has not been received.

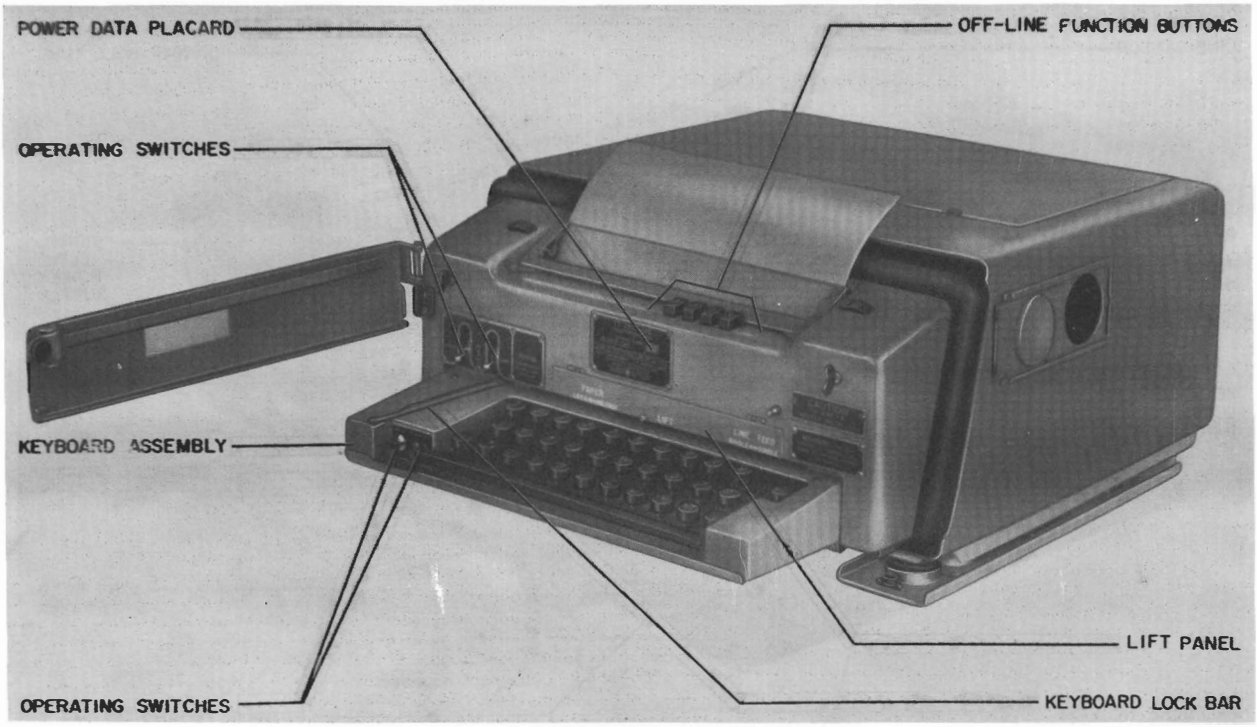


Figure 1-3. Teletypewriter Set Ready for Operation

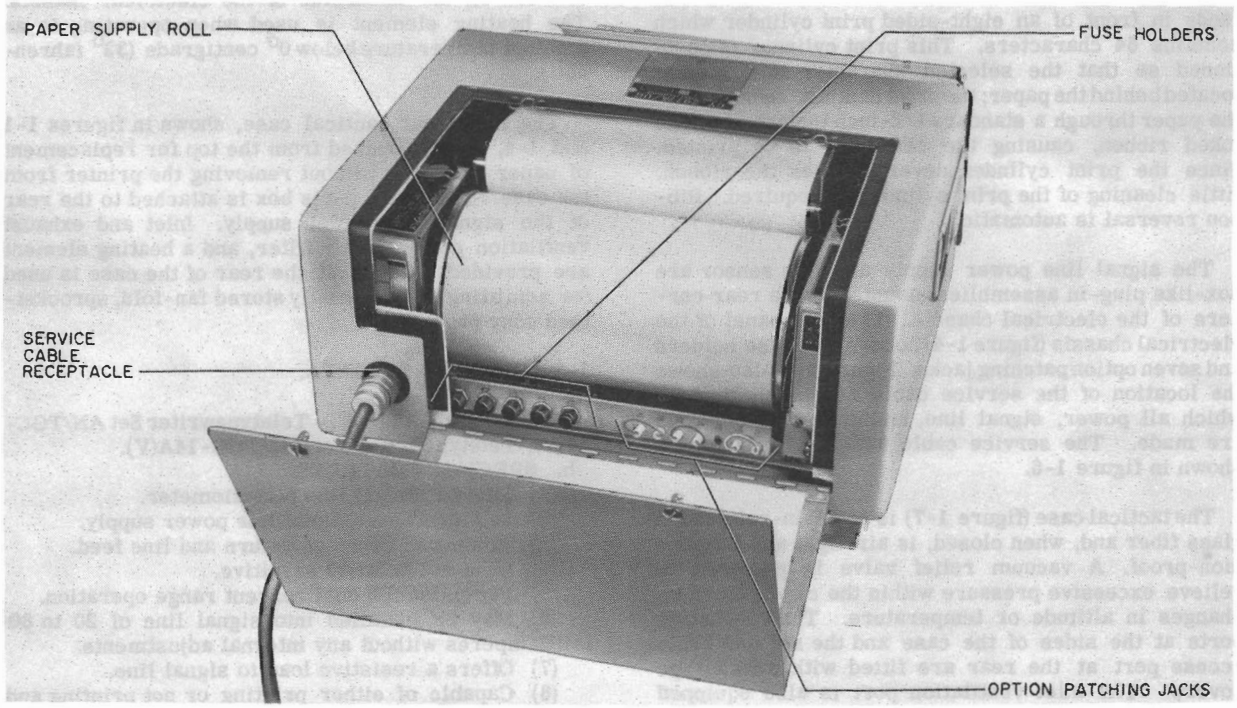


Figure 1-4. Teletypewriter Set, Rear View

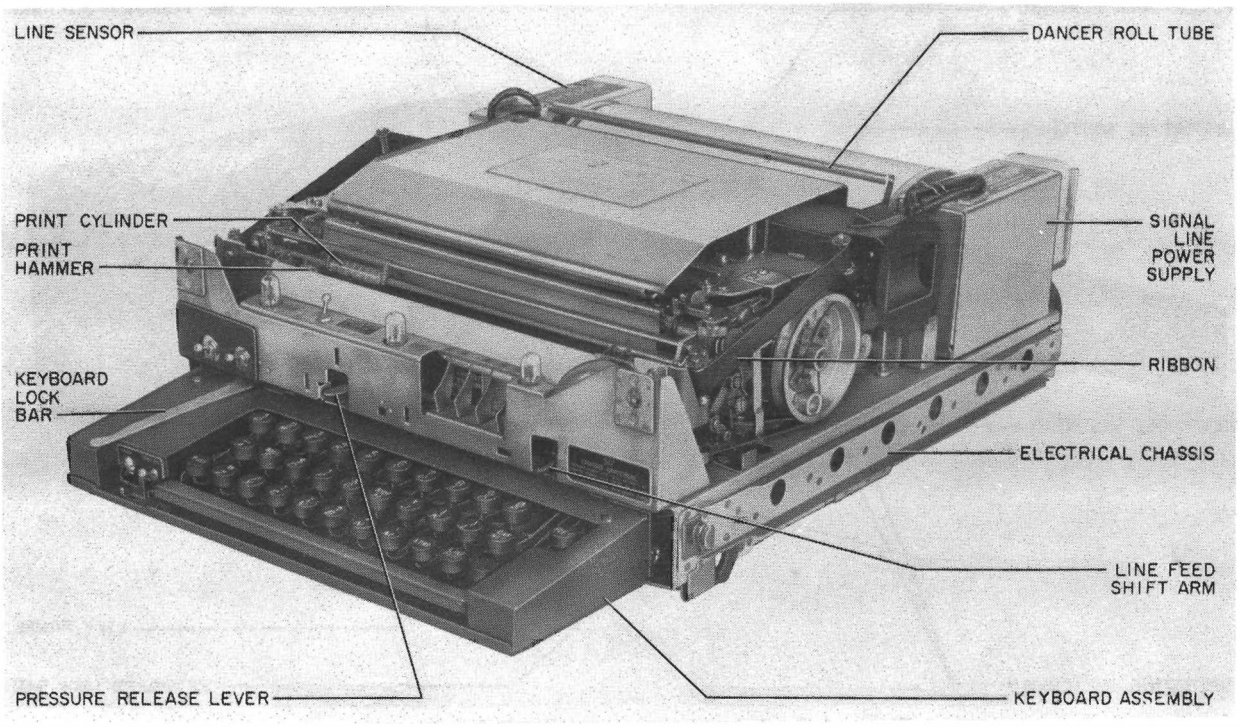


Figure 1-5. Teletypewriter Set, Case and Cover Removed

During operation of the printer, the copy paper feeds in front of an eight-sided print cylinder which contains 64 characters. This print cylinder is positioned so that the selected character is correctly located behind the paper; the print hammer then strikes the paper through a standard 1/2-inch Underwood-type inked ribbon, causing the character to be printed. Since the print cylinder never touches the ribbon, little cleaning of the print cylinder is required. Ribbon reversal is automatic.

The signal line power supply and line sensor are box-like plug-in assemblies mounted at the rear corners of the electrical chassis. The rear panel of the electrical chassis (figure 1-4) houses five fuse holders and seven option patching jacks. Figure 1-4 also shows the location of the service cable receptacle through which all power, signal line, and ground connections are made. The service cable and junction box are shown in figure 1-6.

The tactical case (figure 1-7) is of resin-reinforced glass fiber and, when closed, is air-tight and immersion-proof. A vacuum relief valve is provided to relieve excessive pressure within the case caused by changes in altitude or temperature. The ventilation ports at the sides of the case and the service cable access port at the rear are fitted with screw-type covers. The inlet ventilation port is also equipped with an air filter, which can be removed easily for cleaning. A compartment in the case cover (figure 1-8) provides stowage space for the service cable, spare ribbon, spare fuses and spare lamps. A thermostatically controlled heating element (figure 1-9) is situated on the underside of the electrical chassis. The heating element is used when operating in an ambient temperature below 0^{o} centigrade (32^{o} fahrenheit).

The metal non-tactical case, shown in figures 1-1 and 1-4, may be opened from the top for replacement of paper and fuses without removing the printer from the case. The spare parts box is attached to the rear of the signal line power supply. Inlet and exhaust ventilation ports, an air filter, and a heating element are provided. A slot at the rear of the case is used for admitting the externally stored fan-fold, sprocket-feed copy paper.

1-3. REFERENCE DATA.

a. NOMENCLATURE. - Teletypewriter Set AN/TGC-14(V); Teletypewriter Set AN/TGC-14A(V).

b. SPECIAL FEATURES.

(1) Internal signal line potentiometer.
(2) Self-contained signal line power supply.
(3) Automatic carriage return and line feed.
(4) Input not polarity sensitive.
(5) Provision for dual current range operation.
(6) May be installed into signal line of 20 to 80 milliamperes without any internal adjustments.
(7) Offers a resistive load to signal line.
(8) Capable of either printing or not printing and spacing or not spacing on all functions.
(9) External signal and test connections made to universal binding posts on service cable junction box without necessity of stripping field wire.
(10) Integral copy holder.

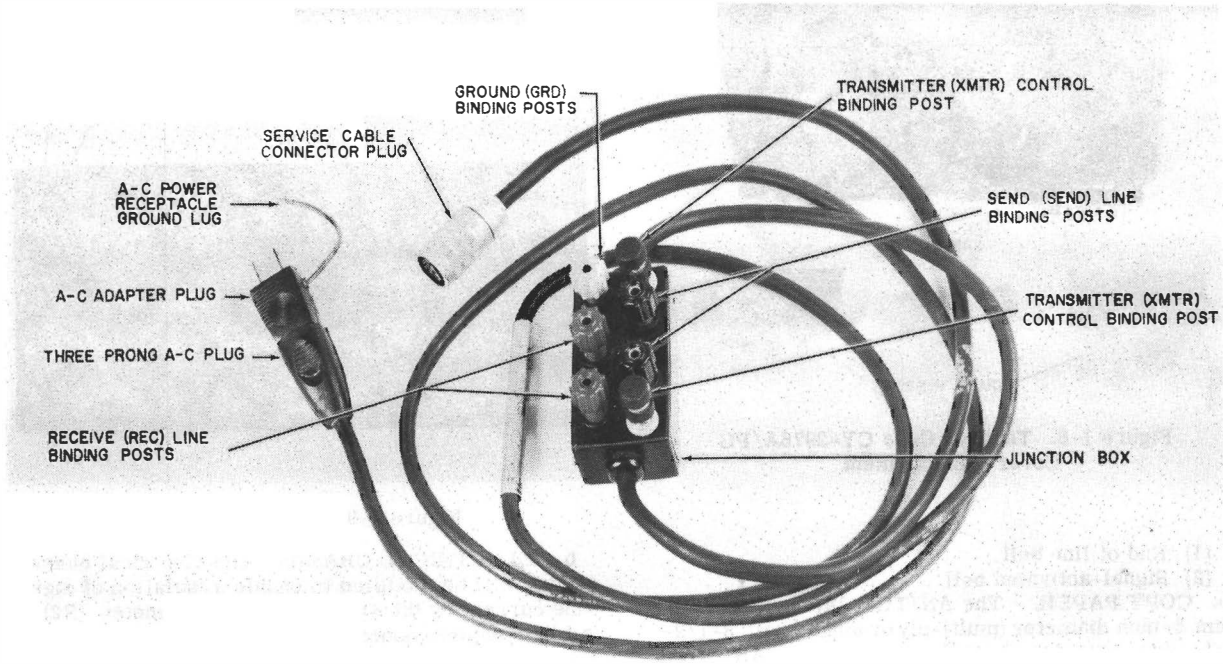


Figure 1-6. Service Cable Assembly

c. POWER REQUIREMENTS.

(1) 115 volts alternating current, 60 cycles per second, single-phase, 70 watts (additional 200 watts required for heating element when operating).

(2) 115 volts alternating current, 400 cycles per second, single-phase, 70 watts (additional 200 watts required for heating element when operating).

d. TYPE OF INSTALLATION.

(1) Tactical. - Mobile and field station.

(2) Non-Tactical. - Airborne and fixed station.

e. AMBIENT TEMPERATURE LIMITS. - Minus 55° Centigrade (-67° Fahrenheit) to plus 55° Centigrade (+131° Fahrenheit).

f. OPERATING SPEED. - Gears for 60, 75, or 100 words per minute are supplied with the AN/TGC-14(V). Gears for 45.45, 50, and 75 baud are supplied with the AN/TGC-14A(V). (Intermediate speed gears are obtainable.)

g. SIGNAL CODE TYPE. - Direct-current pulse, five-level, 7.42-unit (AN/TGC-14(V)) or 7.0-unit (AN/TGC-14A(V), Baudot serial, neutral line.

h. KEYBOARD. - Standard communications.

i. TYPE OF CHARACTERS. - English.

j. TYPE FACE. - Gothic, 12-point.

k. PRINTER LINE SPACING.

(1) Single Line Feed. - Six lines per inch.

(2) Double Line Feed. - Three lines per inch.

l. CHARACTERS PER LINE. - Adjustable for either 72 or 76.

m. INPUT IMPEDANCE.

(1) High Current Range (20 to 80 milliamperes). - 115 ohms, resistive, at 60 milliamperes.

(2) Low Current Range (1 to 5 milliamperes). - 2200 ohms, resistive, at 5 milliamperes.

n. ALARM DEVICES.

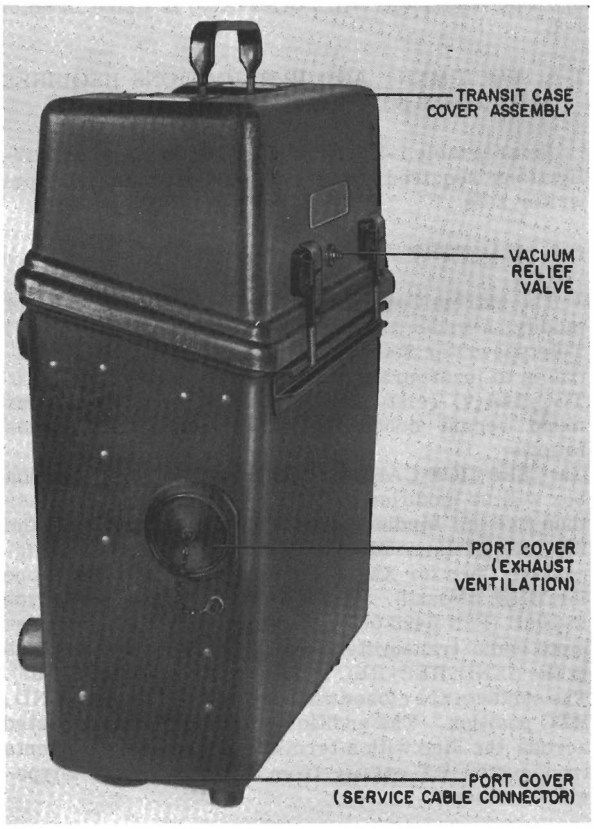


Figure 1-7. Tactical Case CY-2976A/PG

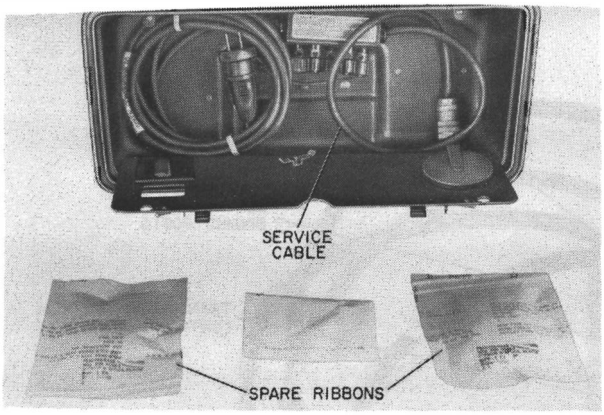


Figure 1-8. Tactical Case CY-2976A/PG Cover Compartment

(1) End of line bell.
(2) Signal-activated bell.

o. COPY PAPER. - The AN/TGC-14(V) uses maximum 5-inch diameter (multi-ply or single) roll, 8-1/2-inch wide, with 1-inch hollow core. The AN/TGC-14A(V) uses either the same copy paper or fan-fold, sprocket-feed, multi-ply paper.

1-4. EQUIPMENT SUPPLIED.

The equipment supplied as Teletypewriter Sets AN/TGC-14(V) and AN/TGC-14A(V) is listed in table 1-1.

1-5. EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED.

Refer to table 1-2 for the list of equipment and publications required but not supplied with the teletypewriter sets.

1-6. FACTORY AND FIELD CHANGES.

The Marine Corps is currently in the process of modifying (under contract NOm 73359) AN/TGC-14(V) Teletypewriter Sets manufactured under earlier contracts to incorporate changes already included in AN/TGC-14A(V) Teletypewriter Sets manufactured under more recent contracts. The modification areas follows:

a. SERVICE CABLE. The service cable junction box will be modified to incorporate seven (7) rather than five (5) binding posts. Two for terminating the REC signal line, two for terminating the SEND signal line, two for XMTR (transmitter) control and one for GRD (ground). The XMTR posts are push type U-106U (FSN 5490 557 1486) to permit keying of a remote radio transmitter through a set of dry contacts in the SEND. REC-REC switch (refer to figure 5-107). The contacts are closed when the switch is in the SEND. REC position. The addition of an RF filter connected across the line with a terminus to ground, prevents transmitter RF energy from reaching the teletypewriter chassis.

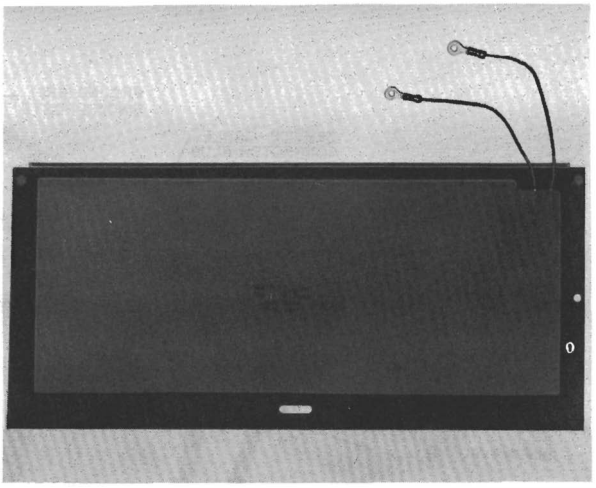


Figure 1-9. Heating Element

b. ELECTRICAL CHASSIS. The electrical chassis wiring will be modified to enable regulation of signal line current by the signal line potentiometer (R2) in all half-duplex modes, battery supplied internally or externally. In full-duplex modes, internal regulation is possible only on the REC line, requiring external regulation of the SEND line.

NOTE

The equipments modified for the Marine Corps have fuse F-5 in series with signal line power supply (1A4). This feature prevents damage to the signal line power supply if more than one equipment in a series loop is supplying signal line current. Fuse F-4, a 2.5 amp. fuse, is connected in the A. C. heater circuit.

1-7. EQUIPMENT SIMILARITIES.

Refer to table 1-4 for a comparison between Teletypewriter Sets AN/TGC-14(V) and AN/TGC-14A(V).

1-8. PREPARATION FOR RESHIPMENT.

The teletypewriter sets require no special preparation for reshipment. The equipment may be shipped to another operating site or depot by repacking the complete teletypewriter set in the original shipping container in accordance with packing specification MIL-P-17555E. A teletypewriter set may also be shipped partially disassembled. Refer to table 1-5 for the sizes and weights of the shipping containers. Advise the packing and packaging facility as to the type of equipment and whether preparation shall be for domestic shipment-immediate use; domestic shipment and storage; or for overseas shipment. If the technical manual is to be included, advise the facility to mark the shipping container, TECHNICAL MANUAL INSIDE.

TABLE 1-1. EQUIPMENT SUPPLIED

QUANT. PER EQUIP.	NOMENCLATURE		UNIT NO.	*OVERALL DIMENSIONS (INCHES)			*VOLUME (CUBIC FEET)	*WEIGHT (POUNDS)
	NAME	DESIGNATION		HEIGHT	WIDTH	DEPTH		
	Teletypewriter Set (includes a Teletypewriter, a Power Supply Kit, a Motor, a Case, and Shock Mounts, if required)	AN/TGC-14(V)	1					With Tactical Case 39 With Tactical Case and Shock Mounts 43 With Non-Tactical Case 37.9 With Non-Tactical Case and Shock Mounts 40.8
1	Teletypewriter (includes)	TT-297/UG						
	Keyboard	TT-318/UG	1A9	1-1/2	12	8-1/4	0.09	3.9
	Printer	1-2-3-104	1A2	4-1/2	12-3/4	9	0.30	13.9
	Electrical Chassis	515-104	1A1	5-1/2	13-1/8	14-1/8	0.60	7.4
**1	A-c Power Supply Kit (includes)	MK-539/UG						
	A-c Line Sensor	543-104	1A3	1-11/16	5-13/16	3-5/16	0.02	1.2
	A-c Signal Line Power Supply	533-104	1A4	1-11/16	4-3/16	3-5/16	0.015	0.8
	A-c Heating Element	3484	1A1A1	1/16	12-3/4	5-15/16	0.003	0.5
	A-c Service Cable Assembly	555-104	1A5			115		1.0
	Running Spares Kit (contains) Spare Patch Cord Spare Panel Lamp 16 Fuses	3271		3/4	2	2-3/16		
**1	A-c Motor (60 cps, 1Ø)	PD-82/U	1A2A2	2-5/16	4-3/16		0.01	2.5
**1	A-c Motor (400 cps, 1Ø)	PD-83/U	1A2A3	2-5/16	4-3/16		0.01	2.5
**1	Tactical Case	CY-2976A/PG		8	16-3/16	19-1/8	1.43	11.7
**1	Non-Tactical Case	CY-2977A/UG		6-15/16	14-13/16	18-5/8	1.11	10.6
**1	Shock Mount (Non-Tactical Case)	5060-3		1-1/2	13-3/4	14-1/8	0.18	2.9
***1	Shock Mount (Tactical Case)	5060-2		1-3/4	2-1/8	11-1/2	0.02	2.9

* Including hardware.
** If used, one per equipment.
*** If used, one pair per equipment.

TABLE 1-1. EQUIPMENT SUPPLIED (Cont)

QUANT. PER EQUIP.	NOMENCLATURE NAME	NOMENCLATURE DESIGNATION	UNIT NO.	*OVERALL DIMENSIONS (INCHES) HEIGHT	WIDTH	DEPTH	*VOLUME (CUBIC FEET)	*WEIGHT (POUNDS)
	Teletypewriter Set (includes a Teletypewriter, a Power Supply Kit, a Motor, a Case, and Shock Mounts, if required)	AN/TGC-14A(V)	1					With Tactical Case 41 With Tactical Case and Shock Mounts 45 With Non-Tactical Case 37.9 With Non-Tactical Case and Shock Mounts 40.8
1	Teletypewriter (includes)	TT-297A/UG						
	Keyboard	TT-318A/UG	1A9	1-1/2	12	8-1/4	0.09	3.9
	Printer	1-2-3-104	1A2	4-1/2	12-3/4	9	0.30	13.9
	Electrical Chassis	515-104	1A1	5-1/2	13-1/8	14-1/8	0.60	7.4
**1	A-c Power Supply Kit (includes)	MK-539A/UG						
	A-c Line Sensor	543-104	1A3	1-11/16	5-13/16	3-5/16	0.02	1.2
	A-c Signal Line Power Supply	33287	1A4	1-11/16	4-3/16	3-5/16	0.015	0.8
	A-c Heating Element	3484	1A1A1	1/16	12-3/4	5-15/16	0.003	0.5
	A-c Service Cable Assembly	555-104	1A5			115		1.0
	Running Spares Kit (contains) Spare Patch Cord Spare Panel Lamp 15 Fuses 10 Sprocket Teeth 0.050 hex wrench	30470		5/8	1-3/8	2-5/16		
**1	A-c Motor (60 cps, 1Ø)	PD-82/U	1A2A2	2-5/16	4-3/16		0.01	2.5
**1	A-c Motor (400 cps, 1Ø)	PD-83/U	1A2A3	2-5/16	4-3/16		0.01	2.5
**1	Tactical Case	CY-2976A/PG		8	16-3/16	19-1/8	1.43	11.7
**1	Non-Tactical Case	CY-2977A/UG		6-15/16	14-13/16	18-5/8	1.11	10.6
**1	Shock Mount (Non-Tactical Case)	5060-3		1-1/2	13-3/4	14-1/8	0.18	2.9
***1	Shock Mount (Tactical Case)	5060-2		1-3/4	2-1/8	11-1/2	0.02	2.9

* Including hardware.
** If used, one per equipment.
*** If used, one pair per equipment.

TABLE 1-2. EQUIPMENT REQUIRED BUT NOT SUPPLIED

QTY PER EQUIP	NOMENCLATURE		REQUIRED USE
	NAME	DESIGNATION	
1	Multimeter	AN/PSM-4	Check resistance, current, and voltage.
1	Oscilloscope	AN/USM-105	Observe waveforms.
1	Electronic Multimeter	TS-505/U	Check voltages.
1	Teletypewriter Tool Kit	TK-122/U	Make adjustments.

TABLE 1-3. FACTORY OR FIELD CHANGES

CHANGE NUMBER	TITLE AND PURPOSE	SERIAL NO. AFFECTED	INDICATION OF ACCOMPLISHMENT
FSB-001	Instructions For Installation of Modification Kit Part No. 10121 on Keyboards Not Modified. Purpose is to prevent damage to the space bar and to prevent accidental shifting of the SEND-REC-REC switch.	All equipment not already modified.	A guard plate is attached to the keyboard.
FSB-003	Instructions For Installation of Modification Kit Part No. 30561 on Tactical Case CY-2976A/PG Purpose is to eliminate warping of the case and subsequent interference between the top of the case and the copy paper.	All equipment not already modified.	A striker bar is attached to the tactical case.
FSB-004	Recommended Retrofit of Ribbon Feed Assembly Through Use of Kit 30746. Purpose is to facilitate maintenance of the ribbon feed assembly.	All equipment not already modified.	Ribbon vibrator shafts are replaced.

TABLE 1-4. EQUIPMENT SIMILARITY

	AN/TGC-14(V)	AN/TGC-14A(V)
Primary Power Supply	115 vac, 60 cps, single phase 115 vac, 400 cps, single phase	Same as AN/TGC-14(V).
Signal Code	Sends and receives 7.42-unit Baudot code at speeds of 60, 75, and 100 wpm. Can also receive 7.0-unit code without adjustment.	Sends and receives 7.0-unit Baudot code at speeds of 45.45, 50, and 75 baud. Can also receive 7.42-unit code without adjustment.
Patching Options	Operates in duplex and half-duplex (simplex) modes; battery supplied internally or externally as desired.	Same as AN/TGC-14(V).
Line Length	Normally prints 72 characters per line; can be adjusted for 76 characters.	Same as AN/TGC-14(V).

TABLE 1-4. EQUIPMENT SIMILARITY (Cont)

	AN/TGC-14(V)	AN/TGC-14A(V)
Paper Feed Mechanism	Uses pressure feed; paper stored within case.	Same as AN/TGC-14(V); or uses sprocket-feed paper stored externally and admitted through slot in rear (non-tactical case only).
Motor Stop Mechanism	Uses figures H motor stop; depression of the FIGS key and then the H key automatically stops the motor, leaving the teletypewriter set in standby condition until receipt of first mark-to-space transition which automatically restarts the motor.	Uses time delay motor stop; turns off motor, leaving the teletypewriter set in standby condition if no mark-to-space transition is received for 90 seconds when operating at 45.45 baud, or for 60 seconds at 75 baud; receipt of first mark-to-space transition automatically restarts motor.
Keyboard TT-318/UG, TT-318A/UG	Transmits 7.42-unit Baudot code.	Transmits 7.0-unit Baudot code.
Case	Supplied in Tactical Case CY-2976A/PG or Non-Tactical Case CY-2977A/UG; either can be shock mounted.	Same as AN/TGC-14(V)

TABLE 1-5. SHIPPING DATA

NOMENCLATURE		UNIT	*OVERALL DIMENSIONS (INCHES)			*VOLUME (CUBIC	*WEIGHT	FEDERAL STOCK
NAME	DESIGNATION	NO.	HEIGHT	WIDTH	DEPTH	FEET)	(POUNDS)	NUMBER
Teletypewriter Set	AN/TGC-14(V)							
**Teletypewriter Set	AN/TGC-14A(V)							5815-078-5480
***Teletypewriter	TT-297/UG							5815-798-0351
****Teletypewriter	TT-297A/UG							
Tactical Case	CY-2976A/PG		13	21-1/4	27	4.7	41 to 61	5815-798-0344
Non-Tactical Case	CY-2977/UG or CY-2977A/UG		13	19-3/4	23-1/2	4.1	41 to 61	
A-c Power Supply Kit	MK-539A/UG		12	30	24	5.5		5815-798-0345
A-c Line Sensor	543-104 or 33287	1A3	4-1/2	8	6	0.21	4	
A-c Signal Line Power Supply	533-104	1A4	4-1/2	7	6	0.2	5	
A-c Service Cable	555-104	1A5	6-1/2	11-1/2	7-1/2	0.45	4	5815-841-9101
A-c Heating Element	3484	1A1A1	3	16-1/2	9	0.35	6	4540-846-1916
Spare Parts Box	3271		2	4	4	0.05	3	
A-c Motor (60 cps, 1Ø)	PD-82/U	1A2A2	7-1/2	7	7	0.3	5	6105-798-0347
A-c Motor (400 cps, 1Ø)	PD-83/U	1A2A3	8	5-1/2	5-1/2	0.2	5	6105-798-0350

* Unless otherwise noted, dimensions are in inches, volume in cubic feet, and weight in pounds; equipment crated and ready for shipment.

** Completely assembled, including A-c Motor PD-82/U in Tactical Case CY-2976A/PG

*** Teletypewriter TT-297/UG will be shipped in Tactical Case CY-2976A/PG or Non-Tactical Case CY-2977A/UG as specified by the using facility.

**** Teletypewriter TT-297A/UG is part of the AN/TGC-14A (V).

SECTION 2

INSTALLATION

2-1. INTRODUCTION.

This section contains installation instructions for Teletypewriter Sets AN/TGC-14(V) and AN/TGC-14A(V). These instructions include information on site and component selection, unpacking, component installation, performance checks, and adjustments.

2-2. UNPACKING AND HANDLING.

NOTE

Retain the shipping containers in which the teletypewriter set is received for use in reshipping the equipment.

a. REMOVING EQUIPMENT FROM SHIPPING CONTAINER.

(1) GENERAL. - The teletypewriter set is packed in accordance with packing specification MIL-P-17555E. Sizes and weights of the various shipping containers are listed in table 1-5.

If the teletypewriter set is received complete with the power supply kit installed, the entire teletypewriter set will be packed in a single shipping container. Examine the shipping container for external signs of damage and carefully open the container. Remove the equipment from the container and inspect as detailed in paragraph 2-2b.

(2) TELETYPEWRITER TT-297/UG or TT-297A/UG. - The teletypewriters (a keyboard, a printer, and an electrical chassis) are shipped in a single container already mounted in Tactical Case CY-2976A/PG, Non-Tactical Case CY-2977/UG or Non-Tactical Case CY-2977A/UG. Examine the shipping container for external signs of damage and carefully open the container. Remove the equipment from the container and inspect as detailed in paragraph 2-2b.

(3) ALTERNATING-CURRENT COMPONENTS. - The alternating-current components are shipped in three separate containers. The alternating-current power supply kit (a line sensor, a signal line power supply, a service cable, a heating element, and a spare parts box) is shipped in one of the containers and the two alternating-current motors (60 cycles per second and 400 cycles per second) are shipped in the others. Since a given installation will require only one of the motors (depending on the primary power source) only two shipping containers will be required for the alternating-current components. Examine the shipping containers for external signs of damage and carefully open the containers. Remove the equipment from the containers and inspect as detailed in paragraph 2-2b.

b. INSPECTION. - Inspect the unpacked teletypewriter components as follows:

NOTE

Always open the vacuum relief valve on the tactical case cover to equalize the case pressure with that of the atmosphere prior to attempting case cover removal.

Step 1. Remove the service cable from its receptacle (figure 2-1).

Step 2. If the equipment is contained in the tactical case, disengage the four snap fasteners on the case cover and remove the cover from the case. The non-tactical case does not have a case cover.

Step 3. Place the teletypewriter set in the operating position.

Step 4. Disengage the two fastener studs on the front cover by turning them counterclockwise.

CAUTION

When the front cover is removed, the electrical chassis locking device is released and the chassis is free to slide out of the case.

Step 5. Carefully pull the top of the front cover out toward the front of the machine and then lift up the cover.

Step 6. Carefully slide the printer and electrical chassis forward and out of the case.

CAUTION

When placing the printer and electrical chassis assembly on a work surface, do not rest the assembly in any position which may damage the MOTOR and LAMP switches or other protruding parts.

Step 7. Inspect the unpacked components to insure that no damage was incurred during shipment and that all items called for on the shipping list have been included.

CAUTION

If the teletypewriter set has been shipped complete (motor, line sensor, and power supply installed), do not connect the equipment to the primary power source without first determining that the teletypewriter set is compatible with the power source. Refer to paragraph 2-5a for instructions on checking part numbers.

Step 8. Compare part numbers on the nameplates of the units in the power supply kit and motors with those called for in the shipping list and table 2-1.

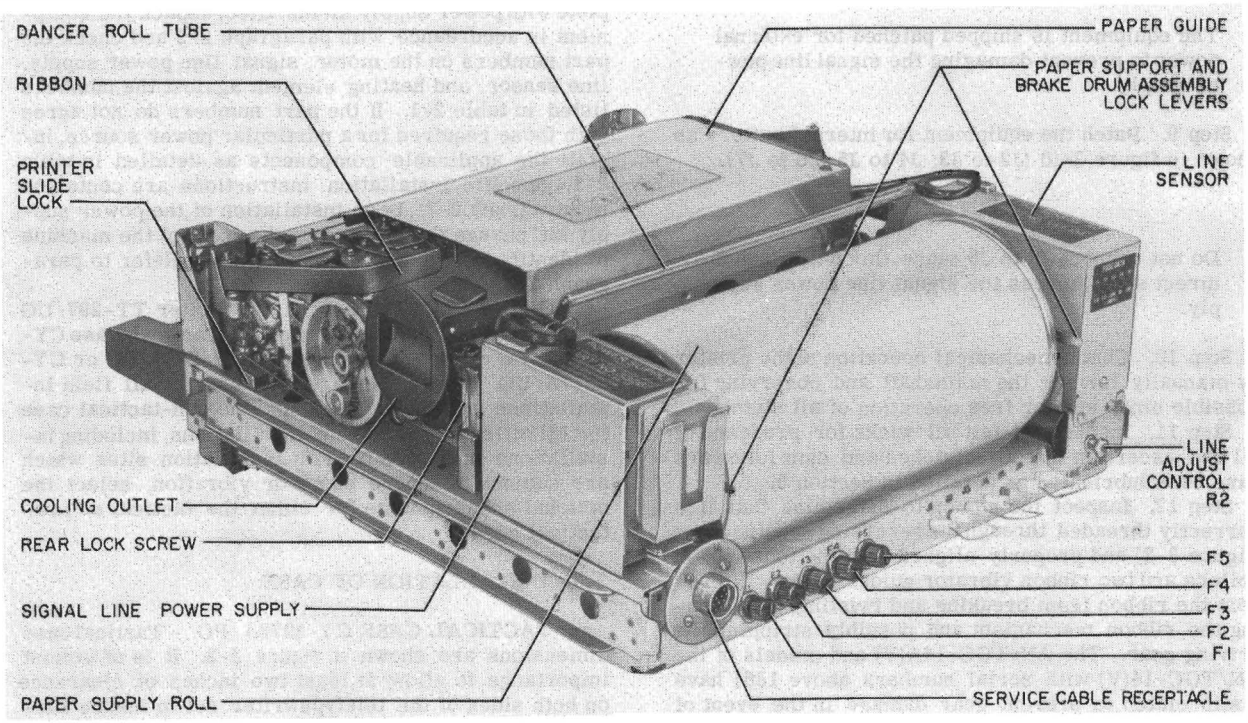


Figure 2-1. Printer and Electrical Chassis, Parts Location

TABLE 2-1. PRIMARY POWER SOURCE OPTIONS

PRIMARY POWER SOURCE	COMPONENTS REQUIRED	NOMENCLATURE	MITE PART NO.	POWER REQUIREMENTS (WATTS)
115 vac, 60 cps	Teletypewriter	TT-297/UG or TT-297A/UG		
	A-c Motor	PD-82/U	521-104	Motor and Power Supply Kit 70
	A-c Power Supply Kit	MK-539A/UG		
	A-c Signal Line Power Supply		533-104 or 33287	
	A-c Line Sensor		543-104	
	A-c Heating Element*		3484	Heating Element 200
	A-c Service Cable Assembly		555-104	
	Spare Parts Box		3271	Total 270
115 vac, 400 cps	Teletypewriter	TT-297/UG or TT-297A/UG		
	A-c Motor	PD-83/U	523-104	Motor and Power Supply Kit 70
	A-c Power Supply Kit	MK-539A/UG		
	A-c Signal Line Power Supply		533-104 or 33287	
	A-c Line Sensor		543-104	Heating Element 200
	A-c Heating Element*		3484	
	A-c Service Cable Assembly		555-104	Total 270
	Spare Parts Box		3271	

*Identified by brown and red leads and 66.5 ohms ± 10% resistance.

NOTE

The equipment is shipped patched for external power to prevent damaging the signal line power supply.

Step 9. Patch the equipment for internal battery as shown in figure 2-10 (J2 to J3; J4 to J5; J6 to J7).

CAUTION

Do not connect J2 to J5 since this will place a direct short across the signal line power supply.

Step 10. Check mechanical operation of the printer by manually turning the mainshaft and observing for possible binds and for free operation of all clutches.

Step 11. Inspect all felt oil wicks for presence of oil and ascertain that all clutches and cam followers have been lubricated as detailed in Section 5.

Step 12. Inspect the ribbon to determine that it is correctly threaded through the reversing sensing arms (figure 3-2) and properly aligned with the four ribbon rollers and two ribbon vibrator guides. This will prevent the ribbon from breaking and twisting, thus binding the ribbon mechanism and possibly stripping the driving gear. The AN/TGC-14A(V) and models of the AN/TGC-14(V) with serial numbers above 1861 have a slip clutch to prevent gear damage in the event of jamming.

2-3. POWER REQUIREMENTS AND DISTRIBUTION.

a. POWER REQUIREMENTS. - Refer to table 2-1 for the power requirements of the two primary power source options.

b. POWER DISTRIBUTION. - Primary power distributions for the alternating-current configuration are shown in figure 4-6 (Appendix).

2-4. SITE SELECTION.

The primary considerations in selecting an installation site are the availability of a primary power source, signal line, and adequate facilities to make a good ground connection. If possible, select a site which is close enough to the primary power source and signal line to allow direct connections between the power source and signal line and the service cable junction box. Determine the exact nature of the primary power source so that the correct motor can be selected as instructed in paragraph 2-5.

2-5. COMPONENT SELECTION.

a. ELECTRICAL COMPONENTS SELECTION. - All of the AN/TGC-14A(V) equipment has been shipped with the motors, line sensors, signal line power supplies, and heaters installed. Although some AN/TGC-14(V) equipment has been shipped complete with power supply kits (motor, signal line power supply, and line sensor), most of the units are shipped with Teletypewriter TT-297/UG (Keyboard TT-318/UG, printer less motor, and electrical chassis) and the power kit packed separately. Table 2-1 lists the primary power sources and the components that must be used with each of these power sources.

If a teletypewriter set is ordered and received complete with power supply kit installed, unpack the equipment in accordance with paragraph 2-2 and check the part numbers on the motor, signal line power supply, line sensor, and heating element against the numbers listed in table 2-1. If the part numbers do not agree with those required for a particular power source, install the applicable components as detailed in table 2-1. Specific installation instructions are contained in paragraph 2-7. Upon installation of the power supply kit, change the placard on the front of the machine to identify the type of motor installed. Refer to paragraph 2-6g for instructions.

b. CASE SELECTION. - Teletypewriter TT-297/UG or TT-297A/UG is shipped in either Tactical Case CY-2976A/PG or Non-Tactical Case CY-2977/UG or CY-2977A/UG. Select the tactical case for all field installations (mobile or fixed) and the non-tactical case for all office or permanent installations, including installations in aircraft. For installation sites which are subject to severe shock or vibration, select the optional shock mounts for either the tactical or non-tactical cases.

2-6. INSTALLATION OF CASE.

a. TACTICAL CASE CY-2976A/PG. - Tactical case dimensions are shown in figure 2-2. It is of utmost importance to allow at least two inches of clearance on both sides of the teletypewriter set to insure adequate ventilation and also at least four inches of clearance in the rear to prevent severe bending of the service cable. The tactical case may be used in fixed plant or mobile installations having a low vibration factor by merely resting it on its rubber feet. If, however, the installation is to be permanent, the teletypewriter set should be bolted to the mounting surface. Installations subject to high vibration or shock should be shock mounted.

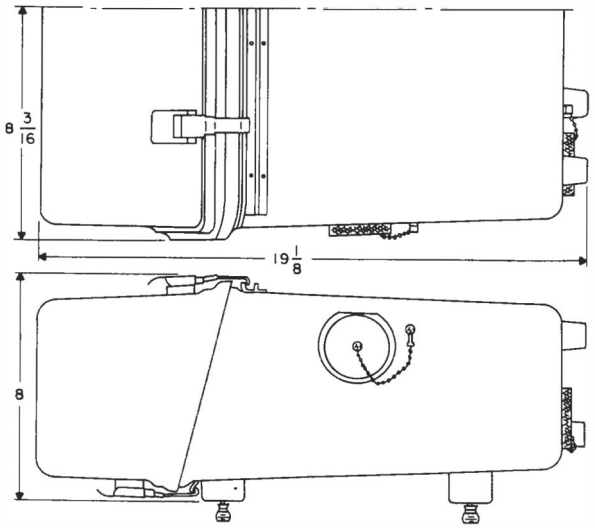


Figure 2-2. Tactical Case CY-2976A/PG, Overall Dimensions

(1) LOW-VIBRATION INSTALLATION. - Temporary installations require only that the case be placed on its rubber feet and the teletypewriter set connected. Permanent installations of the teletypewriter set should be mounted on the surface using the thumb screws supplied. Drill four 5/16-inch holes for the 1/4-20 thumb screws. Space the holes as shown in figure 2-3. Not more than 1/2 inch and not less than 3/8 inch of the mounting screw should project above the mounting surface.

(2) HIGH VIBRATION AND SHOCK INSTALLATIONS. — Installations subject to high vibration and shock factors should incorporate shock mounts. Refer to figure 2-4 and install the shock mounts as follows:

Step 1. Drill six 5/16-inch holes for the 1/4-28 mounting screws. Space the holes as shown in figure 2-4.

Step 2. Loosen and remove the nuts that secure the rubber feet to the threaded inserts protruding through the bottom of the case and remove the rubber feet.

Step 3. Place the rubber feet in the stowage compartment of the case cover.

Step 4. Insert the two threaded inserts through the case mounting holes in one shock mount and secure the case to the shock mount, using the nuts removed in step 2.

Step 5. Repeat steps 3 and 4 for the second shock mount.

Step 6. Position the case and shock mounts over the drilled holes. Insert the 1/4-28 screws up through the mounting surface and thread them into the captive nuts in the shock mount. Use lock washers between the screw head and the bottom of the mounting surface.

CAUTION

Insure that the screws do not hinder motion of the shock mount.

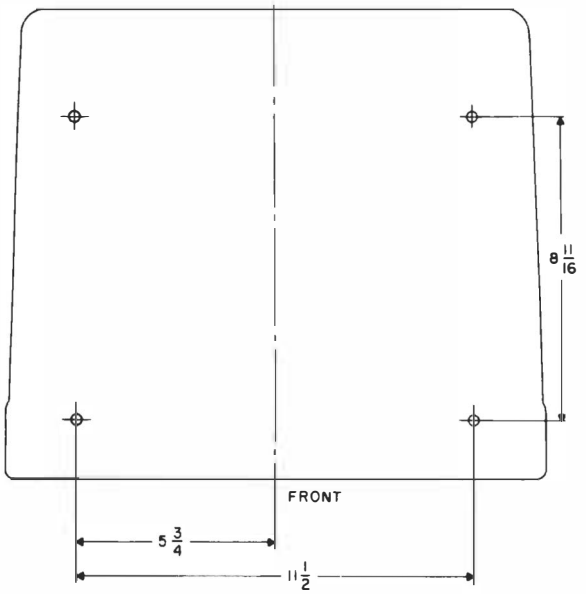


Figure 2-3. Tactical Case CY-2976A/PG, Low Vibration Installation, Mounting Holes Location

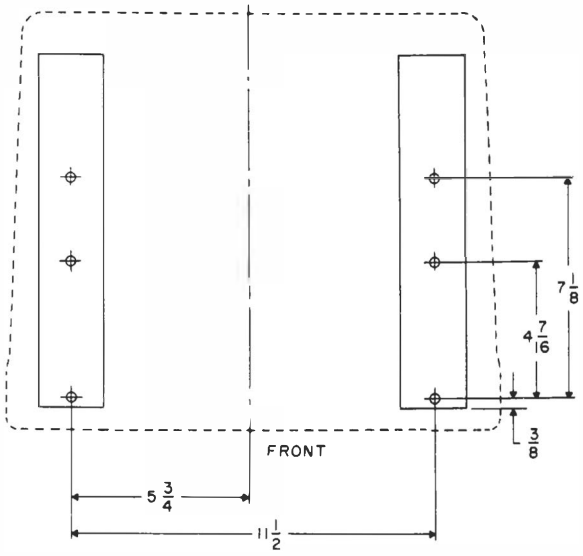


Figure 2-4. Tactical Case CY-2976A/PG, Shock Mounted Installation, Mounting Holes Location

b. NON-TACTICAL CASE CY-2977/UG or CY-2977A/UG. - The non-tactical cases will perform all functions of the tactical case except that the non-tactical cases are not immersion-proof. They can be used in office as well as airborne installations. Refer to figure 2-5 for space requirements for the non-tactical cases.

(1) OFFICE INSTALLATIONS. - The non-tactical cases are normally not secured to the surface on which they rest in an office installation.

(2) AIRBORNE INSTALLATIONS. - The non-tactical cases will always be shock-mounted in airborne installations. Drill eight 5/16-inch holes, spaced as shown in figure 2-6, and secure the shock mount to the mounting surface. Secure the case to the shock mount as follows:

NOTE

Do not remove the rubber feet when mounting the case on the shock mounts.

Step 1. Place the case on the shock mounts.

Step 2. Engage the three hooks on the rear of the shock mounts with the three slots on the rear of the case.

Step 3. Turn the two clamp thumb screws clockwise until the clamps are fully engaged with the front of the case.

WARNING

Use care when opening the top of the non-tactical cases to avoid damaging the service cable.

2-7. INSTALLATION OF ELECTRICAL COMPONENTS.

Check that all switches are in the OFF position and then install the components as instructed in the follow-

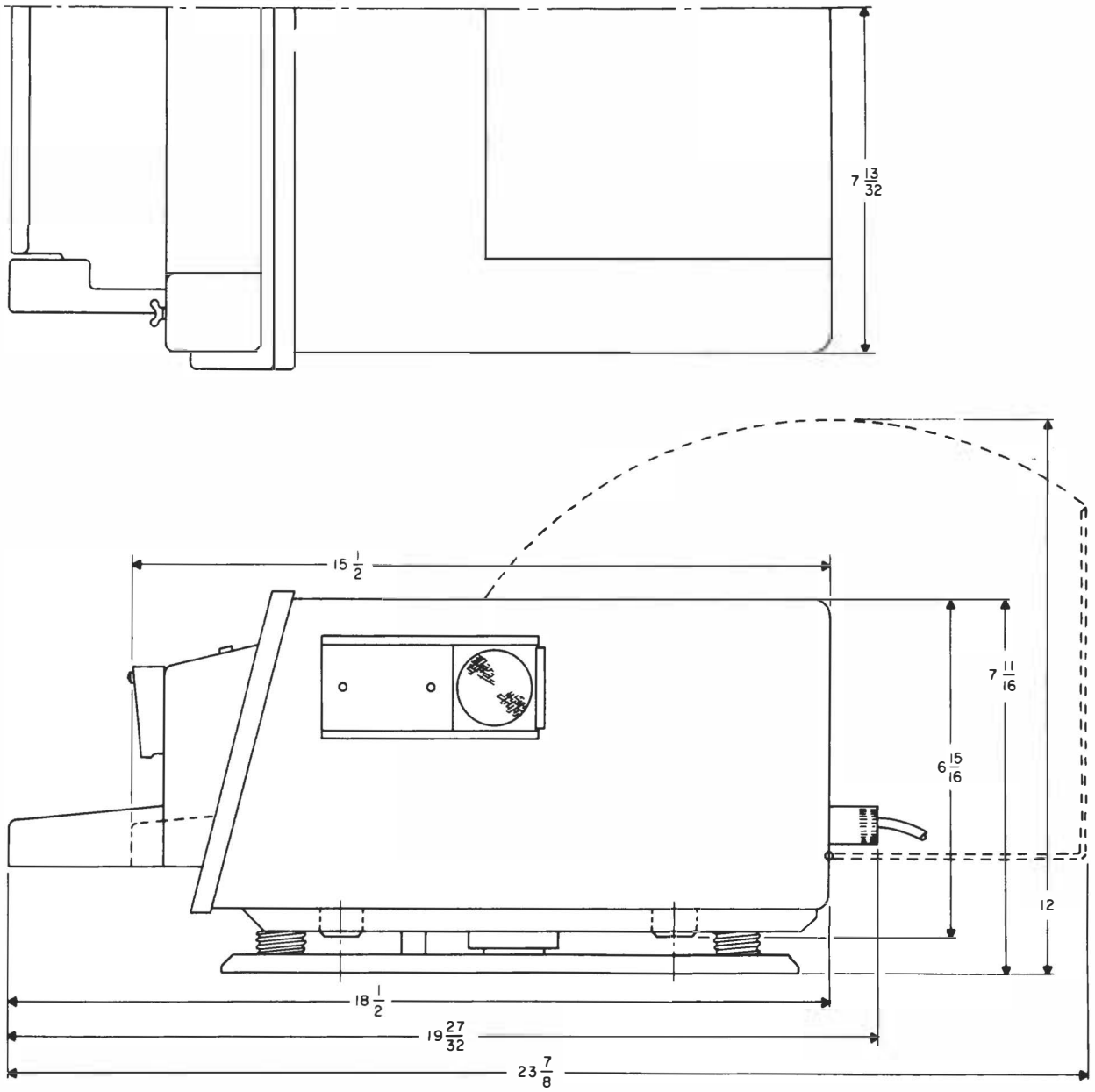


Figure 2-5. Non-Tactical Case CY-2977/UG or CY-2977A/UG, Overall Dimensions

ing paragraphs. Refer to figure 2-1 for parts location information.

a. MOTOR AND FAN OUTLET DUCT INSTALLATION. - Remove the printer from the electrical chassis by disengaging two rear lock screws and two slide locks. Remove the printer back plate (3, figure 5-79, Appendix) and install the motor and fan outlet duct assembly as instructed in paragraph 5-4g(2)(d). After the motor and fan outlet duct assembly has been installed in the printer, install the printer back plate.

NOTE

Do not install the printer in the electrical chassis prior to installing the electrical components.

b. SIGNAL LINE POWER SUPPLY INSTALLATION.

Step 1. Remove the four attaching screws from the electrical chassis.

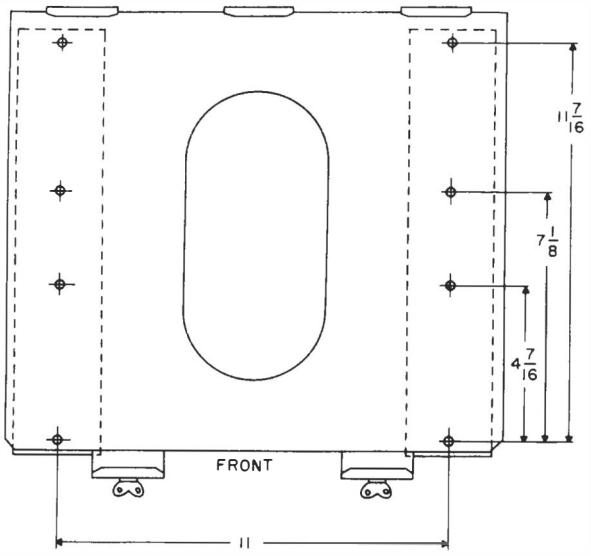


Figure 2-6. Non-Tactical Case CY-2977/UG or CY-2977A/UG, Shock Mounted Installation, Mounting Holes Location

Step 2. Position the signal line power supply plug over the receptacle on the right side of the electrical chassis and engage the plug and the receptacle.

Step 3. Secure the signal line power supply with four attaching screws.

c. LINE SENSOR INSTALLATION.

Step 1. Remove the four attaching screws from the electrical chassis.

Step 2. Align the line sensor plug with the receptable on the left side of the electrical chassis and engage the plug and the receptacle.

Step 3. Secure the line sensor with four attaching screws.

d. ALTERNATING-CURRENT HEATING ELEMENT INSTALLATION. - If installed, the printer should be removed from the electrical chassis prior to installation of the heating element.

NOTE

The alternating-current heating element may be identified by either checking the part number or by noting the color of the leads (brown and red) and measuring the resistance across the terminals (66.5 ohms ±10%).

Step 1. Place the electrical chassis on a bench upside down and insert the heating element (aluminum side toward the bottom) into the grooves provided.

Step 2. Connect the brown lead of the heating element to post E1 and the red lead to post E2 of the electrical chassis.

e. PRINTER INSTALLATION IN ELECTRICAL CHASSIS.

Step 1. Position the printer on the electrical chassis and engage the two printer slide locks and two rear lock screws.

Step 2. Connect the magnetic selector connector to the receptacle provided in the line sensor.

Step 3. Connect the motor connector to the receptable just forward of the signal line power supply.

f. FUSE INSTALLATION. - The teletypewriter sets require the fuse complements indicated in the following lists. Refer to figure 2-1 for the location of fuses.

AN/TGC-14(V)

FUSE	F1	F2	F3	F4
SIZE	5 amp	1 amp	0.5 amp	0.1 amp

AN/TGC-14A(V)

FUSE	F1	F2	F3	F4	F5
SIZE	5 amp	1 amp	0.5 amp	2.5 amp	0.1 amp

Step 1. Turn the fuse holder cap counterclockwise and remove it.

Step 2. Insert the correct fuse, as indicated in the previous lists, into the fuse holder cap.

Step 3. Install and secure the fuse holder cap and fuse by turning clockwise.

g. POWER DATA PLACARD INSTALLATION. - Upon completion of power supply kit installation, move the red power data placard, located in the printer cover nameplate (figure 1-3), to indicate the type of motor and heater which has been installed.

Step 1. Remove the front cover to allow access to the rear of the nameplate.

Step 2. Gently grasp the power data placard with a pair of tweezers or similar tool and slide the placard out of the nameplate.

Step 3. Position the placard in the opening in the nameplate so that the desired portion of the placard will be visible from the front of the cover.

h. RIBBON INSTALLATION. - If the ribbon is not already installed in the machine, it will probably be found in a cloth bag attached to the printer mechanism. A spare ribbon is contained in the tactical case cover stowage compartment. Install the ribbon in accordance with the instructions in paragraph 3-3c(3).

i. PAPER INSTALLATION. - Install the paper in accordance with the instructions in paragraph 3-3c(2).

2-8. INITIAL PERFORMANCE CHECK AND ADJUSTMENTS.

a. GENERAL.

CAUTION

DO NOT SLIDE THE KEYBOARD IN OR OUT WHILE THE MOTOR IS RUNNING OR WHEN THE MOTOR STOP SWITCH IS IN THE ENABLE POSITION. MOVEMENT OF THE KEYBOARD WHILE THE MOTOR IS RUNNING WILL CAUSE SERIOUS DAMAGE TO THE EQUIPMENT.

Move the keyboard lock bar, located on the left side of the keyboard (figure 1-3), to the right and gently pull the keyboard out until it locks in the operating position. Manually rotate the motor shaft to insure that none of the components is binding. Patch the unit

for internal battery, local loop as instructed in paragraph 2-9; adjust the signal line current for 60 milliamperes.

NOTE

For operation above 0° centigrade (32° fahrenheit), open the ventilation ports on the case; for operation below this temperature, close the ports and allow up to 40 minutes warmup before operating the equipment.

b. SERVICE CABLE CONNECTION.

Step 1. Set all switches to the OFF position.

Step 2. Inspect the service cable receptacle (figure 2-1) to insure that no foreign matter is present.

CAUTION

If any interference or binding is encountered while performing the following steps, immediately remove the connector-plug from the receptacle and determine the cause of the interference.

Step 3. Align the key of the service cable connector plug with the keyway of the service cable receptacle.

Step 4. Carefully insert the service cable connector-plug into the service cable receptacle and then turn the connector-plug a quarter turn clockwise to secure it.

Step 5. Connect the other end of the service cable to the source of primary power.

CAUTION

Always ground the service cable by using a grounded receptacle and by grounding the lug on the junction box with an earth ground.

Step 6. Before applying power, make certain that equipment is patched for internal battery and not connected into a signal line supplying battery.

c. INITIAL TURN-ON PROCEDURE. - Set the MOTOR and LAMP switches to the ON position. The copy lamps should glow and illuminate the paper. The motor should start as evidenced by a humming sound.

d. INITIAL PERFORMANCE CHECK. - Set the SEND•REC-REC switch to the SEND•REC position and perform the following checks. Refer to figure 3-1 for the location of operating controls.

Step 1. Depress each of the alphanumeric keys at least three times to determine that each of the characters is printed satisfactorily.

Step 2. Depress the LTRS key and then the A key; the letter A should print. Depress the FIGS key and then the A key; a hyphen (-) should be printed. Repeat this sequence several times.

NOTE

Check that no print or space occurs when the LTRS or FIGS keys are depressed.

Step 3. Depress any alphanumeric key and the REP key simultaneously. Maintain pressure on the REP key and release the alphanumeric key. The character for the key depressed should be repeated until the REP key is released.

Step 4. Depress the space bar and the REP key simultaneously. Release the space bar and allow the printer to operate through several lines. Automatic carriage return and line feed and end-of-line bell must function at the end of each line.

Step 5. Depress the FIGS key and then the S key. The bell must ring each time the S key is depressed.

Step 6. Depress the A key and the REP key simultaneously and then release the A key. Allow several characters to be printed and then quickly depress and release the off-line letters (▼) button; observe that a series of A's is printed. Quickly depress and release the off-line figures (▲) button and observe that a series of hyphens is printed. Repeat the previous sequence several times while maintaining constant pressure on the REP key.

NOTE

Advance is prevented as long as any of the off-line buttons are depressed. The individual function will be accomplished. This condition applies whether the printer is receiving traffic or in an idle condition. The only off-line button that will not function unless the machine is receiving traffic is the letters button. If the printer is already in the position selected by the off-line button, the printer will not shift but advance will be prevented while the button is depressed.

Step 7. Depress the off-line carriage return (↙) button and observe that carriage return takes place. Type approximately a half line of characters and then depress the off-line carriage return button; observe that carriage return takes place.

Step 8. Depress the off-line, line feed button (≡) and observe that line feed takes place.

Step 9. For the AN/TGC-14(V), depress the FIGS key and the H key. The motor should stop. Push the BREAK push button switch and observe that the motor starts. Repeat this sequence several times. For the AN/TGC-14A(V), the motor will stop when there are no mark-to-space transitions for 90 seconds (45.45 baud) or 60 seconds (75 baud). Push the BREAK push button switch and observe that the motor starts. Repeat the sequence several times.

Step 10. Patch the equipment for half-duplex mode (paragraph 2-9).

Step 11. Request one of the remote operators to send a series of test messages. Set the SEND•REC-REC switch to the REC position and check the operation of the teletypewriter set. Upon satisfactory completion of the test message, set the SEND•REC-REC switch to the SEND•REC position in preparation for normal operation.

e. ADJUSTMENTS.

(1) AN/TGC-14(V) LOCAL RANGE ADJUSTMENT. - Check that the equipment is patched for local loop, line battery supplied internally.

NOTE

Because of the variations on the signal line bias, it may be necessary to check the range calibration setting several times during the course of operation.

The local range adjustment is performed using the keyboard installed on the teletypewriter set being tested. Rotation of the range dial is deliberately difficult and may be accomplished by using a coin or similar object.

CAUTION

Do not use a screwdriver for this purpose as unintended force may result in stripping gears.

Step 1. Loosen the range dial lock screw (figure 2-7).

Step 2. While an assistant types any test message, turn the range dial clockwise to the point where the characters start to distort.

Step 3. Record this number.

Step 4. Continue to type the test message and turn the range dial counterclockwise past the point of optimum operation until the message is again distorted.

Step 5. Record this number.

Step 6. Calculate the point of optimum operation using the following example:

$\frac{\text{High} + \text{Low}}{2}$ = Point of Optimum Operation

Example: $\frac{100 + 20}{2}$ = 60 (Optimum Setting)

Step 7. Calculate points of range as follows:

High - Low = Points of Range

Example: 100 - 20 = 80 (Points of Range)

NOTE

The minimum desired points of range on a local loop is 70 points at 60 words per minute.

Step 8. Turn the range dial so that the pointer is directly over the number established as the point of optimum operation. If the uncalibrated portion of the range dial falls under the pointer, relocate the start clutch gear in relation to the timing camshaft gear by one tooth advanced or retarded.

CAUTION

Tighten the range dial lock screw securely to insure that the adjustment will not vary during operation.

NOTE

Refer to timing mark alignment adjustment (paragraph 5-4e(2)(c), if the median range cannot be centered in the calibrated portion of the range dial.

(2) AN/TGC-14A(V) LOCAL RANGE ADJUSTMENT. - Refer to figures 2-7 and 2-8 and proceed as follows:

Step 1. Check that the equipment is patched for local loop, line battery supplied internally.

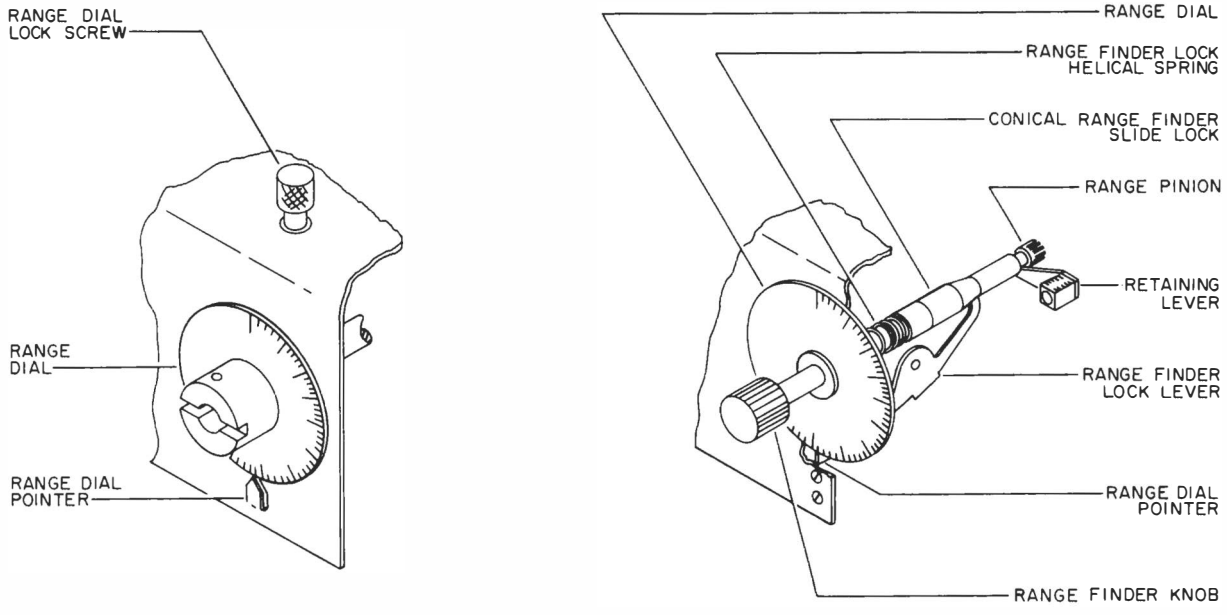
Step 2. While typing a test message, unlock the range dial by pulling out the range finder knob; turn the knob clockwise to the point where the characters start to distort.

Step 3. Record the number indicated on the range dial.

Step 4. Continue to type the test message and turn the knob counterclockwise past the point of optimum operation until the message is again distorted.

Step 5. Record the number indicated on the range dial.

Step 6. Calculate the point of optimum operation using the following example:



AN/TGC-14(V) AN/TGC-14A(V)

Figure 2-7. Range Dial Adjustment, Parts Location

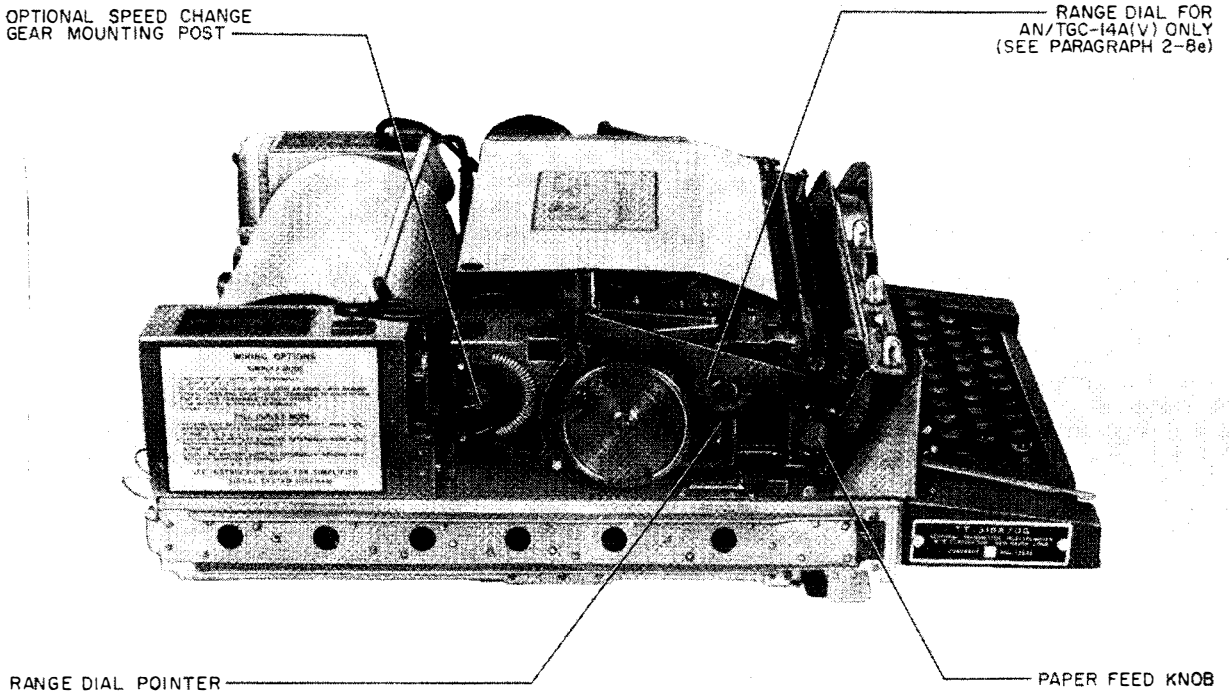


Figure 2-8. Printer and Electrical Chassis, Left-Side View

$\frac{\text{High} + \text{Low}}{2}$ = Point of Optimum Operation

Example: $\frac{100 + 20}{2}$ = 60 (Optimum Setting)

Step 7. Calculate points of range as follows:
High - Low = Points of Range
Example: 100 - 20 = 80 (Points of Range)

Step 8. Turn the knob so that the pointer is directly over the number established as the point of optimum operation.

Step 9. Push the knob in against the printer to ascertain that the mechanism is adequately locked.

If the uncalibrated portion of the range dial falls under the pointer, proceed as follows:

Step 1. Unlock the range dial by pulling the knob out as far as possible and turn the knob to its clockwise limit. Push the knob in toward the printer, locking it in this position.

Step 2. Unlock the retaining lever and pull the complete assembly out until the range pinion is no longer engaged with the range adjustment gear segment.

Step 3. Rotate the knob until the pointer is centered in the uncalibrated portion of the scale.

Step 4. Push the knob toward the printer, rotating slightly back and forth, until the gears mesh and the retaining lever locks the range dial.

Step 5. Unlock the range dial by pulling the knob out; set the dial at 60.

Step 6. Push the knob all the way in to lock the dial.

Step 7. Repeat the range calibration procedure of the first part of this paragraph.

(3) LINE SENSOR RANGE ADJUSTMENT. - When shipped, the line sensor will be set in the high position to operate in the 20 milliampere to 80 milliampere range. If, however, the signal line current is in the range of 1 to 5 milliamperes, remove the printer and electrical chassis from the case (paragraph 2-14) and proceed as follows:

Step 1. Remove the four screws that secure the line sensor to the electrical chassis.

Step 2. Remove the line sensor from the electrical chassis.

Step 3. Remove the three screws that secure the cover to the line sensor frame.

Step 4. Remove the screw in post E3 (figure 2-9) and loosen the screw in post E2.

Step 5. Swing the high-low range strip so that it bridges posts E2 and E1.

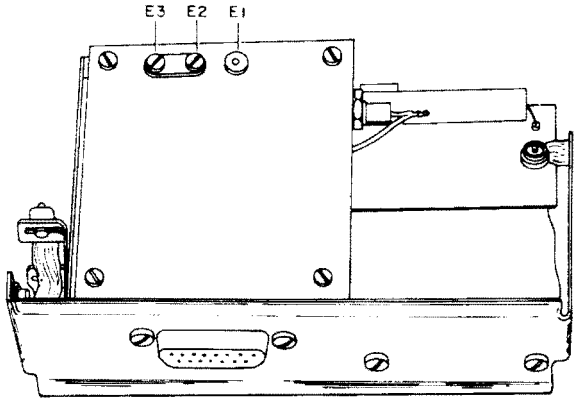


Figure 2-9. Line Sensor Range Adjustment, Parts Location

Step 6. Insert the screw removed from post E3 into post E1 and tighten.

Step 7. Tighten the screw in post E2.

Step 8. Install the cover and secure with three attaching screws.

Step 9. Install the line sensor on the electrical chassis and secure it with four attaching screws.

(4) SIGNAL LINE CURRENT ADJUSTMENT. - To check and adjust the signal line current, proceed as follows:

CAUTION

When using internal signal line power supply for low current (1-5 milliamperes) operation, an external 50,000-ohm variable resistor must be placed in series with the REC (red) binding posts on the junction box. Note that the red and black posts do not designate polarity.

NOTE

When operating in the half-duplex mode, signal line current can be adjusted with line battery supplied internally or externally. When operating in the full-duplex mode, signal line current can be adjusted on the receive line only, as the line adjust potentiometer (R2) is electrically connected in the receive portion of the equipment. Lift off one lead from a red post and insert the multimeter in series with the lead and (red) post and adjust R2 for proper line current value.

Step 1. Remove the jumper wires from the SEND binding posts on the service cable junction box if patched for local loop.

Step 2. Connect the negative lead of Multimeter AN/PSM-4, or equivalent, (set to read approximately 500 direct-current milliamperes) to one of the SEND (black) posts.

Step 3. Momentarily touch the positive lead of the multimeter to the remaining SEND post. If the meter reads in a negative direction, reverse the multimeter leads. If the meter reads in a positive direction, check for a reading of 60 milliamperes. If the reading is below or above 60 milliamperes, continue with step 4.

Step 4. Loosen the lock nut on LINE ADJUST control R2 (figure 2-1).

Step 5. Turn the control clockwise until a reading of approximately 60 milliamperes is obtained.

Step 6. Tighten the locknut on LINE ADJUST control R2.

2-9. PATCHING OPTIONS.

The patching options described in this paragraph are referred to as Modes 1 through 5 and are applicable to land line connections when converters are not in use. Refer to paragraph 2-9c for information on converter connections. These mode numbers are the same as those identified on the placard on the side of the line sensor. Jacks J2 and J5 are colored red for identification; the other patching jacks are white.

CAUTION

Always connect the signal line to the SEND (black) posts of the teletypewriter set supplying the signal line power.

When two or more teletypewriter sets are supplying signal line power, the signal line power supplies must be connected in series. The signal line power supplies are non-polar sensitive in the receive-only condition.

a. HALF-DUPLEX MODE OPERATION (SIMPLEX). - Half-duplex mode operation refers to communication on a circuit in only one direction at a time, with a break feature which enables the receiving station to interrupt the sending station.

CAUTION

Never patch option patching jack J2 to jack J5. This combination will seriously damage the equipment by placing a short circuit across the signal line power supply.

(1) LINE BATTERY SUPPLIED INTERNALLY (MODE 1). - Operation in Mode 1 means that the local teletypewriter set will supply its own signal line power as well as power to other teletypewriter sets in the circuit. (See figures 2-10 and 2-15.) Patch jacks J2 to J3, J4 to J5, and J6 to J7 to obtain Mode 1 operation.

NOTE

Although figures 2-10 and 2-15 show one teletypewriter set supplying signal line power, it is possible in multiple teletypewriter circuits for more than one teletypewriter set to supply signal line power by connecting the signal line power supplies in series. When sets are connected in series, observe polarity carefully.

(2) LOCAL LOOP. - Local loop operation is established as described for Mode 1, except that the service cable junction box binding posts must be shorted, red-to-red and black-to-black.

(3) LINE BATTERY SUPPLIED EXTERNALLY (MODE 2). - Operation in Mode 2 means that signal line power will be supplied by some external source, either by another teletypewriter set or by an external power supply. (See figures 2-11 and 2-16.) Patch jacks J1 to J2, J3 to J4, and J6 to J7 to obtain Mode 2 operation.

b. FULL-DUPLEX MODE OPERATION. - Full-duplex (or duplex) operation refers to communication between two points in both directions simultaneously. This mode of operation does not normally allow the local station to keep a "home" copy of sent messages.

(1) RECEIVE LINE BATTERY SUPPLIED INTERNALLY, SEND LINE BATTERY SUPPLIED EXTERNALLY (MODE 3). - Operation in Mode 3 means that the local teletypewriter set is supplying power to the remote keyboard and the local printer, and the remote teletypewriter set is supplying signal line power to the remote printer and the local keyboard. (See figures 2-12 and 2-17.) Patch jacks J2 to J3, J5 to J6, and J4 to J7 to obtain Mode 3 operation.

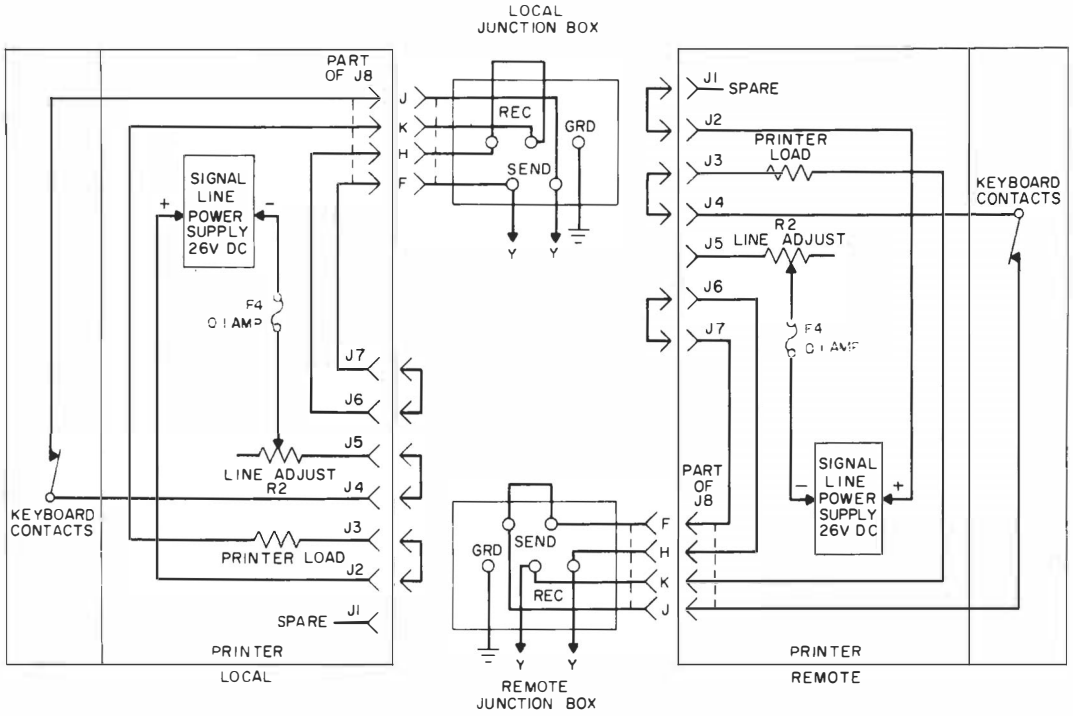


Figure 2-10. Patching Mode 1, (Internal Line Battery) AN/TGC-14(V)

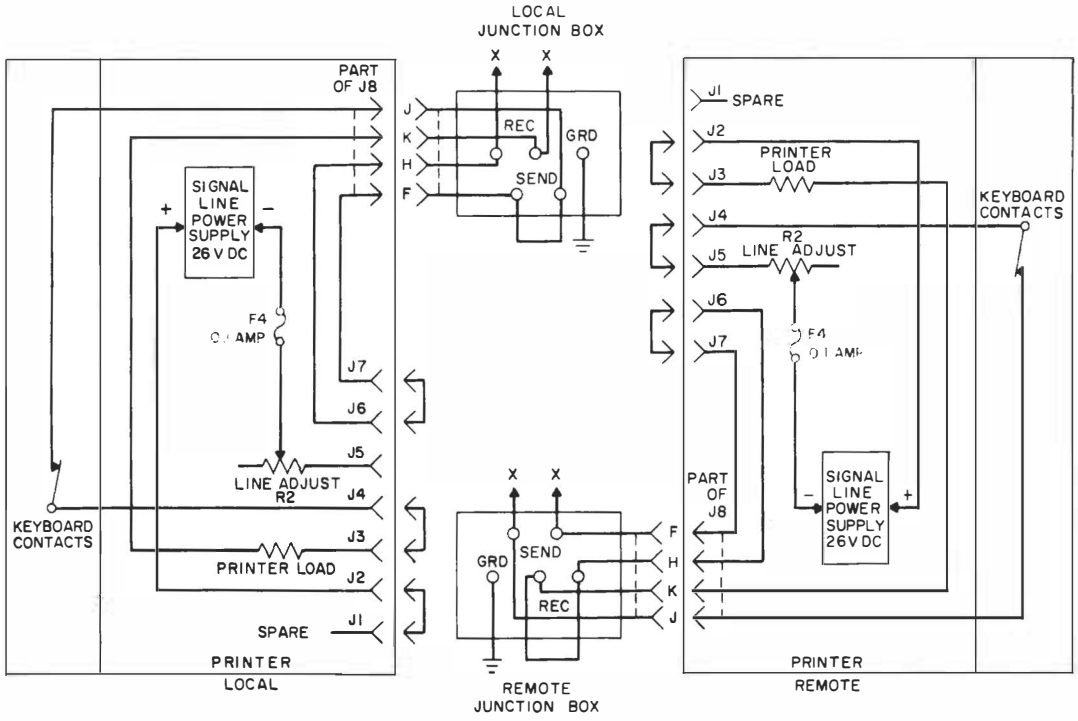


Figure 2-11. Patching Mode 2, (External Line Battery) AN/TGC-14(V)

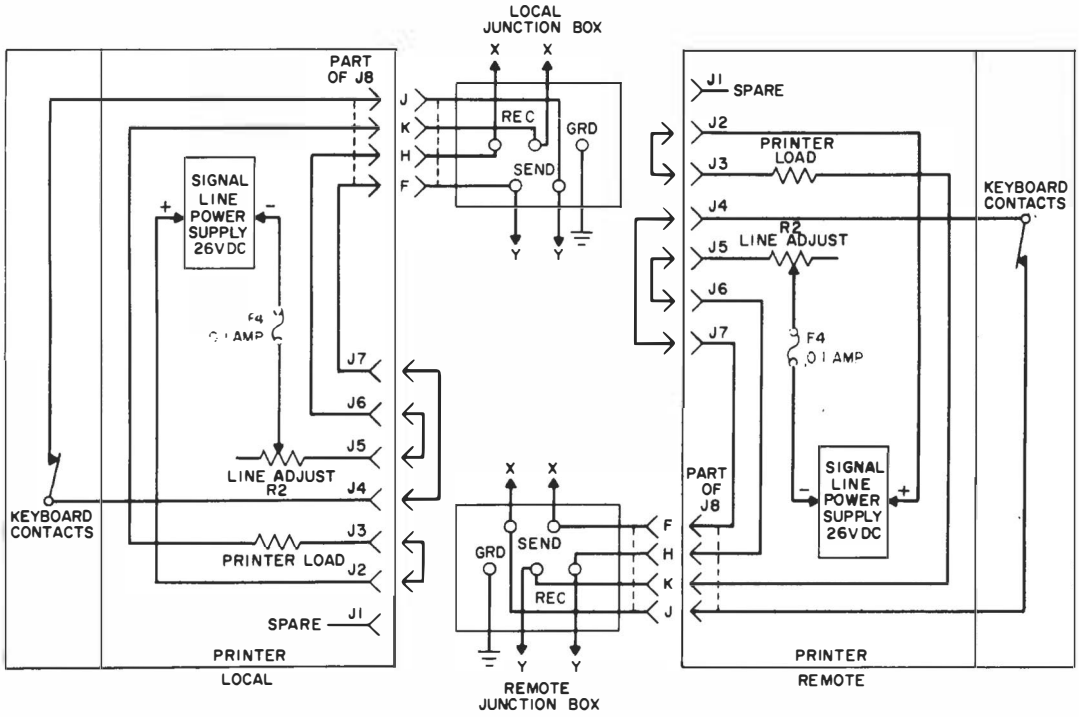


Figure 2-12. Patching Mode 3, (External Battery in Send Line; Internal Battery in Receive Line) AN/TGC-14(V)

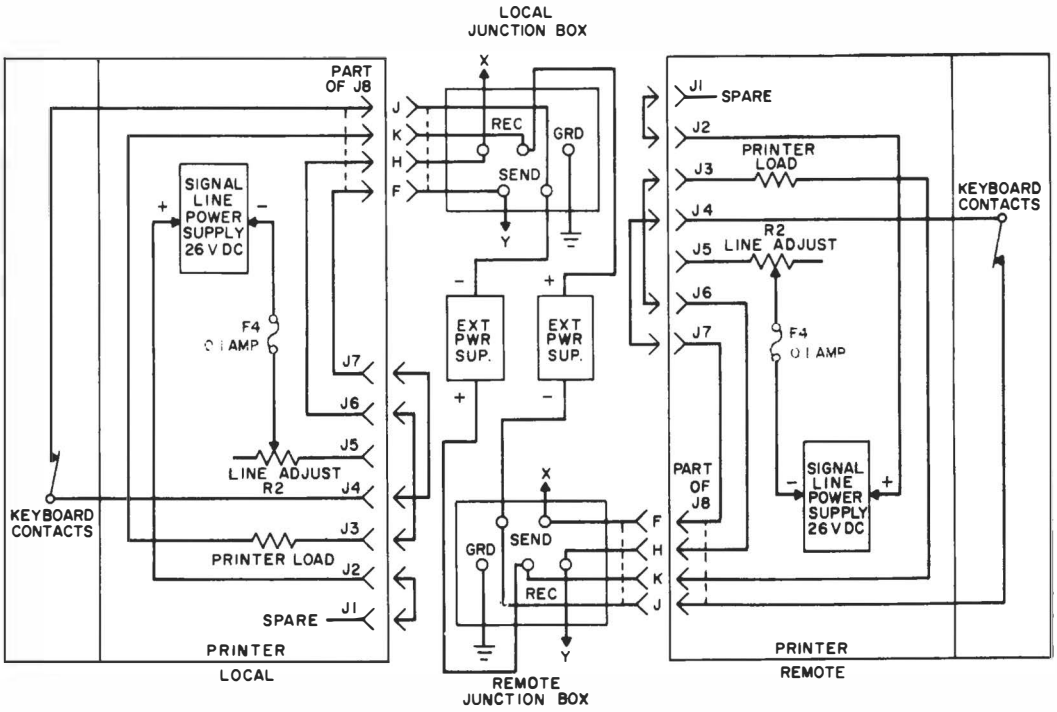


Figure 2-13. Patching Mode 4, (External Battery in Both Send and Receive Lines) AN/TGC-14(V)

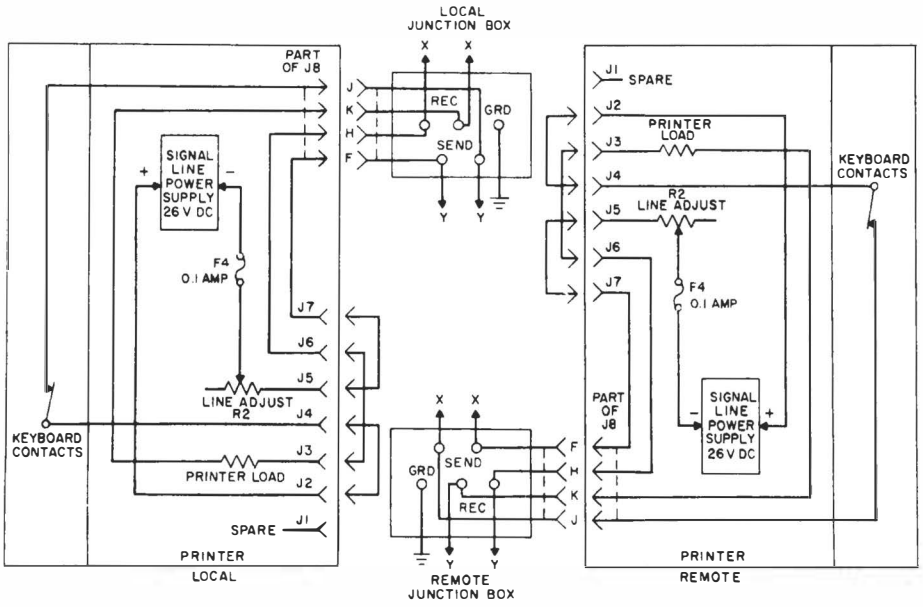


Figure 2-14. Patching Mode 5, Simplified Wiring Diagram
AN/TGC-14(V)

(2) RECEIVE LINE BATTERY SUPPLIED EXTERNALLY, SEND LINE BATTERY SUPPLIED EXTERNALLY (MODE 4). - Operation in Mode 4 (see figures 2-13 and 2-18) means that all signal line power is supplied by an external power supply or by a remote teletypewriter set. Patch jacks J1 to J2, J3 to J6, and J4 to J7 to obtain Mode 4 operation.

(3) SEND LINE BATTERY SUPPLIED INTERNALLY, RECEIVE LINE BATTERY SUPPLIED EXTERNALLY (MODE 5). - Operation in Mode 5 means that the local teletypewriter set is supplying power to the local keyboard and the remote printer, and that the remote teletypewriter set is supplying power to the remote keyboard and the local printer. (See figures 2-14 and 2-19.) Patch jacks J3 to J6, J2 to J4, and J5 to J7 to obtain Mode 5 operation.

1. AN/TGC-14A(V) Chassis
   a. Patch 2 to 3, 4 to 5 and 6 to 7 (Patching jacks on rear of chassis)
2. Service Cable Connections:
   a. Patch receive (red) posts.
   b. Connect external line to the send (black) posts.
   c. For local operation jump the send (black) posts, as shown by the dotted lines.
3. Line sensor load is either the R1(100 ohm) for 20-80 ma operation, or R2 (5.6k) for 5-10 ma operation, located in line sensor.
4. Check line current and adjust R2 (line current adj) for proper line current value.

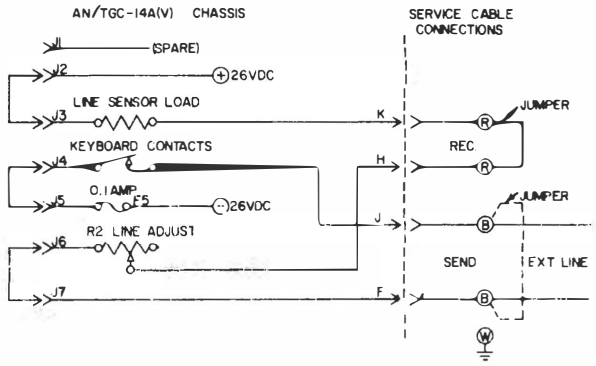


Figure 2-15. Patching Mode 1, Half Duplex (Internal Line Battery)
AN/TGC-14A(V)

1. AN/TGC-14A(V) Chassis:
   a. Patch 1 to 2, 3 to 4 and 6 to 7 (Patching jacks on rear of chassis).
2. Service Cable Connections:
   a. Patch send (black) posts.
   b. Connect external line to the receive (red) posts.
3. Line sensor load is either the R1 (100 ohm) for 20-80 ma operation, or R2 (5.6k) for 5-10 ma operation, located in the line sensor.
4. Check line current and adjust R2 (line adjust pot) for proper line current value.

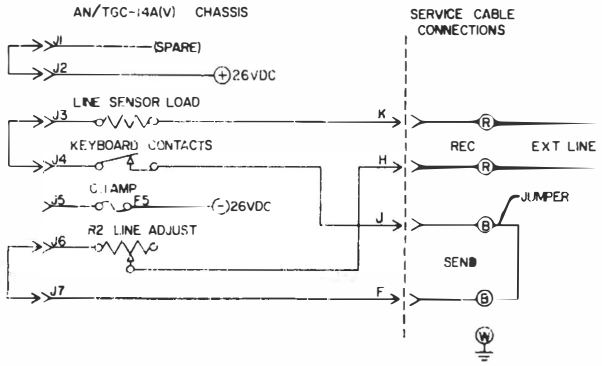


Figure 2-16. Patching Mode 2, Half Duplex (External Line Battery) AN/TGC-14A(V)

1. AN/TGC-14A(V) Chassis:
   a. Patch 2 to 3, 4 to 7, and 5 to 6 (patching jacks on rear of chassis)
2. Service Cable Connections:
   a. Connect remote stations send line to receive (red) posts.
   b. Connect remote stations receive line to send (black)posts.
3. Line sensor load is either the R1 (100 ohm) for 20-80 ma operation, or R2 (5.6k) for 5-10 ma operation, located in the line sensor.
4. Check the line current in the receive line and adjust R2, line adjust pot, for proper line current value. Send line current is controlled externally.

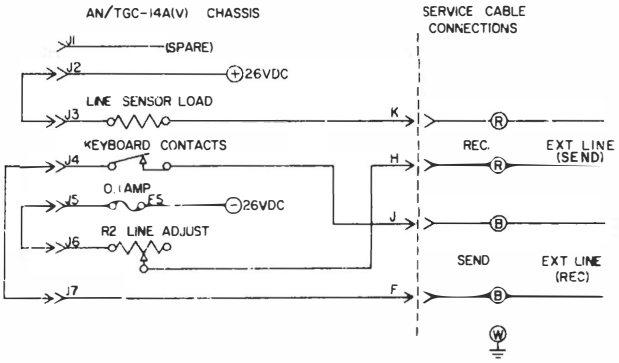


Figure 2-17. Patching Mode 3, Full Duplex (External Battery in Send Line) (Internal Battery in Receive Line) AN/TGC-14A(V)

1. AN/TGC-14A(V) Chassis:
   a. Patch 1 to 2, 3 to 6 and 4 to 7 (Patching jacks on rear of chassis)
2. Service Cable Connections:
   a. Connect remote stations send line to receive (red) posts.
   b. Connect remote stations receive line to send (black) posts.
3. Line sensor load is resistor R1 (100 ohm) for 20-80 ma operation, or R2 (5.6k) for 5-10 ma operation, located in the line sensor.
4. Check line current in the receive line and adjust R2, (line current adjust pot) for proper line current value. The send line current is controlled externally.
5. This mode will always be used with converter TH-5 and similar converters supplying line current.

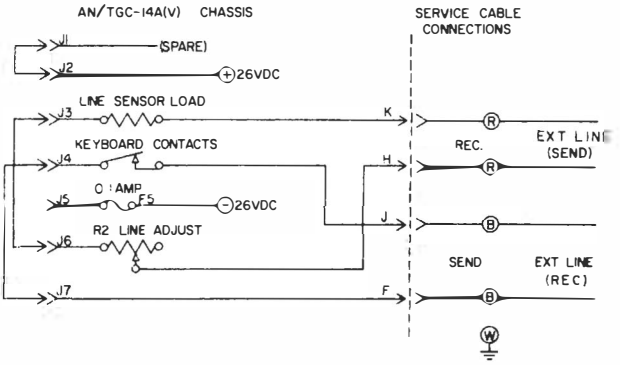


Figure 2-18. Patching Mode 4, Full Duplex (External Battery in Both Send and Receive Lines) AN/TGC 14A(V)

1. AN/TGC-14A(V) Chassis:
   a. Patch 2 to 4, 3 to 6 and 5 to 7 (Patching jacks on rear of chassis).
2. Service Cable Connector:
   a. Connect remote stations send line to receive (red) posts.
   b. Connect remote stations receive line to send (black) post.
3. Line sensor load is resistor R1 (100 ohm) for ma operation, or R2 (5.6k) for 5-10 ma operation, located in the line sensor.
4. Check line current in the receive line and adjust R2 (line current adjust pot) for proper line current value. The send line current is controlled externally.

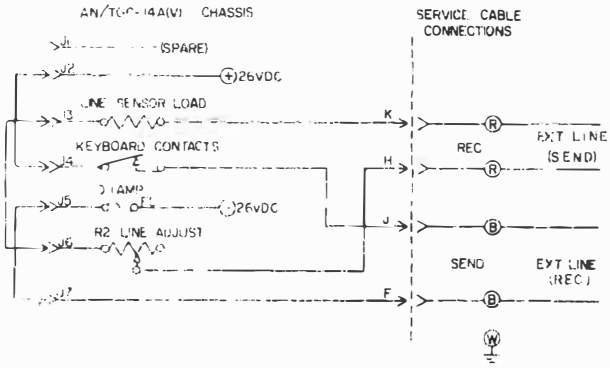


Figure 2-19. Patching Mode 5, Full Duplex (External Battery in the Receive Line) (Internal Battery in the Send Line) AN/TGC-14A(V)

c. EXTERNAL LINE PATCHING OF CONVERTERS. - The AN/TGC-14(V) and AN/TGC-14A(V) equipments may be patched to converters using either two or four wire simplex or duplex connections. Determine the circuitry of the converters before making any connections. Figure 2-20 shows the connections to a typical converter circuit using Converter TH-5/TG, which supplies the line current, connected for full-duplex operation (Mode 4).

d. PATCHING TELETYPEWRITER SET WITH REMOTE RADIO TRANSMITTER. When the teletypewriter set is to be used in conjunction with a remote radio transmitter, connect the transmitter keying relay leads to the XMTR posts on the service cable junction box.

NOTE

It is important that all of the components for any communications link have common ground. This is especially important in aircraft installations.

2-10. SPEED CHANGE GEAR REPLACEMENT.

The teletypewriter sets are supplied with a choice of three speed change gears. Establish the operating speed and install the correct color-coded gear. For the AN/TGC-14(V), the 60 words per minute gear is coded blue, the 75 words per minute gear is coded green, and the 100 words per minute gear is coded white.

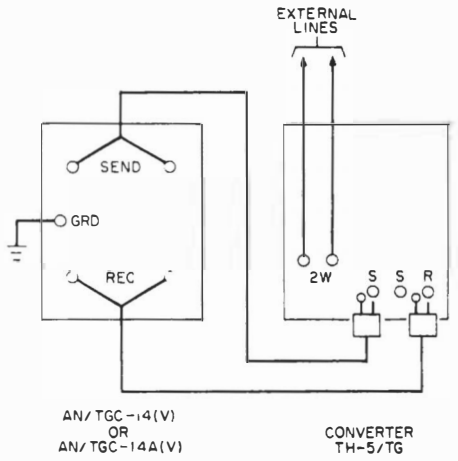


Figure 2-20. External Line Patching, Typical Connection Circuit

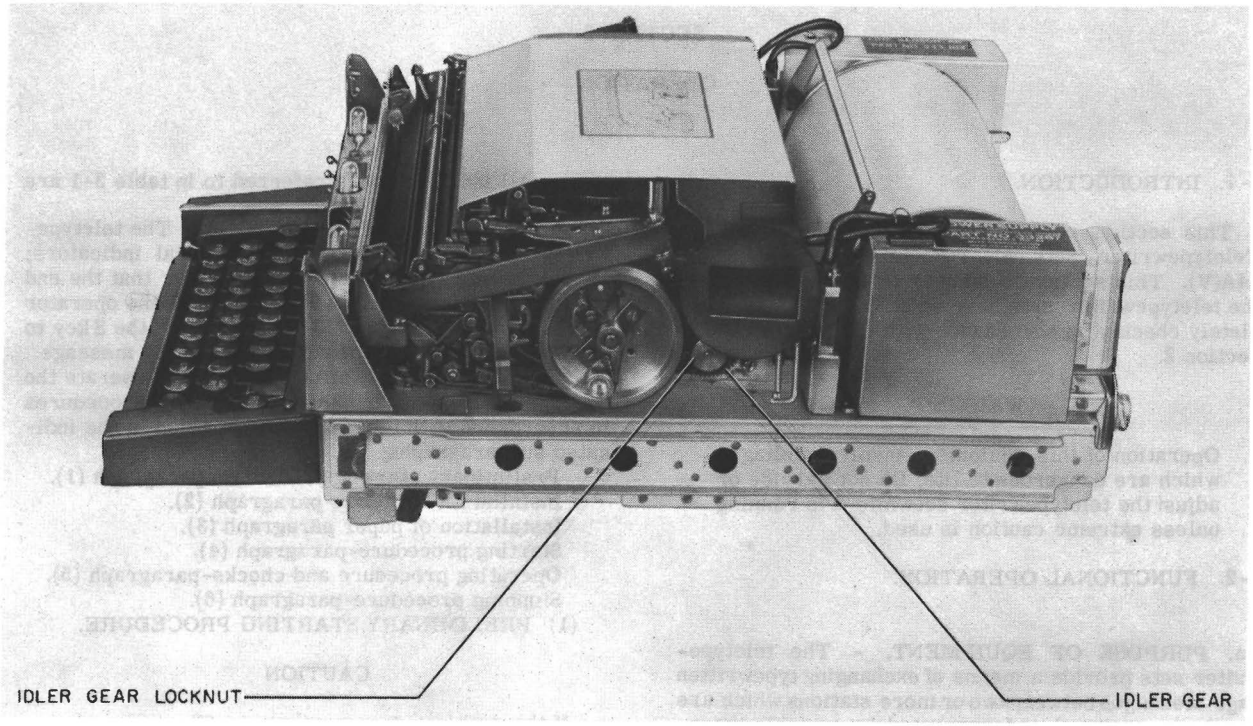


Figure 2-21. Printer and Electrical Chassis, Right-Side View

For the AN/TGC-14A(V), the 45.45 baud gear is coded orange, the 50 baud gear is coded brown, and the 75 baud gear is coded black. Refer to figure 2-8 for the location of the optional speed change gears. To replace a speed change gear, turn off the equipment and proceed as follows:

Step 1. Loosen the idler gear locknut (figure 2-21) and allow the idler gear and locknut to swing away from the speed change gear.

Step 2. Loosen and remove the speed change gear lock knob.

Step 3. Remove the speed change gear.

Step 4. Select the desired replacement speed change gear and install it so that its slot engages the pin on the post.

Step 5. Insure that the speed change gear is properly seated and install the speed change gear lock knob on the shaft.

Step 6. Swing the idler gear upwards against the speed change gear and mesh the two gears, taking care not to exert excessive pressure. Allow minimum backlash (distance between the gears).

Step 7. Tighten the idler gear locknut while holding the speed change gear and idler gear in mesh with the other hand. Adjust the backlash to approximately 0.002 inches.

Step 8. Run the motor; if excessive gear noise indicates too much or too little backlash, stop the motor and readjust the backlash. Repeat this procedure for minimum gear noise.

2-11. FINAL PREPARATION FOR USE.

Upon completion of the adjustments and tests necessary to ascertain that the teletypewriter set is functioning properly, re-install it into the case as follows:

Step 1. Set all switches to the OFF position.

Step 2. Disconnect the service cable from the primary power source; then remove the connector-plug from the electrical chassis by carefully turning the connector-plug a quarter turn counterclockwise and pulling the connector-plug out.

Step 3. Align the electrical chassis groove with the slides in the case and insert the assembly into the case.

NOTE

The half-circle locks on each side of the electrical chassis have now come in contact with the half-circle locks in the case. These matching half circles are locked together by the fork located in the front cover.

Step 4. Secure the electrical chassis in the case by engaging the locking fork in the front cover. Press the bottom of the front cover down and then push the top in toward the case.

Step 5. Secure the front cover by engaging the two quick-disconnect fastener studs with a quarter turn clockwise.

Step 6. Connect the service cable as instructed in paragraph 2-8b.

SECTION 3

OPERATION

3-1. INTRODUCTION.

This section contains operating instructions for Teletypewriter Sets AN/TGC-14(V) and AN/TGC-14A(V). This section is written on the premise that the teletypewriter sets have been installed and completely checked in accordance with the instructions in Section 2.

WARNING

Operation of this equipment involves voltages which are dangerous to life. Do not service or adjust the teletypewriter set while it is running unless extreme caution is used.

3-2. FUNCTIONAL OPERATION.

a. PURPOSE OF EQUIPMENT. - The teletypewriter sets provide a means of exchanging typewritten page messages between two or more stations which are similarly equipped and connected by suitable transmission media.

b. CAPABILITIES AND LIMITATIONS.

(1) PRIMARY POWER SOURCE OPTIONS. - The teletypewriter sets are adaptable for use with 115 volts alternating current, 60 cycles per second or 400 cycles per second primary power by a change in the motors.

(2) OPERATING SPEED OPTIONS.-The AN/TGC-14(V) may be adapted to operate at speeds of 60, 75, and 100 words per minute by changing speed change gears normally provided with the equipment. The AN/TGC-14A(V) will operate at 45.45 baud, 50 baud, or 75 baud. However, gears for other operating speeds may be obtained from the manufacturer. Instructions for changing the gears are contained in paragraph 2-10.

(3) OPERATING MODE OPTIONS. - The teletypewriter sets can be patched for half-duplex (simplex) or full-duplex operation by changing patch cord arrangements. Refer to paragraph 2-9 for complete patching instructions.

c. BASIC PRINCIPLES OF OPERATION. - The teletypewriter sets provide a means of transmitting and receiving printed intelligence by means of exchanging series of coded pulses with similar equipment. The local teletypewriter set generates a standard five-level, 7.0 or 7.42-unit, Baudot serial teletypewriter code which is sent over a transmission medium to a remote teletypewriter set. At the remote station, the teletypewriter set receives, decodes, and prints the transmitted intelligence or performs appropriate functions.

3-3. OPERATING PROCEDURES.

a. DESCRIPTION OF CONTROLS. - Refer to table 3-1 for a listing of all operator's controls and functions. All index numbers referred to in table 3-1 are shown in figure 3-1.

b. DESCRIPTION OF INDICATORS. - The teletypewriter sets are equipped with two aural indicators; an end-of-line bell to alert the operator that the end of the line is near, and a signal bell that the operator may use by striking the FIGS key and then the S key to alert the remote operator to a forthcoming message.

c. SEQUENCE OF OPERATION. - To operate the teletypewriter set, perform the following procedures in accordance with the instructions given in the indicated subparagraphs:

Preliminary starting procedure-paragraph (1).
Installation of ribbon-paragraph (2).
Installation of paper paragraph (3).
Starting procedure-paragraph (4).
Operating procedure and checks-paragraph (5).
Stopping procedure-paragraph (6).

(1) PRELIMINARY STARTING PROCEDURE.

CAUTION

If the ambient temperature is 0° centigrade (+32° fahrenheit), or above, open the ventilation ports on the teletypewriter case prior to commencing operation. If the temperature is below 0° centigrade (+32° fahrenheit), close the ventilation ports. As much as 40 minutes warmup time may be required in temperatures below 0° centigrade (+32° fahrenheit). Power is supplied to the heater thermostat as soon as the service cable is connected, regardless of the position of the MOTOR switch.

Step 1. Make certain that the service cable is connected between the source of primary power and the receptacle on the teletypewriter set.

Step 2. Check the ribbon; if it is damaged or dried out, replace it as instructed in paragraph 3-3c(2).

Step 3. Check the copy paper; if supply is low as indicated by a red or purple line, install a new roll of paper as instructed in paragraph 3-3c(3).

Step 4. Set the LINE FEED control arm (located beneath the LIFT panel) for either single or double spacing of lines.

(2) INSTALLATION OF RIBBON.

NOTE

If standard Underwood-type teletypewriter ribbons are not available, any 1/2-inch typewriter ribbon is usable, provided that an Underwood-type spool is used. If the ribbon does not have eyelets, knot the ribbon a few inches from each end.

Step 1. Remove the front cover by disengaging the fastener studs with a counterclockwise turn, pulling the top of the cover forward, and then lifting the cover up and away from the teletypewriter set.

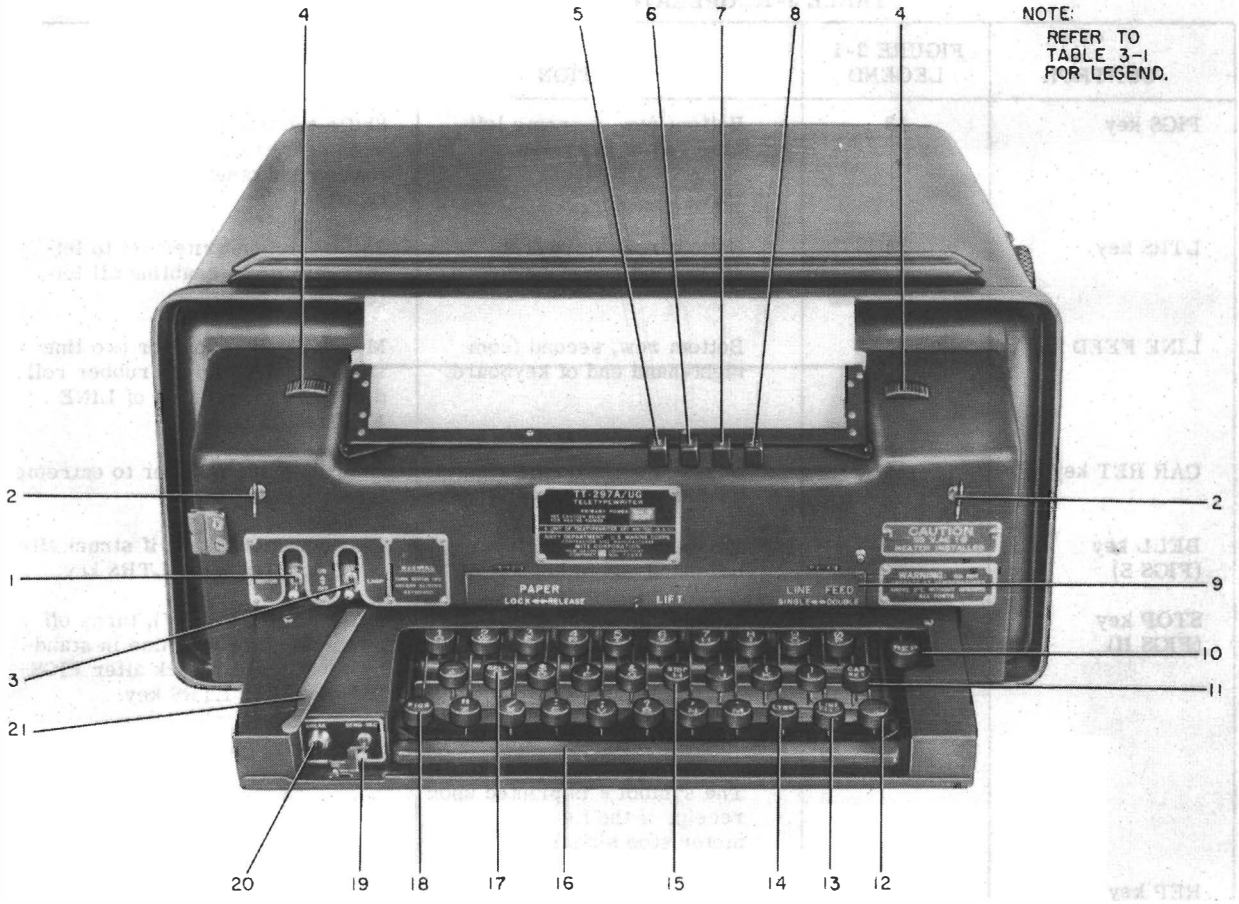


Figure 3-1. Operator's Controls

TABLE 3-1. OPERATOR'S CONTROLS

CONTROL	FIGURE 3-1 LEGEND	LOCATION	FUNCTION
MOTOR switch	1	Left side of printer, above keyboard.	ON position turns on all primary power, except heater. OFF position turns off all primary power, except heater.
LAMP switch	3	Left side of printer, above keyboard.	ON position lights the copy lamp. OFF position extinguishes the copy lamp.
SEND•REC-REC switch	19	Left side of keyboard cover.	REC position allows only reception, but not transmission; SEND•REC position allows both keyboard transmission, printer reception, and keying of a remote radio transmitter.
BREAK push button switch	20	Left side of keyboard cover.	Opens signal line; used to start motors when turned off by STOP key or time delay mechanism (AN/TGC-14A (V)).

TABLE 3-1. OPERATOR'S CONTROLS (Cont)

CONTROL	FIGURE 3-1 LEGEND	LOCATION	FUNCTION
FIGS key	18	Bottom row, extreme left-hand end of keyboard.	Shifts teletypewriter set to figures condition, enabling punctuation and other symbols to be typed.
LTRS key	14	Bottom row, third from right-hand end of keyboard.	Shifts teletypewriter set to letters condition, enabling all letters to be typed.
LINE FEED key	13	Bottom row, second from right-hand end of keyboard.	Moves paper up one or two line spaces on paper feed rubber roll depending on position of LINE FEED shift arm.
CAR RET key	11	Middle row, extreme right-hand end of keyboard.	Returns print cylinder to extreme left margin of paper.
BELL key (FIGS S)	17	Middle row, second from left-hand end of keyboard.	Rings the signal bell, if struck after FIGS key, not after LTRS key.
STOP key (FIGS H)	15	Middle row, fifth from right-hand end of keyboard. NOTE The symbol # is printed upon receipt of the figures H motor stop signal.	In the AN/TGC-14(V), turns off motor to place machine in standby condition if struck after FIGS key, not after LTRS key.
REP key	10	Top row, extreme right-hand end of keyboard.	Repeats the last character or function sent from the machine, for as long as the key is depressed.
Fastener studs	2	Both sides of front cover.	Locks front cover in place and secures teletypewriter in case.
Alphanumeric keys		Keyboard.	Causes the printing of the letter, or symbol, as shown on the key top.
Blank key	12	Bottom row, extreme right-hand end of keyboard.	Transmits blank code group.
Space bar	16	Bottom of keyboard.	Causes print cylinder to move to the right without printing.
Off-line carriage return button (⟨)	8	Top right side of front cover.	Returns local teletypewriter set print cylinder to extreme left margin of paper.
Off-line letters button (↓)	7	Top right side of front cover.	Moves print cylinder of local teletypewriter set to letters position (will not operate unless an incoming signal or signals are being received).
Off-line figures button (↑)	6	Top right side of front cover.	Moves print cylinder of local teletypewriter set to figures position.

TABLE 3-1. OPERATOR'S CONTROLS (Cont.)

CONTROL	FIGURE 3-1 LEGEND	LOCATION	FUNCTION
Off-line line feed button (☰)	5	Top right side of front cover.	Feeds copy paper on local machine.
Paper feed knob		Under front cover.	Rolls the paper through the paper feed rubber roll to facilitate paper installation.
LINE FEED shift arm	9	Under LIFT panel.	In the left position, causes the proper feed rubber roll to move one space; in the right position, causes the paper feed rubber roll to move two spaces.
PAPER lock pressure release lever	9	Under LIFT panel.	Releases pressure on copy paper when moved to the right; grips paper firmly when moved to the left.
Keyboard lock bar	21	Left side of keyboard.	Unlocks keyboard to allow movement to either operate or stowage position.
Copy window release	4	Levers are located at top right and top left of front cover.	Unlocks copy window.
Time delay MOTOR STOP switch		Under front cover (AN/TGC-14A(V) only).	Enables or disables time delay motor stop feature.

Step 2. Remove the service cable from the teletypewriter set by turning the connector-plug counterclockwise and pulling straight out.

Step 3. Carefully slide the printer and electrical chassis out of the case and place the printer and electrical chassis on a clean work surface.

Step 4. Remove the paper, if installed, and then lift the paper guide off the ribbon feed mechanism.

NOTE

If the printer is equipped with the quick removal ribbon feed assembly (identified by lock clips 20, figure 3-2), the entire assembly may be removed by moving the clips to the right and carefully removing the plate and ribbon together. Do not remove the ribbon feed assembly to replace the ribbon.

Step 5. Remove the old ribbon, if installed; retain the old spool.

Step 6. Place the new ribbon and spool (17, figure 3-2) on post (18), insuring that pin (19) engages the slot in the spool.

Step 7. Thread the ribbon in front of left hand tension control brake arm (16), behind ribbon roller (15), and through the fork of left hand ribbon reversing sensing arm (14).

Step 8. Thread the ribbon around ribbon roller (13), around and outside ribbon guide roller (12), and then through left hand ribbon vibrator guide (11), by first passing the ribbon down through the slit and then bringing it up behind the tab that points down.

Step 9. Pass the ribbon across the front of the printer, engaging right hand ribbon vibrator guide (10), around the front of ribbon guide roller (9), and around and behind ribbon roller (8).

Step 10. Engage the end of the ribbon with ribbon spool (1) and wind the new ribbon onto the spool until reversing eyelet (5) is on the spool.

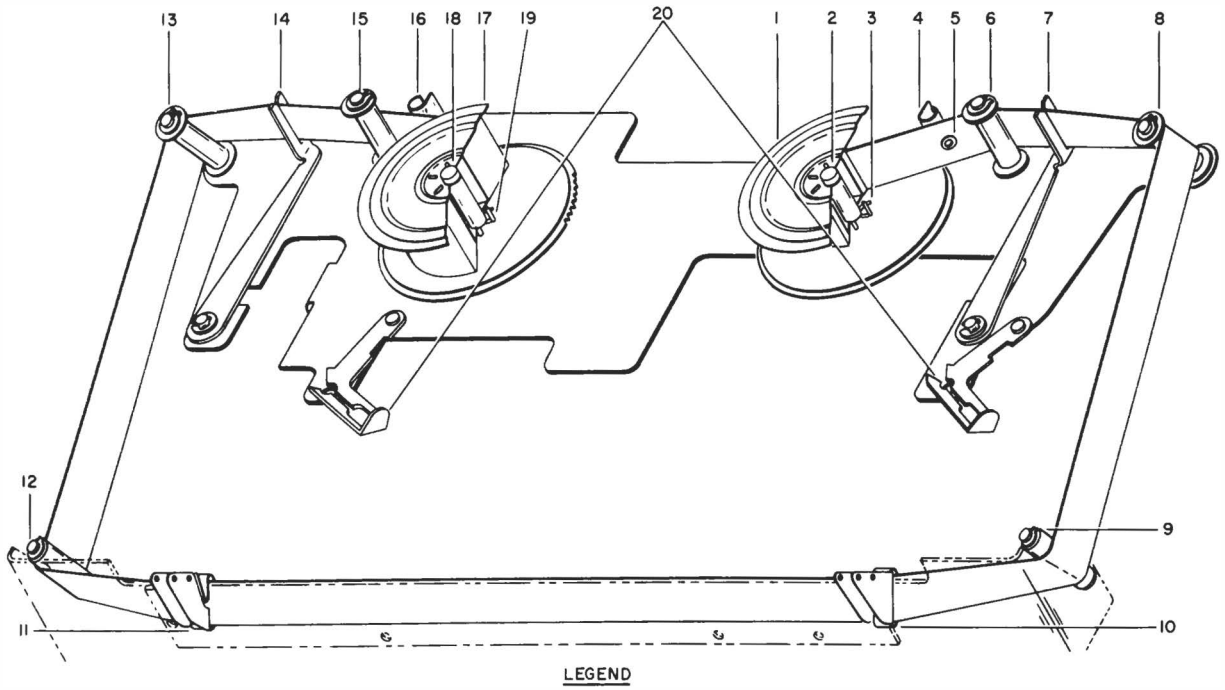
Step 11. Thread the ribbon through the fork of right hand ribbon reversing sensing arm (7), around and behind ribbon roller (6), and in front of right hand tension control brake arm (4); then place ribbon spool (1) on post (2) with pin (3), engaging the spool.

CAUTION

Insure that reversing eyelet (5) is past right hand ribbon reversing sensing arm (7) and on ribbon spool (1). If not, the ribbon will continue to feed.

Step 12. Test the operation of the ribbon feed mechanism by starting the printer motor and then actuating ribbon reversing sensing arms (7 and 14) several times.

If the ribbon feed assembly has been removed, replace it by engaging the rear of the plate with the two clips on the printer; pull the bounce prevent lever up to prevent interference between the bounce prevent lever guide (on the ribbon feed assembly) and the



LEGEND

1. RIBBON SPOOL
2. POST
3. PIN
4. RIGHT HAND TENSION CONTROL BRAKE ARM
5. REVERSING EYELET
6. RIBBON ROLLER
7. RIGHT HAND RIBBON REVERSING SENSING ARM
8. RIBBON ROLLER
9. RIBBON GUIDE ROLLER
10. RIGHT HAND RIBBON VIBRATOR GUIDE
11. LEFT HAND RIBBON VIBRATOR GUIDE
12. RIBBON GUIDE ROLLER
13. RIBBON ROLLER
14. LEFT HAND RIBBON REVERSING SENSING ARM
15. RIBBON ROLLER
16. LEFT HAND TENSION CONTROL BRAKE ARM
17. RIBBON AND SPOOL
18. POST
19. PIN
20. LOCK CLIPS

Figure 3-2. Ribbon Threading Diagram

bounce prevent lever spring. Engage lock clips (20, figure 3-2) by moving them to the left.

Replace the paper guide by engaging the rear apron mounting pins and then snapping the front edge down and over the paper guide retaining pins located on the front of the printer. Install the paper as instructed in paragraph 3-3c(3).

(3) INSTALLATION OF PAPER.

(a) TACTICAL CASE CY-2976A/PG.

Step 1. Remove the front cover by loosening the two fastener studs, pulling the top of the cover forward, and then lifting the entire cover up and away from the teletypewriter set.

Step 2. Remove the service cable from the teletypewriter set by turning the connector-plug a quarter turn counterclockwise and pulling straight out.

Step 3. Carefully slide the printer and electrical chassis out of the case and place the printer and electrical chassis on a clean work surface.

Step 4. Raise the two paper support and brake drum assembly lock levers (figure 2-1) and lift the paper support and brake drum assembly out of the electrical chassis.

Step 5. Grasp knurled discs (3, figure 3-3) on both ends of the paper support and brake drum assembly and turn one end counterclockwise with respect to the other.

Step 6. Remove brake drum (2) from paper support shaft (1).

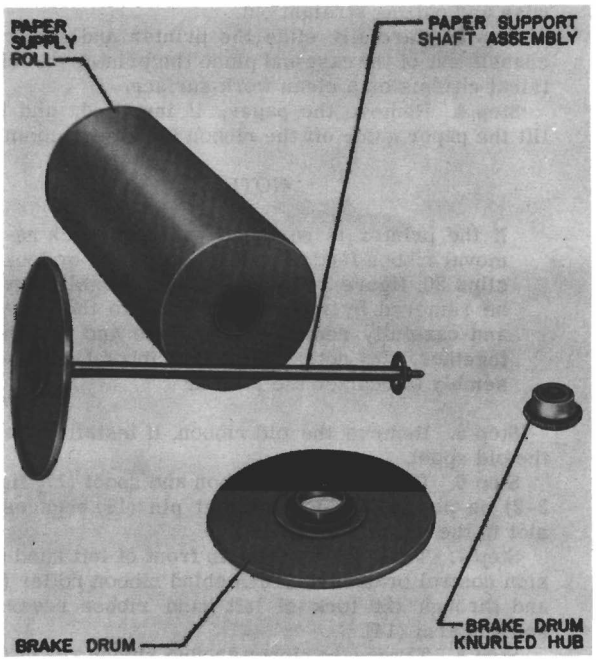


Figure 3-3. Paper Spool Assembly

Step 7. Insert paper support shaft (1) through the core of paper supply roll (4) and then install brake drum (2) by turning knurled discs (3) clockwise with respect to each other.

Step 8. Insert the paper support and brake drum assembly into the paper spool bearing receptacles of the electrical chassis and then lock into position by moving the paper support and brake drum assembly lock levers back and down.

Step 9. Thread the paper behind and over the dancer roll tube, and then over the paper guide.

Step 10. Fold back approximately three inches of the paper to provide a straight edge and then insert the paper down and behind the return cable and print cylinder.

Step 11. Gently press the paper down and against the paper feed rubber roll and pressure roll; then rotate the paper feed knob (figure 2-8) counterclockwise until the paper emerges at the top of the printer.

Step 12. If the paper is not straight in the printer, move the PAPER lock pressure release lever to the right, align the edges, and then lock the paper by moving the lever to the left.

Step 13. Align the electrical chassis slide with the track in the case and carefully slide the electrical chassis back into the case.

Step 14. If the front cover is to be reinstalled, thread the paper through the paper opening.

Step 15. Install the front cover by pressing the bottom of the cover into position to lock the electrical chassis in place and swinging the top of the cover into the closed position; then engage the two fastener studs by turning them clockwise.

Step 16. Install the service cable connector-plug in the receptacle by aligning the key of the connector-plug with the keyway of the receptacle, gently pushing in, and turning the connector-plug one-quarter turn clockwise.

(b) NON-TACTICAL CASE CY-2977/UG.

NOTE

The following procedure is applicable only when there is sufficient clearance over the teletypewriter set to allow the case cover to be opened.

Step 1. Remove the front cover by loosening the two fastener studs, pulling the top of the cover forward, and then lifting the entire cover up and away from the teletypewriter set.

Step 2. Disconnect the two captive fasteners on the hinged cover by turning them counterclockwise and lift the cover, being careful not to bend or chafe the service cable.

Step 3. Perform steps 4 through 12 of paragraph 3-3c(3).

Step 4. Close the cover and engage the two fastener studs by turning them clockwise.

Step 5. Thread the paper through the front cover.

Step 6. Install the front cover by pressing the bottom into position to lock the electrical chassis and swinging the top of the cover into the closed position; then engage the two fastener studs by turning them clockwise.

Step 7. If the paper is not straight in the printer, move the PAPER lock pressure release lever to the right, align the edges, and then lock the paper by moving the lever to the left.

(c) NON-TACTICAL CASE CY-2977A/UG. Either pressure-feed or sprocket-feed copy paper may be used with this case. To install pressure-feed paper, refer to paragraph 3-3c(3)(b). To install sprocket-feed paper, proceed as follows:

NOTE

Check that sprocket teeth (AB, figure 5-34, Appendix) are installed in the paper feed rubber roll. If necessary, install the teeth using a 0.050-inch hex wrench.

Step 1. Remove the front cover by loosening the two fastener studs, pulling the top of the cover forward, and then lifting the cover up and away from the teletypewriter set.

Step 2. Disconnect the two captive fasteners on the hinged cover by turning them counterclockwise and lift the cover, being careful not to bend or chafe the service cable.

Step 3. Fill the front paper receptacle (figure 3-4) with a supply of fan-fold paper, being careful to position it so that when pulled off to the back, the master sheet faces the bottom of the teletypewriter.

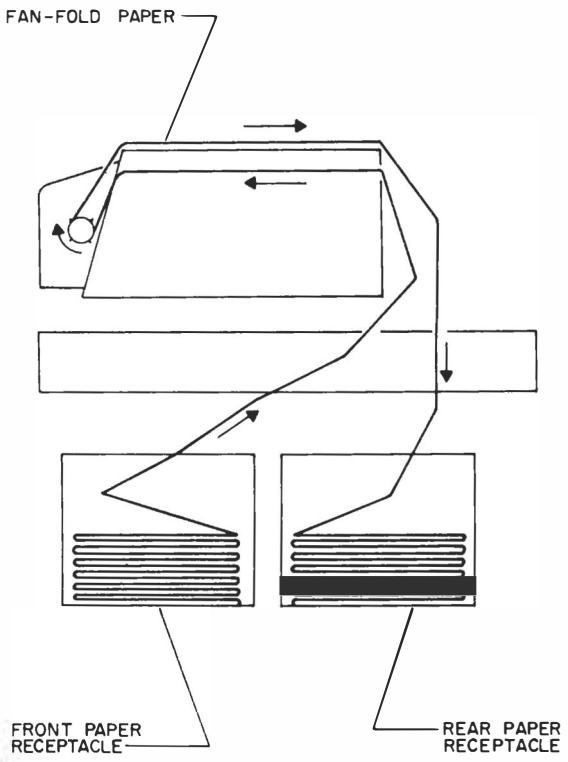


Figure 3-4. Installation Diagram, Sprocket-Feed Paper

Step 4. Carefully tear off one corner or staple the front edge of the paper to facilitate installation into the equipment.

Step 5. Grasp the end of the paper, being careful to have the carbon paper facing in the correct direction, and feed the paper through the slot in the rear of the hinged cover.

Step 6. Draw the paper over the paper guide and out through the opening in the front of the case.

Step 7. Move the PAPER lock pressure release lever to the right and feed the paper down between and behind the return cable and print cylinder.

Step 8. Gently press the paper down and against the paper feed rubber roll and pressure roll; then rotate the paper feed knob counterclockwise until the paper emerges at the top of the printer.

NOTE

Insure that the sprocket teeth are properly engaged with the feed holes in the paper. Also make certain that the PAPER lock pressure release lever is in the RELEASE position.

Step 9. Open the window on the front cover and thread the paper through the cover; install the front cover by pressing the bottom of the cover into position to lock the electrical chassis in place and swinging the top of the cover into the closed position.

Step 10. Engage the two fastener studs by turning them counterclockwise.

Step 11. When operation has begun, check that the copy paper feeds into the rear paper receptacle as shown in figure 3-4.

(4) STARTING PROCEDURE.

Step 1. Set the MOTOR switch to the ON position.

Step 2. Set the SEND•REC-REC switch to the SEND• REC position for half-duplex or full-duplex operation or in the REC position for receive operation only.

Step 3. Set the LAMP switch to the ON position.

NOTE

To start the motor after it has been shut down by a motor stop or time delay function, check that the MOTOR switch is still in the ON position and then push the BREAK push button switch.

(5) OPERATING PROCEDURE AND CHECKS. — Perform the following operating checks prior to commencing operation:

Step 1. Check that the end-of-line bell rings when the 65th character is printer; automatic line feed and carriage return occur after the 72nd character is printed; and carriage return occurs when the carriage return code impulse is received.

Step 2. Observe the action of the ribbon while printing. The ribbon must be lifted each time an alphanumeric character is printed.

Step 3. Check the space bar, FIGS key, and LTRS key to see that they function properly.

Step 4. Depress the FIGS key and then depress the A key. Observe that the hyphen (-) prints. Depress the REP key and then depress the letters off-line button (↓) protruding through the front cover. The print cylinder should return to the letters position as indicated by a series of A's.

Step 5. Space the print cylinder toward the center of the page. Depress the carriage return off-line button ( ) protruding through the front cover. The print cylinder should return to the left margin.

Step 6. Depress the LTRS key and then depress the figures off-line button (↑) protruding through the front cover. The print cylinder should return to the figures position.

Step 7. Depress the line feed off-line button (≡) protruding through the front cover. The paper should continue to advance as long as the button is depressed.

Step 8. Check the signal bell by depressing the FIGS key, then the S key; the signal bell should ring.

Step 9. On the AN/TGC-14(V), check the motor stop function by depressing the FIGS key, then the H key; the motor should stop. If the printer is shut off during normal operation by use of the figures H motor stop, the action will be indicated by the * symbol. Receipt of the first transmitted signal or any break in the signal line will start the motors of all teletypewriter sets in the circuit. On the AN/TGC-14A(V), check that the motor stops 90 seconds (45.45 baud) or 60 seconds (75 baud) after the last mark-to-space transition. If an AN/TGC-14A(V) is on the line with an AN/TGC-14(V) which sends a figures H function, the AN/TGC-14A(V) will print the * symbol, but will not stop until the required time delay has elapsed. Any other AN/TGC-14(V) sets on the line will print the * symbol and then stop.

Step 10. Push the BREAK push button switch; the motor should start.

Step 11. Depress any of the alphanumeric keys and then depress the REP key. Maintain pressure on the repeat key and release the alphanumeric key and note that the character will continue to be typed until the REP key is released.

Step 12. Commence sending or receiving operations.

Step 13. If the received message is garbled, perform the applicable range calibration check as instructed in paragraph 2-8e.

(6) STOPPING PROCEDURE.

Step 1. During operation, a teletypewriter operator at any sending station can stop the motors of all teletypewriter sets equipped with the figures H motor stop feature in the circuit by depressing the FIGS key, placing all machines in the figures position, and then the H key on standard communication keyboards. The motors of all teletypewriter sets in the circuit will be stopped and the teletypewriter set will remain in standby condition. On teletypewriter sets equipped with the time delay motor stop feature, the motor will shut off 90 seconds (45.45 baud) or 60 seconds (75 baud) after the receipt of the last mark-to-space transition.

Step 2. Stop the teletypewriter set and close it to traffic by setting the MOTOR and LAMP switches to the OFF position.

3-4. SUMMARY OF OPERATING PROCEDURES.

Refer to table 3-2 for a summary of the operating procedures.

3-5. OPERATOR'S MAINTENANCE.

The operator's maintenance consists of replacing ribbons, paper, fuses, and copy lamps. In addition,

the operator must check the range calibration and letter spacing as described in paragraph 3-5b. None of these procedures requires special tools or test equipment.

a. REPLACEMENT PROCEDURES.

(1) RIBBON REPLACEMENT. - Replace the ribbon, when required, as instructed in paragraph 3-3c(2).

(2) PAPER REPLACEMENT. - Replace the paper when required, as instructed in paragraph 3-3c(3).

(3) FUSE REPLACEMENT. - To replace a defective fuse, proceed as follows:

NOTE

Step 1 is applicable to Tactical Case CY-2976A/PG only, and step 2 is applicable to Non-Tactical Case CY-2977/UG or CY-2977A/UG only.

Step 1. Remove the printer and electrical chassis from the case as instructed in paragraph 2-2b.

Step 2. Loosen the two fastener studs on the top hinged cover of the case and then open and swing the hinged cover back.

Step 3. Turn the fuse holder cap counterclockwise and remove it and the defective fuse.

Step 4. Refer to the fuse data placard on the rear of the line sensor or on the chassis to determine the required size of the replacement fuse.

Step 5. Insert the fuse into the holder and install the fuse holder cap by turning the cap clockwise.

NOTE

Step 6 applies to Tactical Case CY-2976A/PG only and step 7 to Non-Tactical Case CY-2977/UG or CY-2977A/UG only.

Step 6. Reinstall the printer and electrical chassis in the case according to paragraph 2-11.

Step 7. Close the front cover and secure it by engaging the two fastener studs with a clockwise turn.

(4) COPY LAMP REPLACEMENT.

CAUTION

The electrical chassis is free to slide out of the case upon removal of the front cover.

Step 1. Remove the front cover by loosening the two fastener studs, pulling the top toward the front, and then pulling the entire assembly up and away from case.

Step 2. Depress the defective copy lamp, turn counterclockwise, and then remove the lamp from the socket.

Step 3. Insert a new lamp in the socket, depress, and then turn clockwise approximately a quarter turn.

Step 4. Install the front cover by engaging the electrical chassis locking device, pressing down, pushing the top into position, and then engaging the two fastener studs with a clockwise quarter turn.

b. OPERATING CHECKS AND ADJUSTMENTS. - Operating checks and adjustments are those checks and adjustments which must be made during normal operations in order to maintain the efficiency of the teletypewriter set.

(1) RANGE CALIBRATION CHECK AND ADJUSTMENT. - Due to variations in signal line bias during the day, it may be necessary to check the range calibration several times. Check and, if necessary, adjust the range according to paragraph 2-8e.

(2) LETTER SPACING CHECK. - During daily operations, periodically check the spacing between letters or combinations of letters for variations. If letters close up, notify maintenance personnel and request that corrective action be taken.

c. PREVENTIVE MAINTENANCE. - Refer to operator's checkoff list, paragraph 5-3a for preventive maintenance routine checks which may be used by the operator if an Organizational Maintenance Program is in effect.

TABLE 3-2. SUMMARY OF OPERATING PROCEDURES

STEP NO.	OPERATION	ACTION
1.	Prepare for operation.	Ascertain that the equipment has been completely installed and is ready for operation.
2.	Position keyboard.	Move keyboard lock bar to right and pull on sides of keyboard until keyboard locks into position.
3.	Start equipment.	Set MOTOR and LAMP switches to ON.
4.	Warm up equipment.	Open case ventilation ports if temperature is 0^{O} centigrade ($+32^{O}$ fahrenheit) or above. Close case ventilation ports if temperature is below 0^{O} centigrade ($+32^{O}$ fahrenheit). As much as 40 minutes warm up time may be required when ambient temperatures below 0^{O} centigrade ($+32^{O}$ fahrenheit) are encountered. Heater will be activated whether MOTOR switch is ON or OFF.
5.	Check operating adjustments.	Refer to paragraph 3-5b for adjustment procedures; perform adjustments, if required.
6.	Select operating condition.	Set SEND●REC-REC switch to proper position (up for both send and receive; down for receive only).

TABLE 3-2. SUMMARY OF OPERATING PROCEDURES (Cont)

STEP NO.	OPERATION	ACTION
7.	Perform following on-line (both send and receive) functions as required:	
	(a) Print digits and punctuation marks when selected key is depressed.	Depress FIGS key.
	(b) Print letters when selected key is depressed.	Depress LTRS key.
	(c) Advance paper.	Depress LINE FEED key.
	(d) Return print cylinder to left side.	Depress CAR RET key.
	(e) Repeat last transmitted character.	Depress REP key.
	(f) Obtain space between characters.	Depress space bar.
	(g) Interrupt transmission from remote station.	Push BREAK pushbutton switch.
	(h) Ring bell at both local and remote stations.	Depress FIGS key and then S key.
	*(i) Stop motor at both local and remote stations.	Depress FIGS key and then H key.
	(j) Restart motor at both local and remote stations.	Push BREAK pushbutton switch.
8.	Perform following off-line (only local machine) functions, as required:	
	(a) Provide shift to letters on local printer.	Depress off-line letters button (↓) while receiving intelligence. (Off-line letters button will not operate unless intelligence is being received by printer.)
	(b) Provide shift to figures on local printer.	Depress off-line figures button (↑).
	(c) Provide carriage return on local printer.	Depress off-line carriage return button (<).
	(d) Provide line feed.	Depress off-line line feed button (≡).
9.	Change line feed rate.	Open LIFT panel and move LINE FEED shift arm to either single (six lines per inch) or double (three lines per inch) position, as required.
10.	Stop equipment.	Set MOTOR and LAMP switches to OFF.
11.	Secure equipment.	Move keyboard lock bar to right; push on sides of keyboard until it is recessed. Release lock lever and insure that keyboard is locked.

*Only on AN/TGC-14(V); on AN/TGC-14A(V), motor will stop 90 seconds (45.45 baud) or 60 seconds (75 baud) after last mark-to-space transition.

SECTION 4

TROUBLE SHOOTING

4-1. INTRODUCTION.

This section contains instructions for trouble shooting the electrical and mechanical systems of Teletypewriter Sets AN/TGC-14(V) and AN/TGC-14A(V). Trouble-shooting procedures should be confined to that work which can be accomplished without complete disassembly, or with partial disassembly of the equipment, and not requiring the use of any tools or test equipment other than those found in the field maintenance shop. Instructions for major repairs, adjustments, disassembly procedures, and parts location information are included in Section 5.

4-2. TEST EQUIPMENT AND SPECIAL TOOLS.

The test equipment and special tools required for trouble shooting the teletypewriter sets are listed in table 4-1 (Appendix).

4-3. LOGICAL TROUBLE SHOOTING.

Due to the complex electro-mechanical nature of the teletypewriter sets, historical data based upon actual trouble shooting experience on operating installations has been compiled into trouble-shooting tables which will enable the electronics technician to quickly and efficiently locate the cause of an equipment malfunction or performance deterioration. The first group of overall trouble-shooting tables will isolate the trouble to a particular component, incorrect adjustment, or functional section; the second group of functional section trouble-shooting tables will isolate the trouble to the defective component or incorrect adjustment.

The overall trouble-shooting tables group the equipment as follows: Equipment Already In Use; Equipment of Unknown Condition; and Newly Installed Equipment. The technician chooses the category into which the defective equipment belongs, and follows the step-by-step procedures of the applicable table. If the preliminary procedures as outlined do not isolate the malfunction, the technician is instructed to proceed to the System Trouble-Shooting Chart. This chart lists the most often encountered symptoms of trouble, together with probable causes and corrective actions.

The functional section trouble-shooting tables list the most often encountered symptoms, their probable causes, and corrective actions. The corrective actions provide detailed directions to perform certain adjustments, make voltage and continuity checks, check for obvious damage, or check for incorrect switch settings.

To further assist in isolating malfunctions, both overall and detailed functional descriptions are provided, supported by functional block diagrams, servicing block diagrams, and simplified schematic diagrams. Test points and significant waveforms are provided on the servicing block diagrams and parts location drawings for use with the functional section trouble-shooting tables.

The most rapid method of correcting a malfunction and getting the equipment back into operation is to replace entire defective units (keyboard, line sensor, or signal line power supply) with known good replacement units and then to perform the trouble-shooting procedures on the defective unit. In this manner, the operating equipment will be subjected to the minimum down time.

CAUTION

The electrical and mechanical systems of the teletypewriter set are delicate equipment and must be so treated. Many cases of equipment malfunction may be attributed to careless attempts at repair or adjustment by maintenance personnel. Caution must be exercised to prevent abuse to the various units.

4-4. OVERALL FUNCTIONAL DESCRIPTION.

a. OVERALL OPERATION. - Figure 4-1 (Appendix) is a simplified block diagram showing the functional arrangement of the major assemblies of the teletypewriter set. Electrical chassis 1A1 serves to route the incoming and outgoing signals and to distribute primary power to the appropriate assemblies. The purpose of the alternating current signal line power supply is to furnish a direct-current signal line source with a floating ground. For the transmission of intelligence, keyboard 1A9 functions as a switching device for the output of the signal line power supply. This output may be of either positive or negative polarity, since the teletypewriter set is not polarity-sensitive. Depressing a key or the space bar establishes a mechanical code which is converted into a coded motion of pulsing contacts. The output of these contacts is a coded pulse train which is routed through the electrical chassis to either the line sensor or to the send line.

The coded pulse train shown in figure 4-2 represents the letter D. This letter has a signal code combination of space (no-current) pulses on start, 2, 3, and 5 and mark (current) pulses on 1, 4, and stop. For further information on the signal code combinations, refer to figure 1-2.

Upon receipt of a signal, the line sensor functions as an electronic switch and switches the start pulse, the five intelligence pulses, and the stop pulse in sequence to a selector in printer 1A2. The selector converts the electrical pulses into mechanical functions to operate a system of clutches on the printer

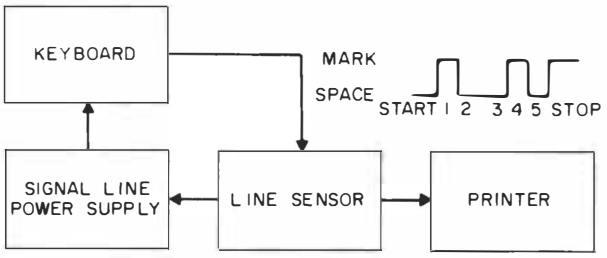


Figure 4-2. Off-Line Local Mode, Functional Block Diagram

main shaft. These clutches operate cams and linkages to perform all mechanical and printing functions to reproduce the received intelligence.

When the pulse train ceases, a steady mark pulse will remain while the signal is applied to the equipment and the signal loop remains closed. Under this steady mark condition, the printer does not perform any mechanical functions and operates in a closed condition. However, if the signal loop is opened and a steady space condition exists, the printer will run open and will appear to be performing, except for printing and non-advancing.

The following paragraphs describe the overall operation of the teletypewriter sets in each of three modes of operation.

b. OFF LINE LOCAL MODE. - In off line local mode (figure 4-2), the teletypewriter set functions as an electric typewriter and requires no connection to external equipment. The signal line power supply, keyboard, and line sensor of the local machine are connected in series to form a closed signal loop. The signal line power supply furnishes direct current for the signal loop.

c. HALF-DUPLEX MODE (SIMPLEX). - In half-duplex mode (figure 4-3), the functional units of both sending and receiving teletypewriter sets are all connected in series. The same signal loop is used for both machines, making it impossible to send and receive simultaneously. Figure 4-3 shows only two machines, but additional teletypewriter sets may be connected into the signal loop provided line current requirements do not exceed the capabilities of the signal line power supply.

When the local operator is sending, direct current flows through the signal loop which includes the input resistance of the remote line sensor, the closed and inactive remote keyboard pulsing contacts, the local line sensor, and the signal line power supply. Both the local and remote printers will print a copy of the message. A similar signal loop is followed when the remote operator is sending. Each keyboard has a BREAK switch connected in series with the signal loop. This switch is normally used to signal the remote operator to stop sending. If the BREAK switch is used, the signal loop will be opened. Both machines will then run open, as indicated by an interruption in printed copy. In addition to the BREAK switch, each keyboard has a SEND•REC-REC switch. With the switch in the SEND•REC position, the keyboard pulsing contacts are connected in series with the signal loop and permit either sending or receiving. With the

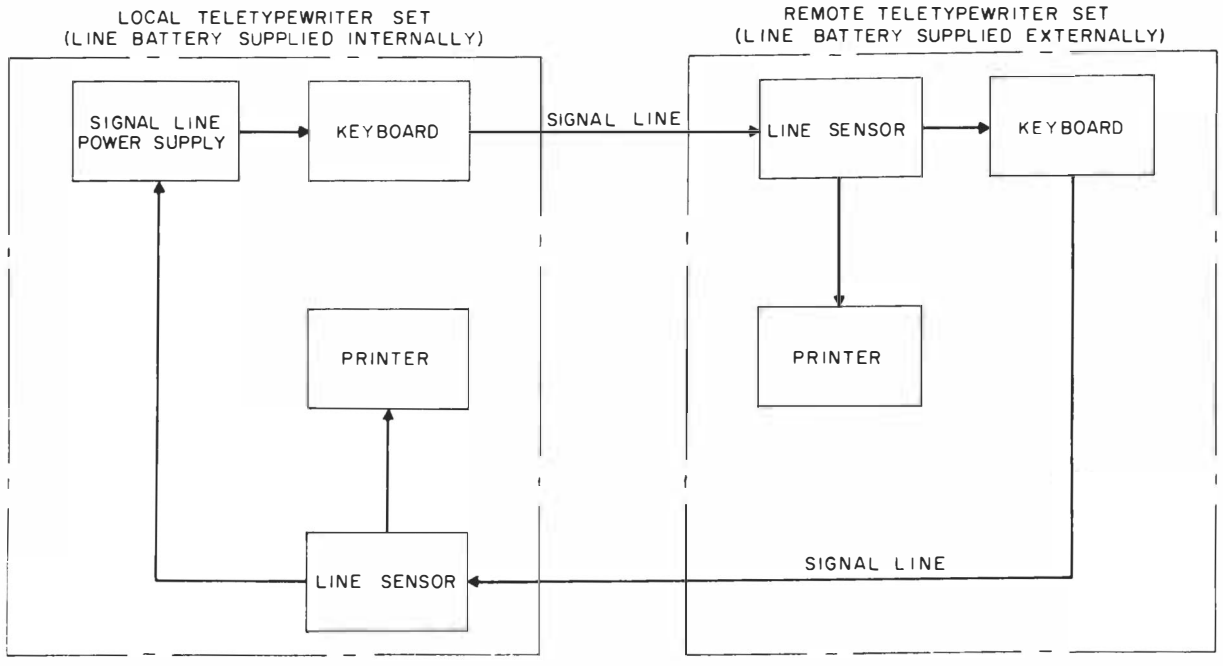


Figure 4-3. Half-Duplex Mode, Functional Block Diagram

switch in the REC position, the keyboard pulsing contacts and the BREAK switch function are both shorted out, resulting in a closed signal loop. Under this condition, the teletypewriter set will function as a receive-only printer.

d. FULL-DUPLEX MODE. - Full-duplex mode operation (figure 4-4) requires two separate signal loops and permits simultaneous sending and receiving. Since each keyboard is operated independently of its printer, no home copy of the message is available.

4-5. OVERALL TROUBLE SHOOTING.

WARNING

Voltages dangerous to life exist in the teletypewriter set. Use extreme caution when servicing this equipment.

a. GENERAL. - The teletypewriter sets considered in this section have been grouped as follows: Equipment Already In Use; Equipment of Unknown Condition; and Newly Installed Equipment.

(1) EQUIPMENT ALREADY IN USE. - Equipment already in use comprises equipment that has previously performed satisfactorily and is now malfunctioning. Refer to table 4-2 (Appendix) for preliminary checks and trouble-shooting instructions.

(2) EQUIPMENT OF UNKNOWN CONDITION. - Equipment of unknown condition is not usable due to an undetermined fault. Refer to table 4-3 (Appendix) for the trouble-shooting procedure.

(3) NEWLY INSTALLED EQUIPMENT. - Newly installed equipment comprises equipment which has been installed but never operated. Perform all tests and adjustments in Section 2 and then proceed with the trouble-shooting procedure in table 4-4 (Appendix).

b. TEST SETUP AND PRELIMINARY CHECKS. - Operate the machine by hand through any single operation. Check for broken or binding parts. If trouble is not apparent, proceed as follows:

Step 1. Patch the equipment for off line local mode (paragraph 2-9a(1)).

CAUTION

Do not connect the equipment to the primary power source without first determining that the teletypewriter set is compatible with the power source. Refer to paragraph 2-5a for verification instructions.

Step 2. Connect the service cable to the electrical chassis receptacle and to the primary power source (paragraph 2-8b).

Step 3. Connect a jumper wire across the REC (red) binding posts on the service cable junction box.

Step 4. Connect Multimeter AN/PSM-4 (connected to read approximately 60 milliamperes), or equivalent, across the SEND (black) binding posts on the service cable junction box.

CAUTION

Do not slide the keyboard in or out while the motor is running or while the MOTOR STOP switch (AN/TGC-14A(V)) is in the ENABLE position. Movement of the keyboard at these times will cause serious damage to the equipment.

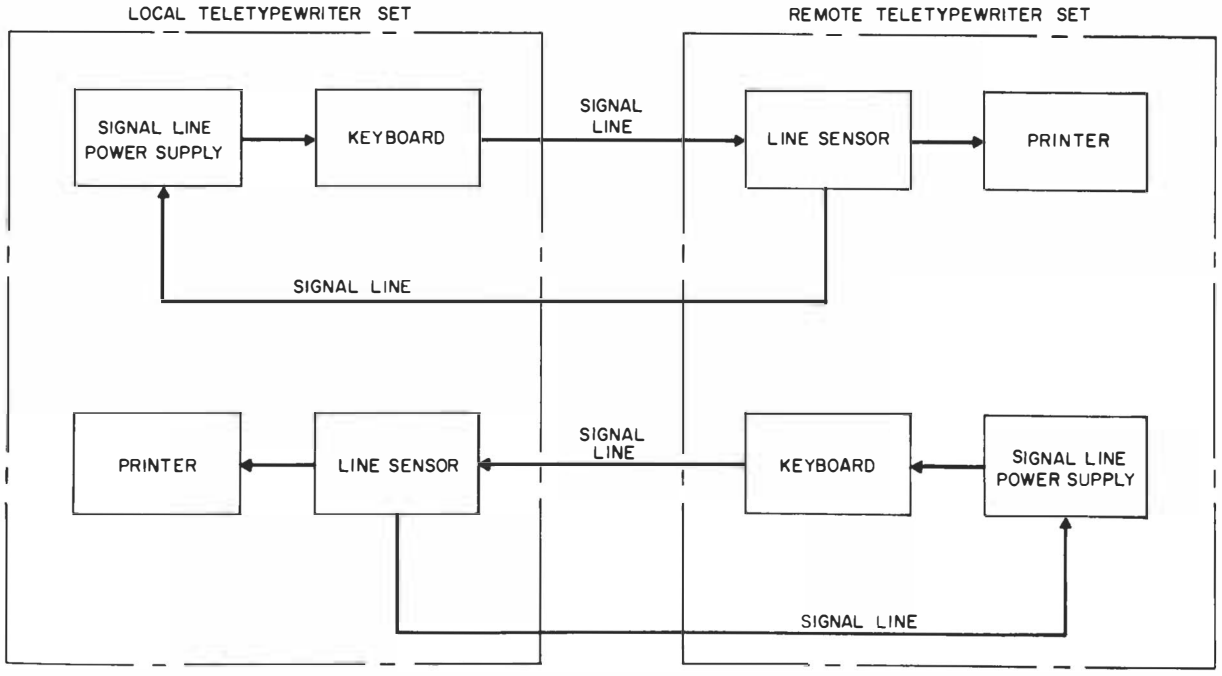


Figure 4-4. Full-Duplex Mode, Functional Block Diagram

Step 5. Set the SEND•REC-REC switch to the SEND•REC position; pull the keyboard out to the operating position.

Step 6. Set MOTOR and LAMP switches to ON position and check that multimeter reads in proper direction; if reading is reversed, reverse the test leads on the SEND (black) binding posts. Observe that copy lamps glow and motor runs; if either or both fail to energize, refer to table 4-4 (Appendix) for trouble-shooting instructions.

Step 7. Using a small screwdriver, turn the LINE ADJUST control (figure 2-1) for a reading of 60 milliamperes on Multimeter AN/PSM-4. If reading cannot be obtained, refer to table 4-4 (Appendix) for trouble-shooting instructions.

If the machine runs open or closed, recheck connections on the junction box and patch cords. If trouble persists, perform the following checks to determine whether the trouble is mechanical or electrical:

Step 1. Set the SEND•REC-REC switch to the REC position. If the machine runs closed, trouble is in the keyboard (table 4-5, Appendix). If the machine runs open, deenergize the equipment and remove the keyboard.

Step 2. Disconnect the motor connector and depress the line shorting contacts while observing the motion of the armatures on the magnetic selector. If the armatures do not move, check for any mechanical blocking or binding. If there are no mechanical defects, the trouble is electrical; refer to table 4-4 (Appendix) for further instructions.

A trouble-shooting flow chart (figure 4-5, Appendix) is provided for quickly isolating troubles in a systematic manner. Choose one of the symptoms in the top row and follow the indicated procedure. If trouble persists, refer to table 4-4 (Appendix) for further procedures.

c. SYSTEM TROUBLE-SHOOTING PROCEDURE. - Table 4-4 (Appendix) provides the trouble-shooting procedure for isolating the particular functional section (send, receive, or power supply and distribution) at fault. Refer to figure 4-6 (Appendix) for the primary power distribution diagram. Refer to Section 5 or the Appendix for overall wiring, schematic, and block diagrams; for removal, disassembly, adjustment, or reassembly procedures; and for parts location information.

4-6. FUNCTIONAL SECTION TROUBLE SHOOTING.

The teletypewriter sets consist of three functional sections as follows: send; receive; and power supply and distribution. The theory of operation for each functional section will be provided, followed by a detailed trouble-shooting procedure.

a. PRELIMINARY PROCEDURES.

Step 1. Perform any applicable preliminary checks in table 4-2 (Appendix).

Step 2. Refer to Section 5 for any required removal, disassembly, adjustment, or reassembly procedures and for parts location information.

b. TEST SETUP.

Step 1. Patch the equipment for off line local mode (paragraph 2-9a(1)).

Step 2. Connect the service cable to the electrical chassis receptacle and to the primary power source (paragraph 2-8b).

Step 3. Connect a jumper wire across the REC (red) binding posts on the service cable junction box.

Step 4. Connect Multimeter AN/PSM-4 (set for 60 milliamperes), or equivalent, across the SEND (black) binding posts on the service cable junction box.

Step 5. Set the SEND•REC-REC switch to the SEND•REC position.

Step 6. Pull the keyboard out to the operating position.

Step 7. Set the MOTOR switch to the ON position and check for reading on multimeter of approximately 60 milliamperes. If meter does not read in correct direction, reverse the connections to the SEND (black) binding posts.

c. TEST POINTS. - Test points for use in signal tracing and voltage and continuity tests are shown on the trouble-shooting tables and illustrations. The test points are divided into three categories: major, secondary, and minor.

Major test points for isolating the cause of a malfunction to a functional section are identified by an encircled Arabic number enclosed in a star; for example, major test point 1 is shown as

Secondary test points for isolating the cause of a malfunction to a specific circuit are identified by an encircled capital letter; for example, secondary test point A is shown as

Minor test points for isolating the cause of a malfunction to a specific part are identified by an encircled capital letter and a subscript Arabic numeral; for example, minor test point A_1 is shown as

4-7. SEND FUNCTIONAL SECTION TROUBLE SHOOTING.

The send functional section consists basically of keyboard 1A9 and its associated circuit.

a. THEORY OF OPERATION.

(1) MECHANICAL FUNCTIONS. - Keyboard 1A9 (figure 4-7, Appendix) consists of a keyboard drive gear (coupled to the printer motor), a drive shaft which rotates continuously as long as the motive power is applied, a clutch mechanism coupled to a set of five code pulsing cams, code pulsing contacts, and a set of five code bars which set up the mechanical code appropriate to the selected character or function.

The clutch, which is mounted on the drive shaft (figure 4-7, Appendix), consists of two housings, a cage, four rollers, four bias compression springs, and two spacers. The housings and the cage are connected by four rivets and two spacers so that the housings are rigidly connected and the cage is free to rotate approximately 20 degrees around the drive shaft in relation to the housings. Bias compression springs (between the cage and the spacers separating the housings) bias the housings in the direction of clutch travel. The four rollers pass through the four slots in the cage and both housings. The slots in the cage fit snugly around the rollers and permit the

rollers to travel the length of the slots. The ends of the slots in the housings contain close-fitting sloped surfaces which, when the clutch is engaged, restrict the motion of the rollers in such a manner as to force the rollers against the drive shaft.

When the clutch release finger disengages the stop tab on the cage, the cage is moved forward by the bias compression springs. This motion cams the rollers down on the drive shaft and the clutch rotates with the drive shaft. This initial camming action is reinforced by the jamming action exerted on the rollers by the sloped surfaces in the housing slots. The clutch will rotate 180 degrees until one of the cage stop tabs engages the clutch release finger. At this point, the forward motion of the cage will be stopped and the camming and jamming action of the rollers against the drive shaft will cease, resulting in the clutch being disengaged.

At the instant the cage is halted by the clutch release finger, the bias compression springs will tend to push the housings backward, thus reestablishing the camming effect. If unrestrained, this backward motion will result in the clutch chattering. Consequently, backstops are provided to prevent any backward motion of the clutch.

Depressing a keyboard key or space bar moves the five separate code bars (figure 4-7, Appendix) according to the alignment of a particular set of Baudot-code slots into which the key drops and moves the clutch release bail downward. As the clutch release bail moves, it pulls the cam follower clutch release toward the front of the keyboard. The clutch release finger, which is engaged with the cutout in the cam follower clutch release, is then moved away from the stop tab on the cage, allowing the clutch to become engaged and to begin rotating the pulsing cam nest. The clutch release cam rotates and raises the cam follower clutch release. This movement pulls the clutch release helical spring connected between the cam follower clutch release and the clutch release finger, thereby holding the clutch release finger close to the surface of the cage as the cage rotates.

During this time, motive power is also applied to the five code pulsing cams, the start-stop cam, and the master pulsing cam. The first motion of the cams releases the keyboard code bar prevent lever, which falls into one of two adjacent slots in each code bar, locking the code bars in place during the character or function generating cycle. The five-level code set up by the code bars is converted into a pulse train by five code pulsing cams, five pulsing fingers, five sets of code pulsing contacts, and the master pulsing contacts. The start-stop cam (actuating another set of pulsing contacts through the master pulsing cam follower) signals the beginning and end of the character transmitting cycle.

The code pulsing contacts are connected in series with the signal loop through the master pulsing contacts and the slip connector contact. When the start-stop pulsing finger moves downward, the associated start-stop pulsing contacts are closed resulting in a steady mark condition. Rotation of the start-stop cam at the beginning of the character cycle causes the start-stop pulsing finger to open the code pulsing contacts and transmit a start or space pulse. Rotation of the five code pulsing cams acts on the associated pulsing fingers which actuate the five code pulsing contacts. Some of the code bars extend under the pulsing finger extensions and may stop the extension from dropping, depending upon the positioning of a code bar under the pulsing finger. When a code bar does not restrict the downward motion of a pulsing finger, the associated set of code pulsing contacts is closed and transmits a mark pulse. The blocking of a pulsing finger by a code bar holds the set of code pulsing contacts open, causing a space pulse to be transmitted. The pulsing finger normally holds the pulsing contacts open except when the pulsing finger drops into the cam for a mark pulse.

Under normal conditions, the six sets of code pulsing contacts (start-stop pulses and five intelligence pulses) would require careful adjustment as the result of switching high signal-line current. To remedy this, a set of master pulsing contacts is provided. These contacts comprise a single-pole, double-throw switch which is alternately switched from the upper to the lower spring leaf contacts by the master pulsing cam follower and master pulsing cam. When the switch is in the upper position, the code pulsing contacts used for transmitting the start-stop, 2, and 4 pulses are connected in the circuit; in the lower switch position, the pulsing contacts used for transmitting pulses 1, 3, and 5 are switched into the circuit. The gap through which the master pulsing contacts oscillate is adjusted to obtain the effect of simultaneously switching one circuit out and the other circuit in. In this manner, the six individual code pulsing contacts handle a minimum amount of current with the master pulsing contacts switching the greater amount, since the six individual pulse contacts close early and open late. The effect of this arrangement is to have six code pulsing contacts determine the presence or absence of a code pulse while the master pulsing contacts oscillate between the start-stop, 2, and 4 circuit and the 1, 3, and 5 circuit, accurately timing the duration of pulses in each circuit.

As the 180 degrees of clutch rotation ends, the keyboard code bar prevent lever is moved out of the code bar slots by the clutch release cam and the clutch is disengaged by the stop tab on the cage engaging the clutch release finger. If the REP (repeat) key is depressed, the clutch release finger will be held back from engaging the cage by the action of the repeat key shaft. As a result, the clutch will remain engaged and apply motive power to the code pulsing cams, retransmitting the last code combination set up on the code bars. This cycle will be repeated continuously as long as the repeat key is held down.

(2) ELECTRICAL FUNCTIONS. - The keyboard circuit (figure 4-8) is shown with filter FL1 separated into two filter sections. In addition, the keyboard slip connector contact and the electrical chassis-mounted contact block are also shown separated. The keyboard slip connector contact and the connector block are so constructed as to close the signal loop when the keyboard is not in the operating position, thus preventing the loop from remaining open.

In this circuit, the signal loop is completed from the negative side of the signal line power supply, through the contact block, keyboard slip connector contact, filter FL1-A, master pulsing contacts S1, code pulsing contacts S2, BREAK switch S4, filter FL1-B, keyboard slip connector contact, contact block, and through the input resistance of the line or load

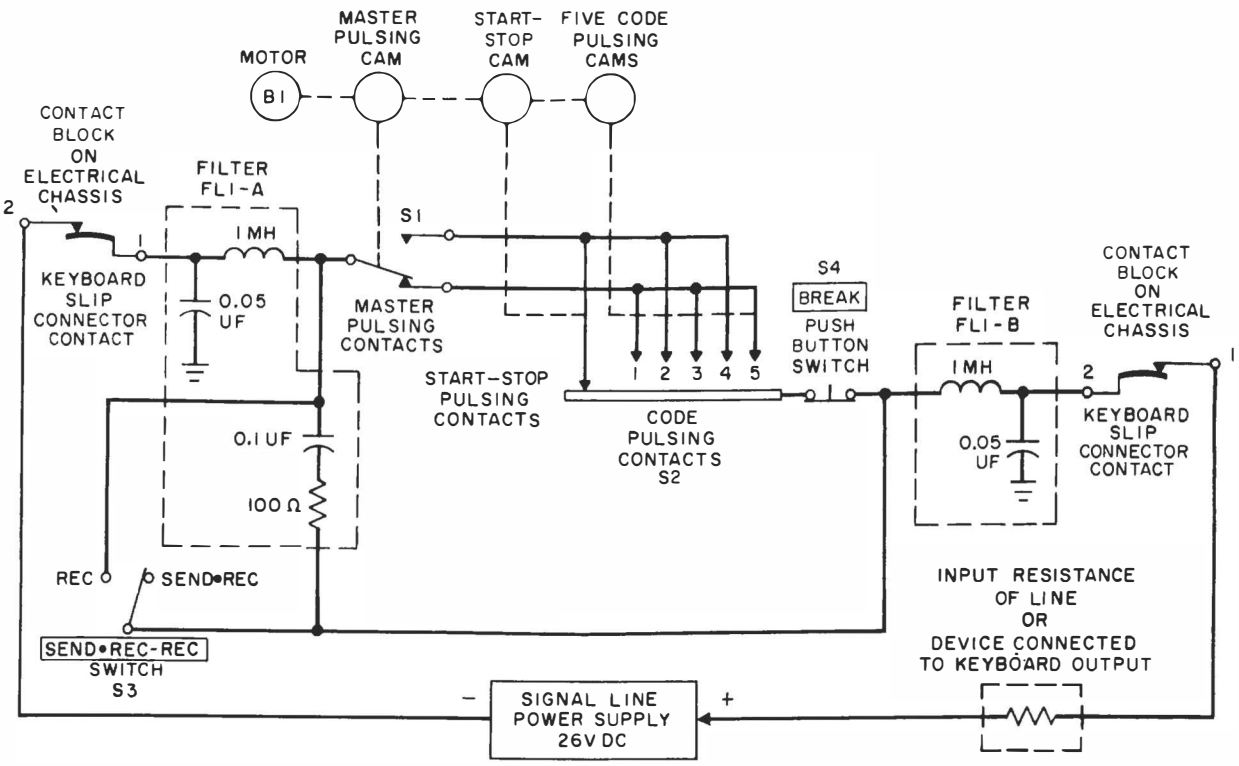


Figure 4-8. Keyboard 1A9, Simplified Schematic Diagram

device back to the signal line power supply. Although the signal line power supply is connected as shown for developing a current that flows in the direction shown, it may be connected so that current flows in the opposite direction, dependent upon the option patching arrangement.

The filter is used to suppress arcing across the switching contacts and to minimize interference with nearby radio equipment. The master pulsing contacts are used to switch current between the set of pulsing contacts that develops start-stop, 2, and 4 pulses, and the set of contacts for 1, 3, and 5 pulses. The BREAK switch is connected in series with the switching circuit and if depressed will open the signal loop, interrupting transmission. The SEND•REC-REC switch is connected across the master pulsing contacts, code pulsing contacts, and the BREAK switch. When this switch is in the SEND•REC position, the operator may either send or receive, since the code pulsing contacts are in the circuit to be used as required. In the REC position, the pulsing contacts and the BREAK switch are shorted out, resulting in a closed signal loop, effectively shorting out the output of the keyboard.

b. TROUBLE-SHOOTING PROCEDURE. - Refer to table 4-5 (Appendix) or figure 4-5 (Appendix) for the trouble-shooting procedure and to figure 4-9 (Appendix) for the location of test points for the keyboard. When making continuity checks on the keyboard, turn the equipment off and remove the keyboard. Rotate the keyboard drive gear by pulling the top of the gear toward the front of the keyboard until the clutch is in the stop position. Make certain that the SEND•REC-REC switch is in the SEND•REC position. Connect Multimeter AN/PSM-4, set for direct-current resistance, across the test points as indicated in table 4-5 (Appendix).

NOTE

If an AN/TGC-14(V) equipment which is patched for internal battery is connected to a signal line supplying signal-line power, the capacitors in filter FL1 will be damaged. Check filter FL1 as described in Symptom 1. Similarly, an open line will occur with an AN/TGC-14A(V) equipment if the battery poles are crossed.

4-8. RECEIVE FUNCTIONAL SECTION TROUBLE SHOOTING.

The receive functional section (figure 4-1, Appendix) contains line sensor 1A3, printer 1A2, and their associated circuits.

a. LINE SENSOR THEORY OF OPERATION. - The line sensor comprises a direct-coupled, transistorized electronic switch and uses an internal power supply

identical in all respects to the circuit described in paragraph 4-9a for signal line power supply 1A4. The line sensor is of the printed-circuit type.

(1) BLOCK DIAGRAM DISCUSSION. - The line sensor (figure 4-10) consists of a semiconductor diode bridge to orient the polarity of the signal to a transistor functioning as a switch, a space coil power amplifier transistor to energize the space solenoid coils on the selector, and a mark coil power amplifier transistor to energize the mark solenoid coils on the selector and to act as a holding circuit for the figures H or time delay motor stop functions.

The semiconductor diode bridge receives direct-current pulses (either positive or negative polarity) from a signal source connected in the signal loop. The bridge orients the pulse polarity such that only negative pulses appear at the base of a PNP transistor functioning as a switch to control current to the space and mark power amplifier transistors. During a spacing condition (absence of a signal), the space coil transistor conducts and energizes the selector space coils in the printer; during a marking condition (presence of signal), the mark coil transistor conducts and energizes the selector mark coils. (The selector is mounted on the printer and has the function of converting the control current into the mechanical motions required for selecting various printing functions.) The mark transistor also sets up a holding circuit for a relay when the STOP key is depressed on AN/TGC-14(V) equipment or when the time delay motor stop mechanism is energized on AN/TGC-14A(V) equipment.

(2) SIMPLIFIED SCHEMATIC DIAGRAM DISCUSSION. - Figure 4-11 illustrates the line sensor circuit condition when receiving the letter R. The letter R pulse train consists of spacing pulses (absence of signal and no current) on start, 1, 3, and 5 and marking pulses (presence of signal and current) on 2, 4, and stop.

Current flow from the signal line power supply is through diode CR3, through the emitter and base circuit of transistor Q1, through diode CR2, and through the keyboard back to the negative side of the power supply. Diodes CR1 and CR4 present an open circuit to current flow. If the signal polarity is reversed (positive mark pulses), current will flow through the keyboard and diode CR1, through the emitter and base circuit of transistor Q1, and through diode CR4 back to the signal line power supply.

The base input circuit of transistor Q1 contains a high-low range strip which can be positioned to shunt either 100-ohm resistor R1 across the input circuit for the 20- to 80-milliampere input current range or 5600-ohm resistor R2 for the 1- to 5-milliampere range. Resistors R1 and R2 shunt portions of the signal current, thereby reducing the input resistance of the circuit. When the strip is positioned for the high range (20 to 80 milliamperes), the line sensor has an input resistance of approximately 125 ohms at 60 milliamperes. When the strip is positioned for the low range (1 to 5 milliamperes), the input resistance is approximately 2500 ohms at 5 milliamperes. (This strip is accessible when the line sensor metal cover is removed.) To avoid transistor damage through application of excessive signal current, zener diode CR5 will effectively shunt any excessive signal current and voltage level above 12 volts. In addition, this zener diode protects transistor Q1 against any transients or spikes caused by radio or other interference.

After the input signal is attenuated, it is applied as forward base bias to transistor Q1. The collector of this transistor is coupled to the base of power amplifier Q3 through resistor R5. The emitter is directly coupled to the base of power amplifier Q2. The base of transistor Q1 normally is held at cutoff by the positive voltage (reverse bias) received through resistor R3 and the attenuator network. With a mark signal applied (negative pulse), the negative signal current

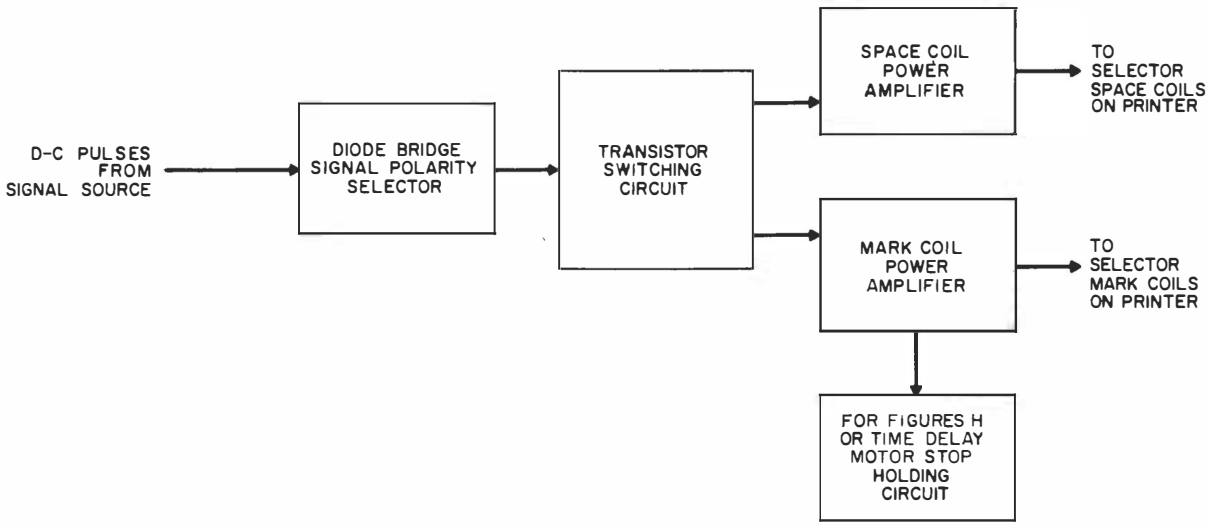


Figure 4-10. Line Sensor 1A3, Functional Block Diagram

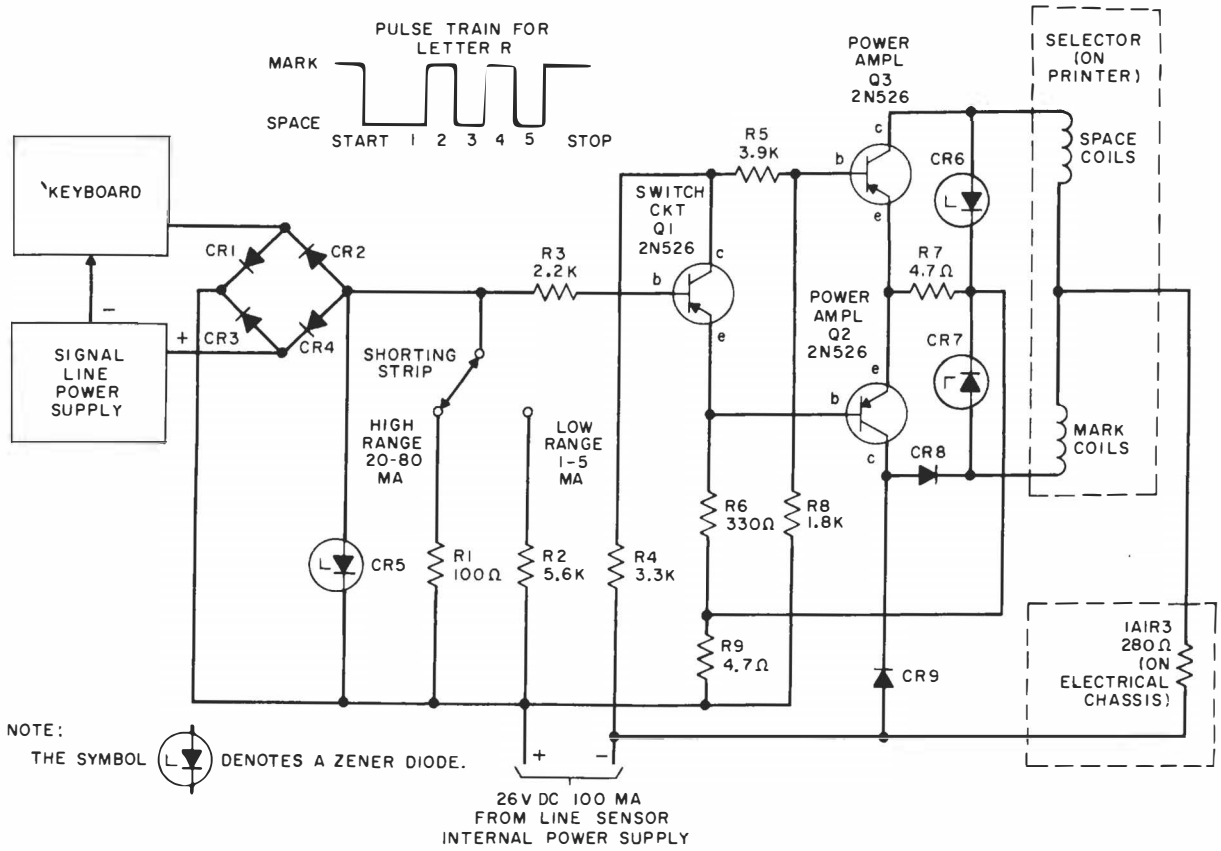


Figure 4-11. Line Sensor 1A3, Simplified Schematic Diagram

is sufficient to drive the transistor into saturation. The large collector current flowing through resistor R4 causes the negative voltage at the junction of resistors R4 and R5 to decrease (become more positive), resulting in a more positive voltage applied to the base of power amplifier Q3. Since this voltage is applied as reverse base bias, power amplifier Q3, which is normally held near cutoff by reverse base bias through resistor R8, will be cut off. The large current flowing through the emitter of conducting transistor Q1 develops a negative pulse across resistor R6, which causes current to flow in the base of power amplifier Q2. Power amplifier Q2, which is normally cut off by reverse base bias through resistors R6 and R9, is driven into saturation and energizes the mark coils of the selector for every mark signal of the input pulse train. When receiving the letter R, the mark coils will be energized on marking pulses 2, 4, and stop.

When space pulses are present, no input signal exists; this condition is the same as opening the signal loop. Consequently, no input signal is applied to the line sensor and transistor Q1 is cut off by the combination of reverse base bias and the high emitter bias through resistor R9. As a result, the collector of transistor Q1 approaches the negative supply voltage level of approximately -26 volts. This negative voltage causes current to flow in the base of power amplifier Q3 and drives it into saturation, energizing the selector space coils. When receiving the letter R, the space coils will be energized on start, 1, 3, and 5 pulses. During a space condition, power amplifier Q2 is cut off by reverse base bias resistors R6, R7, and R9. Zener diodes CR6 and CR7 prevent inductively produced pulses exceeding a level of -25 volts from appearing on the collectors of power amplifiers Q2 and Q3.

(3) LINE SENSOR MOTOR STOP FUNCTION. - Power amplifier Q2 (figure 4-12) is used to set up a relay-holding circuit when the motor stop function is used. During normal teletypewriter set operation, the printer motor supplies motive power to the printer and keyboard and runs continuously. If standby operation is required, the printer motor may be made inoperative until either the remote or local keyboard operator presses the BREAK switch.

Stopping the printer motor is accomplished in the AN/TGC-14(V) equipment by first striking the FIGS key and then the STOP key. In the AN/TGC-14A(V) equipment, the printer motor will automatically stop either 60 seconds (75 baud) or 90 seconds (45.45 baud)

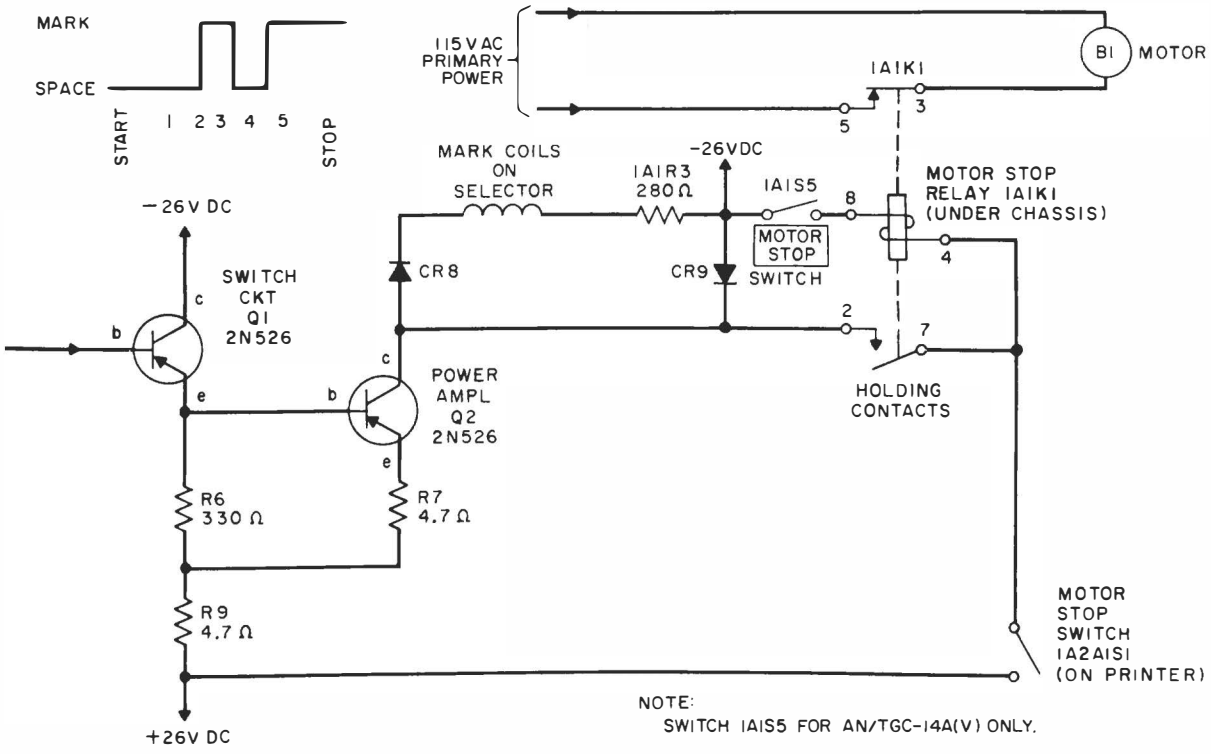


Figure 4-12. Line Sensor 1A3, Motor Stop Function, Simplified Schematic Diagram

after the receipt of the last mark-to-space transition. (For detailed descriptions of the motor stop functions, refer to paragraphs 4-8c(7) and 4-8c(8).) Either of these actions closes motor stop switch 1A2A1S1 and energizes motor stop relay 1A1K1. Energizing this relay closes relay contacts 2 and 7 and opens contacts 3 and 5, removing primary power from the printer motor. However, motor stop switch 1A2A1S1 remains closed momentarily and another method must be used to hold the motor stop relay energized. This holding circuit is accomplished through the conduction of mark power amplifier Q2 during a steady marking condition or on a stop pulse. When mark pulses occur, power amplifier Q2 conducts to energize the mark coils on the selector and to provide a voltage source which keeps the motor stop relay energized after the motor stop switch opens. Assuming that motor stop switch 1A2A1S1 has opened, removing voltage from one side of relay coil 1A1K1, the relay is held energized by the circuit which is completed from negative 26 volts through the relay coil, holding contacts, power amplifier Q2, resistors R7 and R9, and positive 26 volts. The collector of power amplifier Q2 draws current through two circuits in parallel; one circuit includes the relay coil and holding contacts, and the other circuit includes 1A1R3, the mark coils, and diode CR8.

At the instant a start pulse appears (first break in the signal loop), power amplifier Q2 cuts off and the holding circuit is broken. Motor stop relay 1A1K2 is deenergized, closing contacts 3 and 5 to apply primary power to the printer motor.

b. LINE SENSOR TROUBLE-SHOOTING PROCEDURE. - Refer to table 4-6 (Appendix) or figure 4-5 (Appendix) for the trouble-shooting procedures for line sensor 1A3. Refer to figure 4-13 (Appendix) for the location of test points and to table 4-11 (Appendix) for correct voltage measurements under various conditions. Use Multimeter AN/PSM-4 for voltage and resistance checks. Unless otherwise specified, connect the negative lead to +26 volts direct-current common when making direct-current voltage readings.

The line sensor in the teletypewriter set utilizes printed circuit boards. These boards require more care during maintenance procedures than conventionally wired circuits in order to avoid damaging the circuit board or printed wiring. Voltage and resistance measurements may be made from either the component or wiring side of the board by use of a needle point probe for penetrating the preservative coating.

c. PRINTER THEORY OF OPERATION. - A selector incorporated in the printer receives direct-current impulses from the line sensor (space and mark pulses) and converts these pulses into the mechanical motions required to couple various clutches to a continuously rotating main shaft. The selector starts the character printing cycle and all other functions with the start

pulse and then translates each of the five intelligence pulses to start all mechanical functions in the printer. Upon reception of a stop pulse, the selector stops the function or character. Figure 4-14 (Appendix) provides a general concept of how all mechanical functions in the printer are selected. These functions will first be discussed on a block diagram basis, and then each functional system will be separately described in detail.

(1) BLOCK DIAGRAM DISCUSSION. (See figure 4-14, Appendix.) - The selector first receives a direct-current impulse representing start (space). This pulse energizes a set of solenoid coils which attracts an armature in such a manner that the start clutch release arm releases the start clutch mounted on the printer main shaft. The main shaft consists of two sections; a selector main shaft and a function main shaft. The two shaft sections are coupled and rotate as one shaft. All mechanical functions begin on the selector main shaft. When released by the start clutch release arm, the start clutch engages the selector main shaft for 180 degrees rotation. The clutch disengages the selector main shaft when the cage stop tab is blocked by the start clutch release latch. With a steady mark signal (stop pulse), operation of the start clutch release arm is blocked by the selector armature and the start clutch is held stationary by the start clutch release latch. Release time of the start clutch and subsequent sampling of the intelligence pulse is manually controlled by a range dial geared to the start clutch. The start clutch is also gear-coupled to a timing cam shaft assembly which times the selector clutch release functions in relation to the pulse train. A set of timing cams on the timing cam shaft times the operation of the clutch release fingers which release rotary and lateral clutches on the selector main shaft. The selector samples the five intelligence pulses and, by energizing space or mark solenoid coil sets, mechanically locks or unlocks the clutch release fingers that release (engage) the rotary and lateral clutches. The clutch release fingers are only permitted to release their associated clutches when their timing cams are positioned to set up the individual clutches as their respective pulse is received.

During rotation of the timing cam shaft (which rotates 360 degrees to every 180 degrees of the main shaft rotation) one finger of each pair of clutch release fingers is free to operate and correctly position its respective clutch and cam assembly. Upon completion of the clutch and cam assembly positioning cycle of the selector main shaft, the print and function cam assembly is released, regardless of the combination of pulses received, and either printing or a function is completed.

The selector main shaft accommodates two rotary clutches and three lateral clutches, numbered in accordance with the intelligence pulse that controls their positions. When no signal code transitions are taking place, the clutches are disengaged and free-wheel on the shaft. Number one and number two intelligence pulses have the effect of positioning the rotary clutches in one of two 180-degree positions as determined by mark or space pulses. These clutches position carriage pulleys which mechanically position the print cylinder in one of four 45-degree positions, or one of four rows of type. A letters figures carriage pulley, actuated by the letters figures clutch and cam, is used to rotate the print cylinder to any one of two 180-degree positions representing letters or figures. The rotary carriage pulleys also position a rotary function slide in the function selector. Lateral clutches 3, 4, and 5 (operated from intelligence pulses 3, 4, and 5), operating in conjunction with the three lateral carriage pulleys, position the print cylinder laterally to one of eight positions and positions the lateral control function slide in the function selector. The two function slides, which move laterally with respect to one another, select mechanical functions such as blank, space, line feed, figures, bell, letters, and carriage return. Each function slide has various slots arranged so that the proper combination of pulses will align a pair of slots in both the rotary function and lateral control function slides and permit a function sensing finger lever to fall into the slots and perform the selected mechanical function. The function cam follower, when on the high part of the cam, allows the sensing finger levers to determine when two slots are in alignment on the rotary function and lateral control function slides and then select the function to be performed. On the downward motion of the function cam follower, all sensing finger levers are deflected and cammed away from the function slides by the function bar, thus freeing the slides to move to the next position during the subsequent cycle. If a function selection is accomplished by the sensing finger levers, the printing is prevented which would normally immediately follow. When the print function timing cam is free to act on the print hammer, printing is accomplished. The print hammer is moved in a lateral direction across the copy paper and in front of the print cylinder through action of the carriage return, takeup drum, and advance drum systems.

In summary, the function selector can be considered as a positioning servo operating in a closed loop. It receives mechanical positioning information from the rotary and lateral carriage pulleys and senses the information with function selector sensing finger levers. If the information is appropriate for the particular mechanical function (letters figures, carriage return, blank, bell, or line feed), the selected function takes place and printing and advance are suppressed.

(2) SELECTOR MECHANISM. (See figure 4-15.) - The selector mechanism, mounted at the back of the printer, receives pulse information from the line sensor. The selector consists of two armature and solenoid coil sets facing in opposite directions. Each armature set contains four solenoid coils connected so that like magnetic poles are diagonally opposite. The selector operates in polar fashion, using two sets of series coils for space and two sets of series coils for mark. In this manner, recovery time is reduced and the armature sets are mechcnically divided so that the right armature set is controlled by start-stop, 2, and 4 pulses, and the left armature set is controlled by pulses 1, 3, and 5. Energizing either the space or mark coils positions the armature so that it blocks the inward motion of either the space or mark armature paddle latch. As shown in figure 4-15, the number 2 armature paddle latch (mark) is mounted on a movable shaft, to which the number 4 latch and start latch are also mounted. The number 3 armature paddle latch of the left armature set is also mounted on

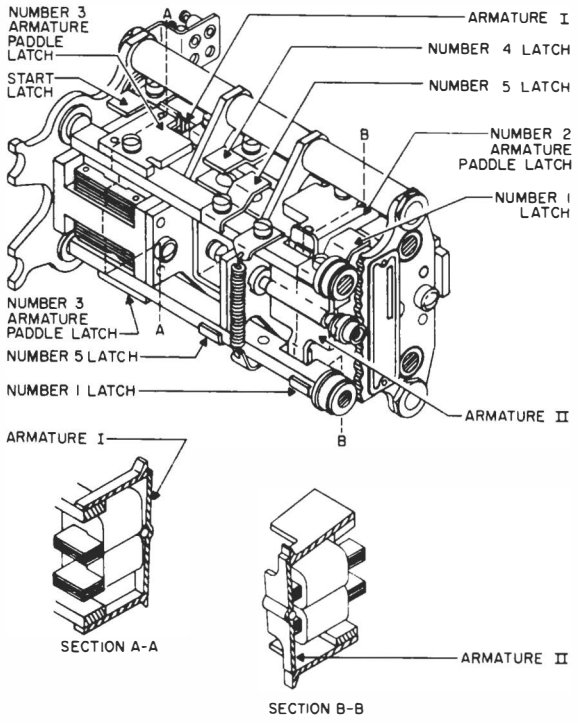


Figure 4-15. Selector Mechanism

a movable shaft to which latches 5 and 1 are attached. A similar pair of armature paddle latches is located on the bottom side of the selector.

Figure 4-16 shows a section of the selector with a pair of clutch release fingers bearing on the mark and space armature paddle latches. There are six clutch assemblies (figure 4-14, Appendix) on the selector main shaft of the printer, each controlled by its respective pulse. Two clutches are controlled by mark and space armature paddle latches and four clutches by latches. In operation, the clutch release fingers press down on the armature paddle latches or latches under spring pressure greater than that required to pull the armature paddle latches away from the armature. The clutch release fingers are free to press on the latches or armature paddle latches by the simultaneous positioning of the timing cam and the receipt of the appropriate intelligence pulse. If a clutch release finger is not blocked by the timing cam or armature, it will press downward on a latch or armature paddle latch. Normally, the high side or top clutch release finger holds on a mark pulse and the low side or bottom clutch release finger holds on a space pulse. When a space pulse arrives, the armature is pulled in toward the space solenoid and permits the mark armature paddle latch to be pressed downward by the top clutch release finger adjustment screw, thereby releasing the clutch on the mark or high side. When energized, the mark solenoid pulls the armature in at the top and releases the low side clutch release finger (space side). Release of a clutch on either the high

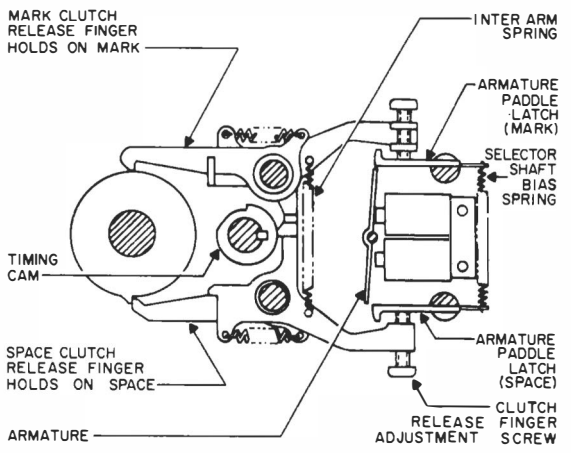


Figure 4-16. Selector, Clutch Release Mechanism

side (mark) or low side (space) allows the clutch to engage the selector main shaft and rotate 180 degrees, where it is stopped by the opposite clutch release finger.

(3) START CLUTCH RELEASE SYSTEM. (See figure 4-17.) - During receipt of a steady mark signal (stop pulse), the start latch, mounted on the same shaft as the number 2 armature paddle latch, locks the start clutch release arm in the stop position. When locked, the start clutch release arm holds the start clutch release latch against the clutch stop tab and the start clutch backstop lever rests in the cutout in the start cam. When a start pulse is received, the spring-loaded start clutch release arm moves down, pulling the start clutch release latch away from the clutch stop tab and thus releasing the clutch for 180-degrees rotation. As the rotation of the clutch cams the start clutch backstop lever out, the start clutch release latch is moved back down to the stop position and the start clutch release arm is simultaneously moved out and away from the selector. As the clutch stop tab moves around to complete its 180-degrees rotation, it is engaged by the start clutch release latch and start clutch backstop lever and held in position until the next start pulse is received. The start clutch backstop lever, which is adjustable to prevent clutch chatter, then drops into the start cam cutout. To permit manual adjustment of the timing cycle or the time relationship between the start of the timing cam shaft and sampling of the intelligence pulses, a range dial is provided. Adjusting this dial orients the start clutch and timing cam shaft translating cycle in the most favorable position in relation to the incoming pulse train.

(4) PRINTER MAIN SHAFT CLUTCH AND CAM ASSEMBLY. (See figure 4-18.) - The printer main shaft consists of the selector main shaft on the left side of the printer (facing the front) and the function main shaft on the right side. Main shaft power is supplied by the printer motor through third reduction gear (19) on the function main shaft. The keyboard

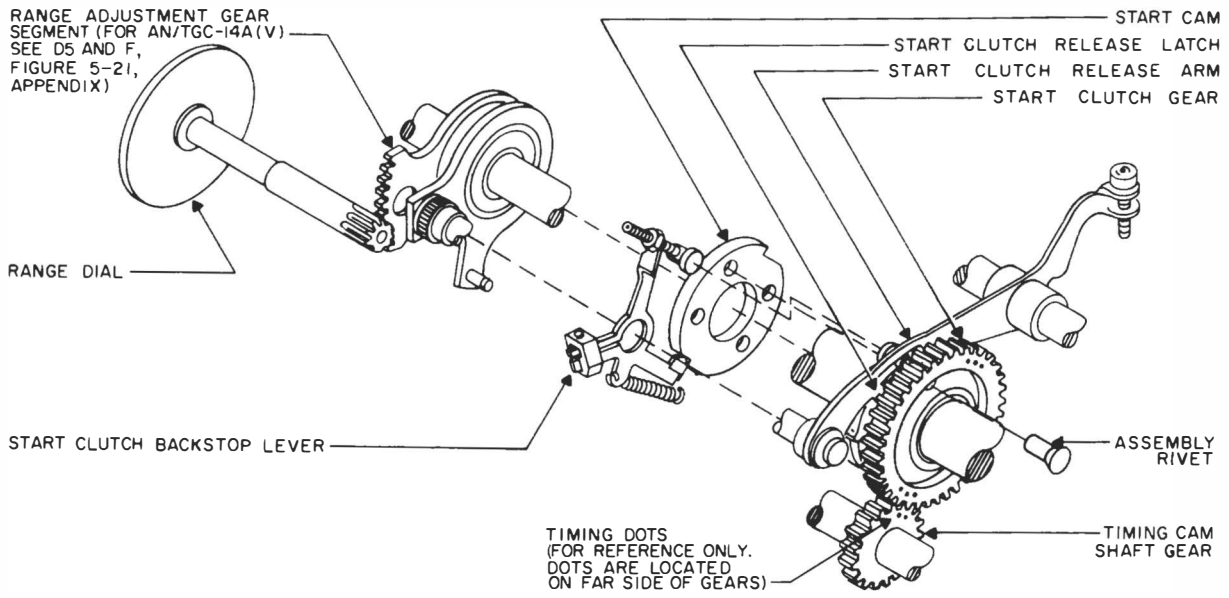
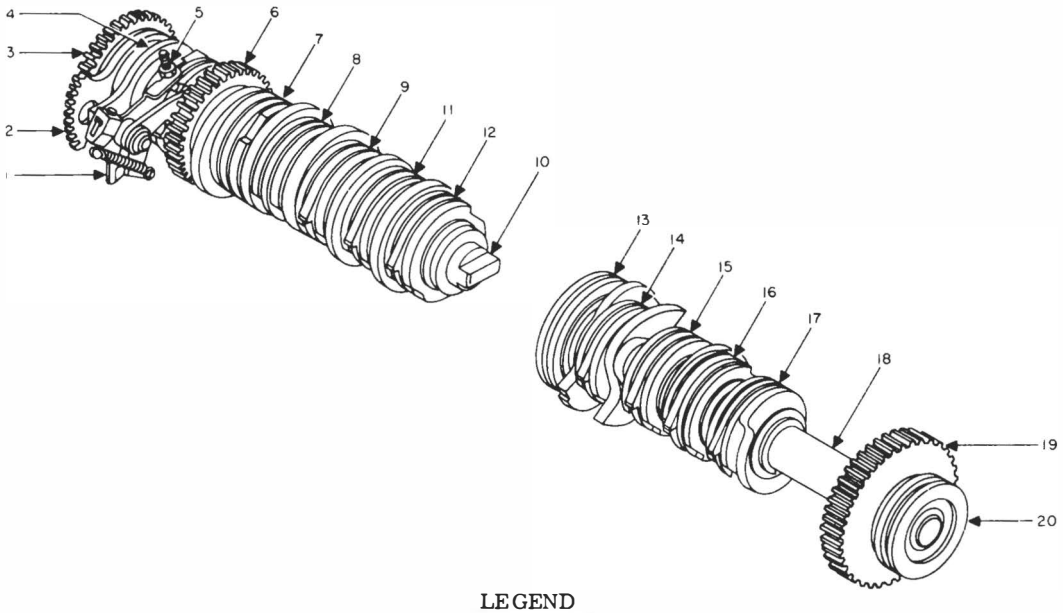


Figure 4-17. Start Clutch Release Mechanism



LEGEND

1. START CLUTCH RELEASE
2. RANGE ADJUSTMENT GEAR SEGMENT*
3. PRINTER HELICAL GEAR
4. LEFT-HAND BEARING AND RETAINER*
5. START CLUTCH RELEASE ADJUSTMENT SETSCREW
6. START CLUTCH GEAR
7. NO. 3 LATERAL CLUTCH AND B CAM
8. NO. 4 LATERAL CLUTCH AND C CAM
9. NO. 5 LATERAL CLUTCH AND D CAM
10. SELECTOR MAIN SHAFT
11. NO. 2 ROTARY CLUTCH AND E CAM
12. NO. 1 ROTARY CLUTCH AND F CAM
13. CENTER BEARING AND RETAINER
14. PRINT FUNCTION CLUTCH AND G AND H CAM
15. LINE FEED CLUTCH AND I CAM
16. LETTERS FIGURES CLUTCH AND J CAM
17. CARRIAGE RETURN CLUTCH AND K CAM
18. FUNCTION MAIN SHAFT
19. THIRD REDUCTION GEAR
20. RIGHT-HAND BEARING AND RETAINER

*Refer to (5 and 6, figure 5-70, Appendix) for AN/TGC-14A(V) configuration.

Figure 4-18. Printer 1A2, Main Shaft Assembly

and ribbon feed mechanisms receive motive power through printer helical gear (3) on the selector main shaft; the timing cam shaft receives motive power from start clutch gear (6), which is attached to the start clutch.

The selector main shaft contains, from left to right, printer helical gear (3), range adjustment gear segment (2), left-hand bearing and retainer (4), start clutch release (1), start clutch release adjustment setscrew (5), start clutch gear (6), number 3 lateral clutch and B cam (7), number 4 lateral clutch and C cam (8), number 5 lateral clutch and D cam (9), number 2 rotary clutch and E cam (11), and number 1 rotary clutch and F cam (12). The clutch and cam assemblies are identified by a stamped capital letter. The operation of the individual components of the selector main shaft are discussed in their appropriate functional descriptions elsewhere in this section.

The function main shaft, from left to right, contains print function clutch and G and H cam (14), line feed clutch and I cam (15), letters figures clutch and J cam (16), carriage return clutch and K cam (17), and third reduction gear (19). The cams of these clutches also have capital letters stamped on them for identification. These clutches are not released directly through the action of the selector as are the selector main shaft clutches, but are released when a particular function is selected by the function selector. The print function clutch and cam assembly consists of a clutch and two cams which rotate 180 degrees for each character printed or function selected. The clutch is released by a print function clutch release timing cam mounted on the timing cam shaft (figure 4-14, Appendix). The function cam starts the mechanical function selection cycle and the print cam operates the print hammer. The line feed clutch and cam assembly operates the line feed mechanism when line feed is selected. The letters figures clutch and cam assembly moves a cam follower and pulley carriage to position the print cylinder in one of two 180-degree positions, representing either letters or figures. The carriage return clutch and cam assembly is used to return the print cylinder and print hammer to the left margin. The mechanical systems controlled by the clutches on the function main shaft are discussed in appropriate paragraphs elsewhere in this section.

(5) PRINT CYLINDER POSITIONING SYSTEM. (See figure 4-19, Appendix.) - The coding of the incoming signal, as interpreted by the selector mechanism, determines the position of the five type positioning cams and their corresponding cam followers. Each cam follower can be left in one of two positions by its positioning cam as follows:

Number 1 Pulse Cam: High side for Mark/Low for Space
Number 2 Pulse Cam: High side for Mark/Low for Space
Number 3 Pulse Cam: Low side for Mark/High for Space
Number 4 Pulse Cam: Low side for Mark/High for Space
Number 5 Pulse Cam: Low side for Mark/High for Space

When the letter A is selected (mark pulse on 1 and 2, and space on 3, 4, and 5) all of the cam followers will be positioned on the high portions of their respective cams. Upon selection of the letter M (space pulse on 1 and 2, and mark on 3, 4, and 5), all of the cam followers will be on the low portions of their respective cams. Since each of the cam followers is connected to a carriage pulley, the high and low positioning of the cam followers positions the carriage pulleys. Therefore, the chains that pass through the carriage pulleys are effectively lengthened and shortened by the motion of the cam followers. In practice, pulleys number 1 and 2 control motion of the rotary chain and pulleys 3, 4, and 5 control motion of the lateral control chain.

In both the rotary and lateral systems, the various cam followers move different preset distances, allowing four possible combinations in the rotary system and eight combinations in the lateral system. Figure 4-20 illustrates the units of travel accomplished by each carriage pulley and how the various combinations can be established.

(a) ROTARY MOTIONS OF PRINT CYLINDER. - As shown in figure 4-19 (Appendix), the effect of the combination of number 1 and 2 pulses is transmitted through the rotary chain, rotary function slide, and rotary cable to the end of the shaft to which the print cylinder is keyed. The cylinder shaft is turned in one direction by the rotary spring and in the other by the rotary cable pulling against the spring. The stroke of carriage pulley number 1 is 3/32 inch and the stroke of carriage pulley number 2 is 3/64 inch. The stroke of the number 2 pulley is exactly half that of number 1 pulley, so that four evenly spaced rotary positions are possible as follows:

ROTARY POSITION	CAM FOLLOWER POSITION 1	CAM FOLLOWER POSITION 2	EFFECTIVE LENGTH OF ROTARY CABLE RELATIVE TO FIRST POSITION IN INCHES
I	High	High	First position
II	High	Low	3/16 longer
III	Low	High	3/8 longer
IV	Low	Low	9/16 longer

The developed view of the print cylinder (figure 4-21) shows the eight vertical (rotary) print cylinder positions. Four of the eight rotary positions correspond to letters; the other four correspond to figures. The letters figures cam follower and pulley system, as the pulley is moved to the high position for letters and low position for figures, determines within which group of four rows the subsequent rotary positioning will take place. The stroke of the pulley, through which the rotary cable passes, positions the print cylinder so that the subsequent selection will be within one of the two 180-degree segments of the cylinder.

(b) LATERAL MOTIONS OF PRINT CYLINDER. - The lateral motions of the print cylinder are similarly transmitted from the lateral control chain (figure 4-19, Appendix) through a transfer shaft, another length of chain, the lateral control function slide, and the lateral control belt to the print cylinder yoke. The actual strokes of the carriage pulleys are as follows:

Carriage Pulley Number 3 - 3/16 inch
Carriage Pulley Number 4 - 3/32 inch
Carriage Pulley Number 5 - 3/64 inch

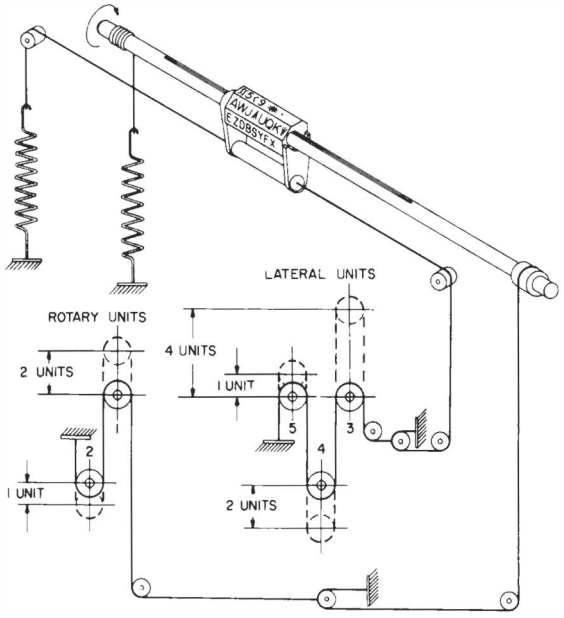


Figure 4-20. Print Cylinder Positioning Mechanism

Here again, the stroke for number 4 is twice that of number 5 and the stroke for number 3 is twice that of number 4, so that eight lateral positions are possible as follows:

LATERAL POSITION	CAM FOLLOWER POSITION 3	4	5	EFFECTIVE LENGTH OF LATERAL CONTROL CABLE RELATIVE TO FIRST POSITION IN INCHES
I	High	High	High	First position
II	High	High	Low	3/16 longer
III	High	Low	High	3/8 longer
IV	High	Low	Low	9/16 longer
V	Low	High	High	3/4 longer
VI	Low	High	Low	15/16 longer
VII	Low	Low	High	1-1/8 longer
VIII	Low	Low	Low	1-5/16 longer

(c) CHARACTER ADVANCE AND CARRIAGE RETURN. - Character advance is achieved by moving the print cylinder and print hammer space-by-space across the page. When the end of the line is reached, the print cylinder and print hammer are returned to the left side of the page.

Character advance is accomplished by the release of the function cam (figure 5-29, Appendix) and the subsequent rise of the function cam follower from the low side to the high side of the function cam. The function cam follower rising on the function cam rotates the character advance lever shaft assembly and the character advance pawl in a clockwise direction. As the function cam follower reaches the high side of the

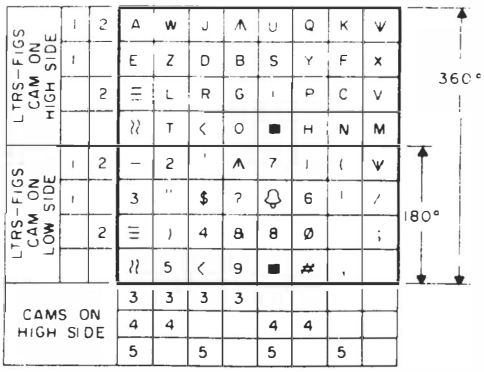


Figure 4-21. Print Cylinder, Developed View

function cam, the check pawl engages the teeth of the advance ratchet, preventing backward movement of the advance drum until the character advance pawl is again in position for the next cycle. As the function cam continues to rotate, the function cam follower falls to the low side of the cam, withdrawing the character advance pawl from the tooth previously engaged and the character advance pawl engages the next tooth on the character advance ratchet. The function cam continues to rotate to its stop position, leaving the function cam follower approximately one-third up the high side of the cam and the print cylinder advanced approximately one-half space.

As shown in figure 4-19 (Appendix), the lateral control belt, print hammer cable, and return cable originate in the advance drum. The advance drum is rotated by the action of the character advance pawl on the advance ratchet as previously described. As the advance drum rotates counterclockwise, the print hammer cable and lateral control belt advance the print hammer and print cylinder toward the right side of the page, tightening the carriage return spiral spring in the takeup drum. This advance continues across the page until, at a preset point, the advance ratchet and pawl system releases the advance drum and the spring-loaded takeup drum returns the print cylinder and print hammer to the left side of the page. The return cable serves to counteract the effects of inertia during carriage return by combining the rapid clockwise motion of the advance drum with the corresponding counterclockwise motion of the takeup drum.

(d) ISOLATION OF PRINT CYLINDER MOTIONS. - In the lateral direction, the print cylinder (paralleled by the print hammer) is subjected to simultaneous motions consisting of character advance (step-by-step) motions and type print motions. In addition, the print cylinder is subjected to two distinct rotary motions; the letters figures selection motions and the discrete type print positioning motions. Since simultaneous lateral or simultaneous rotary motions may be occurring, some method of isolation between these motions must be employed.

The lateral selection motions of the print cylinder are completely isolated from the step-by-step advance and carriage return motions by interposing the lateral control belt pulley (figure 4-19, Appendix) between the advance drum and the print cylinder to introduce lateral selection motion, and by interposing the belt pulley between the print cylinder and the takeup drum to bias the lateral selection motion of the print cylinder.

The rotary motions (letters figures and type positioning) of the print cylinder are completely isolated by interposing the rotary cable pulley (figure 4-19, Appendix) between the letters figures cam follower and the print cylinder shaft, and the use of a rotary spring on the end of the print cylinder shaft.

(e) OPERATION OF PRINT CYLINDER POSITIONING CAMS. - The selector interprets the sequence in which each of the five intelligence pulses is received and converts this series of electrical signals into mechanical motion. This is done by controlling the release of the print positioning cam clutches. Figure 4-22 (Appendix) illustrates the system of clutch release fingers, clutches, and cams controlled by the selector.

The system consists of a driven main shaft to which each of the print positioning cam clutches and the start clutch are capable of being coupled. The pair of release fingers straddling each clutch is capable of controlling the coupling of that clutch to the main shaft, and consequently of positioning the clutch in one of two 180-degree positions, corresponding to a marking or spacing pulse.

Each clutch is held in its mark or space position by one of the two clutch release fingers straddling it. Consequently, if in successive character cycles a given intelligence pulse is the same as in the previous cycle, the corresponding clutch remains stationary. For example, in a repeated RY combination, all clutches turn 180 degrees with each new character cycle because the mark and space combinations are exactly opposite for R and Y. In an RQ combination, however, the number 2 clutch will remain motionless because in both R and Q the number 2 is a marking pulse while all other clutches alternate between mark and space in changing from R to Q. (R has marking pulses on 2 and 4; Q has marking pulses on 1, 2, 3, and 5; Y has marking pulses on 1, 3, and 5.)

As described in paragraph 4-8c(2), more than one pair of clutch release fingers can be affected by the selector at one time. This would permit the wrong clutch to react to a specific pulse and would be completely incompatible with the time base concept of a sequential code. Therefore, the individual pairs of clutch release arms are freed to respond to the selector and release their clutches only during the period when their timing cams permit them to move outwards from the clutch. The timing cams are angularly displaced on a shaft which is gear-coupled to the main shaft through the start clutch. The first break in the neutral circuit (start pulse) through the selector releases the start clutch for 180 degrees rotation which, through the two-to-one gear ratio, drives the timing cam shaft 360 degrees. During this 360-degree turn of the timing cam shaft, each pair of clutch release arms is in turn freed to operate for a period of time corresponding to the pulse length at the appropriate operating speed. The print function clutch release finger is then freed to operate as the last action of the timing cam shaft.

The angular relationship between the timing cams and the stop position of the timing cam shaft (the time relationship between the start of the timing cam shaft and the sampling of the intelligence pulses) is adjusted by the range dial (range check) in order to orient the start clutch and the timing cam shaft in the best possible position in relation to the signal source. An exploratory check is made for the leading and trailing edges of the usable signal; then the unit is set to the midpoint. If a distorted signal is received, the mechanism is then adjusted for the usable portion of the signal.

(6) FUNCTION SELECTOR. - As shown in figure 4-19 (Appendix), the rotary and lateral control chains terminate at slotted plates. These plates, which are called rotary function and lateral control function slides, are used to select mechanical functions as distinguished from the normal printing of a character. The function slides are part of the function selector mechanism which serves to sense various mechanical functions and select the particular function to be performed. Through movement of the five pulley carriages, various combinations of marking and spacing pulses will cause the function slides to move in lateral directions in relation to each other and to the front of the printer. In figure 4-23, the slots in the rotary function and lateral control slides are arranged so that a particular combination of pulses will align a pair of slots in the two slides at a point directly opposite a function sensing finger lever and permit the sensing finger lever (figure 4-19, Appendix) to engage the slots. A sensing finger lever will engage the two slots only momentarily to sense the mechanical function requested and will then be pushed out. A separate function sensing finger lever is provided for sensing each of the mechanical functions shown in figure 4-23. After sensing the mechanical function established by positioning the rotary function and lateral control function slides, the function selector engages the appropriate clutch on the function main shaft to perform the function. The particular combination of incoming pulses required for different functions of the mechanical results are listed in table 4-7 (Appendix).

The function sensing finger levers (figure 4-24, Appendix) are spring biased against the function slides and consequently will fall into a pair of properly aligned slots if not otherwise prevented. The function bar is supported by two arms and pivots on the character advance lever shaft, describing an arc tangent to the edge of the function sensing finger levers. The character advance lever shaft to which the lifter arm is clamped also supports the function cam follower; therefore, the function helical spring tends to hold the function cam follower against the function cam.

(a) START OF FUNCTION CYCLE. - In figure 4-24 (Appendix), the function cam shown is part of the print function clutch which has two cams; a print cam and a function cam. The print function clutch (on the function main shaft) is normally released or engaged at the same time as the number 5 clutch on the selector main shaft (during every character translating cycle, regardless of the pulse arrangement received). The print function clutch is released by a clutch release arm operated by the print function timing cam, which is located on the same timing cam shaft as the selector timing cams.

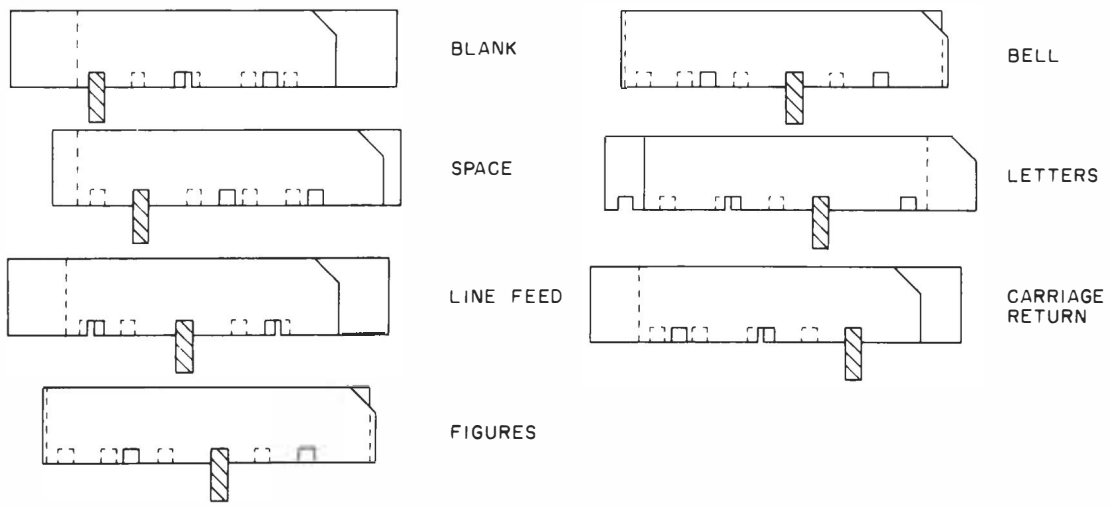


Figure 4-23. Rotary Function and Lateral Control Function Slides, Function Positions

When the print function clutch is in the stop position (disengaged from the function main shaft), the function cam follower is positioned approximately one-third of its movable distance upward on the function cam. Upon its release simultaneously with the receipt of the number 5 pulse, the print function clutch and cam combination rotates, moving the function cam follower toward a higher position. This movement rotates the character advance lever shaft and raises the function lever lifter arm which in turn raises the function bar beyond the tops of the function sensing finger levers. One finger lever is then permitted to fall into a pair of slots (in the rotary function and lateral control function slides) that are aligned by a particular combination of received pulses. During the time the function cam follower is rising on the function cam, positioning of the function slides has been completed and the function slides are stationary. After a function sensing finger lever has been permitted to fall into a pair of slots, the function cam follower drops off the high side of the function cam to the lower side. This allows the function helical spring and the function helical spring yoke link to pull the function bar downward, clearing the function sensing finger levers. The relationship of the function bar to the function sensing finger levers is such that the bar will hit the top of any sensing finger lever already in a pair of slots but will deflect outward toward the bottom of the printer any sensing finger levers which have not fallen into the slots. Only the single function which has been selected by the incoming pulse train can be operated.

(b) COMPLETION OF FUNCTION CYCLE. (See figure 4-25, Appendix.) - Any function sensing finger lever which has been selected to perform a function will be driven toward the rear of the printer by the function bar. This motion of the lever moves the function clutch release arm (to which it is pivotally connected and introduces its individual function, as will be described in succeeding paragraphs. The motion of the function bar continues byyond the point at which the function is performed. This additional motion pushes the inner surface of the function sensing finger lever against a rod, camming the function sensing finger lever outward until it is kicked out from under the bar and is returned by its spring to the original sensing position. The function bar, after reaching its low point, is raised again about one-third by the function cam follower, at which time the print function clutch reaches its stop point and the cycle is completed. When no function is selected, the function bar rises, falls, and then rises part way again on the character cycle, merely deflecting all of the function sensing finger levers slightly outward. When, however, a function is selected, one particular function sensing finger lever will fall under the bar, be pushed toward the rear of the printer to release its clutch or otherwise perform its function, and then be cammed out to return to the waiting position.

(c) BLANK FUNCTION LINKAGE. (See figure 4-26.) - A combination of printing suppression and

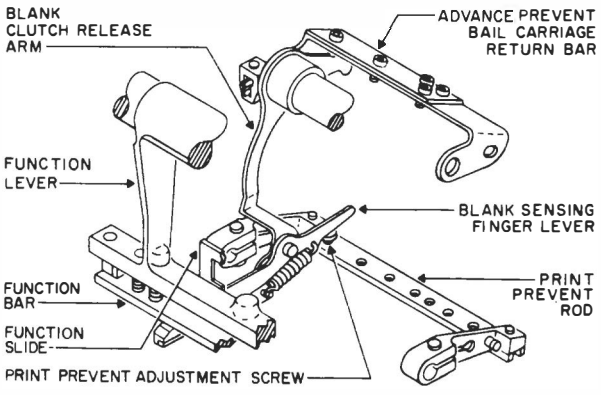


Figure 4-26. Function Selector, Blank Linkage

character advance suppression results from a blank function. The spring action of the blank function sensing finger lever falling into aligned slots in the function slides moves the rear end of the sensing finger lever outward, moving the spring-loaded print prevent rod with it. This positions the print prevent rod so that it blocks the print prevent arm and suppresses printing. The stroke of the sensing finger lever, caused by the function bar, pivots upward the blank clutch release arm to which the blank sensing finger lever is pivoted, contacting one of the adjustment screws on the advance prevent bail and pushes up the advance prevent bail; therefore, printing and advancing are prevented.

(d) SPACE FUNCTION LINKAGE. (See figure 4-27.) - The space function combines the advance function and print suppression. The space function sensing finger falls into the slides and moves the print prevent rod outward without moving the advance prevent bail. Printing will be suppressed, but advance will take place.

(e) BELL FUNCTION LINKAGE. (See figure 5-35, Appendix.) - Unlike other non-printing functions, bell can be selected only when the machine has been put in figures position. The bell prevent lever tab is affixed to the letters figures cam follower so that it prevents the bell sensing finger lever from falling into the slots in the function slides when the machine is in letters position. Operation of the bell sensing finger lever and the bell advance suppression arm prevents printing and advance in the same manner as the other functions. The bell advance suppression arm in this case does not release a clutch, but terminates in an arm to which the bell actuator connecting rod is attached. As the bell advance suppression arm moves it pulls the bell actuator connecting rod, causing the clapper to move away from the bell. As the bell sensing finger lever is cammed out, the bell advance suppression arm returns to its rest position, permitting the clapper to move rapidly towards the bell. As a result of its overtravel, the clapper then strikes the bell.

(f) LETTERS FIGURES FUNCTION LINKAGE. (See figure 4-28, Appendix.) - The letters figures functions operate a common clutch, each function capable of releasing the clutch for a 180-degree rotation. Print and advance prevention take place for either as described for the blank function, with the function clutch release arms serving as clutch releases for the common clutch. Therefore, if the clutch is resting in letters position, repeated letters selection will not release it, but a figures selection will permit a 180-degree rotation. The letters figures cam follower transmits its motions through a torque shaft to its arm and carriage pulley. The motion of the cam follower positions the letters figures pulley in one of two positions, thereby effectively shortening or lengthening the rotary cable the equivalent of 180 degrees on the print cylinder. In practice, the letters position has the cam follower on the high side and the cable is effectively shortened.

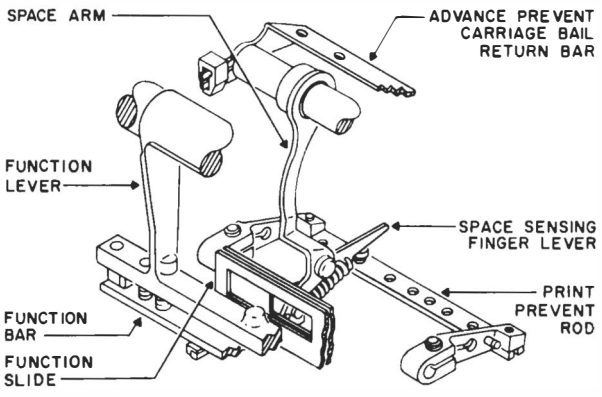


Figure 4-27. Function Selector, Space Linkage

(g) LINE FEED FUNCTION LINKAGE. (See figure 4-28A, Appendix.) - Line feed consists of print and advance suppression as well as a positive mechanical action. In this case, print and advance suppression are as described for the blank function. In addition to advance suppression, the line feed clutch release arm releases the line feed clutch which allows a 180-degree rotation of the line feed actuator cam follower arm affixed to it. The line feed actuator cam follower arm transfers its motion through a torque tube to the line feed pawl which moves the paper feed ratchet.

The change from double to single line feed is accomplished by positioning the line feed shift arm. Setting the line feed shift arm for single space moves the arm closer to the pawl teeth and holds the line feed pawl away from the ratchet so that only the second tooth engages.

(h) PRINTING ACTION. (See figure 4-29.) - The print cam is affixed to the same clutch as the function cam. This clutch is released once every character cycle, regardless of the combination of pulses received. The release of the print function clutch rotates the print cam and moves the print cam follower, which is spring-loaded against the cam by the print spring arm. The print spring arm is attached to the print lever shaft.

When printing is to be performed, the print cam follower will fall off the high portion of the cam (shortly after the function cam follower falls), rotating the print lever shaft and moving the terminal lever. This motion is transmitted through the print hammer actuator link to the print hammer shaft and thence to the print hammer. The print hammer release is moved with the terminal lever, forcing the print hammer actuator link away from the terminal lever just before print hammer impact. The inertia of the print hammer, however, is sufficient to complete the printing stroke although the driving force has been released.

(i) PRINT PREVENTION. (See figure 4-30.) - When a non-printing function is selected, the function sensing finger lever pushes out the spring-loaded print prevent rod. The pivoting action of the print prevent rod moves the print prevent rod lever under the print prevent arm, which just clears it when the print cam follower is on the high portion of the cam. There is a small step in the print cam, to which the print cam follower drops just prior to the fall of the function cam. This slight step allows time to lock the print prevent rod lever under the print prevent arm if a non-printing function is being selected. The function bar action precedes the final drop in the print cam in order to store the print or no-print action until the print cam follower drops.

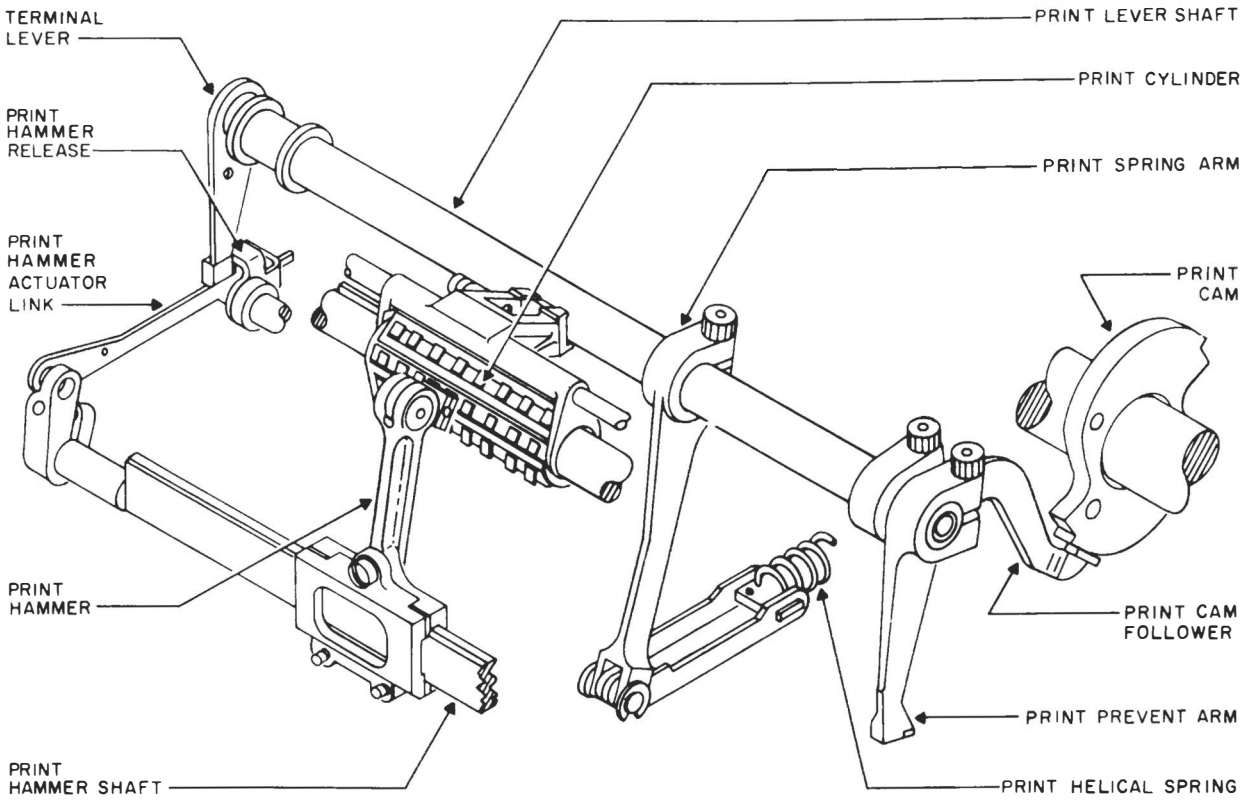


Figure 4-29. Function Selector, Character Printing Linkage

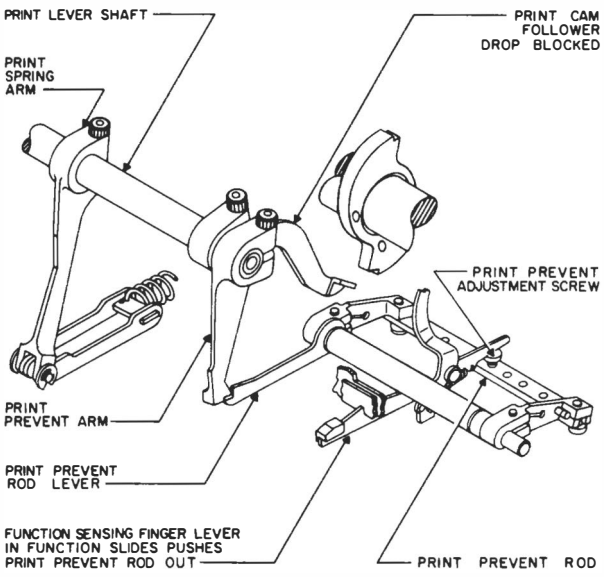


Figure 4-30. Function Selector, Print Prevent Linkage

The positioning of the print prevent lever beneath the print prevent arm blocks the final drop of the print cam follower, thereby preventing printing. The rising of the print cam follower on the next character cycle frees the print prevent lever. The print prevent rod will then be spring-returned to its sensing position. If desired, printing can be permitted on functions by disabling the print prevention linkage; the various function symbols will then be printed.

(j) CHARACTER ADVANCE PREVENTION. (See figure 4-31, Appendix.) - Character advance prevention takes place for all functions except space. The function clutch release arms (by contacting the advance prevent adjustment screws) move the advance prevent bail, which is affixed to the carriage return cam follower, upwards slightly. This motion is equivalent to about one-half the upward motion that is induced by the carriage return cam. This motion is transmitted through the carriage return shaft to the carriage return lever, whose motion is sufficient to withdraw the character advance pawl and engage it on the advance suppression latch but is not sufficient to release the check pawl. Consequently, advancing is prevented without permitting carriage return. If desired, character advance on functions may be allowed by disabling the character advance prevention linkage.

(k) CARRIAGE RETURN FUNCTION LINKAGE. (See figure 5-29, Appendix.) - Carriage return com-

bines print prevention and simultaneous action by the carriage return clutch release arm to release the carriage return clutch and cam. The rising motion of the carriage return cam moves its follower away until the carriage return lock lever intersects the notch in the carriage return cam follower. Movement of the cam follower rotates the carriage return shaft and lever, resulting in a downward motion of the check pawl link and advance prevent lever. This motion disengages the check pawl and character advance pawl from the advance ratchet until carriage return is completed. As the carriage return cycle is completed, the stop pin on the inner face of the advance ratchet strikes the V lever, which in turn rotates the lock lever actuator arm, disengaging the lock lever from the notch in the carriage return cam follower.

(l) AUTOMATIC CARRIAGE RETURN AND LINE FEED. (See figure 4-31A, Appendix.) - Automatic carriage return and line feed are provided at the end of any line if carriage return has not been signaled to the machine. Function sensing finger levers similar to the other function sensing finger levers are provided for these two functions. However, these levers do not actually sense the slide alignment but are spring loaded so that they tend to fall beneath the function bar regardless of the position of the function slides. This action is prevented, however, by the automatic carriage return and line feed actuator arm assembly which is affixed to the V lever shaft. The arm assembly and shaft are spring loaded against the automatic carriage return and line feed sensing finger levers in such a manner that the bias springs pulling or lifting the levers beneath the function bar are overcome. When the advance drum reaches the end of the line with no carriage return signal, the stop pin mounted on the drum pushes against the V lever, overcoming the shaft spring and turning the shaft. This relieves the pressure on the two function sensing finger levers through action of the automatic carriage return and line feed actuator arm on the actuator assembly. These levers fall beneath the function bar on its next stroke. Release of the carriage return and line feed clutches is effected by the pivoting action of their respective backstop clutch release arms.

(m) OFF LINE FUNCTION INTRODUCTION. (See figure 4-32.) - Off line function buttons are provided on the printer front cover to introduce, through appropriate linkage, off line functions of line feed, figures, letters, and carriage return into the printer. These functions, while operating only on the local printer, do not electrically affect the signal line or the selector, and thus can be introduced while receiving copy. With the exception of letters, the off line function buttons operate levers which push the function backstop clutch release arm in and release the appropriate clutches. Since the function sensing finger levers do not fall into the function slides in off line function selection, there is no print prevention motion. However, the motion of the function clutch release arm does prevent character advance, and printing will take place since the printer is receiving intelligence.

In the case of letters, there is a theoretical possibility that the release of the letters clutch at the wrong time may jam the machine. Therefore, the manual introduction of letters is accomplished differently. The letters off line function button moves a slide inward, camming a leaf spring against a sensing finger

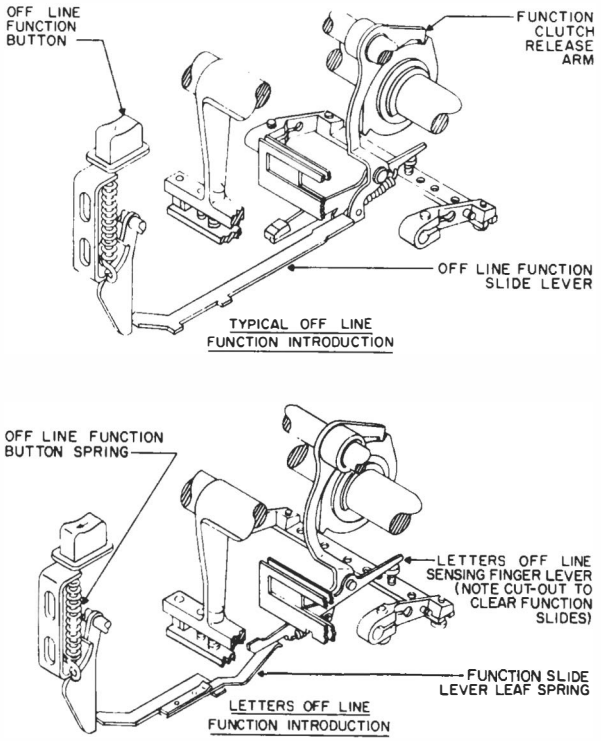


Figure 4-32. Function Selector, Off Line Function Control Linkage

lever. This lever is urged against the function bar, beneath which it falls when the bar is at its high point. The lever falls under the function bar without interfering with the function slide and is driven downward by the bar, pivoting the function clutch release arm and releasing the letters clutch. In this manner, the off line introduction of letters is timed to the normal stroke of the function bar.

(7) AN/TGC-14(V) FIGURES H MOTOR STOP FUNCTION. (See figure 5-55, Appendix.) - This function can only be selected when the equipment is in the figures position and the H key has been depressed. Unlike the bell function which results in print and advance suppression, this function does not prevent printing and advancing.

Figures H is represented by the character #. When figures H is selected, the character # will be printed and the printer will then operate in a steady marking or standby condition until the next mark-to-space transition. Actual stopping of the printer motor is accomplished both mechanically and electrically. The mechanical system used is illustrated in figure 5-72 (Appendix). The mechanical components are mounted on top of the printer front frame assembly and the figures H motor stop switch is mounted on the rear frame assembly.

As shown in figure 5-55 (Appendix), the code bar and code bar extension are operated by the combined action of carriage pins 1, 3, 4, and 5, the code bar return stop, and the character advance lever shaft

assembly. During printing functions, the spring-loaded code bar and its extension are released by the character advance lever shaft and simultaneously blocked by the code bar return stop and one or more of the carriage pins. Upon initiation of the next printing function, the character advance lever shaft moves the code bar and extension to the right and away from the carriage pins and code bar return stop. The carriage pins and the return stop are then repositioned in preparation for the next character to be printed, and the code bar is again released by the character advance lever shaft. When the FIGS key is depressed, the high portion of the letters figures cam is positioned under the code bar return stop cam follower, and the code bar return stop is moved away from the code bar. The code bar, however, is still blocked by one or more of the carriage pins and will continue to be blocked until the H key is depressed. Upon depression of the H key, carriage pins 1, 3, 4, and 5 drop down and carriage pin 2 moves up, allowing the code bar to move to the left, approximately halfway across carriage pins 1, 3, 4, and 5, to actuate the stop switch. When the stop switch is actuated, a relay holding circuit is set up in the line sensor to prevent motor operation until the next start pulse is received.

(8) AN/TGC-14A(V) AUTOMATIC TIME DELAY MOTOR STOP FUNCTION. - The automatic time delay motor stop mechanism (figure 5-54, Appendix) is a controlled system of ratchets, pawls, and a switch which operates a relay control circuit to turn off the motor assembly after either a 60-second (75 baud) or 90-second (45.45 baud) period of inactivity (no mark-to-space transition). The printer is thus placed in stand-by condition.

NOTE

The electrical circuit is identical to the AN/TGC-14(V).

The time delay motor stop mechanism consists of an adapter assembly, a feed pawl assembly, a check pawl assembly, a time delay mounting base plate assembly, a cam shaft extension, a guide, and several springs. The pawl assemblies are spring-connected to the time delay mounting base plate assembly, which is secured to the printer. The springs keep the pawls engaged with their associated ratchets on the ratchet support shaft of the plate assembly. For each revolution of the ratchet support shaft, the feed pawl rotates the reduction ratchet one tooth clockwise; a secondary check pawl, located on an eccentric above this ratchet and spring-connected to the plate, checks the reduction ratchet.

The reduction ratchet has a deep tooth every ninth tooth. When the feed pawl enters a deep tooth, its wide tip also engages a tooth of the advance ratchet and stud assembly on the ratchet support shaft, moving it clockwise one tooth. Then a spring-connected check pawl assembly holds this advanced position of the advance ratchet.

On its outer face, the advance ratchet contains a spring post and a button, approximately 180 degrees apart. The spring post secures one end of a return spiral ratchet spring whose other end is held in a slit of the support shaft tip. As the advance ratchet and stud assembly is advanced tooth-by-tooth during a speed reduction process (advance ratchet moving one tooth for every nine of the reduction ratchet) the return spiral spring is wound on the support shaft. The stud on the advance ratchet travels around clockwise to engage and push a lug on a yoke pivoted on the support shaft, moving the yoke approximately 45 degrees.

As the U-shaped yoke pivots through this distance, a long finger on the yoke moves clockwise against a roller on the switch actuator, closing switch 1A2A1S1. This energizes the motor stop relay which shuts off the teletypewriter motor; the holding circuit provided by transistor Q2 holds the relay energized until the next mark-to-space transition. At the same time, an arrowhead on the rear arm of the yoke overrides a roller on the end of a detent spring, providing tension to insure good switch contact. Then, a lug on the outer yoke arm moves a latch pivoted on the support shaft sufficiently to push the check pawl assembly away from and out of engagement with the advance ratchet.

The feed pawl is disengaged from the reduction ratchet when retracted by eccentric action of the shaft on the main shaft drive adapter assembly as the printer helical gear turns. Under these conditions, the advance ratchet, now free, snaps back counterclockwise due to tension of its return spiral spring coming to rest. In so doing, the button on this ratchet moves the yoke back counterclockwise so that the yoke finger allows the spring pressure switch to open; the yoke arrowhead overrides the roller of the detent spring assembly, and the yoke lug swings back the pivoted latch to release the check pawl assembly. Then, the check pawl springs back to reengage the advance ratchet for the start of another cycle.

The complete cycle for shutting off the motor (beginning with the eccentric action of the adapter, the closing of the pressure switch by the yoke, and the subsequent resetting of the mechanism by the return spiral spring) consumes approximately 60 to 90 seconds, depending on the speed change gear used. Furthermore, this cycle can be completed only if no mark-to-space transition is sent or received by the teletypewriter during this interval. This is due to the governing action of a cam shaft extension, which is a partly open sleeve on a hexagonal base secured to the timing cam shaft assembly. When the cam shaft rotates, the open plane of the sleeve is brought parallel to, and clear of, the feed and check pawls during every 180 degrees of cam shaft revolution. This allows these pawls to contact their ratchets. During the remaining 180 degrees of cam shaft revolution, the half-sleeve of the extension is brought toward the pawls, and the sleeve outside diameter cams the pawls away from the ratchets, preventing ratchet operation.

Whenever the teletypewriter set is sending or receiving, the cam shaft and its extension make many revolutions during a 60-second interval. Hence, the mechanical cycle required to operate the automatic motor stop time delay mechanism can never be completed, and the mechanism remains inoperative. When a lapse in sending or receiving occurs which is sufficiently long to permit completion of this cycle (about 60 to 90 seconds), the open part of the extension sleeve ultimately lines up in a plane parallel to the pawls and remains in this plane. Hence, the pawls can feed and check the ratchets to operate the mechanism which

closes the motor stop circuit to deenergize the teletypewriter motor. The motor is turned on again electrically when the first incoming character is received or when a break is sent to the signal line, thus causing a mark-to-space transition which in turn causes the associated electronics to energize the motor.

(9) RIBBON FEED MECHANISM. (See figure 4-33.) - The ribbon feed mechanism (located under the paper guide plate), automatically advances and reverses the direction of the ribbon. Motive power is supplied from a gear on the selector main shaft and the ribbon feed slip clutch, which transfers power through a worm gear assembly to a clutch and cam mechanism. Direction of ribbon travel is determined by that intermediate drive gear (left or right) which is engaged with its associated ribbon spool drive gear. Automatic ribbon reversal is accomplished when the ribbon eyelet touches a ribbon reversing sensing arm and moves it in an outboard direction. This results in pulling on a wire link which is attached to a clutch stop (left or right). The clutch stop releases the clutch, permitting it and its associated cam to rotate 180 degrees. A reversing cam follower is pivoted on a ribbon reversing slide plate; rotation of the cam associated with the clutch causes the slide plate to disengage the movable ribbon spool drive gear from its matching intermediate drive gear and engage the opposite ribbon spool drive gear, thus reversing the direction of ribbon travel. If the gears do not mesh during reversal, the spring-loaded pivoted cam followers are deflected long enough to allow correct meshing to be established. If after the gears do mesh and the load is too great, the friction clutch on the ribbon feed drive mechanism will slip and prevent an overload condition from being placed on the mechanism. Instead of a slip clutch, some models have a shearpin across the worm hub for overload protection. There are two vibrator ribbon guides, one on each side of the front plate. These vibrator guides move the ribbon upward in front of the print hammer each time the print hammer performs a printing stroke.

(10) PRINTER MOTORS. - There are two types of motors which are available with the teletypewriter set; Alternating-current Motor PD-82/U and Alternating-current Motor PD-83/U. These motors are of the hysteresis-synchronous type. They require a capacitor in series with a stator winding to provide phase shift for directional starting and running. Alternating-current Motor PD-82/U requires 115-volts alternating current, 60-cycles per second primary power; Alternating-current Motor PD-83/U requires 115-volts alternating current, 400-cycles per second primary power.

NOTE

Motor pinion gear speed should be 3600 rpm for both 115 vac, 60 cycle and 115 vac, 400 cycle motors. Frequency can vary ±5% (57 to 63 cycles per second for the 115 vac, 60 cycle motor and 380 to 420 cycles per second for the 115 vac, 400 cycle motor); however, distortion is greatly increased with any change in frequency.

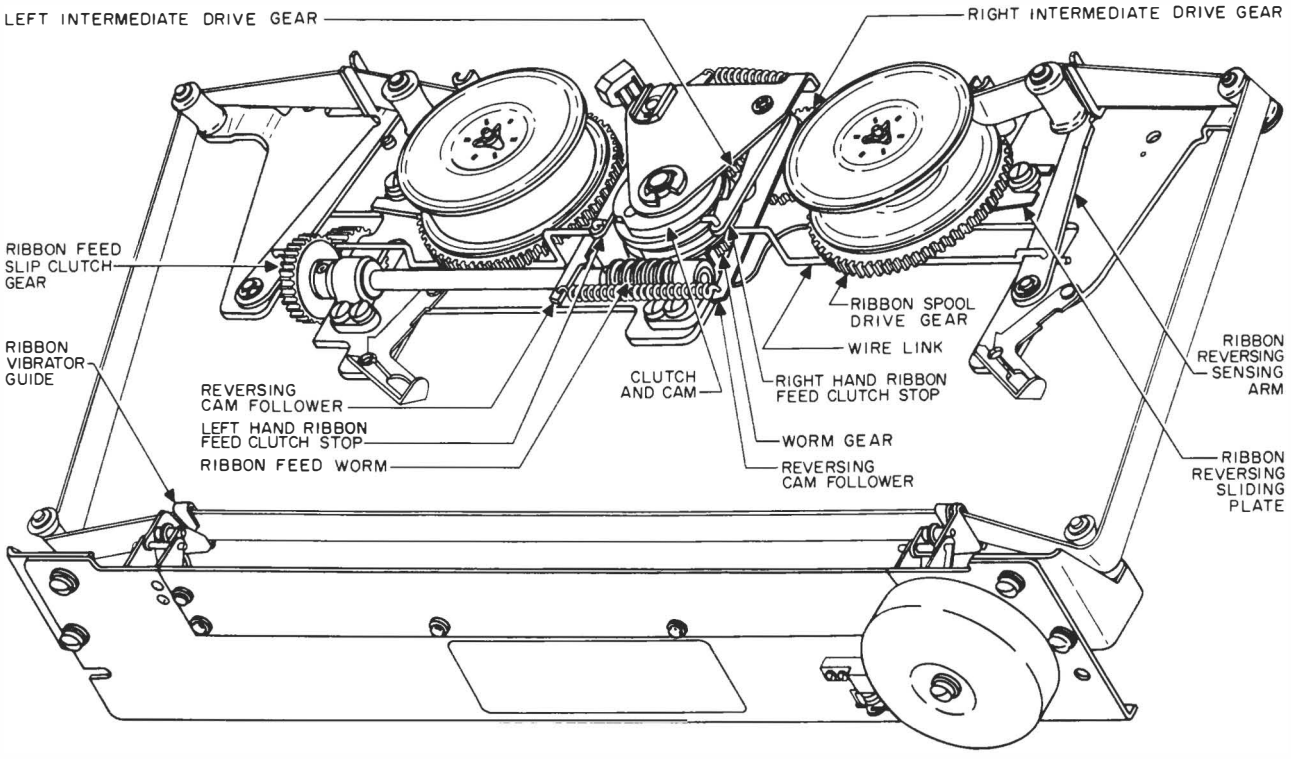


Figure 4-33. Ribbon Feed Mechanism

d. PRINTER TROUBLE-SHOOTING PROCEDURE. - Refer to table 4-8 (Appendix) or figure 4-5 (Appendix) for the printer trouble-shooting procedure. Refer to figure 4-34 (Appendix) for location of test points.

4-9. POWER SUPPLY AND DISTRIBUTION FUNCTIONAL SECTION TROUBLE SHOOTING.

a. GENERAL. - The power supply and distribution functional section contains basically electrical chassis 1A1, signal line power supply 1A4, service cable 1A5, and their associated circuits.

b. SIGNAL LINE POWER SUPPLY THEORY OF OPERATION. - Signal line power supply 1A4 (figure 4-35) functions as a source of direct-current signal line current for the operation of the local teletypewriter equipment or as an external signal line current source for other equipment requiring currents not exceeding 100 milliamperes at 26 volts direct current and a floating ground. The input to the power supply is 115 volts alternating current, either 60 or 400 cycles per second, single phase. The power supply consists of a power transformer capable of operating on either 60 or 400 cycles per second, a conventional full-wave bridge rectifier, and a resistance-capacitance filter network. With the exception of transformer T1, the components are mounted on a printed-circuit board. Power transformer T1 is a step-down transformer applying 33 volts alternating current across the rectifier formed by diodes CR1 through CR4. After filtering, the output voltage across bleeder resistor R2 is 26 volts direct current at 100 milliamperes of load current. The negative side of the power supply is returned through the outside signal loop (when used) through LINE ADJUST control 1A1R2. This control is used to adjust the signal line current on the equipment supplying line battery.

c. SIGNAL LINE POWER SUPPLY TROUBLE-SHOOTING PROCEDURE. - Refer to table 4-9 (Appendix) or figure 4-5 (Appendix) for the signal line power supply trouble-shooting procedure.

d. ELECTRICAL CHASSIS TROUBLE-SHOOTING PROCEDURE. - Refer to table 4-10 (Appendix) or figure 4-5 (Appendix) for the electrical chassis trouble-shooting procedure.

4-10. VOLTAGE, CURRENT, AND RESISTANCE MEASUREMENTS.

CAUTION

Perform continuity checks only on completely deenergized equipment. Make certain that there are no transistors connected indirectly into the circuit under test. Disconnect the unit under test from the equipment so that the transistor circuits are completely isolated.

Table 4-11 (Appendix) provides typical operating voltages and currents for the various components of the teletypewriter set. Unless otherwise indicated, voltage measurements are taken with respect to ground (chassis). Since this equipment uses transistor circuits, the only resistance measurements which should be made are those for determining continuity in circuits other than the transistor circuits.

4-11. SIGNAL DISTORTION IN TELETYPEWRITER SYSTEMS.

a. GENERAL. - Teletypewriter signals, as well as all direct current signals, are subject to distortion. This distortion may be caused by the line facilities, natural and man-made electrical disturbances, crossfire, or sporadic changes of operating speed at either the local or remote station. A possible cause of distortion would be to operate at a high transmitting speed into a long-line circuit, thereby resulting in the line current not reaching its steady-state value during the marking interval because of the inherent resistance and capacitance of the circuit.

The types of distortion (expressed in percent of a unit pulse) are classified as bias distortion, characteristic distortion, fortuitous distortion, and end distortion.

b. BIAS DISTORTION. - Bias, which is the simplest and common component of distortion, may be either marking (positive) or spacing (negative). Marking bias appears as a uniform lengthening of all of the marking pulses, and an equal uniform shortening of all of the spacing pulses. Spacing bias appears as a uniform shortening of all of the marking pulses, and an equal uniform lengthening of all spacing pulses. Zero bias is that state in which the marking pulses are equal in length to the spacing pulses.

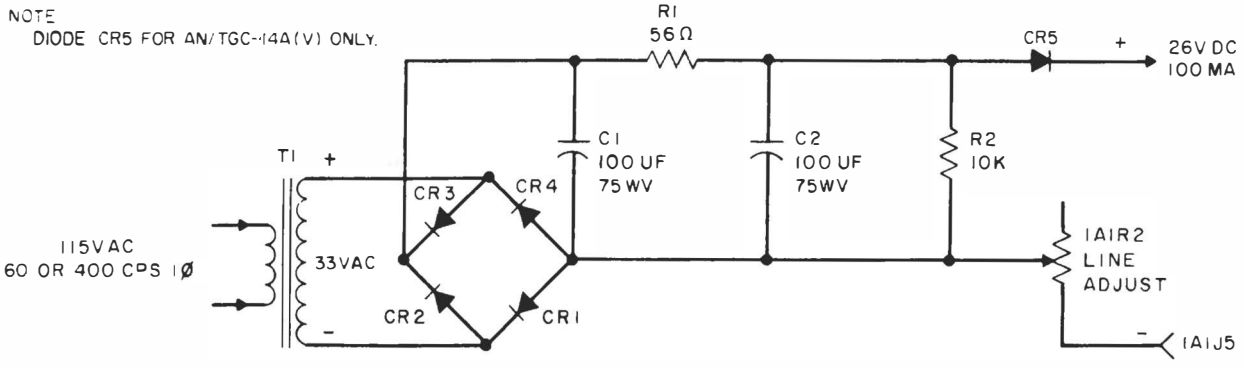


Figure 4-35. Signal Line Power Supply 1A4, Simplified Schematic Diagram

Bias is caused by an improper relation between the levels at which the selector or other receiving device responds and the steady-state marking and spacing levels of the signal. This condition is caused by the presence of inductance and capacitance in the circuit, changes in the value of current, and improper values of operate and release currents of the receiving device. The value of current in the selector which causes the armature to pull up is called the operating current of the selector. The value of current which causes the armature to fall back is called the release current of the selector. The release current is smaller in value than the operating current.

These values are indicated on the waveshapes in figure 4-38 as the points O and R. The duration of the signal repeated by the armature is the time T. In the theoretical waveshape shown in A, the operation and the release of the armature take place immediately upon the transmission and completion of the impulse. The operating time T is exactly equal to the duration of the pulse. B, C, and D show the waveshapes received over lines of different transmission characteristics, and the effect of waveform distortion on operating time.

In B, points O and R have been delayed because of the time T required for the current to reach the operating and release value. In C, the points O and R have been delayed even more, and by unequal amounts, because an increase in the inductance in the circuit causes the current to build up and decrease more slowly. In D, the points O and R are at greater values because the tension of the spring holding the armature in place has been increased, requiring the current to have a greater value for the armature to pull up. Here, also, there is a time delay before the armature operates. Note that in B, C, and D operating time T, during which the armature repeats the signal, may be different from the duration of the transmitted pulses. Positive bias, the increase of the marking pulse, is illustrated in C. Negative bias, the decrease of the marking pulse, is illustrated in D. It is the unequal delay of the operating time T, that causes bias distortion.

c. CHARACTERISTIC DISTORTION.

(1) GENERAL. - Characteristic distortion is best defined in terms of its major properties. First, the distortion takes place when there is a transition, not from a steady-state marking or spacing current as in bias distortion, but from a changing current, because the steady-state value has not yet been reached. Second, it is a distortion of the transmitter pulses that is characteristic of the inductance, capacitance, and resistance of a particular circuit. For some other circuit with different circuit constants, the amount of characteristic distortion is different. Finally, the form of the distortion does not change in sign or magnitude when the marks and spaces are interchanged.

(2) NEGATIVE CHARACTERISTIC DISTORTION. - Waveshape A, figure 4-39, shows a theoretically perfect waveshape; waveshape B shows the same waveshape in which the steady-state value of current is not attained during the short pulse following a long pulse because of the characteristics of the line. The first marking pulse is a long one, allowing the current

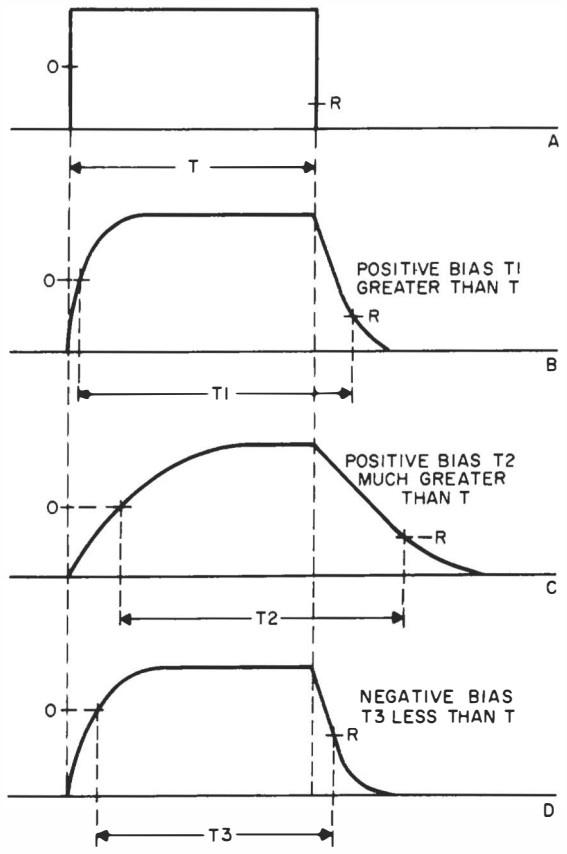


Figure 4-38. Effect of Series Inductance on Pulse Lengths

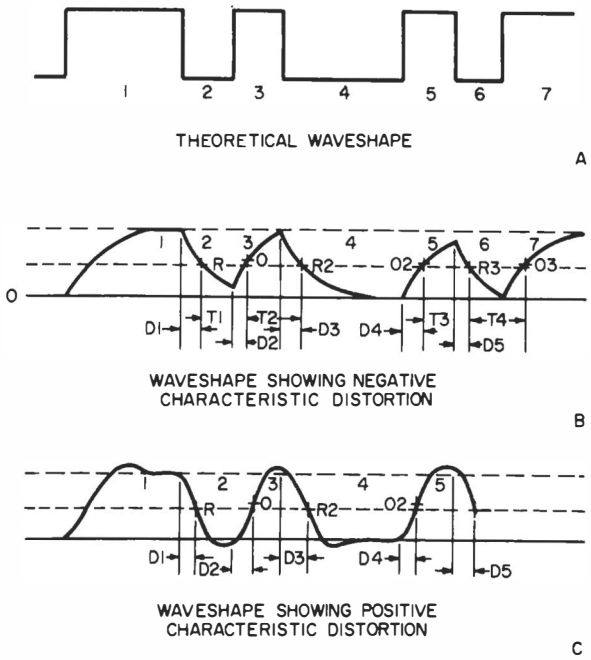


Figure 4-39. Waveshapes Showing Characteristic Distortion

to reach its steady-state value. The duration of the first space pulse is not long enough to allow the current to decrease to its zero steady-state value before the following space-to-mark transition. During interval 3, the current builds up to approximately the steady-state value before the mark-to-space transition for interval 4. The effect on the short pulse (interval 2) after a long pulse (interval 1) is to shorten it. The time delay from the mark-to-space transition and the point of the armature release at R (shown by D1) is greater than the time delay from the space-to-mark transition and the armature operating at O (shown by D2). The short pulse (interval 2) is shortened because the armature operation is delayed less after the short pulse than after the long one. This is shown in B where T1, the duration of short pulse 2, is shorter than T2, the duration of short pulse 3.

The current during pulse 4 decreases to its zero steady-state value before the space-to-mark transition of pulse 5 which is a short pulse. The current again does not reach the steady-state value before the mark-to-space transition of pulse 6. The current decreases to approximately the zero steady-state value during interval 6 before the space-to-mark transition of pulse 7. The time delay from the space-to-mark transition of pulse 5 to the operation of the armature at point O2 (shown by D4) is greater than the time delay from the mark-to-space transition of pulse 6 to the release point of the armature at point R3 (shown by D5). Thus, the short pulse again is shortened. This is apparent from B where T3, the duration of short pulse 5, is shorter than T4, the duration of short pulse 6. The effect of negative characteristic distortion is to shorten the short pulse after a long pulse, and this is true whether the pulse is marking or spacing.

(3) POSITIVE CHARACTERISTIC DISTORTION. - The effect of positive characteristic distortion is to lengthen the short pulse after a long pulse. This effect is caused by the operation of the armature being delayed less after a long pulse than after a short one. This is true whether the pulse is marking or spacing. Waveshape C shows a wave in which the current overswings the steady-state value and fails to return to the steady state within the duration of the shortest pulse. During the first long pulse, the current rises above the steady-state value but decreases approximately to the steady state before the first mark-to-space transition. During short pulse 2, the current decreases below the steady-state value and fails to return to it before the space-to-mark transition of pulse 3. During pulse 3, the current overshoots the steady-state value and does not complete the return to it during the pulse. With this condition D1 (the time delay between the transition and the armature release) is less than the time delay of the operation of the armature which is shown by D2. As a result, the duration of the short pulse 2 after the long pulse 1 is increased.

Since the time interval of D4 is less than the time interval of D5, the length of the short marking pulse 5 after the long spacing pulse 4 is also increased. When a short pulse is lengthened after a long pulse, while the pulse is marking or spacing, the effect is known as positive characteristic distortion.

If a wave performs a damped oscillation before settling to a steady state, it is possible that it will produce a negative characteristic effect on certain transitions and a positive characteristic effect on others. Because characteristic distortion is dependent on the previous history of the signal, it is referred to as inter-symbol interference.

d. FORTUITOUS DISTORTION. - In comparison with bias and characteristic distortion, both of which are systematic forms of distortion (that is, they occur in the same way at all times) fortuitous distortion causes the lengths of the received impulses to vary in an erratic manner. The reason for this is simply that the causes of fortuitous distortion do not occur in any regular way. The causes are the chattering or sparking of relays; paralleling telegraph circuits and the crossfire introduced by these circuits; natural causes such as lightning; paralleling power lines; and intermittent shorts, opens, and grounds on the transmission line.

e. END DISTORTION. - End distortion of start-stop teletypewriter signals is the shifting of the end of all marking pulses from their proper positions in relation to the beginning of the start pulse.

4-12. TRANSMITTER CONTROL CIRCUITRY.

Placing the SEND. REC-REC switch in the SEND. REC position completes the transmitter control (XMI TR) circuit through chassis connector pins L and M and the XMTR binding posts on the service cable to the remote equipment, turning it on. The addition of an RF filter comprised of two capacitors (100 picofarad, 500 working volts) in the XMTR control circuit connected across the line with a terminus to ground, prevents transmitter RF energy from reaching the teletypewriter chassis. The Ground binding post on the service cable permits grounding of the teletypewriter and the remote equipment, reducing RF interference to the equipment. Refer to Table 4-10A, Transmitter Control Circuitry Trouble-Shooting, to diagnose any problems in keying the remote transmitter.

NOTE

The transmitter control contacts contained in the SEND. REC-REC switch (S3) located in the keyboard are dry contacts. Power for keying the transmitter must be supplied from some external source (normally the transmitter).

4-13. SIGNAL LINE CURRENT REGULATION.

AN/TGC-14A(V) signal line current can be regulated in all half-duplex modes, battery supplied internally or externally by the signal line potentiometer (R2). In full-duplex modes, internal regulation by the signal line potentiometer (R2) is possible only on the REC line, requiring external regulation of the SEND line, by the remote station supplying battery.

NOTE

Fuse F5 (.100 ma) in the AN/TGC-14A(V) and F4 in the AN/TGC-14(V) is in series with the signal line power supply, and prevents damage to the signal line power supply (1A4) if more than one equipment on the signal loop is supplying signal line current. F4 in the AN/TGC-14A(V) is a (2. 5 amp) fuse and is in series with the A. C. heater element.

SECTION 5

MAINTENANCE

5-1. INTRODUCTION.

This section contains preventive maintenance, corrective maintenance, and repair information for Teletypewriter Sets AN/TGC-14(V) and AN/TGC-14A(V).

This section is divided into three subsections; Preventive Maintenance, Maintenance Standards, and Repair.

The Preventive Maintenance subsection contains tabular test procedures to be performed by the operator and maintenance personnel at specified intervals to detect areas of abnormal performance. The Maintenance Standards subsection contains maintenance standards which will establish the proper performance of the teletypewriter sets.

The preventive maintenance procedures provide a systematic and efficient method for checking and performing routine preventive maintenance on the teletypewriter sets. Comparison of preventive maintenance results with the maintenance standards and proper analysis and correction of any abnormal results will avert impending equipment malfunction.

The repair subsection contains information required to test, repair, adjust and lubricate all electrical and mechanical assemblies of the teletypewriter sets.

NOTE

All references to direction in this section are based upon viewing the equipment as seen from the operator's position.

5-2. TEST EQUIPMENT AND TOOLS.

Table 5-1(Appendix) lists the test equipment and tools required to service and repair the teletypewriter sets.

5-3. PREVENTIVE MAINTENANCE.

GENERAL. - This section is divided into five parts, Operator's Checkoff Lists, Technician's Checkoff Lists, Maintenance Standards, Scheduled Parts Replacement, and Isolation of Printer Malfunction. When properly adhered to, these checks and procedures indicate the performance of individual electrical and mechanical functional circuits and also provide for systematic preventive maintenance of the teletypewriter sets.

The preventive maintenance tables establish a calendar inspection system. If, however, 250 hours operation time is accrued prior to the calendar due date, follow the inspection requirements established in tables 5-4 through 5-7 (Appendix).

A list of operating conditions which apply to the entire table (unless otherwise noted in a given step) is provided at the top of each procedure table. Where illustrations are supplied, the step numbers of the procedures will correspond to the step numbers on accompanying illustrations. Arrows leading from a given step number on an illustration graphically present certain basic information given in the associated step of the procedure table. This basic information includes the point where the test equipment is to be connected to the teletypewriter set and similar information.

Prior to performing the scheduled preventive maintenance procedures, the teletypewriter set should be checked to insure that the equipment is operating within its design capabilities. The maintenance standards given in paragraph 5-3c should be performed to ascertain that the equipment is operating normally.

Comparison of test results with the given maintenance standards will reveal any significant change in the operation of the teletypewriter sets. It is expected that the test results will occasionally show nominal variances, but this does not necessarily mean that the equipment is operating improperly. If, however, a particular step produces an indication which varies progressively each time the check is made, improper operation or impending failure are indicated and corrective measures should be taken

a. OPERATOR'S CHECKOFF LISTS. - The following checks (tables 5-2 and 5-3, Appendix) are included for use by Operating Personnel. All of the conditions under which these checks are to be accomplished, are included in the upper left-hand side of the tables.

b. TECHNICIAN's CHECKOFF LISTS. - The technician's checkoff lists (tables 5-4 through 5-7, Appendix) comprise daily, weekly, monthly, and quarterly checks. Each of these tables contains a step number, the items to be checked, and a reference to the maintenance standard (satisfactory operating condition). If while performing the various checks a specified maintenance standard cannot be obtained, refer to (paragraph 5-1) ISOLATION OF PRINTER MALFUNCTIONS in an effort to isolate the problem area. When it is felt that the problem area has been isolated, do not perform the adjustment sequence without first checking the adjustment to insure that your diagnosis is correct. If it is then found that the adjustment is not correct, perform the adjustment sequence as instructed in paragraph 5-4e.

c. MAINTENANCE STANDARDS. - This section is comprised of a group of standards (operating and adjustment) which must be met to insure optimum performance of the teletypewriter set. These standards are to be used as a guide when performing preventive maintenance and trouble isolation procedures. If the standards cannot be met, the related adjustment procedure required to obtain the standard appears next to the standard.

When using this table (5-8, Appendix), note that there are three columns; the left column contains a reference number when referring to this section from other sections, the middle column contains the standard, and the right column contains a reference to the paragraph in which the related adjustment is contained.

d. LUBRICATION. - The normal lubrication interval for Teletypewriter Set AN/TGC-14(V) and Teletypewriter Set AN/TGC-14A(V) is 250 hours. If, however, a unit is operated under high temperature and high humidity conditions, the lubrication interval should be shortened to 125 hours. Non-fluid Oil (FSN 5815-869-9148), MITE Corporation Part Number 34304, is used on all parts except the gear train and the tips of the cam followers. The gear train and cam follower tips are lubricated with grease, (MITE Corporation Part Number 5041-1) MIL-G-3278A (FSN 9150-261-8297).

e. SCHEDULED PARTS REPLACEMENT. - The following schedule should be checked for wear at the end of 500, 1000, and 1500 hour intervals of operation. The parts should be replaced if there is any indication that they may become unserviceable during the next 500 hours of operation. Refer to the appropriate disassembly, assembly, or replacement procedure.

PART NAME	500 HOURS AREA TO CHECK	INDICATION THAT REPLACEMENT PROCEDURE IS NECESSARY
Character Advance Pawl (33, figure 5-85, Appendix).	Tip (where pawl engages the advance ratchet).	Rounded tip, improper spacing across the line, overprinting of characters.
Check Pawl (64, figure 5-85, Appendix).	Tip (where pawl engages advance ratchet).	Rounded tip, improper spacing across the line, overprinting of characters.
Advance Drum and Advance Ratchet (11, figure 5-85, Appendix).	Advance drum inner cable groove and advance ratchet.	Damage to inner cable groove in drum, worn chipped advance ratchet teeth.
Motor Pinion and lst Reduction Gear (5, figure 5-74, Appendix, 6, figure 5-73, Appendix).	Teeth of pinion and 1st Reduction Gear, where they engage.	Excessively worn teeth resulting in abnormal noise when operating.
Hammer Face (42, figure 5-89, Appendix).	Bond between hammer face and hammer assembly.	Separation of rubber between hammer face and hammer assembly.
Index Link (43, figure 5-85, Appendix).	Index Link bearings.	Worn index link bearings are indicated by excessive movement of the index link or inability to maintain 0. 010 inch clearance between the rotary detent pin and the tips of index wheel.
Detent Pawl Actuator (50, figure 5-89, Appendix).	Actuator bearing.	Check bearing for wear, indicated by excessive side movement or end play of the actuator.
Contact Block Assembly (38, figure 5-90, Appendix).	Contact points in contact block (located in chassis).	Check contacts for wear. Check self-shorting contact for continuity when keyboard is removed. Check continuity on leads wired to the contact.
Master Pulsing Contacts (40, figure 5-89, sheet 3, Appendix).	Contacts located in keyboard actuated by master pulsing cam follower.	Contacts worn or bent to a point where keyboard output is not accepted by the printer and range is less than 70 points, when keyboard is checked with a printer of known range capability.
Keyboard Pulsing Contacts (44, figure 5-89, Appendix, sheet 3).	Contacts located in keyboard actuated by pulsing cam followers.	Gap between contacts cannot be maintained due to metal fatigue in contact leaves.

PART NAME	500 HOURS AREA TO CHECK	INDICATION THAT REPLACEMENT PROCEDURE IS NECESSARY
Special Function Bar Screws (delrin) (86, figure 5-85, Appendix).	Screw Heads (white) holding function bar to function section.	Replace every 1000 hours.
Function Clutch Release Spring (51, figure 5-78, Appendix).	Spring loops and/or main spring body.	Functions are repeated. Inability to select functions. Check for distortion of spring loops and/or main spring body.
Time Delay Motor Stop Parts: Feed Pawl (31, figure 5-54, Appendix).	Tip (where pawl engages ratchet).	Rounded tip, feed pawl does not advance ratchet. Motor shut-down time excessive.
Check Pawl (33, figure 5-54, Appendix).	Tip (where pawl engages ratchet).	Rounded tip, check pawl does not hold ratchet when advanced by feed pawl. Motor shut-down time excessive.
Secondary Check Pawl (12, figure 5-54, Appendix).	Tip (where pawl engages ratchet).	Rounded tip, ratchet is not held by secondary check pawl when advanced by the feed pawl. Motor shut-down time excessive.
Springs: (figure 5-54, Appendix) Feed Pawl (30) Check Pawl (37) Secondary Check Pawl (14) Spiral Return (2).	Attaching loops.	Check for distortion of spring loops and/or main spring body.
Function Timing Cam and Cam Follower (57, figure 5-78, Appendix).	Check cam surface (point of cam drop off) and tip of cam follower.	Worn cam surface (at drop off point) or cam follower tip. Functions or characters are selected more than once or are not selected at all.
Spring Yokes (print and function springs) (11, figure 5-79, Appendix).	Rubber pads on spring yokes and yoke bearings.	Separation of rubber pad on bottom of yoke from yoke main body, worn bearings, and loose fitting clevis pins resulting in excessive vibration during operation.
Print Prevent Arm (36, figure 5-84, Appendix).	Tip (point of contact with the step in the print prevent bail).	Rounded tip, no print prevent (intermittent printing of functions) during function selection.
Print Prevent Bail Screws (46, figure 5-86, Appendix).	Check bail screws on the print prevent bail.	Check for stripped bail screws, will not retain correct adjustment, printing is not prevented during function selection.
Print cylinder, print cylinder shaft, and print strips (21, 20, figure 5-82, Appendix).	End plugs of print cylinder, surface of print cylinder shaft, and individual print strips.	Worn print cylinder end plugs, resulting in excessive end play and poor rotary positioning. Worn or damaged print cylinder shaft resulting in poor carriage return or lateral positioning (printed copy). Damaged print strap results in poor printed copy.

PART NAME	500 HOURS AREA TO CHECK	INDICATION THAT REPLACEMENT PROCEDURE IS NECESSARY
Speed Change Gears (7, figure 5-77, Appendix).	Teeth of speed change gear.	Check for worn or damaged teeth.
Start Clutch (20, figure 5-70, Appendix).	Cam surface, carbide inserts (above jamming rollers).	Cam surface worn, carbide inserts disloged from clutch housing, start clutch will not rotate (release).
Print-Function Clutch (7, figure 5-71, Appendix)	Print-function clutch cams, carbide inserts.	Cam surfaces worn, carbide inserts disloged from clutch housing, clutch jammed, rotates continuously or will not engage.
Print and Function Cam Followers (37, figure 5-84, Appendix)(89, figure 5-85, Appendix).	Check carbide cam follower tips at point of contact with their respective cams.	Check for excessive wear on cam followers and their respective cams. Normally when a cam follower is replaced the clutch on which it rides should also be replaced.
Function Bar (87, figure 5-85, Appendix).	Leading edge of function bar. fit of function bar guide pins.	Worn leading edge on function bar, loose fit of function bar on guide pins.
Function Lever Assembly (61, figure 5-85, Appendix).	Oillite bearings and pins in function lever assembly.	Worn oillite bearings and guide pins in function lever assembly. The function bar will usually show signs of wear when above conditions are present.
Lifter Arm (58, figure 5-85, Appendix).	Lifter arm clamp and point of contact (tip of lifter arm) with slot in function lever assembly.	Lifter arm clamp does not hold function shaft, no function selection. Worn tip of lifter arm permits excessive lateral movement of the function lever assembly.
Bounce Lever (24, figure 5-85, Appendix).	Check first tooth and clamp of bounce lever.	Worn first tooth and/or clamp on bounce lever results in continuous automatic carriage return and line feed after printing a few characters on the line.
Lateral Belt; Hammer, Rotary, and Return Cables (93, 92 and 94, figure 5-85, Appendix).	Check belt and cables near pulleys.	Worn, frayed, or cut sections of belt or cables.
Rotary and Lateral Chains (54 and 91, figure 5-86, Appendix).	Check chain links and connecting pins.	Worn links and pins with flat spots causing poor rotary and lateral stroke (poor copy) and inability to adjust stroke (rotary and lateral).
Sensing Finger Stop Strip (105, figure 5-86, Appendix)	Check inner surface of stop strip (top).	Grooves worn in inner surface of stop strip or stop strip bent from jammed sensing fingers.
U Bars and Sensing Fingers (15, 14 (Typical) figure 5-86, Appendix).	Pin holding sensing finger to U bar.	Pin holding sensing finger to U bar is worn resulting in excess play and non-selection of functions.

PART NAME	500 HOURS AREA TO CHECK	INDICATION THAT REPLACEMENT PROCEDURE IS NECESSARY
Speed Change Gears (7, figure 5-77, Appendix).	Teeth of speed change gear.	Check for worn or damaged teeth.
Start Clutch (20, figure 5-70, Appendix).	Cam surface, carbide inserts (above jamming rollers).	Cam surface worn, carbide inserts disloged from clutch housing, start clutch will not rotate (release).
Print-Function Clutch (7, figure 5-71, Appendix)	Print-function clutch cams, carbide inserts.	Cam surfaces worn, carbide inserts disloged from clutch housing, clutch jammed, rotates continuously or will not engage.
Print and Function Cam Followers (37, figure 5-84, Appendix) (89, figure 5-85, Appendix).	Check carbide cam follower tips at point of contact with their respective cams.	Check for excessive wear on cam followers and their respective cams. Normally when a cam follower is replaced the clutch on which it rides should also be replaced.
Function Bar (87, figure 5-85, Appendix).	Leading edge of function bar. fit of function bar guide pins.	Worn leading edge on function bar, loose fit of function bar on guide pins.
Function Lever Assembly (61, figure 5-85, Appendix).	Oillite bearings and pins in function lever assembly.	Worn oillite bearings and guide pins in function lever assembly. The function bar will usually show signs of wear when above conditions are present.
Lifter Arm (58, figure 5-85, Appendix).	Lifter arm clamp and point of contact (tip of lifter arm) with slot in function lever assembly.	Lifter arm clamp does not hold function shaft, no function selection. Worn tip of lifter arm permits excessive lateral movement of the function lever assembly.
Bounce Lever (24, figure 5-85, Appendix).	Check first tooth and clamp of bounce lever.	Worn first tooth and/or clamp on bounce lever results in continuous automatic carriage return and line feed after printing a few characters on the line.
Lateral Belt; Hammer, Rotary, and Return Cables (93, 92 and 94, figure 5-85, Appendix).	Check belt and cables near pulleys.	Worn, frayed, or cut sections of belt or cables.
Rotary and Lateral Chains (54 and 91, figure 5-86, Appendix).	Check chain links and connecting pins.	Worn links and pins with flat spots causing poor rotary and lateral stroke (poor copy) and inability to adjust stroke (rotary and lateral).
Sensing Finger Stop Strip (105, figure 5-86, Appendix)	Check inner surface of stop strip (top).	Grooves worn in inner surface of stop strip or stop strip bent from jammed sensing fingers.
U Bars and Sensing Fingers (15, 14 (Typical) figure 5-86, Appendix).	Pin holding sensing finger to U bar.	Pin holding sensing finger to U bar is worn resulting in excess play and non-selection of functions.

PART NAME	500 HOURS AREA TO CHECK	INDICATION THAT REPLACEMENT PROCEDURE IS NECESSARY
All screws, springs and retaining rings.	Screw heads and threads; spring loop main spring body, and retaining rings.	Check screw heads for damage threads for distortion, spring loops and main spring body for damage or distortion, retaining rings for security.

f. ISOLATION OF PRINTER MALFUNCTIONS. - This section contains samples of printed copy from printers with known malfunctions. If your printer is starting to garble, type a series of "AM's", "OU's", "RY's" and the message, "NOW IS THE TIME FOR ALL GOOD MEN TO COME TO THE AID OF THEIR COUNTRY". Compare this typed material with the samples that follow, noting exactly which one of the samples corresponds to the material you have just typed. When the correct sample is selected, follow the instructions given to correct the malfunction.

Each of these samples will have a series of notes, such as; "only half a character appears to be printed" or "functions are printed". Pay particular attention to these notes as they will guide you in recognizing the cause of printing malfunctions.

NOTE

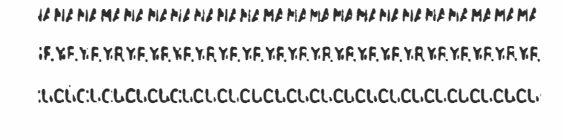
A check of slide alignment in letters A should always be the first step in diagnosing printer malfunctions.

Sample 1

HAMMER ALIGNMENT OUT

Half a printed character appears, but character spacing is good. There will be no printing on functions, if hammer misalignment is the problem. If there is printing on functions, refer to Sample 2.

1. HAMMER NOT ALIGNED PROPERLY



CHECKS Put the printer in letters "A" and check hammer alignment with the letter "A".

CAUSE Hammer slipping on hammer cable.

CORRECTION

Step 1 With the printer in letters "A", loosen the cable clamp.

Step 2 Place a split 1/2" length of spaghetti tubing over the cable and slide it under the clamp. Refer to figure 5-1 (Appendix).

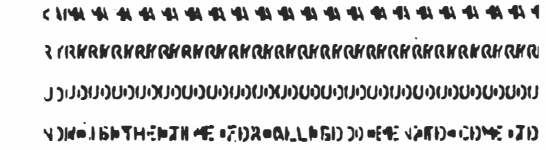
Step 3 Retighten in the proper position.

Sample 2

LATERAL SLIDE NOT PROPERLY ALIGNED

Half characters will appear to print over one another. Function characters will also be printed, when slide misalignment has gone too far.

2. LATERAL SLIDE NOT ALIGNED PROPERLY



CORRECTION

Place the printer in letters A. Realign the slides and recheck the automatic chain takeup adjustment.

NOTE

If the stroke is good but the functions are being printed, check the rotary slide adjustment.

CAUSE

Lateral belt stretching and automatic chain take up adjustment.

CORRECTION

Perform the lateral slide alignment adjustment and realign the hammer.

Perform the lateral function slide alignment and realign the hammer to the letter A.

Sample 3

LATERAL TAKEUP ARM HITTING FRAME

Any characters that are located at the extreme right on the cylinder, will appear to print over the previous character.

3. LATERAL TAKEUP ARM PIN HITTING FRAME IN TAKEUP BRACKET ASSEMBLY

CAUSE

No clearance between the takeup arm pin and the frame, in the letters "M" position.

CORRECTION

Check slide alignment in letters A and realign slides, if necessary. Then position printer in letters M and adjust lateral control belt to establish proper clearance (1/16-inch) between takeup arm pin and rear of slot in takeup bracket assembly.

CAUSE

Lateral belt stretching, or lateral slide going out of adjustment.

CORRECTION

Check lateral belt and lateral slide alignment adjustments.

NOTE

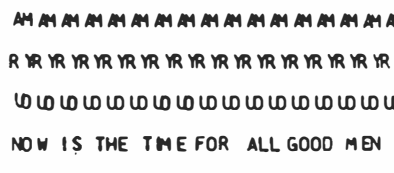
This condition will not exist with printers which have the shortened takeup arm pulley pin, since pin contact with the back of the notch in the takeup drum bracket assembly is not possible.

Sample 4

LATERAL STROKE NOT ADJUSTED PROPERLY

Uneven spacing between certain characters.

4. STROKE NOT ADJUSTED PROPERLY



CAUSE

Lateral belt stretching.

CORRECTION

Check slide alignment in letters A, and realign slides if necessary. Check lateral belt adjustments.

CAUSE

Lateral stroke screws loose.

CORRECTION

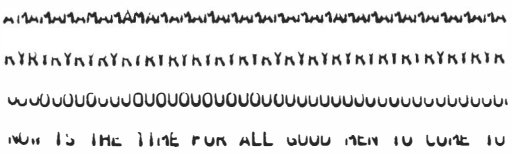
Check slide alignment in letters A. Perform lateral stroke adjustment.

Sample 5

HAMMER FACE NOT PROPERLY ALIGNED WITH CHARACTER STRIPS OR ROTARY CABLE IMPROPERLY ADJUSTED

The upper or lower portion of the character may appear light or does not print.

5. HAMMER FACE NOT PROPERLY ALIGNED



CAUSE

Hammer face on the hammer assembly not properly aligned to the cylinder or rotary cable not adjusted properly.

CORRECTION

Readjust hammer face, or rotary cable.

CAUSE

Rotary cable stretching.

CORRECTION

Check rotary cable adjustments.

CAUSE

No index wheel clearance.

CORRECTION

Check rotary detent pawl adjustment.

5-4. REPAIR.

The following paragraphs contain instructions for repairing and adjusting the teletypewriter sets. Parts location illustrations are provided throughout the text or in the Appendix as required. Overall schematic and wiring diagrams are provided in the Appendix.

a. FAILURE REPORTS. - Report each failure of the equipment, whether caused by a defective part, wear, improper operation, or an external cause. Use ELECTRONIC FAILURE REPORT form DD787. Each pad of the forms includes full instructions for filling out the forms and forwarding them to the Marine Corps Supply Activity, Philadelphia, Pennsylvania. Be sure that you include the model designation and serial number of the equipment (from the equipment identification plate) and the type number and reference designation of the particular defective part (from this section). Describe the cause of the failure completely, continuing on

the back of the form if necessary. Do not substitute brevity for clarity. And remember . . . there are two sides to the failure report . . .

YOUR SIDE

Every FAILURE REPORT is a boost for you:

1. It shows that you are doing your job.
2. It helps make your job easier.
3. It insures available replacements.
4. It gives you a chance to pass your knowledge to every man on the team.

HEADQUARTERS SIDE

1. Evaluate present equipment.
2. Improve future equipment.
3. Order replacements for stock.
4. Prepare field changes.
5. Publish maintenance data.

Always keep a supply of failure report forms on hand. You can get them from the Marine Corps Supply Activity, Philadelphia, Pennsylvania.

b. REMOVAL AND INSTALLATION PROCEDURES. - The following procedures establish the manner in which the teletypewriter sets are to be dismantled to their component levels for adjustment or further disassembly. Specific disassembly and assembly instructions are contained in paragraphs 5-4f and 5-4g.

(1) SERVICE CABLE REMOVAL. - Set all switches in the OFF position, turn the connector-plug one quarter turn counterclockwise and pull straight out.

(2) SERVICE CABLE INSTALLATION.

Step 1. Set all switches in the off position.

Step 2. Inspect the service cable receptable in the right rear of the electrical chassis to insure that no foreign matter is present.

CAUTION

If interference or binding is encountered while performing the following steps, immediately remove the connector-plug from the receptacle and determine the cause of interference.

Step 3. Align the key of the service cable connector-plug with the keyway of the service cable receptacle.

Step 4. Carefully insert the service cable connector-plug into the service cable receptacle and then turn the connector-plug a quarter turn clockwise to secure it.

CAUTION

Be sure that the service cable is grounded at the primary power source.

(3) PRINTER FRONT COVER AND ELECTRICAL CHASSIS REMOVAL.

NOTE

Remove the service cable (paragraph 5-4b(1) prior to performing the following steps.

Step 1. Disengage the two captive fasteners on the printer front cover by turning them 1/4 turn counterclockwise.

CAUTION

When the front cover is removed, the electrical chassis locking device is released and the chassis is free to slide out of the printer.

Step 3. Slide the chassis out of the case.

(4) PRINTER COVER AND ELECTRICAL CHASSIS REPLACEMENT. - The printer front cover and electrical chassis are replaced in the case by reversing the removal procedure.

(5) KEYBOARD REMOVAL.

CAUTION

Insure that the printer motor has been turned off prior to attempting keyboard removal.

NOTE

The keyboard cannot be removed without first removing the printer front cover.

Step 1. Remove the front cover as instructed in paragraph 5-4b(3).

Step 2. Move the keyboard lock bar to the right.

Step 3. Grasp the sides of the keyboard and carefully pull the keyboard out of the electrical chassis.

Step 4. If the keyboard is provided with a ground strap, loosen the ground strap thumb screw, disengaging the strap from the side of the keyboard and continue to pull the keyboard carefully until it is completely removed from the chassis.

(6) KEYBOARD INSTALLATION. - The keyboard is replaced in the electrical chassis by reversing the steps in the keyboard removal procedure.

NOTE

If the keyboard is provided with a ground strap, be sure to refasten the end of the ground strap to the side of the keyboard by use of the thumb screw provided.

(7) PAPER GUIDE PLATE REMOVAL.

Step 1. Remove the front cover and chassis assembly as instructed in paragraph 5-4b(3).

Step 2. Carefully grasp the paper guide with your index fingers and pull forward and up.

Step 3. Remove the paper guide from the printer assembly.

(8) PAPER GUIDE PLATE INSTALLATION.

Step 1. Engage the two pins in the paper guide plate in the holes in the back of the printer back plate.

Step 2. Grasp the front of the paper guide plate and hook the two clips on the front of the paper guide plate over the two screw posts located on the front of the printer assembly.

NOTE

This may be done by pressing downward on the front of the paper guide.

Step 3. Reinstall the chassis assembly and front cover.

(9) PRINTER REMOVAL FROM ELECTRICAL CHASSIS.

Step 1. Remove the front cover and chassis assembly in accordance with paragraph 5-4b(3).

Step 2. Disconnect the motor and selector connector plugs.

Step 3. Disengage the printer slide locks and the two rear lock screws.

Step 4. Lift the printer assembly away from the electrical chassis by lifting up and to the rear to prevent damage to the off-line function slide.

(10) PRINTER INSTALLATION ON ELECTRICAL CHASSIS.

Step 1. Position the printer on the electrical chassis and engage the two printer slide locks and two printer attaching screws.

Step 2. Connect the magnetic selector plug to the receptacle provided in the line sensor. Connect the motor plug to the receptacle provided in the line sensor. Connect the motor plug to the receptacle just forward of the signal line power supply.

Step 3. Reinstall the front cover and chassis assembly.

(11) LINE SENSOR REMOVAL.

Step 1. Remove the front cover and chassis assembly from the case as instructed in paragraph 5-4b(3).

NOTE

The selector connector should be unplugged from the line sensor prior to removal of the line sensor.

Step 2. Remove the four attaching screws and gently life the line sensor away from the electrical chassis, being careful not to damage the chassis connector.

(12) LINE SENSOR INSTALLATION. - Reverse the line sensor removal procedure to replace the line sensor on the electrical chassis, being careful not to damage the chassis connector.

NOTE

Replace the selector connector in the connector receptacle in the line sensor.

(13) SIGNAL LINE POWER SUPPLY REMOVAL.

Step 1. Remove the front cover and chassis assembly from the case as instructed in paragraph 5-4b(3).

NOTE

The motor connector should be unplugged from the signal line power supply prior to removal of the signal line power supply.

(14) SIGNAL LINE POWER SUPPLY INSTALLATION. - Reverse the signal line power supply procedure to replace the signal line power supply on the electrical chassis, being careful not to damage the chassis connector.

NOTE

Replug the motor connector in the receptacle in the power supply.

c. REPLACEMENT PROCEDURES. - The replacement of cables, lateral belt, advance drum ratchet, and master pulsing contacts described in the paragraphs that follow require only minor disassembly. Adjustments which are effected by a replacement procedure are indicated in the replacement procedure. In most instances all that is required is that a check of the indicated adjustments be made before returning the equipment to service. The replacement of worn or defective mechanical parts requires disassembly of the equipment as far as necessary to gain access to parts. Replace the part with the correct replacement part listed in Repair Parts List SL-4-03315B.

(1) ELECTRONIC COMPONENT REPLACEMENT. - The replacement of defective electronic components is accomplished using standard hand tools and soldering techniques. Replace all defective electronic parts with the correct replacement part listed in Repair Parts List SL-4-00315B. Solder the replacement part into the circuit using resin-core solder, Federal Specification QQ-S-571C, Type Sn60WARP2, or equivalent. Use only enough solder to insure a sound connection. When soldering transistor leads, use a very light soldering iron and only enough heat to make the solder flow. In addition, hold the connection with a pair of long nose pliers while soldering. The pliers placed between the connection and the component being replaced will act as a heat sink and dissipate excessive heat from the transistor body.

(2) FIBERGLAS LATERAL CONTROL BELT REPLACEMENT.

Step 1. Place printer in letters "A".

Step 2. Release function clutch, depress carriage return off-line function slide, and rotate mainshaft until carriage return occurs.

Step 3. Loosen lateral belt clamp on advance drum (figure 5-1A, Appendix).

Step 4. Remove lateral belt from under its clamp.

Step 5. Loosen lateral belt clamp screw on takeup drum.

Step 6. Remove lateral belt from the takeup drum, the tension pulley, and the lateral pulley (located on the left corner of the printer).

Step 7. Remove print cylinder yoke shaft "E" ring located outside of the printer right frame wall.

Step 8. Slide print cylinder yoke shaft to the left to disengage shaft from hole in right frame wall.

Step 9. Slide print cylinder yoke shaft to the right and remove shaft completely from print cylinder yoke and printer frame.

Step 10. Loosen print cylinder yoke clamp screw.

Step 11. Remove wedge holding lateral belt in print cylinder yoke.

Step 12. Remove lateral belt from print cylinder yoke clamp.

NOTE

Do not pull old lateral belt out of printer, it will be used to thread the new belt through the pulley system.

Step 13. Pull old belt just far enough to the right to clear the left frame wall of the printer.

Step 14. Place the long portion of fiberglas lateral belt (the length of lateral belt measured from sleeving to end) to the right of the print cylinder yoke clamp.

Step 15. Using a screwdriver, gently press sleeved portion of fiberglas belt into the print cylinder yoke clamp.

CAUTION

Exercise care not to kink the belt during the installation procedure, as kinking will fracture the material.

Step 16. Insert wedge in print cylinder clamp notch and turn clockwise properly seat belt and wedge in the clamp.

Step 17. Tighten cylinder yoke clamp screw when the belt is properly inserted in clamp.

Step 18. Slide print cylinder yoke shaft from right to left into print cylinder yoke.

Step 19. Slide print cylinder yoke shaft into hole in left frame wall and then to the right into hole in right frame wall.

Step 20. Insert yoke shaft "E" ring into its notch outside of the right frame wall.

Step 21. Staple left end of old lateral belt to the long portion of fiberglas belt.

NOTE

When stapling the overlapped ends of the belts together, be sure that there are no twists in the old or new belts.

Step 22. Gradually pull the right end of the old belt to the right until new fiberglas lateral belt comes out of printer right side.

Step 23. Separate the old belt from the new fiberglas belt at the point where they are stapled together.

Step 24. Twist the fiberglas belt 1/4 turn clockwise and then pass the belt around the pulley on the right side of the frame just outside the hole in the frame wall.

Step 25. Make a 1/4 clockwise turn in the lateral belt and then a full counterclockwise turn with the belt around the advance drum; then insert the lateral belt through the notch in the advance drum.

Step 26. Place the lateral belt under lateral belt clamp on the advance drum (there should be approximately 2 inches of excess belt).

Step 27. Loop the excess belt, insert belt end under lateral belt clamp and tighten the lateral belt clamp screw.

Step 28. Check to be sure that lateral belt remains under the clamp when the clamp screw is tightened.

Step 29. Thread left end of the lateral belt around lateral belt pulley on left corner of the printer.

Step 30. Loop lateral belt over top of lateral belt tension pulley and then under the tension pulley.

NOTE

If the takeup drum spring tension has been released, preload the takeup drum by turning it two or three complete turns counterclockwise. Then insert a piece of drill rod or similar object into the hole in the takeup drum and the takeup bracket to prevent the takeup drum from unwinding.

Step 31. Make one full clockwise turn (as viewed from the left side of printer) around takeup drum and insert belt through notch in the takeup drum.

Step 32. Pull left end of the lateral belt until the outside diameter of the lateral tension pully is approximately 1/16 inch away from the outside diameter of the takeup drum.

Step 33. Insert the lateral belt under its clamp on the takeup drum.

Step 34. Loop the excess belt, insert the belt end under the clamp and tighten the lateral belt clamp screw.

Step 35. Check to be sure that lateral belt remains under the clamp when the clamp screw is tightened.

Step 36. Advance the print cylinder all the way across its shaft by turning the advance drum counterclockwise until two clicks are heard or felt, indicating that the end of the line has been reached.

Step 37. Check for 1/2 inch clearance between the right end of the print cylinder yoke and print cylinder shaft bearing in the printer right frame wall (1/2 inch for 72 character line and 1/16 inch for a 76 character line format).

Step 38. If the clearance is not specified in step 38 loosen the lateral belt clamp on the advance drum and let out or takeup as required, until 1/2 or 1/16 inch clearance is established between the print cylinder yoke and print cylinder shaft bearing.

Step 39. Readjust for 1/16 inch clearance as explained in step 32.

Step 40. Depress the off-line carriage return slide while rotating the mainshaft until carriage return occurs.

Step 41. Advance the print cylinder half-way across its shaft by rotating the advance drum counterclockwise.

Step 42. Loosen the hammer clamp screw.

Step 43. Align the hammer to the letter A.

Step 44. Tighten the hammer cable clamp on the hammer cable when the alignment of the hammer and the letter A is correct.

(3) NYLON LATERAL CONTROL BELT REPLACEMENT.

NOTE

The lateral control belt may be replaced by fusing the new belt to the old belt extending from the right side of the printer. The new belt may then be drawn through the printer pulley and slide system by gradually pulling on the old lateral control belt from the left-hand side of the printer. Observe that the belt follows the pulley system correctly and has the required twists and one complete turn around the takeup drum.

Step 1. Depress carriage return lever (on right side of printer), disengaging check pawl, if necessary, manually rotate the advance drum clockwise to the limit of its travel.

NOTE

This positions the mechanism as it would be at the beginning of a line.

Step 2. Cut a length of belt (or use exact length replacement belt) approximately 38 inches long and knot one end; fuse the end of the belt.

Step 3. See figure 5-2 (Appendix). Slip the knotted end of the belt under the lateral control belt clamp. Secure the belt clamp and thread the belt through the hole and up through slot at top center groove of the takeup drum; wind belt one full turn counterclockwise.

Step 4. Pass the belt under the bottom and around the top of the belt pulley and then to the pulley located on the top left corner of the printer, being careful to twist the belt one-quarter turn counterclockwise as shown.

Step 5. Pull the belt across the front of the printer to the top pulley on the right side.

Step 6. Thread the belt over the top and down to the pulley just under the top pulley; then bring the belt under the bottom pulley and toward the center of the machine.

Step 7. Thread the belt over and around the pulley on the lateral control function slide.

Step 8. Twist the belt one-quarter turn clockwise. Pass the belt through the hole in the frame and then around the pulley on the right side frame just outside of the hole.

Step 9. Twist the belt one-quarter turn clockwise. Pull the belt moderately tight and then slip the belt through the slot in the advance drum; twist the belt one-quarter turn clockwise and slip it under the lateral control belt clamp on the advance drum.

Step 10. Secure the belt in the clamp.

NOTE

Allow the excess belt to hang free until it is determined that none will have to be used; then knot and fuse the end of the belt.

Step 11. Advance the print cylinder all the way across the page by turning the advance drum counterclockwise until two clicks are heard or felt, indicating that the end of the line has been reached.

Step 12. Check for 1/2 inch clearance between the right end of the print cylinder yoke and the print cylinder shaft bearing in the printer right frame wall (1/2 inch for 72 characterline and 1/16 inch for a 76 character line format).

Step 13. If the clearance is not as specified in step 12, loosen the lateral belt clamp on the advance drum and let out or takeup as required, on the lateral belt until 1/2 or 1/16 inch clearance is established between the print cylinder yoke and the print cylinder shaft bearing.

Step 14. Adjust for a 1/16 inch clearance between the circumferences of the lateral takeup arm pulley and the takeup drum by loosening the lateral belt clamp on the takeup drum and letting out or taking up on the lateral belt until the clearance is established.

Step 15. Retighten the clamp on the lateral belt when the 1/16 inch clearance is established.

Step 16. Depress the off-line carriage return slide while rotating the mainshaft until carriage return occurs.

Step 17. Advance the print cylinder half-way across the page by rotating the advance drum counterclockwise.

Step 18. Loosen the hammer clamp screw.

Step 19. Align the hammer with the letter A.

Step 20. Tighten the hammer cable clamp on the hammer cable when the alignment of the hammer and the letter A is correct.

(4) ROTARY CABLE REPLACEMENT.

NOTE

Do not remove the old rotary cable as it will be used to thread the new rotary cable through the printer pulley system.

Step 1. Place the print in letters A.

CAUTION

In the next step, rapid unwinding of the rotary motion spring will seriously damage the spring. If the rotary motion spring retainer is released suddenly, or the rotary cable has broken, remove the grip ring and two washers and insure that the spring (figure 5-3, Appendix) has not been damaged.

Step 2. While holding the rotary motion spring retainer, loosen the print cylinder shaft bearing retainer screws and allow the spring retainer to unwind slowly until the spring tension is released.

Step 3. Place the printer on its backplate and turn the rotary cable adjustment screw (figure 5-4, Appendix)

until the rotary cable adjustment bracket reaches the center of its travel.

Step 4. Cut a length of cable (or use replacement cable of exact length) approximately 15 inches long, knot one end tightly and then fuse the knotted end of the cable with a match.

CAUTION

Be sure that the spring tension has been released as directed in step 2, before performing step 5.

Step 5. If the old rotary cable is still threaded through the rotary pulley system, cut off the knotted ends of the cable. (The end knotted against the index wheel and the end knotted against the rotary cable adjustment bracket) and proceed with step 8. If the old rotary cable has been removed from the printer proceed with step 6.

Step 6. Thread the new cable through the hole in the rotary cable adjustment bracket (figure 5-5, Appendix).

Step 7. Thread the free end of the rotary cable over the top of the letters-figures pulley under the next idler pulley, over and around the pulley on the rotary strip, through the hole in the right frame, under the idler pulley up and over the upper idler pulley and then under and over the front of the index wheel. Skip step 8 and proceed with step 9.

Step 8. Thread the new cable through hole in the rotary cable adjustment bracket and then fuse the unknotted end of the new rotary cable to the end of the old cable near the index wheel until the new cable is drawn out of the printer.

Step 9. Release the print function clutch and rotate the mainshaft until the function cam follower falls to the low of its cam; then rotate the index wheel counterclockwise so that the index mark is two notches away from the detent pawl. (See figure 5-4, Appendix).

Step 10. Thread the cable through the hole in the index wheel and tie a tight knot approximately 1/4 inch from the index wheel and fuse the end of the cable.

Step 11. Rotate the mainshaft until the print function cam stops rotating.

Step 12. Turn the rotary motion spring retainer 3-1/2 turns counterclockwise and clamp tightly.

Step 13. Turn the rotary cable adjustment screw until the dot on the index wheel is opposite the rotary detent pawl pin.

Step 14. Check the rotary slide alignment adjustment (paragraph 5-4e(3)(b) and then perform the rotary cable adjustment (paragraph 5-4e(3)(c) with the unit under power.

(5) PRINT HAMMER CABLE REPLACEMENT.

NOTE

It is not necessary to perform the preloading instructions contained in steps 1 and 2 unless the takeup drum spring tension has been released. (Refer to figure 5-6, Appendix.)

Step 1. Preload the takeup drum by turning it counterclockwise no less than two turns and no more than three turns, aligning the hole in the takeup drum with the one in the takeup drum bracket.

Step 2. Insert a piece of drill rod or other similar object through the holes in the takeup drum and the takeup drum bracket to prevent the takeup drum from unwinding.

NOTE

Perform the following step only when the printer cables are still in tact.

Step 3. Depress the carriage return lever to disengage the check and advance pawls from the advance ratchet and manually rotate the advance drum clockwise to the limit of its travel to insure that full carriage return occurs.

NOTE

This positions the print cylinder and hammer at the beginning of the line.

Step 4. Cut a length of cable (or use exact length replacement cable) approximately 31 inches long, knot and fuse one end.

Step 5. Hook the knotted end of the print hammer cable in the outer groove slot on the takeup drum.

Step 6. Wind the cable one turn counterclockwise around the takeup drum, (as viewed from the left side of printer) off the bottom of the drum, and through the pulley located on the left-hand corner of the printer.

Step 7. Thread the cable through the clearance hole adjacent to the pulley; draw it across the front of the printer and through the clearance hole in the right front frame of the printer.

Step 8. See figure 5-7 (Appendix). Thread the cable around the pulley just outside the clearance hole and directly into the outer groove slot in the bottom of the advance drum.

Step 9. String the hammer cable under its clamp on the advance drum and tighten the clamp.

Step 10. Check to insure that there is no hammer cable overlap on the takeup drum when the printer is in the full carriage return position.

Step 11. Turn the advance drum counterclockwise until the print cylinder has advanced half-way across the line.

Step 12. Depress the carriage return lever and observe carriage return action (movement of the print cylinder to the left-hand margin).

NOTE

Carriage return should be rapid. If carriage return is slow, proceed with step 13. If the carriage return is satisfactory proceed with step 14.

Step 13. Loosen the hammer cable until carriage return speed is satisfactory.

NOTE

There must be no cable overlap on the takeup drum upon completion of this adjustment.

Step 14. Place the printer in letters A.

Step 15. Rotate the advance drum counterclockwise until the print cylinder is half way across the page.

Step 16. Align the hammer with the letter A and clamp the hammer on the hammer cable.

(6) RETURN CABLE REPLACEMENT.

NOTE

It is not necessary to perform the preloading instructions contained in steps 1 and 2 unless the takeup drum spring tension has been released. (Refer to figure 5-8, Appendix.)

Step 1. Preload the takeup drum by turning it counterclockwise no less than two turns and no more than three turns, aligning the hole in the takeup drum with the one in the takeup bracket.

Step 2. Insert a piece of drill rod or other similar object through the holes in the takeup drum and the takeup drum bracket to prevent the takeup drum from unwinding.

Step 3. Depress the carriage return lever to disengage the check and advance pawls from the advance ratchet and manually rotate the advance drum clockwise to the limit of its travel to insure that full carriage return occurs.

NOTE

This step should result in having both advance and takeup drums in their full clockwise limits and the print cylinder and hammer all the way to the left hand margin.

Step 4. Cut a length of cable (or use replacement cable of exact length) approximately 31 inches long; knot and fuse one end.

Step 5. Remove the old return cable and hook the knotted end of the new return cable (red) in the inner groove slot of the takeup drum and thread the cable through the upper pulley at the top of left front corner of the printer.

Step 6. See figure 5-9 (Appendix). Pull the cable across the front of the printer; thread through the pulley on the right front side and then to the inner groove of the advance drum.

Step 7. Wind the cable one turn clockwise around the advance drum (as viewed from the right side of printer) and then thread it through the slot in the advance drum.

Step 8. Pull the cable across the groove in the adjacent guide drum and lightly clamp it under the upper left clamp, leaving several inches of loose cable. Knot and fuse the end of the cable.

Step 9. Rotate the advance drum counterclockwise until the print cylinder is halfway across the line and then depress the carriage return lever and observe that carriage return occurs. Carriage return should be rapid. If carriage return is slow proceed with step 10.

Step 10. Readjust the tension on the return cable, loosening the return cable until carriage return is rapid.

NOTE

There should be no cable overlap in the takeup drum when the print cylinder and hammer are in the full carriage return position.

(7) MASTER PULSING CONTACT ASSEMBLY REPLACEMENT.

NOTE

Six-leaf master pulsing contact assemblies may be identified by reddish-brown glyptal spot on end of mounting screws.

Step 1. Remove the keyboard from the electrical chassis (paragraph 5-4b (5).

Step 2. Loosen both upper and lower spring leaf adjustment setscrews (1, figure 5-10, Appendix) approximately four or five turns using the insulated 1/16 inch internal-hex wrench supplied in Tool Kit, MITE Corporation Part Number 7140.

Step 3. Loosen master pulsing cam follower screw (4).

Step 4. Swing keyboard contact actuator (5) 90 degrees in a clockwise direction as observed from the bottom of keyboard.

Step 5. Remove two screws and lockwashers (6).

Step 6. Pull master pulsing contact assembly (18) out from bottom of keyboard and unsolder the three wires attached to the master pulsing contact assembly.

NOTE

It may be necessary to remove the space bar safety guard cover (7) to permit access to yellow wire to provide slack. Slack is available on all three wires by pulling gently through lacing or plastic tubing, whichever is provided.

Step 7. Solder the three wires (9) to the master pulsing contact assembly; green to the top master pulsing contact adjustment screw bracket near screw head; yellow to both upper and lower leaf contact assemblies and red to lower master pulsing contact adjustment screw bracket.

Step 8. Slide master pulsing contact assembly (8) up into place in keyboard frame and secure loosely with screws and lockwashers (6).

NOTE

The slack on all three wires must be taken up to reposition master pulsing contact assembly (8).

Step 9. Slide the lacing or plastic tubing back into position.

Step 10. Replace space bar safety guard cover (7).

Step 11. Swing keyboard contact actuator (5) back into position between upper and lower leaf contact assemblies.

Step 12. Tighten master pulsing cam follower screw (4).

NOTE

Do not bend excessively when spreading upper and lower leaf contact assemblies.

Step 13. Place a shim (0.010 inch for six-leaf master pulsing contact assemblies or 0.005 inch for two-leaf master pulsing contact assemblies under master pulsing cam follower tip (2)) while on the low of the cam; move the master pulsing contact assembly until keyboard contact actuator (5) is centered between upper and lower leaves of contact assemblies and tighten screws and lockwashers (6).

Step 14. Adjust master pulsing contacts in accordance with master pulsing contact assembly adjustment procedure in paragraph 5-4e(25)(h). Use the insulated 1/16 inch internal-hex wrench supplied in Tool Kit, Part Number 7140.

d. STANDARD PROCEDURES. - A number of the procedures described in the following paragraphs are called for repeatedly during performance of adjustment and replacement procedures. These procedures minimize the number of tools required to service the unit and permit many of the adjustments to be performed with power off.

WARNING

Operation of this equipment involves voltages which are dangerous to life. Do not service or adjust the teletypewriter sets while they are running unless extreme caution is used.

(1) TURNING THE MAINSHAFT BY HAND. - This operation is accomplished by rotating the speed change gear (1, figure 5-11, Appendix) clockwise, or the idler gear (2) counterclockwise. This operation will turn any of the clutches which have been released and consequently coupled to the mainshaft. When the start clutch is released and the mainshaft is turned, it will also rotate the timing cam shaft.

(2) RELEASING THE START CLUTCH. - The preferred method of releasing the start clutch is accomplished electrically by pushing the break button on the keyboard. It can also be accomplished by removing the patch cord at J4 or J5 at the rear of the chassis and simultaneously turning the mainshaft by hand. The start clutch can be mechanically released with the stop magnet deenergized, by depressing the start side of the armature toward the start coil (armature #2 space side) (figure 5-12, Appendix) which will allow the start paddle to fall and release the clutch finger.

CAUTION

If the start clutch has been released electrically it is necessary to turn the motor switch off and wait approximately 30 seconds prior to reconnecting the motor plug.

(3) STOPPING THE START CLUTCH. - When performing or checking adjustments (without power) it may be necessary to manually rotate the mainshaft numerous times yet maintain the same mark and space condition (letters A or M, figures, functions, etc.) setup on the mainshaft. Stopping the start clutch permits continuous rotation of the mainshaft, without disturbing a preset mark and space condition and also facilitates the setting up of the mainshaft for the mark and space condition desired. To stop the start clutch proceed as follows:

CAUTION

Exercise care when holding in the armature to avoid distortion of the armature pivot points.

Step 1. Hold in the top portion of armature (figure 5-12, Appendix), while rotating the mainshaft until the start clutch comes to the stop position.

NOTE

It might be necessary to rotate the mainshaft a number of times while holding in on the armature to stop the start clutch.

Step 2. Rotate the mainshaft a number of times to be certain that the start clutch and all clutches are stopped.

NOTE

Since a clutch will now change mark or space position only after manually pulling out the clutch release finger, stopping the start clutch, greatly facilitates setting up the mainshaft.

(4) RELEASING THE OTHER CLUTCHES. - Clutches #1 through #5 and the function clutch can most easily be released, by using a spring hook to pull the clutch release finger away from the clutch. The line feed, letters-figures, and the carriage return clutches are most easily released by operating their off-line function pushers. In the case of letters, however, the function clutch must also be released and the off-line pusher held in while the mainshaft is turned through 180 degrees rotation, thus operating the function cam follower for one full cycle.

(5) PUSHING CLUTCHES INTO POSITION. - On occasion it will be inconvenient to turn clutches by rotating the mainshaft as this may disturb the position of previously positioned clutches. In this case, the clutch to be moved can be pushed around into position by pushing against the backstop notch (figure 5-13, Appendix) with a screwdriver, while holding out the proper clutch release finger with a spring hook.

(6) PUTTING THE PRINTER IN THE LETTER A AND PERIOD POSITION. - This operation places all of the type positioning cam followers on the high portions of their cams. It is performed by locating the #1 and #2 clutches on the mark side (held by the top fingers) and the #3, #4 and #5 clutches located on the space side (held by the bottom fingers). The letters-figures cam follower must be located on the letters side (the high side of the cam).

(Letters A position -- mark-mark-space-space-space) - The converse of this operation would be to place the printer in the period position by having clutches #1 and #2 on the low portion of the cam, (held by the top fingers). The letters-figures clutch should then be rotated so that the cam follower will fall to the low portion of the cam.

(Period position -- space-space-mark-mark-mark) - Assembly of the front and rear halves will be much easier if the clutches are in the period position. After mating these assemblies it is recommended that the clutches then be put in the letters A position during all power off adjustments.

(7) MANUAL ADVANCE AND CARRIAGE RETURN. - The ability to advance the print cylinder and hammer (moving them to the right across the front of the printer) and affect carriage return (movement of the print cylinder and hammer to the left hand margin) expedites the performance of a number of adjustments procedures.

(a) MANUAL ADVANCE. - Using the thumb and forefinger, rotate the advance drum (located on the right side of the printer) counterclockwise to manually advance the print cylinder and hammer to the right.

(b) MANUAL CARRIAGE RETURN. - Depress the carriage return lever (lever with a vertical link to the check pawl, located on the right side of the printer). Observe that when the carriage return lever is depressed, both advance pawl and check pawl are disengaged from the advance drum ratchet, releasing the advance drum for carriage return.

e. ADJUSTMENT PROCEDURES. - A complete adjustment of the teletypewriter set can be accomplished by following the adjustment sequence presented in this section. The teletypewriter should be readjusted following major disassembly, parts replacement, or involved trouble shooting. Minor parts replacement or correction of minor operating malfunctions requires only that the section of the teletypewriter affected be readjusted. When making these adjustments, use care not to disturb related adjustments indicated as such in the adjustment procedure.

NOTE

It is suggested that no adjustment procedure be accomplished prior to making sure that the suspect area is out of adjustment.

WARNING

Operation of the equipment involves voltages which are dangerous to life. Do not service or adjust the teletypewriter while it is running without using extreme care.

(1) CLUTCH BACKSTOP ADJUSTMENT. - The backstops for all clutches must be adjusted in order to have optimum operation of each clutch. The backstop prevents the clutch from chattering when it is in the stop (disengaged) position and consequently prevents overloading of the motor and also preloads clutch cage for rapid engagement of the clutch with the mainshaft when released.

NOTE

Check to insure that the clutch backstops perform in accordance with the requirements established in steps 3 and 6. If the requirements are not met, perform the following adjustment sequence.

Step 1. Loosen the backstop clamp screw (figure 5-14, Appendix).

Step 2. With the clutch in the stop position, turn the backstop eccentric until the backstop falls into its notch in the clutch cage.

Step 3. Check backstop action (controlled by the eccentric setting) by releasing the appropriate clutch and turning the mainshaft by hand while observing that the backstop drops into its notch in the clutch cage simultaneously with the stop of the clutch (tab) by the clutch release.

NOTE

The print function clutch backstop action must be checked with power applied to the equipment.

Step 4. Readjust the backstop eccentric if the backstop operation is not as described in step 3.

NOTE

The action of the line feed, letters-figures, and carriage return clutches can best be observed by standing the printer on its back plate and viewing from the bottom.

Step 5. The backstop should engage the clutch so that slight additional forward motion of the engaged clutch disc is possible. Repeat steps 1, 2, and 3 if no forward motion of the engaged backstop clutch disc is possible.

Step 6. Pull upward on the clutch release and check for slight forward motion of the clutch stop tab. If the reengagement of the clutch release with the stop tab flat, the backstop eccentric is improperly adjusted in steps 1 through 3 should be repeated.

Step 7. Tighten backstop clamp screw when backstop is properly aligned.

(2) RANGE CALIBRATION.

(a) PRELIMINARY RANGE DIAL ADJUSTMENT (AN/TGC-14A(V). - This adjustment is used to mechanically preposition the range dial at its midpoint and does not constitute a calibration check.

Step 1. Unlock the range dial by pulling out the lock knob (8, figure 5-15, Appendix) as far as possible and then rotate the knob fully to its clockwise limit. Push the knob in toward the printer, locking it in this position.

NOTE

AN/TGC-14(V) Teletypewriter Sets have a locking screw directly above the range dial which must be loosened to permit turning of the range dial knob.

Step 2. Unlock the retaining lever (5) and pull the complete assembly (1) out until the range pinion (4) is no longer engaged with the range adjustment gear segment.

Step 3. Rotate the knob (8) until the pointer (7) is centered in the uncalibrated portion of the scale. Insure that the pointer is located as close as possible to the center of the uncalibrated portion of the scale when performing step 3.

Step 4. Push the knob toward the printer, rotating slightly back and forth, until the gears mesh and the retaining lever (5) locks in its notch in the range dial.

Step 5. Unlock the range dial by pulling the knob out; set the dial at 60.

Step 6. Push the knob all the way in to lock the dial.

(b) RANGE ADJUSTMENT. - The range dial adjustment is performed while receiving a message over a signal loop from a remote station or with the equipment patched for local loop (line battery supplied internally) while typing a test message from the equipments keyboard. Setting the range dial at its point of optimum operation assures optimum acceptance of signals by the Teletypewriter. Refer to figure 5-15, Appendix.

Step 1. While receiving a message from a remote station or typing a test message (RY's, AM's, etc.) unlock the range dial by pulling out the range finder knob; (On AN/TGC-14(V) Teletypewriter Sets, loosen the screw directly over the knob to release the range dial).

Step 2. Rotate the range finder knob gradually and record the number indicated on the range dial (low point) where the message is no longer distorted.

Step 3. While continuing to type the test message or receive the message from the remote station; turn the knob toward the high end of the scale past the point of optimum operation until the message is again distorted.

Step 4. Backup the range finder knob gradually and record the number indicated on the dial (high point) where the message is no longer distorted.

Step 5. Calculate the point of optimum operation by using the following formula:

$$\frac{\text{High} + \text{Low}}{2} = \text{Point of Optimum Operation}$$

Example: $\frac{100 + 20}{2} = 60$ (Optimum Setting)

Step 6. Turn the range dial so that the pointer is directly on the number established as the point of optimum operation. In the example above the point of optimum operation would be 60 on the range dial.

Step 7. Push the range finder knob against the printer to ascertain that the mechanism is adequately locked. (On AN/TGC-14(V) Teletypewriter Sets it is necessary to tighten the locking screw, located directly over the range dial knob).

(c) TIMING MARK ALIGNMENT. - If after repeated performance of the preliminary range dial adjustment, it is impossible to get the median range reading near the center of the calibrated portion of the range dial, it will be necessary to perform the following adjustment procedure:

Step 1. Determine the location of the median range reading on the range dial.

NOTE

If the median range reading is on the high side of the dial it will be necessary to retard the timing shaft relationship to the mainshaft. If the median reading is on the low side of the dial it will be necessary to advance the timing shaft relationship to the mainshaft.

Step 2. Remove the printer from the chassis and stand it on its backplate.

Step 3. Make a small diagram showing the timing mark relationship as it exists. (Refer to figure 5-99, Appendix, for location of timing marks only.)

Step 4. Remove the retaining ring to the left of the timing cam shaft gear, pressing it out of the groove in the shaft with a screwdriver.

Step 5. Slide the timing cam shaft gear to the left, disengaging it from the start clutch gear.

NOTE

Do not lose timing cam shaft gear key, when sliding gear to the left. Be sure that the key is in place when the gear is moved back into position in step 7.

Step 6. If the median reading is on the high side of the range dial, offset the timing cam shaft and its gear one dot (timing mark) to the right, referring to diagram prepared in step 3. If the median range reading is on the low side of the range dial, offset the timing shaft and its gear one dot (timing mark) to the left.

Step 7. Re-engage the timing cam shaft gear with start clutch gear.

Step 8. Replace the retaining ring, removed in step 4, in its notch to the left of the timing cam shaft gear.

Step 9. Perform the preliminary range dial adjustment (paragraph 5-4e(2)(a) and then the range dial adjustment (paragraph 5-4e(2)(b).

(3) ROTARY SPRING, FUNCTION SLIDE ALIGNMENT AND CABLE ADJUSTMENTS. - The following series of adjustments are related in that they affect rotary motion of the type cylinder and should be performed in sequence after replacement of the rotary spring, or cable. The adjustments can be performed separately, but a check should be made of all the adjustments after performing any one of the series. In addition, the rotary stroke adjustment permits further refinement of rotary selection. The rotary stroke adjustment procedure is covered in paragraph 5-4e(17)(a) and should be performed only after a thorough check of rotary spring, slide, and cable adjustments, paragraph 5-4e(17).

(a) ROTARY SPRING ADJUSTMENT. - The rotary spring adjustment assures proper spring tension for rotary action of the type cylinder.

Step 1. Place the printer in letters A.

CAUTION

Rapid unwinding of the rotary spring when performing the following steps will seriously damage the spring.

Step 2. While holding the rotary spring housing (located on the left end of type cylinder shaft) loosen the two housing clamp screws and allow the spring housing to rotate slowly until all the tension is removed from the rotary spring.

Step 3. Remove the retaining ring and two washers (nylon, steel) on the end of the rotary spring housing.

Step 4. Check the rotary spring (figure 5-16, Appendix) for damage and replace if necessary.

Step 5. Replace the two washers (place the nylon washer against rotary spring) on the end of the rotary spring housing and secure with the retaining ring.

Step 6. Turn the rotary housing 3-1/2 turns counterclockwise and secure housing by tightening the two housing clamp screws.

(b) ROTARY FUNCTION SLIDE ALIGNMENT. - The rotary function slide adjustment is performed to assure proper alignment of slide notches with the sensing fingers to permit function selection. Check the rotary function slide alignment as follows:

Step 1. Place the printer in letters A and stand the printer on its backplate.

Step 2. Release the print-function clutch and manually rotate the mainshaft until the print cam follower drops to the low of its cam. This assures that all the sensing fingers have been stripped out of the function slides by the function bar.

Step 3. Disengage the rotary detent pawl pin from the index wheel by unhooking rotary detent pawl pin spring.

Step 4. Check the alignment of the rotary slide index mark with the mark on the function selector frame (figure 5-17, Appendix).

CAUTION

In steps 5 and 6, the screw should be held with an Allen wrench when the rotary adjustment nut is turned or serious distortion of the rotary chain will result.

NOTE

If the rotary function slide is properly aligned with the marks on the frame, do not perform steps 4 and 5.

Step 5. If the rotary slide index mark (figure 5-17, Appendix) is to the right of the mark on the function selector frame, shorten the chain by turning the rotary chain adjustment nut (figure 5-18, Appendix) clockwise.

Step 6. If the index mark (figure 5-17, Appendix) on the rotary function slide is on the left side of the mark on the function selector frame, lengthen the chain by turning the rotary function slide adjustment nut (see CAUTION note after step 3) counterclockwise.

(c) ROTARY CABLE ADJUSTMENT. - The rotary cable adjustment is performed to assure that proper alignment of the detent pawl pin with the letter A notch in the index wheel and that the cable is under proper tension. To check cable adjustment in normal operation continuously repeat the letter A and observe the index wheel for movement. If there is less than 0.010 inch movement of the index wheel the cable adjustment is correct. If the rotary cable adjustment (more than 0.010 inch movement of the index wheel) is incorrect, perform the following adjustments:

Step 1. Place the printer in letter A.

Step 2. Release the print-function clutch and manually rotate the mainshaft until the print cam follower drops to the low of its cam.

Step 3. Pull the detent pawl pin away from the notch in the index wheel and then allow the detent pawl spring action to return the detent pawl pin into the marked A notch in the index wheel, while checking pin alignment with the notch. If a definite movement of the index wheel is caused by the detent pawl pin, proceed with step 3. If no movement or less than 0.010 inch movement of the index wheel occurs, proceed with step 4.

Step 4. Adjust the rotary cable adjustment screw (figure 5-18, Appendix) until the best possible alignment of the detent pin with the notch in the index wheel is attained. There should be less than 0.010 inch movement of the index wheel when engaged by the detent pawl pin. Actuate the detent pawl pin a number of times to check the pin and notch alignment and then proceed with step 4.

Step 5. Apply power to the equipment and using the repeat key continuously repeat the letter A, while observing the index wheel for movement.

Step 6. Readjust the rotary cable adjustment screw until there is no movement or less than 0.010 inch movement of the index wheel when engaged by the detent pawl pin. (No movement is the optimum condition when performing the rotary cable adjustment).

(4) LATERAL CONTROL BELT AND SLIDE ALIGNMENT ADJUSTMENTS. - The lateral control belt and the lateral slide alignment adjustments are performed to assure that the belt and slide are under proper tension from the lateral takeup arm spring and that the alignment of the lateral slide permits the selection of desired functions. The adjustments can be performed separately but when one adjustment is performed the other adjustment should be checked.

(a) LATERAL CONTROL BELT ADJUSTMENT.

NOTE

Check to insure that the lateral control belt adjustment has been performed in accordance with the requirements established in steps 1 through 3 and step 5. If the requirements are not met, perform the following adjustment sequence.

Step 1. Place the printer in letters A.

Step 2. Advance the print cylinder across its shaft by manually rotating the advance drum (drum on right side of printer) counterclockwise until two clicks are heard or felt, indicating that the end of the line has been reached.

Step 3. Check of 1/16 inch clearance (when 76 character line is the format) between the print cylinder yoke and the print cylinder shaft bearing in the right frame or a 1/2 inch clearance (when a 72 character line is the format) between the print cylinder yoke and the print cylinder shaft bearing located in the right frame.

Step 4. Loosen the lateral control belt clamp screw on the advance drum and adjust for a 1/16 or 1/2 inch clearance between the print cylinder yoke and the print shaft bearing by letting out or taking up on the lateral control belt.

Step 5. Check for approximately 1/16 inch clearance between the circumference of the lateral takeup arm pulley and the circumference of the takeup drum. (See figure 5-19, Appendix).

Step 6. If the 1/16 inch clearance between the lateral takeup arm pulley and the takeup drum circumference is not correct, loosen the belt clamp on the takeup drum and let out or take up on the lateral belt until the clearance is established. If the 1/16 inch clearance is present between the lateral takeup arm pulley and the takeup drum circumferences the lateral control belt is properly adjusted.

Step 7. Depress the carriage return lever and after carriage return advance the type cylinder halfway across the line by manually rotating the advance drum counterclockwise.

Step 8. Check the alignment of the hammer face with the letter A, and proceed with steps 9 and 10 if not properly aligned.

Step 9. Loosen the hammer cable clamp and realign the hammer face with the letter A.

Step 10. Tighten the hammer cable clamp on the hammer cable when the hammer face is properly aligned with the letter A.

(b) LATERAL SLIDE ALIGNMENT ADJUSTMENT.

NOTE

Check to see if the lateral slide adjustment conforms with the requirements established in steps 1 and 2. If the requirements are not met, perform the following adjustment procedure.

Step 1. Place the printer in letters A remove the printer from the chassis, and stand it on its backplate.

Step 2. Check the alignment of the lateral slide index mark with the mark in the selector frame (figure 5-20, Appendix). If the marks are aligned (see figure 5-20, Appendix) the lateral slide is adjusted properly. If the marks are not aligned proceed with step 3.

Step 3. If the lateral function slide index mark is to the left of the function selector frame mark, lengthen the chain by holding both the automatic chain takeup feed pawl and the check pawl away from the feed ratchet while turning the ratchet clockwise.

Step 4. If the lateral function slide index mark is to the right of the function selector frame mark, shorten the chain by manually actuating the automatic chain takeup to the ratchet counterclockwise.

Step 5. Advance the type cylinder halfway across the line by manually rotating the advance drum counterclockwise.

Step 6. Check the alignment of the hammer face with the letter A and proceed with steps 7 and 8 if not properly aligned.

Step 7. Loosen the hammer cable clamp screw and realign the hammer face with the letter A.

Step 8. Tighten the hammer cable clamp screw when hammer face is properly aligned with the letter A.

(5) START CLUTCH RELEASE ADJUSTMENT. - The start clutch release adjustment is intended to insure that the start clutch will release quickly upon receipt of the start signal and that it will come to rest in the same position for every stop signal. This will insure the same angular relation to the timing cam during every stop pulse and will consequently afford maximum receiving range.

Step 1. Hold the start clutch release arm (10, figure 5-21, Appendix) down against the clutch cage (7) and rotate the mainshaft until one of the two stop tabs (8) on the clutch makes contact with the release latch (2).

Step 2. While continuing to hold down the start clutch release arm (10), loosen the backstop clamp screw (4) and adjust the backstop eccentric bushing (3) until the backstop (5) is free to fall (pivot) into the backstop cam restoring notch (6). (The notch in the knurled eccentric bushing should be aligned approximately with the V in the backstop).

NOTE

The backstop eccentric should be rotated toward the rear of the printer when adjusted.

Step 3. Tighten the backstop clamp screw (4) and release the start clutch release arm.

Step 4. Try to depress the start clutch release arm (10). If the backstop eccentric is adjusted properly, full depression of the start clutch release arm should be prevented by one of the clutch tabs which pivoted under the release latch when the start clutch release arm was released in step 3. If the start clutch release arm can be depressed to permit contact of the release latch with the clutch cage repeat steps 1 through 3. If the release latch does not make contact with clutch cage (latch should contact tab on clutch) when the start clutch release arm is depressed, proceed with step 5.

Step 5. Rotate the mainshaft while depressing the start clutch release arm. The backstop should pivot sharply toward the front of the printer when a clutch tab makes contact with the release latch indicating that the backstop has been adjusted properly. If backstop pivoting action is slow repeat steps 1 through 4. If backstop pivoting action is sharp proceed with step 6.

NOTE

There are two tabs on the start clutch and therefore step 5 should be repeated at least twice to assure proper backstop pivoting action on both tabs.

Step 6. Rotate the mainshaft until the release latch is located approximately midway between the two stop tabs on the clutch cage in order to insure that the backstop is riding on the high portion of the restoring cam. (The tabs on the clutch will be approximately horizontal).

Step 7. Loosen the lock nut (11) and while depressing the start clutch release arm (10), adjust the start clutch adjustment screw (1) until there is a 0.010 inch clearance (12) between the tip of the screw (1) and the flat surface of the release latch pin (9).

Step 8. Recheck for the 0.010 inch clearance while depressing the start clutch release arm (10) after tightening the lock nut (11).

(6) FUNCTION BAR AND SHAFT ADJUSTMENT. - Prior to the function bar and shaft adjustments as well as the character advance adjustments, it will be to the technician's advantage to adjust four eccentrics which are located on the right-hand side of the printer. Correct positioning of these eccentrics now will save unnecessary work and confusion during later adjustments, however, further refinement of these adjustments will probably be necessary.

(a) PRELIMINARY SETTING OF ECCENTRICS ON RIGHT SIDE OF PRINTER.

Step 1. Stand the printer on its back plate and turn it so the right side is facing you.

Step 2. Set the heavy portion of the ADVANCE CHECK PAWL eccentric (13, figure 5-22, Appendix) at about 9:00 o'clock.

Step 3. Set the heavy portion of the ADVANCE PREVENTION eccentric (11) at about 3:00 o'clock.

Step 4. Set the heavy portion of the ADVANCE FEED PAWL eccentric (5) at about 1:00 o'clock.

Step 5. Set the heavy portion of the DETENT ARM eccentric (12) at about 5:00 o'clock, which will make it perpendicular to the detent lifter arm (1).

(b) FUNCTION BAR ADJUSTMENT. - The function bar adjustment assures that the function bar actuates only the sensing finger for the function which is to be selected and deflects the rest of the sensing fingers.

NOTE

Check to see if the function bar performs in accordance with the requirements established in steps 1 through 3. If the requirements are not met, perform the following adjustment sequence.

Step 1. Place the printer in letter A, remove the printer from the chassis, and place it on its backplate.

Step 2. Release the print-function clutch and rotate the mainshaft until the function cam follower drops to the low of its cam.

Step 3. Raise and lower the function spring yoke a number of times and check the point of contact of the function bar (figure 5-23, Appendix) with the blank sensing finger (sensing finger on the extreme left) and the carriage return sensing finger (sensing finger on the extreme right).

NOTE

The point of contact by the function bar should be 1/3 to 1/2 of the way down the angled surface on both sensing fingers (figure 5-23, Appendix). Both of the sensing fingers should be deflected by the function bar toward the bottom of the printer (not to the rear).

(c) FUNCTION SHAFT ADJUSTMENT. - The purpose of this adjustment is to establish the correct angular relationship between the function lever and bar assembly and the function cam follower (figure 5-24, Appendix).

NOTE

Check to see if the function shaft adjustment is in compliance with the requirements established in step 13. If the requirements are not met, perform the following adjustment sequence.

Step 1. Loosen the function cam follower clamp screw (figure 5-25, Appendix) and the function bar lifter arm clamp screw.

Step 2. Stand the printer on its back plate, with the (space side) bottom facing you.

Step 3. Place the allen wrench in the function cam follower screw (figure 5-25, Appendix), and using it like a lever, hold the cam follower down on the function cam by holding upward pressure on the wrench.

Step 4. Maintain this pressure and release the function clutch and rotate the mainshaft until the cam follower falls to the low portion of the function cam.

NOTE

Observe that the wrench was forced downward and when the low portion of the cam was reached, it popped upward.

Step 5. Engage the advance prevention catch (figure 5-22, Appendix) at point (9).

NOTE

Observe that the pin on the advance pawl (6) is touching the advance prevention catch (10).

Step 6. Apply downward pressure on the function shaft terminal at point (3), until the pin on the advance feed pawl (6) has some, but not more than 0.005 inch clearance between it and the advance prevention catch (10). While maintaining this clearance, check to insure that the function cam follower is laterally aligned with and is on the low side of the cam.

Step 7. Tighten the function cam follower screw.

Step 8. Next rotate the mainshaft until the function cam follower is on the high portion of the function cam.

NOTE

The clutch will come to the stop position and will have to be released before it will go to the high.

Step 9. Place an internal-hex headed wrench in the lifter arm clamp screw (figure 5-26, Appendix).

Step 10. Insert a screwdriver through the function spring yoke until the tip of the screwdriver is positioned under the lifter arm. (Check to be sure that the lifter arm is in the slot in the function lever assembly).

Step 11. Using the screwdriver as a lever, pivot the screwdriver on shock pad located on the printer frame to move the lifter arm, function lever assembly and function bar until a clearance of 0.030 inches between the function bar and the tips of the sensing fingers is established.

NOTE

It is possible to shift the function section laterally to the right or left to center the spring yoke assembly on the shock pad prior to tightening the lifter arm.

Step 12. Tighten the lifter arm clamp screw, maintaining the 0.030 inch clearance between the function bar and the tips of the sensing fingers.

NOTE

Depress the function terminal lever or check to be certain that the function cam follower is riding on its cam when establishing the 0.030 inch clearance.

Step 13. Release the print-function clutch and rotate the mainshaft until the function cam follower rises to the high of its cam and check to be certain that the function bar clears the sensing fingers by approximately 0.030 inches.

(7) ROTARY DETENT ADJUSTMENT.

NOTE

The rotary detent pawl adjustment assures that during rotary selection, (rotation of the index wheel), the rotary detent pawl pin clears the tips of the index wheel by at least 0.010 inch.

Step 1. Release the print function clutch and rotate the mainshaft until the function cam follower drops to the low of its cam.

Step 2. Loosen the locknut (4, figure 5-27, Appendix).

Step 3. Adjust the rotary detent screw (5) until 0.030 inch clearance is established between the tip of the rotary detent screw and the actuator (3).

Step 4. Tighten locknut (4).

Step 5. Rotate the mainshaft until the function clutch comes to the stop position.

Step 6. Check for a 0.010 inch clearance between the rotary detent pawl pin (6) and any point on the index wheel (2).

NOTE

Manually rotate the index wheel to be certain that 0.010 inch clearance exists between the tip of the index wheel and the detent pawl pin.

(8) CHARACTER ADVANCE ADJUSTMENT. - The character advance adjustment established the correct relationship between the advance feed pawl, check pawl, and the function cam follower. When the correct relationship has been established, each down stroke of the function cam follower will result in one tooth being fed on the advance drum ratchet, except when advance is intentionally suppressed.

NOTE

Check to see if the character advance adjustment is in compliance with the requirements established in Notes after steps 4 and 7. If the requirements are not met, perform the following adjustment sequence.

Step 1. Release the print function clutch and rotate the mainshaft until the function cam follower rises to the high of the cam.

Step 2. Slowly rotate advance drum (1, figure 5-28, Appendix, view A) and check for a 1/4 tooth clearance between advance check pawl and engaged tooth of advance ratchet.

NOTE

When advance feed pawl (2) falls into a tooth in the advance ratchet (3) there should be a 1/4 tooth clearance between the tip of the advance check pawl (5) and the engaged tooth on the advance ratchet (3) at point (6).

Step 3. Set 1/4 tooth clearance between the tip of the advance check pawl and the engaged tooth by adjusting the advance check pawl eccentric (4).

Step 4. Turn the advance drum (1) counterclockwise for five or six teeth to check the eccentric setting.

NOTE

With the function cam follower on the high of the cam, counterclockwise rotation of the advance drum should result first in the advance check pawl and then the advance feed pawl falling into a tooth in the advance ratchet.

Step 5. Rotate the mainshaft until the function cam follower drops to the low of the cam.

Step 6. Slowly rotate the advance drum (1, figure 5-28, Appendix, view B) counterclockwise until both the advance check pawl (3) and the advance feed pawl (6) fall into teeth in the advance ratchet (2).

Step 7. Turn the advance drum counterclockwise for five or six teeth and check the eccentric setting.

NOTE

With the function cam follower on the low of the cam, counterclockwise rotation of the advance drum should result first in the advance feed pawl and then the advance check pawl falling into a tooth in the advance ratchet.

Step 8. If necessary readjust the advance check pawl eccentric (4) to establish the 1/4 tooth clearance between the tip of the advance feed pawl (6) and the engaged tooth in the advance ratchet (2).

Step 9. If it was necessary to readjust check pawl eccentric (4) in step 8, place the function cam follower on the high of the cam and recheck for a 1/4 tooth clearance between the tip of advance check pawl (3) and the engaged tooth on advance ratchet (2).

(9) CARRIAGE RETURN ADJUSTMENTS. - The following adjustments are intended to put the carriage return lock lever and the carriage return lock lever disconnect arm in the proper relationship to one another and to the carriage return cam follower. This insures that the carriage return cam follower will be: (a) held out and away from the cam until full carriage return has taken place; and (b) released to fall onto its cam as soon as carriage return has taken place.

NOTE

Check the clearances established in steps 8 and 9 prior to performing the following adjustment.

Step 1. Adjust the first character adjustment screw (4, figure 5-29, Appendix, view A) in the V-lever (2) so that it protrudes about 1/8 inch at point (3).

Step 2. Back out the five screws on the advance prevention bail (10, figure 5-29, Appendix, view B) so they do not project below the bail.

Step 3. Check to make sure that pin (12) on carriage return cam follower (11) is in the advance prevent bail (10).

Step 4. With the carriage return clutch in the stop position, (low position) loosen clamp screw (9) and align cam follower (11) laterally with cam (1), using a wrench in the cam follower clamp screw (9).

Step 5. Using slight pressure with the wrench, simultaneously hold the cam follower against the cam and push down on carriage return lever (3).

Step 6. Release latch (8, figure 5-30, Appendix), and hold down on carriage return lever (3, figure 5-29, Appendix, view B) to set a 1/32 inch clearance between the surface of advance feed pawl (1, figure 5-30, Appendix) and the inner surface of the tab on the advance prevention lever (9).

Step 7. When 1/32 inch is obtained, tighten the carriage return cam follower clamp screw (9, figure 5-29, Appendix, view B).

Step 8. Rotate the carriage return clutch until cam follower (11) is located on the high portion of the cam.

NOTE

This is best accomplished by pushing down on the off-line carriage return slide lever and rotating the mainshaft.

Step 9. Engage the check pawl link (6, figure 5-30, Appendix) in the check pawl eccentric (5) on advance check pawl (7). Check for 1/16 to 3/32 inch clearance between the tip of check pawl (7) and the teeth on advance ratchet (4) at point (3). Adjust this clearance by rotating the check pawl eccentric (5) on the advance check pawl (7) either clockwise or counterclockwise.

Step 10. Turn the mainshaft until the carriage return clutch comes to the stop position.

NOTE

The carriage return lock lever (6, figure 5-29, Appendix, view A) may have to be pushed down to allow the cam follower to ride on the cam to get the clutch to stop.

(a) CARRIAGE RETURN AND LOCK LEVER ADJUSTMENT. - This adjustment is necessary to insure that full carriage return occurs with the type cylinder and print hammer moving to the left hand margin.

NOTE

Check to see if the carriage return and lock lever adjustment is correct (refer to step 9). If the adjustment is incorrect, perform the following adjustment sequence.

Step 1. Depress the carriage return off-line function slide and rotate the mainshaft until the carriage return cam follower (6, figure 5-31, Appendix) is on the high of its cam.

Step 2. With the carriage return cam follower still on the high of its cam (full return carriage has occurred) slightly loosen the lock lever disconnect arm screw (7, figure 5-29, Appendix, view A) so that it may be moved on its shaft and yet remain in position after each movement.

Step 3. Loosen the hex-headed locknut (8, figure 5-29, Appendix, view A) using two special wrenches provided in MITE Corporation Tool Kit.

Step 4. Adjust the lock lever eccentric bushing (2, figure 5-31, Appendix) until a 0.010 inch clearance (1) is established between the notch in the carriage return cam follower and the lock lever tip.

Step 5. Tighten the hex-headed locknut (hold the eccentric when tightening locknut) when the clearance is established.

Step 6. With the carriage return cam follower still on the high of the cam manually position the lock lever to obtain 0.020 inch clearance (move the lock lever disconnect arm to position the lock lever) as shown in figure 5-32, Appendix.

Step 7. Tighten the lock lever disconnect arm screw (7, figure 5-29, Appendix, view A) when the clearance is correct.

Step 8. Rotate the mainshaft until the carriage return clutch comes to the stop position and advance the printer cylinder halfway across the line by manually rotating advance drum counterclockwise.

Step 9. Depress the carriage return off-line function slide while rotating the mainshaft until carriage return occurs. This checks the carriage return adjustment.

NOTE

Manual carriage return can be effected by using index finger to depress the carriage return lever (3, figure 5-29, Appendix, view B) and thumb to push in on first character adjustment screw (4, figure 5-29, Appendix, view A).

(b) AUTOMATIC CARRIAGE RETURN AND LINE FEED ADJUSTMENT. - The automatic carriage return and line feed adjustment is to insure that automatic carriage return and line feed take place after printing of the 72nd and 76th character, as desired.

NOTE

Check to see if the automatic carriage return and line feed adjustment is in compliance with the requirements established in steps 8 through 11. If the requirements are not met, perform the following sequence.

Step 1. Rotate the mainshaft and depress off-line carriage return function slide until carriage return occurs.

Step 2. Advance the print cylinder across the line to its midpoint of travel by rotating the advance drum counterclockwise.

Step 3. Gently pull outward on the automatic carriage return and line feed actuator (4, figure 5-33, Appendix) and observe that both sides of the actuator (4) strike the automatic carriage return (1) and line feed (6) sensing fingers simultaneously.

Step 4. If simultaneous contact is not made adjust the automatic carriage return eccentric (2).

Step 5. Loosen the actuator arm screw (3) to permit movement of the arm on its shaft.

Step 6. Using the actuator arm as a lever, set sensing fingers (6 and 1) midway between the function bar (1, figure 5-34, Appendix) and the stop strip (3) approximately 1/32 inch at points (4) and tighten actuator arm screw.

Step 7. Rotate the advance drum counterclockwise until the stop pin comes in contact with the V-lever and two clicks are heard or felt. (This indicates that the end of line has been reached).

Step 8. Pull outward on function clutch release (5, figure 5-33, Appendix) to release the function clutch while rotating the mainshaft.

Step 9. Rotate mainshaft until the function cam follower moves to the high of its cam.

NOTE

The two automatic sensing fingers (6 and 1, figure 5-33, Appendix) should fall under the function bar (1, figure 5-34, Appendix).

Step 10. Repeat steps 1 through 6 if both the sensing fingers do not fall under the function bar. If the sensing fingers do fall under the function bar proceed with step 11.

Step 11. Rotate the mainshaft and observe that the motion of the function bar pushes the line feed and carriage return fingers to the rear of the printer, the motion of the fingers released their respective clutches, and the line feed and carriage return functions are performed.

(10) BELL SENSING FINGER ADJUSTMENT.

NOTE

Check to see if the bell sensing finger adjustment is in compliance with the requirements established in steps 5 and 6. If the requirements are not met, perform the following adjustment sequence.

Step 1. Place the printer in LETTERS (LTRS) by releasing print-function clutch, depressing letters clutch release arm (6, figure 5-35, Appendix), and rotating the mainshaft.

Step 2. Continue to rotate the mainshaft until the shift to LETTERS (LTRS) is accomplished and letters-figures clutch stops rotating.

Step 3. Remove printer from chassis and stand it on its backplate.

Step 4. Remove two screws and advance prevent stop spring from frame (spring rides on advance prevent bail).

Step 5. Loosen the bell prevent lever clamp screw (2) and adjust the lever (4) to hold the bell sensing finger (3) 1/32 inch away from the face of the function bar (6).

Step 6. Place the printer in the figures position by releasing function clutch and rotating mainshaft while depressing the figures off line function slide.

Step 7. Check to insure that the bell prevent lever tab (5) is clear of the bell sensing finger (3) allowing the finger to fall into the aligned slots in the lateral and rotary slides (8) when the bell function is selected.

Step 8. Replace advance prevent bail spring, securing spring with two screws, removed in step 4.

(11) LINE FEED ADJUSTMENT. - The line feed adjustment is performed to assure single and double line feed can be selected.

NOTE

Check to see if line feed adjustment is in compliance with the requirements established in steps 1, 9. and 10. If the requirements are not met, perform the following adjustment sequence.

Step 1. Remove the printer from the chassis and stand it on its backplate.

Step 2. Depress the line feed off line function slide to release the line feed clutch (9, figure 5-36, Appendix) and rotate the mainshaft until the line feed cam follower (7) is at the high point of the cam.

Step 3. Rotate the paper roller (8) to make sure that the detent is set in a tooth on the line feed ratchet (1). There will be an audible click when this occurs.

Step 4. Lift the line feed pawl (3) as high as it will go then slowly let it down until the reference tooth falls into the line feed ratchet (1). (Ratchet is located directly behind line feed pawl (3).)

Step 5. Hold the line feed pawl in this position and place a screwdriver or spring hook over the space shaft (4) and under torque tube roller (5). (Use the screwdriver as a lever to hold the line feed pawl in place, engaged with the line feed ratchet.)

Step 6. With the screwdriver holding under the torque tube roller and the line feed pawl engaged in the ratchet place an allen wrench in the line feed cam follower clamp screw (6).

Step 7. Using the allen wrench as a lever, align laterally and hold the line feed cam follower against the high of the cam.

Step 8. Tighten the line feed cam follower clamp screw (6).

Step 9. Check this adjustment a few times by depressing the off line line feed function slide (9) and rotating the mainshaft.

Step 10. Check in both single (11) and double (12) line feed by using the line feed shift arm (10).

NOTE

If the line feed shift arm is on single line feed and you get double line feed, turn the line feed shift adjustment screw (2) clockwise until single line feed is accomplished.

(12) PRINT CYLINDER CLEARANCE FROM RIGHT FRAME AND HAMMER ALIGNMENT ADJUSTMENTS. - Perform the following steps to establish the proper margin and print cylinder clearance on the right end of the line and to align the hammer with the print cylinder.

Step 1. Place the printer in letters A.

Step 2. Rotate the advance drum fully counterclockwise until two clicks are heard or felt, indicating the end of the line has been reached.

Step 3. Check for 1/8 inch clearance between the print cylinder yoke and the right print cylinder shaft bushing when the printer is set for a 76 character line (1/2 inch clearance when a 72 character line is the format).

Step 4. If the clearance as specified in step 3 is not correct, proceed with step 5.

Step 5. Loosen the lateral belt clamp on the advance drum and let out or takeup on the lateral belt to establish the proper clearance (1/8 inch for a 76 character line or 1/2 inch for a 72 character line format).

Step 6. Place the printer in letters A and check for a 1/16 inch clearance between the lateral tension pulley pin and the front portion of the notch in the takeup drum bracket.

NOTE

Most of the printers have a shortened lateral tension pulley pin and it is easier to see a 1/16 inch clearance between the circumference of the lateral tension pulley and the circumference of the drum when in letters A.

Step 7. If the clearance in step 6 is not correct loosen the lateral belt clamp on the takeup drum.

Step 8. Let out or takeup on the lateral belt until the lateral-tension pulley pin is approximately 1/16 inch from the front portion of the notch in the takeup drum bracket assembly.

Step 9. When the clearance in step 8 is correct insert the lateral belt under its clamp on the takeup drum, looping the excess belt and positioning it also under the lateral belt clamp.

Step 10. Tighten the lateral belt clamp, checking to be sure that the belt remains under the clamp when it is tightened.

Step 11. Advance halfway across the line by turning the advance drum counterclockwise.

Step 12. With the printer still in letters A, loosen the hammer cable clamp screw.

Step 13. Align the hammer with the letter A.

Step 14. Check to be certain that the hammer cable is under the hammer cable clamp and tighten clamp screw.

(13) HAMMER BACKSTOP ADJUSTMENT. - The hammer backstop adjustment prevents the hammer from striking the backplate on its backstroke.

NOTE

Check to see if the hammer backstop adjustment complies with the requirements established in step 4. If the requirements are not met, perform the following adjustment sequence.

Step 1. Tighten the hammer backstop clamp screw (5, figure 5-37, Appendix) sufficiently for the clamp to grip the shaft (2) but loosely enough so that the clamp can be turned upon the shaft with slight pressure.

Step 2. Hold the hammer (1) down on the face of the cylinder while pivoting the hammer backstop clamp (4) up until it touches the stop pin stud (3) on the frame.

Step 3. Position the hammer backstop clamp about 1/32 inch from the bearing end (8).

Step 4. Pull the hammer (1) slowly back towards the front plate (6) until it is about 1/8 inch at point (7) from the front plate (6).

Step 5. Tighten the backstop clamp screw (5).

NOTE

This adjustment is to insure that the hammer (1) will not strike the front plate (6) on its backstroke.

(14) PRINT DISCONNECT ADJUSTMENT. - The print disconnect adjustment releases the hammer from the action of the print spring approximately 0.010 inch to 0.015 inches before the hammer face comes in contact with the print cylinder.

NOTE

Check to see if the print disconnect adjustment is in compliance with the requirements established in step 10. If the requirements are not met, perform the following adjustment sequence.

Step 1. Loosen print spring arm clamping screw (figure 5-38, Appendix) the print prevent arm clamping screw and the print cam follower clamping screw.

Step 2. Tighten one of the ribbon vibrator arm clamp screws (3, figure 5-39, Appendix) to be used as a lever.

NOTE

Because there is a certain amount of play between the hammer and the hammer shaft, the vibrator arm is used as a lever in the following steps.

Step 3. Push down on the terminal lever (12, figure 5-39, Appendix) and tighten the print spring arm clamp screw (figure 5-38, Appendix). (This is to use the print spring arm as a lever to move the terminal lever up and down.)

Step 4. Place an allen wrench in the print cam follower clamp screw.

Step 5. Release the print function clutch and rotate the mainshaft holding a slight upward pressure on the wrench.

NOTE

The wrench will travel downward until the cam follower (7, figure 5-40, Appendix) falls into the low portion of the print cam (6) and there will be a slight drop off on the cam before the low portion. This is due to the print prevent notch on the cam.

Step 6. Loosen its screw and position the hammershaft link guide plate (14) and the hammer link clamp (13) so that the link is in line with the print shaft terminal lever (17) and at a right angle to the hammer shaft (12).

Step 7. Tighten the guide plate screw.

Step 8. Hold the hammer (11) down on the type cylinder (2) by using the ribbon vibrator arm (1, figure 5-39, Appendix).

Step 9. Move the print spring arm (3, figure 5-40, Appendix) up and down using the print spring yoke (10).

Step 10. Check to see that the terminal lever (17) engages the hammer shaft link (15) when the print spring yoke is moved up and down.

Step 11. Move the hammer shaft link (2, figure 5-39, Appendix) downward until the terminal lever and hammer shaft link just clear with a minimum of perceptible clearance at point (5) when the print spring yoke is moved up and down.

Step 12. Tighten the hammer shaft link clamp screw (2).

Step 13. Move the print spring yoke up and down a number of times while checking that the tip of the terminal lever and hammer shaft link just clear each other.

NOTE

The hammer should disconnect (from the print spring action) approximately 0.010 inch before contact with the type cylinder. In normal operation the forward travel of the hammer causes the hammer to strike the type cylinder.

Step 14. Loosen the print spring clamp screw (4, figure 5-40, Appendix).

NOTE

The print shaft adjustment outlined in paragraph 15 must be performed after the print disconnect adjustment.

(15) PRINT SHAFT ADJUSTMENT. - This adjustment establishes the correct angular relationship between the print cam follower, the print shaft terminal lever, and the print prevent arm. Print shaft adjustment is accomplished as follows:

NOTE

Check to see if the print shaft adjustment is in compliance with the requirements established in step 13. If the requirements are not met, perform the following adjustment sequence.

Step 1. Loosen the following clamp screws: print cam follower clamp screw (1a, figure 5-41, Appendix); print prevent arm clamp screw (2); and print spring arm clamp screw (11).

Step 2. Insert an allen wrench in the print cam follower clamp screw.

Step 3. Release the print function clutch and rotate the mainshaft until the print cam follower is on the low of its cam. (The wrench should pivot to the front indicating that the low of the cam has been reached.)

Step 4. Loosen the stop tab screw (4, figure 5-42, Appendix).

Step 5. Holding down on the terminal lever (8) against the disconnect link (3), establish a 1/32 inch clearance between the terminal lever and the hammer shaft link at point (2).

NOTE

Pushing the terminal lever (8) down against the print disconnect link (3) pivots the disconnect link which moves the hammer shaft link away from the terminal lever. Pushing against the hammer shaft link (1) pivots the print disconnect link and reduces the clearance.

Step 6. When the 1/32 inch clearance (between terminal lever and hammer shaft link) is established tighten the stop tab screw (4). (The stop tab holds the 1/32 inch clearance.)

Step 7. With an allen wrench inserted in the print cam follower clamp screw (7) and holding down on the terminal lever (8) bottom, laterally align the print cam follower on the low of its cam.

Step 8. Tighten the print cam follower clamp screw (7).

Step 9. Check the 1/32 inch clearance after tightening the print cam follower screw. (Repeat steps 3 through 8 if clearance is not 1/32 inch.)

Step 10. Rotate the mainshaft gradually until the 1/32 inch clearance closes to 0.010 inch.

Step 11. Center and bottom the spring yoke on the shock pad (9) and tighten the print spring arm clamp screw (11).

NOTE

Steps 10 and 11 prevent the bottoming of the print cam follower on its cam and will permit the print spring yoke to contact the shock pad (9) cushioning the shock from the print spring.

Step 12. Rotate the mainshaft until the print function clutch comes to the stop position.

Step 13. Check for approximately 0.020 inch clearance between the print spring yoke and the shock pad on the printer front frame. Repeat steps 1 through 13 if clearance is not present.

NOTE

Holding up on the function spring yoke will help prevent the complete drop of the print cam follower to the true low of its cam and permit positioning print cam follower in the notch on the high.

Step 14. Release the print function clutch and rotate the mainshaft gradually until the print cam follower rises to the high and drops into notch in the high of the print cam.

Step 15. Place an allen wrench in the print prevent arm clamp screw (6, figure 5-43, Appendix) and holding outward on the print prevent bail and (2) using the wrench as a lever, engage the print prevent arm in the notch (8) in the print prevent bail lever (1).

NOTE

Be sure that the print prevent arm is engaged in the notch and not on top of the print prevent bail lever.

Step 16. Tighten the print prevent arm clamp screw (6).

(16) MAGNETIC SELECTOR ADJUSTMENT. - The magnetic selector adjustment is performed with the teletypewriter patched for local loop (2 to 3, 4 to 5, 6 to 7, patching jacks located in left-rear of chassis), line battery supplied internally. The magnetic selector adjustment is performed as follows:

Step 1. Remove motor plug and turn the teletypewriter ON.

Step 2. Pull out the range dial knob and rotate the range dial fully counterclockwise.

Step 3. Rotate the mainshaft until all the clutches stop.

Step 4. Break the signal line (momentarily) by pulling out patching jack J2 or pressing the keyboard break button.

Step 5. Rotate the range dial fully clockwise and then back-up 1/16-inch.

Step 6. Adjust the number 1, 3, and 5 (figure 5-44, Appendix) clutch release arm adjustment screws on the mark side (located on the top of the printer) for a clearance of 0.008 to 0.010-inch (figure 5-45, Appendix) between the tips of the clutch release arm adjustment screws and the paddle or tab directly below it. (This clearance is established with the paddle or tab depressed.)

Step 7. Loosen the printer locking screws and disengage the printer slide locks.

Step 8. Slide the printer slightly to the rear to disengage the manual off-line function slide pushers from the front of the electrical chassis and place the printer on its backplate.

Step 9. Open the signal line by removing patching jack J2. (Be sure that the jack does not make contact with the electrical chassis during the following steps.)

Step 10. Adjust all the clutch release arm adjustment screws (number 1 through 5) on the space side (located on the bottom of the printer) for a clearance of 0.008 to 0.010 inch between the tips of the clutch release arm adjustment screws and the paddle directly below it. This clearance is established by moving the armature under the paddle and then depressing the paddle.

Step 11. Insert the patching jack J2 to remake the signal line.

Step 12. Replace the printer on the chassis, by reversing steps 7 and 8.

Step 13. Tighten the printer locking screws and engage the printer slide locks.

Step 14. Rotate the mainshaft until the number 1 clutch release arm drops.

Step 15. Adjust the start clutch (6, figure 5-44, Appendix) number 2 and number 4 clutch release arm adjustment screws located on the mark side (top of the printer) for a clearance of 0.008 to 0.010 inch (figure 5-45, Appendix) between the tips of clutch release arm adjustment screws and the paddle or tab directly below it. (This clearance is established with the paddle or tab depressed.)

CAUTION

Discharge the motor starting capacitor by turning the motor switch off for approximately 30 seconds prior to reconnection of the motor.

(17) ROTARY, LATERAL, AND LETTERS FIGURES CARRIAGE PULLEY STROKE ADJUSTMENTS. - The rotary, lateral, and letters figures carriage pulley stroke adjustments are performed to assure the proper positioning of the print cylinder. The adjustments can be performed separately but when one is performed a check of the other adjustments should be made. Figure 5-46 (Appendix), Plan View of Print Cylinder is included for reference while performing the following adjustments.

(a) ROTARY STROKE ADJUSTMENT. - The rotary stroke adjustment is performed to assure the proper rotary positioning of the print cylinder strips. Perform steps 1, 2, 3, 4, 6, 9, and 12 to check the rotary stroke adjustment. The rotary stroke adjustment is performed as follows:

Step 1. Put the printer in letter A, remove the printer from the chassis, and place it on its backplate.

Step 2. Check the rotary slide alignment with the index mark on the function selector frame.

NOTE

If the alignment is not correct refer to paragraph 5-4e(3)(b) for the rotary slide alignment adjustment procedure and realign the rotary slide. If rotary slide alignment is correct proceed with steps.

Step 3. Replace the printer on the chassis.

Step 4. Continuously print the letter A, using the repeat key and observe the index wheel (4, figure 5-47, Appendix) for movement.

Step 5. Adjust the rotary cable adjustment screw (3) until the detent pawl pin engagement with the index wheel results in minimum or no movement of the index wheel.

Step 6. Continuously print the letter E, using the repeat key and observe the index wheel for movement.

Step 7. Adjust the number 2 cam follower stroke adjustment screw (5) until the detent pawl pin engagement with the index wheel results in minimum or no movement of the index wheel.

Step 8. Tighten the number 2 cam follower stroke adjustment screw, locknut, while holding the screw to prevent disturbing the stroke setting (screw adjustment).

Step 9. Continuously print the letter L, using the repeat key and observe the index wheel for movement.

Step 10. Adjust the number 1 cam follower stroke adjustment screw (3, figure 5-48, Appendix) until the detent pawl pin engagement with the index wheel results in minimum or no movement of the index wheel.

Step 11. Tighten the number 1 cam follower stroke adjustment screw, locknut while holding the screw to prevent disturbing the stroke setting (screw adjustment).

Step 12. Continuously print the letter T, using the repeat key and observe the index wheel for movement. This checks the cam follower stroke adjustments performed in steps 1 through 11. If the movement of the index wheel is more than 0.010 inch when the letter T is printed, repeat steps 1 through 11.

(b) LATERAL STROKE ADJUSTMENT. - The lateral stroke adjustment assures the proper lateral alignment of the print cylinder behind the hammer. Perform steps 1, 4, 6, and 8 to check the lateral stroke adjustment. The first nine steps of the following lateral stroke adjustment are performed without paper in the printer to permit a check of print cylinder characters and hammer alignment.

Step 1. Transmit the letter A and check the alignment of the hammer with the letter A.

Step 2. If necessary, realign the hammer with the letter A by loosening the hammer cable and repositioning the hammer on its cable.

Step 3. Tighten the hammer cable clamp when the hammer is aligned.

Step 4. Transmit the letter W and observe the alignment of the letter W with the hammer face.

Step 5. Adjust the number 5 cam follower stroke adjustment screw (2, figure 5-48, Appendix) until the letter W is aligned with the hammer face.

Step 6. Transmit the letter J and observe the alignment of the letter J with the hammer face.

Step 7. Adjust the number 4 cam follower stroke adjustment screw (6, figure 5-47, Appendix) until the letter J is aligned with the hammer face.

Step 8. Transmit the letter U and observe the alignment of the letter U with the hammer face.

Step 9. Adjust the number 3 cam follower stroke adjustment screw (1, figure 5-48, Appendix) until the letter U is aligned with the hammer face.

Step 10. Insert paper in the printer and print a line of super-imposed T's over a line of A's.

Step 11. Adjust the number 5 cam follower stroke adjustment screw (2) until the T's are centered over the A's. TT

Step 12. Tighten the number 5 cam follower screw, locknut while holding the screw to prevent disturbing the stroke setting (screw adjustment).

Step 13. Print a line of superimposed I's over a line of A's.

Step 14. Adjust the number 3 cam follower stroke adjustment screw (1, figure 5-48, Appendix) until the I's are centered over the A's. AA

Step 15. Tighten the number 3 cam follower stroke adjustment screw, locknut while holding the screw to prevent disturbing the stroke setting.

Step 16. Print a line of D's superimposed over a line of E's.

Step 17. Adjust the number 4 cam follower stroke adjustment screw (6, figure 5-47, Appendix) until the letter D's are superimposed squarely over the letter E's. DD

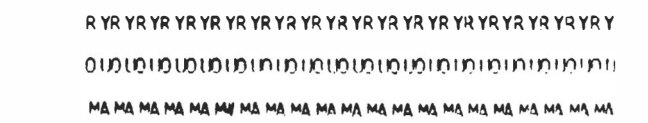
Step 18. Tighten the number 4 cam follower stroke adjustment screw, locknut, while holding the screw to prevent disturbing the stroke setting (screw adjustment).

Step 19. Print a line of AM's, RY's, and OU's and observe the spacing between the characters.

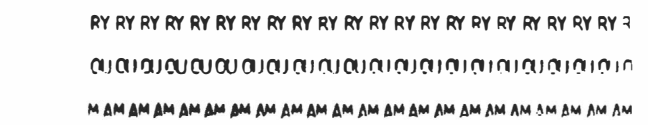
Step 20. The following table should be used for fine adjustment of the number 3, 4, and 5 cam follower stroke adjustment screws to correct the spacing between the characters AM, RY, and OU. The adjustment of the spacing between the characters AM, RY, and OU improves the overall spacing of all printed copy. In some instances it might be necessary to throw out the spacing of a combination of characters to correct the spacing of another combination of characters.

CORRECTION OF SPACING BETWEEN LETTERS AM, RY, AND OU

Example 1. (Cause: #3 screw too far "IN")



Example 2. (Cause: #3 screw too far "OUT")



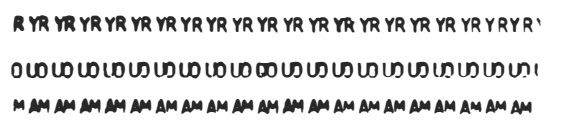
Step 1. Observe the spacing between the letters A-M, R-Y, and O-U.

Step 2. If the spacing between the letters AM, RY, and OU is too far apart (example 1) turn the #3 cam follower stroke adjustment screw counterclockwise (moving the letters M, Y, and U to the left) until proper spacing occurs.

Step 3. If the spacing between the letters AM, RY, and OU is too tight (example 2) turn the #3 cam follower stroke adjustment screw clockwise (moving the letters M, Y, and U to the right) until proper spacing occurs.

Example 3. (Cause: #4 screw too far "IN")

Example 4. (Cause: #4 screw too far "OUT")

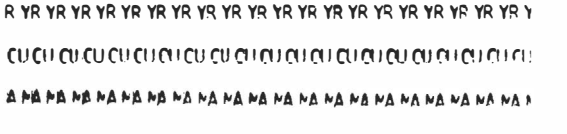


Step 1. Observe the spacing between the letters A-M, R-Y, and O-U.

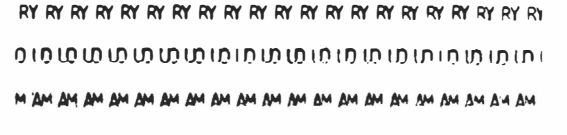
Step 2. If the letters Y and U are too far to the left, and the letter M is too far to the right (example 3) turn the #4 cam follower stroke adjustment screw counterclockwise (moving the letter M to the left and the letters Y and U to the right) until proper spacing occurs.

Step 3. If the letters Y and U are too far to the right and the letter M is too far to the left (example 4) turn the #4 cam follower stroke adjustment screw clockwise (moving the letter M to the right and the letters Y and U to the left) until proper spacing occurs.

Example 5. (Cause: #5 screw too far "IN")



Example 6. (Cause: #5 screw too far "OUT")



Step 1. Observe the spacing between the letters A-M, R-Y, and O-U.

Step 2. If the letters M and Y are too far to the right and the letter U is too far to the left (example 5) turn the #5 cam follower stroke adjustment screw counterclockwise (moving the letters M and Y to the left and the letter U to the right), until proper spacing occurs.

Step 3. If the letters M and Y are too far to the left and the letter U is too far to the right (example 6) turn the #5 cam follower stroke adjustment screw clockwise (moving the letters M and Y to the right and the letter U to the left), until proper spacing occurs.

(c) LETTERS-FIGURES CARRIAGE PULLEY STROKE ADJUSTMENT. - The last stroke adjustment to be made is that of the letter-figures which operates on the rotary cable to shift from letters to figures or vice versa.

NOTE

Check to see if the letters-figures carriage pulley stroke adjustment is in compliance with the requirements established in Steps 1 through 4. If the requirements are not met, perform the following adjustment procedure.

Step 1. Operate the letters off line function lever and repeatedly transmit the letter A, while observing the index wheel for movement.

Step 2. If necessary adjust the rotary cable adjustment screw until there is little or no movement in the index wheel when engaged by the rotary detent pin.

Step 3. Operate the figures off line function lever and repeatedly transmit the figures A (–), and observe the index wheel for movement.

Step 4. If there is more than 0.010 inch movement in the index wheel, or the figure A (–) type row is not aligned with the hammer face, adjust letters figures cam follower stroke adjustment screw (4, figure 5-48, Appendix) until repeated transmissions of figures A (–) result in minimum or no movement of the index wheel. This insures that the letters figures shift is resulting in exactly 180 degrees rotation of the print cylinder.

NOTE

Steps 5 through 7 should be performed only if the following conditions prevail: (a) letters figures arm (5, figure 5-48, Appendix) is hitting against mainshaft (6) or carriage return cam follower shaft (2, figure 5-47, Appendix); and (b) the letters figures carriage pulley stroke adjustment cannot be obtained by adjustment of letters figures cam follower adjustment screw (4, figure 5-48, Appendix) the letters figures arm adjustment screw is preset at the factory and should not require readjustment.

Step 5. Put the printer in letter A.

Step 6. Loosen the locknut on letters figures arm adjustment screw (5, figure 5-48, Appendix); using an internal-hex wrench, turn the adjustment screw inward until the letters figures arm clears carriage return shaft (2, figure 5-47, Appendix) by approximately 1/32 to 1/16 inch.

Step 7. Tighten the locknut on the letters figures arm adjustment screw when the 1/32 to 1/16 inch clearance is established between the letters figures arm and the carriage return shaft.

(18) PRINT PREVENT ADJUSTMENTS. - The print prevent adjustment suppresses printing of the functions blank, line feed, figures, bell, letters, and carriage return.

NOTE

If there is a print prevent a problem, always remove the front cover and check out all of the functions. If the printer prints functions with the cover on, but does not print functions with the cover off, perform the off-line function control adjustments contained in paragraph 5-4e(28). If the printer prints functions with the cover off as well as on, perform the following adjustment sequence.

Step 1. Stand the printer on its backplate on the chassis and check the alignment of the lateral and rotary slides while in letters "A".

Step 2. Realign the rotary and lateral slides if out of alignment; see paragraphs 5-4e(3)(b) and 5-4e(4)(b).

Step 3. Back out all print prevention screws (2, figure 5-49, Appendix) counterclockwise on the print prevent bail until the tips of the screws are flush with the inner face of the bail.

Step 4. Turn in all the print prevention screws on the print prevent bail two turns clockwise.

Step 5. Loosen two bail arm screws (3) and pull the bail away from sensing fingers (4) approximately 1/8-inch.

Step 6. Loosen locknut (1) on the letters "A" print prevent stop screw located on the manual off-line function slide.

Step 7. Pull outward on print-function clutch release arm (5) to transmit the letters "A" repeatedly while turning the print prevention stop screw (1) clockwise until the printing of the letters "A" is suppressed. (Hammer does not strike the type cylinder.)

Step 8. Turn print prevention stop screw (1) counterclockwise until the letters "A" just starts to print and continue 1/2 turn counterclockwise beyond first indication of printing.

Step 9. Tighten locknut (1).

Step 10. Position the print prevent bail so that the heads of the print prevent bailscrews establish approximately a 1/32-inch clearance over the sensing fingers (figure 5-50, Appendix).

Step 11. Tighten the print prevent bail arm screws (3).

Step 12. Replace the printer on the electrical chassis.

Step 13. Check all the functions for suppression of printing manually setting up clutches 1 through 5 for each function and manually releasing print-function clutch.

Step 14. If individual functions print, adjust the print prevent screw on the print prevent bail for the functions.

NOTE

If correct print prevent adjustment is unobtainable, recheck print shaft adjustment (paragraph 5-4e(15)) and reperform this procedure.

Step 15. Replace printer on chassis and check all functions, using keyboard for print prevent.

NOTE

If print prevention occurs with the printer standing on its backplate but not when in normal operating position on the electrical chassis, the print prevent bail spring is defective (not strong enough) and should be replaced.

(19) FUNCTION ADVANCE PREVENTION ADJUSTMENT. - The purpose of this adjustment is to prevent the type cylinder from advancing or backspacing when the functions blank (13, figure 5-51, Appendix) line feed (12), figures (11), bell (10), and letters (9) are selected.

Step 1. Using an allen wrench back out all the advance prevention bail screws (turn counterclockwise) (9 through 13, figure 5-51, Appendix) until they are held in the bail by only a few threads.

NOTE

Step 5 check for a clearance of 1/32-inch between character advance pawl and advance prevent lever tab. Refer to steps 4, 5 and 6 of carriage return adjustment (paragraph 5-4e(g)) if 1/32-inch clearance is not present.

Step 2. Turn the blank bail screw (13) clockwise until the carriage return cam follower (8) starts to lift off the carriage return cam and then turn the bail screw counterclockwise gradually until the cam follower just makes contact with the cam again.

NOTE

Do not use forward pressure when turning the bail screws as this will give an incorrect adjustment. Observe the movement of the carriage return cam follower during each adjustment of a bail screw, as in step 2.

Step 3. Repeat Step 2 for all the remaining advance prevention bail screws; line feed (12), figures (11), bell (10), and letters (9).

Step 4. Depress each function key at least three times to check for advance prevention. If advance is not prevented on an individual function turn the individual advance prevention screw gradually clockwise until advance is prevented.

Step 5. If backspacing occurs back out the individual advance prevention bail screw for that function until backspacing stops.

(20) BOUNCE PREVENT ADJUSTMENT. - The bounce prevent adjustment is performed as follows:

NOTE

Check to see if the bounce prevent adjustment is in compliance with the requirements in steps 1 and 2. If the requirements are not met, perform the following adjustment sequence.

Step 1. Depress the carriage return lever (7, figure 5-51, Appendix) and observe that carriage return occurs.

Step 2. Turn advance drum (4) counterclockwise gradually for approximately seven spaces (characters) and observe that bounce lever (3) rises and then falls with the first tooth of the bounce prevent lever engaging in the notch in V-lever (2) with a slight backward movement of the V-lever.

Step 3. If the first tooth of the bounce prevent lever does not engage the notch in the V-lever or causes movement of the V-lever when it does engage, loosen the bounce lever eccentric clamp screw (5).

Step 4. Adjust the bounce lever eccentric (6) until the engagement of the bounce prevent lever (3) first tooth and the notch in the V-lever (2) causes a minimum amount of movement (slight movement backward) of the V-lever when the advance drum is rotated counterclockwise.

Step 5. Tighten the bounce prevent lever clamp screw (5).

Step 6. Depress the carriage return lever (7) for carriage return and advance by turning the advance drum (4) counterclockwise a number of times while checking the bounce prevent adjustment (engagement of first tooth of bounce prevent lever should cause a slight backward movement in the V-lever).

(21) FIRST CHARACTER SPACING ADJUSTMENT. - The spacing of the first two characters in a line is adjusted by the first character spacing screw (1, figure 5-52, Appendix), located in the carriage return V-lever (2). This screw determines the exact relationship of the advance feed pawl to the ratchet.

NOTE

Check to see the first character spacing adjustment is in compliance with the requirements established in step 1. If the requirements are not met, perform the following adjustment sequence.

Step 1. Using the keyboard, transmit the following in the order shown:

1. Carriage Return
2. Line Feed
3. MMMMMMMMM

NOTE

The spacing of the letter M should be even. If the spacing is uneven, refer to the following steps.

Step 2. Remove the printer from the chassis and stand it on its backplate.

Step 3. If the first two M's are too close together such as MM MMM, turn first character adjustment screw (1) counterclockwise until the spacing is the same as the last two M's typed.

Step 4. If the first two M's are too far apart, such as M MMMM turn the first character spacing screw (1) clockwise, until the spacing is the same as the last two "M's".

Step 5. When the first character screw has been adjusted for optimum spacing of the first two characters tighten the locknut.

NOTE

The adjustment of the first character spacing screw (1) should always be checked if there is no character advance at the beginning of a line following the receipt of a transmitted signal. It may be necessary to recheck the carriage return lock lever, and the anti-bounce adjustment.

(22) RIBBON FEED ADJUSTMENT. - The ribbon feed mechanism requires an adjustment to the reversing clutch backstop to assure that ribbon reversal is accomplished.

NOTE

Check to see if the ribbon feed adjustment performs in accordance with the requirements established in step 1. If the requirements are not met, perform the following adjustment sequence.

Step 1. Actuate both the ribbon sensing arms (4, figure 5-53, Appendix) to determine if ribbon reversal is accomplished.

Step 2. Loosen the backstop clamp screw (1).

Step 3. Adjust the reversing clutch backstop eccentric (2) so the backstop lever falls into the notch of the ribbon reversing clutch (3) and prevents clutch chattering.

Step 4. Tighten the backstop clamp screw (1).

NOTE

If a replacement ribbon does not have eyelets (near both ends of the ribbon), it is necessary to tie a knot close to either end of the ribbon to assure actuation of the ribbon sensing arms.

(23) MOTOR STOP ADJUSTMENTS.

(a) AUTOMATIC TIME DELAY MOTOR STOP ADJUSTMENT.

NOTE

Check to see if the automatic time delay motor stop adjustment is in compliance with the requirements established in step 17. If the requirements are not met, perform the following adjustment sequence.

NOTE

Before proceeding with this adjustment, check that the time delay feed and check pawl springs (11 and 12, figure 5-54, Appendix) and time delay secondary check pawl stop spring (2) are correctly installed.

Step 1. Position the enable-disable switch in the enable position.

Step 2. Set the range dial at its midpoint (60).

Step 3. Turn all power switches OFF.

Step 4. Check that the flat surfaces of timing cam shaft extension (9, figure 5-41, Appendix) are parallel with time delay check pawl (13). If the flats on the timing cam shaft are not parallel to the time delay check pawl (13) proceed with step 4 and 5. If the flats on the timing cam extension are parallel to time delay check pawl (13) proceed with step 7.

Step 5. Loosen screw which secures timing shaft extension (9) to the timing cam shaft, and then turn the 3/8-inch hexagon until the flats on the timing cam shaft extension are parallel to time delay check pawl (13).

Step 6. Tighten the screw holding the timing shaft extension to the timing shaft.

Step 7. Turn the mainshaft slowly until reduction ratchet (6) is moved by feed pawl (10) and the feed pawl comes to the high point of its eccentric action (the reduction ratchet starts to back up).

Step 8. Loosen screw (1) on secondary check pawl (3) and adjust the secondary check pawl eccentric until a 1/4 tooth clearance is established between the tip of the secondary pawl and the tooth in the reduction ratchet (6).

Step 9. Tighten the locking screw (1) when the 1/4 tooth clearance is established.

Step 10. With the secondary check pawl (3) in one of the deep teeth in the reduction ratchet (6), turn post (4) until the tip of the secondary check pawl (3) clears the teeth on the advance ratchet (5) and does not interfere with the return motion of advance ratchet (5).

Step 11. Loosen two screws (22) holding time delay switch (21) and position the switch so that yoke (18) when rotated depresses roller (19) and switch actuator (20) and the click of the switch indicates that the button has been depressed and the switch is turned off.

Step 12. Tighten two screws (22) when the switch is properly positioned and the yoke rotates freely past the point of contact with the switch button. An additional amount of play in the switch button should be possible at the point of greatest contact by the yoke against the switch actuator, yet the button should be depressed sufficiently to be turned off.

Step 13. Rotate the mainshaft until the advance ratchet is released and the yoke is positioned as illustrated. The button on the advance ratchet should be in contact with the tab on the yoke. If the button is not bearing on the yoke tab proceed with step 14. If the button is bearing on the flat tab on the yoke proceed with step 17.

Step 14. Loosen the locknut and disengage the shaft lock on the opposite end of time delay ratchet support shaft (16).

Step 15. Insert a screwdriver in the slot in the time delay ratchet support shaft and turn the shaft counterclockwise until the button on advance ratchet (5) makes contact with the flat tab on the yoke.

Step 16. Re-engage the shaft lock and tighten the ratchet support shaft locking nut on the opposite end of ratchet support shaft (16).

Step 17. Check the operation of the time delay motor stop by turning the printer on with a steady mark supplied on the signal loop. The motor should shut off in approximately one minute when the 75 baud speed change gear is installed and in approximately 1-1/2 minutes when the 45.45 baud speed change gear is installed.

NOTE

The enable-disable switch must be in the enable position in order to check the operation of the automatic time delay motor stop.

(b) FIGURES H MOTOR STOP ADJUSTMENT.

NOTE

This procedure applies to the AN/TGC-314(V) only.

Step 1. Loosen the two screws on the figures H motor stop switch (figure 5-55, Appendix) and move the switch to the extreme left position.

Step 2. Place the machine in the figure J position. Verify this position by checking the individual clutches.

Step 3. Adjust carriage pins numbers 1, 3, 4, and 5 so that the top surface of each pin is even with the top surface of the code bar.

Step 4. Place the machine in figures H position and turn power off.

Step 5. Manually release the print function clutch and rotate the main shaft until the function cam follower is on the high portion of the cam. Check that the code bar return stop clears the code bar tabs when the machine is in the figures position.

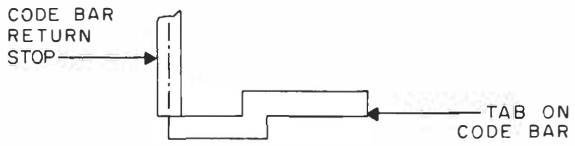
Step 6. Adjust the number 2 carriage pin so that the lower surface of the bottom bushing clears the top of the code bar by approximately 0.010 inch. Check that the code bar sensing tabs are halfway across carriage pins numbers 1, 3, 4, and 5.

Step 7. Adjust the code bar actuator clamp so that it just contacts the code bar actuator. Check that there is approximately 0.005-inch end clearance in the character advance lever shaft.

Step 8. Move the figures H motor stop switch to the right until it is just past the point at which it closes. This point is determined by an audible click; tighten the switch.

Step 9. Manually rotate the main shaft until the function cam follower falls to the low portion of the cam.

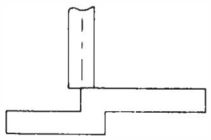
Step 10. Position the code bar return stop so that its centerline is aligned with the left face of the code bar tab as shown in the following sketch viewed from the front of the equipment. Insure that the code bar return stop cam follower still contacts the letters figures cam.



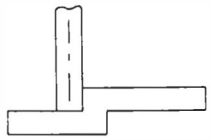
Check the operation of the code bar as follows:

Step 1. Set the MOTOR switch to the ON position.

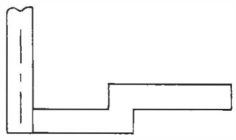
Step 2. Depress the FIGS (figures) key and check that the centerline of the code bar return stop is aligned with the step on the code bar tab as shown in the following sketch viewed from the front of the equipment.



Step 3. Depress the LTRS (letters) key again and check that the code bar return stop is engaged with the step on the code bar as shown in the following sketch viewed from the front of the equipment.



Step 4. Depress the LTRS (letters) key again and check that the code bar return stop is engaged with the left face of the code bar tab as shown in the following sketch viewed from the front of the equipment.



NOTE

None of the figures H motor stop mechanism components should move as long as the machine is in letters position.

(24) AUTOMATIC LATERAL CHAIN TAKEUP ADJUSTMENT.

NOTE

The following steps apply if the lateral slide index mark is not aligned with the frame index mark (figure 5-20, Appendix) when the printer is in letters A.

Step 1. Rotate the ratchet (figure 5-56, Appendix) manually and set the lateral slide alignment so that index mark on the frame is aligned with the index mark on the lateral slide when letter A is transmitted.

Step 2. Check that the setscrew on the stop bracket (figure 5-56, Appendix) extends approximately 1/8-inch out of the bracket toward the front of the machine; adjust setscrew so that 1/4 tooth clearance exists between the check pawl and the ratchet tooth.

Step 3. Transmit letter M and set adjustable slide link (1, figure 5-57, Appendix) by loosening eccentric lock screw (3) far enough so that the adjustable slide link can be moved to the proper notch (2nd from left); then turn eccentric (2) for fine adjustment. If adjustment cannot be obtained by turning the eccentric, move entire slide assembly into the next notch. Make this adjustment so that the feed pawl (figure 5-56, Appendix) is withdrawn on the ratchet to the point that it just about falls into the next tooth on the ratchet.

Step 4. Hold the check pawl and advance pawl (figure 5-56, Appendix) out of engagement, and then turn the ratchet about 3/4 turn clockwise.

Step 5. Transmit a series of AM's and check that the ratchet advances; advancing should cease when the index mark on the lateral function slide is aligned with the mark on the frame when in letters A.

Step 6. If the automatic lateral chain takeup over feeds, rotate eccentric (2, figure 5-57, Appendix) so that the tab at the end of lever (5) which contacts Y lever (4) moves to the left side of the machine.

Step 7. If the automatic lateral chain takeup does not takeup for enough, rotate the eccentric so that the tab moves to the right side of the machine, tilting the Y lever more. Make certain that alignment marks on the frame and lateral slide maintain alignment within the width of one marker line.

(25) OVERALL KEYBOARD ADJUSTMENTS.

NOTE

Check to see if the keyboard meets with the requirements established in following steps. If the requirements are not met, perform a check of each of the adjustment sequences which begin with paragraph 5-4e(25)a.

CAUTION

Be sure to turn off the motor switch before removing the keyboard to prevent damage to the gears.

Step 1. Remove the keyboard from the case. Refer to paragraph 5-4b(5).

Step 2. Visually check keyboard for obvious mechanical defects.

Step 3. Clean the keyboard slip contacts and, if necessary, carefully bend the keyboard slip contacts upward to improve their contact with the chassis block contacts.

Step 4. If possible, insert the keyboard into a teletypewriter of known range (minimum of 70 points at 100 words per minute or 75 bauds). Refer to paragraph 5-4b(6).

Step 5. Patch the teletypewriter set for Mode 1 (with jacks patched as follows: 2 to 3, 4 to 5, and 6 to 7).

Step 6. Check the printer range, refer to paragraph 5-4e(2)(b). If the printer accepts the message transmitted by the keyboard with a minimum of 70 points of range, the keyboard is properly adjusted. If the total points of range is less than 70 points, proceed with the adjustment sequences starting with paragraph 5-4e(25)(a), checking each adjustment sequence prior to performance.

(a) CLUTCH RELEASE LEVER ECCENTRIC.

Step 1. Loosen the clutch release eccentric (see figure 5-58, Appendix), clamp screw.

Step 2. While depressing one key, adjust the clutch release eccentric until a minimum clearance of 0.010-inch exists between the stop tab on the keyboard clutch and the clutch release.

Step 3. Tighten the clutch release eccentric clamp screw.

Step 4. Simultaneously depress two keys and check the relationship of the clutch release and the stop tab on the keyboard clutch. When two keys are depressed simultaneously, the clutch release should not clear the stop tab on the keyboard clutch. If the clutch release does clear the stop tab repeat steps 1 through 3.

Step 5. Depress each of the keyboard keys and check to be sure that the clutch release clears the stop tab with a minimum clearance of 0.010-inches.

(b) CLUTCH STOP ADJUSTMENT.

Step 1. Check to be sure that the clutch release is aligned with the clutch cage.

Step 2. Loosen the grip ring on the repeat key shaft and reposition the bronze bushing on the repeat key shaft so that the clutch release is aligned with the center of the clutch cage.

(c) REPEAT KEY CLAMP ARM ADJUSTMENT.

Step 1. Loosen the repeat key clamp arm screw.

Step 2. Depress the REPEAT key and simultaneously position the repeat key arm on its shaft so that the clutch release tab just clears the clutch tab. See figure 5-59, Appendix.

Step 3. Tighten the repeat key arm clamp screw and release the REPEAT key.

Step 4. Check for 0.005 to 0.010 inch clearance between the tab on the clutch release arm and the clutch cage. See figure 5-59 (Appendix).

Step 5. Repeat the procedure if the keyboard clutch is not released upon depression of the REPEAT key.

(d) LATERAL POSITION AND CLEARANCE OF BACKSTOP.

Step 1. Loosen the hex-head setscrew in the keyboard frame that secures the backstop eccentric shaft.

Step 2. Position the backstop eccentric shaft so that the backstop rests on the center of the clutch housing.

Step 3. Tighten the hex-head setscrew in the keyboard frame just enough to prevent lateral movement of the eccentric shaft.

Step 4. Adjust the backstop eccentric so that the motion of the backstop sliding to the bottom of the backstop notch, causes the clutch housing to backup slightly.

Step 5. Manually rotate the keyboard clutch and check to see that the backstop slides to the bottom of its notch, moving the clutch housing back slightly.

NOTE

The backward motion of the clutch housing insures that the clutch rollers are fully disengaged from the drive shaft.

(e) KEYBOARD RAILS SPACING. - If the keyboard rails (located on top of keyboard) are loosened or removed, adjust the spacing between the rails as follows:

Step 1. Loosen the screws on the right rail.

NOTE

If a ruler is available, rails should be spaced 8-5/16-inches apart. If no ruler is available proceed with step 2.

Step 2. Remove key locking strip (located on back of keyboard) and use it as a clearance gage for spacing keyboard rails.

(f) CODE BAR-PULSING FINGER CLEARANCE.

NOTE

The code bar pulsing finger clearance is preset at the factory and should be performed only if the code bar guide and the code pulsing finger assemblies have been removed or replaced.

Step 1. See figure 5-61 (Appendix), detail B. Depress the blank key to slide all of the code bars to the left and check for 0.005 to 0.010-inch clearance between the code bars and the pulsing fingers.

Step 2. Repeat step 1 for the remaining code bars and pulsing fingers, rotating the keyboard clutch to select the pulsing fingers. If the clearance between the code bars and pulsing fingers is not 0.005 to 0.10-inches proceed with step 3.

Step 3. Remove the two shaft clamp screws, clamps, shims, and the pulsing finger assembly from the keyboard frame, taking care to keep the same clamps and shims together (also remember the keyboard frame notch location in the frame for the clamps and shims).

Step 4. Add to or take away shims from under the shaft clamps to establish 0.005 to 0.010-inch clearance between the code bars and the pulsing fingers (adding shims decreases the clearance and removing shims increases the clearance).

NOTE

Each shim is 0.002-inches thick and removal or addition or more shims under one clamp than the other will cause misalignment of the code pulsing finger shaft and the code pulsing cam assembly.

Step 5. Replace the pulsing finger assembly, shaft clamps, shims, and secure with the clamp screws.

Step 6. Repeat step 1 to check for 0.005 to 0.010-inch code bars and the pulsing fingers.

NOTE

It is necessary to perform the code pulsing contact clearance adjustment (paragraph 5-4e(25)(g)) if shims were removed or added under the pulsing finger shaft clamp. (Code bar-pulsing finger clearance.)

(g) CODE PULSING CONTACT CLEARANCE ADJUSTMENT.

NOTE

The keyboard adjustments and clearance have been preset at the factory. Only if replacement of code pulsing contacts is required or distortion from the keyboard becomes excessive should the code pulsing contact clearance require adjustment.

Step 1. Position the keyboard as shown in detail A, (figure 5-61, Appendix) and note the location of the code pulsing contacts.

Step 2. Depress the blank key and manually rotate the keyboard drive gear until the first contact (start stop) opens and its pulsing finger is on the high side of the cam.

Step 3. Using a screwdriver or contact bender adjust the contacts by carefully bending the bottom contact leaf or the bottom contact leaf stiffener for a clearance of 0.020 to 0.025 inch.

Step 4. Continue to rotate the keyboard drive gear until the low side of the cam is opposite the number 1 pulsing finger; adjust the contact clearance for 0.015 to 0.020 inch (detail C); repeat this procedure for the number 2 through number 5 pulsing fingers.

Step 5. Depress the letters key and manually rotate the keyboard drive gear until the number 1 pulsing finger drops off the high side of the cam (detail D); check for a clearance between the pulsing finger pusher and the top contact leaf of 0.010 inch (minimum); repeat this procedure for the number 2 through 5 pulsing fingers. If clearance is incorrect, check the condition of the cam, pulsing fingers, code bars, and associated mechanism.

(h) CODE PULSING CONTACT TENSION. - Check that the pressure required to open a closed set of code pulsing contacts (figure 5-61, Appendix, detail D) is 3 to 4 ounces.

(i) MASTER PULSING CONTACT ADJUSTMENT. - Position the keyboard clutch in the stop position, and perform the master pulsing contact adjustment as follows:

Step 1. Using the special internal-hex 1/16-inch wrench turn the upper and lower leaf adjusting screw (figure 5-61, Appendix) counterclockwise until the leaf contacts do not make contact.

Step 2. Turn the upper leaf adjusting screw clockwise until the leaf contacts make contact and continue turning the screw 1/8 turn past this point.

Step 3. Depress any key to release the keyboard clutch.

Step 4. Rotate the keyboard clutch slowly until the master pulsing cam follower (the first cam follower near the outside frame wall) is on the low if its cam (centered in the low of the stop).

Step 5. Turn the lower leaf adjusting screw clockwise until the leaf contacts make contact and continue turning the screw 1/8 turn past this point.

Step 6. Replace the keyboard in the chassis.

Step 7. Turn the machine on and type a series of R's using the REP key.

Step 8. If the machine runs open, the upper leaf adjusting screw is not in far enough. If the letter V prints, the upper leaf adjusting screw is too far in.

Step 9. Type a series of Y's using the REP key. If LETTERS is selected and the Y does not print, the lower leaf adjusting screw is too far in.

(26) OSCILLOSCOPE ADJUSTMENT OF MASTER PULSING CONTACTS.

NOTE

Insure that the master pulsing contact assembly has been centered (5-4 steps 11 and 12) prior to performing this adjustment.

Step 1. Remove the electrical chassis from the case (paragraph 5-4b(3)) and extend the keyboard to the operating position.

Step 2. Refer to figure 2-12 (Appendix) and patch in Mode 1 (line battery supplied internally).

Step 3. Insert a 280-ohm, 8-watt resistor (FSN 5905-100-4802) in series in the signal loop.

Step 4. Connect Oscilloscope AN/USM-105, or equivalent, across the 280-ohm, 8-watt resistor.

Step 5. Turn on the equipment and adjust the LINE ADJUST control for approximately 30 milliamperes of signal line current as described in paragraph 2-8e(4).

Step 6. Locate the lower spring leaf adjusting screw; (figure 5-61, Appendix, detail E) directly under the upper spring leaf adjusting screw; insert the insulated 1/16-inch internal-hex wrench (supplied in Tool Kit TK-122/U) through the split rubber cover into the lower spring leaf adjusting screw; transmit the letter Y using the REP (repeat) key and turn the lower spring leaf adjusting screw counterclockwise until the letter Y is no longer transmitted.

Step 7. Open the upper spring leaf adjusting screw access plate (figure 5-61, Appendix, detail E); insert the special wrench between the ribbon roller and the printer front plate into the upper spring leaf adjusting screw and turn the screw counterclockwise until the printer runs open.

Step 8. Transmit a series of letters R using the REP (repeat) key: Turn the upper spring leaf adjusting screw clockwise until the waveform on the oscilloscope shows a marking pulse on pulses 2, 4, and stop and spacing pulses on start, 1, 3, and 5 as shown in waveform A, figure 5-62 (Appendix). As the screw first comes in contact with the pulsing finger, waveform B will appear. Further clockwise rotation of the screw will produce waveform A; if the screw is turned too far in, waveform C will appear.

Step 9. Transmit a series of letters Y using the REP (repeat) key. Turn the lower spring leaf adjusting screw clockwise until the waveform shows marking pulses on 1, 3, 5, and stop and spacing pu pulses on start, 2, and 4 as shown in waveform A, figure 5-63 (Appendix). Waveform B shows the lower spring leaf adjusting screw too far out; waveform C shows the lower spring leaf adjusting screw approaching the proper adjustment; and waveform D shows the lower spring leaf adjusting screw too far in.

Step 10. Transmit LTRS (letters) using the REP (repeat) key. The oscilloscope waveform should appear as shown in waveform A, figure 5-64 (Appendix). Readjust the upper and lower adjusting screws slightly for minimum width and height of the pips. Transmit letters R; if the lower screw is properly adjusted and the upper screws is in too far, waveform B will appear. Transmit letters Y; if the upper spring leaf adjusting screw is properly adjusted and the lower spring leaf adjusting screw is in too far, waveform C will appear.

Step 11. Before proceeding with step 12, check the speed change gear which is installed in the equipment. Refer to paragraph 2-10 for speed change gear replacement and install the 100-word per minute (white) gear, AN/TGC-14(V) or 75 baud gear, AN/TGC-14A(V). Refer to figure 5-65 (Appendix) for the proper length of the start pulse of the speed change gear installed.

Step 12. Using a convenient time base on the oscilloscope, note the length of the start pulse (first spacing pulse); this start pulse should appear as shown in figure 5-65 (Appendix). For the AN/TGC-14(V) operating on 7.42-unit code and 100 words per minute, the pulse length should be 13.49 milliseconds (or 22 milliseconds at 60 words per minute). For the AN/TGC-14(V) operating on 7.0-unit code, the pulse length should be 13.33 milliseconds at 75 baud and 22 milliseconds at 45.45 baud. If the pulse lengths are incorrect adjust the pulse length as described in the following steps.

NOTE

There are two alternate methods for checking the start pulse length. The first method is to compare the lengths of the start pulse and the number 1 pulse during letters condition; the end of the number 1 pulse appears as a small pip in figure 5-65 (Appendix). The second method is to transmit letters X (marking on 1, 3, 4, and 5) and observe that the start pulse is the same length as the number 1 (marking) and number 2 (spacing) pulses.

Step 13. Locate the start pulse eccentric screw (figure 5-66, Appendix) in the master pulsing cam and rotate the pulsing cam assembly until this start pulse eccentric is aligned with the top adjustment hole in the keyboard frame; check that a screw is aligned with the bottom hole.

NOTE

Do not loosen or move either the eccentric or the screw as yet.

Step 14. Rotate the pulsing cam assembly until the second screw appears in one of the adjustment holes; loosen this screw by inserting an internal-hex wrench through the hole in the frame. Rotate the cam assembly until the third screw appears in one of the adjustment holes; loosen the screw.

Step 15. Rotate the pulsing cam assembly until the start pulse eccentric again appears in the top adjustment hole and the first screw again appears in the bottom hole. Insert a screwdriver through the top hole and into the start pulse eccentric; insert an internal-hex wrench through the bottom hole and loosen the third screw.

Step 16. If the start pulse must be lengthened, turn the start pulse eccentric in a manner that will retard the master pulsing cam in relation to the start stop cam. These cams move clockwise when viewed from the left side of the keyboard. If the start pulse must be shortened advance (clockwise) the relative position of the master pulsing cam with the start stop cam.

Step 17. Upon completion of the adjustment, tighten the first screw and then the remaining two screws; close the upper spring leaf adjusting screw access plate (figure 5-61, Appendix, detail E).

(27) FIELD ADJUSTMENT OF KEYBOARD.

(a) CODE PULSING CONTACT CLEARANCE.

NOTE

Insure that the master pulsing contact assembly has been centered, (steps 11 and 12) prior to performing this adjustment.

Step 1. Position the keyboard as shown in detail A, figure 5-61 (Appendix) and note the location of the code pulsing contacts.

Step 2. Depress the blank key and manually rotate the keyboard drive gear until the first contact (start stop) opens and its pulsing finger is on the high side of the cam.

Step 3. Using a contact bender, adjust the contacts by carefully bending the bottom contact leaf or the bottom contact leaf stiffener for a clearance of 0.020 to 0.025 inch.

Step 4. Continue rotating the keyboard drive rear until the low side of the cam is opposite the number 1 pulsing finger; adjust the contact clearance for 0.015 to 0.020 inch (figure 5-61, Appendix, detail C); repeat this procedure for the number 2 through number 5 pulsing fingers.

Step 5. Depress the letters key and manually rotate the keyboard drive rear until the number 1 pulsing finger drops off the high side of the cam (figure 5-61, Appendix, detail D); check for a clearance between the pulsing finger pusher and the top contact leaf of 0.010 inch (minimum); repeat this procedure for the number 2 through number 5 pulsing fingers. If clearance is incorrect, check the condition of the cam, pulsing fingers, code bars, and associated mechanism.

(b) MASTER PULSING CONTACTS. - The following procedures will place the keyboard contacts in nearly perfect alignment. For further refinement of the adjustment, perform the oscilloscope adjustment procedure in paragraph 5-4e(26).

Step 1. Loosen the three master pulsing cam retaining screws (figure 5-66, Appendix).

NOTE

It is necessary to rotate the master pulsing cam in small increments, aligning the master pulsing cam retaining screws with the adjustment hole in the side of the keyboard frame. When a retaining screw is aligned with adjustment hole, insert an allen wrench into the hole and loosen the retaining screw.

Step 2. Align the start pulse eccentric screw with one of the adjustment holes, insert a small screwdriver and rotate the screw until the three retaining screws are in approximate center of their slots.

Step 3. Retighten the three master pulsing cam retaining screws.

Step 4. Depress the blank key and manually rotate the keyboard drive gear until the master pulsing cam follower drops to the first low on the master pulsing cam. Check to see that the number 1 pulsing finger contact is open.

NOTE

If the master pulsing contact assembly has been removed from the frame, proceed with step 5 through 10. If the master pulsing contact assembly has not been dismantled from the keyboard frame, proceed with steps 11 through 26.

Step 5. Loosen the master pulsing contact actuator retaining screw and pivot the actuator (see figure 5-61, Appendix) off to the side.

Step 6. Back out the upper and lower spring leaf adjusting screws on the replacement contacts using special internal-hex 1/16 inch wrench (supplied in Teletypewriter Maintenance Kit. MITE Corporation P/N 7140, FSN 5815-902-3328) so that the screws are just engaged in their threads.

NOTE

Backing out the screws in this manner provides maximum clearance between the contacts.

Step 7. Attach the replacement master pulsing contact assembly loosely to the left bottom frame of the keyboard using two screws and two lockwashers.

NOTE

When mounting the master pulsing contact assembly, try to align the contact with the center line of the master pulsing cam follower.

Step 8. Spread the upper and lower leaf contacts apart just enough to insert contact actuator between the leaf contacts; tighten master pulsing cam follower screw.

Step 9. Place a shim (0.010 inch for six-leaf master pulsing contact assembly or 0.005 inch for two-leaf master pulsing contact assembly between the tip of master pulsing cam follower and its cam, while on the low. This establishes the midway point of travel of the master pulsing cam follower.

Step 10. Loosen master pulsing contact attaching screws two screws and move the entire master pulsing contact assembly into position so that keyboard contact actuator is pointing at the center insulator and upper and lower leaf contact assemblies are parallel to keyboard contact actuator tighten two screws and remove the shim.

Step 11. Connect an ohmmeter (Multimeter AN/PSM-4, or equivalent) across the keyboard slip connector contacts.

Step 12. Rotate the keyboard drive gear toward the front until the shaft rotates freely; the clutch will then be in the stop position.

Step 13. Depress letter A and turn the keyboard over with the space bar toward you.

Step 14. Observing the pulsing fingers (figure 5-61, Appendix) from right to left, note that the first

one is the master pulsing cam follower and second one is the start stop pulsing finger which is now resting on the low side of its cam.

Step 15. Slowly rotate the keyboard drive gear away from you until the master pulsing cam follower is riding in the center of the first low part of its cam.

Step 16. Turn the lower spring leaf adjusting screw (figure 5-61, Appendix) counterclockwise until no reading (meter pointer at infinity end) is observed on the ohmmeter; then turn the screw clockwise until the meter first reads. Continue turning the screw one-eighth turn past this point.

Step 17. Very carefully turn the keyboard drive gear away from you until the master pulsing cam follower is riding on the center of the high point of its cam.

Step 18. Turn the keyboard over and turn the upper leaf adjusting screw (figure 5-61, Appendix) counterclockwise until no reading is observed on the ohmmeter; then turn the screw clockwise until the reading is first observed and continue turning the screw one-eighth turn past this point.

Step 19. Remove the ohmmeter and reinsert the keyboard in the printer.

Step 20. Turn the machine on the type a series of letters R, using the REP (repeat) key.

Step 21. Adjust the printer range as instructed in paragraph 5-4e(2)(b) until the low end of the range is found.

NOTE

If letter V prints, the upper spring leaf adjusting screw is in too far.

Step 22. Move the range dial up ten points from the low end.

Step 23. Type a series of letters Y, using the REP (repeat) key; turn the lower spring leaf adjusting screw clockwise until the letters Y print correctly.

NOTE

If letters function is selected, the lower spring leaf adjusting screw is in too far.

Step 24. Move the range dial back to the low end and type a series of letters R, using the REP (repeat) key; if letters V print, the upper spring leaf adjusting screw is too far in. If the machine runs open, the upper spring leaf adjusting screw is too far out. Make the indicated adjustment and verify that letters R are printing correctly.

Step 25. Type a series of letters Y, using the REP (repeat) key; if letters V print, the upper spring leaf adjusting screw is too far in; if the machine runs open, the upper spring leaf adjusting screw is too far out. Make the indicated adjustment and verify the letters Y are printing correctly.

NOTE

When both letters R and Y are printing correctly at the low end of the printer range, the keyboard is correctly adjusted.

Step 26. Reset the pointer to the middle of its range according to paragraph 5-4e(2)(b).

(28) OFF-LINE FUNCTION CONTROL BUTTON ADJUSTMENT. - The off-line function control adjustments are "factory type" adjustments and are not frequently required in the field. If it is found that the teletypewriter set is operational with the cover off and then malfunctions with the cover installed, inspect for any of the three following problems:

1. Nothing happens when the off-line function control button is depressed.

2. The off-line function is performed, and the button fails to return.

3. Printing of the function symbol and performance of the function are simultaneous upon depression of the off-line function control button. This condition is also exhibited during operation of the keyboard.

Step 1. Observe figure 5-67 (Appendix) and note the relationship of the off-line function plunger with that of the off-line function lever.

Step 2. If no function is performed when the off-line function control button is depressed, bend down the plunger foot at point "A".

NOTE

Bend the foot in small increments until satisfactory operation is obtained.

Step 3. If the function is performed upon depression of the off-line function button, but the button fails to return to upon its release, bend the foot down at point "B" to prevent its passing point "C" on the off-line function lever.

Step 4. If the selected function is performed and the function symbol is also printed, remove the front cover and manually depress the off-line function lever. Observe whether or not the function symbol is still printed. If upon removal of the front cover the symbol is no longer printed, it is possible the cover was installed incorrectly. Re-install the cover and if operation is now normal, do not continue this adjustment.

Step 5. Reshape the foot at points "A" and "B" to relieve the pressure against the off-line function lever. Continue to bend the foot up until normal operation is accomplished.

(29) SIGNAL LINE CURRENT ADJUSTMENT.

NOTE

The line adjust, rheostat is in output of the power supply in the AN/TGC-14(V). In the AN/TGC-14A(V) it is in the receive line of the teletypewriter.

This adjustment is required only when the teletypewriter is operated on internal battery or supplying line battery. To check and adjust the signal line current, proceed as follows:

Step 1. Place the teletypewriter on local loop (patch the patching cords on the rear of the chassis: 2-3, 4-5, and 6-7).

Step 2. Remove the jumper wires from the SEND binding posts on the service cable junction box when patched for local loop. If no service cable is used, remove the patch cord between J4 and J5 chassis receptacles, located on the rear of the chassis.

Step 3. If on low current operation (1 to 5 milliamperes) place a 50,000-ohm resistor in series with the REC (red) binding posts on the service cable junction box (when using a AN/PSM-4 or equivalent multimeter) or if no service cable is used insert one end of the 50,000-ohm resistor in chassis receptacle J5 and let the other end hang free.

Step 4. Connect the negative lead of the multimeter AN/PSM-4 or equivalent, (set to read approximately 500 direct-current milliamperes) to one of the SEND (black) posts or if no service cable is present, connect the negative end of the multimeter to the free end of the 50,000-ohm resistor previously inserted in J5 chassis receptacle.

Step 5. Momentarily touch the positive lead of the multimeter to the remaining service cable SEND post or the J4 chassis receptacle (when no service cable is used). If the meter reads in a negative direction reverse the multimeter leads for a reading of 20 to 80 (60) milliamperes (high range) or 1 to 5 (2.5) milliamperes (low range). If the reading is below 20 ma or above 80 ma (high range) or below 1 ma or above 5 ma (low range), continue with step 6.

Step 6. Loosen the locknut on LINE ADJUST control R2 (located on the left rear corner of the chassis).

Step 7. Turn the control clockwise or counterclockwise until desired 60ma (high range) or 2.5ma (low range) is obtained.

Step 8. Tighten the locknut on LINE ADJUST control R2.

(30) PAPER BRAKE ADJUSTMENT.

NOTE

Check to insure that paper brake operation is in accordance with the requirements established in step 3. If the requirements are not met, perform the following adjustment sequence.

CAUTION

Never lift the equipment by means of the dancer roll tube (paper brake release arm), located between the two brake arms as this will result in permanent damage to the paper brake link.

Step 1. Adjust the two paper brake link eccentrics (figure 5-68, Appendix) so that the spring end of the paper brake link is located midway between the two stop tabs when the rubber part of the brake mechanism eccentric touches the flared edge of the brake drum

NOTE

While performing step 1, it is important that the paper brake link eccentrics be adjusted to keep the dancer roll tube (paper brake release arm) parallel with the paper supply roll.

Step 2. Operate the line feed key and observe that sufficient paper is fed for a new line.

NOTE

Line feed action pulls the paper, pivoting dancer roll tube (paper brake release arm), paper brake links, and paper brake link eccentrics (rubber discs), releasing the paper brake drums. When sufficient paper has been released the spring biased pivoting action of the paper brake assembly should cause the paper brake drums, preventing further rotation of the paper roll.

Step 3. Attach 8 ounce spring scale to the center of the dancer roll tube (paper brake release arm) and check that the pressure required to move it away from the paper supply roll is 1-1/2 to 2 ounces. Move the scale to both ends and check that the pressure required to move the dancer roll tube (paper brake arm) is 1/2 to 1 ounce.

NOTE

If the requirements of step 3 are not met, or if the mechanism is binding, check for distortion or damage to the dancer roll tube (paper brake release arm) the brake drums or the two upright paper brake links and replace the damaged parts.

(31) SPROCKET FEED PAPER ADJUSTMENT. - This procedure applies to AN/TGC-14A(V) teletypewriter sets only.

Step 1. Check to be certain that the 72 character block is installed in operating position on the V lever. If the block is installed proceed with step 7. If the block is not installed, proceed with step 2.

Step 2. Manually depress the carriage return lever and observe that carriage return occurs.

Step 3. Remove the retaining ring and then the advance drum (with the cables attached) from the right side of the printer.

Step 4. Remove the screw and the 72 character block from the stowage position on the V lever.

Step 5. Position the 72 character block over the threaded hole in the V lever (operating position is located near the tip of the "V") and thread the screw through the block into the V lever.

Step 6. Install the advance drum on its shaft and secure it with the retaining ring. Check to insure that all cables are installed correctly.

Step 7. Depress the carriage return lever and observe that carriage return occurs.

Step 8. Set the printer in letters A.

Step 9. Check the alignment of the lateral function slide with the index mark on the function selector frame and if necessary realign the lateral function slide (refer to paragraph 5-4e(4)(b)).

Step 10. Loosen the lateral control belt clamp on the takeup drum and allow 3/8 inch of lateral control belt to be released; then retighten the lateral control belt clamp.

Step 11. Loosen the lateral control belt clamp on the advance drum and take up the 3/8 inch of lateral

control belt previously released from the takeup drum; then retighten the lateral control belt clamp.

Step 12. Manually rotate the advance drum until two clicks are heard or felt indicating that the end of the line has been reached.

Step 13. Check for 1/8 inch clearance between the print cylinder yoke and the print cylinder shaft bearing located in the right wall of the frame. Proceed with step 14 if the 1/8 inch clearance is not present and with step 16 if 1/8 inch clearance is present.

Step 14. If the 1/8 inch clearance between the print cylinder yoke and the print cylinder shaft bearing is not correct, loosen the lateral control belt clamp on the advance drum and take up or let out the lateral control belt until the clearance is established.

Step 15. Retighten the lateral control belt clamp on the advance drum when the 1/8 inch clearance has been established.

Step 16. Depress the carriage return lever and observe that carriage return occurs (print cylinder and hammer move to the left-hand margin).

Step 17. Check for a clearance of 1/16 inch between the takeup arm pulley and the takeup drum circumferences.

Step 18. If the 1/16 inch clearance between the takeup arm pulley and the takeup drum circumferences is not correct, loosen the lateral control belt clamp on the takeup drum and let out or take up on the lateral control belt until the clearance is established; retighten lateral control belt clamp on the takeup drum.

Step 19. Rotate the advance drum counterclockwise until the print cylinder is positioned in the center of the line.

Step 20. Loosen the hammer cable clamp and realign the hammer with the letter A.

Step 21. Tighten the hammer cable clamp on the hammer cable when the hammer is correctly aligned with the letter A.

Step 22. Using a .050 internal hex-wrench, thread the individual sprocket teeth into the threaded holes on either end of the paper feed roller.

Step 23. Loosen the two screws holding the plate behind the slot on the back of the case (CY-2977A/UG) and slide the plate down uncovering the slot to permit the access of fan-fold sprocket feed paper through the slot to the printer.

Step 24. Move the paper feed assembly, release lever to the right and up into the notch in the chassis to release the paper feed roller pressure.

NOTE

Sprocket feed fan-fold paper is run without pressure from the rollers of the paper feed assembly.

f. DISASSEMBLY PROCEDURES. - Perform the following disassembly procedures in the exact sequence indicated. Use extreme care not to damage any removed parts; do not disturb adjacent parts or adjustments. Carefully place disassembled parts on a clean dry surface in their approximate relative position to facilitate reassembly. The figure and index references used in the procedures refer to parts location illustrations in other parts of this section or in the Appendix.

g. DISASSEMBLY OF PRINTER INTO THREE MAIN SUBASSEMBLIES.

Step 1. Remove paper guide (A2, figure 5-81, Appendix) by pulling up and back.

Step 2. Remove ribbon from ribbon vibrator guides (25 and 27) on the front plate of the printer.

Step 3. Detach the secondary number 3 cam follower spring from secondary number 3 cam follower (18, figure 5-95, Appendix) and ribbon feed mechanism or (on AN/TGC-14A(V)) from its post on the frame.

Step 4. Remove five mounting screws (AN/TGC-14(V) only) that secure ribbon feed top plate assembly (30, figure 5-96, Appendix) and the bounce prevent bracket to the printer frame; place ribbon feed top plate on a clean surface. For AN/TGC-14A(V), remove ribbon feed top plate by moving lock clips (9) to the right and lift the ribbon feed top plate assembly away from ribbon feed base spring clips (8 and 30, figure 5-79, Appendix).

Step 5. On AN/TGC-14(V) only, remove guide covers (16 and 19, figure 5-80, Appendix).

Step 6. Position printer on its back plate, loosen three frame clamp screws (25, figure 5-97, Appendix) and three frame clamp screws (19, figure 5-95, Appendix); then disengage the three frame clamps on top of the printer and the three frame clamps on the bottom.

Step 7. Remove retaining ring (38, figure 5-84, Appendix) from print spring yoke pivot stud (40) and remove stud from print spring arm (39).

Step 8. Remove retaining ring (85, figure 5-85, Appendix) from function spring yoke pivot stud (84) and remove the stud (84) from function level (61).

NOTE

Insure that the main shaft remains in the rear half of the printer while lifting off the front half.

Step 9. Carefully grasp front half of printer and lift it away from rear half.

NOTE

For AN/TGC-14(V), proceed to step 12; for AN/TGC-14A(V), continue with step 10.

Step 10. Remove time delay check pawl helical spring (37, figure 5-69, Appendix) and time delay feed pawl helical spring (30).

Step 11. Remove two screws (29) and two lock washers (24) from printer helical gear (2, figure 5-70, Appendix), freeing feed mechanism and motor stop assembly (28, 31-36, figure 5-69, Appendix).

Step 12. Make a small diagram showing the existing timing mark relationship, so that the same relationship can be established during assembly (refer to figure 5-99, Appendix, or location of timing marks only).

NOTE

Timing mark relationship has been established at the factory and should be maintained as long as no range calibration problems have been encountered.

Step 13. Grasp main shaft by its ends and lift it out of rear frame.

(1) MAIN SHAFT DISASSEMBLY.

Step 1. Separate the two halves of the main shaft at the center bearing.

Step 2. Remove retaining ring (1, figure 5-70, Appendix) from selector main shaft (24).

Step 3. Slide printer helical gear (2) off selector main shaft (24), being careful not to lose woodruff key (3).

NOTE

If the key does not come off the shaft when the gear is removed, push it out.

Step 4. Slide start clutch release assembly (which consists of: 4, 7, 8, 9, 10, 11, 12, 14 and 15) off the main shaft.

Step 5. Unhook start clutch backstop lever spring (4) from range adjustment assembly (5) and start clutch backstop lever (12).

Step 6. Remove retaining ring (15); slide start clutch release latch (14) and felt washer (13) off the pin on which they are mounted.

Step 7. Slide start clutch backstop lever assembly (which consists of part numbers: 7, 8, 9, 10, 11, 12) off the pin on which it is mounted.

Step 8. Loosen clamp screw (8) and slide clamp (7) off start clutch backstop lever (12).

Step 9. Remove start clutch backstop eccentric bushing (9a) from start clutch backstop lever (12).

Step 10. Remove lock nut (10) and start clutch release adjustment setscrew (11) from start clutch backstop lever (12) by turning counterclockwise.

Step 11. Slide left-hand bearing (16) out of left-hand bearing retainer (6) by pressing out with fingers.

Step 12. Disassemble the remainder of the selector main shaft by removing the parts in the sequence established in figure 5-21 (Appendix).

CAUTION

Use extreme caution removing items (19) from clutches (20, 22, 23, 28, 27, and 26) as each item consists of 28 rollers which can be easily lost.

Step 13. Remove center bearing retainer (1, figure 5-22, Appendix) and center bearing (2) from function main shaft (14).

Step 14. Remove center bearing (2) from center bearing retainer (1) by pushing it out with fingers.

Step 15. Remove items (3) through (15) from function main shaft (14) in the sequence shown in figure 5-22 (Appendix).

CAUTION

Use extreme care when removing items (6) from clutches (7, 9, 17, and 15) as each item consists of 28 rollers which can be easily lost.

Step 16. Remove right-hand bearing (11) and right-hand bearing retainer (10) from function main shaft (14) and disassemble as instructed in step 14.

Step 17. Slide third reduction gear (13) off function main shaft (14); remove third reduction gear key (12) from the shaft.

(2) REAR HALF DISASSEMBLY.

(a) AUTOMATIC TIME DELAY MOTOR STOP DISASSEMBLY.

NOTE

This procedure applies to AN/TGC-14A(V) only.

Step 1. Remove screw (25, figure 5-69, Appendix), lock washer (24), and timing cam shaft extension (27) from timing cam shaft assembly (64, figure 5-78, Appendix).

Step 2. Remove time delay switch probe (6, figure 5-69, Appendix) from the selector connectors.

NOTE

In the following step, four sleeve spacers (21) and time delay feed and check pawl guide (26) will fall free when screw (27) and lock washer (24) are removed.

Step 3. Remove time delay mounting base plate assembly (22) and associated parts from rear frame by removing four screws (27) and four lock washers (24).

Step 4. Remove lock nut (18), lock washer (19), and ratchet support shaft lock (20) from ratchet support shaft (43).

Step 5. Remove ring (38 or 50 (see insert)), sleeve (39), one shim (40), time delay latch (41), and another shim (40) from ratchet support shaft (43).

Step 6. Slowly remove ratchet support shaft (43) from time delay yoke (42), picking off advance ratchet (1), return spiral spring (2), and reduction ratchet (3) as the shaft is removed from the yoke.

Step 7. Remove return spiral spring (2) from recess in advance ratchet (1).

Step 8. Remove retaining ring (36) and felt washer (25) from main shaft drive adapter assembly (28).

Step 9. Remove retaining ring (34), time delay check pawl (33), sleeve spacer (32), and time delay feed pawl (31) from main shaft drive adapter assembly (28).

Step 10. Remove retaining ring (49) and detent spring assembly (47) from time delay mounting base plate assembly (22).

Step 11. Remove retaining ring (48) from detent spring pin (45), freeing detent spring roller (46).

Step 12. Loosen and remove screws (4) and washers (5) from nut plate (17), freeing spacer (9), time delay switch actuator (8), and time delay switch (7).

Step 13. Remove time delay secondary check pawl spring (14), screw (10), time delay secondary check pawl eccentric (11), time delay secondary check pawl (12), and spacer (13).

Step 14. Remove nut (16), lock washer (15), and post (44).

(b) BACK PLATE REMOVAL AND DISASSEMBLY.

Step 1. Loosen and remove two screws, lock washers, and washers (2, 3, and 4, figure 5-72, Appendix).

Step 2. Loosen the six back plate clamp retaining screws and slide back plate (1, figure 5-79, Appendix) to the left and then back to the right; remove the back plate.

(c) MOTOR, MOUNTING PLATE, AND FAN OUTLET DUCT REMOVAL.

Step 1. Remove lock nut (8, figure 5-77, Appendix) from speed change gear (7); loosen idler gear lock nut (21) and push idler gear assembly toward the bottom of the printer; slide speed change gear (7) off first reduction gear (5).

Step 2. Remove three screws (3), lock washers (2), and washers (1); slide motor mounting plate (13) and motor assembly out of rear frame.

Step 3. Remove three screws (15, figure 5-73, Appendix or 6, figure 5-74, Appendix) and three lock washers (8, figure 5-73, Appendix or 7, figure 5-69, Appendix); remove the motor mounting plate from the motor.

Step 4. Remove two screws (1, figure 5-72, Appendix) from cooling housing (6) and slide the motor out of the housing.

CAUTION

Do not remove the gear head and drive pinion on the 400-cycle motor. Gear tolerances are such that all repairs must be made at the factory.

Step 5. On the 400-cycle motor only, slide motor cover (7, figure 5-73, Appendix) off motor and gear head assembly (13).

Step 6. Loosen motor fan setscrew (1) and slide motor fan (2) off motor shaft.

Step 7. Disassemble the 60-cycle motor by following the index sequence established in figure 5-74 (Appendix).

(d) SELECTOR REMOVAL AND DISASSEMBLY. - Remove the printer back plate (paragraph step 2) prior to removing the selector. For AN/TGC-14(V), remove the two figures H motor stop probes (insert, figure 5-79, Appendix) and proceed as follows:

Step 1. Loosen screws (14, figure 5-75, Appendix) in lock bar (12).

Step 2. Slide lock bar (12) to the left to pull out the right side of the bar and then to the right to pull out the left side of the bar.

CAUTION

In the next step, insure that none of the armature mark and space paddle latches (11 and 33) catch on the clutch release arms.

Step 3. Grasp the selector assembly and pull toward the back of the printer.

Step 4. Remove selector shaft bias springs (9) from the selector assembly.

Step 5. Remove nuts (1) from selector tie rod studs (32).

Step 6. Remove outer frame plate spacers (35) and inner frame plate spacers (36).

CAUTION

In the next step, be careful not to drop armature (25), armature shaft spacers (24), lubricating wick non-metallic washers (22), and lubricating wick retainers (23) when removing left-hand outer frame plate (41).

Step 7. Remove screw (29), lock washer (30), and cable strain relief bracket (40); pull left-hand outer frame plate (41) off selector mark shafts (18) and selector space shafts (34).

CAUTION

Armature magnets and their respective armatures are matched at the factory and should be assembled accordingly. The left and right inner frames are not interchangeable and should be assembled in their original positions. In the next step, be careful not to drop armature (25), armature shaft spacers (24), lubricating wick non-metallic washers (22), and lubricating wick retainers (23) when removing right-hand outer frame plate (31).

Step 8. Remove screw (29) and lock washer (30); pull right-hand outer frame plate (31) off selector mark shafts (18) and selector space shafts (34).

Step 9. Remove selector mark shafts (18) and selector space shafts (34) from the selector assembly.

Step 10. Remove screws (7), lock washers (6), and latches (5) from selector mark shafts (18) and selector space shafts (34).

Step 11. Remove screws (7), lock washers (6), and selector shaft bias spring arms (8) from selector mark shafts (18) and selector space shafts (34).

Step 12. Remove screws (7), lock washers (6), armature mark paddle latches (11), and armature space paddle latches (33) from selector mark shafts (18) and selector space shafts (34).

Step 13. Remove selector magnet assemblies (15) by removing screws (29) and lock washers (30).

Step 14. Pull selector magnets off right-hand inner plate (26) and left-hand inner plate (26).

For AN/TGC-14A(V) removal and disassembly of selector, proceed as follows (Serial 3706 and higher):

Step 1. Loosen screws (6, figure 5-76, Appendix) in lock bar (8).

Step 2. Slide lock bar (8) to the left to pull out the right side of the bar and then to the right to pull out the left side of the bar.

CAUTION

Insure that none of the armature mark and space paddle latch portions of selector mark and space latch shafts (9 and 14) catch on the clutch release arms.

Step 3. Grasp the selector assembly and pull toward the back of the printer.

Step 4. Remove selector shaft bias springs (10) from the selector assembly.

Step 5. Remove nuts (1) and terminal plate assembly (4) from selector tie rod studs (12).

Step 6. Remove outer frame plate spacers (5) and inner frame plate spacers (11).

Step 7. Remove screw (19), lock washer (20), and cable strain relief bracket (21); pull left-hand magnet frame assembly (18) away from selector mark latch shafts (9) and selector space latch shafts (14).

Step 8. Remove selector mark latch shafts (9) and selector space latch shafts (14) from right-hand magnet frame assembly (13).

(e) GEAR TRAIN AND AUTOMATIC CARRIAGE RETURN AND LINE FEED ASSEMBLY REMOVAL. - Refer to figure 5-77 (Appendix) and proceed as follows:

NOTE

Lock nut (8) and speed change gear (7) must be removed prior to motor removal.

Step 1. Remove pin (4) from first reduction gear (5).

Step 2. Remove three screws (10) and lock washers (11) from motor mounting plate (13).

Step 3. Remove bearing cup (12) from motor mounting plate (13).

Step 4. Remove first reduction gear (5) from motor mounting plate (13).

Step 5. Press bearings (6) out of motor mounting plate (13) and bearing cup (12).

Step 6. Remove idler gear lock nut (21) and slide idler gear stud (14) out of idler gear arm assembly (15).

Step 7. Remove ring (20) and idler gear (16) from idler gear arm assembly (15).

Step 8. Pull idler gear bearing (17), spacer (19), and ring (18) out of the shouldered side of idler gear (16); press remaining idler gear bearing (17) out of idler gear (16).

Step 9. Remove four retaining rings (36) from V lever shaft (35).

Step 10. Loosen lock lever actuator arm screw (38) and automatic carriage return and line feed actuator arm screw (39).

NOTE

The parts on the V lever shaft are loose and will fall out of the printer when the V lever shaft is removed.

Step 11. Remove lock lever actuator arm helical spring (43) and automatic carriage return and line feed bail actuator helical spring (44); then slide V lever shaft (35) out of the printer frame.

Step 12. Support third reduction pinion (24), using a suitable fixture or block, and carefully press pin (23) out of third reduction pinion (24).

NOTE

Idler gear arm assembly (15) is loose when ring (29) is removed.

Step 13. Slide third reduction pinion (24) off the shaft on second reduction gear (28). Slide second reduction gear (28) out of bearing (25), rings (26) and (29), and spacer (27).

(f) MARK (10) AND SPACE (36) CLUTCH RELEASE SELECTOR SHAFT. TIMING CAM SHAFT, AND BACKSTOP SHAFT (1) REMOVAL.

Step 1. Remove six inter-arm springs (35, figure 5-78, Appendix).

Step 2. Remove print and function clutch release arm spring (51).

Step 3. Remove eight retaining rings (11) from mark clutch release selector shaft (10) and ten retaining rings (11) from space clutch release selector shaft (36).

Step 4. Remove line feed pawl spring (26).

Step 5. Remove function timing cam wick (52) and timing cam wick (53).

NOTE

If the mark and space shafts referred to in step 6 have a tapped hole in their left end, insert a 6-32 screw to aid in removing the shafts.

Step 6. Slowly pull mark clutch release selector shaft (10) to the left and pick off each part as it falls off the shaft; repeat this procedure for space clutch release selector shaft (36).

NOTE

If the space shaft is tight, loosen line feed cam follower arm clamping screw (49).

Step 7. Remove retaining ring (19) and safety spring (18); slide mark clutch release finger (34) off mark clutch release arm assembly (20); remove clutch release finger adjustment screw (13) and lock nut (14) from mark clutch release arm assembly (20).

Step 8. Disassemble the remainder of the clutch release assemblies in the manner described in step 7.

Step 9. Loosen line feed cam follower arm clamping screw (49) and slide line feed cam follower arm (44) off line feed torque tube arm assembly (45).

Step 10. Remove retaining ring (47) and slide roller (46) off line feed torque tube actuator (45).

NOTE

In the next step do not remove screw (27) unless absolutely necessary; this is a factory-set adjustment.

Step 11. Remove screws (31 and 27), washers (32), screw (27), and nuts (29 and 28); then remove bell prevent lever (33) from letters figures pulley carriage actuator and cam follower (22A).

Step 12. Remove retaining ring (24) and slide line feed pawl (25) off line feed motion amplify link (23).

Step 13. Remove two retaining rings (8) from backstop shaft (1).

Step 14. Unfasten clutch backstop springs (9) from clutch backstop lever (5).

Step 15. Slowly pull backstop shaft (1) to the left and pick off each part as it falls off the shaft.

Step 16. Loosen clamp screw (6) and slide clamp (7) off clutch backstop lever (5).

Step 17. Push clutch backstop eccentric bushing (4) out of clutch backstop lever (5).

Step 18. Remove three screws and three lock washers (22 and 23, figure 5-79, Appendix) from bearing retainer (67, figure 5-78, Appendix).

Step 19. Remove timing cam shaft assembly (items 56 through 64) by pulling to the left.

Step 20. Remove bearing retainer (67) and bearing (66) from timing cam shaft (64).

Step 21. Push bearing (66) out of bearing retainer (67).

Step 22. Remove retaining ring (63) and pull timing cam shaft gear (62) off timing cam shaft (64).

Step 23. Remove key (54) and spacer (61) from timing cam shaft (64).

Step 24. Remove timing cams (59) and keys (54).

Step 25. Remove bowed retaining ring (56) and pull function clutch release cam (57) off timing cam shaft (64).

Step 26. Remove key (54) and slide spacer (55) and bearing (58) off timing cam shaft (64).

(g) REAR FRAME DISASSEMBLY.

Step 1. Remove print and function helical spring yoke link assemblies (11, figure 5-79, Appendix) from function helical spring (10) and print helical spring (18) by twisting links off springs counterclockwise.

Step 2. Remove function and print helical springs (10 and 18) from their mounting brackets by twisting them counterclockwise.

Step 3. See insert on figure 5-79, Appendix. Remove two screws (AN/TGC-14(V) only) and cable clamps; remove wires to the selector and then remove switch plate assembly.

NOTE

The switch plate assembly (AN/TGC-14(V) only) is comprised of all items shown in insert on figure 5-79 (Appendix).

Step 4. Disassemble the switch plate assembly (AN/TGC-14(V) only) by removing screws and washers. See insert on figure 5-79 (Appendix).

Step 5. Remove two screws (4) and advance prevent stop spring (5).

Step 6. Loosen screw (33) and washer (34); remove backstop spring clip (12).

Step 7. Remove screws (6), blocks (7), and ribbon feed base spring clips (8 and 30).

Step 8. Remove screw (32) and lock washer (31); remove change gear post (27) from the frame.

CAUTION

When pin (28) is removed, change gear post (29), detent ball (27), detent helical spring (26), and lock arm (25) are free.

Step 9. Press pin (28) out of change gear post (29).

Step 10. Remove screw (21), lock washer (20), and start cam lubricating wick assembly (19) from rear frame (9).

Step 11. Remove three retaining rings (17) and one retaining ring (17); remove frame clamp stud pivots (13 and 13) from frame clamps (14 and 24).

Step 12. Remove frame clamp screws (16 and 16) and frame clamp pads (15 and 15) from frame clamps (14 and 24).

(3) FRONT FRAME DISASSEMBLY.

(a) TAKEUP DRUM AND LINKAGE DISASSEMBLY.

Step 1. Remove two screws (12, figure 5-80, Appendix) and two screws (53).

Step 2. Hold takeup drum (7, figure 5-84, Appendix) and loosen the return and print hammer cables by sliding the knots out of their respective slots; loosen the lateral control belt by removing screw (1), lock washer (2), and lateral control belt clamp (3) on the takeup drum. Release the carriage return spiral spring tension by allowing the takeup drum to slowly rotate.

Step 3. Remove the lateral control belt and print hammer and return cables.

Step 4. Pull takeup drum bracket assembly (24) to the left to disengage it from the front frame.

Step 5. Remove two retaining rings (21) and two flat washers (22) from takeup arm (15).

Step 6. Slide lateral tension helical spring (23) from takeup arm (15) and takeup drum bracket assembly (24).

CAUTION

All pulley bearings are pressed into the pulleys at the factory and should not be pressed out.

Step 7. Remove ring (13), flat washer (14), and takeup arm (15) from takeup drum bracket assembly (24).

Step 8. Remove grip ring (20) and spacer (19) slide belt pulley (16) off takeup arm (15).

Step 9. For AN/TGC-14(V), unscrew range pinion lock knob (insert, figure 5-84, Appendix) by turning counterclockwise. Press range pinion dial pin out of range pinion and remove range pinion dial, spacer, and range finder lock helical spring (29) from range pinion. Remove range pinion from the takeup drum bracket assembly.

Step 10. For AN/TGC-14A(V), press groove pin (27) out of range finder knob (56) and remove conical range finder slide lock (28) and range finder lock helical spring (29); remove range finder knob (56) from range dial (55); then remove range dial (55) from takeup drum bracket assembly (24).

Step 11. Remove two screws (52) to remove left-hand belt pulley bracket (48) from takeup drum bracket assembly (24).

Step 12. Remove ring (20), spacer (19), belt pulley assembly (16), and spacer (35) from left-hand belt pulley bracket (48).

Step 13. Remove ring (20), spacer (19), cable pulley assembly (49), and spacer (19) from takeup drum bracket assembly (24).

Step 14. Remove nut (26) and lock washer (25); grasp takeup drum (7) and pull to the left.

NOTE

In the next step, insure that carriage return spring holder (12) remains close to takeup drum (7) to prevent carriage return spiral spring (9) from jumping out.

Step 15. Slide carriage return spring mounting cup (11) off takeup drum shaft (10).

Step 16. Remove retaining ring (4) and pull takeup drum (7) off takeup drum shaft (10).

Step 17. Carefully remove carriage return spring holder (12) and carriage return spiral spring (9) from takeup drum (7).

NOTE

Ring (8) prevents bearings (5) from being pushed out. Each bearing must be pushed from the center outward.

Step 18. Push bearings (5) out of takeup drum (7) and catch spacer (6).

Step 19. Remove ring (8) from takeup drum (7).

Step 20. For AN/TGC-14A(V) only, remove two screws (54) and two flat washers (53) to remove range finder lock lever assembly (31).

NOTE

In the next step, range finder lock lever (31) and range finder lock lever spring (32) will fall free as range finder lock lever shaft (30) is removed.

Step 21. Remove retaining ring (34) and pull range finder lock lever shaft (30) from range finder lock lever bracket (33).

(b) RIBBON FEED FRONT PLATE REMOVAL AND DISASSEMBLY.

Step 1. Disengage left-hand and right-hand ribbon vibrator guide assemblies (25 and 27, figure 5-81, Appendix) from left-hand and right-hand vibrator arms (43 and 50, figure 5-82, Appendix).

Step 2. Remove two screws (56, figure 5-80, Appendix) and remove ribbon feed front plate assembly (29, figure 5-81, Appendix).

Step 3. Remove screw (10), lock washer (19), and bell (20).

Step 4. Remove retaining rings (6) and slide ribbon guide rollers (7) off left-hand and right-hand ribbon guide brackets (28 and 8).

Step 5. Remove screws (10) and flat washers (9) to remove left-hand and right-hand ribbon guide brackets (28 and 8).

Step 6. For AN/TGC-14(V), remove retaining rings (23) and felt washers (24); pull ribbon vibrator pivot shaft (26) out to remove left-hand and right-hand ribbon vibrator guide assemblies (25 and 27). For AN/TGC-14A(V), remove two spring clips freeing left-hand and right-hand ribbon vibrator guide assemblies (25 and 27). See insert on figure 5-81 (Appendix).

Step 7. Remove retaining ring (12) from the post on front plate assembly (22), freeing end of line bell lever assembly (11) and wire link (18).

Step 8. Remove end of line bell bracket assembly (17) from front plate assembly (22) by removing screws (16).

Step 9. Remove retaining ring (14), end of line bell lever (15), and torsion spring (13) from end of line bracket and shaft assembly (17).

(c) PRINT HAMMER SHAFT REMOVAL AND DISASSEMBLY.

Step 1. Remove four screws (33, figure 5-82, Appendix) and four lock washers (34).

Step 2. Unfasten print hammer actuator link helical spring (39) from print hammer actuator link (40).

Step 3. Remove print hammer return spring (54) from pin on lower portion of print hammer shaft stop (52).

Step 4. Disengage print hammer cable from print hammer cable clamp (48) by loosening print hammer cable clamp screw (49).

Step 5. Lift print hammer shaft assembly (44) out of front frame.

Step 6. Slide left-hand and right-hand bearings (35 and 35) and felt washers (36) off print hammer shaft (44).

Step 7. Remove grip ring (37), felt washer (38), and retaining ring (62); slide print hammer actuator link (40) off print hammer actuator link lever (60).

Step 8. Loosen screw (61) and slide print hammer actuator link lever (60) off print hammer shaft (44).

Step 9. Loosen screw (53) and slide print hammer shaft stop (52) off print hammer shaft (44).

Step 10. Loosen screws (41), lock nuts (55), washers (56), and lock washers (42) from left-hand and right-hand vibrator arms (43 and 50).

Step 11. Slide left-hand and right-hand vibrator arms (43 and 50) off print hammer shaft (44).

Step 12. Remove print hammer cable clamp screw (49), lock washer (24), and print hammer cable clamp (48) from print hammer (45).

Step 13. Remove three screws (58) and three lock washers (34) to remove print hammer cap (57) from print hammer (45).

Step 14. Remove print hammer (45) from print hammer shaft (44).

Step 15. Remove print hammer face pad clamp screw (47) and print hammer face pad (46) from print hammer (45).

(d) PRINT CYLINDER YOKE SHAFT REMOVAL AND DISASSEMBLY.

Step 1. Remove retaining ring (9, figure 5-82, Appendix) from print cylinder yoke shaft (1).

Step 2. Slide print cylinder yoke shaft (1) out of the front frame.

NOTE

It is necessary to remove the print cylinder yoke shaft prior to print cylinder shaft removal. However, the lateral control belt does not have to be removed from the print cylinder yoke.

Step 3. Remove lateral control belt from print cylinder yoke (8) by loosening screw (2) and nylon lockstrip (3).

Step 4. Remove belt clamp wedge (5) and belt clamp (4), thus freeing lateral control belt.

NOTE

Bushings (7) are close tolerance, press fit bushings and should not be replaced unless absolutely necessary.

(e) PRINT CYLINDER SHAFT REMOVAL AND DISASSEMBLY.

NOTE

If the print cylinder shaft is to be removed temporarily, allow the rotary cable to remain attached to the index wheel and allow the index wheel to hang on the side of the printer.

Step 1. Remove rotary cable from index wheel (27, figure 5-82, Appendix).

Step 2. Remove screw (30) and lock washer (31) from right-hand bearing retainer (23).

CAUTION

When performing step 3, the rotary motion spring will become loosened and may become damaged if not released slowly. See paragraph 5-4e(3)(a).

Step 3. Remove two screws (15) and two lock washers (16) from left-hand bearing retainer (18) while holding rotary motion spring retainer (32) and allowing the spring to unwind slowly.

Step 4. Lift print cylinder shaft assembly (20) from the front frame.

Step 5. Loosen and remove special nut (29) and sleeve spacer (28).

NOTE

If the next step, do not lose machine key (26) when removing index wheel (27).

Step 6. Slide index wheel (27) off print cylinder shaft (20).

Step 7. Remove machine key (26) if not already done.

Step 8. Remove sleeve spacer (25), right-hand bearing retainer (23), and bearing (24).

Step 9. Push bearing (24) out of right-hand bearing retainer (23).

Step 10. Slide washer (22) and print cylinder (21) off print cylinder shaft (20).

Step 11. Remove grip ring (10), rotary motion spring retaining washer (11), rotary motion spring retaining nylon washer (12), and rotary motion spring retainer (32) (containing rotary motion spring (13) and rotary motion spring housing nylon washer (14)) from print cylinder shaft (20) by sliding them to the left.

Step 12. Slide bearing (17), left-hand bearing retainer (18), and threading flange (19) to the left and off print cylinder shaft (20).

(f) PAPER FEED REMOVAL AND DISASSEMBLY.

Step 1. Loosen screw (1, figure 5-83, Appendix) and pull paper feed knob (34) off paper feed rubber roll (2).

Step 2. Remove two screws (10, figure 5-80, Appendix) and two paper guide retaining pins (14); lift paper feed mechanism out of front frame.

Step 3. Remove two pressure roll springs (12, figure 5-83, Appendix).

Step 4. Remove four retaining rings (6) from paper feed pressure release shaft (19); remove paper pressure release lever spring (29) from paper pressure release lever (28) and paper feed pressure release shaft (19).

Step 5. Remove retaining ring (30) and slide paper pressure release lever (28) off paper pressure release lever pivot clamp (27).

Step 6. Loosen screw (26) on paper pressure release lever pivot clamp (27) and pressure release cam set-screws (24); pull paper feed pressure release shaft (19) to the left, freeing pad springs (21), pressure pad (20), pressure release cams (23), and paper pressure release lever pivot clamp (27).

Step 7. Remove retaining rings (6) and pull pressure roll shaft (15) to the left, freeing pressure roll (16).

Step 8. Remove four retaining rings (6), and slide pressure roll pivot shaft (37) but to the right, freeing left-hand and right-hand pressure roll actuator arms (36 and 17).

Step 9. Remove paper feed detent spring (5) from paper feed guide (4) and paper feed detent arm (14).

Step 10. Remove retaining rings (12 and 6) and slide detent roller (13) off paper feed detent arm (14).

Step 11. Slide paper feed detent arm (14) off paper feed guide (4).

Step 12. Remove screw (1).

Step 13. Remove grip ring (35), washer (8), and ball bearing (7) off the left side of paper feed rubber roll (2).

Step 14. Press ratchet roll pin (9) out of paper feed rubber roll (2) and slide paper feed detent and ratchet (10) off of paper feed rubber roll (2).

Step 15. Remove lock washer (8) and ball bearing (7) from paper feed rubber roll (2).

Step 16. Lift out paper feed rubber roll (2); on AN/TGC-14A(V) only, remove paper feed tooth sprockets (3).

(g) PRINT LEVER SHAFT REMOVAL AND DISASSEMBLY.

Step 1. Loosen print prevent arm clamping screw (46, figure 5-84, Appendix), print cam follower clamping screw (47), and print spring arm clamping screw (46).

NOTE

In the next step, print prevent arm (36), print cam follower (37); and print spring arm (39) will fall free as print lever shaft assembly (43) is removed.

Step 2. Remove two retaining rings (44) and print lever shaft assembly (43) by pulling to the left. Bearing (42) will have to be drilled or reamed if removal is necessary.

Step 3. Slide two felt washers (45) off of print lever shaft (43).

(h) ADVANCE DRUM AND LINKAGE DISASSEMBLY.

Step 1. Remove bounce prevent lever spring (25, figure 5-85, Appendix).

Step 2. Loosen and remove three cable clamp screws (14), lock washers (13), and cable clamps (12).

Step 3. Remove return cable (92), print hammer cable (93), and lateral control belt (93) from advance drum (11).

Step 4. Remove grip ring (16) and pull advance drum (11) off advance drum bracket (8).

NOTE

Bearings (9 and 9) must be removed by pushing outward from the center because of internal retaining ring (10).

Step 5. Push bearings (9 and 9) out of advance drum (11), freeing spacer (15).

Step 6. Remove internal retaining ring (10) from advance drum (11).

Step 7. Remove grip ring (7), spacer (3), rotary cable pulley (4), and spacer (3), from rotary pulley shim (2).

Step 8. Remove two screws (30, figure 5-80, Appendix) freeing check pawl guide bracket (91, figure 5-85, Appendix).

Step 9. Pull advance drum bracket (8) and rotary pulley shim (2) from front frame.

Step 10. Press out dowel pins (1) from rotary pulley shim (2).

Step 11. Remove retaining ring (29), check pawl link (30), and spacer (31) from carriage return shaft assembly (26).

Step 12. Remove advance prevent lever spring (27) and character advance pawl spring (36).

Step 13. Remove retaining ring (41), ring (40), advance prevent lever (39), and shim (38) from character advance lever shaft assembly (53).

Step 14. Remove screw (31), character advance pawl eccentric bushing (32), and character advance pawl (33) from character advance lever shaft assembly (53).

Step 15. Remove retaining rings (42 and 42) and slide index link (43) off character advance lever shaft assembly (53) and rotary detent pawl actuator arm (46).

Step 16. Unhook check pawl spring (62) from check pawl (64) and advance suppression latch (72).

Step 17. Remove screw (67), check pawl eccentric bushing (68), check pawl assembly (64), and spacer (69).

Step 18. Remove nut (66), lock washer (65), and check pawl eccentric stud (63) from check pawl (64).

Step 19. Unhook and remove rotary detent pawl spacing (52) from rotary detent pawl (50) and character advance lever shaft assembly (53).

Step 20. Remove screw (44), rotary detent pawl eccentric bushing (45), rotary detent pawl actuator arm (46), felt washer (47), rotary detent pawl assembly (50), and washer (51) from front frame.

Step 21. Loosen nut (49) and remove rotary detent pawl adjustment screw (48) from rotary detent pawl (50).

Step 22. Remove felt strip clip (35) and felt strip (34) from character advance lever shaft assembly (53).

Step 23. Remove screw (70), advance suppression latch eccentric bushing (71), advance suppression latch (72), and felt washer (73) from advance suppression latch mounting stud (74).

Step 24. Loosen and remove advance suppression latch mounting stud (72) and screw (36, figure 5-80, Appendix), freeing rotary cable pulley assembly (78, figure 5-85, Appendix), lateral control belt pulley assembly (82), and spacer bracket (81).

Step 25. Remove grip ring (76), spacer (77), rotary cable pulley (78), and spacer (77) from rotary cable pulley shaft assembly (79).

Step 26. Remove grip ring (76), spacer (77), internal control belt pulley assembly (82), and spacer (79) from lateral control belt pulley bracket (83).

Step 27. Loosen code bar actuator clamp screw (57), lifter arm clamping screw (59), and function cam follower clamping screw (90).

Step 28. Remove screws (18, figure 5-80, Appendix), lock washers (17), and print lever and character advance lever shaft support bracket assembly (51).

NOTE

Function cam follower assembly (89, figure 5-85, Appendix), function lever assembly (61), lifter arm spring (60), lifter arm assembly (58), code bar actuator clamp assembly (56), spacer (55), ring (54), and felt strip (37) will be freed when character advance lever shaft assembly (53) is removed in step 29.

Step 29. Slide character advance lever shaft assembly (53) to the right and out of the front frame.

Step 30. Remove function cam follower clamping screw (90) from function cam follower (89).

Step 31. Remove two special screws (86), function bar (87), and compression springs (88) from function lever (61).

Step 32. Remove retaining rings (19) from carriage return shaft assembly (26).

NOTE

Carriage return cam follower (18), felt washer (20), and bounce prevent lever assembly (24) will fall free when carriage return shaft assembly (26) is removed in step 33.

Step 33. Loosen carriage return cam follower clamping screw (17) and slide carriage return shaft assembly (26) out of the front frame to the right.

Step 34. Remove carriage return cam follower clamping screw (17) from carriage return cam follower (18).

Step 35. Remove setscrew (23) and slide clamp (22) off bounce prevent lever (24).

Step 36. Push bounce prevent lever eccentric bushing (21) out of bounce prevent lever (24).

(i) FRONT FRAME MIDSECTION DISASSEMBLY.

Step 1. Remove four screws (50, figure 5-80, Appendix), and off line function slide assembly (102, figure 5-86, Appendix); slide out function sensing finger lever stop strip (165).

Step 2. Remove code bar spring (AN/TGC-14(V) only) shown in insert on figure 5-80 (Appendix).

Step 3. Remove function backstop springs (25, figure 5-86, Appendix) and figures H code bar return stop spring (AN/TGC-14(V) only) shown in insert.

NOTE

Step 4 through step 8 are for AN/TGC-14(V) only; see insert on figure 5-80 (Appendix).

Step 4. Remove retaining ring, compression spring retainer, compression spring, and code bar guide.

Step 5. Remove screw, clamp plate, and washer.

Step 6. Remove figures H code bar.

Step 7. Remove retaining ring, figures H code bar actuator, actuator spring, actuator stud, and lock washer.

Step 8. Remove guide pin and code bar support.

Step 9. For AN/TGC-14A(V), remove two screws (15, figure 5-80, Appendix).

Step 10. Remove left-hand and right-hand guide covers (16 and 19), screw (20), and return cable pulley bracket assembly (21).

Step 11. Remove retaining ring (1), sleeve spacers (2), and return cable pulley (3) from return cable pulley bracket (21).

Step 12. Remove three screws (42) and lock washers (43).

Step 13. Lift line feed spacing arm assembly (40A) out of front frame.

Step 14. Remove shift lever adjustment screw (37) from shift bracket (38).

Step 15. Remove ring (45) and washer (44); pull out line feed shift arm (40).

Step 16. Remove retaining ring (41) and line feed shift (39) from line feed shift arm (40).

Step 17. Remove retaining rings (1), sleeve spacers (2), and lateral control belt pulleys (46) from front frame.

Step 18. Remove retaining rings (1), sleeve spacers (2), and pulleys (3) from left and right corner of front frame.

Step 19. Remove two retaining rings (31) and frame clamp pivot (35); slide off frame clamp assembly (32).

Step 20. Remove frame clamp screws (33) and frame clamp pads (34) from frame clamps (32).

Step 21. Remove two lock nuts (13) and pull printer electrical chassis locators (52) out of front frame.

Step 22. Remove retaining ring (1), two sleeve spacers (2), and pulleys (3) from pin (22).

Step 23. Remove nut (44) and pull pin (22) out of front frame.

Step 24. Remove retaining rings (23) and pull straight pin (29) out of front frame. Removal of straight pin (29) frees letters figures carriage pulley assembly.

Step 25. Remove retaining ring (28), sleeve spacer (27), and spring clip (26).

Step 26. Pull letters figures pulley carriage (25) off letters figures pulley carriage rod (24) to free letter figures pulley (3).

Step 27. Remove screw (10) and print hammer release stop lever (11) from front frame.

Step 28. Remove self-locking nut (54), washers (55 and 57), print hammer release (9), and print hammer release shaft (8) from front frame.

Step 29. Remove screw (7) and print hammer actuator link guide bracket (6) from front frame.

(j) FUNCTION SELECTOR DISASSEMBLY.

Step 1. Remove seven function clutch release arm return helical springs (22, figure 5-86, Appendix); remove bell actuator connecting rod (24) from bell advance suppression arm (17).

NOTE

While performing step 2, insure that none of the function sensing finger levers are lost as the function selector is removed from the front frame.

Step 2. Remove three screws (47) and pull function selector assembly away from front frame.

Step 3. Remove print prevent rod actuator arm bias spring (38) from function clutch release and backstop frame assembly (35) and right-hand print prevent rod actuator arm (40).

Step 4. Remove screws (44), flat washers (43), and print prevent rod assembly (42).

Step 5. Remove print prevent adjustment screws (46) and print prevent rod lock strip (45) from print prevent rod (42).

Step 6. Remove print prevent rod actuator arm screws (41) and slide right-hand and left-hand print prevent rod actuator arms (40 and 49) off print prevent rod lever shaft assembly (48).

Step 7. Remove retaining ring (39) and slide print prevent rod lever shaft assembly (48) to the left and out of function clutch release arm stop shaft (36).

Step 8. Remove function sensing finger lever helical spring (12) and off line letters sensing finger lever spring (23).

Step 9. Remove clamp setscrew (1) and clamp (2) from advance prevent bail carriage return bar assembly (28).

Step 10. Slide advance prevent bail carriage return bar shaft (29) out of function clutch release shaft (33) to free advance prevent bail carriage return bar assembly (26).

Step 11. Remove function advance prevent adjustment screws (26) and nylon locking plate (27) from advance prevent bail carriage return bar (28).

Step 12. Remove retaining rings (34) and slide blank advance suppression arm (30), spacer (9), space arm (32), and spacer (9) off function clutch release shaft (33).

Step 13. Slide function clutch release shaft (33) to the left and out of function clutch release and back-stop frame assembly (35) to free spacers (9), line feed and figures clutch release arms (11 and 15), bell advance suppression arm (17), letters clutch release arm (18), and carriage return clutch release arm (21).

Step 14. Remove retaining ring (8) and slide blank sensing finger lever (31) off blank advance suppression arm (30).

Step 15. Remove retaining ring (8) and slide function sensing finger lever (14) off space arm (32).

Step 16. Remove retaining ring (8) and slide line feed sensing finger lever (10) off line feed clutch release arm (11).

Step 17. Remove retaining ring (8) and slide line feed sensing finger lever (13) off line feed clutch release arm (11).

Step 18. Remove retaining ring (8) and slide function sensing finger lever (14) off figures clutch release arm (15).

Step 19. Remove retaining ring (8) and slide bell actuator sensing finger lever (16) off bell advance suppression arm (17).

Step 20. Remove retaining ring (8) and slide function sensing finger lever (14) off letters clutch release arm (18).

Step 21. Remove retaining ring (8) and slide off line letters sensing finger lever (19) off letters clutch release arm (18).

Step 22. Remove retaining ring (8) and slide off line carriage return sensing finger lever (20) off carriage return clutch release arm (21).

Step 23. Remove retaining ring (8) and slide carriage return sensing finger lever (10) off carriage return clutch release arm (21).

Step 24. Remove retaining ring (6) and slide function backstop shaft (7) out of function clutch release and backstop frame assembly (35). Removal of function backstop shaft (7) will free sleeve spacers, three function backstops, and (AN/TGC-14(V) only) the figures H code bar return stop.

Step 25. Remove clamp setscrews (1) and slide clamps (2) off function backstops (3); press out function backstop eccentric bushings (4).

Step 26. See insert on figure 5-86 (Appendix). Remove clamp setscrew (AN TGC-14(V) only) and slide clamp off figures H code bar return stop.

Step 27. Remove retaining ring (37) and slide function clutch release arm stop shaft (36) out of function clutch release and backstop frame assembly (35).

Step 28. Loosen nut (102) and remove print prevent stop adjustment setscrew (103) from off line function slide assembly (105).

Step 29. Remove retaining ring (96) and bell lever assembly (106) from off line function slide assembly (105).

Step 30. Remove off line function return helical springs (104) from off line function slide assembly (105).

Step 31. Remove retaining ring (94) and slide pin (92) out of lateral control chain (91). Be careful not to lose spacers (95) when removing pin (92).

Step 32. Remove safety spring (99) from lateral control strip (83).

Step 33. Remove retaining ring (60) from lateral control function slide (75) and pull lateral control belt assembly (83) to front of machine.

Step 34. Remove retaining ring (79), pin (80), and lateral control belt pulley (76) from fork (81).

Step 35. Remove fork (81) and slack takeup spring (82) from slack takeup slide (83) by turning fork counterclockwise.

Step 36. Remove retaining ring (96) and pin (98) to free link (85).

Step 37. Remove screw (89), lock washer (88), lateral control chain takeup eccentric (87), lateral control chain takeup lever (86), and detent link (97) from link (85).

Step 38. Remove retaining ring (96) and pin (90) from link (85) to free lateral control chain (91). Be careful not to lose spacer (95).

Step 39. Remove safety spring (58) from rotary strip (59).

Step 40. Remove retaining ring (60) and pull rotary cable strip assembly (59) off rotary function slide (71).

Step 41. Remove nut (50) from rotary chain adjustment stud (51).

Step 42. Remove retaining ring (53) from pin (52) and rotary chain adjustment stud (51) from rotary chain (54).

Step 43. Remove retaining ring (57), pin (56), and rotary chain (54) from rotary strip (59). Be careful not to lose spacer (55).

Step 44. Remove retaining ring (61), pin (65), rotary cable pulley (63), and rotary cable pulley bearing (64) from rotary strip (59).

Step 45. Remove three screws (68) and spacers (67) from support (74); move the function slide assembly out of front frame.

Step 46. Remove screws (72), lock washers (71), clips (70), and spacers (69) from support (74). Lateral control function slide (75) and rotary function slide (73) are now free.

(k) FRONT FRAME REAR SIDE DISASSEMBLY. –

Step 1. Remove springs (37 and 47, figure 5-87, Appendix) and secondary number 3 cam follower spring (24).

Step 2. Remove retaining ring (18) and slide pin (20) out of lateral transfer pulley chain (19).

Step 3. Remove automatic chain takeup ratchet (45) from automatic chain takeup adjustment stud (58) by turning it clockwise.

Step 4. Remove retaining ring (18) and spacer (23); slide pin (21) out of lateral transfer pulley chain (19) and remove chain from frame.

Step 5. Remove retaining ring (34) and automatic chain takeup feed pawl (44) from automatic chain takeup actuator lever (46).

Step 6. Remove retaining ring (34) and automatic chain takeup pawl (33) from the point at which they are mounted.

Step 7. Remove ring (57) and slide lateral transfer pulley assembly (22) out of front frame assembly (56).

Step 8. Remove screw (14), printer keyboard idler gear stud (17), printer keyboard idler gear assembly (16), and nut (31) (see insert) from front frame assembly (56).

Step 9. Remove letters figures cam follower stroke adjustment screw (48) from front frame assembly (56).

Step 10. Remove retaining ring (50), straight pin (54), and line feed shift lever (49) from front frame assembly (56).

Step 11. Remove retaining ring (53) and rotary cable adjustment screw (55) from front frame assembly (56), freeing rotary cable adjustment bracket (52) and nylon lock block (51).

Step 12. Remove screw (27), lock washer (26), and chain adjustment slide bracket (25) from front frame assembly (56).

Step 13. Remove automatic chain takeup actuator adjustment setscrew (28) and nut (29) from chain adjustment slide bracket (25).

Step 14. Remove number 5 lateral stroke adjustment screw (36), nut (31), and sleeve spacer (35) from front frame assembly (56).

Step 15. Remove remaining four stroke adjustment screws (36), lock washers (32), and nuts (31) from front frame assembly (56).

Step 16. Remove retaining ring (38) and link (39); pull shaft (43) out of front frame assembly (56), freeing spacer (40), chain pulley (41), and spacer (42).

NOTE

Removal of number 1 through 5 carriage pins (1, 2, and 1) allows carriage pulley assemblies (5) to fall free.

Step 17. Compress carriage pin lock (3) and remove number 2 carriage pin (1) by turning it counterclockwise, freeing carriage pin lock (3).

Step 18. See insert on figure 5-87 (Appendix). Remove retaining ring (AN/TGC-14(V) only), compression spring retainer, compression spring, and carriage pin number 2 stop from number 2 carriage pin (1).

Step 19. Compress carriage pin locks (3) and remove number 1, 3, and 5 carriage pin (2) and remove number 4 carriage pin (1) by turning them counterclockwise, freeing carriage pin locks (3).

Step 20. Remove retaining ring (8), sleeve spacer (7), and carriage clip (6) from carriage pulley rod (4).

Step 21. Pull carriage (5) off carriage pulley rod (4), freeing carriage pulley (9).

(4) RIBBON FEED TOP PLATE DISASSEMBLY. -

Step 1. Remove retaining rings (4, 2, and 5, figure 5-88, Appendix).

Step 2. Loosen clamp setscrew (16); remove ribbon feed backstop eccentric (3) and brace plate (1).

Step 3. Remove ribbon feed backstop helical spring (19), sleeve spacer (15), and ribbon feed backstop (18).

Step 4. Slide clamp (17) off ribbon feed backstop (18) and remove clamp setscrew (16).

Step 5. Remove clutch stop helical spring (6), retaining ring (7), sleeve spacer (20), and left-hand and right-hand ribbon feed clutch stops (21 and 8).

Step 6. Remove reversing cam follower spring (22), sleeve spacers (9 and 23), and left-hand and right-hand reversing cam followers (10 and 10).

Step 7. Remove two retaining rings (66) and two ribbon spool drive gears (65).

Step 8. Remove spool clips (67) from ribbon spool drive gears (65).

Step 9. Remove tension control brake arm spring (26) from right-hand tension control brake arm (14) and then remove right-hand intermediate drive gear assembly (11A), washer shim (13), and right-hand tension control brake arm (14) from post on ribbon feed mounting base plate (36). Do not press bearing (11) out of right-hand intermediate drive gear (12) unless bearing is worn or damaged and requires replacement.

Step 10. Remove left-hand intermediate drive gear assembly (118), washer (13), and left-hand tension control brake arm (25) with spring (26). Do not press bearing (11) out of left-hand intermediate drive gear (24) unless bearing is worn or damaged and requires replacement.

Step 11. Slide ribbon feed clutch (71), washer (70), and clutch shaft worm gear assembly (44, 45, and 46) off ribbon feed mounting base plate (36).

Step 12. Remove four clutch rollers (72) out of ribbon feed clutch (71).

Step 13. Do not press sleeve bearing (69) out of clutch shaft worm gear (68) unless bearing is worn or damaged and requires replacement.

Step 14. Remove retaining rings (7) and slide left-hand and right-hand ribbon reversing sensing arms (62 and 37) off ribbon feed mounting base plate (36).

Step 15. Remove left-hand and right-hand wire links (63 and 38)

Step 16. Remove two screws (27), two washers (28), ribbon reversing sliding plate (64), and guide pin spacers (29) from ribbon feed mounting base plate (36).

Step 17. Remove four retaining rings (30) and ribbon roller assemblies (31) from ribbon feed mounting base plate (36).

Step 18. Do not remove ribbon roller bushings (32) from ribbon rollers (33) unless bushings are worn or damaged and require replacement.

Step 19. Remove retaining ring (7), ribbon feed idler gear assembly (58), and spacer (61) from ribbon feed mounting base plate (36).

Step 20. Do not press ribbon feed idler gear bearing (59) out of ribbon feed idler gear (60) unless bearing is worn or damaged and requires replacement.

NOTE

On models not equipped with ribbon feed slip clutch assembly (52A) (see insert), omit steps 21 through 23. Remove the ribbon feed drive gear by loosening the set screw on the gear and sliding the gear off ribbon feed worm shaft (46).

Step 21. Remove retaining ring (57), key washers (54), washer spring (56), ribbon feed slip clutch gear (55), and key washer (54) from ribbon feed slip clutch hub (53).

Step 22. Loosen ribbon feed slip clutch hub socket screw (52) and slide ribbon feed slip clutch assembly (View A) off ribbon feed worm shaft (46).

Step 23. Remove felt washers (36) from ribbon feed worm shaft (46).

Step 24. Remove four screws (42) from left-hand and right-hand bearing block assemblies (48 and 39) and lift them and the ribbon feed worm shaft off ribbon feed mounting base plate (36).

Step 25. Slide left-hand and right-hand bearing block assemblies (48 and 39) and thrust washer (43) off ribbon feed worm shaft (46).

Step 26. Do not remove bearings (50 and 44) unless bearings are worn or damaged and require replacement.

Step 27. Press out roll pin (45) and remove ribbon feed worm (44) from ribbon feed worm shaft (46); remove retaining ring (47).

Step 28. For AN/TGC-14A(V) only, remove two screws (34) and bounce prevent lever guide (35) from ribbon feed mounting base plate (36).

h. KEYBOARD DISASSEMBLY.

Step 1. Remove screws (5 and 4, figure 5-89, sheet 1, Appendix) and lock washers (3); remove keyboard left-hand rail (2).

Step 2. Remove screw (6) and lock washer (3); remove keyboard right-hand rail (7).

Step 3. Remove keyboard lock bar helical spring (58) and then remove keyboard lock bar (1).

Step 4. Remove four screws (39) and remove space bar safety guard cover (41); remove four screws (39) and remove keyboard cover (57) and BREAK push button switch nut (48).

Step 5. Remove nuts (42), lock washers (43), and space bar control arms (44); slide out space bar shaft (45).

Step 6. Remove screws (18, figure 5-89, sheet 2, Appendix), lock washers (17), and key retaining strip (19).

Step 7. Remove space bar (47, figure 5-89, sheet 1, Appendix) by pulling forward.

Step 8. Remove all keys by pulling them forward.

NOTE

A key assembly consists of a lever and keytop, but these will not be disassembled in this manual.

Step 9. Remove wear pad (46).

Step 10. Remove four screws (39), space bar safety guard cover (41), and front key guide (38) from front support (31, figure 5-89, sheet 2, Appendix).

Step 11. Remove screws (39, figure 5-89, sheet 1, Appendix), and lock washers (3); remove switch bracket (52), complete with switches and filter.

Step 12. Remove two screws (36, figure 5-89, sheet 3, Appendix), two lock washers (6), and slip connector contact (37); then remove two screws (44), two lock washers (43), two flat washers (42), and code pulsing contact (41) from left frame assembly (78, figure 5-89, sheet 2, Appendix). For AN/TGC-14(V), remove two screws, lock washers, flat washers, and slip connector contact assembly (see insert on figure 5-89, sheet 3, Appendix).

Step 13. Remove screws (39) and lock washers (38); remove master pulsing contact assembly (40), identified by a reddish-brown glyptol spot on end of mounting screw. For AN/TGC-14(V), remove screws (39) and lock washers (38); remove master pulsing contact assembly. See insert on figure 5-89, sheet 3, (Appendix).

Step 14. Remove backstop spring (8).

Step 15. Remove screws (2) and lock washers (1).

Step 16. Remove left top frame (52).

Step 17. Remove screws (5), lock washers (6), and top left code bar guide (7).

Step 18. Lift keyboard cam shaft assembly (all parts assembled on 26) out of left bottom frame (78).

Step 19. Remove bearing (33), sleeve spacer (32), keyboard drive gear (31), and clutching rollers (30).

Step 20. Loosen clutch assembly setscrew (34); slide clutch assembly (29) off keyboard drive shaft assembly (26).

Step 21. Slide pulsing cam assembly (25) off start stop cam bushing (24).

Step 22. Remove bearing (19) and sleeve spacer (20); pull keyboard drive shaft assembly (26) out of start stop cam bushing (24).

Step 23. Remove bearings (21) from start stop cam bushing (24).

Step 24. Remove screws (22), master pulsing cam (23), and start pulse eccentric (35) from start stop cam bushing (24).

Step 25. Remove cam follower clutch release eccentric (6, figure 5-89, sheet 2, Appendix) by removing nut (10), flat washer (9), and felt washer (13).

Step 26. Remove clutch release helical spring (11) and cam follower clutch release (8).

Step 27. Remove repeat key actuator arm screw (49, figure 5-89, sheet 3, Appendix) and repeat key actuator arm nutplate (51); remove repeat key actuator arm (50).

Step 28. Remove clutch release finger (48) and felt washer (47) from repeat key shaft (76, figure 5-89, sheet 2, Appendix).

Step 29. Remove screws (18) and lock washers (17); remove right side cover (25).

Step 30. Remove screw (22), clamp nutplate (24), and screw (27); slide repeat key lever clamp (23) off repeat key shaft (76).

Step 31. Remove repeat key lever helical spring (21) and pull repeat key lever (32) but of right frame.

Step 32. Remove grip rings (28) and retaining ring (77); pull repeat key shaft (76) out of left bottom frame (78) and right frame (30).

NOTE

Repeat key shaft bushing (46, figure 5-89, sheet 3, Appendix) should be removed from the left bottom frame after repeat key shaft (76, figure 5-89, sheet 2, Appendix) has been removed.

Step 33. Loosen ball support shaft setscrew (79); remove ring (72) and slip clutch release ball (12) out of ball support shaft (73) and straight pin (29).

Step 34. Remove ball support shaft (73), ring (72), and felt washer (74) from left bottom frame (78).

Step 35. Remove straight pin (29) from right frame (30) by removing retaining ring (72) and felt washer (74).

Step 36. Remove screws (18), lock washers (17), and rear support (20) from frames (78) and (30).

Step 37. Remove screws (18), lock washers (17), key lever leaf spring mounting strip (15), and key lever leaf spring (16) from rear support (20).

Step 38. Remove screws (18), lock washers (17), and front support (31) from frames (78) and (30).

Step 39. Remove screw (36, figure 5-89, sheet 1, Appendix), lock washer (3), and keyboard contact actuator (35) from master pulsing cam follower (33).

Step 40. Remove helical springs (14 and 16).

Step 41. Remove screw (57), lock washer (3), shaft clamp (9), and pulsing finger adjustment shim (8) from left bottom frame.

Step 42. Lift pulsing finger and prevent lever assembly (10) from left bottom frame.

Step 43. Disassemble pulsing finger and prevent lever assembly by removing retaining ring (11) and sliding all the parts off pulsing finger and prevent lever shaft (69, figure 5-89, sheet 2, Appendix).

Step 44. Remove screws (70) and lock washers (71); lift code bar guide (69) and number 1 through 5 code bars (1, 2, 3, 4, and 5) out of frames (78 and 30).

Step 45. Remove numbers 1 through 5 code bars from code bar guide (69).

Step 46. See insert on figure 5-89, sheet 3, (Appendix). Remove two screws (AN TGC-14(V) only), lock washers, and spring bar from left bottom frame.

Step 47. Loosen backstop eccentric shaft set-screw (17) and remove retaining ring (11).

Step 48. Slide backstop eccentric shaft (9) from clutch backstop assembly (10).

Step 49. Remove screws (18, figure 5-89, sheet 2, Appendix), lock washers (17), and top right code bar guide (26) from right frame (30).

NOTE

Do not remove threaded inserts (14 and 14)

i. ELECTRICAL CHASSIS DISASSEMBLY.

Step 1. Refer to figure 5-90 (Appendix) and raise the two paper support and brake drum assembly lock levers; lift the paper supply roll and paper support and brake drum assembly out of the electrical chassis.

Step 2. Grasp the knurled nuts on both ends of paper support and brake drum assembly (3 and 1) and turn them counterclockwise.

Step 3. Remove brake drum (1) and slide paper support shaft assembly (3) out of the paper supply roll; remove guide disc (4).

Step 4. Remove patch cord assemblies (45, 46, and 47).

Step 5. Remove three lamps (52) by pressing in and turning counterclockwise.

Step 6. Disassemble the remaining parts of chassis assembly (33) using figure 5-90 (Appendix) as a guide. Do not remove nameplates (40), studs (39 and 58), or printer slide locks (see insert for stud and slide disassembly).

j. LINE SENSOR DISASSEMBLY.

NOTE

Do not remove nameplates as removal will destroy the nameplates.

Step 1. Remove three screws (4, figure 5-91, Appendix) and cover (18) from bracket (14).

Step 2. Remove selector cable clip (1) and holder clip (2) by removing two screws (19).

Step 3. Remove three screws (4) and three flat washers (5), freeing board assembly (10); disconnect four wires and remove board assembly (10).

Step 4. Remove four screws (4) and four flat washers (5) freeing board assembly (10); disconnect twelve wires and remove board assembly (10).

Step 5. Remove screw (24), lock washer (23), and high-low range strip (22) from board (16).

Step 6. Disconnect six wires on transformer (13); remove four screws (4), four nuts (12), and transformer (13) from bracket (14).

Step 7. Remove selector receptacle (17) by removing two mounting nuts and disconnecting attached wires.

Step 8. Remove line sensor connector (15) by removing two screws (4) and two nuts (12); disconnect attached wires.

Step 9. Remove diode (11) from bracket (14) by removing mounting nut and associated parts; disconnect attached wires.

k. SIGNAL LINE POWER SUPPLY DISASSEMBLY.

NOTE

Do not remove nameplate as removal will destroy the nameplate.

Step 1. Remove two screws (9, figure 5-92, Appendix) and cover (16) from bracket (13).

Step 2. Remove motor cable clip (1) and holder clip (2) by removing two screws (15).

Step 3. Remove three screws (9) and three washers (8), freeing board assembly (10); disconnect four wires and remove board assembly (10).

Step 4. Disconnect six wires on transformer (12); remove four screws (9), four nuts (11), and transformer (12) from bracket (13).

Step 5. Remove signal line power supply connector (14) from bracket (13) by removing two screws (9) and two nuts (11); disconnect attached wires.

l. SERVICE CABLE DISASSEMBLY.

Step 1. Remove four screws (2, figure 5-93, Appendix), four lock washers (3), and cover (1) from junction box (4).

Step 2. Disconnect wires attached to the binding post lugs.

Step 3. Remove two red binding posts (9), two black binding posts (10), and two push type binding posts (9) from junction box (4).

Step 4. Remove white binding post (8) from junction box (4), freeing flat washer (16).

Step 5. Remove two splicers (15) from wires.

Step 6. Remove adapter (6) from cord (5); remove cord (5) from junction box (4).

Step 7. Remove service cable connector-plug (11), electric cable (12), and sleeve bushing (13) from junction box (4).

Step 8. Remove sleeve bushings (13) from electric cable (12) and cord (5).

m. CLEANING. - Adequate cleaning is an essential factor in all maintenance and repair procedures. It is impossible to perform accurate inspections or adjustments of parts that are dirty or covered with dirty lubricants. Mechanical components may be cleaned by dipping and brushing them in petroleum solvent; Federal Specification P-S-661.

CAUTION

Never dip main shaft in solvent for cleaning purposes without first removing all sealed bearings. Relubricate all clutches with non-fluid oil. Never dip presealed bearings in solvent or clean ultrasonically. Individual subassemblies may be cleaned ultrasonically or by dipping in solvents if they contain no sealed bearings. Do not allow parts with placards to remain in cleaning solvent as the solvent will loosen the placards.

n. INSPECTION. - Inspection procedures for the parts of the teletypewriter sets consist primarily of visual inspections.

(1) MECHANICAL COMPONENTS. - Reject any part which shows excessive wear, rounded edges, or scores on contacting and bearing surfaces. Refer to paragraph 5-3(c), Scheduled Parts Replacement. When shafts appear to be excessively loose in their bushings, the bushings and/or shafts must be replaced. Distortion, cracking, and any other obvious defects are causes for rejection.

(2) ELECTRICAL COMPONENTS. - Check all electrical components for evidence of burning; check their mountings for security. Check all wiring connections for loose or cold-soldered joints.

o. LUBRICATION. - The teletypewriter sets are lubricated at the factory and normally will not require lubrication until 250 hours operation time has elapsed. The two lubricants to be used on the teletypewriter sets are Standard Oil Beacon Lubricant No. 325, Specification MIL-G-3278A and non-fluid oil. Frequency of lubrication and type of lubricant are indicated in table 5-9 (Appendix).

CAUTION

Do not use excessive lubricant in any procedure.

p. ASSEMBLY PROCEDURES. - Perform the following assembly procedures in the exact sequence indicated. Use extreme care when reassembling the various parts to avoid damaging adjacent parts or disturbing any adjustments. Any required special cleaning, inspection, or lubrication instructions will be included as part of the assembly procedures. The figure and index numbers used in the procedures refer to parts location illustrations in other parts of this section or in the Appendix.

q. MARK AND SPACE CLUTCH RELEASE SELECTOR SHAFT, TIMING CAM SHAFT, AND BACKSTOP SHAFT ASSEMBLY.

(1) TIMING CAM SHAFT ASSEMBLY.

NOTE

It is important to install spring (60, figure 5-78, Appendix) between timing cams (59) as shown.

Step 1. Insert key (54) into correct keyway in timing cam shaft (64); install timing cams (59) on the key.

Step 2. Assemble remaining four timing cams (59) in the same manner as the first cam.

Step 3. Slide spacer (61) onto timing cam shaft (64).

Step 4. Insert key (53) into keyway and slide timing cam shaft gear (62) into position.

Step 5. Secure cam assembly by pressing ring (63) into groove on timing cam shaft (64).

Step 6. Press bearing (58) onto timing cam shaft (64); then slide spacer (55) onto timing cam shaft (64).

Step 7. Insert key (54) into timing cam shaft (64); slide function clutch release cam (57) into position over the key and secure it with bowed retaining ring (56).

Step 8. Press bearing (66) into bearing retainer (67) and press both onto timing cam shaft (64).

Step 9. Insert timing cam shaft assembly into rear frame (9, figure 5-79, Appendix) and secure it with three screws (22) and three lock washers (23).

(2) MARK AND SPACE CLUTCH RELEASE SELECTOR SHAFT ASSEMBLY.

Step 1. Slide mark clutch release finger (34, figure 5-78, Appendix) over hub on mark clutch release arm assembly (17 or 20) secure with retaining ring (19).

NOTE

Clutch release arm (17), of which there is one, has a longer bushing than the remaining four clutch release arms (20). Other than the longer bushing in arm (17), the clutch release assemblies are identical.

Step 2. Attach safety spring (18) between mark clutch release arm assembly (20) and mark clutch release finger (34).

Step 3. Install lock nut (14) on clutch release finger adjustment screw (13); install clutch release finger adjustment screw (13) in mark clutch release arm assembly (20).

Step 4. Assemble the remaining clutch release assemblies as described in steps 1 through 3.

NOTE

In the next step, do not insert the mark clutch release selector shaft all the way into the rear frame; insert the shaft in small increments from left to right as the mark clutch release assemblies and type positioning cam followers are installed on the shaft.

Step 5. Refer to figure 5-94 (Appendix) for hole location and insert mark clutch release selector shaft (10, figure 5-78, Appendix) partially into the left side of rear frame (9, figure 5-79, Appendix).

Step 6. Install two felt washers (12, figure 5-78, Appendix), start clutch release arm assembly (15), type positioning cam follower (16), and felt washer (12) on mark clutch release selector shaft (10).

Step 7. Install a previously assembled mark clutch release assembly on mark clutch release shaft (10).

Step 8. Install the remaining clutch release assemblies, type positioning cam followers (16), and felt washers (12) in the sequence shown in figure 5-78, (Appendix).

NOTE

Mark clutch release selector shaft (10) should just pass through the center bearing of rear frame (9, figure 5-79, Appendix) after installation of the last mark clutch release assembly.

Step 9. Attach bell prevent lever (33, figure 5-78, Appendix) to letters figures pulley carriage actuator and cam follower (22A) using screw (31) and washer (32); then slide letters figures pulley carriage actuator and cam follower (22A) onto mark clutch release selector shaft (10). Install screw (27), washer (32), and nut (29) on letters figures pulley carriage actuator and cam follower (22A); then install screw (27) and nut (28).

Step 10. Slide felt washer (21) and line feed motion amplify link (23) onto mark clutch release selector shaft (10).

Step 11. Complete assembly of the mark clutch release assemblies by positioning all of the installed assemblies between their respective retaining ring grooves and secure them with eight retaining rings (11).

NOTE

In the next steps, do not insert the space clutch release selector shaft all the way into the rear frame; insert the shaft in small increments from left to right as the space clutch release assemblies and type positioning cam followers are installed on the shaft.

Step 12. Assemble space clutch release assemblies (consisting of clutch release finger adjustment screw (13), locknut (14), safety spring (18), retaining ring (19), mark clutch release finger (38), and one of clutch release arms (39, 40, 41, or 43)) as described in steps 1 through 3.

NOTE

Clutch release arms (39, 40, 41, and 43) have different length bushings. Other than the different bushing lengths, the clutch release assemblies are identical.

Step 13. Refer to figure 5-94 (Appendix) for the hole location and insert space clutch release selector shaft (36, figure 5-78, Appendix) partially into the left side of rear frame (9, figure 5-79, Appendix).

Step 14. Install secondary number 3 cam follower (37, figure 5-78, Appendix) and space number 3 clutch release assembly on space selector shaft (36).

Step 15. Install type positioning cam follower (16) and felt washer (12) on space clutch release selector shaft (36).

Step 16. Refer to figure 5-78 (Appendix) to install the remaining clutch release assemblies on mark clutch release selector shaft (36).

NOTE

Space clutch release selector shaft (36) should pass through the center bearing of rear frame (9, figure 5-79, Appendix) after the space number 1 clutch release assembly is installed.

Step 17. Install two felt washers (50, figure 5-78, Appendix), print and function clutch release assembly (42), and felt washer (50) on space clutch release selector shaft (36).

Step 18. Slide line feed cam follower arm (44) onto line feed torque tube actuator (45).

Step 19. Install line feed cam follower arm clamping screw (49) into line feed cam follower arm (44) and tighten lightly; install line feed actuator assembly (45) onto space clutch release selector shaft (36).

Step 20. Slide roller (46) onto line feed torque tube actuator (45) and secure with retaining ring (47).

Step 21. Slide all clutch release assemblies into their respective positions between the retaining ring grooves and secure them with six retaining rings (11).

Step 22. Fasten print and function clutch release arm spring (51) between print and function clutch release assembly (42) and the spring post on rear frame (9, figure 5-79, Appendix).

Step 23. Install five inter-arm springs (35, figure 5-78, Appendix), between the mark and space clutch release assemblies.

Step 24. Complete the assembly of the space clutch release assemblies by installing inter-arm spring (35) between start clutch release arm (15) and the tab on rear frame (9, figure 5-79, Appendix).

NOTE

The last inter-arm spring (35, figure 5-78, Appendix) is stretched about 1/2 inch farther than the other inter-arm springs but is otherwise identical.

(3) BACKSTOP SHAFT ASSEMBLY.

Step 1. Install six clamp screws (6, figure 5-78, Appendix) into six clamps (7); slide six clamps (7) onto clutch backstop levers (5).

Step 2. Press clutch backstop eccentric bushings (4) into clutch backstop levers (5) and tighten clamp screws (6).

Step 3. Refer to figure 5-94 (Appendix) for hole location and insert backstop shaft (1, figure 5-78, Appendix) partially into the left side of rear frame (9, figure 5-79, Appendix) just far enough to install the clutch backstops as was done with the mark and space clutch release selector shafts.

Step 4. Install and secure five clutch backstop assemblies on backstop shaft (1) in the following sequence (left to right); retaining ring (8); clutch backstop assembly retaining ring (8); two felt washers (2); retaining ring (8); clutch backstop assembly; two retaining rings (8); clutch backstop assembly; retaining ring (8); four felt washers (2); retaining ring (8); clutch backstop assembly; two retaining rings (8); clutch backstop assembly; retaining ring (8); and two felt washers (2).

NOTE

Install each clutch backstop assembly just to the right of the mark clutch release fingers. Backstop shaft (1) should just pass through the center plate of rear frame (9, figure 5-79, Appendix) as the fifth clutch backstop assembly is installed.

Step 5. Install two felt washers (2, figure 5-78, Appendix) and sixth clutch backstop assembly on backstop shaft (1) after the shaft passes through the center plate of rear frame (9, figure 5-79, Appendix); secure with retaining ring (8, figure 5-78, Appendix).

Step 6. Attach five clutch backstop springs (9) between clutch backstop levers (5) and their respective attaching holes in rear frame (9, figure 5-79, Appendix); attach print and function clutch backstop spring (9, figure 5-73, Appendix) between its clutch backstop lever and backstop spring clip (12, figure 5-79, Appendix).

Step 7. Attach backstop spring clip (12) to rear frame (9) with screw (33) and washer (34).

Step 8. Snap timing cam wick (53, figure 5-78, Appendix) on space clutch release selector shaft (36) between the left and center plate of the rear frame, positioning the wick so that it contacts the timing cams; snap function timing cam wick (52) on space clutch release selector shaft (36) under the function timing cam.

Step 9. Slide line feed pawl (25) onto line feed motion amplify link (23) and secure with retaining ring (24); connect line feed pawl spring (26) between the post on line feed pawl (25) and the hole in line feed motion amplify link (23).

r. THIRD REDUCTION PINION ASSEMBLY.

Step 1. Install ring (26, figure 5-77, Appendix) in retainer on right-hand rear plate of frame (9, figure 5-79, Appendix).

Step 2. Slide idler gear arm assembly (15, figure 5-77, Appendix) onto the rear frame and secure with ring (29).

Step 3. Press one bearing (25) onto the shaft of second reduction gear (28); slide spacer (27) onto second reduction gear (28).

Step 4. Slide second reduction gear (28) through retainer and press second bearing (25) onto second reduction gear (28).

Step 5. Check third reduction pinion (24) for pin hole; if required, drill the hole and then slide third reduction pinion (24) onto second reduction gear (28).

Step 6. Support the shaft on second reduction gear (28); align the holes in second reduction gear (28) and third reduction pinion (24); press in pin (23).

s. IDLER GEAR ASSEMBLY.

Step 1. Install ring (18, figure 5-77, Appendix) into idler gear (16).

Step 2. Press one idler gear bearing (17) onto post of idler gear arm assembly (15); slide idler gear (16) onto idler gear bearing (17).

Step 3. Slide spacer (19) onto post of idler gear arm assembly (15).

Step 4. Press one idler gear bearing (17) into idler gear (16); secure with ring (20).

Step 5. Slide idler gear stud (14) through the idler gear assembly and secure with idler gear lock nut (21).

t. V LEVER AND LINKAGE ASSEMBLY.

Step 1. Install first character adjustment screw (34, figure 5-77, Appendix) into V lever of V lever shaft (35); secure with anti-turn nut (33).

Step 2. Install and secure bail eccentric (42) on automatic carriage return and line feed bail actuator (49) using screw (46).

Step 3. Install anti-turn nuts (40) and (40) and screws (38) and (38) into lock lever actuator arm (41) and automatic carriage return and line feed actuator arm (48).

Step 4. Install carriage return lock lever eccentric bushing (45) in carriage return lock lever (42); secure with nut (39).

Step 5. Install two felt washers (37) on V lever shaft (35) and slowly slide shaft into rear frame (9, figure 5-79, Appendix) while installing lock lever actuator arm (41, figure 5-77, Appendix), carriage return lock lever (42), automatic carriage return and line feed bail actuator (49), and automatic carriage return and line feed actuator arm (48); secure with retaining rings (36).

Step 6. Attach carriage return and line feed bail actuator helical spring (44) and lock lever actuator arm helical spring (43) to carriage return lock lever (42); extend spring (44) and attach it to automatic carriage return and line feed bail actuator (49); attach spring (43) to lock lever actuator arm (41).

u. REAR FRAME ASSEMBLY.

Step 1. Insert detent helical spring (26, figure 5-79, Appendix), detent ball (27), and lock arm (25) into change gear post (29); secure with pin (28).

Step 2. Attach change gear post (29) to rear frame (9) with screw (32) and lock washer (31); apply locktite compound to the mating surfaces.

Step 3. Attach start cam lubricating wick assembly (19) to rear frame (9) with screw (21) and lock washer (20).

Step 4. Attach function helical spring (10) and print helical spring (18) to their respective brackets on rear frame (9).

Step 5. Attach print and function helical spring yoke link assemblies (11) to function helical spring (10) and print helical spring (18).

CAUTION

Align the spring yoke link assemblies parallel to the frame to avoid any twisting motion of the clevis pin.

Step 6. Attach frame clamp pads (15 and 15) to frame clamps (14 and 24) with frame clamp screws (16 and 16).

Step 7. Attach frame clamps (14 and 24) to rear frame (4) with frame clamp stud pivots (13 and 13) and retaining rings (17 and 17).

Step 8. Install the switch plate assembly (AN/TGC-14(V) only) comprised of all items in insert on figure 5-79 (Appendix).

Step 9. Install advance prevent stop spring (5) and secure with screws (4); install ribbon feed base spring clips (8) and (30) and secure with blocks (7) and screws (6).

v. MOTOR AND MOTOR MOUNT ASSEMBLY.

NOTE

For the 60-cycle motor, refer to figure 5-74 (Appendix); for the 400-cycle motor, refer to figure 5-73 (Appendix).

Step 1. Slide motor cover (400-cycle motor only) (7, figure 5-73, Appendix) over motor and gear head assembly (13).

Step 2. Slide motor fan (2) onto the motor shaft and secure with motor fan setscrews (1).

Step 3. Press bearing (6, figure 5-77, Appendix) into motor mounting plate (13).

Step 4. Press bearing (6) onto first reduction gear (5).

Step 5. Insert first reduction gear (5) in motor mounting plate (13).

Step 6. Install bearing cup (12) over first reduction gear (5); then secure the bearing cup to motor mounting plate (13) using screws (10) and lock washers (11).

Step 7. Press pin (4) into first reduction gear (5) so that the pin protrudes the same distance from each side of the first reduction gear.

Step 8. Slide the motor into cooling housing (6, figure 5-72, Appendix) insuring that the cable is aligned with the cutout and that there is clearance between the motor fan and the rear of the cooling housing.

Step 9. Install two screws (1) into cooling housing (6) and tighten temporarily.

Step 10. Align motor mounting plate (13, figure 5-77, Appendix) with bottom of air outlet of the cooling housing and attach the motor to the mounting plate using three screws (9, figure 5-73, Appendix) and lock washers (8) or three screws (6, figure 5-74, Appendix) and lock washers (7).

Step 11. Insert motor assembly into rear frame (figure 5-94, Appendix) and align the mounting holes.

Step 12. Secure the motor assembly to the rear frame with three screws (3, figure 5-77, Appendix), lock washers (2) and washers (1).

CAUTION

A clearance should exist between the function timing cam follower and the motor shroud (after installation of the motor and shroud assembly) or excessive wear will result to the cam surface.

Step 13. Align the slot in speed change gear (7) with pin (4) and slide the speed change gear onto shaft of first reduction gear (5); secure the speed change gear with lock nut (8). Adjust idler gear assembly (16) to mesh with speed change gear (7) by loosening idler gear lock nut (21) and swinging the assembly until the gears mesh: tighten the lock nut when the gears are properly meshed.

w. SELECTOR ASSEMBLY, INSTALLATION, AND CHECK. - For selectors without (-2) stamped after the serial number, proceed as follows:

Step 1. Align pins (16, figure 5-75, Appendix) with holes in right-hand inner plate (26); press selector magnet assembly (15) against right-hand inner plate (26).

Step 2. Install screw (29) and lock washer (30) into right-hand inner plate (26), securing selector magnet assembly (15).

Step 3. Press armature shaft bearing (21) into right-hand inner plate (26).

Step 4. Insert lubricating wick non-metallic washer (22) and lubricating wick retainer (23) into armature shaft bearing (21).

Step 5. Slide two armature shaft spacers (24) onto armature (25).

Step 6. Slide one end of armature (25) into armature shaft bearing (21).

Step 7. Press armature shaft bearing (21) into right-hand outer frame plate (31).

Step 8. Insert lubricating wick non-metallic washer (22) and lubricating wick retainer (23) into armature shaft bearing (21).

Step 9. Align positioning pins (16) of selector magnet assembly (15) and armature (25) with their respective mounting holes and press right-hand outer frame plate (31) against selector magnet assembly (15).

Step 10. Secure right-hand outer frame plate (31) with screw (29) and lock washer (30).

Step 11. Attach left-hand inner plate stop bar (27) to left-hand inner plate (26) using screws (7) and lock washers (28).

Step 12. Attach right-hand inner plate stop bar (19) to right-hand inner plate (26) using screws (7) and lock washers (20).

Step 13. Align mounting holes in left-hand inner plate (26) with pins in selector magnet assembly (15) and press left-hand inner plate against selector magnet assembly; secure with screw (29) and lock washer (30).

Step 14. Press armature shaft bearing (21) into left-hand inner plate (26).

Step 15. Insert lubricating wick non-metallic washer (22) and lubricating wick retainer (23) into armature shaft bearing (21).

Step 16. Slide two armature shaft spacers (24) onto armature (25).

Step 17. Slide one end of armature (25) into armature shaft bearing (21).

Step 18. Press armature shaft bearing (21) into left-hand outer frame plate (41).

Step 19. Insert lubricating wick non-metallic washer (22) and lubricating wick retainer (23) into armature shaft bearing (21).

Step 20. Align the left-hand outer frame pins of selector magnet assembly (15) and armature (25) with their respective mounting holes and press left-hand outer frame plate (41) against selector magnet assembly (15).

Step 21. Secure with screw (30), lock washer (29), and cable strain relief bracket (40).

Step 22. Attach latches (5) to two selector mark shafts (8) and two selector space shafts (34) using screws (7) and lock washers (6).

Step 23. Attach selector shaft bias spring arms (8) to selector mark shafts (18) and selector space shafts (34) using screws (7) and lock washers (6).

Step 24. Press straight pins (10) into selector mark shafts (18) and selector space shafts (34).

Step 25. Attach two armature mark paddle latches (11) to two selector mark shafts (18) and two armature space paddle latches (33) to two selector space shafts (34) using screws (7) and lock washers (6).

Step 26. Press shaft bearings (17) into right-hand outer frame (31).

Step 27. Press shaft bearings (17) into left-hand outer frame plate (41).

Step 28. Insert one end of selector mark shafts (18) into shaft bearings (17) in right-hand outer frame plate (31); insert one end of selector space shafts (34) into shaft bearings (17) in right-hand outer frame plate (31).

Step 29. Align the bearing holes in left-hand outer frame plate (41) with the other end of selector mark shaft (18) and selector space shaft (34); press left-hand outer frame plate (41) toward right-hand outer frame plate (31).

CAUTION

In the next step, place the selector assembly on a flat surface prior to tightening the selector tie rod studs in order to prevent twisting while tightening.

Step 30. Slide selector tie rod studs (32) through right-hand outer frame plate (31), outer frame plate spacers (35), right-hand inner frame plate (26), inner frame plate spacers (36), left-hand inner frame plate (26), outer frame plate spacers (35), and left-hand outer plate (41); attach terminal plate assembly (4) and secure with nuts (1).

Step 31. Attach the electrical hardware as shown in figure 5-75 (Appendix).

Step 32. Attach selector shaft bias springs (9).

NOTE

Check the operation of the selector as described in steps 33 through 35 prior to installing the selector assembly in the rear frame.

Step 33. Apply force at point A on figure 5-98 (Appendix) while applying force to the armature mark paddle latch (point B).

Step 34. Push the armature mark paddle latch under the armature and hold in position; then try to push the armature space paddle latch past the armature. If the armature space paddle latch bypasses the armature, the assembly must be repinned. Reverse this procedure to check the armature mark paddle latch clearances.

Step 35. Repeat steps 33 and 34 for the three remaining armature paddle latches.

Step 36. Install the selector assembly in the rear frame (figure 5-94, Appendix), insuring that the armature mark and space paddle latches (11 and 33, figure 5-75, Appendix) do not bind or catch on any of the clutch release arms.

NOTE

When installed, the grooves in outer frame plates (31 and 41) must be engaged with mark and space clutch release selector shafts (10 and 36, figure 5-78, Appendix).

Step 37. Insert lock bar (12, figure 5-75, Appendix) into the left hole on the rear frame and then back out to the right to engage the outer side.

Step 38. Secure lock bar and selector assembly using two screws (14) and two lock washers (13).

For selectors with (-2) stamped after the serial number, proceed as follows:

Step 1. Insert one end of selector mark latch shafts (9, figure 5-76, Appendix) and selector space latch shafts (14) into bearings in right-hand magnet frame assembly (13).

Step 2. Align the bearing holes in left-hand magnet frame assembly (18) with the other end of selector mark latch shafts (9) and selector space latch shafts (14); press left-hand magnet frame assembly (18) toward right-hand magnet frame assembly (13).

Step 3. Attach cable strain relief bracket (21) using screw (19) and lock washer (20).

CAUTION

In the next step, place the selector assembly on a flat surface prior to tightening the selector tie rod studs in order to prevent twisting while tightening.

Step 4. Slide selector tie rod studs (12) through outer frame of right-hand magnet frame assembly (13), outer frame plate spacers (5), inner frame of right-hand magnet frame assembly (13), inner frame plate spacers (11), inner plate of left-hand magnet frame assembly (18), outer frame plate spacers (5), and outer frame of left-hand magnet frame assembly (18); attach terminal plate assembly (4) and secure with nuts (1).

Step 5. Attach the electrical hardware as shown in figure 5-76 (Appendix).

Step 6. Attach selector shaft bias springs (10).

NOTE

Check the operation of the selector as described in preceding steps 33 through 35 prior to installing the selector assembly in the rear frame.

Step 7. Install the selector assembly in the rear frame (figure 5-94, Appendix), insuring that the armature mark and space paddle latch portions of the selector mark and space latch shafts (9 and 14, figure 5-76, Appendix) do not bind or catch on any of the clutch release arms.

NOTE

When installed, the grooves in outer frames of left-hand and right-hand magnet frame assemblies (18 and 13) must be engaged with mark and space clutch release selector shafts (10 and 36, figure 5-78, Appendix).

Step 8. Insert lock bar (8, figure 5-76, Appendix) into the left hold on the rear frame and then back out to the right to engage the other side.

Step 9. Secure the lock bar and selector assembly using screws (6) and lock washers (7).

x. BACK PLATE ASSEMBLY AND INSTALLATION.

Step 1. Insert rear lock screws (2, figure 5-79, Appendix) into back plate (1).

Step 2. Secure rear lock screws with retaining rings (3).

Step 3. Position the back plate against rear frame (9); then slide it to the left to engage the tabs on the clamping plates with the slots in the rear frame.

Step 4. Tighten six screws to secure the back plate to rear frame (9).

Step 5. Align the holes in the fan outlet duct assembly with those in the back plate; install and tighten screws (2, figure 5-72, Appendix), lock washers (3) and washers (4).

y. TIME DELAY MOUNTING BASE PLATE ASSEMBLY AND INSTALLATION.

NOTE

This procedure applies to AN/TGC-14A(V) only.

Step 1. Attach post (44, figure 5-69, Appendix) using lock washer (15) and nut (16).

Step 2. Press time delay secondary check pawl eccentric (11) into time delay secondary check pawl (12) using screw (10) and spacer (13); install this assembly on the post of time delay mounting base plate (22).

Step 3. Attach time delay secondary check pawl spring (14) to time delay secondary check pawl (12) and post on time delay mounting base plate assembly (22).

Step 4. Attach time delay switch (7), time delay switch actuator (8), and spacer (9) to time delay mounting base plate (22) using screws (4), washers (5), and nut plate (17).

Step 5. Install detent spring roller (46) into detent spring (47); secure with detent spring pin (45) and retaining ring (48).

Step 6. Attach detent spring assembly (47) to time delay mounting base plate assembly (22) using retaining ring (49).

Step 7. Insert return spiral spring (2) into recess in advance ratchet (1).

Step 8. Place the unthreaded portion of ratchet support shaft (43) into the hole on the right side of time delay yoke (42); as you feed the shaft into the yoke, install reduction ratchet (3) and advance ratchet (1) on the shaft; then push the shaft through the hole in the left side of the yoke.

Step 9. Install one shim (40), time delay latch (41), another shim (40), sleeve (39), and ring (38) on ratchet support shaft (43).

Step 10. Attach ratchet support shaft (43) to time delay mounting base plate (22) using ratchet support shaft lock (20), lock washer (19), and lock nut (18).

Step 11. Attach timing cam shaft extension (23) to timing cam shaft assembly (64, figure 5-78, Appendix) using screw (25, figure 5-69, Appendix) and lock washer (24).

Step 12. Attach time delay mounting base plate (22) to left side frame of rear frame assembly (9, figure 5-79, Appendix) using four screws (27, figure 5-69, Appendix), lock washers (24), and sleeve spacers (21). Attach time delay feed and check pawl guide (26) prior to installing lower screw (27) and lock washer (24).

z. MAIN SHAFT ASSEMBLY AND INSTALLATION.

(1) SELECTOR MAIN SHAFT ASSEMBLY. - (Refer to figure 5-70, Appendix.)

NOTE

When assembled, the clutch and cam assemblies on the selector main shaft will be positioned in cam alphabetical order as follows: A cam and start clutch assembly (20); B cam and lateral number 3 clutch (22); C cam and lateral number 4 clutch (23); D cam and lateral number 5 clutch (28); E cam and rotary number 2 clutch (27); and F cam and rotary number 1 clutch (26).

Step 1. Oil all clutch cavities and the inner cam race with non-fluid-oil prior to installing the clutches on the main shaft.

Step 2. Insert 28 rollers (19) into cam on A cam and start clutch assembly (20).

Step 3. Insert four rollers (21) into the four cavities of A cam and start clutch assembly (20).

Step 4. Install retaining ring (17) on selector main shaft (24).

Step 5. Slide washer (18) onto selector main shaft (24).

Step 6. Slide A cam and start clutch assembly (20) onto selector main shaft (24), insuring that none of the 28 rollers (19) has moved out of position.

Step 7. Slide washer (18) onto selector main shaft (24) and secure A cam and start clutch assembly (20) by installing retaining ring (17).

Step 8. Install clutches (22, 23, 28, 27, and 26) as described in steps 2 through 7; refer to the note preceding step 1 for the position of the clutches on the selector main shaft.

Step 9. Press left-hand bearing (16) into left-hand bearing retainer (6).

Step 10. Install start clutch release adjustment set-screw (11) into start clutch backstop lever (12) so that approximately 3/32 inch of the threads still protrudes.

Step 11. Install lock nut (10) on start clutch release adjustment setscrew (11).

Step 12. Install start clutch backstop eccentric bushing (9A) into start clutch backstop lever (12).

Step 13. Slide clamp (7) onto start clutch backstop lever (12); temporarily secure with clamp screw (8).

Step 14. Slide start clutch backstop lever assembly (13A), felt washer (13), and start clutch release latch (14) onto pin of range adjustment assembly (5); secure with retaining ring (15).

NOTE

On AN/TGC-14(V), range adjustment assembly (5) and left-hand bearing retainer (6) are an inseparable assembly.

Step 15. Slide range adjustment assembly (5) onto left-hand bearing retainer (6) and then onto selector main shaft (24).

Step 16. Attach start clutch backstop lever spring (4) between range adjustment assembly (5) and start clutch backstop lever assembly (13A).

Step 17. Install woodruff key (3) into keyway of selector main shaft (24).

Step 18. Slide printer helical gear (2) over woodruff key (3) on selector main shaft (24); secure with retaining ring (1).

Step 19. Slide spacer (25) onto selector main shaft (24).

(2) FUNCTION MAIN SHAFT ASSEMBLY. - (Refer to figure 5-71, Appendix.)

NOTE

When assembled, the clutch and cam assemblies on the function main shaft will be positioned in cam alphabetical order (left to right) as follows: G and H cam and print function clutch (7); I cam and line feed clutch (9); J cam and letters figures clutch (17); K cam and carriage return clutch (15).

Step 1. Oil all clutch cavities and the cam inner race with non fluid oil prior to installing the clutches on the function main shaft.

NOTE

In the following steps, the sequence will be starting from the right and working left as parts are installed on function main shaft (14).

Step 2. Install retaining ring (4) in the first groove on the right side of function main shaft (14).

Step 3. Slide flat washer (5) onto function main shaft (14).

Step 4. Insert 28 rollers (6) into K cam and carriage return clutch (15).

Step 5. Insert four rollers (8) into K cam and carriage return clutch (15).

Step 6. Slide K cam and carriage return clutch (15) onto function main shaft (14), insuring that none of the rollers has moved out of place.

Step 7. Secure K cam and carriage return clutch (15) with flat washer (5) and retaining ring (4).

Step 8. Assemble clutches (17, 9, and 7) as described in steps 2 through 6; refer to note preceding step 1 for the position of the clutches on the function main shaft.

Step 9. Slide spacer (3) onto function main shaft (14); press center bearing (2) into center bearing retainer (1) and place them on function main shaft (14).

Step 10. Insert third reduction gear key (12) into keyway in function main shaft (14); install third reduction gear (13), insuring that the slot in the third reduction gear is aligned with the third reduction gear key.

Step 11. Press right-hand bearing (11) into right-hand bearing retainer (15); place the assembly onto function main shaft (14).

(3) MAIN SHAFT INSTALLATION.

Step 1. Engage key of the selector main shaft with the keyway of the function main shaft.

Step 2. Carefully place the main shaft assembly in rear frame (9, figure 5-79, Appendix) insuring that none of the backstops or other linkage obstruct entry of the shaft.

Step 3. Insure that the backstops are resting on the correct clutches.

Step 4. Align timing marks on timing cam shaft gear and start clutch gear using the diagram prepared during disassembly (referring to figure 5-99, Appendix, for location of timing marks only).

NOTE

Timing mark relationship has been established at the factory and should be maintained as long as no range calibration problems have been encountered.

aa. FEED MECHANISM AND MOTOR STOP ASSEMBLY AND INSTALLATION.

NOTE

This procedure applies to AN/TGC-14A(V) only.

Step 1. Attach time delay feed pawl assembly (31, figure 5-69, Appendix), sleeve spacer (32), and time delay check pawl assembly (33) to main shaft drive adapter assembly (28) using retaining ring (34).

Step 2. Attach felt washer (35) to main shaft drive adapter assembly (28) using retaining ring (36).

Step 3. Attach time delay check pawl helical spring (37) and time delay feed pawl helical spring (30) to their respective posts on time delay mounting base plate (22).

Step 4. Attach feed mechanism and motor stop assembly (28) to printer helical gear (2, figure 5-70, Appendix) using two screws (29, figure 5-69, Appendix) and two lock washers (24).

ab. FRONT FRAME ASSEMBLY.

(1) REAR SIDE ASSEMBLY.

Step 1. Insert straight pin (54, figure 5-87, Appendix) into front frame assembly (56); attach line feed shift lever (49) to straight pin (54); secure with retaining ring (50).

Step 2. Insert rotary cable adjustment screw (55) through top bracket of front frame assembly (56); then through top half of rotary cable adjustment bracket (52), nylon lock block (51), the bottom half of rotary cable adjustment bracket (52), and the bottom half of the bracket on front frame assembly (56).

Step 3. Secure rotary cable adjustment screw (55) in rotary cable adjustment bracket (52) with retaining ring (53).

Step 4. Insert letters figures cam follower stroke adjustment screw (48) approximately halfway into bracket of front frame assembly (56).

Step 5. Insert lateral transfer pulley assembly (22) into front frame assembly (56) and secure with ring (57).

Step 6. Insert shaft (43) through front frame assembly (56); install spacer (42), chain pulley assembly (41), and spacer (40) as shaft (43) is advanced through the front frame.

Step 7. Pass shaft (43) through the tab on front frame assembly (56); install link (39) and then secure shaft (43) with retaining ring (38).

Step 8. Install number 5 lateral stroke adjustment screw (36), nut (31), and sleeve spacer (35) in square tab on front frame assembly (56).

Step 9. Install remaining four rotary and lateral stroke adjustment screws (36) and nuts (31) on front frame assembly (56).

Step 10. Install automatic chain takeup actuator adjustment setscrew (28) and nut (29) into chain adjustment slide bracket (25).

Step 11. Attach chain adjustment slide bracket (25) to front frame assembly (56) using screw (27) and lock washer (26).

Step 12. Press carriage pulley assembly (9) into carriage (5).

Step 13. Insert carriage pulley rod (4) through front frame assembly (56); place carriage (5) over carriage pulley rod (4) and then secure with carriage clip (6), sleeve spacer (7), and retaining ring (8).

Step 14. Align holes in carriage pin locks (3) with hole in carriage pulley rod (4) by compressing carriage pin lock (3) around carriage pulley rod (4); then install number 1 carriage pin (2) through carriage pin lock (3) and carriage pulley rod (4).

Step 15. Repeat steps 12 through 14 for number 3 and 5 carriage pins (2).

Step 16. Install number 2 and 4 carriage pins (1 and 1) as described in steps 12 through 14.

Step 17. See insert on figure 5-87 (Appendix). Place carriage pin number 2 stop (AN/TGC-14(V) only), compression spring, and compression spring retainer on carriage pin number 2; secure with retaining ring.

Step 18. Insert printer keyboard idler gear stud (17) into printer keyboard idler gear (16).

Step 19. Insert screw (14) through the printer keyboard idler gear (16), standoff gear support (17), and front frame assembly (56); secure with nut (31) (see insert).

Step 20. Attach automatic chain takeup pawl (33) to front frame assembly (56); secure with retaining ring (34).

Step 21. Attach lateral transfer pulley chain (19) to lateral transfer pulley (22) using spacers (23), pin (21), and retaining ring (18).

Step 22. Feed lateral transfer pulley chain (19) through carriages (5) and attach to automatic chain takeup adjustment stud (58), using pin (20) and retaining ring (18).

Step 23. Attach automatic chain takeup feed pawl (44) to automatic chain takeup actuator lever (46) using retaining ring (34).

Step 24. Insert automatic chain takeup adjustment stud (58) through its mounting hole in front frame assembly (56); place automatic chain takeup actuator lever (46) over automatic chain takeup adjustment stud (58); secure with left-hand threaded automatic chain takeup ratchet (45).

Step 25. Attach spring (37) to link (39) and automatic chain takeup actuator lever (46).

Step 26. Attach spring (47) to automatic chain takeup pawl (33) and automatic chain takeup feed pawl (44).

(2) FRONT SIDE ASSEMBLY.

NOTE

The cable and belt pulley bearings are pressed into the pulleys at the factory and the entire pulley assembly should be replaced if defective.

Step 1. Slide three sleeve spacers (2, figure 5-80, Appendix), three pulley assemblies (3), and three sleeve spacers (2) on the posts on the front frame and pin (22); secure with three retaining rings (1).

Step 2. Insert pin (22) into the front frame and secure with nut (49).

Step 3. Slide two sleeve spacers (2), two lateral control belt pulley assemblies (46), and two sleeve spacers (2) onto two pins on the front frame; secure with two retaining rings (1).

Step 4. Press letters figures carriage pulley bearing (4) into letters figures carriage pulley (5); push letters figures carriage pulley assembly (3) into letters figures pulley carriage (25).

Step 5. Insert letters figures pulley carriage rod (24) through letters figures pulley carriage (25).

Step 6. Slide spring clip (26) and sleeve spacer (27) onto letters figures carriage pulley rod (24); secure the entire assembly with retaining ring (28).

Step 7. Insert the drilled head of letters figures pulley carriage rod (24) through the correct hole in the front frame; slide straight pin (29) through the tabs of the riveted casting assembly mounted on the front frame and letters figures pulley carriage rod (24).

Step 8. Install two retaining rings (23) on straight pin (29).

Step 9. Press return cable pulley bearing (4) into return cable pulley (5).

Step 10. Slide sleeve spacer (2), return cable pulley assembly (3), and sleeve spacer (2) onto pin of return cable pulley bracket (21); secure the entire assembly with retaining ring (1).

Step 11. Attach return cable pulley bracket assembly (21) or (on AN/TGC-14(V) only) pulley mounting bracket to front frame using screw (20).

Step 12. Attach two frame clamp pads (34) and two frame clamp screws (33) to two frame clamps (32).

Step 13. Attach two frame clamp assemblies (32) to the front frame using two clamp pivots (35) and two retaining rings (31).

Step 14. Attach print hammer actuator link guide bracket (6) to the front frame using screw (7).

Step 15. Slide print hammer release (9) and washer (57) over print hammer release shaft (8).

Step 16. Insert print hammer release shaft (8) into front frame; secure with flat washer (55) and self-locking nut (54).

Step 17. Attach print hammer release stop lever (11) to the front frame using screw (10).

Step 18. Attach two printer electrical chassis locators (52) to the front frame using lock nuts (13).

NOTE

Step 19 through step 26 apply to AN/TGC-14(V) only. See insert on figure 5-80 (Appendix).

Step 19. Place figures H code bar on the code bar support, the riveted bracket located on left side of front frame, and the pulley mounting bracket.

Step 20. Slide code bar guide, compression spring, and compression spring retainer onto guide pin; secure with a retaining ring.

Step 21. Insert guide pin through figures H code bar and code bar support; screw the guide pin into the front frame.

Step 22. Attach washer and clamp plate to the front frame using screw.

Step 23. Attach actuator stud and lock washer to the front frame.

Step 24. Place actuator spring over actuator stud, engaging the end of the spring in the hole in the front frame.

Step 25. Engage the top end of actuator spring with the hole in figures H code bar actuator; place the figures H code bar actuator on actuator stud and secure with retaining ring.

Step 26. Attach code bar spring to figures H code bar and to tab on riveted bracket on left side of front frame.

Step 27. Align left-hand guide cover (16) with riveted bracket on front frame and right-hand guide cover (19) with return cable pulley bracket (21) or (AN/TGC-14(V) only) pulley mounting bracket.

Step 28. Secure left-hand and right-hand guide covers (16 and 19) with two screws (15).

Step 29. Attach line feed shift (39) to line feed shift arm (40) with retaining ring (41).

Step 30. Attach line feed spacing shift bracket (38) to line feed shift arm (40); secure with washer (44) and ring (45).

Step 31. Install shift lever adjustment screw (37) in line feed spacing shift bracket (38).

Step 32. Secure line feed spacing arm assembly (consists of 37, 38, 40, 41, 44, and 45) to the front frame using three screws (42) and lock washers (1).

Step 33. Attach print lever and character advance lever shaft support bracket assembly (51) to the front frame using lock washers (17) and screws (18).

ac. FUNCTION SLIDE ASSEMBLY.

Step 1. Attach lateral control function slide (73, figure 5-86, Appendix) to support (74) using two spacers (69) clips (70), screws (72), and lock washers (71).

Step 2. Attach rotary function slide (73) to support (74) using two spacers (69), clips (70), lock washers (71), and screws (72).

CAUTION

Make certain that spacers (67) are installed under the function slide assembly; otherwise the function slides will bind and the unit will not function properly.

Step 3. Position function slide assembly and three spacers (67) on front frame; secure with three screws (68) by passing them through the front frame from the rear to the front. Refer to (12, figure 5-94, Appendix) for relative location of parts.

Step 4. Install print lever and character advance lever shaft support bracket assembly (51, figure 5-80, Appendix) on the front frame; secure with four screws (18) and lock washer (17).

ad. STRIP ASSEMBLY.

(1) LATERAL CONTROL BELT STRIP ASSEMBLY.

Step 1. Install lateral control belt pulley assembly (76, figure 5-86, Appendix) in fork (81); secure with pin (80) and retaining ring (79).

Step 2. Insert slack takeup slide (84) into lateral control strip (81).

Step 3. Slide slack takeup spring (82) onto shaft of fork (81); then pass the shaft through lateral control strip (83) and screw into slack takeup slide (84).

Step 4. Engage the tab of lateral control chain takeup lever (86) in the slot of link (85).

Step 5. Insert screw (89) through lock washer (88), lateral control chain takeup eccentric (87), lateral control chain takeup lever (86), and link (85); secure the entire assembly by threading screw (89) into detent link (97).

Step 6. Engage the tab on detent link (97) with the fourth tooth from the right side of link (85); turn lateral control chain takeup eccentric (87) so that the heavy portion faces down (bottom).

Step 7. Attach lateral control chain takeup lever (86) to lateral control strip (83) using pin (98) and retaining ring (86).

Step 8. Attach lateral control chain (91) to link (85) by inserting pin (90) through one side of lateral control chain (91), spacer (95), link (85), spacer (95), and other side of chain; then secure with retaining ring (96).

Step 9. Attach the loose end of lateral control chain (91) to lateral transfer pulley (22, figure 5-87, Appendix) using pin (92, figure 5-86, Appendix), spacers (93), and retaining ring (94).

Step 10. Position lateral control strip (83) over post of lateral control function slide (75); secure with retaining ring (60).

Step 11. Attach safety spring (99) to pin in lateral control strip (83) and post of lateral control function slide (75).

(2) ROTARY CABLE STRIP ASSEMBLY.

Step 1. Place rotary cable pulley assembly (62, figure 5-86, Appendix) in rotary strip (59); secure with pin (65) and retaining ring (61).

Step 2. Attach rotary chain (54) to rotary strip (59) using pin (56), spacer (55) and retaining ring (57).

Step 3. Place rotary strip (59) over center post of rotary function slide (73); secure with retaining ring (60).

Step 4. Attach safety spring (58) to post of rotary strip (59) and center post of rotary function slide (73).

Step 5. Feed the rotary chain through number 1 and number 2 carriage pulleys as shown in figure 4-19 (Appendix).

Step 6. Attach rotary chain adjustment stud (51, figure 5-86, Appendix) to rotary chain (54) using pin (52) and retaining ring (53).

Step 7. Insert rotary chain adjustment stud (34, figure 5-97, Appendix) through the unthreaded hole in the upper tab of the casting on the front frame; secure the stud with nut (50, figure 5-86, Appendix).

Step 8. Press spring bar (107) onto the front frame.

ae. FUNCTION BACKSTOP ASSEMBLY.

Step 1. Place line feed sensing finger lever (10, figure 5-86, Appendix) on the pin on left side of line feed clutch release arm (11); secure with retaining ring (8).

Step 2. Place offline line feed sensing finger lever (13) on the pin on right side of line feed clutch release arm (11); secure with retaining ring (8).

Step 3. Assemble remaining function clutch release arms (15, 17, 18, 21, 30, and 32) as described in steps 1 and 2.

Step 4. Align the keyway of function clutch release shaft (33) with the key of function clutch release and backstop frame assembly (35) when installing function clutch release shaft (33) in function clutch release and backstop frame assembly (35); slide function clutch release shaft (33) into left side of function clutch release and backstop frame assembly (35), spacer (9), line feed clutch release arm (11), figures clutch release arm (15), spacer (9), bell advance suppression arm (17), spacer (9), letters clutch release arm (18), carriage return clutch release arm (21), spacer (9), and then the right side of function clutch release and backstop frame assembly (35).

Step 5. Install spacer (9), space arm (32), spacer (9), and blank advance suppression arm (30) on function clutch release shaft (33).

Step 6. Install retaining rings (34) in their respective grooves in function clutch release shaft (33).

Step 7. Install five function advance prevent adjustment screws (25) in nylon locking plate (26) and advance prevent bail carriage return bar (28).

Step 8. Position advance prevent bail carriage return bar (28) so that its arms are in contact with the ends of function clutch release shaft (33); insert advance prevent bail carriage return bar shaft (29) through function clutch release shaft (33).

Step 9. Secure advance prevent bail carriage return bar shaft (29) by installing and tightening clamp (2) and clamp setscrew (1) on advance prevent bail carriage return bar (28); check that advance prevent bail carriage return bar shaft (29) is flush with both ends of advance prevent bail carriage return bar (28).

Step 10. Insert function clutch release arm stop shaft (36) into function clutch release and backstop frame assembly (35); secure with retaining rings (37).

Step 11. Slide print prevent rod lever shaft assembly (48) through function clutch release arm stop shaft (36); secure with retaining ring (39).

Step 12. Slide left-hand print prevent rod actuator arm (49) onto left side of print prevent rod lever shaft assembly (48) and temporarily secure with print prevent rod actuator arm screw (41).

Step 13. Slide right-hand print prevent rod actuator arm (40) onto right side of print prevent rod lever shaft (48) and temporarily secure with print prevent rod actuator arm screw (41).

Step 14. Install seven print prevent adjustment screws (46) through print prevent rod (42) and lock strip (45).

Step 15. Attach print prevent rod (42) to left-hand and right-hand print prevent rod actuator arms (49) and (40) using screw (44) and flat washer (43).

Step 16. Slide clamp (2) onto function backstop (3); install function backstop eccentric bushing (4) into function backstop (3); install and tighten clamp setscrew (1).

Step 17. Repeat step 16 for remaining function backstops (3), making certain that the carriage return backstop eccentric bushing is installed exactly as shown in figure 5-86 (Appendix).

Step 18. See insert on figure 5-86 (Appendix). Install clamp setscrew (AN/TGC-14(V) only) in clamp; install clamp assembly on figures H code bar return stop.

Step 19. Install sleeve spacer (AN/TGC-14(V) only) in figures H code bar return stop; clamp in position by tightening clamp setscrew.

Step 20. Insert function backstop shaft (7) through function clutch release and backstop frame assembly (3), line feed backstop (5), sleeve spacer (35), letters figures backstop (3), and carriage return backstop (3); secure function backstop shaft (7) by installing retaining ring (6).

Step 21. Grasp entire function backstop assembly and align the function sensing finger levers with their respective slots in function slide support (74), position function clutch release and backstop frame assembly (35) against the front frame and secure with three screws (45).

Step 22. Attach three function backstop springs (22) to function backstops (3) and pins of function clutch release and backstop frame assembly (33).

Step 23. Attach print prevent rod actuator arm bias spring (38) to right-hand print prevent rod actuator arm (40) and spring post on right side of function clutch release and backstop frame assembly (35).

Step 24. Attach function clutch release arm return helical springs (22) between blank advance suppression arm (30) and space arm (32) and their respective posts on spring bar (107).

Step 25. Attach function clutch release arm return helical springs (22) between clutch release arms (11, 15, 17, 18, and 21) and their respective posts on spring bar (107).

Step 26. Attach function sensing finger lever helical spring (12) to blank sensing finger lever (31) and blank advance suppression arm (30).

Step 27. Attach function sensing finger lever helical spring (12) to function sensing finger lever (14) and space arm (32).

Step 28. Attach function sensing finger lever helical spring (12) to line feed sensing finger lever (10) and line feed clutch release arm (11).

Step 29. Attach function sensing finger lever helical spring (12) to off line feed sensing finger lever (13) and line feed clutch release arm (11).

Step 30. Attach function sensing finger lever helical spring (12) to function sensing finger lever (14) and figures clutch release arm (15).

Step 31. Attach function sensing finger lever helical spring (12) to bell actuator sensing finger lever (16) and bell advance suppression arm (17).

Step 32. Attach function sensing finger lever helical spring (12) to function sensing finger lever (14) and letters clutch release arm (18).

Step 33. Attach off line letters sensing finger lever spring (23) to off line letters sensing finger lever (19) and letters clutch release arm (18).

Step 34. Attach function sensing finger lever helical spring (12) to off line carriage return sensing finger lever (20) and carriage return clutch release arm (21).

Step 35. Attach function sensing finger lever helical spring (12) to carriage return sensing finger lever (10) and carriage return clutch release arm (21).

Step 36. Slide function sensing finger lever stop strip (108) between the springs and the function sensing finger levers, with the flat edge against the printer frame.

Step 37. Install nut (102) on print prevent stop adjustment set screw (103) and install setscrew in off line function slide assembly (105).

Step 38. Install off line function return helical springs (104) between off line function slide assembly (105) and the tabs on four function levers.

Step 39. Attach bell lever assembly (106) on off line function slide assembly (105) and secure with retaining ring (96); insert bell actuator connecting rod (24) into bell advance suppression arm (17) and bell lever assembly (106); attach function clutch release arm return helical spring (22) to end of bell actuator connecting rod (24) and spring bar (107).

Step 40. Position off line function slide assembly (105) on the front frame; align the holes of the function sensing finger lever stop strip and the off line function slide with the front frame; secure the entire assembly with four screws (50, figure 5-80, Appendix).

af. ADVANCE DRUM ASSEMBLY AND INSTALLATION.

Step 1. Install internal retaining ring (10, figure 5-85, Appendix) in advance drum (11).

Step 2. Press ball bearing (9) into rear of advance drum (11).

Step 3. Install spacer (15) and bearing (9) in advance drum (11).

Step 4. Slide advance drum assembly onto shaft on advance drum bracket (8); secure with grip ring (16).

Step 5. Press two dowel pins (1) into rotary pulley shim (2) so that they are flush with the right side of the rotary pulley shim.

Step 6. Slide spacer (3) onto shaft of rotary pulley shim (2).

Step 7. Slide one spacer (3) and rotary cable pulley assembly (4) onto shaft of rotary pulley shim (2).

Step 8. Install another spacer (3) and secure the entire assembly with grip ring (7).

Step 9. Loosely install three cable clamps (12) on advance drum (11) using lock washers (13) and cable clamp screws (14).

Step 10. Align the mounting hole in check pawl guide bracket (91) with the pins of rotary cable pulley shim assembly (2) and advance drum bracket (8); attach check pawl guide bracket (91), rotary cable pulley shim assembly (2), and advance drum assembly (10) to the holes in the front frame using screws (30, figure 5-80, Appendix).

ag. FRONT FRAME AND MAIN SHAFT ASSEMBLY.

Step 1. Rest rear frame assembly (9, figure 5-94, Appendix) on its back plate, insuring that the main shaft is still properly located in the three bearing cutouts.

Step 2. Position front frame assembly (11) over the main shaft and rear frame so that the top of front frame engages the rear frame first.

CAUTION

In the next step, insure that the line feed pawl is properly aligned and engaged with its respective slot in the front frame and that the function sensing finger levers are behind the automatic carriage return and line feed bail actuator.

Step 3. Engage all the type positioning cam followers with their respective carriage pulleys; then slowly apply pressure toward the back plate and engage the bottom row of type positioning cam followers with their respective carriage pulleys.

CAUTION

In the next step, if for any reason front and rear frames do not fit together properly, check the following before proceeding.

(1) Range adjustment assembly (5, figure 5-70, Appendix) must be between the two pins on front frame (56, figure 5-87, Appendix).

(2) All type positioning cam followers and the letters figures carriage pulley arm must be engaged with their respective carriage pulleys.

(3) Line feed pawl must not be jammed under front frame.

(4) Function sensing finger levers must be behind the automatic carriage return and line feed bail actuator.

(5) Insure that there is no other interference between any of the parts on either frame.

Step 4. Press front and rear frames together, insuring that the corner of advance drum bracket (7, figure 5-85, Appendix) does not engage first character adjustment screw (34, figure 5-77, Appendix).

Step 5. Engage and tighten six frame clamps (three on bottom and three on top).

Step 6. For AN/TGC-14A(V), attach secondary number 3 cam follower spring (24, figure 5-87, Appendix) between the post on rear of front frame assembly (56) and the post on secondary number 3 cam follower (37, figure 5-78, Appendix). For AN/TGC-14(V), attach the spring between the post on the cam follower and the hole in ribbon feed mounting base plate (36, figure 5-88, Appendix).

ah. TAKEUP BRACKET ASSEMBLY AND INSTALLATION.

Step 1. Install ring (8, figure 5-84, Appendix) in takeup drum (7).

Step 2. Press inside bearing (5) into takeup drum (7).

Step 3. Install carriage return, spiral spring (9) in takeup drum (7), engaging the hook of the carriage return spiral spring with the slot in the takeup drum as shown in figure 5-84 (Appendix); loosely install lateral control belt clamp (3) using screw (1) and lock washer (2).

Step 4. Slide takeup drum shaft (10) into the takeup drum assembly.

Step 5. Slide spacer (6) into takeup drum (7).

Step 6. Press outside bearing (5) into takeup drum (7) and secure shaft with retaining ring (4).

Step 7. Engage carriage return spring mounting cup (11) with carriage return spiral spring (9); secure with carriage return spring holder (12).

Step 8. Slide takeup drum shaft (10) through the mounting hole in takeup drum bracket assembly (24) and engage the two tabs of carriage return spring mounting cup (11) with the appropriate holes in takeup drum bracket assembly (24); apply light tension to the carriage return spiral spring to prevent it from disengaging the carriage return spring mounting

cup by aligning the hole in the takeup drum with the hole in the bracket and securing it with a pin.

Step 9. Secure the takeup drum assembly with lock washer (25) and nut (26).

Step 10. Slide spacer (35), belt pulley assembly (16), and spacer (19) onto left-hand pulley bracket (48); secure with ring (20).

Step 11. Install spacer (19), cable pulley assembly (49), and spacer (19) onto takeup drum bracket assembly (24); secure with ring (20).

Step 12. Attach left-hand belt pulley bracket (48) to takeup drum bracket assembly (24) using two screws (52).

Step 13. Install belt pulley assembly (16) on takeup arm (15); secure with spacer (19) and grip ring (20).

Step 14. Attach takeup arm (15) onto takeup drum bracket assembly (24) using flat washer (14) and ring (13).

Step 15. Install lateral tension helical spring (23) on post of takeup drum bracket assembly (24) and pin of takeup arm (15); secure with flat washers (22) and retaining rings (21).

NOTE

Steps 16 through 18 pertain to AN/TGC-14A(V) only; steps 19 and 20 pertain to AN/TGC-14(V) only.

Step 16. Insert range dial (55) into takeup drum bracket assembly (24), range finder lock helical spring (29), and conical range finder slide lock (28); install range finder knob (56) into range dial (55); press groove pin (27) through conical range finder slide lock (28) and into range finder knob (56).

Step 17. Insert range finder lock lever shaft (30) through range finder lock lever bracket (33), range finder lock lever (31), and range finder lock lever spring (32); secure with retaining ring (34).

Step 18. Install range finder lock lever assembly (31) on takeup drum bracket assembly (24) with screw (54) and flat washer (53).

Step 19. See AN/TGC-14(V) insert on figure 5-84 (Appendix). Insert the range pinion into the range finder lock helical spring and takeup drum bracket assembly; install spacer and range pinion dial; press range pinion dial pin into range pinion.

Step 20. Install range pinion lock knob in clamp of takeup drum bracket assembly.

Step 21. Preload takeup drum by turning it counterclockwise two to three complete turns. Insert a screw or some similar object into the hole in the takeup drum and the front frame to prevent the takeup drum from unwinding.

ai. PRINT LEVER SHAFT INSTALLATION.

Step 1. Install bearing (42, figure 5-84, Appendix) into print lever shaft (43).

Step 2. Install two felt washers (45) on print lever shaft assembly (43) and slide them to the extreme left side of the print lever shaft assembly.

Step 3. Install print prevent arm clamping screw (46) in print prevent arm (36), print cam follower clamping screw (47) in print cam follower (37), and print spring arm clamping screw (46) in print spring arm (39).

NOTE

In the next step, slide print spring arm and clamping screw (46 and 39), print cam follower assembly (37), and print prevent arm assembly (43) onto print lever shaft assembly (41) as it is installed in front frame.

Step 4. Install print lever shaft assembly (43) through hole in left side of front frame (figure 5-80, Appendix).

Step 5. Attach print helical spring yoke link (11, figure 5-79, Appendix) to print spring arm (39, figure 5-84, Appendix) using print spring yoke pivot stud (40); secure with retaining ring (38) or, on some equipment, nylon washer and cotter pin.

Step 6. Install retaining rings (44) in their appropriate grooves on print lever shaft assembly (43).

Step 7. Attach takeup drum and linkage assembly (figure 5-84, Appendix) to front frame (figure 5-80, Appendix) using two screws (53, figure 5-80, Appendix) and two screws (12).

aj. FUNCTION SHAFT AND RIGHT-HAND SECTION ASSEMBLY AND INSTALLATION.

Step 1. Oil felt strip (36, figure 5-85, Appendix) and then install it on character advance lever shaft assembly (52).

Step 2. Partially install character advance lever shaft assembly (52) through the hole in the right side of front frame (figure 5-80, Appendix).

Step 3. Install code bar actuator clamp screw (56, figure 5-85, Appendix) into code bar actuator clamp (56).

Step 4. Install lifter arm clamping screw (59) into lifter arm (58).

Step 5. Install two compression springs (88) in the recess of function lever (61); then place function bar (87) over the ends of compression springs (88) and engage the slots of function bar (87) with the tabs of function lever (61).

CAUTION

In the next step, depress function bar (87) prior to turning special screws (86). If the screws are turned without first disengaging function bar (87), the locking feature will be destroyed.

Step 6. Install special screws (86) in function lever (61) by compressing the function bar and compression springs and then turning the special screws clockwise until there is 1/4-inch clearance between the function bar and the function lever.

Step 7. Install function cam follower clamping screw (90) into function cam follower (89).

Step 8. Engage lifter arm spring (60) with the holes in function lever (61) and lifter arm assembly (58).

Step 9. Install spacer (54), spacer (55), code bar actuator clamp assembly (56), lifter arm spring (60), function lever (61), and function cam follower (89) on character advance lever shaft assembly (53) as it is installed in front frame assembly (56, figure 5-80, Appendix).

Step 10. Install clamp setscrew (23, figure 5-85, Appendix) in clamp (22).

Step 11. Slide bounce prevent lever eccentric bushing (21) into bounce prevent lever (24); then install the clamp assembly on the bounce prevent lever and lightly clamp.

Step 12. Install carriage return cam follower clamping screw (17) in carriage return cam follower (18).

Step 13. Install retaining ring (19), shown to the right of bounce prevent lever (24), on carriage return shaft assembly (26).

Step 14. Slide bounce prevent lever (24) and felt washer (20) onto carriage return shaft assembly (26); then slide shaft partially through front frame assembly (56, figure 5-80, Appendix).

Step 15. Install carriage return cam follower assembly (18, figure 5-85, Appendix) on carriage return shaft assembly (26) as it is slid through front frame.

Step 16. Engage the left side of carriage return shaft assembly (26) with the hole in advance prevent bail carriage return bar shaft (29, figure 5-86, Appendix); then engage the pin of carriage return cam follower (18, figure 5-85, Appendix) with the hole in advance prevent bail carriage return bar (28, figure 5-86, Appendix).

Step 17. Install retaining ring (19, figure 5-85, Appendix) on carriage return shaft assembly (26).

Step 18. Attach bounce prevent lever spring (25) to bounce prevent lever (24) and advance drum bracket (8).

Step 19. Install felt strip (34) and felt strip clip (35) on lever of character advance lever shaft assembly (53); then crimp felt strip clip (35).

Step 20. Slide spacer (77), rotary cable pulley assembly (78), and spacer (77) onto pin of rotary cable pulley shaft assembly (80); secure with grip ring (76).

Step 21. Slide spacer (79), lateral control belt pulley assembly (82), and spacer (77) onto pin of lateral control belt pulley bracket (83); secure with grip ring (76).

Step 22. Attach rotary cable pulley shaft assembly (79), spacer bracket (81), and lateral control belt pulley bracket (83) on the right side of front frame assembly (56, figure 5-80, Appendix), using advance suppression latch mounting stud (74, figure 5-85, Appendix) and screw (36, figure 5-80, Appendix).

Step 23. Install felt washers (73, figure 5-85, Appendix), advance suppression latch (72), and advance suppression latch eccentric bushing (71) on advance suppression latch mounting stud (74); secure with screw (70).

Step 24. Install check pawl eccentric stud (63) on check pawl (64) using lock washer (65) and nut (66).

Step 25. Install spacer (69), check pawl assembly (64), and check pawl eccentric bushing (61) on front frame assembly (56, figure 5-87, Appendix); secure with screw (70, figure 5-85, Appendix).

Step 26. Install nut (49) on rotary detent pawl adjustment screw (48); then install screw (48) in rotary detent pawl (50) so that the screw protrudes 1/16 inch.

Step 27. Install washer (51), rotary detent pawl (50), felt washer (47), rotary detent pawl actuator arm (46), and rotary detent pawl eccentric bushing (45) on front frame assembly (56, figure 5-87, Appendix); secure with screw (44, figure 5-85, Appendix).

Step 28. Install character advance pawl (33) and character advance pawl eccentric bushing (32) on lever of character advance lever shaft assembly (53) using screw (31).

Step 29. Attach character advance pawl spring (36) to lever of character advance lever shaft assembly (53) and character advance pawl (33).

Step 30. Attach rotary detent pawl spring (52) to lever of character advance lever shaft assembly (53) and rotary detent pawl (50).

Step 31. Install index link (43) on rotary detent pawl actuator arm (46) and lever of character advance lever shaft assembly (53); secure with retaining rings (42 and 42).

Step 32. Install shim (38), advance prevent lever (30), felt washer (40) on character advance lever shaft assembly (53); secure with retaining ring (41).

Step 33. Attach check pawl spring (62) to post on check pawl assembly (64) and to advance suppression latch (72).

Step 34. Attach advance prevent lever spring (27) to advance prevent lever (39) and to lever of carriage return shaft assembly (26).

Step 35. Install spacer (28) and check pawl link (30) on lever of carriage return shaft assembly (26); secure with retaining ring (29) and check that check pawl link (30) is engaged with check pawl (64).

Step 36. Install lateral control belt (93), return cable (92), and print hammer cable (94) in this sequence as instructed in paragraph 5-4c(5) and 5-4c (6). The rotary cable will be installed later.

Step 37. Fasten function helical spring yoke link assembly (11, figure 5-79, Appendix) to function lever (61, figure 5-85, Appendix) using function spring yoke pivot stud (84); secure with retaining ring (85) or, on some equipment, nylon washer and cotter pin.

ak. PAPER FEED ASSEMBLY AND INSTALLATION.

Step 1. For AN/TGC-14A(V) only, install paper feed tooth sprockets (3, figure 5-83, Appendix) into paper feed rubber roll (2).

Step 2. Install paper feed rubber roll (2) into paper feed guide (4); secure by installing two ball bearings (7 and 7) on the end shafts of paper feed rubber roll (2).

Step 3. Install washer (8) on the left side of paper feed rubber roll (2) and secure with grip ring (3).

Step 4. Install screw (1) in paper feed rubber roll (2).

Step 5. Install lock washer (8) and paper feed detent and ratchet (10) on the right side of paper feed rubber roll (2); secure by pressing in ratchet roll pin (9).

Step 6. Install detent roller (13) on paper feed detent arm (14); secure with retaining ring (6).

Step 7. Slide paper feed detent arm (14) and detent roller (13) onto shaft of paper feed guide (4); secure with retaining ring (6).

Step 8. Attach paper feed detent spring (5) to paper feed guide (4) and paper feed detent arm (14).

Step 9. Attach left-hand and right-hand pressure roll actuator arms (36 and 17) to paper feed guide (4) by inserting pressure roll pivot shaft (37) through left-hand and right-hand pressure roll actuator arms

(36 and 17) and then through the tabs on paper feed guide (4).

Step 10. Secure pressure roll pivot shaft (37) with retaining rings (6).

Step 11. Slide pressure roll shaft (15) through the hole in left-hand pressure roll actuator arm (36), through pressure roll (16), and through the hole in right-hand pressure roll actuator arm (17); secure with retaining rings (6).

NOTE

In the next step, install pad spring (21), paper pressure release lever pivot clamp (27), pressure release cams (23), and pad spring (21) on paper feed pressure release shaft (19) as it is slid through the tabs of pressure pad (20) and paper feed guide (4). Insert paper feed stop arm (32) on left end of paper feed pressure release shaft (19), and anti-turn nut (31) and screw (33) in paper feed stop arm (32).

Step 12. Position pressure pad (20) against paper feed guide (4); secure by sliding paper feed pressure release shaft (19) through the tabs of paper feed guide (4) and pressure pad (20).

Step 13. Secure paper feed pressure release shaft (19) with four retaining rings (6).

Step 14. Install two pressure release cam setscrews (24) into pressure release cams (23); tighten pressure release cams (23) on their respective flats of paper feed pressure release shaft (19).

Step 15. Install screw (26) in paper pressure release lever pivot clamp (27).

Step 16. Attach paper pressure release lever (28) to paper pressure release lever pivot clamp (27); secure with retaining ring (30).

Step 17. Attach paper pressure release lever spring (29) to paper feed pressure release shaft (19) and paper pressure release lever (28).

Step 18. Attach two pressure roll springs (18) to left-hand and right-hand pressure roll actuator arms (36) and (17) and to posts of paper feed guide (4).

Step 19. Place paper feed assembly in position on front frame assembly (56, figure 5-87, Appendix) and secure with two screws (10, figure 5-80, Appendix) and paper guide retaining pins (14).

Step 20. Install paper feed knob (34, figure 5-83, Appendix) and secure with screw (1).

al. PRINT CYLINDER SHAFT ASSEMBLY AND INSTALLATION.

Step 1. Place print cylinder (21, figure 5-82, Appendix) and washer (22) on print cylinder shaft (20).

Step 2. Press bearing (24) into right-hand bearing retainer (23).

Step 3. Slide bearing and right-hand bearing retainer assembly and sleeve spacer (25) onto the right side of print cylinder shaft (20).

Step 4. Place machine key (26) into the keyway of print cylinder shaft (20).

Step 5. Install index wheel (27) over the key on print cylinder shaft (20) insuring that the red dot (figure 5-82, Appendix) in the index wheel is aligned between the type strip containing the letter E and the type strip containing the letter L.

Step 6. Slide sleeve spacer (28) onto print cylinder shaft (20); secure with special nut (29).

Step 7. Slide threading flange (19), left-hand bearing retainer (18), and bearing (17) on print cylinder shaft (20).

Step 8. Insert rotary motion spring housing nylon washer (14) into rotary motion spring retainer (32).

Step 9. Install rotary motion spring (13) into rotary motion spring retainer (32) by inserting outer end of the spring into the retainer slot and gradually winding the spring counterclockwise into the retainer. Refer to figure 5-100 (Appendix) for the correct method of installing rotary motion spring (13, figure 5-82, Appendix).

Step 10. Slide retainer assembly onto print cylinder shaft (20), insuring that the tab on rotary motion spring (13) is engaged with the slot in print cylinder shaft (20).

Step 11. Install rotary motion spring retaining washer (11) and rotary motion spring retaining nylon washer (12); secure with grip ring (10).

Step 12. Place print cylinder shaft (20) in position on front frame assembly (56, figure 5-87, Appendix); secure with screw (30, figure 5-82, Appendix) and lock washer (31) on the right side and with screws (15) and lock washers (16) on the left side.

am. PRINT CYLINDER YOKE SHAFT ASSEMBLY AND INSTALLATION.

Step 1. Attach nylon lockstrip (3, figure 5-82, Appendix) to print cylinder yoke (8) using screw (2).

Step 2. Install belt clamp (4) and belt clamp wedge (5) in print cylinder yoke (8); temporarily tighten with screw (2).

Step 3. Position print cylinder yoke (8) over print cylinder (21) and secure by sliding print cylinder yoke shaft (1) through front frame assembly (56, figure 5-80, Appendix), through the hole in the top of print cylinder yoke (8, figure 5-82, Appendix), and then through the other side of the front frame. Refer to figure 5-94 (Appendix) for relative location of parts.

Step 4. Secure print cylinder yoke shaft (1, figure 5-82, Appendix) with two retaining rings (9).

an. PRINT HAMMER SHAFT ASSEMBLY AND INSTALLATION.

Step 1. Place print hammer (45, figure 5-82, Appendix) on print hammer shaft (44); fit print hammer cap (57) on print hammer (46) using three screws (58) and lock washers (34).

NOTE

Insure that print hammer (45) can be easily slid from one end of the print hammer shaft to the other without binding.

Step 2. Install print hammer face pad (46) on print hammer (45) using print hammer face pad clamp screw (47); temporarily tighten screw (47).

Step 3. Install print hammer cable clamp (48) on print hammer (45) using print hammer cable clamp screw (49) and lock washer (34).

Step 4. Install right-hand vibrator arm (50), screw (41), lock washer (42), washer (56), and lock nut (55); temporarily tighten lock nut (55).

Step 5. Install screw (53) in print hammer shaft stop (52); slide print hammer shaft stop (52) onto print hammer shaft (44) and temporarily tighten screw (53).

Step 6. Install left-hand vibrator arm (43) on print hammer shaft (44) using screw (41), lock washer (42), washer (56), and lock nut (55); temporarily tighten lock nut (55).

Step 7. Install screw (61) in print hammer actuator link lever (60); temporarily fasten print hammer actuator link lever (60) to print hammer shaft (44).

Step 8. Attach print hammer actuator link (40) to print hammer actuator link lever (60) and secure with retaining ring (62); attach felt washer (38) to print hammer actuator link lever (60) and secure with grip ring (37).

Step 9. Install one felt washer (54) on each end of print hammer shaft (44). Place left-hand and right-hand bearings (35 and 35) on their respective ends of print hammer shaft (44); position print hammer shaft assembly (44) in front frame assembly (56, figure 5-80, Appendix) as shown in figure 5-94 (Appendix).

Step 10. Secure the print hammer shaft assembly in the front frame using four screws (33, figure 5-82, Appendix) and lock washers (34).

Step 11. Attach print hammer return spring (54) to print hammer shaft stop (52) and spring post on front frame.

Step 12. Attach print hammer actuator link helical spring (39) to print hammer actuator link (40) and spring post on front frame.

ao. FRONT PLATE ASSEMBLY AND INSTALLATION.

Step 1. Attach right-hand ribbon guide bracket (8, figure 5-81, Appendix) to front plate assembly (22) using screws (10) and flat washers (9).

Step 2. Install retaining ring (6), ribbon guide roller (7), and retaining ring (6) on right-hand ribbon guide bracket (8).

Step 3. Install left-hand ribbon guide bracket (28) on front plate assembly (22) using screws (10) and flat washers (9).

Step 4. Install retaining ring (6), ribbon guide roller (7), and retaining ring (6) on left-hand ribbon guide bracket (28).

Step 5. For AN/TGC-14(V), install right-hand ribbon vibrator guide assembly (27) on front plate assembly (22) using ribbon vibrator pivot shaft (26), retaining rings (23), and felt washers (24). For AN/TGC-14A(V), install right-hand ribbon vibrator guide assembly (27) using spring clip. See insert onfigure 5-81 (Appendix).

Step 6. For AN/TGC-14(V), install left-hand ribbon vibrator guide assembly (25) on front plate assembly (22) using ribbon vibrator pivot shaft (26), retaining rings (23), and felt washers (24). For AN/TGC-14A(V), install left-hand ribbon vibrator guide assembly (25) using spring clip. See insert on figure 5-81 (Appendix).

Step 7. Install torsion spring (13) into end of line bell lever (15); attach end of line bracket and shaft assembly (11) to end of line bell lever (15) using retaining ring (14).

Step 8. Install end of line bracket assembly (17) on front plate assembly (22); secure with two screws (16).

Step 9. Connect wire link (18) between end of line bell lever assembly (11) and end of line bell lever (15); install end of line bell lever assembly (11) onto post on front plate assembly (22) and secure with retaining ring (12).

Step 10. Install bell (20) on post of front plate assembly (22); secure with screw (10) and lock washer (19).

Step 11. Install front plate assembly (22, figure 5-81, Appendix), securing it to the front frame (11, figure 5-94, Appendix) with two screws (10) and washers (9).

Step 12. Engage left and right hand ribbon vibrator guide assemblies (25 and 27, figure 5-81, Appendix) with the left and right hand vibrator arms (43 and 50, figure 5-82, Appendix).

ap. RIBBON FEED TOP PLATE ASSEMBLY.

Step 1. Install two guide pin spacers (29, figure 5-88, Appendix) on the appropriate posts of ribbon feed mounting base plate (36).

Step 2. Position ribbon reversing sliding plate (64) on post of ribbon feed mounting base plate (36); fasten with two washers (28) and two screws (27).

Step 3. Position clutch shaft worm gear assembly (68) on post of ribbon feed mounting base plate (36).

Step 4. Install washer (70) and ribbon feed clutch (71) on clutch shaft worm gear (68).

Step 5. Install four clutch rollers (72) in ribbon feed clutch (71).

Step 6. Install left-hand tension control brake arm (25) over the appropriate post of ribbon feed mounting base plate (36).

Step 7. Press bearing (11) into left-hand intermediate drive gear (24).

Step 8. Install washer (13), left-hand intermediate drive gear assembly (24), left-hand reversing cam follower (10), sleeve spacer (23), left-hand ribbon feed clutch stop (21), and sleeve spacer (20).

Step 9. Install clamp setscrew (16) in clamp (17).

Step 10. Slide clamp (17) onto ribbon feed backstop (18).

Step 11. Install right-hand tension control brake arm (14), washer shim (13), right-hand intermediate drive gear assembly (12), right-hand reversing cam follower (10), sleeve spacer (9), and right-hand ribbon feed clutch stop (8); secure with retaining ring (7).

Step 12. Attach clutch stop helical spring (6) to left-hand and right-hand ribbon feed clutch stops (21 and 8).

Step 13. Install ribbon feed backstop (18), sleeve spacer (15), brace plate (1), and ribbon feed backstop eccentric (3); secure with retaining rings (4, 2, and 5).

Step 14. Attach ribbon feed backstop helical spring (19) to ribbon feed backstop (18) and brace plate (1).

Step 15. Attach reversing cam follower spring (22) to left- and right-hand reversing cam followers (10 and 10).

Step 16. Press ribbon feed idler gear bearing (59) into ribbon feed idler gear (60).

Step 17. Install ribbon feed idler gear assembly (58) and spacer (61); secure with retaining ring (7).

Step 18. Attach tension control brake arm spring (26) to left-hand and right-hand tension control brake arms (25 and 14).

Step 19. Insert one end of left-hand wire link (63) into left-hand ribbon feed clutch stop (21).

Step 20. Insert the other end of left-hand wire link (63) into left-hand ribbon reversing sensing arm (62); secure left-hand ribbon reversing sensing arm (62) to the post on ribbon feed mounting base plate (36) with retaining ring (7).

Step 21. Insert one end of right-hand wire link (38) into right-hand ribbon feed clutch stop (8).

Step 22. Insert the other end of right-hand wire link (38) into right-hand ribbon reversing sensing arm (37); secure right-hand ribbon reversing sensing arm (37) to the post on ribbon feed mounting base plate (36) with retaining ring (7).

Step 23. Press ribbon roller bushings (32) into ribbon rollers (33); repeat this step for total of four assemblies.

Step 24. Install four ribbon roller assemblies (31) on their respective posts of ribbon feed mounting base plate (36); secure with retaining rings (30).

Step 25. Install ribbon feed worm (44) on ribbon feed worm shaft (46); secure by pressing in roll pin (45).

Step 26. Press bearing (40) into right-hand bearing block (41).

Step 27. Slide thrust washer (43) and right-hand bearing block assembly (39) onto ribbon feed worm shaft (46); install retaining ring (47) on ribbon feed worm shaft (46).

Step 28. Press bearing (50) into left-hand bearing block (49).

Step 29. Slide left-hand bearing block assembly (48) onto ribbon feed worm shaft (46).

NOTE

On models not equipped with ribbon feed slip clutch assembly (consisting of items 42, 48, 49, 50, 52, 53, 54, 55, 56, and 57), omit steps 30 through 32. Install the setscrew in the ribbon feed drive gear, slide the gear onto ribbon feed worm shaft (46), and tighten the setscrew.

Step 30. Install felt washers (51) on ribbon feed worm shaft (46).

Step 31. Install key washer (54), ribbon feed slip clutch gear (55), key washer (54), washer spring (56), and key washer (54) on ribbon feed slip clutch hub (53); secure with retaining ring (57).

Step 32. Install ribbon feed slip clutch assembly on ribbon feed worm shaft (46); secure with ribbon feed slip clutch hub socket screw (52).

Step 33. Install the ribbon feed worm shaft assembly on ribbon feed mounting base plate (36); secure with four screws (42). Insure that the ribbon feed worm shaft rotates freely after the bearing blocks have been secured.

Step 34. Attach two spool clips (67) to ribbon spool drive gears (65); install ribbon spool drive gears (65) on posts on ribbon reversing sliding plate (64) and secure with retaining rings (66).

NOTE

Steps 35 and 36 pertain to AN/TGC-14A(V) only; proceed to step 37 for AN/TGC-14(V).

Step 35. Attach bounce prevent lever guide (35) to ribbon feed mounting base plate (36) using two screws (34).

Step 36. Attach ribbon feed top plate assembly to printer assembly by inserting rear of ribbon feed mounting base plate (36) into ribbon feed base spring clips (8 and 30, figure 5-79, Appendix) on rear frame and aligning slotted holes of ribbon feed mounting base plate (36, figure 5-88, Appendix) over two screws (15, figure 5-80, Appendix); secure ribbon feed top plate assembly (29, figure 5-81, Appendix) by moving lock clips to the left engaging screws (15, figure 5-80, Appendix).

Step 37. For AN/TGC-14(V), attach the ribbon feed top plate assembly to printer assembly with five screws and washers.

aq. KEYBOARD ASSEMBLY.

Step 1. Check for the presence of threaded insert (14, figure 5-89, sheet 2, Appendix) in left bottom frame (78) and threaded insert (14) in right frame (30).

Step 2. Position front support (31) against left bottom frame (78); align spring pin (75) and secure with screws (18) and lock washers (17).

Step 3. Align spring pins (75) with their respective holes in front support (31) and right frame (30); secure with screws (18) and lock washers (17).

Step 4. Assemble key lever leaf spring (16), key lever leaf spring mounting strip (15), and rear support (20); secure with screws (18) and lock washer (17).

Step 5. Attach rear support (20) to frames (30 and 78) using screws (18) and lock washers (17).

Step 6. See insert on figure 5-89, sheet 3 (Appendix). Attach spring bar (AN/TGC-14(V) only) to left bottom frame (78, figure 5-89, sheet 2, Appendix) using screws and lock washers.

Step 7. Attach code bar guide (69) to frames (78 and 30) using screws (70) and lock washers (71).

Step 8. Assemble pulsing finger and prevent lever assembly (19) as shown on sheet 1 of figure 5-89 (Appendix).

Step 9. Attach pulsing finger and prevent lever assembly (10) to left bottom frame (78, figure 5-89, sheet 2, Appendix) using screw (37, figure 5-89, sheet 1, Appendix), lock washer (3), shaft clamp (9), and pulsing finger adjustment shim (8).

NOTE

Keyboard code bar prevent lever (19) passes through the opening in front support (31, figure 5-89, sheet 2, Appendix). Check freedom of motion by allowing the unit to move back and forth by its own weight.

Step 10. Attach helical springs (14 and 16, figure 5-89, sheet 1, Appendix) between the fingers and spring bar portion of code pulsing contact assembly (41, figure 5-89, sheet 3, Appendix). For AN/TGC-14A(V), see insert on figure 5-89, sheet 2 (Appendix) and attach helical springs (14 and 16, figure 5-89, sheet 1, Appendix) between fingers and spring bar.

Step 11. Attach master pulsing contact assembly (40, figure 5-89, sheet 3, Appendix) loosely to left bottom frame (78, figure 5-89, sheet 2, Appendix) using two screws (39, figure 5-89, sheet 3, Appendix) and lock washers (38) center and tighten master pulsing contact assembly (40, figure 5-89, sheet 3, Appendix) as described in paragraph 5-4e(27) steps 8 through 10.

Step 12. Insert straight pin (29, figure 5-89, sheet 2, Appendix) into right frame (30).

Step 13. Insert bail support shaft (73) into left bottom frame (78).

Step 14. Install felt washer (74) and ring (72) on bail support shaft (73) from the inboard side of right frame (30).

Step 15. Insert clutch release bail (12) through left bottom frame (78) and engage with straight pin (29) and bail support shaft (73).

Step 16. Insert cam follower clutch release eccentric (6) through felt washer (74), cam follower clutch release (8), and clutch release bail (12); secure with flat washer (9) and nut (10).

Step 17. Attach clutch release helical spring (11) to cam follower clutch release (8) and clutch release finger (48, figure 5-89, sheet 3, Appendix).

Step 18. Install ring (72, figure 5-89, sheet 2, Appendix) on bail support shaft (73) from the outboard side of left bottom frame (78). Secure cam follower clutch release (8) over cam on clutch assembly (26, figure 5-89, sheet 3, Appendix); insure that clutch release bail (12, figure 5-89, sheet 2, Appendix) is free to rotate.

Step 19. Insert repeat key shaft bushing (46, figure 5-89, sheet 3, Appendix) into left bottom frame (78, figure 5-89, sheet 2, Appendix).

Step 20. Insert repeat key shaft (76) through frames (78) and (30); secure with grip rings (45, figure 5-89, sheet 3, Appendix) and retaining ring (77).

Step 21. Install clutch release finger (48, figure 5-89, sheet 3, Appendix) and felt washer (47) on repeat key shaft (76, figure 5-89, sheet 2, Appendix).

Step 22. Install repeat key actuator arm (50, figure 5-89, sheet 3, Appendix) on repeat key shaft (76, figure 5-89, sheet 2, Appendix); secure with repeat key actuator arm screw (49, figure 5-89, sheet 3, Appendix) and repeat key actuator arm nutplate (51).

Step 23. Assemble backstop eccentric shaft (9), clutch backstop assembly (10), and retaining ring (11); then insert assembly through left top frame (52).

Step 24. Secure with backstop eccentric shaft setscrew (17).

Step 25. Attach backstop spring (8) to clutch backstop assembly (10), and retaining ring (18, figure 5-89, sheet 1, Appendix).

Step 26. Insert code bars (1 through 5, figure 5-89, sheet 2, Appendix) in their respective slots in code bar guide (69).

Step 27. Install top right code bar guide (26) against top right frame (30).

Step 28. Align top right code bar guide (26) with code bars; then secure with screws (18) and lock washers (17).

Step 29. Engage keyboard code bar prevent lever (19, figure 5-89, sheet 1, Appendix) with slots in code bars (1 through 5, figure 5-89, sheet 2, Appendix); insert repeat key assembly (32) through front support (31).

Step 30. Install flat washer (42, figure 5-89, sheet 3, Appendix) and repeat key lever clamp (23, figure 5-89, sheet 2, Appendix) onto repeat key shaft (76).

Step 31. Secure repeat key lever (32) to repeat key lever clamp (23) using screws (27).

Step 32. Secure repeat key lever clamp (23) to repeat key shaft (76) with screw (22) and clamp nut plate (24).

Step 33. Attach repeat key lever helical spring (21) to repeat key assembly (32) and to pin on right frame (30).

Step 34. Check repeat key lever (32) for freedom of motion.

Step 35. Install clutch assembly (29, figure 5-89, sheet 3, Appendix) on keyboard drive shaft (26) and secure with clutch assembly setscrew (34); install clutching rollers (30) into clutch assembly (29).

Step 36. Install keyboard drive gear (31), sleeve spacer (32), and bearing (33) on keyboard drive shaft (26).

Step 37. Attach master pulsing cam (23) to start stop cam bushing (24) using screws (22); insert start pulse eccentric (35) into master pulsing cam (23).

Step 38. Install bearings (21) into start stop cam bushing (24); slide pulsing cam assembly (25) onto start stop cam bushing (24).

Step 39. Slide start stop cam bushing (24), sleeve spacer (20), and bearing (19) onto keyboard drive shaft (26).

Step 40. Place keyboard cam shaft assembly (consists of items 19-35) into left bottom frame (78, figure 5-89, sheet 2, Appendix).

Step 41. Secure code pulsing contact assembly (41, figure 5-89, sheet 3, Appendix) to left bottom frame (78, figure 5-89, sheet 2, Appendix) using two screws (44, figure 5-89, sheet 3, Appendix), lock washers (43), and flat washers (42); then secure slip connector contact assembly (37) to code pulsing contact assembly (41) using two screws (36) and lock washers (6). For AN/TGC-14(V), refer to insert on figure 5-89, sheet 2 (Appendix) and secure slip connector contact assembly to left bottom frame (78, figure 5-89, sheet 2, Appendix) using two screws (44, figure 5-89, sheet 3, Appendix), lock washers (43) and flat washers (42).

Step 42. Secure left top frame (52) to left bottom frame (78, figure 5-89, sheet 2, Appendix) using screws (2, figure 5-89, sheet 3, Appendix) and lock washers (1).

Step 43. Install keyboard cover pad (56, figure 5-89, sheet 1, Appendix) in keyboard cover (57), install keyboard lock bar (1) over frames (78 and 30, figure 5-89, sheet 2, Appendix).

Step 44. Install left-hand and right-hand keyboard rails (2 and 7, figure 5-89, sheet 1, Appendix), secure with screws (5, 4 and 6) and lock washers (3 and 3).

NOTE

Keyboard lock bars (1) is secured by rails (2 and 7).

Step 45. Install keyboard lock bar helical spring (58) by attaching to keyboard lock bar (1) and top left code bar guide (7, figure 5-89, sheet 3, Appendix).

Step 46. Install wear pad (46, figure 5-89, sheet 1, Appendix) by inserting its arms through the outermost slots in rear support (20, figure 5-89, sheet 2, Appendix).

Step 47. Install key lever dust seals (68) over each key lever to be installed.

Step 48. Press key tops on their appropriate key levers as shown on sheet 2 of Figure 5-89 (Appendix).

Step 49. Install space bar (45, figure 5-89, sheet 1, Appendix) through outermost slots in front support (31, figure 5-89, sheet 2, Appendix) and rear support (20).

NOTE

The arms of the space bar pass through the same slots used for wear pad.

Step 50. Secure keys by installing key retaining strip (19) using screws (18) and lock washers (17).

Step 51. Assemble items (3, 48, 50 and 51, figure 5-89, sheet 1, Appendix) on switch bracket (49); attach switch bracket (49) to frame assembly (78, figure 5-89, sheet 2, Appendix) using screws (39, figure 5-89, sheet 1, Appendix) and lock washers (3).

Step 52. Refer to the keyboard wiring diagram (figure 5-112, Appendix) and solder all electrical connections.

Step 53. Install front key guide (38, figure 5-89, sheet 1, Appendix) to front support (31, figure 5-89, sheet 2, Appendix) with two screws (39, figure 5-89, sheet 1, Appendix).

Step 54. Install keyboard cover (57, figure 5-89, sheet 1, Appendix) and secure to front support (31, figure 5-89, sheet 2, Appendix) with screws (39, figure 5-89, sheet 1, Appendix).

Step 55. Attach space bar safety guard cover (41) to front support (31, figure 5-89, sheet 2, Appendix) and keyboard cover (57, figure 5-89, sheet 1, Appendix) using four screws (39).

Step 56. Attach right side cover (25, figure 5-89, sheet 2, Appendix) to right frame (30) with screws (18) and lock washers (17).

ar. ELECTRICAL CHASSIS ASSEMBLY.

Step 1. Replace three lamps (52, figure 5-90, Appendix) by pressing in and turning clockwise.

Step 2. Replace patch cord assemblies (45, 46, and 47).

Step 3. Insert paper support shaft assembly (3) through paper supply roll (2); place brake drum (1) on the end of paper support shaft assembly (3) and turn clockwise until tight.

Step 4. Raise the two paper support and brake drum assembly lock levers and install paper supply roll (2) and paper support and brake drum assembly (consisting of part numbers 1 through 5) in the electrical chassis; secure by pulling the two paper support and brake drum assembly lock levers down.

Step 5. Assemble the remaining parts of chassis assembly (33) using figure 5-90 (Appendix) as a guide.

as. LINE SENSOR ASSEMBLY.

Step 1. Install diode (11, figure 5-91, Appendix) on bracket (14) using the mounting screw and associated parts; connect wiring according to the wiring diagram (figure 5-105, Appendix).

Step 2. Connect wiring to line sensor connector (15) according to the wiring diagram (figure 5-105, Appendix); install the connector on bracket (14, figure 5-91, Appendix) using two screws (4) and two nuts (12).

Step 3. Connect wiring to selector receptacle (17) according to the wiring diagram (figure 5-110, Appendix); install the receptacle on bracket (14, figure 5-91, Appendix) using its mounting hardware.

Step 4. Install transformer (13) on bracket (14) using four screws (4) and four nuts (12); connect wiring according to the wiring diagram (figure 5-110, Appendix).

Step 5. Install high-low range strip (22) on board (16) using screw (24) and lock washer (23).

Step 6. Connect wiring to board assembly (16) according to the wiring diagram (figure 5-110, Appendix); install the board assembly on bracket (14, figure 5-91, Appendix) using four screws (4) and four flat washers (5).

Step 7. Connect wiring to board assembly (10) according to the wiring diagram (figure 5-110, Appendix); install the board assembly on bracket (14, figure 5-91, Appendix) using three screws (4) and three flat washers (5).

Step 8. Install holder clip (2) and selector cable clip (1) on cover (18) using two screws (19).

Step 9. Install cover (18) on bracket (14) using three screws (4).

at. SIGNAL LINE POWER SUPPLY ASSEMBLY.

Step 1. Connect wiring to signal line power supply connector (14, figure 5-92, Appendix) according to the wiring diagram (figure 5-111, Appendix); install the connector on bracket (13, figure 5-92, Appendix) using two screws (9) and two nuts (11).

Step 2. Install transformer (12) on bracket (13) using four screws (9) and four nuts (11); connect wiring according to the wiring diagram (figure 5-111, Appendix).

Step 3. Connect wiring to board assembly (10) according to the wiring diagram (figure 5-111, Appendix); install the board assembly on bracket (13, figure 5-92, Appendix) using three screws (9) and three washers (8).

Step 4. Install holder clip (2) and motor cable clip (1) on cover (16) using two screws (15).

Step 5. Install cover (16) on bracket (13) using two screws (9).

au. SERVICE CABLE ASSEMBLY.

Step 1. Install sleeve bushing (13, figure 5-93, Appendix) on electric cable (12) and cord (5).

Step 2. Attach electric cable (12) and cord (5) to junction box (4) using sleeve bushings (13).

Step 3. Install adapter (6) on cord (5).

Step 4. Install white binding post (8) on junction box (4) using flat washer (16).

Step 5. Install two black binding posts (10) and two red binding posts (9) on junction box (4).

Step 6. Install two push-type binding posts (7) on junction box (4).

Step 7. Connect wiring, capacitors (14) and splicers (15) according to the wiring diagram (figure 5-113, Appendix).

Step 8. Install cover (1) on junction box (4) using four screws (2) and four lock washers (3).

5-5. REFERENCE DATA.

a. SEATING TORQUE VALUES. - Refer to the following list for the recommended seating torque for stainless steel cap screws.

Screw Size	Torque (inch-pounds)
2-56	3.8
3-48	5.7
4-40	8.0
5-40	12.0
6-32	15.0
8-32	28.0
10-32	45.0
1/4-20	95.0

To prevent permanent damage to the screws, do not exceed the above values. When the screws are installed into lightly threaded holes, individual judgment is necessary to determine the exact amount of force to use so as not to strip the threads.

b. TENSION VALUES. - Refer to table 5-10 (Appendix) for the tension values of the springs in the equipment.

5-6. OVERALL SCHEMATIC AND WIRING DIAGRAMS.

Refer to Appendix figure 5-106 (sheets 1 and 2) for the overall schematic diagram and to Appendix figures 5-108 and 5-110 through 5-114 for the wiring diagrams for Teletypewriter Set AN/TGC-14(V). For Teletypewriter Set AN/TGC-14A(V), refer to Appendix figure 5-107 (sheets 1 and 2) for the overall schematic diagram and to Appendix figures 5-109 and 5-110 through 5-114 for the wiring diagrams.