

32 AND 33 TELETYPEWRITER SETS

DESCRIPTION

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1. GENERAL

1.01 This section is issued to provide a brief description of the 32 and 33 Teletypewriter Sets, together with principal components

and available accessories. The section describes typical applications and gives pertinent technical data. Also, the section is issued to present the information in a separate section.

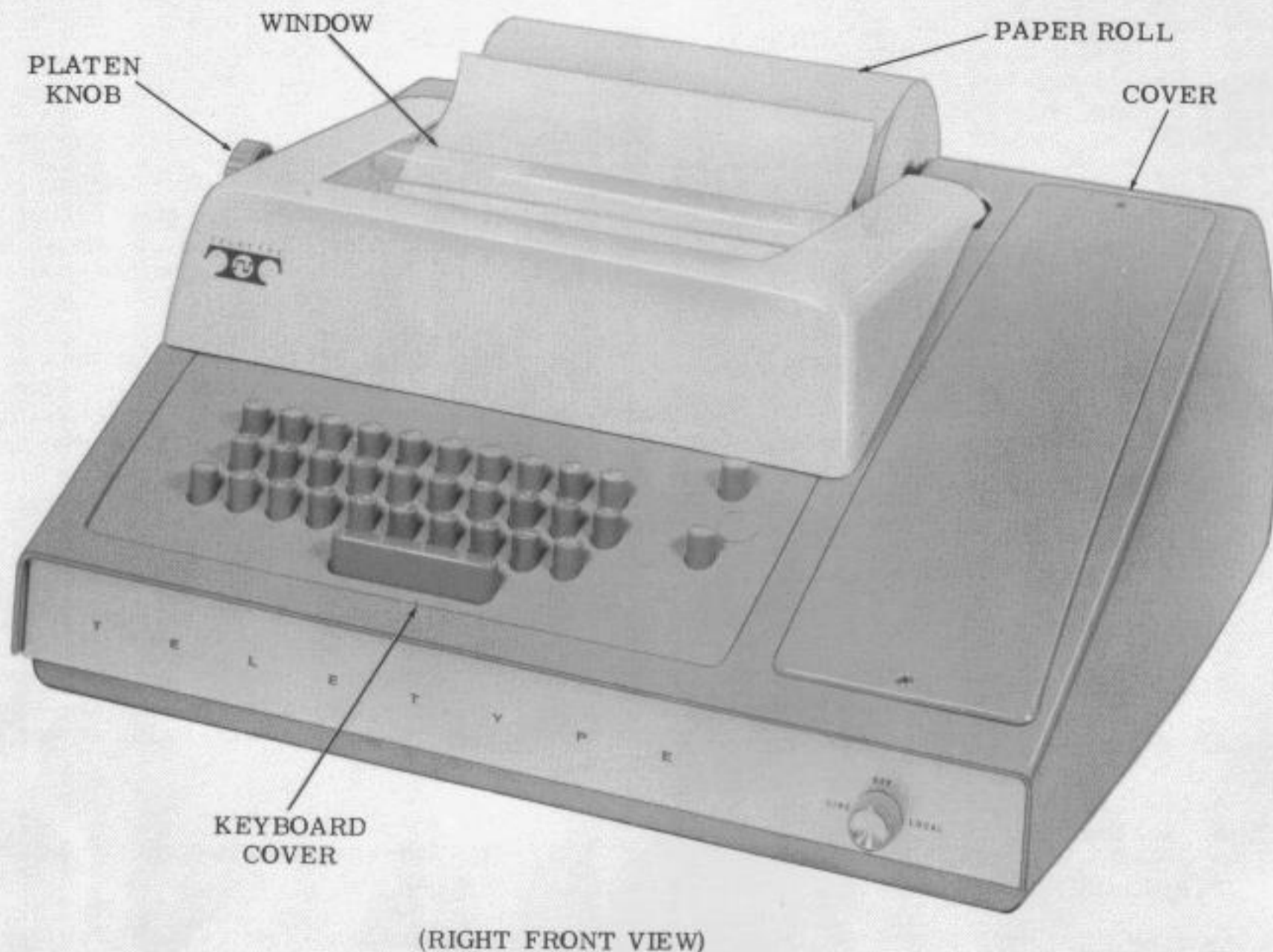
1.02 The 32 and 33 Teletypewriter Sets described herein are electromechanical apparatus that provide terminal facilities for exchanging recorded communication via appropriate transmission facilities, including telegraph lines, telephone networks, and radio channels.

1.03 References to the "left," "right," "up," "down," "front," or "rear," etc consider the Teletypewriter Set to be viewed from a position where the keyboard cover faces the viewer, with the platen knob to the viewer's left.

1.04 The following Teletypewriter Sets are covered:

- (a) Keyboard Send-Receive (KSR) Teletypewriter Set (Figure 1).
- (b) Receive-Only (RO) Teletypewriter Set (Figure 2).
- (c) Automatic Send-Receive (ASR) Teletypewriter Set (Figures 3 and 4).

1.05 Transmission and reception are effected by a start-stop signaling code which is carried by the transmission facilities. The basic difference between the 32 and 33 Teletypewriter Sets is that the former utilizes a 5-level code and the latter utilizes an 8-level code. (See the appropriate section for an explanation of codes.) The Teletypewriter Set will operate at speeds up to 100 words per minute (wpm).



(RIGHT FRONT VIEW)

Figure 1 — Keyboard Send-Receive (KSR) Teletypewriter Set

2. TELETYPEWRITER SETS

KEYBOARD SEND-RECEIVE (KSR) TELETYPEWRITER SETS (Figure 5)

2.01 The KSR provides facilities for originating messages for transmission by the manual operation of a keyboard, and for receiving and printing messages, whether originated locally or remotely, on page-width copy paper.

2.02 The basic KSR consists of the following major components (Figures 1 and 5) which are described in the indicated paragraphs:

| <u>COMPONENT</u> | <u>PARAGRAPHS</u> |
|-------------------|-------------------|
| Keyboard | 3.01 - 3.04 |
| Typing Unit | 3.05 - 3.06 |
| Motor | 3.07 - 3.08 |
| Call Control Unit | 3.09 - 3.11 |
| Cover | 3.12 |
| Subbase | 3.13 |

2.03 The keyboard, typing unit, and call control unit are mounted on the subbase (Figure 5). The motor is mounted on the typing unit base casting. The cover encloses the other components and is attached to the subbase.

On friction feed Teletypewriter Sets, paper feeds from a roll at the rear and is led around a platen, where it is printed. On sprocket feed Teletypewriter Sets, forms normally feed from the forms' original container at the rear, under a paper roll spindle, and around a platen, where they are printed. A window permits viewing the printed copy. Facilities are provided for connecting the KSR to an ac power source and the transmission facilities.

2.04 The 32 KSR has a 3-row keyboard (Figure 6) and uses a 5-level start-stop signaling code. The 33 KSR has a 4-row keyboard (Figure 7) and uses an 8-level start-stop signaling code.

RECEIVE-ONLY (RO) TELETYPEWRITER SETS (Figure 2)

2.05 The RO provides facilities for receiving messages and printing them on page-width copy paper.

2.06 The basic RO consists of the same components as the KSR, listed in 2.02 above. However, the keyboard is blank and has no facilities for transmission. Paragraph 2.03 above also applies to the RO.

2.07 The 32 RO uses a 5-level start-stop signaling code, and the 33 RO uses an 8-level start-stop signaling code.

AUTOMATIC SEND-RECEIVE (ASR) TELETYPEWRITER SETS (Figures 3 and 4)

2.08 The ASR provides facilities for originating messages for transmission by either the manual operation of a keyboard or the reading of perforated paper tape. They provide facilities for recording messages, whether originated locally or remotely, by perforating them in tape and/or printing them on page-width copy paper. The ASR may be used in the following ways:

- (a) To transmit messages from the keyboard while making a printed page copy with or without perforating tape.
- (b) To receive messages from line and print them on page copy with or without perforating tape.
- (c) To locally perforate messages in tape from keyboard for later transmission while making a printed page copy.

- (d) To transmit messages from tape while making a page copy with or without perforating tape.

2.09 The basic ASR includes the same components as the KSR listed in 2.02 above. Paragraphs 2.03 and 2.04 above also apply to the ASR. In addition, they have a tape reader (3.14 - 3.15) and a tape punch (3.16 - 3.18).

2.10 The tape punch and tape reader are mounted on the left side of the ASR. The tape feeds forward from a roll into the tape punch, where it is perforated. It can then be fed into the tape reader for transmission. Controls are provided for the tape punch and tape reader. A removable metallic chad container collects the paper (chad) punched out of the perforations in the tape.

ACCESSORIES

2.11 A number of optional accessories are available with the equipment, including the following:

- (a) A sheet metal stand (Figure 3), which will support the subbase and components at a convenient operating level. It consists of chrome feet, equipped with leveling screws, and an enclosure to house auxiliary apparatus, such as a data set and the tape reader power pack. A removable rear panel provides access to the enclosure. If desirable, the feet of the stand may be bolted to the floor.
- (b) A copy holder with line guide (Figure 3).
- (c) Call control facilities, including buttons, indicator lamps, motor control relay, speaker, ringer, buzzer, and rotary, TOUCH-TONE, and card dialers.
- (d) Low-paper alarm.
- (e) An answer-back mechanism (see Figure 9) which will automatically identify a station by transmitting predetermined character sequences.
- (f) Optional functions, including unshift on space and automatic carriage return-line feed.

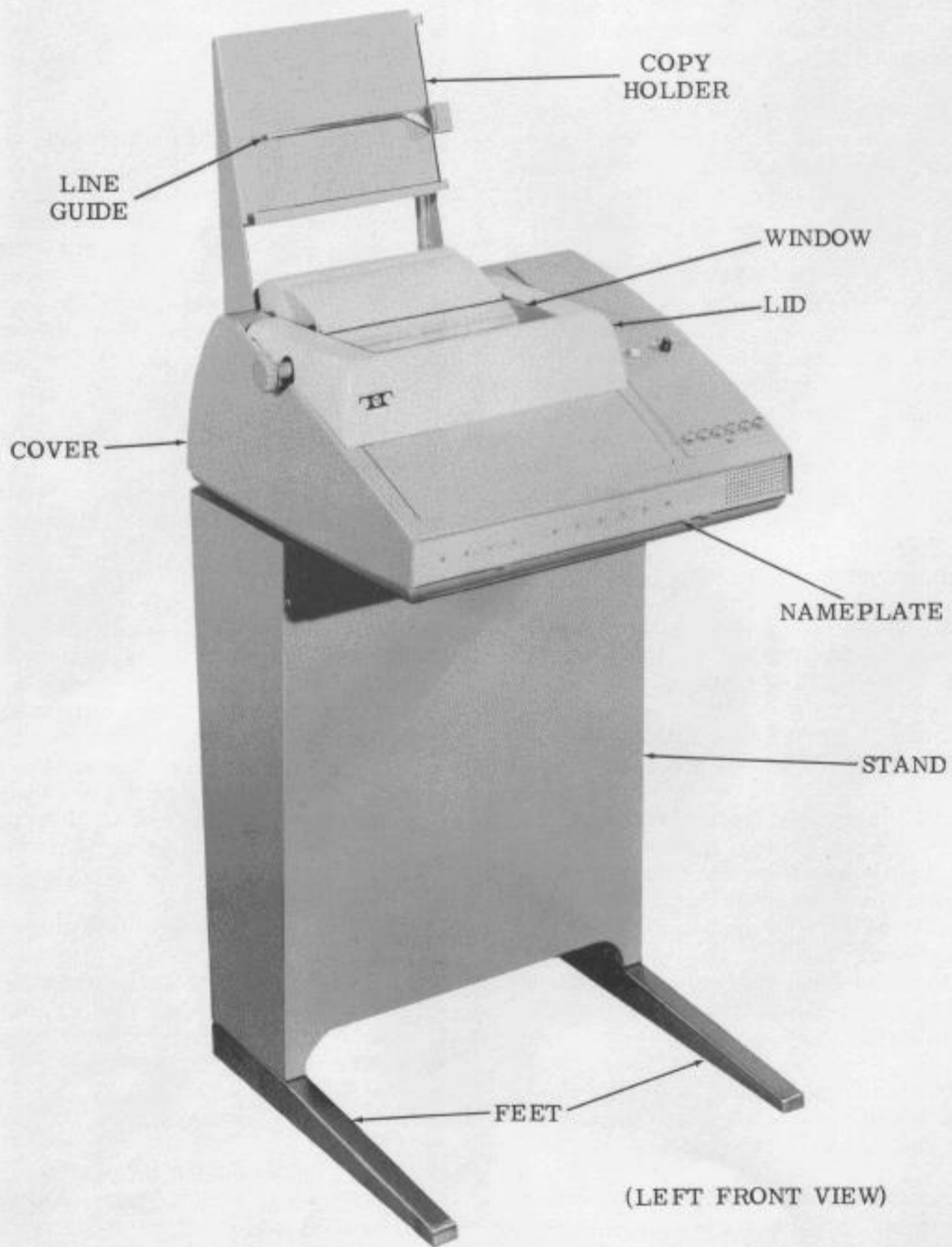


Figure 2 — Receive-Only (RO) Teletypewriter Set

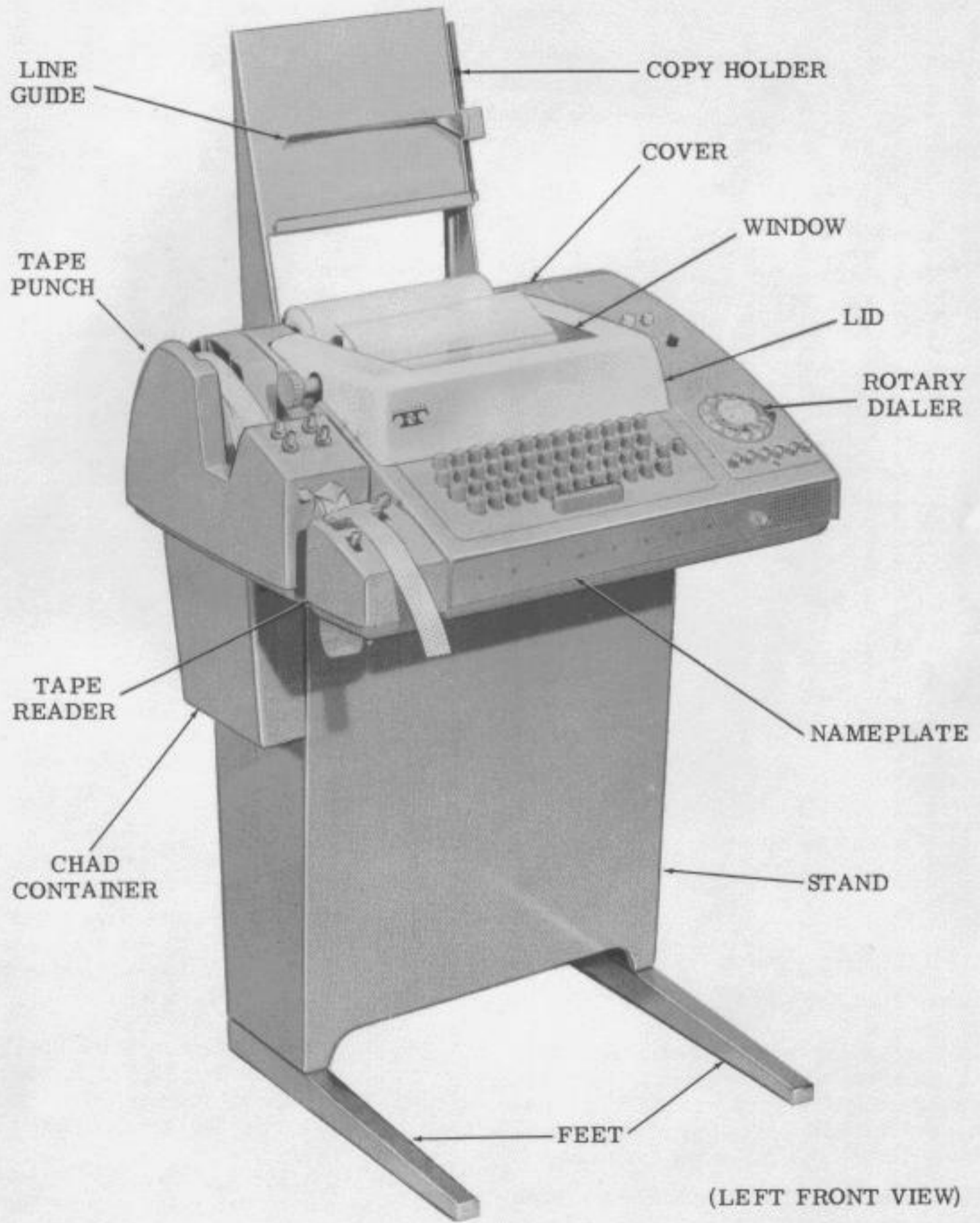


Figure 3 - Automatic Send-Receive (ASR) Teletypewriter Set

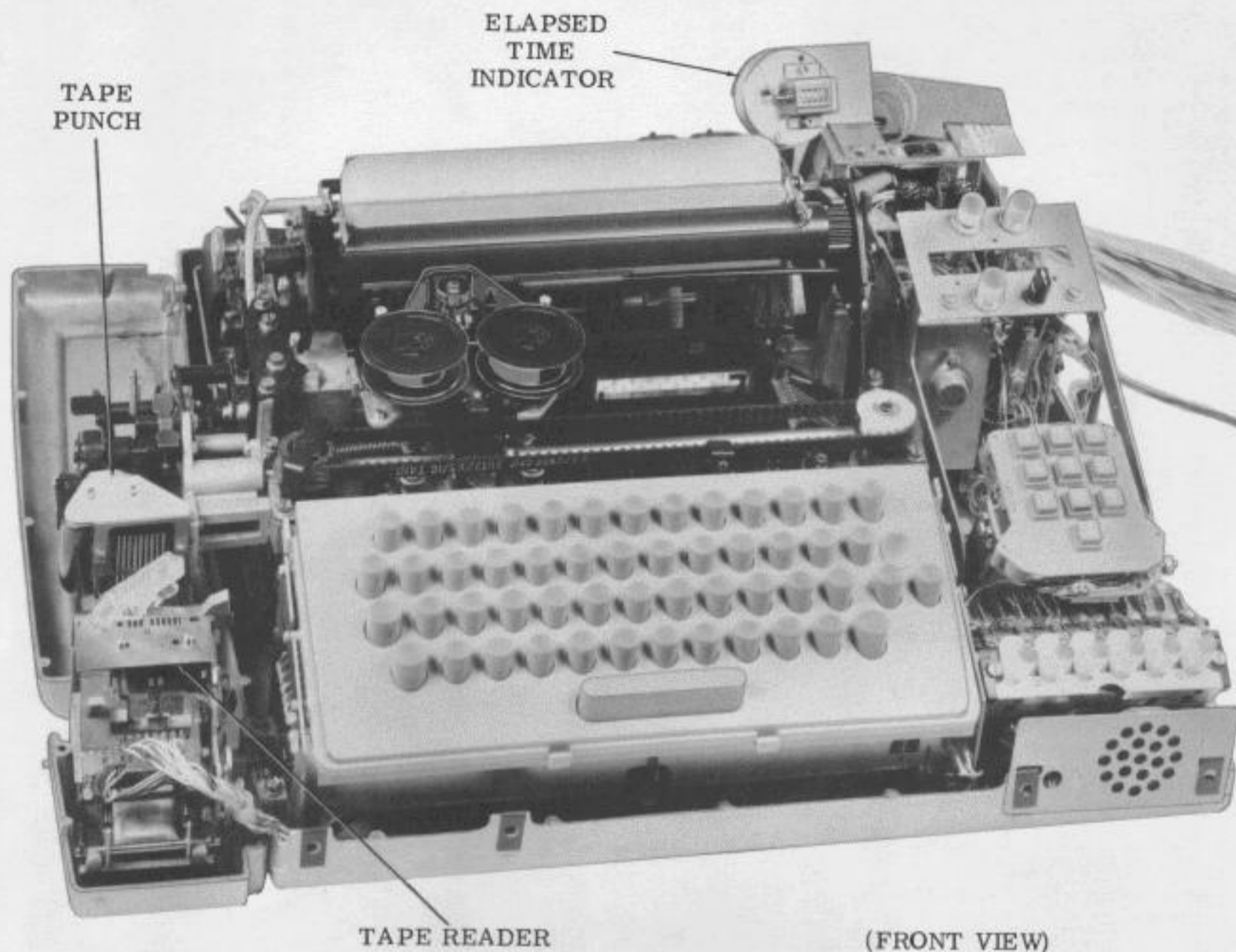


Figure 4 — Automatic Send-Receive (ASR) Teletypewriter Set (Without Cover)

3. COMPONENTS

KEYBOARD (Figures 6 and 7)

A. KSR and ASR Keyboard

3.01 In conjunction with a distributor mechanism on the typing unit, the keyboard provides facilities for transmitting messages by the manual operation of a group of keys. It includes the following components:

- (a) A spacebar and keys similar to those on a typewriter.
- (b) A codebar mechanism which converts the manual depression of the keys to mechanical positions corresponding to the proper code combinations.

- (c) A contact mechanism in which the codebar mechanism sets up the code combinations for conversion to start-stop signals by the distributor.

Note: A second contact mechanism is found on the left side of keyboards equipped to detect errors by the "even parity" method. (See Paragraph 3.03(a).)

- (d) A frame and two side brackets which support the mechanisms and a cover which serves as a guide for the keys.
- (e) A cable with connector which electrically interconnects the keyboard with the call control unit.

3.02 The 32 keyboard (Figure 6) has three rows of keys and generates a 5-level code that utilizes a letters-figures shift feature. To transmit the characters appearing on the lower part of keytops, the letters (LTRS) key must first be pressed. To transmit the characters on the upper part of the keytops, the figures (FIGS) key must first be pressed. Auxiliary keys such as line break (BREAK), repeat (REPT), and answer-back actuation (HERE IS) are located at the upper right of the three rows.

3.03 The 33 keyboard (Figure 7) is similar to the 32 in appearance, but more closely resembles a typewriter keyboard. It has four rows of keys and generates an 8-level code.

(a) Many 33 keyboards are equipped with an error detection feature called "even parity." Even parity provides for adding a

pulse whenever the number of marking pulses in a code combination is odd, and normally uses the eighth level for this purpose. The 33 keyboards which are not equipped with "even parity" will always have the eighth level marking.

(b) The characters on the lower part of the keytops, including the numerals in the upper row, can be transmitted without the use of a shift operation. A SHIFT key is used to transmit the printing characters (such as "&," "%," and "#") appearing on the upper part of the keytops.

Note: When the SHIFT key is held down, all the keys which do not print characters which appear on the upper part of the keytops are mechanically locked and cannot be operated. This prevents transmission of false characters for those keys blocked.

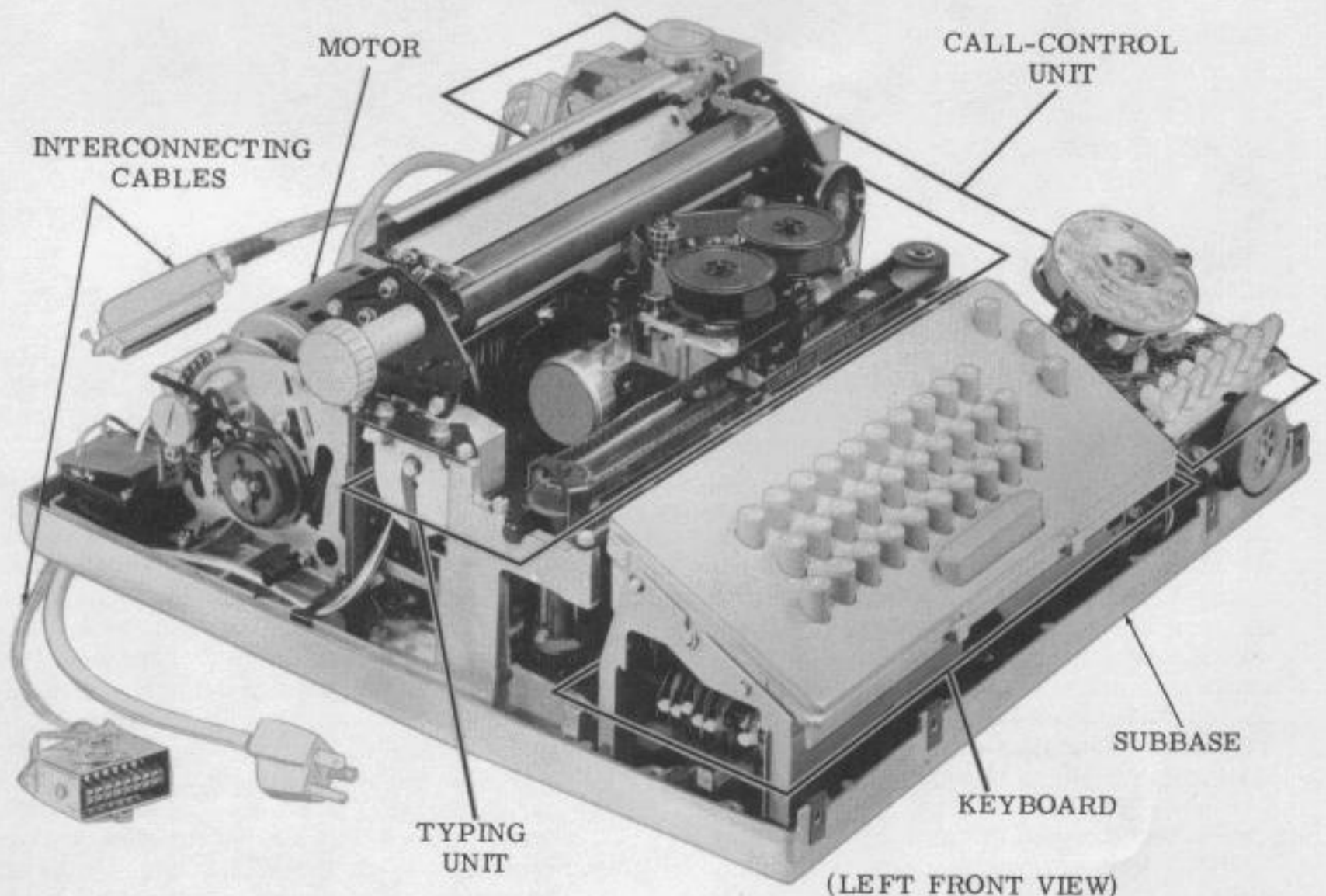


Figure 5 — Keyboard Send-Receive (KSR) Teletypewriter Set (Without Cover)

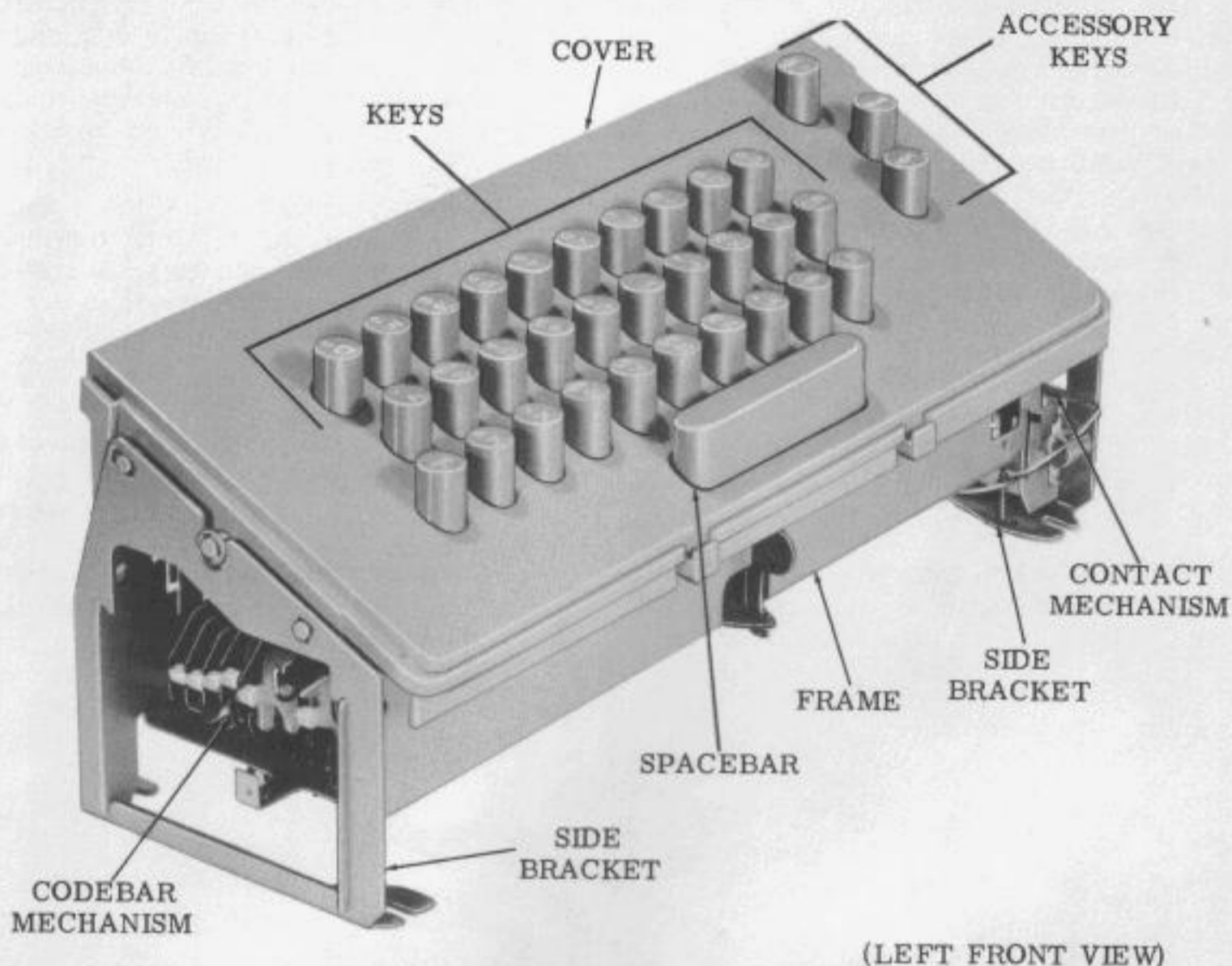


Figure 6 — 32 Keyboard

(c) A control (CTRL) key is used to transmit the control functions (such as WRU, BELL, and TAB) which appear on the upper keytops.

Note: When the CTRL key is held down on those keyboards equipped with "even parity," the sixth pulse codebar is shifted to its spacing position, and all keys with characters that normally have the no. 6 code element marking are mechanically locked and cannot be operated. This prevents the transmission of false characters for those keys blocked.

(d) Simultaneous use of both the CTRL and SHIFT keys allows access to special functions (such as "S₅"). In every case, the SHIFT and/or CTRL keys must be held down while the appropriate character key is depressed.

(e) Because of the frequency of use, separate keys for certain functions, such as RE-TURN (carriage return) and LINE FEED are provided, and the CTRL key is not necessary to generate their code combinations. In the case of RE-TURN and LINE FEED, the CTRL key can be used in conjunction with either the RE-TURN or LINE FEED keys, but, for keyboards equipped with "even parity," parity is lost if the CTRL key is used.

Note: In addition to the separate key provided, the "line feed" code combination can be generated by the simultaneous use of the CTRL and J keys. Likewise, the "carriage return" code combination can be generated by the simultaneous use of the CTRL and M keys.

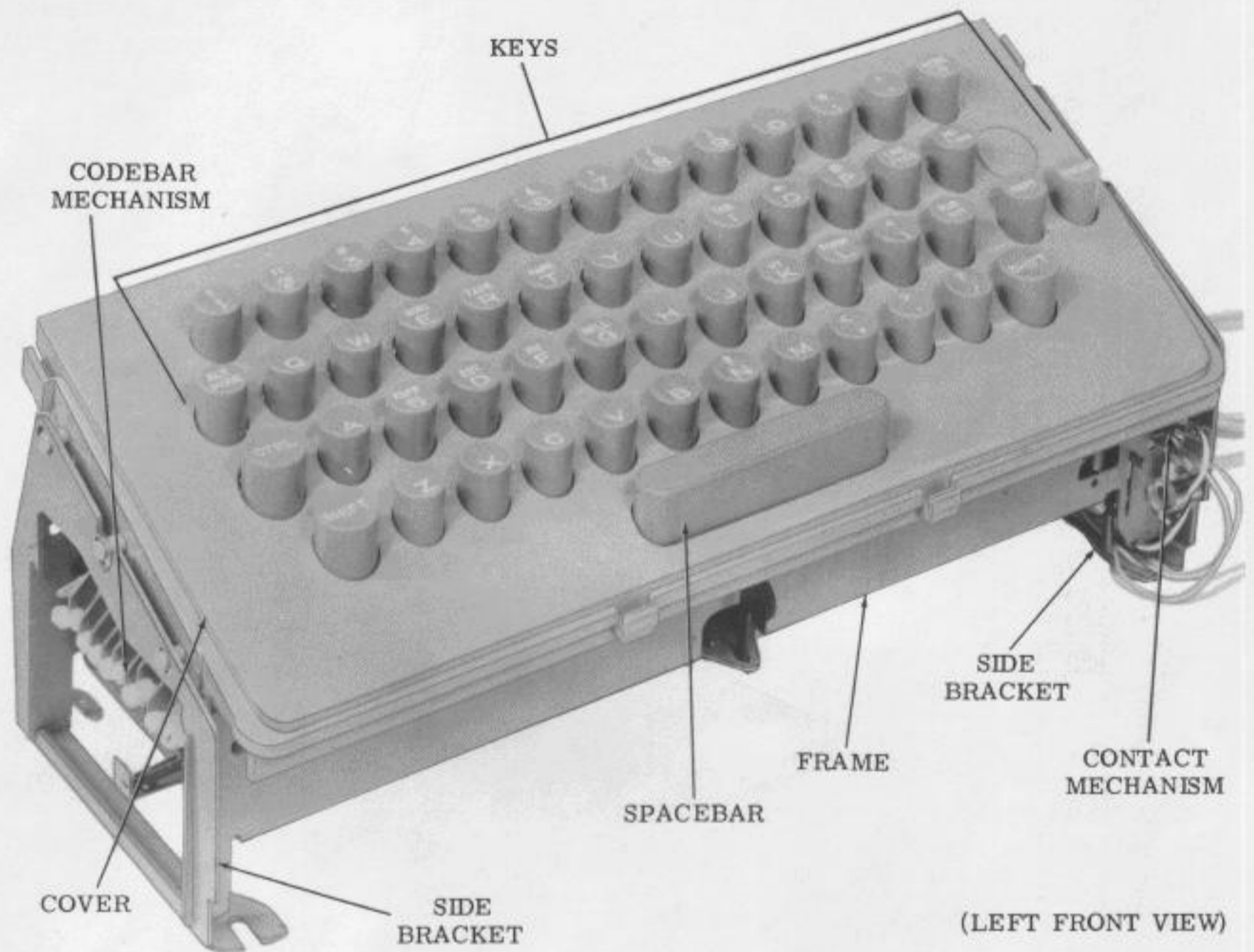


Figure 7 - 33 Keyboard

B. RO Keyboard (Figure 2)

3.04 The RO keyboard has the frame and side brackets mentioned in 3.01(d) above. However, its cover is blank and has no facilities for transmission described in 3.02 and 3.03.

TYPING UNIT (Figures 8 and 9)

3.05 The typing unit receives start-stop signals from the call control unit and uses them to control mechanical motions which print the messages, perform functions, and, in the case of the ASR, perforate tape.

3.06 The principal components of the typing unit include the following:

(a) A main shaft which receives motion from the drive parts and distributes it to the various mechanisms through three (four) internal expansion clutches.

Note: Friction feed typing units have three clutches. Sprocket feed typing units have four clutches.

(b) A selector mechanism which translates the start-stop signals to corresponding mechanical arrangements that control a codebar mechanism. A range finder permits the selector to be adjusted so as to sample the signals at the most favorable time.

(c) A codebar mechanism which controls printing, functions, and, in the case of the ASR, tape perforation.

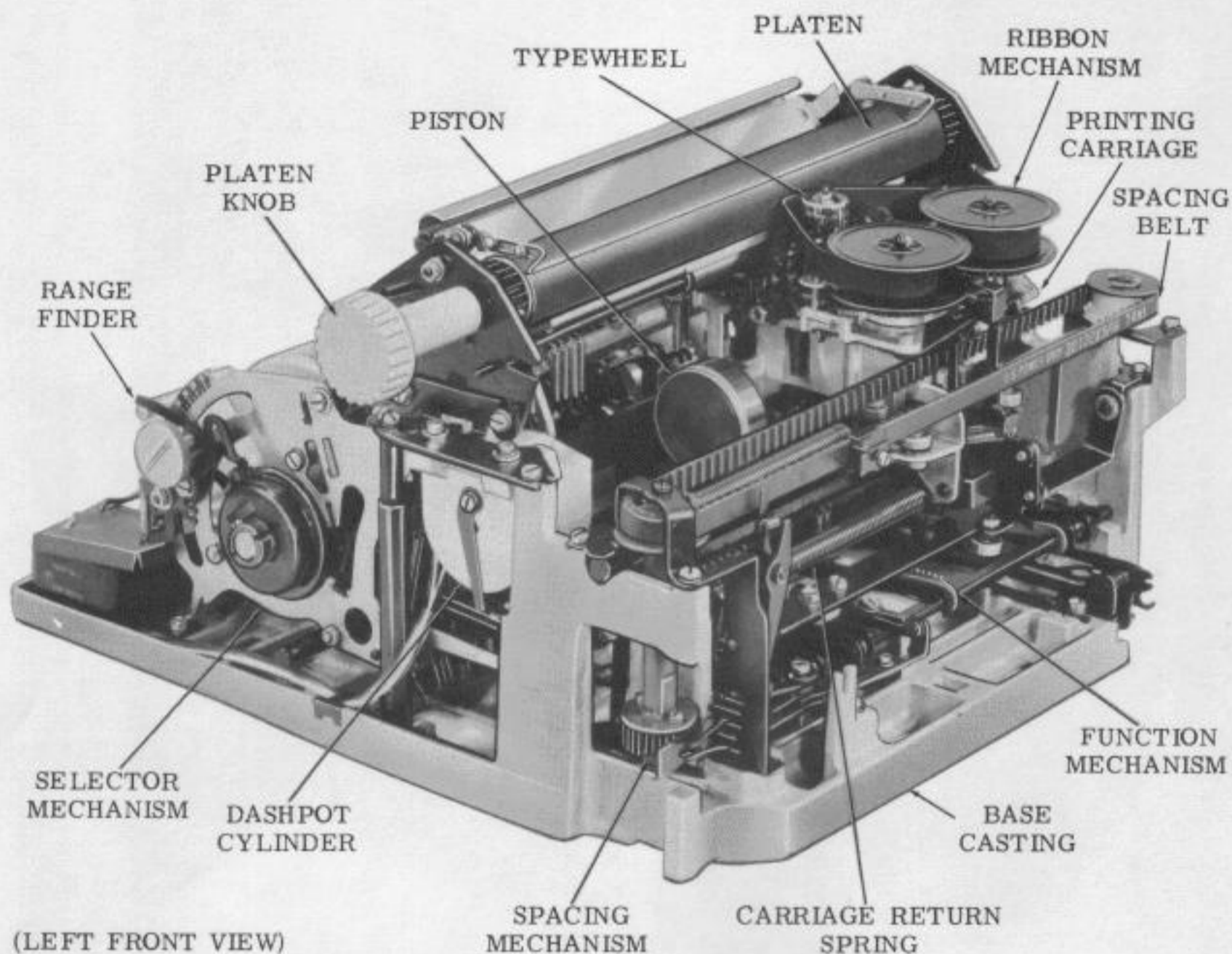


Figure 8 — Typing Unit (Friction Feed)

(d) A printing carriage which prints the messages on the paper. The characters are embossed on the cylindrical surface of a typewheel. The typewheel is positioned rotationally and vertically to select the proper characters, and a hammer drives it and an inked ribbon against the paper to effect printing. A ribbon mechanism feeds the ribbon and reverses its direction when one of its spools is depleted.

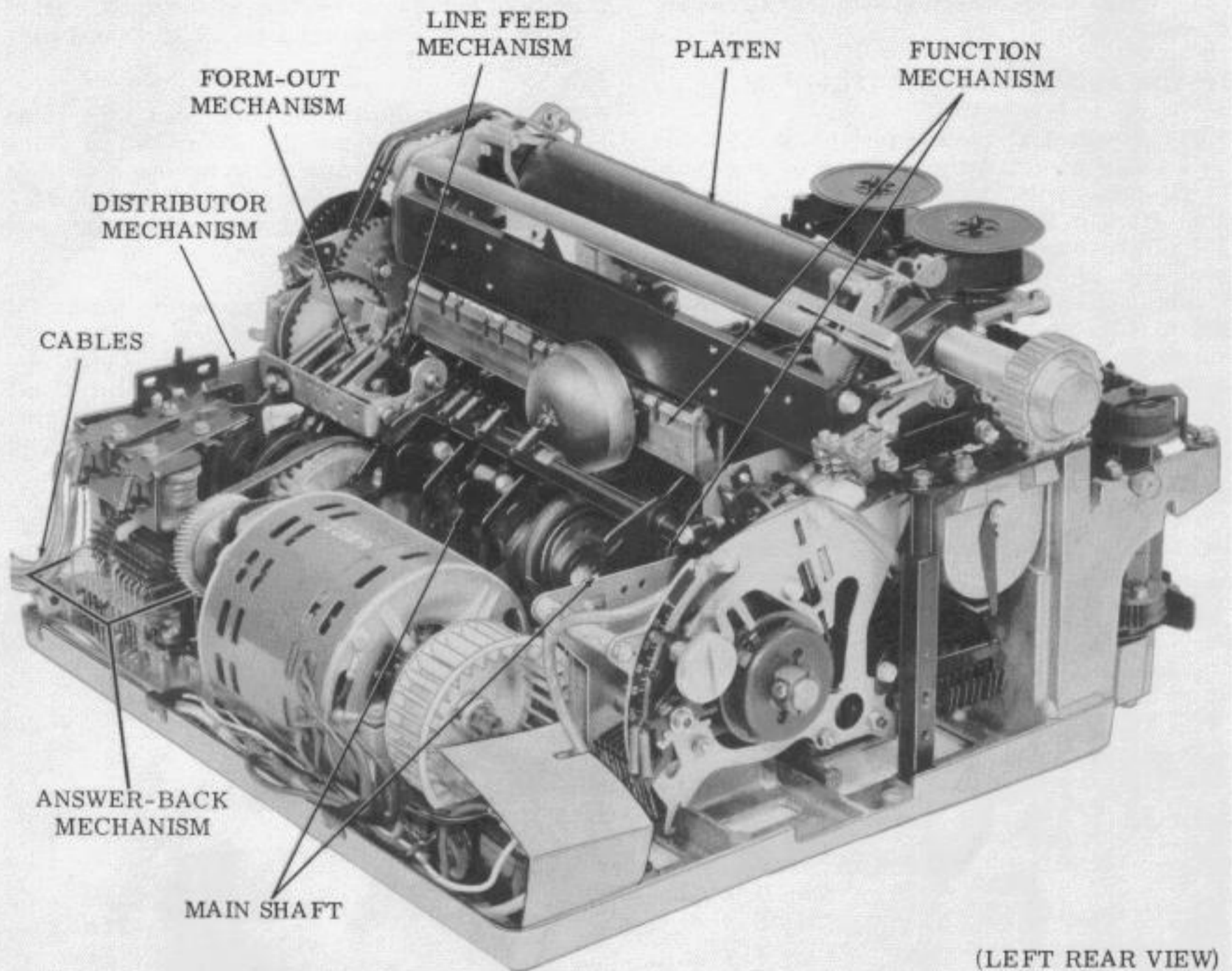
(e) A function mechanism which enables the typing unit to perform functions supplementary to printing. The standard functions are "space," "carriage return," "line feed,"

"blank," "bell," and (for the 32 typing unit) "letters" (lower case) and "figures" (upper case).

Note: In addition, sprocket feed typing units have the function "form-out."

(f) A paper feed mechanism which positions paper or forms vertically so that the characters are properly located in lines. A platen feeds the paper or forms. A knob permits manual feeding. The mechanism can be adjusted for single or double line feed.

(g) A spacing mechanism which positions the carriage so that the characters are properly located horizontally on the paper.



(LEFT REAR VIEW)

Figure 9 — Typing Unit (Sprocket Feed)

It moves the carriage, which rides on rollers, by a spacing belt. It returns the carriage to the left margin by a carriage return spring. The carriage is pneumatically stopped without shock by a piston and dash-pot cylinder arrangement.

(h) A disc and brush type distributor mechanism which converts the positions of the keyboard contacts (3.01 (c)) to start-stop signals for application to transmission facilities.

Note: An answer-back mechanism, which is an optional accessory, often is used in conjunction with the distributor. It will automatically transmit a sequence of characters for station identification. It may be coded to transmit any sequence of up to 20 characters and may be actuated locally or remotely.

(i) A base casting which provides mounting facilities for the mechanisms.

- (j) Two cables with connectors which provide interconnection with the call control unit.

MOTOR AND DRIVE PARTS (Figure 10)

3.07 Mechanical motion for the 32 KSR and RO is ordinarily provided by a 2-pole, single-phase synchronous motor which operates from a 115 volt ac source and develops 25 millihorsepower at 3600 rpm. It consists basically of a housing, end bells, a wound stator, and a squirrel-cage rotor with shaft which rides on ball bearings. Cooling is provided by three fans — two within the end bells and one at the left end of the shaft. The motor is mounted by rubber vibration mounts which are clamped in a cradle formed by the typing unit's base casting. A start capacitor, a current-operated start relay, and a run capacitor are mounted on the base casting to the left of the motor. A pinion on the

right end of the shaft transfers the rotary motion generated by the motor to a set of drive parts which consist of a gear-pulley and motor belt.

3.08 The motor ordinarily used to provide motion for the 32 ASR and all 33 Teletypewriter Sets is similar to the one described above, except that it develops 33 millihorsepower, is equipped with sleeve bearings, and is not a capacitor-run motor.

CALL CONTROL UNIT (Figures 11 through 13)

3.09 The call control units couple the equipment to the transmission facilities and serve as an area of convergence for its circuitry. Two typical assemblies are shown in Figures 12 and 13.

3.10 A sheet metal plate secured to the sub-base provides mounting facilities.

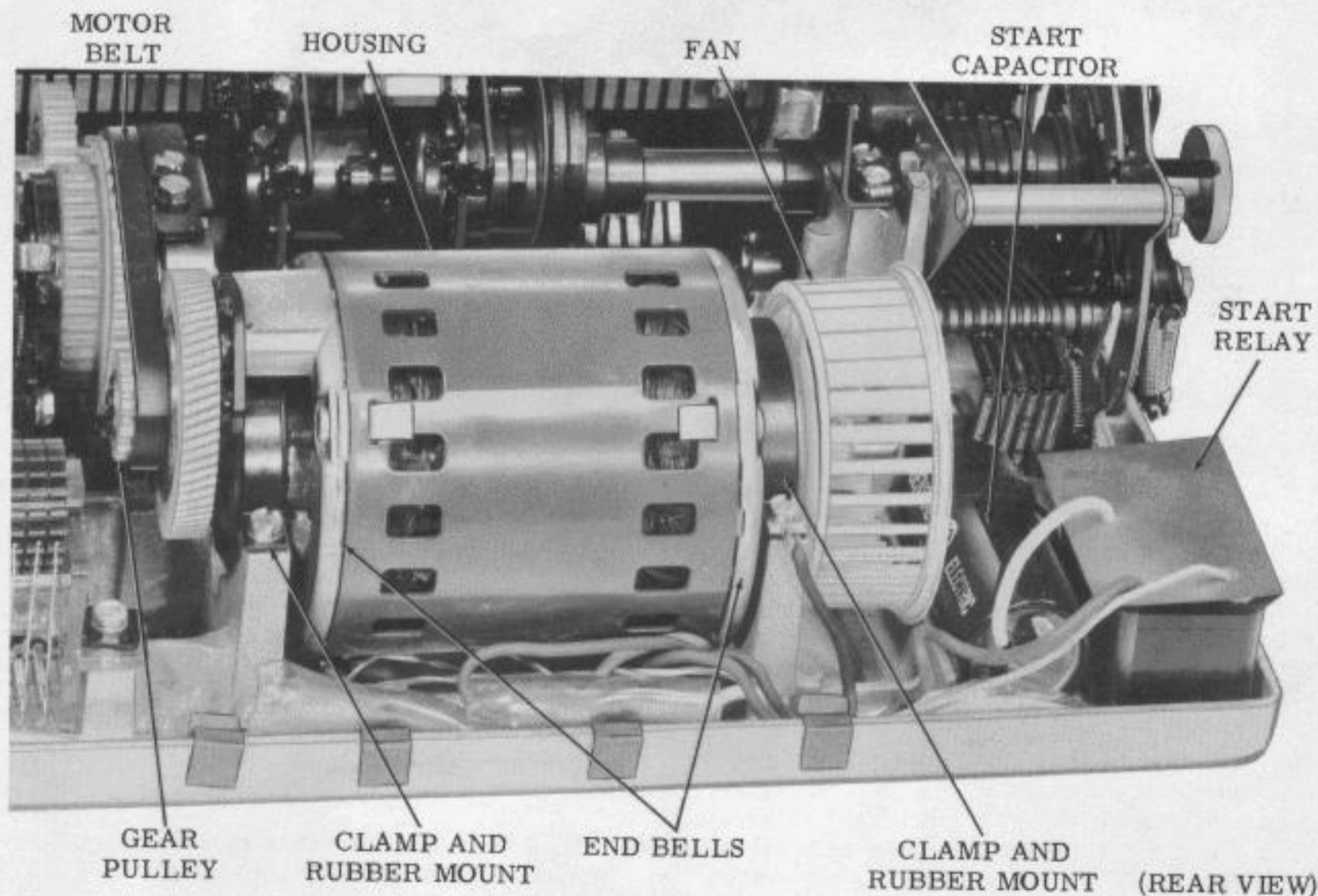


Figure 10 - Motor and Drive Parts

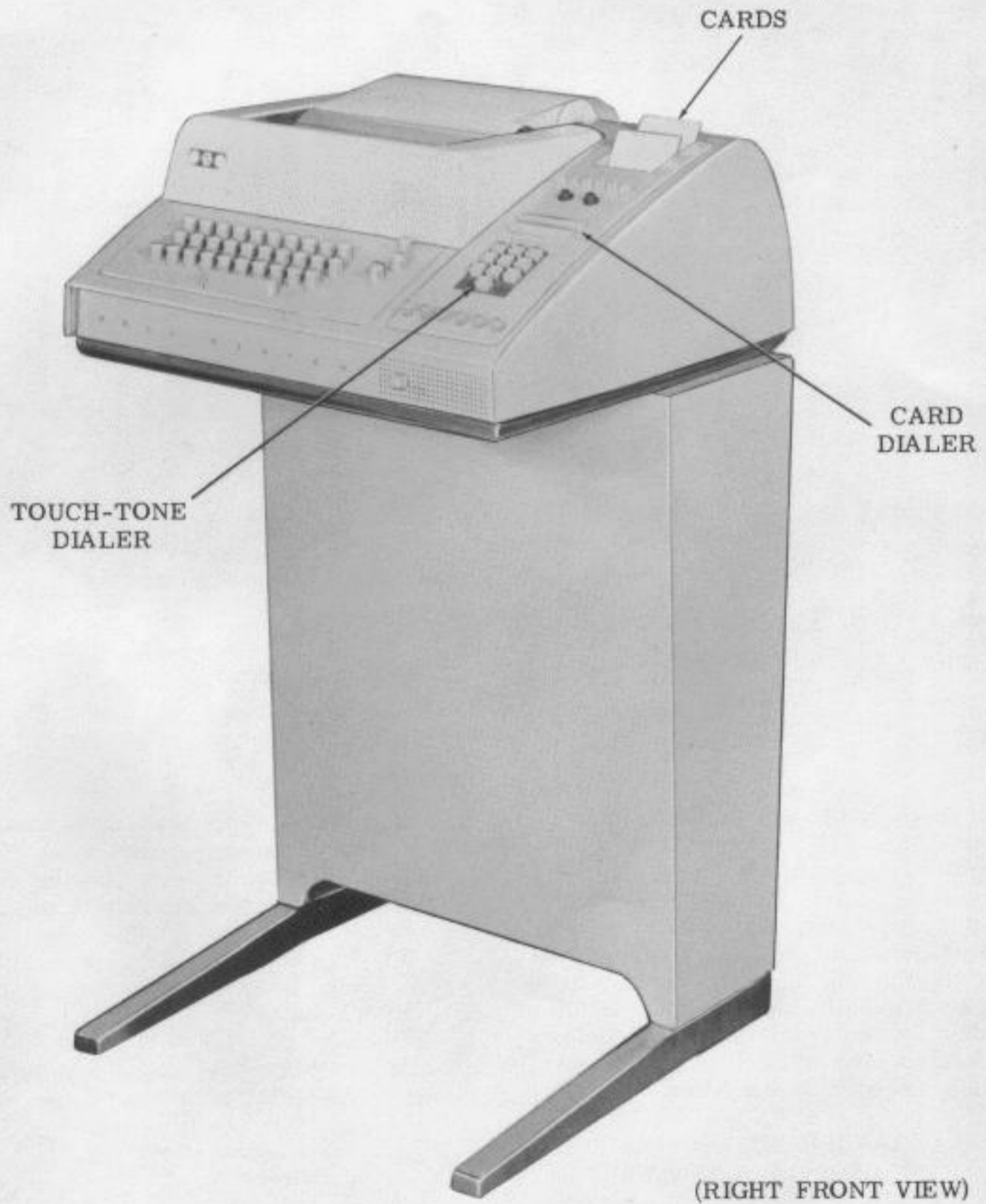


Figure 11— Keyboard Send-Receive (KSR) Teletypewriter Set with Card and Touch-Tone Dialers

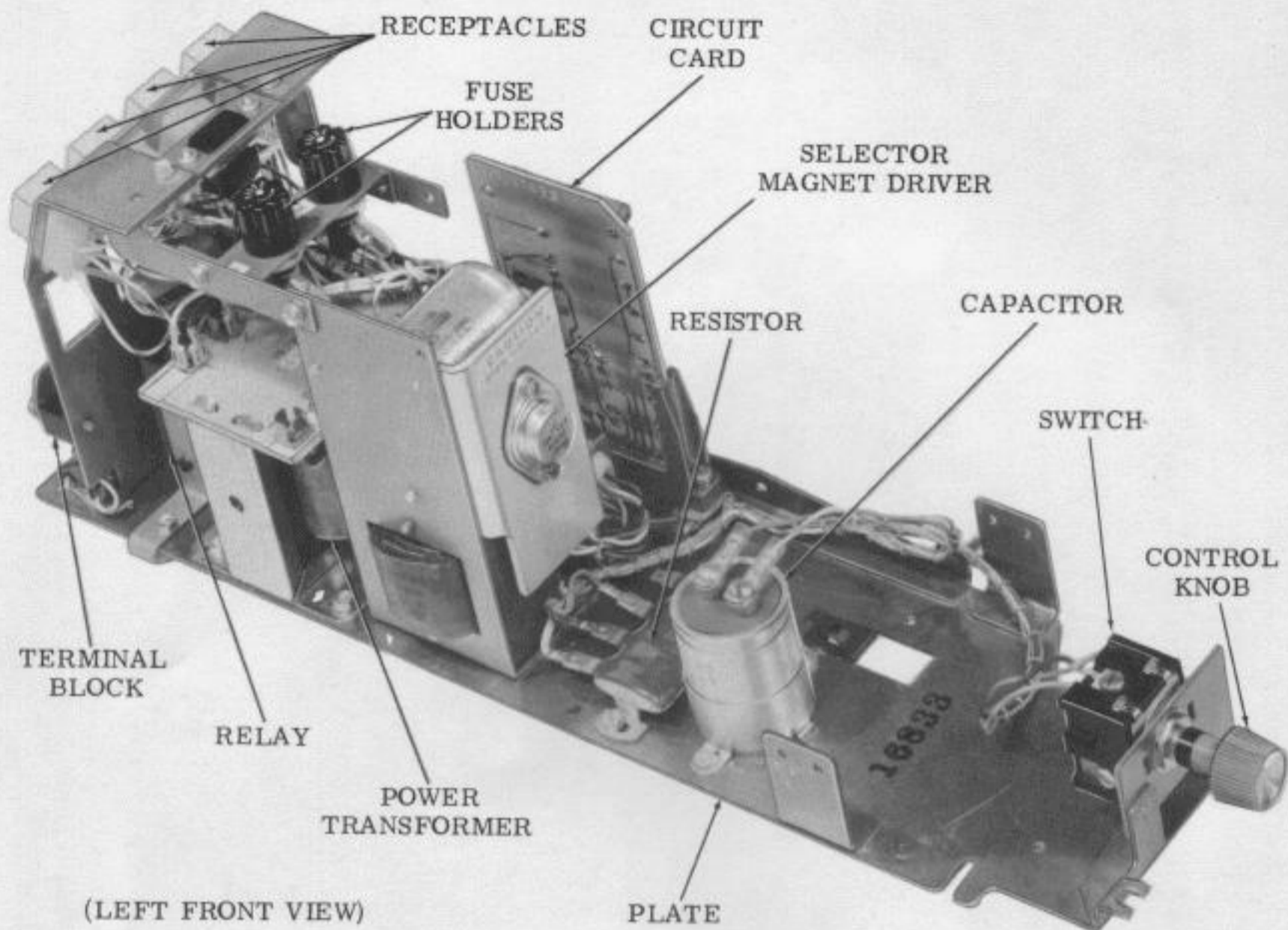


Figure 12 — Typical Call Control Unit

3.11 Call control units are available in variations that incorporate certain combinations of the following features:

(a) A selector magnet driver which couples the equipment to the transmission facilities and repeats the line signals in a form that will efficiently operate the selector mechanism on the typing unit. It includes a transistorized circuit card, a transformer, a rectifier, and a capacitor filter.

(b) Rotary, TOUCH-TONE and/or card dialers for making connections with other stations through dial switching facilities (Figures 3 and 11).

(c) A ringer or buzzer which provides an audible indication of incoming calls.

(d) A small speaker with volume control for monitoring dial tone, ringing, and busy signals on telephone networks. It is driven by a transistorized amplifier card.

(e) Pushbuttons and lamps to aid in initiating, accepting, controlling, and terminating calls.

(f) A motor control relay which will automatically turn the motor on and off.

(g) Fuses which protect the circuitry of the equipment.

(h) Automatic answering circuitry.

(i) Interconnecting facilities, including receptacles, cables, and a terminal board.

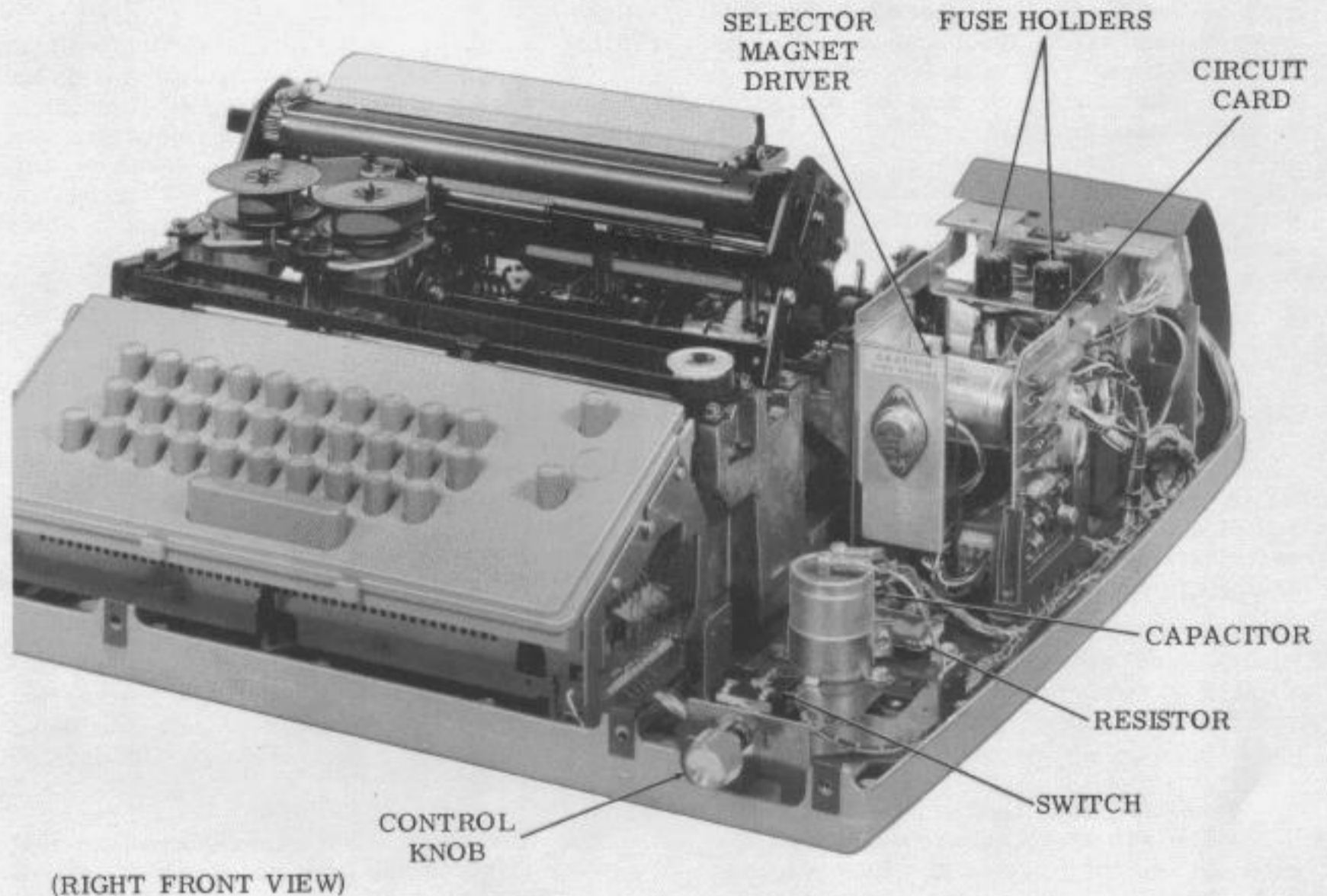


Figure 13 — Keyboard Send-Receive (KSR) Teletypewriter Set
with Call Control Unit

COVER AND SUBBASE (Figures 2 and 5)

3.12 A plastic cover provides a decorative and protective enclosure of the typing unit, keyboard, and call control unit. A lid, which is spring detented in its open position, may be raised to gain access to the typing unit for changing ribbon or installing paper or forms. A window permits viewing the copy and provides a cutting edge for tearing the paper or forms. Depressions at the rear of the cover hold the paper roll spindle. Mounting slots are provided for a copy holder. A nameplate is mounted at the front.

3.13 The cover is mounted at its outer edges on a subbase casting which serves as a foundation for the keyboard, typing unit, and call control unit. Rubber vibration isolators support the typing unit.

TAPE READER (Figures 3 and 4)

3.14 The tape reader, in conjunction with the distributor mechanism on the typing unit, provides facilities for transmitting messages from perforated tape.

3.15 The complete tape reader package includes the following components:

- (a) A tape-sensing mechanism which converts code holes in the tape to corresponding positions in a set of contact springs. The holes are sensed by pins which operate the contact springs. The positions of the contact springs are converted to start-stop signals by the distributor mechanism.
- (b) A feed mechanism which advances the tape after a combination of code holes has been read. A feed pawl and ratchet

arrangement rotates a feed wheel whose pins engage feed holes in the tape. The tape feeds from rear to front and is held down on the sensing pins and feed wheel by a hinged tape lid which may be opened to facilitate tape threading.

- (c) A feed magnet and armature arrangement which supplies motion for the sensing and feed mechanisms. It is pulsed by a contact on the distributor mechanism.
- (d) A magnet-controlled clutch-trip mechanism which actuates the distributor mechanism. It is mounted above the distributor on the typing unit.
- (e) A power pack, mounted in the enclosure of the stand, which provides current rectification for the feed magnet. It is protected by a metal housing.
- (f) A cable which interconnects the tape reader with the power pack, the magnet pulsing contact, and the call control unit.
- (g) Tape-out and tight-tape mechanisms which will stop the tape reader when it runs out of tape or when the tape becomes taut.
- (h) A free-wheeling mechanism which disengages the feed wheel and tape-out mechanisms and permits the tape to be moved freely through the tape reader.
- (i) A frame which is mounted on the typing unit's subbase and provides mounting facilities for the other mechanisms, excluding the power pack and clutch-trip mechanism.
- (j) A base casting and plastic cover which provide a protective and decorative enclosure for the tape reader.
- (k) The auxiliary ASR power supply is mounted in the enclosure of the stand (2.11 (a)). It is used in the off-line mode, to provide 115 volts on the tape reader, keyboard, answer-back, and distributor contacts only when a tape reader is used. When the tape reader is not used, a dummy plug with a jumper wire is inserted in position "R2" at the rear of the call control unit.

TAPE PUNCH (Figures 3 and 4)

- 3.16 The tape punch, in conjunction with the selector and codebar mechanisms on the typing unit, provides facilities for perforating messages in paper tape. The messages are received as start-stop signals from the call control unit and are converted to mechanical motions that punch corresponding code holes in the tape.
- 3.17 The punch includes the following components:
 - (a) A drive mechanism which receives motion from the function rocker shaft on the typing unit and distributes it to other mechanisms.
 - (b) An intelligence-transfer mechanism which receives intelligence from the codebar mechanism on the typing unit.
 - (c) A tape-punching mechanism which, under the control of the intelligence-transfer mechanism, perforates feed and code holes in the tape by means of punch pins located in a holder.
 - (d) A tape feed and guide mechanism that advances the tape by means of rollers and a feed pawl and ratchet arrangement.
 - (e) A base casting which is attached to the typing unit base and provides mounting facilities for the various mechanisms.
 - (f) A supply reel which accommodates a roll of blank tape.
 - (g) A pan casting and 2-piece plastic cover which provides a protective and decorative enclosure for the tape punch.
 - (h) A metallic chad container which collects the paper (chad) punched out by punch pins.
- 3.18 The following four pushbuttons are provided:
 - (a) ON - Turns the tape punch on.
 - (b) OFF - Turns the tape punch off.
 - (c) REL (Release) - Releases the tape feed and guide mechanism so that tape can be easily removed from the tape punch.

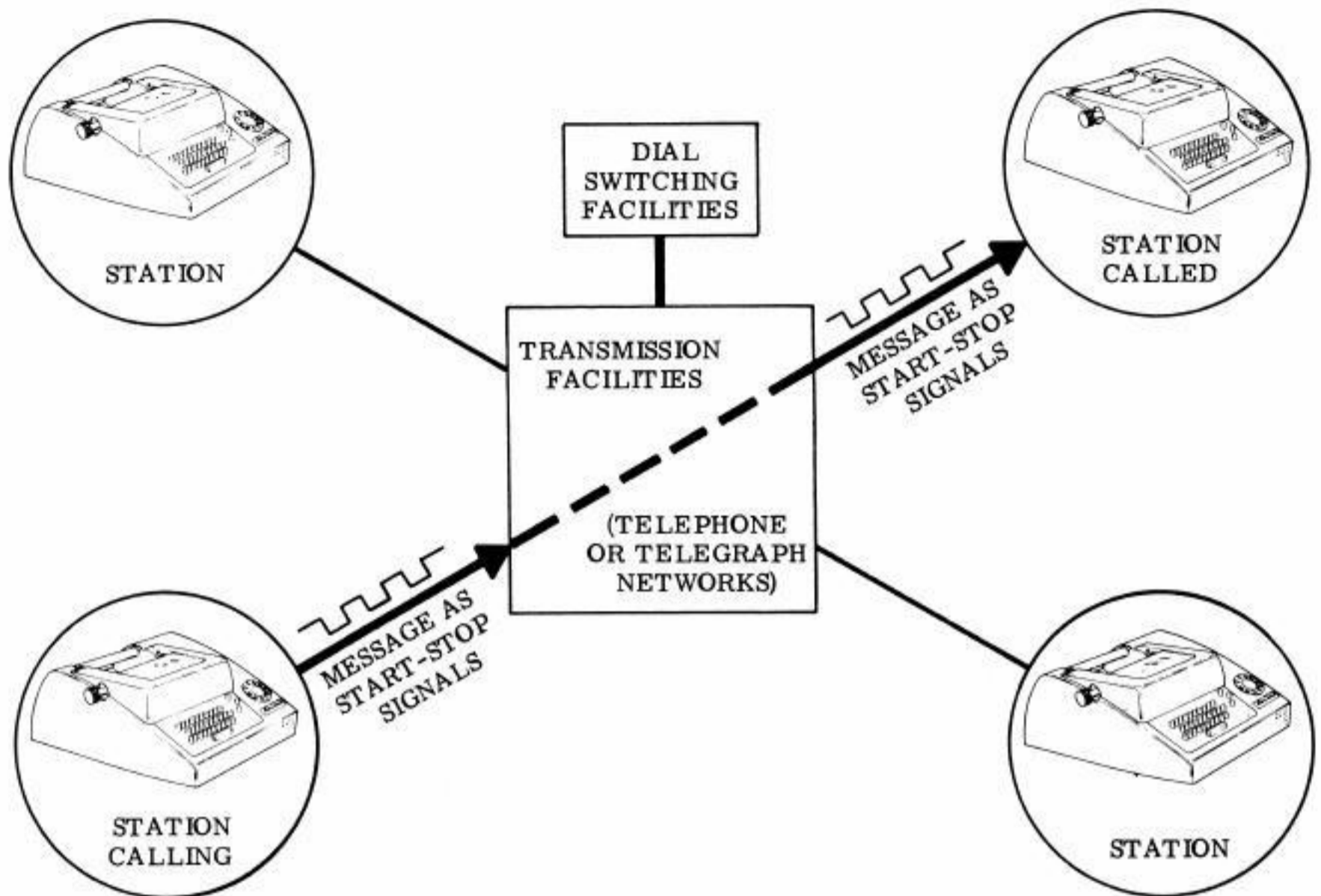


Figure 14 - Typical Applications

- (d) B. SP. (Backspace) - Backspaces tape one combination of code holes.

4. TYPICAL APPLICATIONS (Figure 14)

4.01 The following is a brief description of how 32 or 33 Teletypewriter Sets, equipped with call control and answer-back features, may be used in a typical communication system. (See Figure 14.) When a call is to be made, an operator uses the controls on his Teletypewriter Set to gain access to the system's switching and transmission facilities, which may be dial telephone or telegraph networks. He then dials the number of the called station.

4.02 The switching center selects the proper station and signals an incoming call there by visual and/or audible indicators. Using the controls on his Teletypewriter Set, the operator at the called station completes the connection and

conditions the equipment so that communication can proceed in either direction, a fact that is indicated visually and/or audibly at the calling station.

Note: Variations of call control features provide unattended reception of calls.

4.03 Ordinarily the stations then identify themselves by the answer-back feature. The operator at the calling station can then type the message on his keyboard, or, if he has the ASR, can send it from perforated tape. In either case the Teletypewriter Set translates the message to dc sequential start-stop signals which it applies to the transmission facilities. The Teletypewriter Sets at both the sending and receiving stations receive the signals and translate them to mechanical motions which print the message on page copy or forms and/or, in the case of the ASR, perforate it in tape. If

telephone networks are used, the dc start-stop signals are converted to tone frequencies for transmission and reconverted to dc start-stop signals for reception.

4.04 Finally, the operator at either station can terminate the call and return the Teletypewriter Sets to their idle condition by his controls.

5. TECHNICAL DATA

5.01 Speeds 60 wpm (364 opm),
66 wpm (400 opm),
100 wpm (600 opm)

Note: WPM = Words per minute, OPM = operations per minute.

5.02 Transmission Codes

32 Sets . . . 5-level start-stop signals with
7.5-unit transmission pattern

33 Sets . . . 8-level start-stop signals with
11-unit transmission pattern

5.03 Dimensions and Weight (Approximate)

(a) KSR

Width 18-5/8 inches
Depth 18-1/2 inches
Height 8-3/8 inches
Weight 40 pounds

(b) RO

Width, depth and height same as KSR
in 5.03(a) above

Weight 39 pounds

(c) ASR

Width 22 inches
Depth 18-1/2 inches
Height 8-3/8 inches
Weight 44 pounds

(d) Stand

Width 17-3/4 inches
Height 24-1/2 inches
Depth at Top of
Enclosure 8 inches
Depth of Bottom of
Enclosure 6-1/2 inches
Length of Feet 17-3/4 inches
Weight 12 pounds

5.04 Electrical

Power Requirements . . 115-volts ac $\pm 10\%$
60 cps ± 0.45 cycle, single phase
Signal Line Current 0.020 or 0.060
ampere

Nominal Input to
Selector. . . 0.500 ampere at 20-volts dc

Operating Margins-All signal contacts and
Distributor:

Long Telegraph Loops . . 0.015 to 0.070
ampere at 48-to 240-volts dc
inductive

Short Telegraph Loops . . 0.058 to 0.072
ampere at 16-to 22-volts dc resistive

5.05 Printing and Paper or Form Handling

Feed

Friction or Sprocket: six lines per inch,
adjustable for single or double line
feed.

Paper or Form

Friction Feed: 8-1/2 inches wide, max
5-inch diameter roll.

Sprocket Feed: 8-1/2 inches wide; 7-,
8-1/2-, 9-, 10-, 11-, and 12- inch
form lengths or multiples of 1/3 or
1/2 thereof.

Characters and Line

Friction Feed: 10 characters per inch,
max 74 character line

Sprocket Feed: 10 characters per inch,
max 72 character line

Legible Copies:

Friction Feed: original and one copy

Sprocket Feed: original and two copies

5.06 Motor (TP181870-ordinarily used on 32 ASR and all 33 Sets)

Type Synchronous, capacitor start
Input 115-volts ac $\pm 10\%$, 60 cps
 ± 0.45 cycle, single phase

Input Current 2 amperes

Output 33 millihorsepower

Speed 3600 rpm

Temperature Rating 50°C continuous

Power Factor 0.40

5.07 Motor (TP181861-ordinarily used on 32 R/O and KSR)

Same as 5.06 above except as follows:

- Type . . . Synchronous, capacitor start and run
- Input Current 0.85 ampere
- Output25 millihorsepower
- Power Factor0.70

5.08 Tape Reader

(a) Dimensions and Weight (Approximate)

Feeding and Sensing Portion

- Width 3-1/2 inches
- Depth4 inches
- Height 3-1/2 inches
- Weight2 pounds

Power Pack

- Width 6-1/4 inches
- Depth 2-1/2 inches
- Height 2-3/4 inches
- Weight1 pound

(b) Power Pack

High Voltage:

Input 115-volts ac (see "Power Requirements" in par. 5.04)

1560
600

600 char

Output Min. 137-volts dc @ 0.160 ampere

Low Voltage (Rectifier for Relay*):

- Input 48-volts ac
- Output 32 ± 8-volts dc
- Heat Dissipation with Tape Reader Operating17 watts

*Applicable to tape readers equipped with automatic reader control.

CAUTION: HIGH VOLTAGE PERSISTS 10 SECONDS AFTER POWER REMOVED.

(c) Feed Magnet

- Power Dissipation 2-1/4 watts
- Nominal Attract Time 8-11 milliseconds at 0.220 ampere
- Nominal Release Time 7-10 milliseconds

5.09 Tape Punch

(a) Dimensions and Weight (Approximate)

- Width 3-1/2 inches
- Height 7-1/2 inches
- Depth 13-1/4 inches
- Weight 1-1/2 pounds

(b) Tape Specifications

- Levels 5-or 8-level
- Width - (5-level) 11/16 inch
- Width - (8-level)1 inch
- Code Combinations per inch 10
- Feed Hole Diameter 0.0465 inch

1600

34/2

1110