extel

SERIES AE AND AF
TELEPRINTERS

Installation and Operation Manual

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PROPRIETARY STATEMENT

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SECTION 1
Introduction

1-1. GENERAL DESCRIPTION

Series AE and AF teleprinters are solid-state, electronic, receive-only units that provide a 5 x 7 dot matrix printout upon receipt of serialized data from appropriate transmission sources. The units are designed for continuous or intermittent-duty applications, and are capable of printing asynchronously at all speeds up to 15 characters per second. Their very low operating noise level and high degree of reliability is the product of a design philosophy which combines a simple, reliable printing mechanism with advanced electronic control circuitry.

Series AE and AF teleprinters are designed to operate from either a 115 VAC or 230 VAC, 50/60 Hz., power source. (400 Hz. operation is available on special request.) The AE series of teleprinters employs a 50 character-per-line format, using 6-inch wide pressure-sensitive (ink-encapsulated) paper. The AF teleprinter series is capable of accepting either 50, 69, 74, or 80 character-per-line formats on 8½-inch wide paper. Units equipped with **Ribbon Mechanisms** use standard 8½-inch wide teleprinter paper, while **Non-Ribbon** machines employ pressure-sensitive (ink-encapsulated) paper. In addition, all machines are capable of accepting up to three-ply paper thickness.

Modular construction, used throughout the machine, facilitates easy access to electronic and mechanical assemblies, while providing versatile component interchangeability. The teleprinter cover has a hinged lid which provides ready access to the typing unit for paper and ribbon threading. A window, integral to the hinged lid, permits viewing of the printed copy during data reception, while also providing a convenient cutting edge to remove completed messages from the machine.
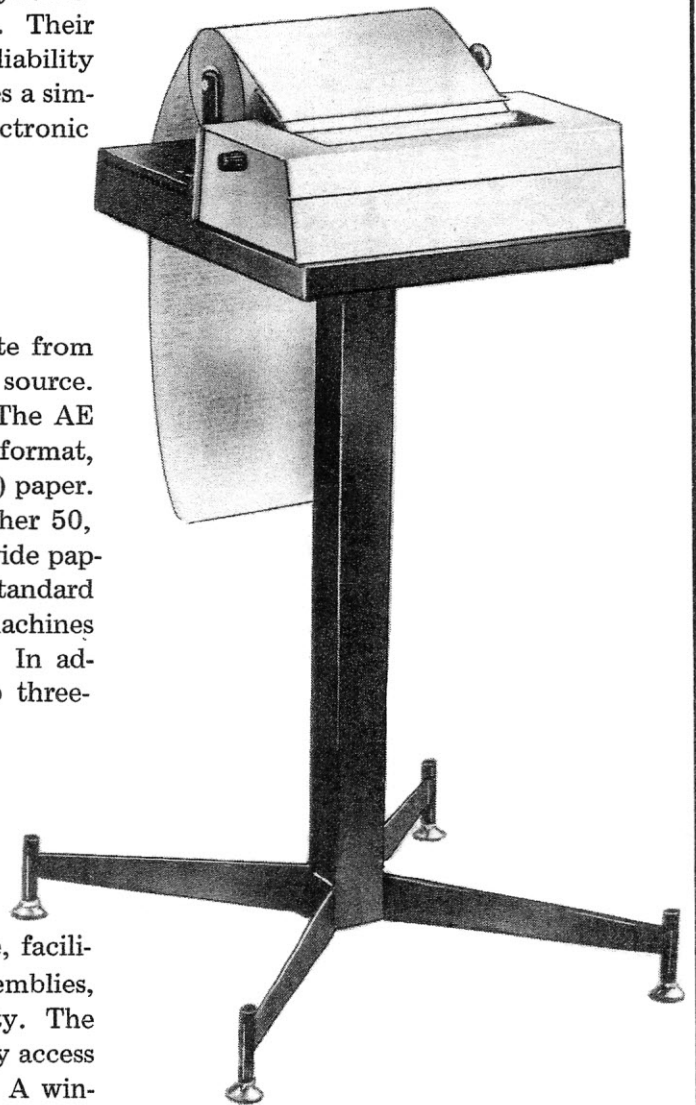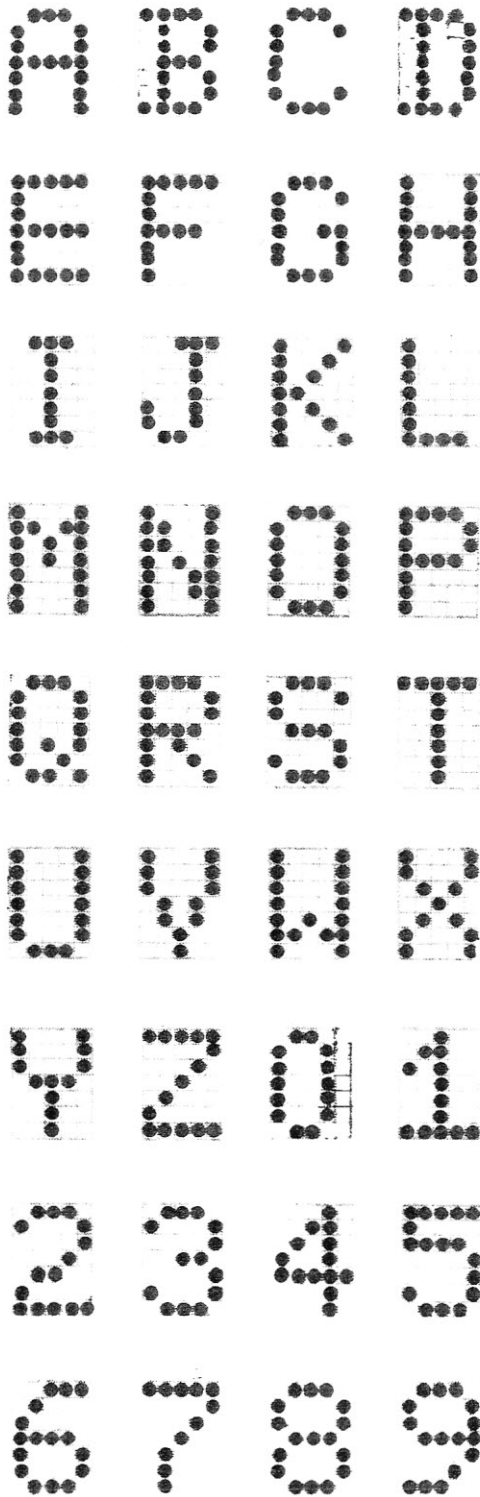
Figure 1-1. Dot Matrix Character Formation

1-2. PRINCIPLES OF OPERATION

The following is a general discussion of the basic principles of operation. A more detailed analysis of the teleprinter's operational theory is contained in subsequent sections of this manual and the **Service Manual for AE and AF Teleprinters.**

a. Character Printing and Spacing

Printing is achieved by the electronic activation of seven needles which are vertically mounted in the carriage assembly. A special stepper motor, the impulses to which are also derived from the electronic circuitry within the unit, powers the carriage assembly across the platen. The carriage assembly moves eight steps for each character printed—three steps provide the spacing between characters, and the remaining five steps are used to print the 5 x 7 dot-matrix character pattern, as illustrated in Figure 1-1.

Stepper motors are also used to control the line feed function and ribbon movement of the teleprinter. The spacing mechanism, comprised of the above-mentioned spacing drive stepper motor, pulley, drive belt, drive pawl, and associated gears and capstans, laterally positions the carriage assembly so that the characters are properly located horizontally on the paper. This mechanism is activated each time a character or space is called for in the received code. Internal logic suppresses the carriage spacing action when certain "function" characters are received by the teleprinter.

b. Paper Feed Drive Mechanism

The Paper Feed Drive Mechanism, comprised of a paper feed drive stepper motor, pulleys, drive belt and platen, positions the paper vertically so that spacing between the printed lines is of consistant dimension. Four lines per inch are normally printed when the unit is functioning in the Single-line Feed mode. Upon receipt of a "line feed" encoded character, the Paper Feed Drive Mechanism will advance the paper vertically to the next line position.

If specified at the time of ordering, AE and AF series teleprinters will be equipped with a Line Feed Selector Switch. This is either a two- or three-position toggle switch located under the front of the unit. The two-position switch will offer selection of either single- or double line feed, or single-1½-line feed, operation. The three-position switch allows selection of single-, 1½- or double-line feed functions.

c. Carriage Return

The carriage return action is performed by the spacing drive stepper motor, located at the rear right-hand side of the typing unit assembly, together with gears and drive belts. When the spacing drive stepper motor is driven in reverse, the idler gear disengages from the right-hand capstan, permitting the force of the carriage return spring to return the carriage to the left side of the platen. Upon receipt of a "carriage return" encoded character, the teleprinter's control circuitry causes the spacing drive stepper motor to reverse, thus releasing the idler gear and allowing the carriage return spring to pull the carriage to the left-hand margin to begin a new line of print. A Decelerator, which is an inertia device (Shown in **Figure 1-2.**), cushions the carriage assembly as it reaches the left side of the platen. In most instances, the "carriage return" function is performed coincidental with the "line feed" function, so that the paper will be advanced vertically when the carriage is returned to begin a new line.
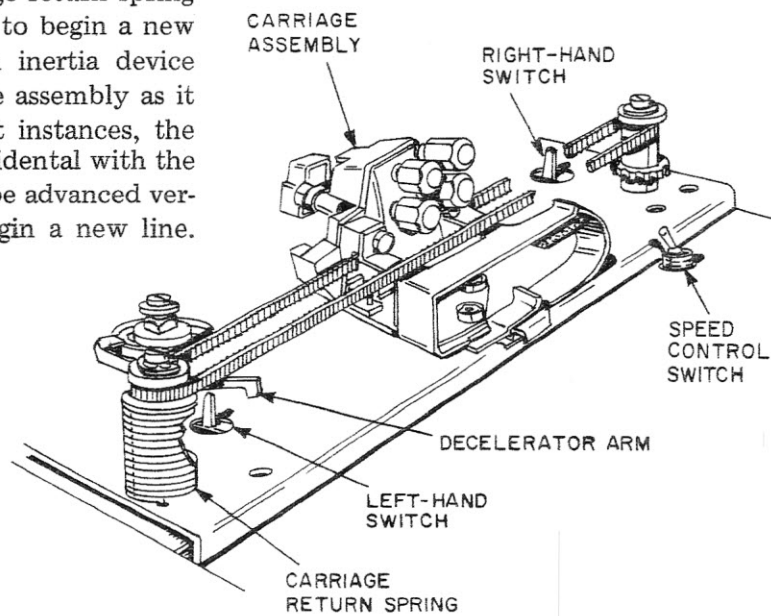
Figure 1-2. Typing Unit Component Identification

In Series AE and AF teleprinters, left margin and right margin switches are used to signal the unit's control circuitry as to when the carriage assembly has reached either the extreme right-hand or left-hand margin. Once the carriage has been returned to the left side of the platen, the Left Margin Switch signals the internal logic that the carriage is again ready for printing a new line. If, for any reason, the unit does not receive a "carriage return" encoded character, and the carriage assembly is allowed to reach its maximum predetermined excursion across the platen (i.e. for 50-, 69-, 74- or 80-character lines), the Right Margin Switch is activated, causing the carriage assembly to be returned automatically. These switches can be seen in **Figure 1-2.**

1-3. SPECIAL FEATURES

a. Bell

When received, the "Bell" encoded character activates a bell which provides the operator with an audible signal, useful for identifying at a distance information which is about to, or did, move on the wire. If an EBS (Emergency Broadcasting System) option is installed on your particular machine, the external alarm circuitry is also activated with the bell.

b. Last Character Visibility (LCV)

Teleprinters equipped to receive Six-Level (Teletypesetter) Code, and certain other specially-equipped units, contain this feature. If a pause in the incoming data causes the carriage to stop printing for more than one second, a special interval line feed causes the paper to be advanced upward. This aids considerably in viewing the last characters printed. When incoming traffic resumes, the platen then retracts the paper to its original position and printing continues where it had previously stopped. Section 3 shows the location of the switch which controls this feature.

c. Rail Monitor Switch

Six-Level (Teletypesetter) machines also feature a switch which allows the operator to monitor the Rail Shift symbols. When this switch is turned on, the unit will print unique symbols for "upper" and "lower" rail. Location of this switch is shown in Section 3 of this manual.

d. Full Monitor Switch

On Six-Level (Teletypesetter) machines it is often more desirable to have the teleprinter print out the symbols for all functions, while performing all functions except "carriage return" and "line feed". While in this Full Monitor Mode, the unit will print the unique symbols for "carriage return" and "line feed", but will not execute these mechanical operations at the time they are called for in the text. Rather, the teleprinter will completely fill each line with the maximum number of characters permitted and then automatically perform a "carriage return" and "line feed". This mode of operation is most useful in providing compact copy and greater

utilization of total printing area on the paper. Section 3 of this manual shows the position of the Full Monitor Switch on the teleprinter.

1-4. TELEPRINTER CODE RECEPTION

Transmitted messages to the teleprinter are received in the form of an on/off signaling code. These on/off pulses are sent on-line, and follow each other in rapid succession (i.e. Serialized Data or Serial Data) according to a specified signaling code arrangement. Current widely-used codes contain either 5, 6 or 8 on/off bits to signify a given character or function. The teleprinter's logic circuitry must decode these 5-, 6- or 8-bit sequences to produce an intelligible printout. Standard codes that can be accepted by various units in the AE and AF Series of teleprinters are:

5-Level (Murray), US-A	CCITT No.2
US-B	with £ Sign
US-C	

6-Level (Teletypesetter)

8-Level (ASCII)   CCITT No. 5

NOTE: Other codes are available upon request.

In the reception of a code, each character and function is represented by a series of current or no-current time intervals when operating on a **Neutral DC Current Loop.** On this type of line, current flowing on the line is referred to as a **Mark,** while a no-current condition is termed a **Space.** In an **Audio Communications System,** a shift in the frequency of the tone on the line determines a **Mark** or **Space** condition. **Polar DC Current** systems have current flowing in one direction for a **Mark** condition and current flowing in the reverse direction to indicate a **Space** condition.

One of the principle codes used by the telecommunications industry is the CCITT No. 2 Code (5-Level). When receiving CCITT No. 2 encoded characters, each character or function is defined by at least 7 "on/off" units—one start pulse, one stop pulse, and five units (or levels) which determine the specific character or function. **Figure 1-3** illustrates the transmitted character "E" using this code. The stop and start
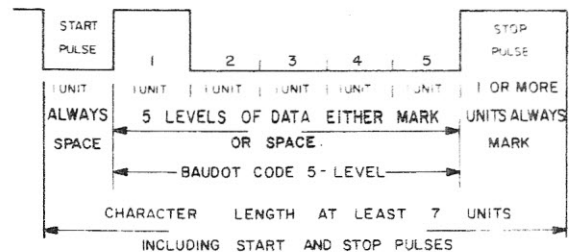
Figure 1-3. Five-Level Character "E" Representation

pulses are used to synchronize message reception with the transmitting site, allowing the receiver to know when a character begins and ends.

With five levels (or bits) available for defining characters and functions, the CCITT No. 2 Code can basically accomodate only 32 permutations. However, by utilizing the "Letters" and "Figures" shift, it is possible to double the effective complement of characters and/or functions to 64.

CCITT No.5 is a so-called 8-Level code, of which the American ASCII Code is a variation. This code can accomodate a larger number of unique characters and functions. Again, stop and start pulses are used for synchronizing the message, but this code uses eight bits (or levels) to define a character or function—bits 1-7 delineate the character, while the eighth bit is used for parity. Thus, with seven levels of mark or space information available, the CCITT No.5 Code can accomodate 128 permutations. In general, of these possibilities, 96 are assigned to printing characters, while the rest are devoted to non-printing (or function) characters or are unassigned. **Figure 1-4** is a pictorial representation of the character "E" as defined in the 8-Level CCITT No.5 Code.
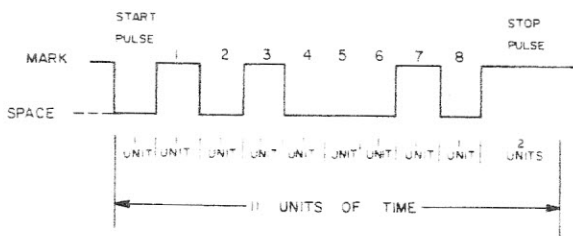
Figure 1-4. Eight-Level Character "E" Representation

1-5. CHARACTERISTICS AND SPECIFICATIONS

a. MODEL DESIGNATIONS

MODEL	RIBBON MECHANISM	NO. OF CHARACTERS/LINE	PAPER SIZE
AE	NO	50	6-inch wide paper (152 mm wide)
AF	NO	50, 69, 74, or 80	8½-inch wide paper (216 mm wide) OR 210 mm wide paper
AFR	YES	50, 69, 74, or 80	
AFL	NO*	50, 69, 74, or 80	

* OPTIONAL (May be Field Installed)

b. PRINTING CHARACTERISTICS

Printing Method . . . . 5 x 7 Dot Matrix-
Character by Character

Horizontal Spacing . . . . 10 Characters per Inch

Vertical Spacing . . . . Four Lines per Inch (Single Line Feed)

Printing Rate . . . . A "Speed Control" switch provides a choice of high or low operating speeds up to 15 characters per second.

Available Codes . . . . CCITT No.2 (5-Level), CCITT No.5 [8-Level (ASCII)], 6-Level (Teletypesetter). Other codes available on request.

c. PAPER SPECIFICATIONS

Standard Teleprinter Paper . . . . Ribbon Teleprinters

Pressure-Sensitive (Ink-Encapsulated) . . . . Non-Ribbon Teleprinters
Single-Ply . . . . .For Single Copy Requirements
Up to 3-Ply . . . . .For Multiple Copy Requirements

d. GENERAL SPECIFICATIONS

Duty Cycle . . . . Continuous or Intermittent Duty

Input Voltage . . . . 115 VAC or 230 VAC (Single Phase), 50/60 Hz. (400 Hz operation available on request)

Signal Line Input . . . . GENERAL:
Signal termination isolated from ground and other circuitry, unless otherwise specified. Isolation: 2500 volts DC. Standard series resistance: approximately 70 ohms, unless otherwise specified. Other inputs available to conform to specific customer requirements.

D.C. INPUT:
Neutral: 10-80 ma., Polar: 20-60 ma., or EIA standard interface RS-232-C.

Signal Line Input (Continued)	AUDIO SIGNAL INPUT: Narrow-Band Audio Frequency Shift Keying (FSK), CCITT standard channel spacing available. Also compatible with Bell System or equivalent Dataset 103, 108, 109 or 113.
Input Impedance	U.S.—70 ohms approx., U.K.—4K ohms approx., West Germany—240 ohms approx.
DC Distortion	Teleprinter will accept up to 40% marking or spacing distortion at any operating speed.
Audio Distortion	Teleprinter will accept up to 25% marking or spacing distortion at any operating speed.
Power Consumption	60 Watts Maximum while printing. 25 Watts Maximum in standby condition.
Operating Temperature	+32°F to +110°F at altitudes from mean sea level to 10,000 feet above mean sea level.
Dimensions and Weight (Without Paper Roll)	MODEL AE: 5" high, 15½" deep, 10¼" wide, 17 lbs. MODEL AF: 5" high, 17¾" deep, 12 5/8" wide, 25 lbs.
Mounting.	Desk-top surface or Pedestal Stand (available in 28" and 36" heights.)

1-6. AVAILABLE OPTIONS

a. SENSOR UNIT FOR LOW PAPER ALARM

This feature can be connected by the customer to activate an external visual or audible alarm to signify that the paper roll supply is nearly exhausted. In Selective Calling applications, this feature can be used to alert the transmitting station that the teleprinter is not ready for message reception because of its inadequate paper supply. On units equipped with the EIA interface, the Sensor Unit performs a similar function.

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b. SELECTIVE CALLING

This option, which must be specified at the time or ordering the machine, permits individual station selection on a common communications loop. In addition, a single-character Answerback may be provided in the Selective Calling network. If your machine has this option, refer to the **Options Section** of this manual for complete details.

c. SINGLE/DOUBLE LINE FEED SWITCH

This option consists of a small toggle switch, conveniently located in the lower left-hand corner under the teleprinter base, which allows the operator to choose either single- or double-line feed operation. Use and location of this switch is described in more detail in **Section 3** of this manual.

d. PAPERWINDER

This device, which mounts on the rear of the teleprinter, retains all received messages on a continuous roll. It may be added as an accessory at some later date; or, if ordered with your particular machine, it will be sent separately and must be attached to the teleprinter by the installing technician. **Figure 1-5** illustrates the Paperwinder assembly, and complete details for installing it are given in **Section 2**.

PAPERWINDER
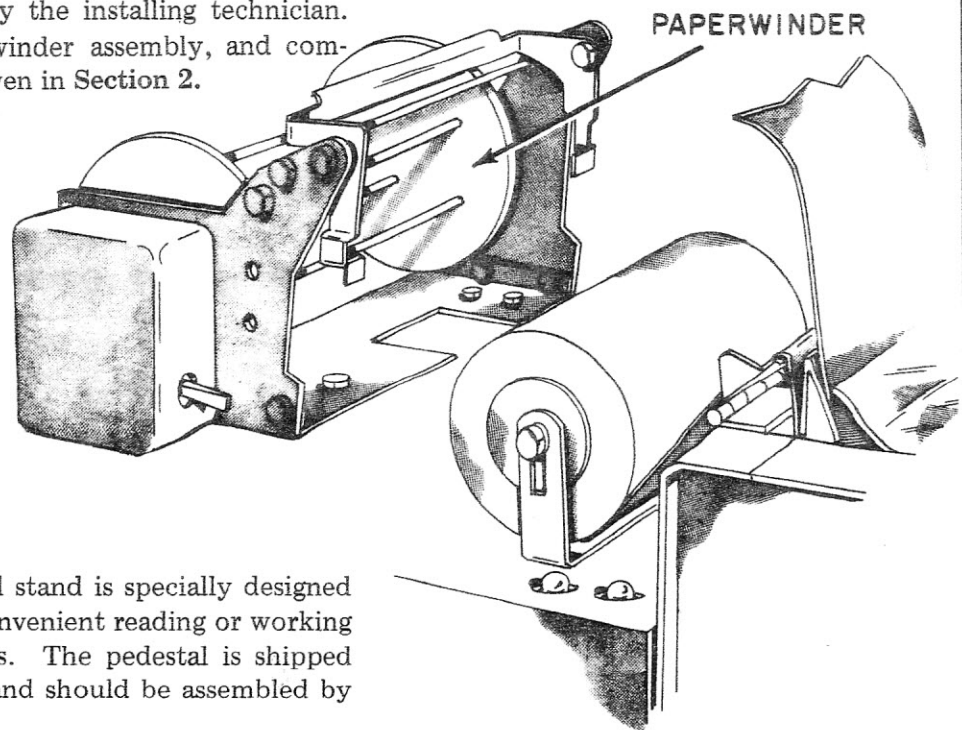
e. PEDESTAL STAND

This sturdily-constructed pedestal stand is specially designed to support the teleprinter at a convenient reading or working height of either 28 or 36 inches. The pedestal is shipped separately from the teleprinter, and should be assembled by the installing service personnel.

Figure 1-5. Paperwinder Assembly

f. EMERGENCY BROADCAST SYSTEM (EBS) RELAY OPTION

The EBS Relay Option provides the user with a normally-open pair of contacts which function merely as a line closure, suitable for wiring in series with some external signaling device, such as a bell, horn or light. If the EBS Option was requested at the time of ordering your machine, your unit has been equipped with a special transformer assembly which includes a socket for accepting an EBS relay. This relay, and a barrier strip for mounting on the outside of the teleprinter cabinet, are shipped separately from the machine and must be installed by a qualified servicing technician.

g. DUAL-PRIMARY TRANSFORMER

As a factory-installed option which must be specified at the time of ordering, Series AF teleprinters can be equipped with a Dual-Primary Transformer in the power supply. This option permits the user to change the operating voltage from 230 VAC to 115 VAC, or visa versa.

1-7. CONVERSION KITS

The following is a list of Conversion Kits which are available for your Series AE or AF teleprinter. These kits are suitable for installation at some future date, should certain requirements for your machine change. Only qualified servicing personnel should install these Conversion Kits.

a. RIBBON CONVERSION KIT

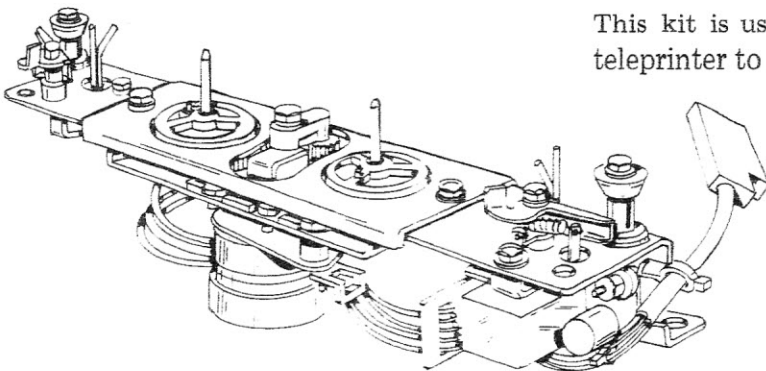This kit is used when it is desirable to change a Non-ribbon teleprinter to one utilizing a Ribbon Mechanism.

Figure 1-6. Ribbon Mechanism

b. EMERGENCY BROADCAST SYSTEM (EBS)
CONVERSION KIT

This kit allows for the modification of the transformer assembly to accept an EBS relay and its associated barrier strip for connecting a remote alarm device to the teleprinter. This device would then be activated every time the bell rings.

c. 74-CHARACTER TO 69-CHARACTER LINE
CONVERSION KIT

This kit allows a Model AF teleprinter, previously equipped for printing a 74-character line format, to be converted for 69-character-per-line use.

d. 69-CHARACTER TO 74-CHARACTER LINE
CONVERSION KIT

This kit allows a Model AF teleprinter, previously equipped for printing a 69-character line format, to be converted for 74-character-per-line use.

e. 74-CHARACTER TO 80-CHARACTER LINE
CONVERSION KIT

This kit allows a Model AF teleprinter, previously equipped for printing a 74-character line format, to be converted for 80-character-per-line use.

f. 80-CHARACTER TO 74-CHARACTER LINE
CONVERSION KIT

This kit allows a Model AF teleprinter, previously equipped for printing an 80-character line format, to be converted for 74-character-per-line use.

g. 8½-INCH TO 6-INCH PAPER CONVERSION KIT

This kit allows a Model AF teleprinter, previously equipped to use 8½-inch wide paper, to be converted to accept 6-inch wide paper rolls.

h. 6-INCH TO 8½-INCH PAPER CONVERSION KIT

This kit allows a Model AF teleprinter, previously equipped to use 6-inch wide paper, to be converted to accept 8½-inch wide paper rolls.

SECTION 2
Installation

2-1. GENERAL

This section provides instructions for installing your Series AE or AF teleprinter. Be certain to follow all "NOTES" and "CAUTIONS" described in the following pages, as they are provided for your safety and for the protection of your machine.

When reference is made to the physical location of various component parts, the teleprinter is considered to be viewed from the **front of the unit**—or operator's position—unless otherwise specified. **No special tools are required to correctly install the unit.**

2-2. UNPACKING AND INSPECTING

When removing the unit from its shipping carton, all instructions and CAUTIONS which may appear on the outside of the shipping container should be observed.

The unit is enclosed in a protective, dust-proof plastic bag which is surrounded by a shock-absorbing material. This packaging material, including the carton itself, should be saved in the event the unit must be returned or forwarded. Figure 2-1 illustrates the correct sequence for re-packaging the teleprinter for storage or re-shipping. When removed, the unit should be thoroughly inspected for any damage which might have occurred while the machine was in transit. If any damage is evident, it should be immediately reported to the transportation company.

NOTE

If the teleprinter is not to be put into operation until some future time, re-package the unit, using the original packing materials. Storage temperatures may range from $32^{\circ}F$ to $150^{\circ}F$ at altitudes up to 10,000 feet above mean sea level.
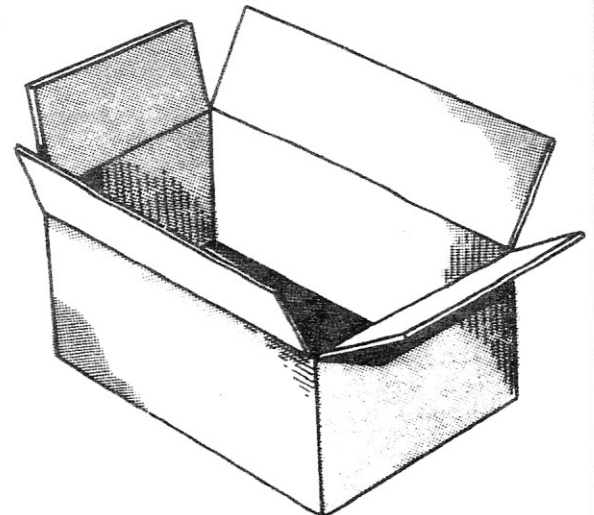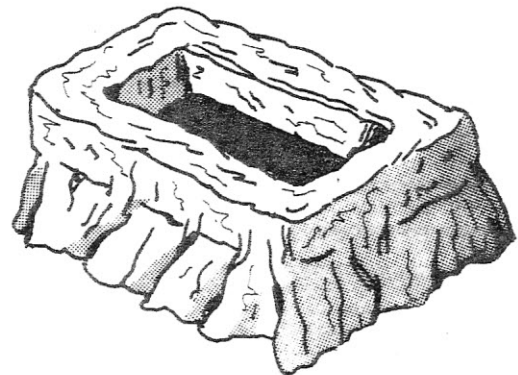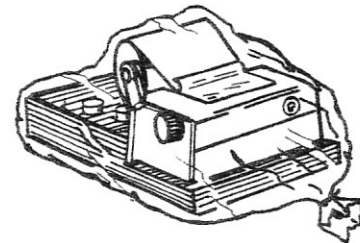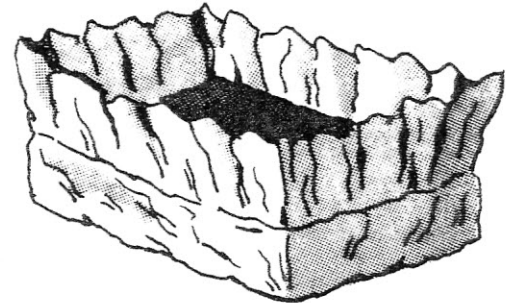
Figure 2-1. Packaging Sequence

2-3. INSTALLATION LOCATION

Since Series AE and AF teleprinters have an unusually low operating noise level, they may be installed without special enclosures or sound-absorbing material. In fact, it is **NOT** recommended that any padding or cushioning material be placed under the unit, as this could constrict air flow through the ventilation ports located underneath the machine.

The unit may be installed on any solid, level surface of sufficient area to accommodate the physical dimensions of the machine, but should not be situated in a room where the ambient temperature is likely to exceed 45°C (113°F) while the teleprinter is in operation. Likewise, it is not advisable to locate the unit within very close proximity to sources of direct heat, such as radiators or heating ducts.

The teleprinter may also be installed on its own specially-designed pedestal stand which provides proper ventilation for the unit, while supporting the teleprinter at a convenient working height.

In addition, the placement of the teleprinter should be convenient to an AC power source and data terminal facility. Data reception may be provided via appropriate transmission means, including telegraph lines, telephone networks or radio channels.

2-4. CONTROLS AND INDICATORS

a. POWER ON/OFF SWITCH

Figure 2-2 shows the location of the Power ON/OFF Switch on the Rear Bracket Assembly. This switch will be one of two varieties—either a red-handle type, mounted such that the upward position of the handle denotes the "ON" position and the downward position signifies "OFF"; or a black-handle type, mounted in such a way that the handle must be moved laterally for the "ON" and "OFF" positions.
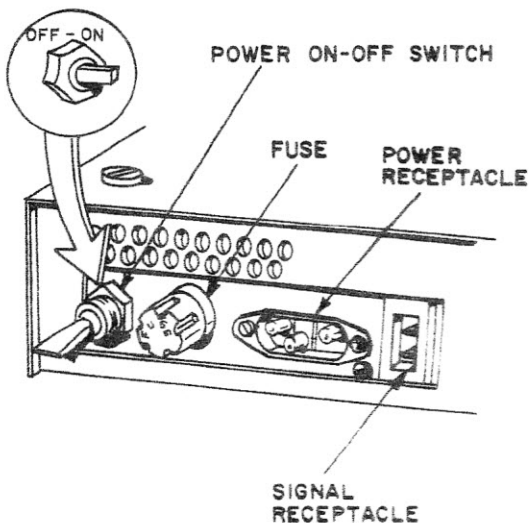

OFF – ON

POWER ON-OFF SWITCH

FUSE   POWER RECEPTACLE

SIGNAL RECEPTACLE

Figure 2-2. Rear Bracket Assembly (Typical)

b. POWER-ON LAMP

When the teleprinter is connected to an AC power source and the power switch has been turned "ON", a GREEN lamp adjacent to the left-hand side of the Paper Roll Bracket will light. This lamp will remain lit as long as the machine is "ON". See Figure 2-3 for its location.

c. CIRCUIT ALARM LAMP

When the teleprinter is connected to one of the various possible incoming signal sources—and a signal is present—this RED lamp next to the Power-ON lamp will blink ON and OFF in direct relationship to "mark" and "space" conditions on the line. Thus, under normal operating conditions, this lamp DOES NOT REMAIN LIT. If, however, there is a faulty signal line connection to the teleprinter, or, if for some reason normal signals are not present, the RED Circuit Alarm Lamp will remain lit continuously until the proper signal returns. See Figure 2-3.

Figure 2-3. Indicator Lamps

d. SPEED CONTROL SWITCH

As described later in this section, this switch is located under the teleprinter cover. The switch selects either of two crystals installed in the machine which control the speeds at which the unit is capable of operating. The frequencies of the crystals installed in your machine have a direct relationship to applicable baud rates, and the specific crystals in your machine were specified at the time of ordering. See paragraph 2-7 in this section for further information.

2-5. POWER INTERFACE

a. GENERAL

Series AE and AF teleprinters are equipped with either a detachable or "hard-wired" power cord which is six (6) feet in length and meets the electrical specifications of the geographical area in which the unit is to be operated. One end of the detachable variety is normally terminated in a three-
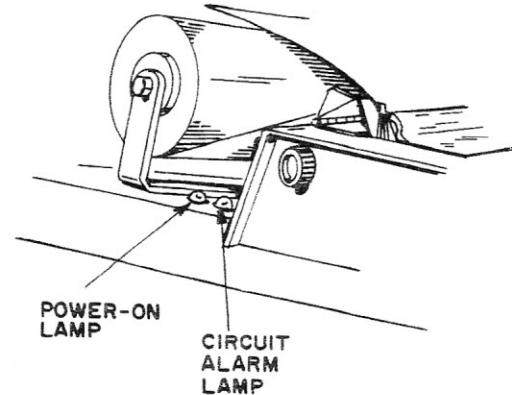

CAUTION

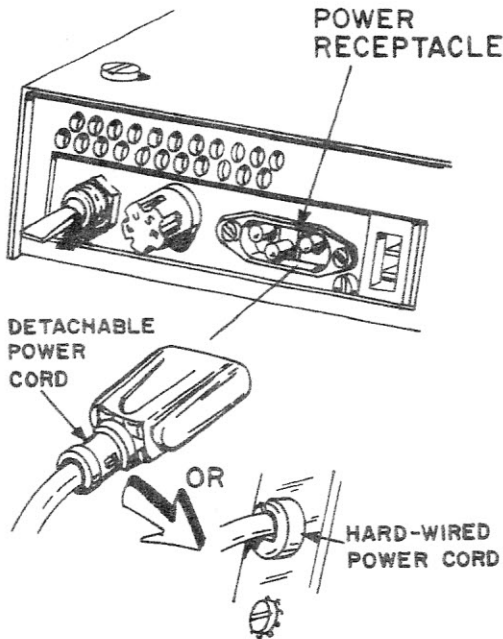Before making any power or signal line connections, place the Power Switch (Shown in Figure 2-2) in the OFF position.

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prong male plug (as shown in **Figure 2-5**) for connection to an external AC power source which meets the specifications outlined on the model data plate affixed to the right-hand side of the machine. The molded female connector at the opposite end of the cord (as shown in **Figure 2-4**) connects to the power input receptacle which is part of the teleprinter's Rear Bracket Assembly.

Figure 2-4 also illustrates the alternate "hard-wired" power cord configuration which is permanently attached to the Rear Bracket Assembly. This version may or may not be terminated with a plug for connection to an appropriate AC power receptacle. In those cases where no plug is provided, the power cord will be terminated only with three stripped wires (as shown in **Figure 2-5**) and the installer must provide a plug of proper configuration for connection to power receptacles in the user's area.

POWER
RECEPTACLE

DETACHABLE
POWER
CORD

OR

HARD-WIRED
POWER CORD

Figure 2-4. AC Power Connection
to Teleprinter

b. OPERATING VOLTAGES

Your machine has been wired to operate from either a 115 VAC **OR** a 230 VAC power source, 50/60 Hz. Check the Status Card attached to the machine to ensure that it has been wired to meet the voltage requirements of your particular area.
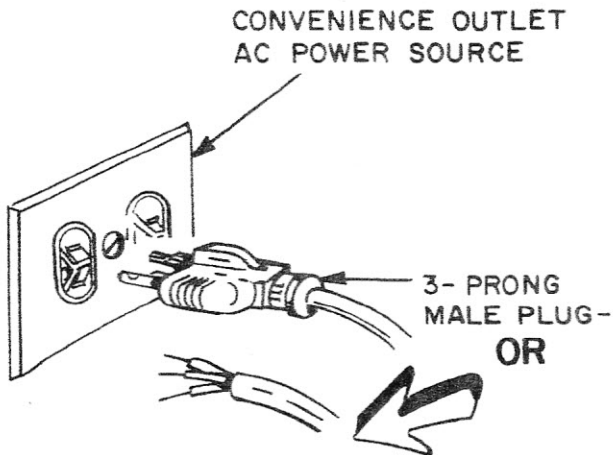
CONVENIENCE OUTLET
AC POWER SOURCE

3- PRONG
MALE PLUG -

OR

CAUTION

Connecting teleprinter to improper AC power source can cause serious damage to unit. BE SURE VOLTAGE IS CORRECT BEFORE PLUGGING INTO SOCKET.

Figure 2-5. AC Power Cord Terminations

All units are normally wired so that both sides of the AC power line are opened and closed by the Power ON/OFF Switch, and one side (Live Side) of the line is fused. If it is ever necessary that the Line Fuse be replaced, be certain that the replacement fuse is of the same value as the one originally installed in the machine.

c. DUAL-PRIMARY TRANSFORMER

As an option that must be specified at the time of ordering Series AF teleprinters can be equipped with a Dual-Primary Transformer, allowing the user to change the operating voltage of the machine. Normally, units which are equipped with this option are shipped from the factory wired for 230 VAC operation. Again, reference should be made to the Status Card attached to each teleprinter to ensure that this is, in fact, the case for that particular machine.

If for some reason the operating voltage of a unit equipped with the Dual-Primary Transformer must be changed, the installing technician must gain access to the power supply within the cabinet. To do this, follow the instructions outlined in **paragraph 2-11** dealing with **INTERNAL ACCESS**.

To change the operating voltage, the plastic protective cover over the transformer terminals must be removed. This can be accomplished by loosening its two retaining screws and sliding the cover toward the front of the unit while lifting upward. Referring to **Figure 2-6**, remove the existing jumper wire(s) and solder new jumper wire(s) to the appropriate terminal lugs, as indicated in the **Figure 2-6** schematic.

NOTE

When changing operating voltage, the fuse (housed in fuse holder on Rear Bracket Assembly) must also be changed to confrom to the values shown in **Figure 2-6**. The alternate value fuse is provided in a retaining clip on the transformer.

Once the jumper wires have been soldered to the correct terminals, replace the protective cover and re-assemble the cabinet.

When you are certain the teleprinter meets the electrical specifications of the area in which it is to be used, the power cord may be connected to the appropriate receptacle.
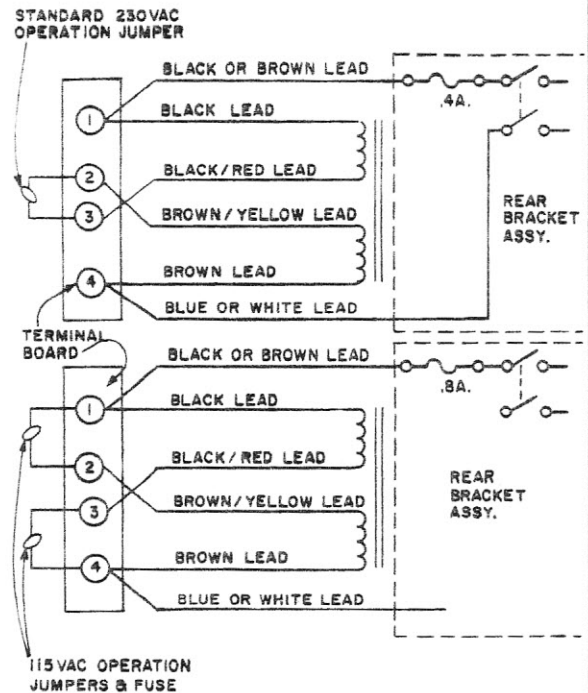

Figure 2-6. Dual-Primary Transformer Voltage Programming Schematic

2-6. SIGNAL INTERFACE

a. NEUTRAL/POLAR/AUDIO LINES

Series AE and AF teleprinters may come equipped with a variety of signal line terminations. In general, the Signal Line Cable is attached to the teleprinter, either as a "hard-wired" cable extending from the rear of the unit, or as a cable fitted with a connector which mates with a Signal Line Receptacle mounted on the teleprinter's Rear Bracket Assembly. (See **Figure 2-7**.) Additionally, this Signal Line Cable may be terminated at the opposite end in a number of different ways. **Figure 2-7** illustrates the most common forms of termination for units designed to operate with DC current loops or audio input signals. Before making any signal line connections, check the Status Card attached to the machine for complete information on the type of signal your particular machine is designed to accept.
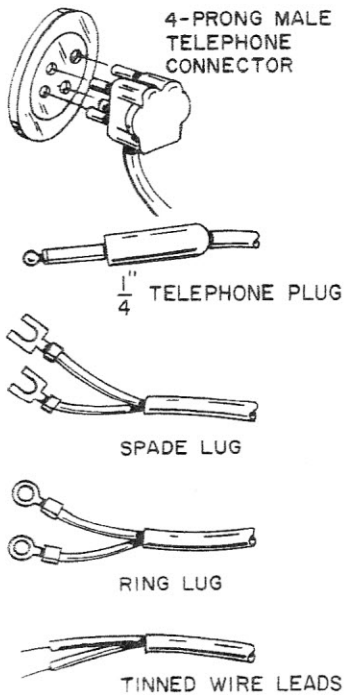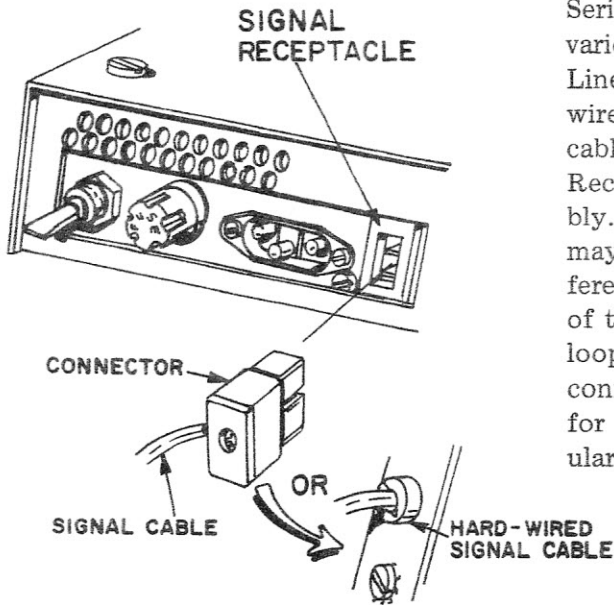

CAUTION

If a teleprinter equipped for audio signal use is connected to a DC source, serious damage to the modem will result. No damage will occur if the reverse connections are made; however, the teleprinter will be inoperative after AC power is applied, and the CIRCUIT ALARM LAMP will remain lit to signify an open circuit.

The teleprinter is designed to normally operate from any DC signal line current, neutral or polar, between 10 and 60 milliamperes. However, if the unit is to be operated from peripheral equipment having a higher current rating than 60 milliamperes, current limiting resistor(s) of proper value must be placed in series with the DC input signal line. When specified at the time of ordering, the resistor(s) will be factory installed on the input printed circuit board. Provisions have been made on this board to accomodate a pair of 2-watt resistors in series with the loop for field modification.

Figure 2-7. Signal Line Cable Terminations

NOTE

The jumpers presently installed on the input printed circuit board must be removed before installing the new resistor(s).

PART NO. 1417

When the teleprinter is interfaced with an external audio modem, the current setting should be between 30 and 50 milliamperes in the MARK condition. Refer to the instruction manual for the external modem for specific adjustment procedures.

In some cases it will be recommended that a 620 ohm terminating resistor be installed in the telephone wall jack on audio lines. **Figure 2-8** illustrates Part No. 1417 and the correct installation position for the 620 ohm ($\pm$5%, ¼ watt) resistor.

620 OHM ($\pm$5% $\frac{1''}{4}$ W) CARBON RESISTOR

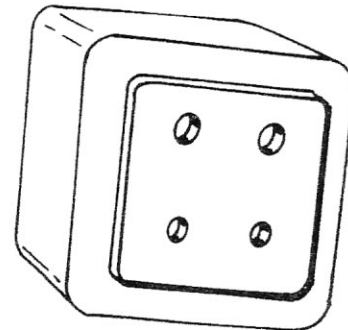**Figure 2-8. Wall Jack with Audio Line Terminating Resistor**

NOTE

When initially connecting the signal line, it may be necessary to reverse the polarity of the line before the teleprinter will receive properly.
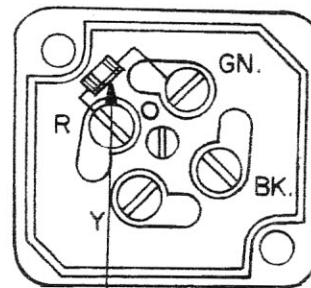
TO REVERSE POLARITY:

To reverse the polarity of the signal line on units which utilize the connector/receptacle method of attachment to the teleprinter, simply remove the signal line connector and locate the polarizing key wedged into its housing. Pry this key out of the housing and re-install it on the other side of the connector. Re-insert the connector into the signal line receptacle.

On machines having a "hard-wired" signal line cable, it will be necessary to reverse the leads at the terminal connecting point in order to change polarity.
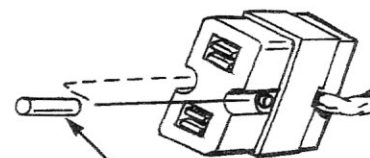

POLARIZING KEY

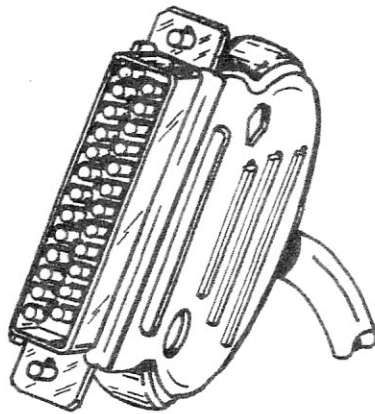**Figure 2-9. Signal Line Cable Connector**

Figure 2-10. 25-Pin EIA Connector

b. RS-232-C (EIA) INTERFACE

On teleprinters using the commonly-referred-to EIA-type interface, the signal line cable will generally be "hard-wired" to the teleprinter and terminated with a 25-pin connector like that shown in **Figure 2-10**. Series AE and AF machines designed for use with this interface utilize the following connector pins and associated signals:

Pin No. 1   Protective Ground
"   "   2   Transmitted Data (Always -14 VDC)
"   "   3   Received Data
"   "   7   Signal Ground
"   "   20   Data Terminal Ready (+14 VDC)

Figure 2-11 is a wiring schematic for the EIA interface, showing wire colors and their connections within the teleprinter.
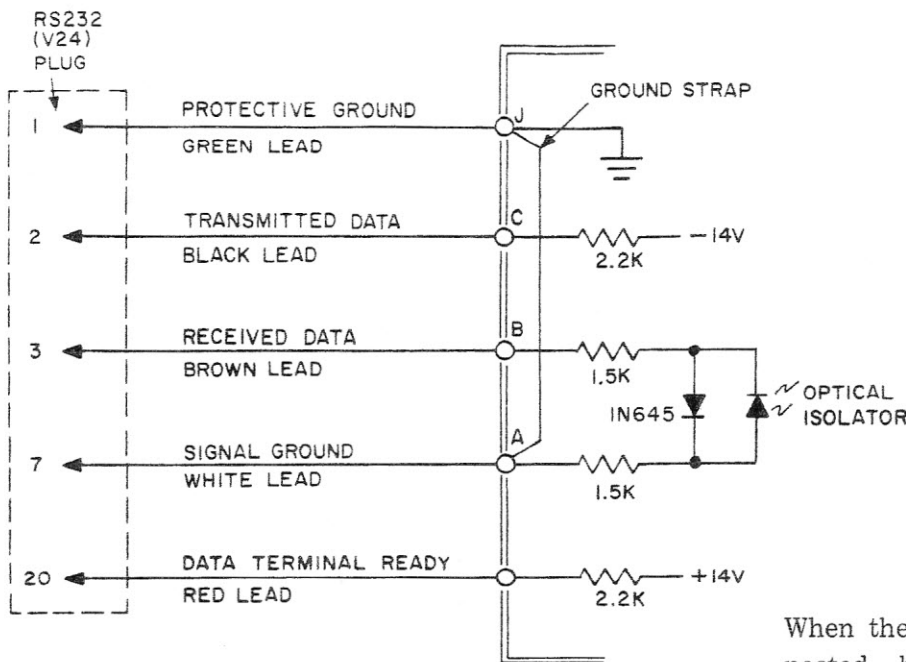

Figure 2-11. EIA Wiring Schematic

NOTE

When the signal line has been connected, be certain that the teleprinter's Speed Control Switch has been set to the proper position for the baud rate at which the unit will be receiving data. The Status Card on the unit will tell you the two baud rates at which the machine will operate.

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2-7. OPERATING FREQUENCIES

The operating speed of the teleprinter may be changed by use of the Speed Control Switch which selects either of two crystals installed in the unit. This switch is positioned in the front right-hand corner of the printer mechanism base (See **Figure 2-12**), and is accessible by lifting the hinged lid in the teleprinter cover.

On teleprinters with a ribbon mechanism, access to the Speed Control Switch must be made by inserting the finger through the carriage drive belt loop and moving the switch handle to to the left or right. (An opening in the ribbon mechanism allows access to the switch.)

> *CAUTION*
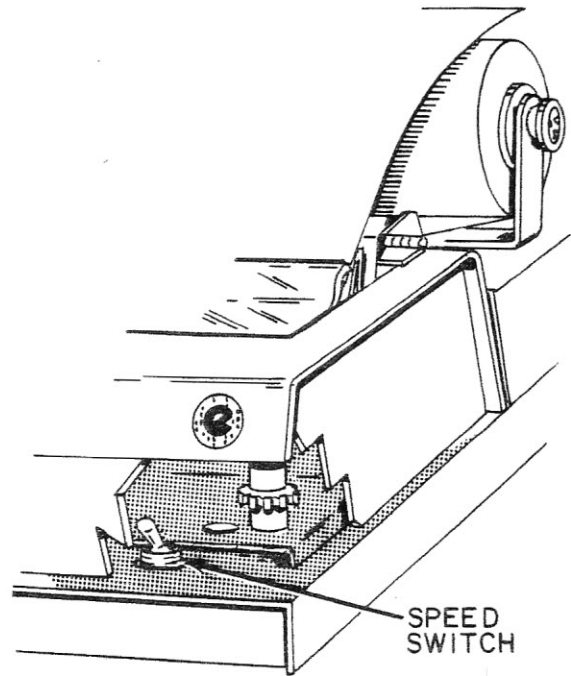> Power to the unit must be turned OFF when changing from one speed to another.

Crystal frequencies bear direct correlation to applicable baud rates for the various unit codes used. Thus, if it is necessary to convert the teleprinter for use at a different baud rate the crystals on the Driver printed circuit board must be changed.

Consult the chart below for correct crystal frequency and part number for various operating speeds.

Figure 2-12. Speed Switch Location

SECTION 2
INSTALLATION

PART NO.	FREQ. KHz.	BAUD RATE	CHARACTERS PER SECOND				
			5-LEVEL CODE		8-LEVEL CODE		6-LEVEL CODE
			7.42	7.5	10	11	8.5
2354-01	25.6	50	6.74	6.667	5.0	4.545	5.882
-02	38.4	75	10.108	10.0	7.5	6.818	8.824
-03	56.32	110	14.825	14.667	11.0	10.0	12.941
-04	57.6	112.5	15.162	15.0	11.25	10.227	13.235
-05	23.296	45.5	6.123	6.067	4.55	4.136	5.353
-06	84.48	165	22.237	22.0	16.5	15.0	19.412
-07	102.40	200	26.954	26.667	20.0	18.182	23.529
-08	51.2	100	13.477	13.333	10.0	9.091	11.765
-09	37.547	73.33	9.883	9.777	7.333	6.666	8.627
-10	28.8	56.25	7.581	7.5	5.625	5.114	6.618
-11	28.493	55.65	7.5	7.42	6.565	5.059	6.547
-12	37.99	74.2	10.0	9.893	7.42	6.745	8.729
-13	153.6	300	40.431	40.0	30.0	27.273	35.294
-14	26.9	52.539	7.081	7.005	5.254	4.776	6.181
-16	115.2	225	30.32	30.0	22.5	20.45	26.471
-17	76.8	150	20.216	20.0	15.0	13.363	17.647
-18	40.96	80	10.781	10.667	8.0	7.272	9.412
-19	34.15	66.7	8.99	8.893	6.67	6.063	7.847
-20	29.133	56.9	7.668	7.587	5.69	5.173	6.694
-21	43.52	85	11.456	11.333	8.5	7.727	10.0
-22	65.28	127.5	17.183	17.0	12.75	11.591	15.0

TO CHANGE CRYSTALS:

(1) Remove the teleprinter cover, power supply cover and typing unit base, as outlined in Paragraph 2-11.

(2) Locate crystals on the Driver printed circuit board (the uppermost of the two boards mounted in the base of the teleprinter).

(3) Remove crystals from Driver Board and replace with crystals of proper frequencies for the baud rates at which the machine is to operate. See chart for crystal frequencies and applicable baud rates.

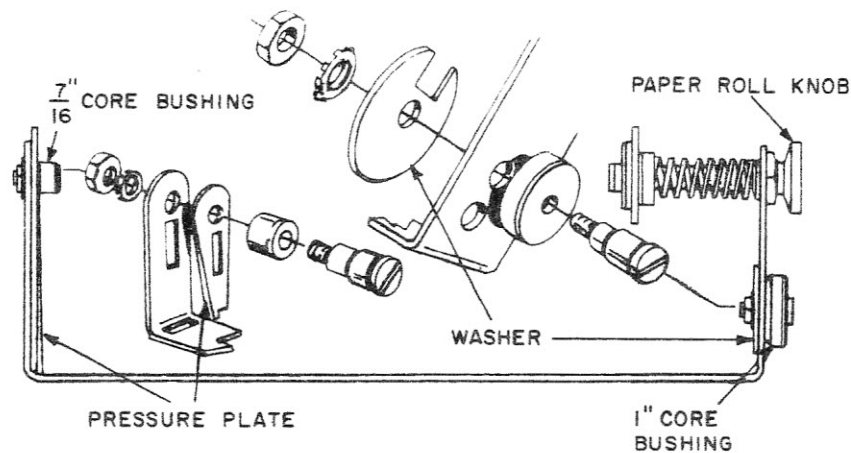(4) Re-assemble teleprinter cabinet as per Paragraph 2-11 of this Section.

Figure 2-13a. Paper Roll Bracket for 8½" or 210 mm, 7/16" Core Roll with Pressure Plate
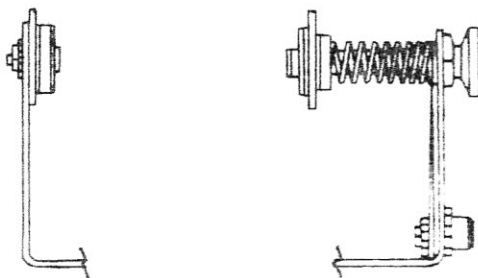

Figure 2-13b. Paper Roll Bracket for 8½" or 2 mm, 1" Core Roll, with Washer

2-8. PAPER ROLL BRACKET

If your machine is not equipped with a Sensor Unit for Low Paper, the Paper Roll Mounting Bracket will appear as one of the four configurations shown in **Figure 2-13**. All Series AE (6-inch machines) will have a Paper Roll Bracket like that shown in **Figure 2-13a**; that is, one which utilizes a pressure plate and bushing to accept 7/16-inch core rolls. Likewise, Series AF (8½-inch) Teleprinters not equipped with