35 KEYBOARD SEND-RECEIVE (KSR) AND RECEIVE-ONLY (RO) TELETYPEWRITER SETS

DESCRIPTION AND OPERATION

CONTENTS PAGE

1. GENERAL

1.01 This section is reissued to add information on operating temperature range and to provide a general description of 35 RO Teletypewriters used for No. 1 ESS-ADF (ADNET), 85A1, 86A1, and 86B1 Selective Calling. The added information is indicated by marginal arrows.

1.02 The 35 KSR Teletypewriter Sets are electromechanical apparatus that provide terminal facilities for exchanging page-printed messages over appropriate transmission facilities including telegraph lines, telephone networks, and radio channels. An operator sends the messages by typing them on a keyboard, and the originating set and those at distant stations print them on page-width copy paper or continuous business forms. The sets translate the messages to a serial start-stop (teletypewriter) code for transmission and convert the code to printed characters at the point of reception. They will operate at various speeds up to 100 words per minute.

1.03 The 35 RO Sets are similar to the KSR Sets, but have no keyboard sending facilities. They are used in applications that require only the reception of page-printed messages.

1.04 The KSR and RO Sets can be used for recorded communication either cross office or cross country. With the proper modifications, they will function in dial or other switched-line networks. Utilizing the capabilities of a built-in switching device, the function box, the sets will provide local or remote control of external equipment or operations.

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2. VARIATIONS

2.01 The sets are available in several configurations to meet varying installation and operational requirements.

2.02 With the proper modifications certain models will function in conjunction with tone-modulated telephone networks (Switched Network Service). These sets employ a call control unit in conjunction with a data set. The data set is not supplied with the equipment. When used, it is mounted on an apparatus rack in the pedestal of the cabinet or, in some installations external to the equipment. All of these components are discussed in detail in appropriate sections.

(a) Floor Model Set - A floor-standing set with space in the pedestal for accessory equipment. The cabinet pan on this model is welded to the top of the pedestal (Figures 1, 2 and 3).

(b) Table Model Set - Identical to the floor model set except that it has no stand (pedestal) and thus rests on any flat surface.

(c) Wall Mounted Set - May be mounted on a wall surface to conserve floor space (Figure 4).

3. COMPONENTS

3.01 The component complement of a KSR Set may vary from one installation to another, depending upon the operational requirements. In general, a KSR Set consists of a typing unit, a keyboard base, motor unit, electrical service unit, and enclosure. A complete description of these components will be found in the appropriate section for a particular component.

3.02 The motor unit and typing unit are mounted on the base portion of the keyboard. The motor unit supplies rotary motion through a gear set to the typing unit which, in turn, supplies it to the keyboard. Gear sets may be interchanged to obtain various operating speeds up to 100 wpm. The keyboard and electrical service unit are mounted in a cabinet or enclosed by covers. The receive-only base replaces the keyboard in the Receive-Only Set.

TYPING UNIT

3.03 The typing unit contains the mechanism necessary for translating electrical input signals into printed, alpha-numeric characters or functional control operations. The unit may be equipped to accommodate either friction or sprocket feed paper (friction feed only on wall mounted models) in single or multicopy form; either rolled or fan folded. It includes a function box that provides, non-printing functions such as case shifting, carriage return and line feed and, in addition, switching facilities for remote controls, station selection, and other applications.

SEND-RECEIVE KEYBOARD AND RECEIVE-ONLY BASE

3.04 Both the send-receive keyboard and the receive only base provide mounting facilities for the typing unit, motor, driving gears, and various mechanisms required for control of the set. Unlike the receive-only base, the send-receive keyboard is equipped with mechanisms for generating and transmitting teletypewriter signals.

MOTOR UNITS

3.05 The motor units are mounted on top of the base, on the right rear corner, of table and floor models, and below the base, on the left rear side, of wall mounted models. The units provide mechanical motion for KSR and RO Sets and are of two basic types: ac synchronous and ac/dc series governed. The ac synchronous motor is used when the power source is regulated; the ac/dc series governed motor operates from either regulated or unregulated power. The latter is required where only unregulated power is available and special speeds are required.

ELECTRICAL SERVICE UNIT

3.06 The electrical service unit is mounted on the cabinet pan, directly behind the typing unit on floor and table models and on the lower mounting frame below the base on wall mounted models. The unit serves as the area of concentration for the wiring of KSR and RO Sets, and provides mounting facilities for various electrical assemblies and components. It may include such assemblies as a line shunt relay, rectifier, motor control mechanism, and selector magnet driver. The latter is a solid-state device required to amplify and shape incoming signals. The facilities provided by the unit will vary depending upon the number and complexity of functions performed by the sets.

ENCLOSURES (Figures 1 through 4)

3.07 The components of KSR and RO Sets may be housed in a number of different enclosures, including the floor model, the table model and the wall mounted enclosure. The table model is identical to the floor model except the cabinet pan rests on a flat surface instead of being welded to the top of the pedestal.

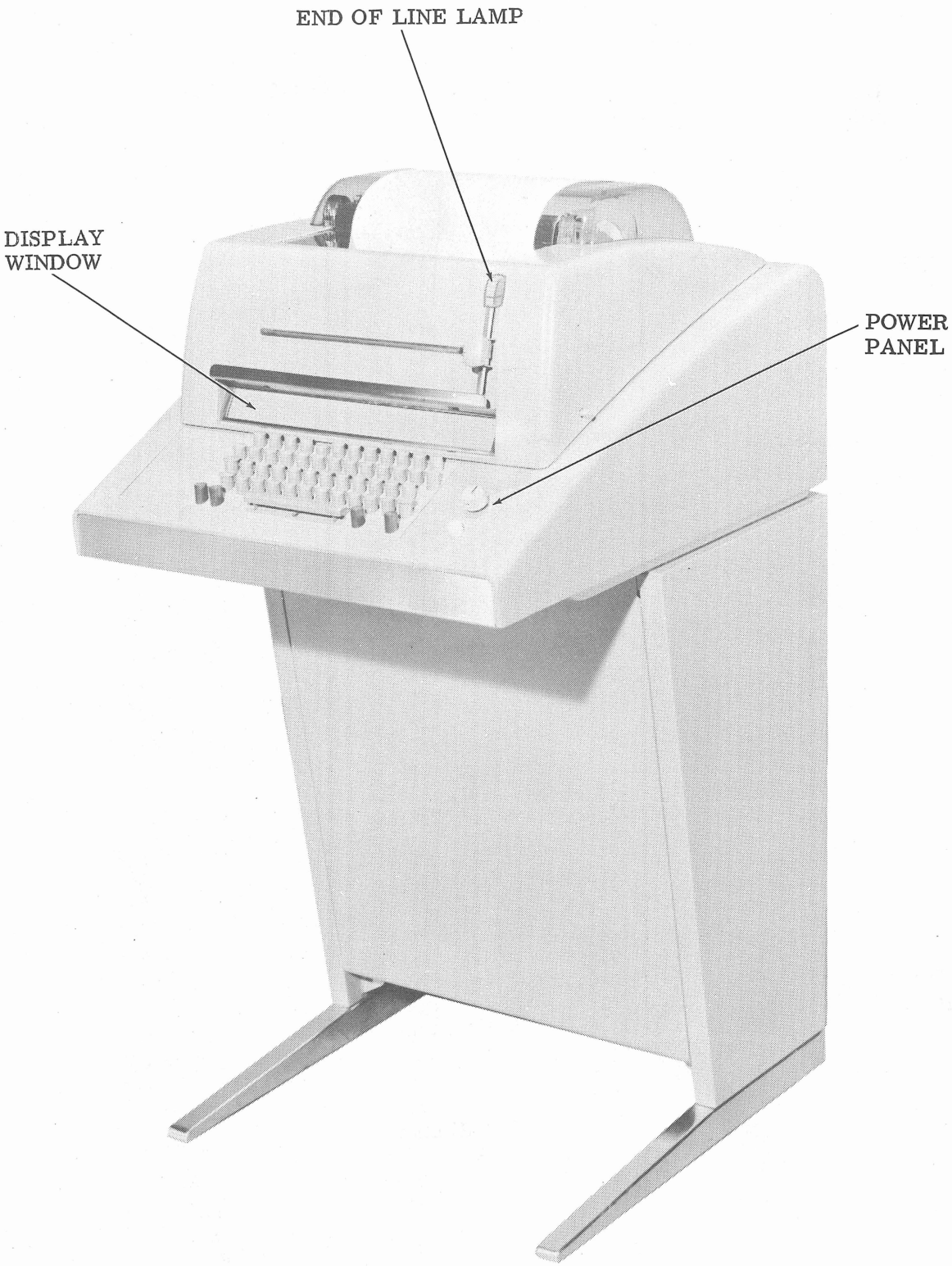

Figure 1 - 35 Keyboard Send-Receive (KSR) Teletypewriter Set (Private Line Service)

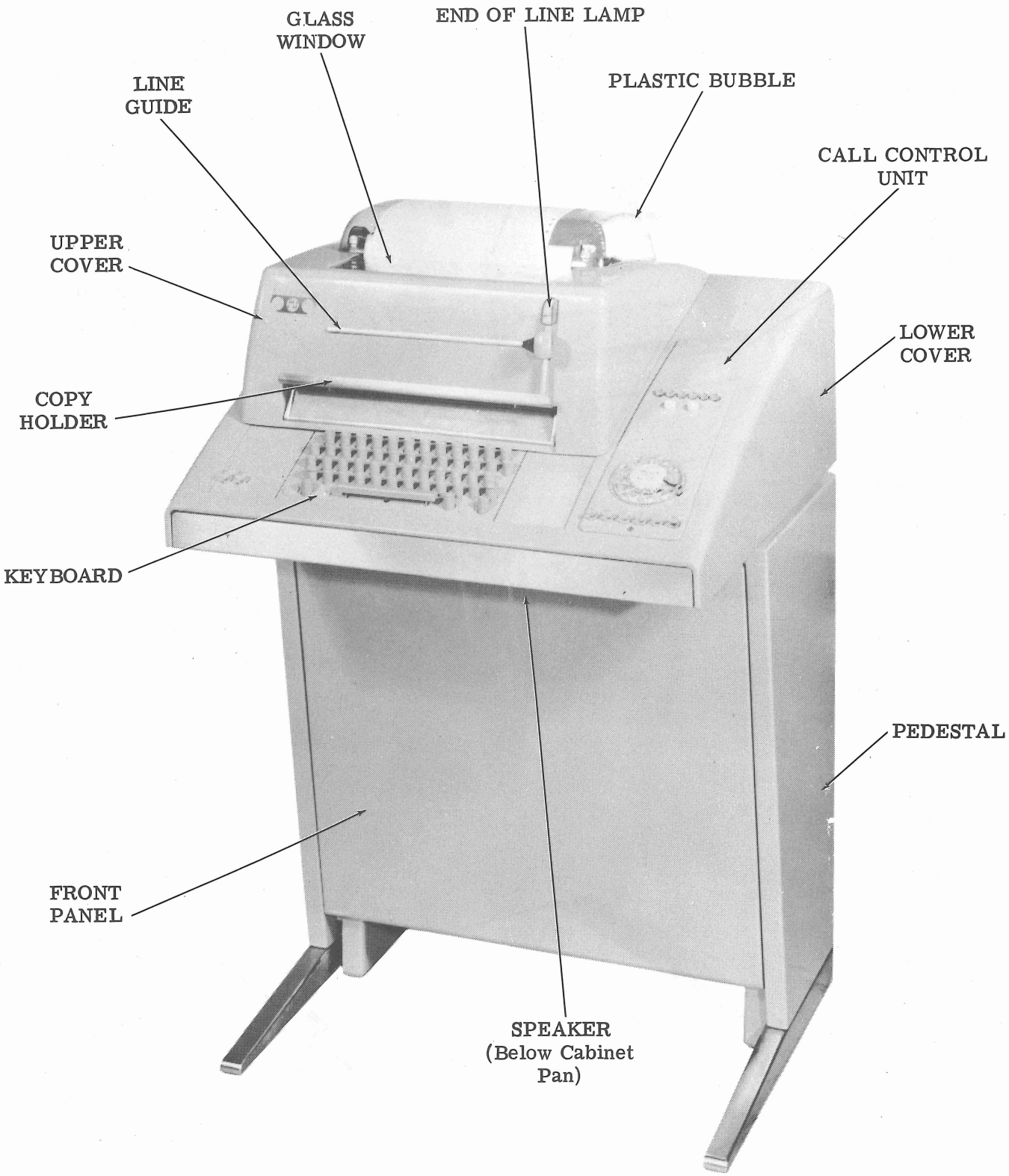

Figure 2 - 35 KSR Set With Call Control Unit
(Switched Network Service)

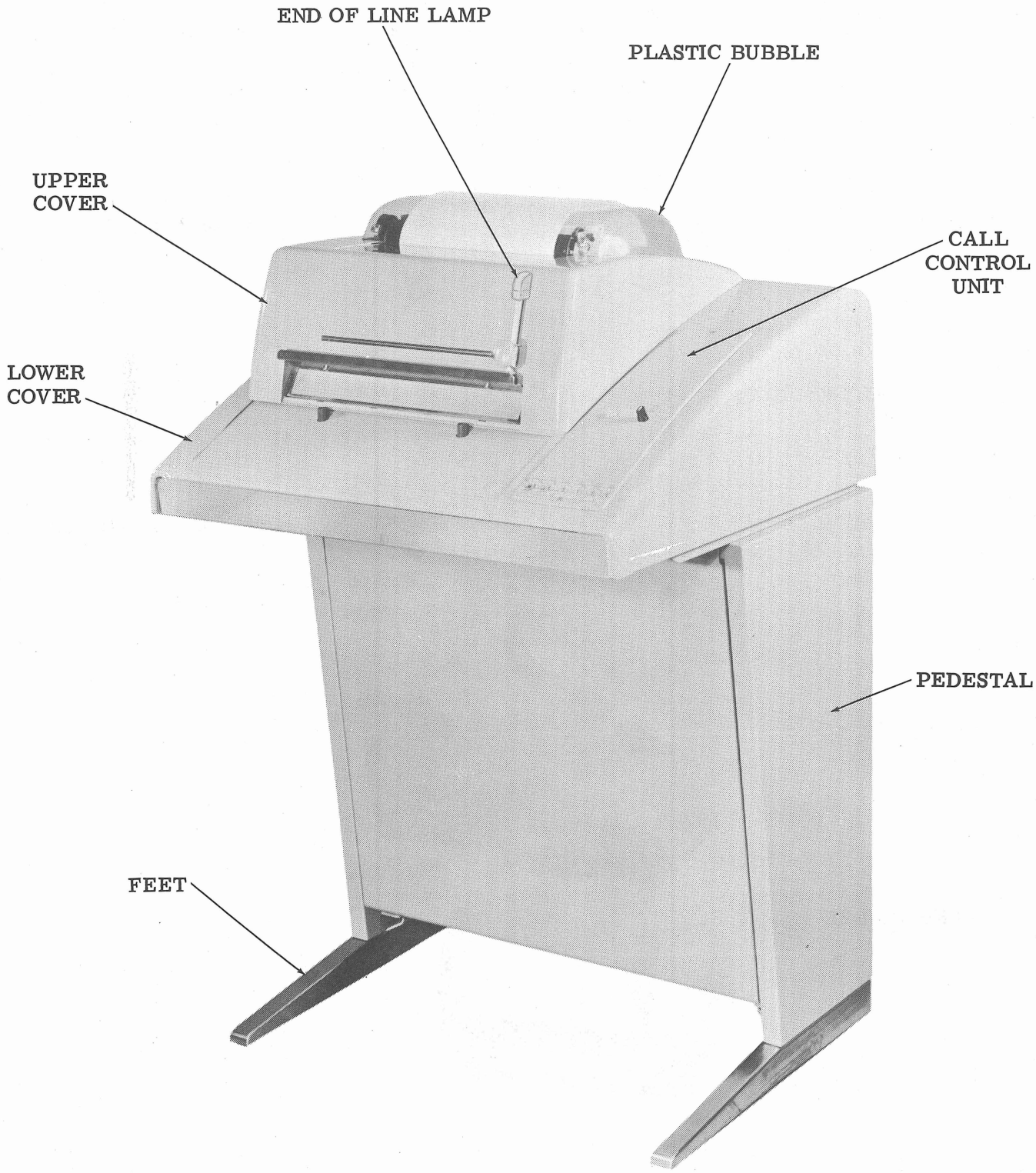

Figure 3 - 35 RO Set With Call Control Unit
(Switched Network Service)

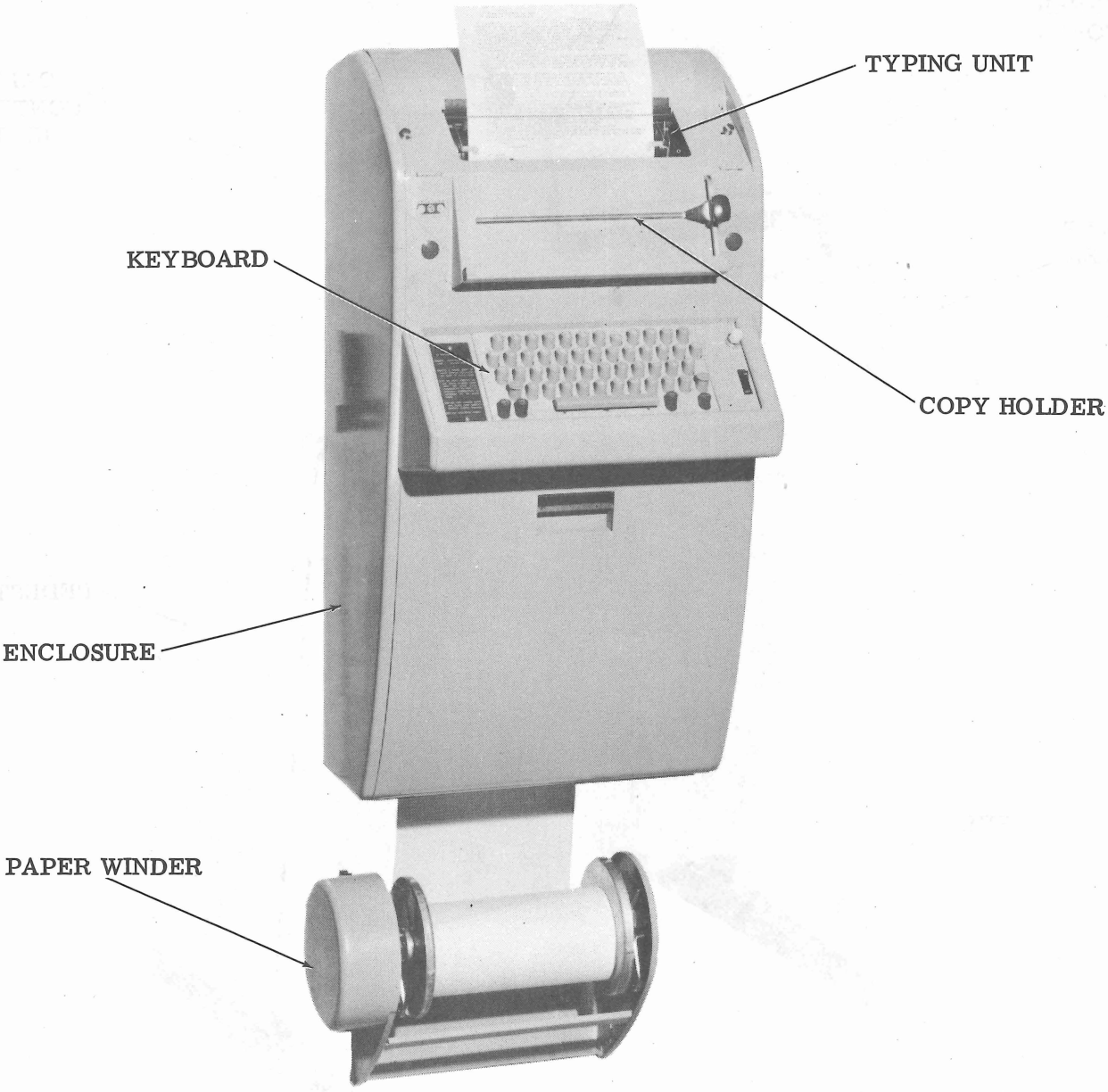

Figure 4 - Wall Mounted 35 KSR Set
(Private Line Service)

VARIABLE FEATURES

4.01 A wide variety of optional features are available with the equipment. These features, which provide special, nonprinting operations or control facilities, or serve as an aid in operation, are in most cases readily installed in the field. Some of the features are described briefly below:

(a) Answer-Back Unit - With this feature, sets can automatically transmit their station identification character sequence, upon request of another station or by local control.

(b) Call Control Unit - In conjunction with the data set, may provide facilities for initiating, accepting, controlling, monitoring, and completing tone-modulated calls. It may include a speaker or hand held receiver, a selector magnet driver, a dialer, and various controls and indicators.

(c) Motor Control Relay - Starts or stops the set's motor during active or idle transmission periods, or in response to other, predetermined signal-line or separate-line conditions.

(d) Accessories - A number of accessories are available to facilitate paper and form handling, including low supply indicator alarms, special trays and shelves, and paper winders.

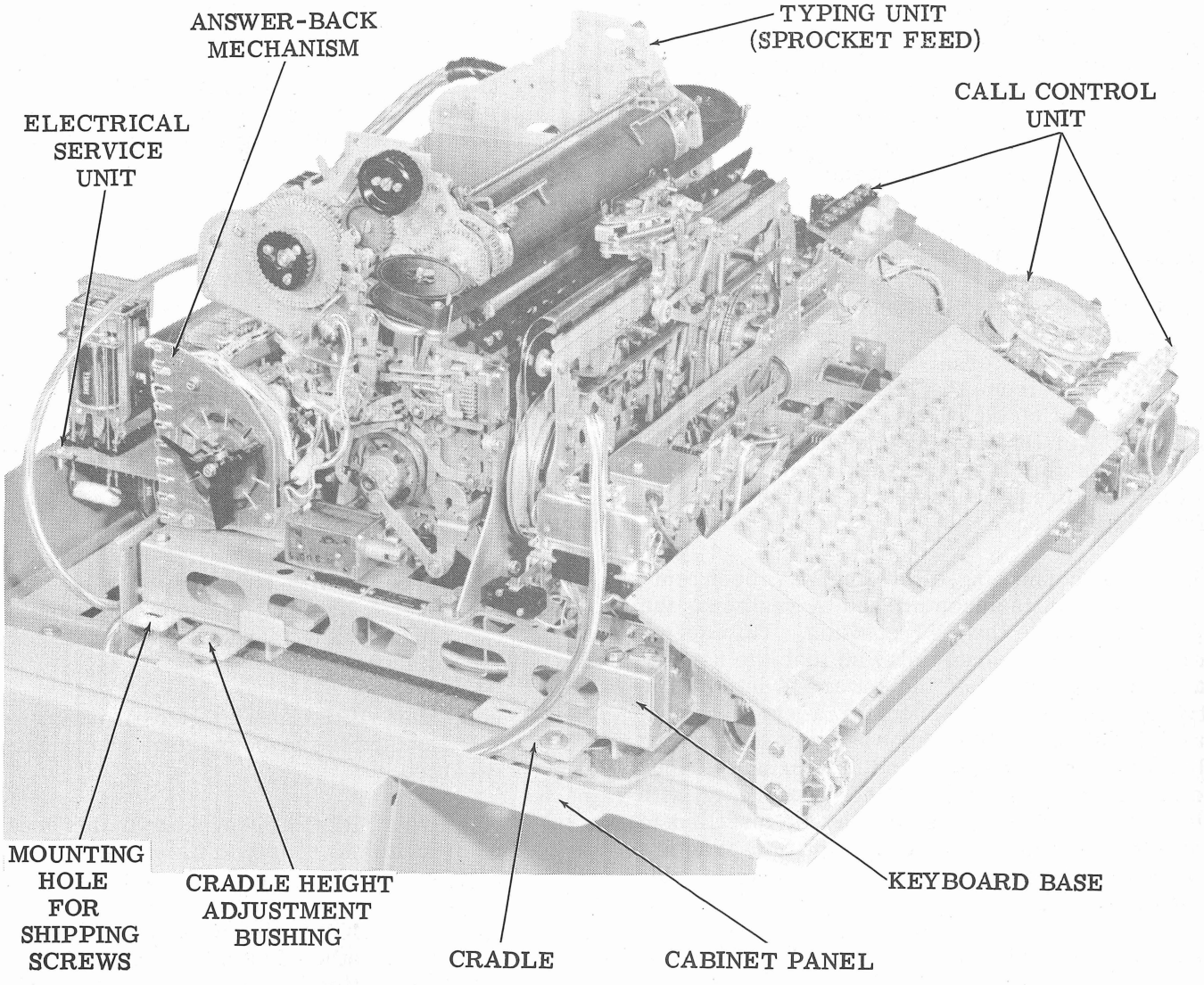

Figure 5 - 35 KSR Set With Cover Removed

5. OPERATION

5.01 The operation of 35 type sets may differ from set to set, depending upon the equipment complement and the service for which the set is designed. In general, two types of application will be discussed: sets that operate over standard lines and whose signal is transmitted as dc pulses, and sets that operate over telephone networks and employ a call control unit in conjunction with a data set to transmit by means of tone (or frequency) modulation.

STANDARD OPERATION (PRIVATE LINE)

A. KSR and RO Sets Without Motor Control Relay

5.02 In this type of operation, the set is energized by placing the power switch in the ON position. The keyboard signal generator (on KSR Sets) BREAK key and selector magnet driver (on KSR and RO Sets) are connected in a series loop with the external signal line and other sets on the line. In this way transmission between stations may proceed, provided the other station(s) are also turned on. It should be noted, however, that in the OFF position a station will be bypassed by the line shunt relay.

5.03 Each station can send only by operating the BREAK key which breaks the series loop with the external line. This stops data transmission from the distant station. In this way, any station on a loop is able to stop transmission over the line. The sending station must restore its ability to transmit by means of the BRK-RLS (break-release) key on the keyboard following a break.

5.04 Disconnecting, after a call has been completed, is accomplished by restoring the power switch to the OFF position. This de-energizes the line shunt relay so that the sending and receiving units of the set are shunted. The typing unit will run open for a short period, as a result of the line shunt relay de-energizing before the motor stops, and may print spurious characters. (An optional line-local relay, with its associated components, may be installed to prevent the printing of spurious characters when switching from line to off and to provide for off-line operation.)

B. KSR and RO Sets With Motor Control Relay

5.05 Where the sets in a system are equipped with electrical service units in which a motor control relay is included, the motor control relay also is inserted in series with the signal line. In this arrangement the power switch remains in the ON position during operating hours.

5.06 This option enables a set to be externally controlled giving unattended operation. The sending station turns the receiving station on by sending a BREAK and turns it off after the data has been transmitted by sending the EOT (end of transmission) code.

C. Set Functions

5.07 Besides the usual printing function of the sets, certain other functions are available for controlling local and distant station equipment.

(a) KSR and RO Sets

(1) Operation of the LOC CR (local carriage return) key releases the type box carriage allowing it to return to the left.

(2) The LOC LF (local line feed) key, when depressed, causes the paper or form to feed out of the printer at an accelerated rate.

(b) KSR Sets Only

(1) The REPT (repeat) key and any other key associated with a character depressed simultaneously results in repeated transmission of the character.

(2) Operation of the SHIFT key simultaneously with any other key having a graphic symbol on the upper half of the keytop results in transmission of that code combination.

(3) The BREAK key when operated causes the keyboard to be electrically shunted.

(4) The BRK-RLS key allows the break switch to return to its unoperated position, unblinding the keyboard.

(5) ALT MODE (alternate mode) key provides other functions (customer option) in station equipment. Pressing ALT MODE key before operating the desired function key will provide the nonprinting function.

(c) Local and distant station equipment functions are controlled by the function box of the typing unit transmitting. They are selected by depressing the CTRL (control) key and the desired function key on the keyboard simultaneously. The function occurs at both the sending and receiving stations.

(1) TAB (horizontal tabulation), VT (vertical tabulation) and FORM (form out) are functions used only in sets containing sprocket feed printers.

(2) The signal bell operates through function box make contacts.

(3) EOT (end of transmission) is used in sets equipped with a motor control relay. The set is turned off when the code combination is transmitted by function box make contacts which cause the motor control stop magnet to energize.

OPERATION OF SWITCHED NETWORK SERVICE SETS

A. Station KSR and RO Sets

5.08 A more detailed explanation of operation of these sets will be found in the section describing the 35 call control unit.

5.09 A call is originated by depressing the ORIG pushbutton. This connects the station to the line, and lights the ORIG lamp. The lamp will remain on until the originate mode is terminated. A dial tone will be heard over the receiver in the set. Upon receipt of the dial tone, the operator may proceed to dial the desired telephone number. A speaker or hand held receiver will monitor the call progress. If the line is busy, depress the CLR (clear) pushbutton and try again. A rotary dialer may be temporarily connected into the telephone line for maintenance purposes by RO Sets. Dialing may be accomplished as follows, depending upon the equipment of a particular set:

- Rotary dial - used in the same manner as a telephone dial.
- Pulsing card dial - a card with the desired station's number punched in it is inserted into the card slot and pushed in. After the START bar is depressed the number is automatically dialed as the card advances out of the slot. Depress RELEASE bar to remove card.
- Touch-tone dial - depress the numbered pushbuttons in correct sequence. Each digit creates a tone which can be heard over the loudspeaker.
- Touch-tone card dial - operates same as pulsing card dial except the card is released by depressing the START bar again.

5.10 When a distant station is called, the ringer will momentarily sound and the set will automatically answer. The ANS (answer) lamp will light, and remain on for the duration of the call. If the set is in LCL (local) mode, the automatic answer feature is disabled, and the ANS pushbutton must be depressed in order to answer the call.

5.11 Other features of the station sets include the following:

(a) Provision is made for insertion of an auxiliary receive-only typing reperforator (ROTR) selector magnet driver in series with the typing unit selector magnet driver. In this way, a perforated and typed record of message transaction can be prepared on tape. A detailed description of the ROTR Set will be found in another section.

(b) The OUT OF SERVICE switch, when operated, renders the set unresponsive to incoming calls. The OUT OF SERVICE lamp is lit, the ringer is disconnected, and the set appears as a don't answer (or busy, if the set has been so modified).

(c) Paper handling controls of the sets provide low paper alarm circuits, a paper out disconnect feature, and a form control and tabulating system.

(1) Low paper alarm is given by a buzzer. A BUZ-RLS (buzzer release) key silences the buzzer and lights the BUZ-RLS lamp. The paper supply must be replenished and the key released to return the set to normal.

(2) The automatic answer circuit is disabled by operation of the low paper switch or when the tape supply runs low in the auxiliary ROTR Set. However, an operator can override the disabled automatic answer circuit by manually answering.

(3) The paper out disconnect feature in sprocket feed typing units performs the same function as the CLR key. It is used in conjunction with low paper contacts, so that no calls will be accepted following the disconnect until paper is replaced in the set.

(4) The form feed operation in a sprocket feed typing unit is initiated from the function box following recognition of the FORM code combination. It is also tripped whenever the data set disconnects, unless the paper is already between forms.

(5) The sprocket feed typing unit is also equipped with horizontal and vertical tabulation mechanisms which are controlled by code recognition in the function box.

(d) The WRU (who are you) key, when held down simultaneously with the CTRL (control) key, allows either station to operate the distant stations answer-back.

(e) The HERE IS key allows a station to send its own answer-back to the distant stations.

(f) The BREAK pushbutton is used by sending KSR stations to immediately stop transmission without losing the connection. The break will blind both sending and receiving keyboards so that no transmission can occur. The condition is indicated by the lighting of the break lamp in the BRK-RLS pushbutton. Each station must restore its ability to transmit by depressing its BRK-RLS pushbutton. The BREAK pushbutton should not be operated when the set is in LCL mode. The BREAK pushbutton is used by receiving RO stations to control an automatic test line.

(g) The REST lamp on KSR Sets lights to warn the typist to slow down when communicating with a slower speed station. If the conversion apparatus is overloaded, a break signal will be generated. The break is distinguished by the fact that both the restrain and break lamps are lighted. To restore transmission, the BRK-RLS pushbutton must be operated.

(h) To use the KSR Set for practice typing and other off-line functions, depress the LCL (local) pushbutton. This will turn the motor unit on and disable the automatic answer-back mechanism. The ringer will signal any incoming calls. These can be answered by depressing the ANS pushbutton.

Note: If the TEST key is operated by KSR or RO Sets while connected to a test center, the message sent by the test center will be turned around and sent back for analysis.

B. Central Office Sets

5.12 These sets are operated in a manner similar to station sets, but have no call control facilities for originating calls. The sets are used for monitoring purposes, and for supervisory direction applications.

5.13 Normally, these sets are operated remotely by energizing their motor control relays, which closes the circuit to the motor units. When the motor starts, the typing unit will respond to the incoming signals and convert them into typed copy.

6. TECHNICAL DATA

SIGNAL REQUIREMENTS

6.01 Data is received or transmitted using the American National Standard Code for Information Interchange (ASCII). This code has seven intelligence bits which are used in the 11-unit teletypewriter code. The start bit, always transmitted as spacing, seven intelligence bits, an eighth (parity) bit, and a stop pulse two bits in length and always transmitted as marking for synchronization purposes, make up the code. Intelligence bits one through seven may be either marking or spacing depending upon the character or function to be transmitted. The eighth bit is always marking unless the sets are equipped to provide an even parity output. If even parity is provided, the eighth bit may be either marking or spacing in order to always supply an even number of marking pulses for each code transmitted. (This is a feature of sets that provide error detection.) At an operating speed of 100 words per minute, each bit is 9.09 milliseconds in length. See the applicable section for a detailed description of the code.

6.02 The dc signal received over the incoming line is an on-off (mark-space) current type which varies from either 0.060 ampere or 0.020 ampere (marking) to zero ampere (spacing), depending upon the equipment. In tone modulation circuits a data set provides the 0.020

ampere dc signal by demodulating ac tones that have been transmitted over telephone networks.

6.03 Signals from the incoming line or from the data set are amplified to 0.500 ampere marking and zero ampere spacing pulses by the selector magnet driver.

POWER REQUIREMENTS

6.04 The motor units that provide electromechanical rotating motion for operating the various 35 teletypewriter sets are of two basic types: synchronous and series (governed).

(a) Sets with synchronous motor units — 115 v ac, ±10%, 60 ±75% Hz single phase.

(b) Sets with governed motor units —

(1) 115 v ac ±10%, 50-60 Hz single phase.

(2) 115 v dc ±10%, with external resistance.

6.05 This equipment is intended to be operated in a room environment within the temperature range of 40°F to 110°F. Serious damage to it could result if this range is exceeded. In this connection, particular caution should be exercised in using acoustical or other enclosures.

7. RO SETS FOR NO. 1 ESS-ADF (ADNET), 85A1, 86A1, AND 86B1 SELECTIVE CALLING

7.01 A 35 RO used in a No. 1 ESS-ADF (ADNET), 85A1, 86A1, or 86B1 Selective Calling Service includes a special electrical service unit and related components which permit it to operate as a terminate only primary receiver, an auxiliary receiver, or a primary station with an auxiliary receiver. The type of service is determined by strapping options, cabling, and adjunct equipment.

7.02 A terminate only RO is interfaced, through appropriate cables, to two data auxiliary sets: an 820 type used as a station controller and an 804 type used as an attendant set. The RO is controlled by the data auxiliary sets and is the only receiver of the station.

7.03 When used as an auxiliary receiver, the auxiliary RO is connected by cable to a primary RO or ASR. The auxiliary RO receives its signals from the primary, and must be called in manually or by appropriate control signals from the primary.

7.04 The power switch on the electrical service unit has two positions used as follows: A MAINT. ON position permits operation of the

DIMENSIONS (INCHES)

Set	Height	Width	Depth
Floor Model (With Call Control Unit)			
KSR	38-1/2	24	24
RO	38-1/2	24	24
Floor Model (Without Call Control Unit)			
KSR	38-1/2	20	24
RO	38-1/2	20	24
Table Model			
KSR	13-1/2	20	24
RO	13-1/2	20	24
Wall Mounted Model			
KSR	31-3/4	16-1/2	14-1/4
RO	31-3/4	16-1/2	10-1/2

terminal for test purposes without energizing the motor start relay. In the NORMAL ON position the motor start relay must be energized by the data auxiliary set in order for the motor to turn on.

7.05 When the RO is serving as an auxiliary receiver, manual call-in of the auxiliary set is provided by the AUXILIARY RECEIVER switch. This is a locking pushbutton switch which is located on the primary receiver and, when depressed, energizes the auxiliary teletypewriter receive only relay. This unblinds the auxiliary receiver, which remains unblinded until the switch is depressed again. A lamp in the pushbutton remains lit as long as the switch is on.

7.06 The receive only relay can also be energized by closure of the DC2 stunt box contacts in the primary receiver. A received DC2 closes these contacts, which lock to hold the auxiliary receiver unblinded. The DC2 contacts are unlocked to blind the auxiliary receiver by a received DC4 or ETX.

7.07 The selector of an RO used in this service is equipped with selector auxiliary contacts used as a lost character detect feature. The normally closed contact opens for each character received by the printer, and serves as an indication that the character has been processed. If for some reason the contact does not open, a character is "lost" and the controller is alerted to the fact that the message is incomplete.

7.08 An optional print suppress feature on the primary RO is available when an associated auxiliary RO is used.

7.09 Test jacks are provided for connecting test equipment.