35 RECEIVE-ONLY TELETYPEWRITER SET

GENERAL DESCRIPTION AND OPERATION

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1. GENERAL DESCRIPTION

1.01 This section has been generally revised to include recent engineering changes and to add late 35 Type equipment.

1.02 The 35 Receive-Only Teletypewriter (RO) Set is a basic teletypewriter set. It is an electro-mechanical device, capable, when properly adapted, of receiving messages over telephone networks, telegraph lines, or radio channels. The RO Set prints these messages on page size copy paper or continuous business forms at rates up to 100 words per minute.

1.03 The components used in an RO Set will vary from one installation to another, depending upon the installation requirements. In general, a set consists of a typing unit, a base, a motor, and an electrical service unit, all mounted in a cabinet. Sets that are required to operate over tone modulated telephone networks (Switched Service Networks) include a call control unit and an answer-back mechanism. All of these components are discussed in detail in the appropriate section for that unit.

1.04 RO Sets employed in tone modulated telephone networks require the use of a data set. However, the data set is not supplied as a part of the RO Set. When used, it is mounted on an apparatus rack in the pedestal of the cabinet or, in some installations, is included with switchboard equipment. A description of the data set will be found in a separate section.

2. COMPONENTS

CABINET

2.01 Cabinets designed to house the components of the RO Sets are floor standing enclosures. They are made up of two main parts: the pedestal or lower part and the cover or upper part.

(a) The pedestal is a sheet metal box-like construction that rests on two feet which extend forward to support the weight of the set. Cabinets used with sets that print data

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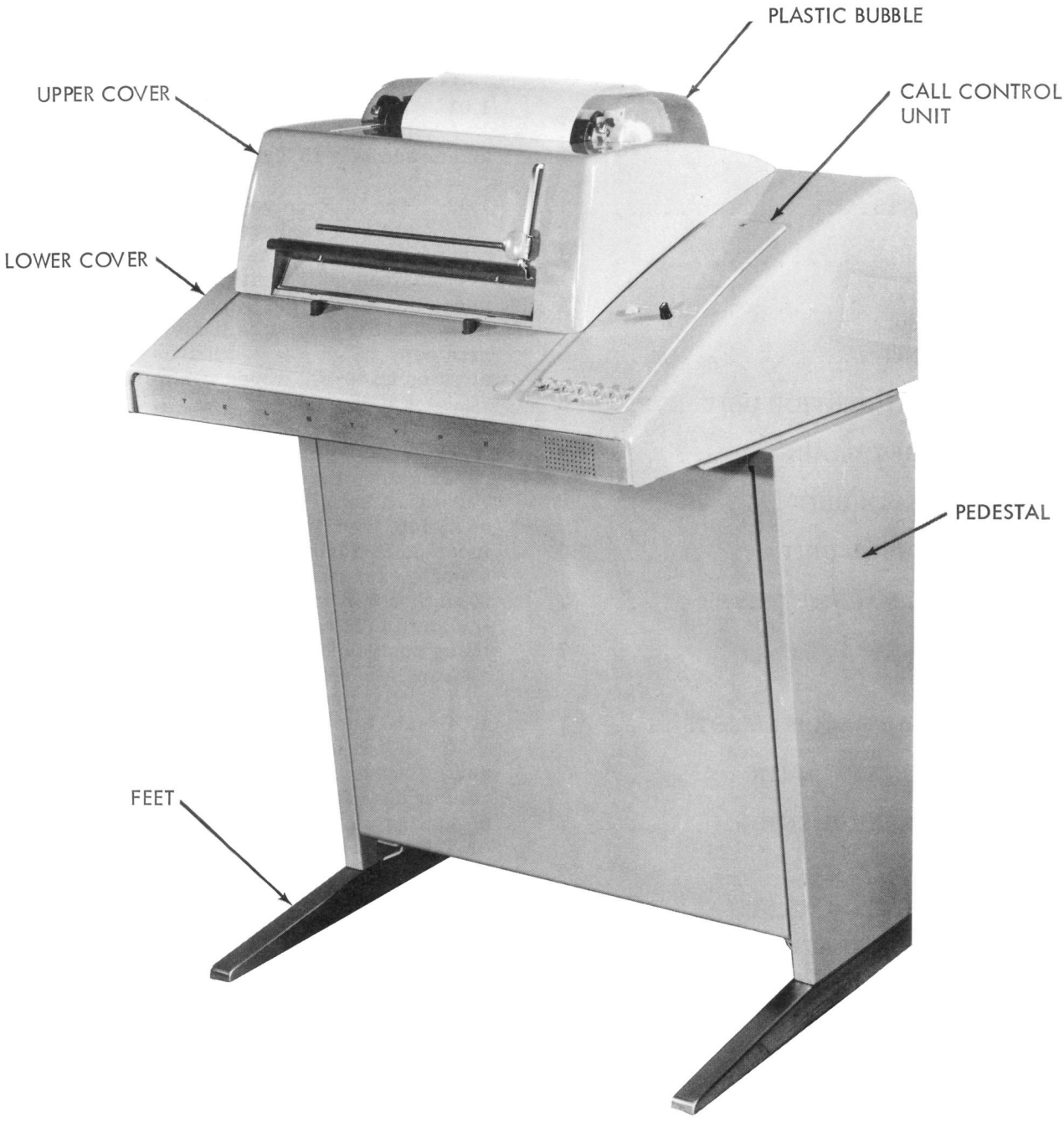

Figure 1 - 35 Receive Only Set (Station Equipment)

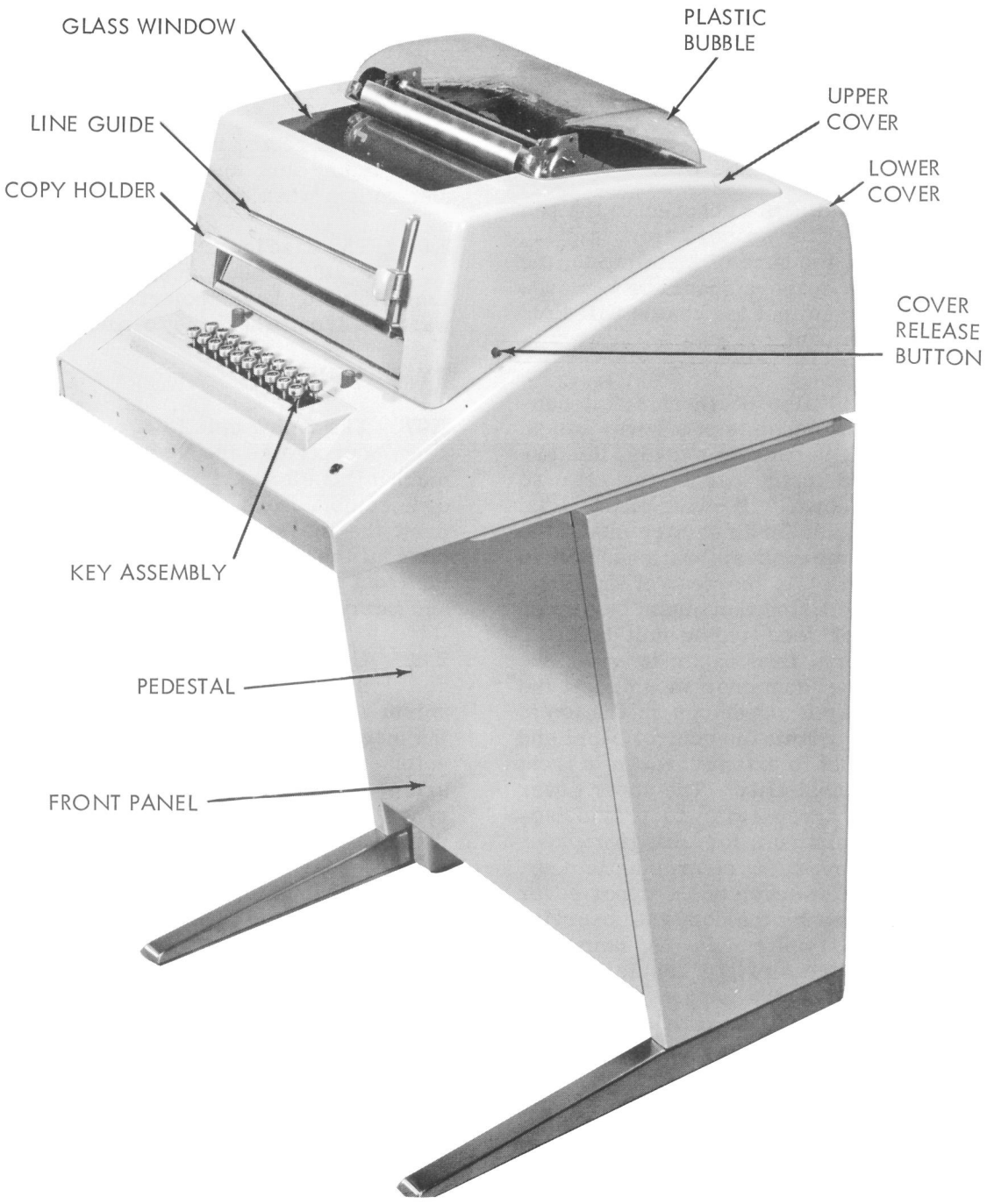

Figure 2 - 35 Receive Only Set (Central Office Equipment)

on continuous business forms are supplied with rearward extending feet to prevent tilting of the enclosure when the cover is opened. A removable panel on the front of the pedestal provides access to the apparatus mounting racks. The rack is used to support any necessary relay assemblies or a data set, if used. An equipment supporting pan is spot welded to the top of the pedestal. The pan contains mounting facilities for the components of the set, including a shock mounted cradle onto which the base for the typing unit is secured.

Note: The cradle is anchored to the pan by four bolts with spacers, for shipping purposes. At the time of installation, the four bolts and spacers should be removed and discarded so that the cradle will float on its shock mounts.

(b) The cover is also of sheet metal construction. It consists of a lower and an upper cover and, in present models, this assembly is hinged to the pan at the rear so that the entire cover will swing clear of the enclosed equipment. (In an earlier model the cover rests on four rubber vibration isolators and is not hinged.) At the rear of the lower cover is a closed slot that must be opened when a sprocket feed typing unit is used. This permits form feed paper to enter the cabinet from the container mounted at the rear of the pedestal. Openings in the top of the lower cover permit the control panel and keys of the RO Set to extend through in front for operator accessibility. The upper cover is hinged to the lower cover to provide access to the equipment for changing paper supply or ink ribbon. A clear plastic door, or bubble, is located on top of the upper cover to provide for viewing the copy and observing operation of the typing unit. A laminated glass window in front of the bubble enables the operator to view the copy as it is typed. The rear edge of the glass provides a paper tearing surface for typed copy.

2.02 The cabinets are also equipped with a copyholder and line guide for short copy, and copy illuminating lamps for the typing unit printing area.

2.03 Cabinets that have facilities for mounting a call control unit are about four inches wider than cabinets not having such mounting facilities.

BASE

2.04 The base is a sheet metal box arrangement designed to serve the function of a mounting for the typing unit, motor, and the answer-back mechanism when used. The base also incorporates such manual controls as are required for operation of the set.

2.05 An intermediate drive gear assembly, which determines the speed of operation, is located centrally toward the rear of the base. It transmits rotary motion from the motor unit to the typing unit and also to the answer-back mechanism when this feature is used.

2.06 The base is installed on the shock mounted cradle in the pan of the cabinet pedestal. Local function keys project beyond the base toward the front where they can be easily operated.

TYPING UNIT

2.07 The typing unit is a mechanism that incorporates the necessary electrical and mechanical elements to translate the signaling code combinations into mechanical actions which print the messages and perform functions incidental thereto. It is mounted centrally, toward the front of the base, in front of the motor unit and intermediate gear assembly.

2.08 Code signals are applied to a two coil magnet associated with a selecting mechanism which interprets the signals and controls the mechanical action involved in typing a character or performing a required function. Means are provided for orientating the selector to the received signal. The ac motor is geared to the mainshaft of the typing unit by way of the intermediate gear assembly mentioned in 2.05. Typing and various functional sections of the typing unit are activated by individual clutches.

2.09 Typing is produced by type pallets which are arranged in a small typebox. In operation, the typebox moves across the paper and presents the proper type pallets to the printing hammer while the platen remains stationary. The pallets are driven forward against the inked ribbon and paper to print characters.

2.10 The friction feed typing unit uses single or multi-copy paper from a five inch diameter roll. The roll of paper is mounted between the side frames of the typing unit and passes around the platen, which is a cylinder free to rotate on its axis. A low paper switch is operated when a low paper supply condition

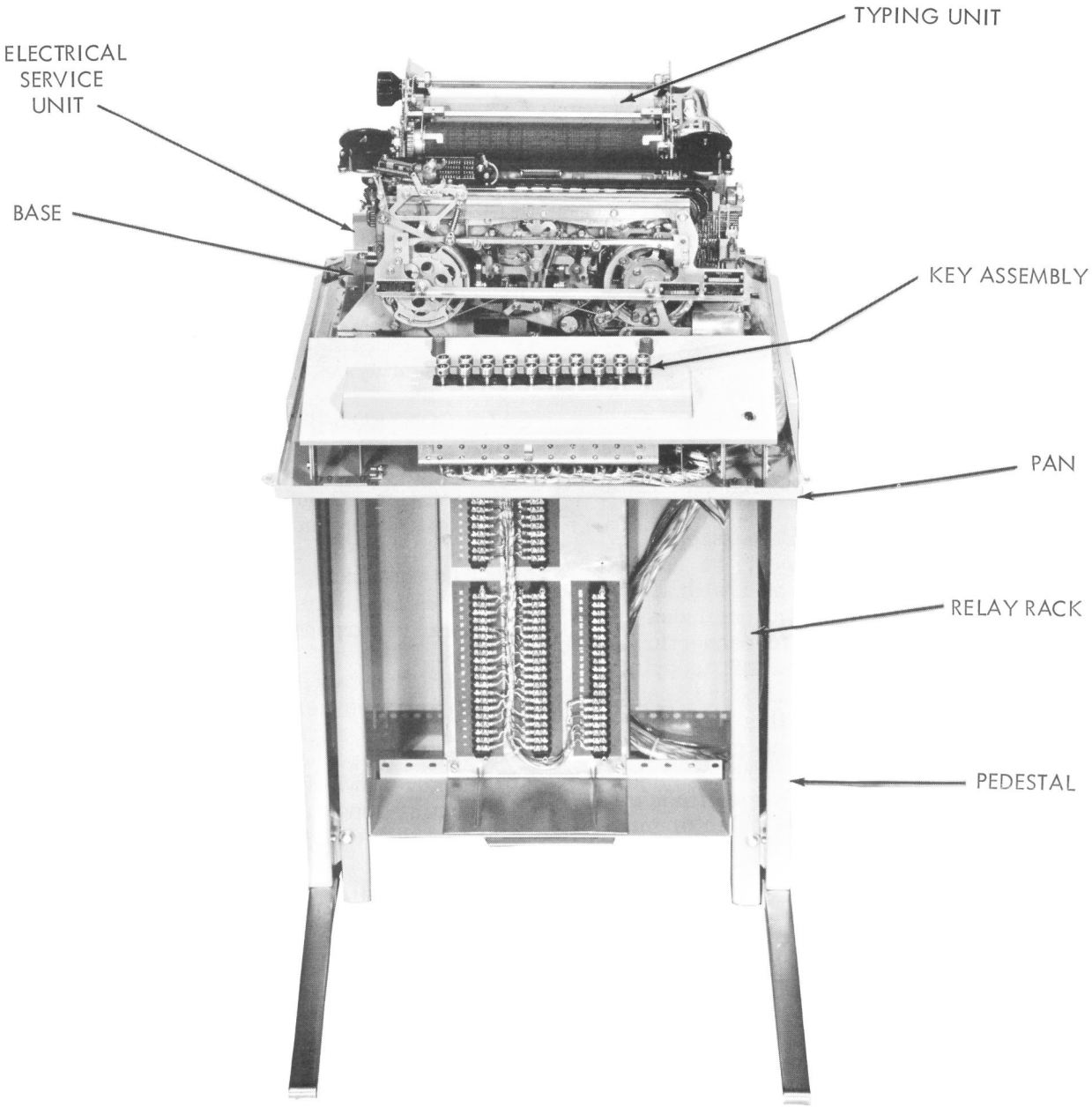

Figure 3 - 35 Receive Only Set (Central Office Equipment)
Cover and Front Panel Removed

exists. In addition to the above functions, built-in facilities in a function box permit the operation of associated contacts on predetermined code combinations for certain recognition or remote functions.

2.11 The sprocket feed typing unit uses form feed paper. The forms enter the cabinet through a slot at the rear of the cabinet. The supply of form feed paper is kept on a form supply and accumulating shelf attached to the rear of the cabinet, on sets so equipped. The forms are advanced around the platen by sprockets located at both ends of the platen. Vertical and horizontal tabulation and remote form feed-out are optional features of this typing unit.

2.12 Selector magnet signal lines and function box contact lines are connected to their associated circuits by way of a connector receptacle located on the right frame of the typing unit towards the rear.

ELECTRICAL SERVICE UNIT

2.13 The electrical service unit is mounted in the cabinet pan, directly behind the cradle and base. It consists, basically, of a main chassis and a number of mounting plate assemblies. The assemblies rest on the top of the chassis and are interconnected, as required, with strapping. The electrical service unit includes the cables with connectors for interconnection of the various components of the set, copylight power facilities, a main terminal board assembly, a control panel assembly with a BREAK key or a power panel connector, and circuitry for signal improvement. Other facilities contained in the electrical service unit for specific applications include line relay, fuses, selector magnet driver, etc.

LOCKING KEY PANEL

2.14 The RO Set for central office use in tone modulated telephone network service is equipped with a locking key panel and a momentary erase key, both associated, through the apparatus rack in the pedestal, with the switchboard circuit. The panel is located in front of the typing unit area in the space that would be occupied by a keyboard in the KSR Set. It has two rows of ten locking keys to enable the attendant to interconnect a monitoring desk with an operating position. The number displayed for the selected circuit may be erased before the called party answers, by operation of the display erase key.

ANSWER-BACK UNIT

2.15 The answer-back unit is located on the left rear corner of the base in sets so equipped. Its main components are a coded message drum, a main shaft, and a distributor assembly. The answer-back mechanism receives its motive power from the motor unit by way of the intermediate gear assembly. Its speed of operation is the same as the set with which it is used.

2.16 The answer-back unit is designed to distribute, upon receipt of a "who are you" (WRU) or HERE IS signal, a predetermined sequence of characters which identifies the station. A maximum of twenty characters may be transmitted from the coded message drum. The character sequence is determined by the manner in which the drum is coded by the customer. Specific coding information is contained in the adjustment section for the 35 Answer-Back Assembly.

CALL CONTROL UNIT

2.17 The call control unit is a component of station RO Sets used in switched service networks. In conjunction with a data set, it provides facilities for initiating, accepting, controlling, and completing tone modulated calls. (Initiating calls in this application is included for maintenance purposes primarily.)

Note: The data set is a solid state device that provides certain control functions and converts dc signals from a sending station to tone frequencies for transmission over telephone switched networks and converts incoming tone frequencies to dc signals for use by the teletypewriter set.

2.18 The call control assembly is located to the right of the typing unit in the cabinet pan. Its indicators and controls are accessible on the right side of the top of the cover. The visible indicators and controls are:

(a) Hand held receiver - for monitoring calls.

(b) Illuminated push buttons.

ORIG (Originate)
CLR (Clear)
ANS (Answer)
TST (Test)
LCL (Local)
BUZ RLS (Buzzer Release)

(c) Out of service lamp.

(d) Out of service rotary switch.

2.19 Elements of the call control unit located under the cover are:

(a) Ringer - Sounds momentarily when set is called.

(b) Selector magnet driver - Located in call control unit in station RO equipment. See 2.13 and 2.20.

(c) Power supply - Provides isolated operating potential for the selector magnet driver.

(d) Fuses - One for selector magnet driver circuit and one for power circuit.

(e) Convenience outlet - 115 vac.

(f) Cable termination area - Located at rear of unit.

(g) Break switch - Located under bezel, for maintenance use.

(h) Here is switch - Located under bezel, for maintenance use.

SELECTOR MAGNET DRIVER

2.20 The selector magnet driver is a solid state device that amplifies and shapes the incoming signal. It is mounted on a printed circuit card that plugs into a card edge connector. The assembly may be installed in the electrical service unit, call control unit, or a remote control unit as required. The input signal may be 0.020a or 0.060a, depending on the card used, and the output signal is 0.500a to operate the selector mechanism of the typing unit.

MOTOR UNIT

2.21 The motor unit is a complete assembly consisting of a 1/20 horsepower synchronous motor and a suitable mounting arrangement. It provides all the motive power for the 35 RO Set.

3. ELECTRICAL REQUIREMENTS

POWER REQUIREMENTS

3.01 The Receive-Only Set operates on 115 vac $\pm$ 10%, single phase, 60 cycles $\pm$ 0.5 cycle. The operating set draws 225 va. The power cord is a three-pin, grounded type on sets equipped with a power cord.

SIGNAL REQUIREMENTS

3.02 Data is received using the eight-level data interchange code. This code is an eleven unit equal bit code. The start bit, always spacing, eight intelligence bits, and a stop pulse, two bits in length and always 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 transmitted. The eighth intelligence bit is always marking unless the set is 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.

3.03 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.

3.04 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.

4. OPERATION

4.01 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

A. Sets Without Electrical Motor Control Relay

4.02 In this type of operation, the Receive-Only Teletypewriter Set is energized by turning the rotary switch on the power panel to

the ON position. The BREAK key and selector magnet driver are connected in a series loop with the external signal line and other sets on the line. In this way transmission between stations and to RO Sets may proceed. It should be noted, however, that in the OFF position, a station will be by-passed by the line shunt relay.

4.03 The RO Set 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.

4.04 To disconnect after a call has been completed, turn the rotary 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 some 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. Sets With Electrical Motor Control Relay

4.05 Where the RO Sets in a system are equipped with electrical service units in which an electrical motor control relay is included, the motor control relay also is inserted in series with the signal line. In this arrangement, the rotary switch to the right of the keyboard remains in the ON position during operating hours.

4.06 This option enables a set to be externally controlled, giving unattended operation. The sending station turns the RO Set 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

4.07 Besides the printing function of an RO Set, certain other functions are available for controlling the local equipment.

(a) Operation of the LOC CR (local carriage return) key releases the typebox carriage allowing it to return to the left.

(b) Operation of the LOC LF (local line feed) key causes the paper or form to feed out of the printer at an accelerated rate.

4.08 Certain specific non-printing functions (customer options) will be performed upon receipt of the proper code from the sending station.

4.09 Other non-printing functions that are performed in response to the incoming signal include operation of a bell and, in sprocket feed typing unit, such features as form feed-out, horizontal tabbing, and vertical tabbing.

OPERATION IN TONE MODULATED CIRCUITS (SWITCHED SERVICE NETWORKS)

A. Central Office RO Sets

4.10 Normally, these RO 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.

4.11 In RO Sets equipped with the locking key panel, the attendant can selectively interconnect the monitoring desk with any operating position at the teletypewriter switchboard center. The key panel displays two rows of ten keys each. By selecting the right combination of TENS key and UNITS key, a given operating position can be monitored. Operating another TENS or UNITS key mechanically releases the keys used in the previous selection. A DISPLAY ERASE key, when operated, will effect a disconnect before the called party answers.

B. Station RO Sets

4.12 When a station RO Set is called, the ringer will sound for a moment and the set will automatically answer, that is, the ANS lamp will light and remain on for the duration of the call, the motor will start and the automatic answer-back is triggered. The multiple character station identification is sent to the calling station and will be typed by the typing unit at both the called and calling stations. The transmitted message is then received and typed at the called station.

4.13 To answer a call manually, the ANS non-locking key is operated. This connects the station to the line and lights the ANS lamp. The sequence is then the same as in 4.12. Manual answering is required only when the auto-

matic answer circuit is disabled. (Automatic answer circuit is disabled by tabulating and form feed contacts in the sprocket feed typing unit, low paper contacts, low tape contacts in the auxiliary ROTR (receiving only typing reperforator), and data set relay contacts in the local mode.)

4.14 A call is normally terminated by the end of transmission (EOT) code combination generated at the calling station. To manually clear a connection, operate the CLEAR non-locking key that triggers the clearing sequence in the data set and lights the CLEAR lamp which remains lit for the duration of the clearing sequence.

4.15 To originate a call for maintenance purposes only the ORIG non-locking key is operated. This lights the ORIG light and connects the station to the line. A hand held receiver permits monitoring of supervisory signals when originating the call and a rotary dial is temporarily connected into the telephone line to dial the desired telephone number. When connection has been made with the called station, the typing unit motors will turn on and both sets will be ready for data transmission. The HERE IS key can be operated to send the answer-back message to the distant station. The BREAK push button is used to control an automatic test line.

4.16 Other features of station Receive-Only Sets include the following:

(a) Provision is made for insertion of an auxiliary receive-only typing reperforator 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 self-contained ROTR set will be found in a separate 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.

(c) Paper handling controls of the RO Set provides 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 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 condition 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 operation. 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 test (TST) key is operated while the set is connected to a test center. The message sent by the test center will be printed by the typing unit and turned around and sent back for analysis.