

**BULLETIN 309B
VOL 1**

**TECHNICAL MANUAL
32 TELETYPEWRITER SETS
RECEIVE-ONLY (RO)
KEYBOARD SEND-RECEIVE (KSR)
AUTOMATIC SEND-RECEIVE (ASR)**



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309B
VOLUME 1

INTRODUCTION

Bulletin 309B is a technical manual that provides general and specific information about the 32 Receive-Only (RO), Keyboard Send-Receive (KSR), and Automatic Send-Receive (ASR) Teletypewriter Sets and their component units.

Volume 1 contains a description of the 32 Teletypewriter Sets and gives installation instructions. Also included in Volume 1 is information on the disassembly and reassembly, lubrication, and principles of operation of the component units of the Teletypewriter Sets. Circuit descriptions (Section 574-160-103TC) which were deleted from Change 1 have been reinstated in Change 2. Volume 2 includes adjustment information on all component units of 32 Teletypewriter Sets.

Each volume is made up of a group of appropriate, independent sections. They are separately identified by title and section number, and the pages of each section are numbered consecutively, independent of other sections. The identifying number of a section, a 9-digit number, appears on each page of the section, in the upper left corner of left-hand pages and the upper right corner of right-hand pages.

To locate specific information, refer to the table of contents. Find the name of the involved equipment in column one and the content of the section in column two. The correct 9-digit section will then be found in column three. The sections are arranged in the order shown in the table of contents. Turn to page one of the section indicated where the contents of that section will be found (except where a section is small and does not require a listing of contents).

The sections comprising this bulletin are now stocked separately and may be individually ordered if the entire bulletin is not required.

TABLE OF CONTENTS

FILING INSTRUCTIONS

1. The following filing instructions apply to changes sent to the field.
2. Asterisk (*) in the table of contents indicate changes.
3. When the issue of a section changes, replace the old issue with the attached new one.
4. In the case of addendums, turn to the affected section and follow the instructions on the first page of the attached addendum.
5. Replace the old table of contents with the new one.

<u>Equipment</u>	<u>Content</u>	<u>Section</u>	<u>Issue</u>
32 Teletypewriter Sets	General Description and Operation	574-160-100TC	2
32 Teletypewriter Sets	Circuit Descriptions	574-160-103TC	1*
32 Teletypewriter Sets	Installation	574-160-200TC	2
32 Teletypewriter Sets	Removal and Replacement of Components	574-160-702TC	1
32 Keyboard	General Description and Principles of Operation	574-171-100TC	2
32 Keyboard	Lubrication	574-171-701TC	2
32 Keyboard	Disassembly and Reassembly	574-171-702TC	2
32 Typing Unit	General Description and Principles of Operation	574-172-100TC	2
32 Typing Unit	Lubrication	574-172-701TC	2
32 Typing Unit	Disassembly and Reassembly	574-172-702TC	1
32 Call Control Unit	General Description and Operation	574-173-100TC	1
32 Tape Reader	General Description and Principles of Operation	574-174-100TC	2
32 Tape Reader	Lubrication	574-174-701TC	2
32 Tape Reader	Disassembly and Reassembly	574-174-702TC	1
32 Tape Punch	General Description and Principles of Operation	574-175-100TC	2
32 Tape Punch	Lubrication	574-175-701TC	2
32 Tape Punch	Disassembly and Reassembly	574-175-702TC	1
32 Cover	General Description	574-176-100TC	1
32 Cover	Lubrication	574-176-701TC	1

32 TELETYPEWRITER SETS

GENERAL DESCRIPTION AND OPERATION

CONTENTS	PAGE
1. GENERAL	1
2. TELETYPEWRITER SETS	1
RECEIVE-ONLY (RO) TELETYPE- WRITER SET	1
KEYBOARD SEND-RECEIVE (KSR) TELETYPEWRITER SET	1
AUTOMATIC SEND-RECEIVE (ASR) TELETYPEWRITER SET	1
3. COMPONENTS	3
A. Typing Unit	3
B. Call Control Unit	4
C. Keyboard	4
D. Tape Punch	6
E. Tape Reader	6
4. SET FEATURES	6
5. TYPICAL APPLICATION	7
6. TECHNICAL DATA	8

1. GENERAL

1.01 This section provides a general description of the 32 teletypewriter sets. It is reissued to include engineering changes, and to make corrections. Marginal arrows indicate changes and corrections.

1.02. The 32 teletypewriter sets described in this section 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 left, right, up, down, front, rear, etc, consider the teletypewriter set as viewed by the teletypewriter operator.

1.04 This section covers the following teletypewriter sets:

- (a) Receive-Only (RO) Teletypewriter Set
- (b) Keyboard Send-Receive (KSR) Teletypewriter Set
- (c) Automatic Send-Receive (ASR) Teletypewriter Set

2. TELETYPEWRITER SETS

RECEIVE-ONLY (RO) TELETYPEWRITER SET (Figure 1)

2.01 The RO set can only receive messages and print them on a paper copy. It has no transmitting capabilities. Essentially the RO consists of two components:

- (a) Typing unit
- (b) Call control unit

KEYBOARD SEND-RECEIVE (KSR) TELETYPEWRITER SET (Figure 2)

2.02 The KSR set can receive and transmit messages, and print them on a paper copy or sprocket form. It consists of the following components:

- (a) Typing unit
- (b) Call control unit
- (c) Keyboard

AUTOMATIC SEND-RECEIVE (ASR) TELETYPEWRITER SET (Figure 3)

2.03 The ASR set consists of the following components:

- (a) Typing unit
- (b) Call control unit

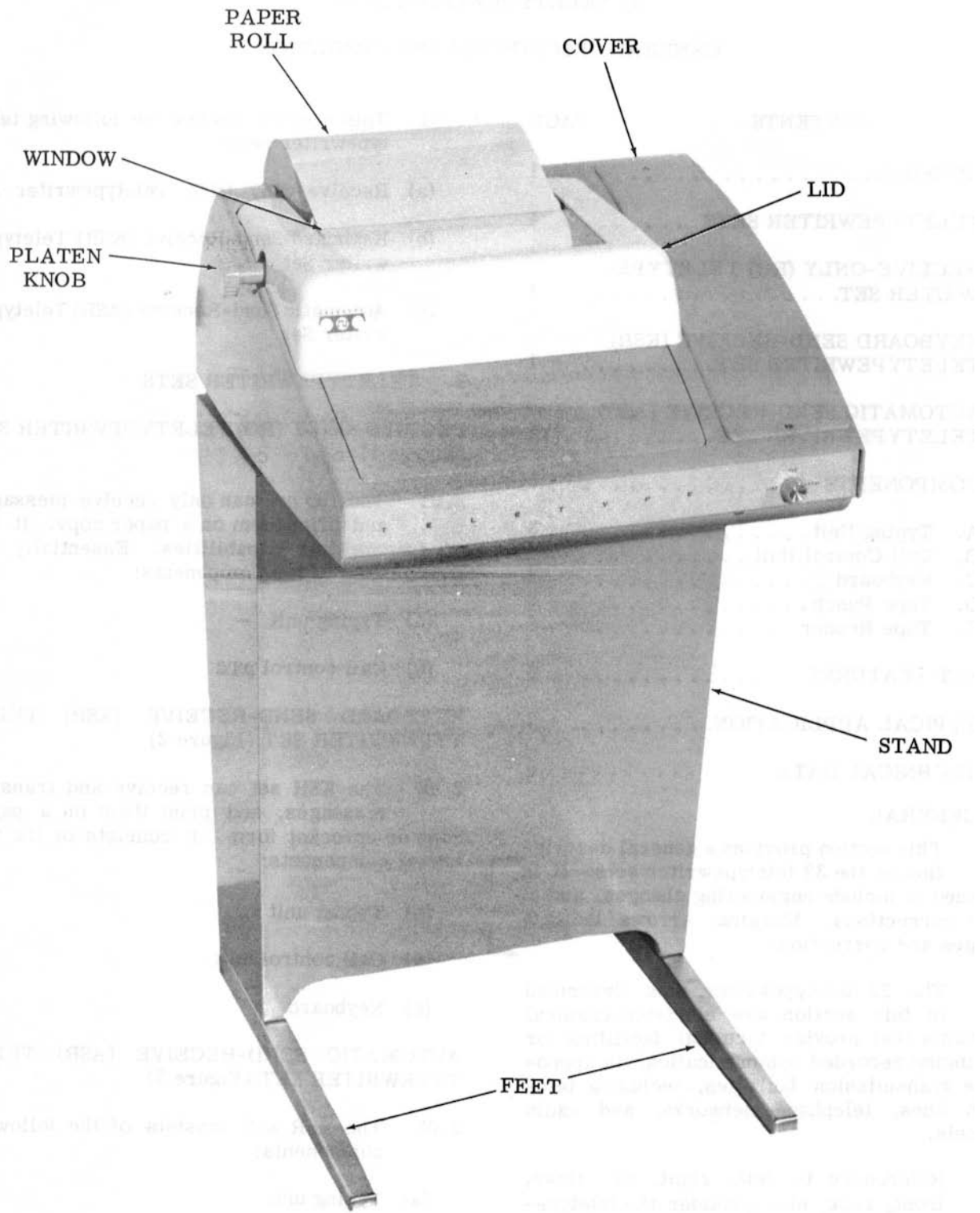


Figure 1 - Model 32 Receive-Only (RO) Teletypewriter Set

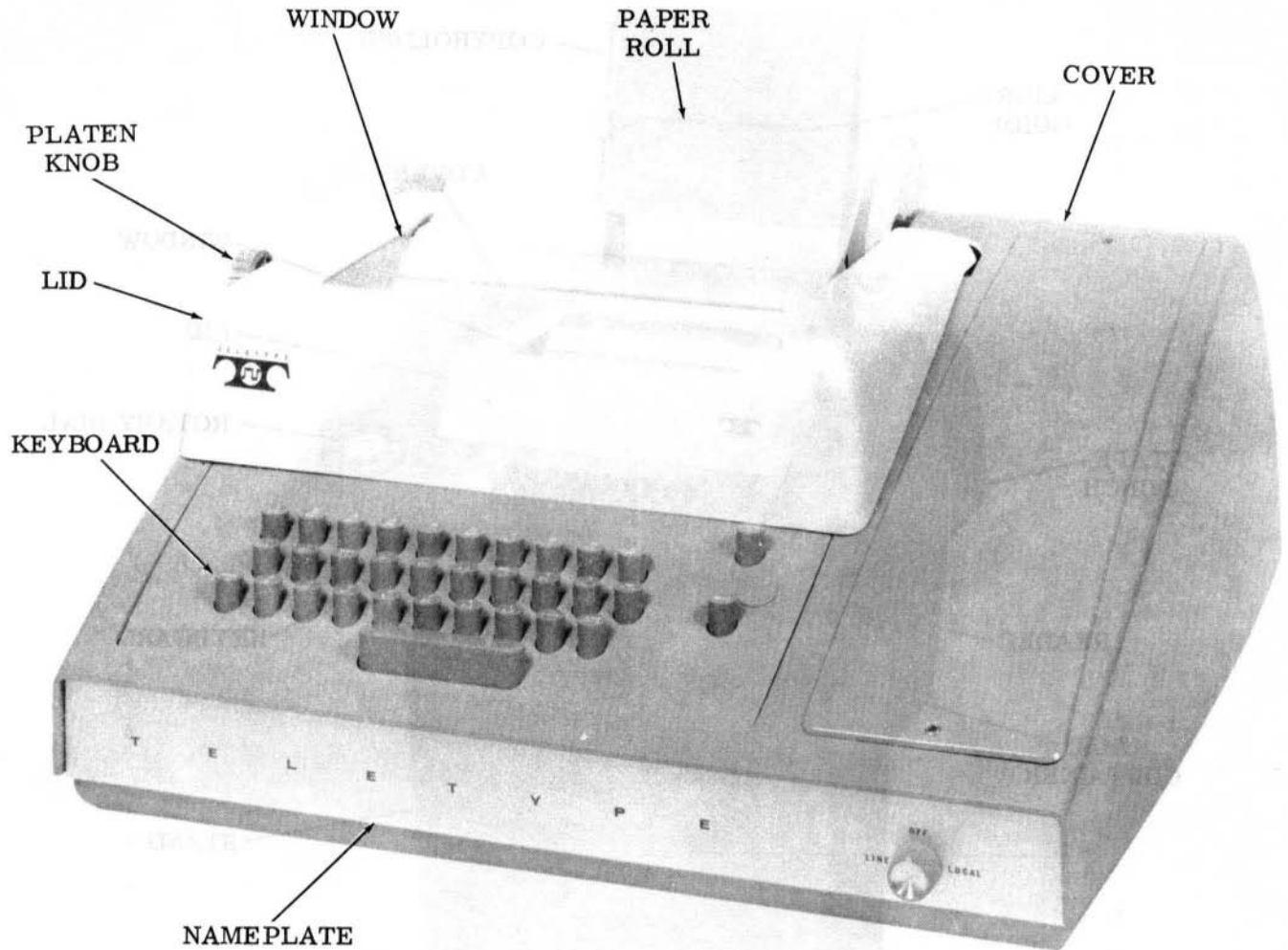


Figure 2 - Model 32 Keyboard Send-Receive Teletypewriter Set (Without Stand)

- (c) Keyboard
- (d) Tape punch
- (e) Tape reader

Typing Unit	574-172-100TC
Call Control Unit	574-173-100TC
Keyboard	574-171-100TC
Tape Punch	574-175-100TC
Tape Reader	574-174-100TC

2.04 The ASR set can receive and transmit messages. It can print messages on a paper copy or on sprocket form. The tape punch perforates paper tape. The reader senses the code punched in tape which can then be transmitted to the local or distant set.

3. COMPONENTS (Figure 4)

3.01 In this section, only a brief outline of the component operation will be presented. Individual components are described in detail each in a separate section. Refer to the following for a general description and principles of operation of the components:

A. Typing Unit

3.02 The typing unit is the receiving component of the set. A signal coming into the typing unit is translated into a mechanical arrangement of codebars. The position of these codebars determines two things: the position of a type wheel upon which characters are embossed and the selection of functions such as carriage return and line feed. A motor, by means of a main shaft, supplies all the motive force to effect the printing and perform the functions. The friction feed set may be considered the standard type of set. It handles 8-1/2 inch paper, and will accommodate 74 characters per

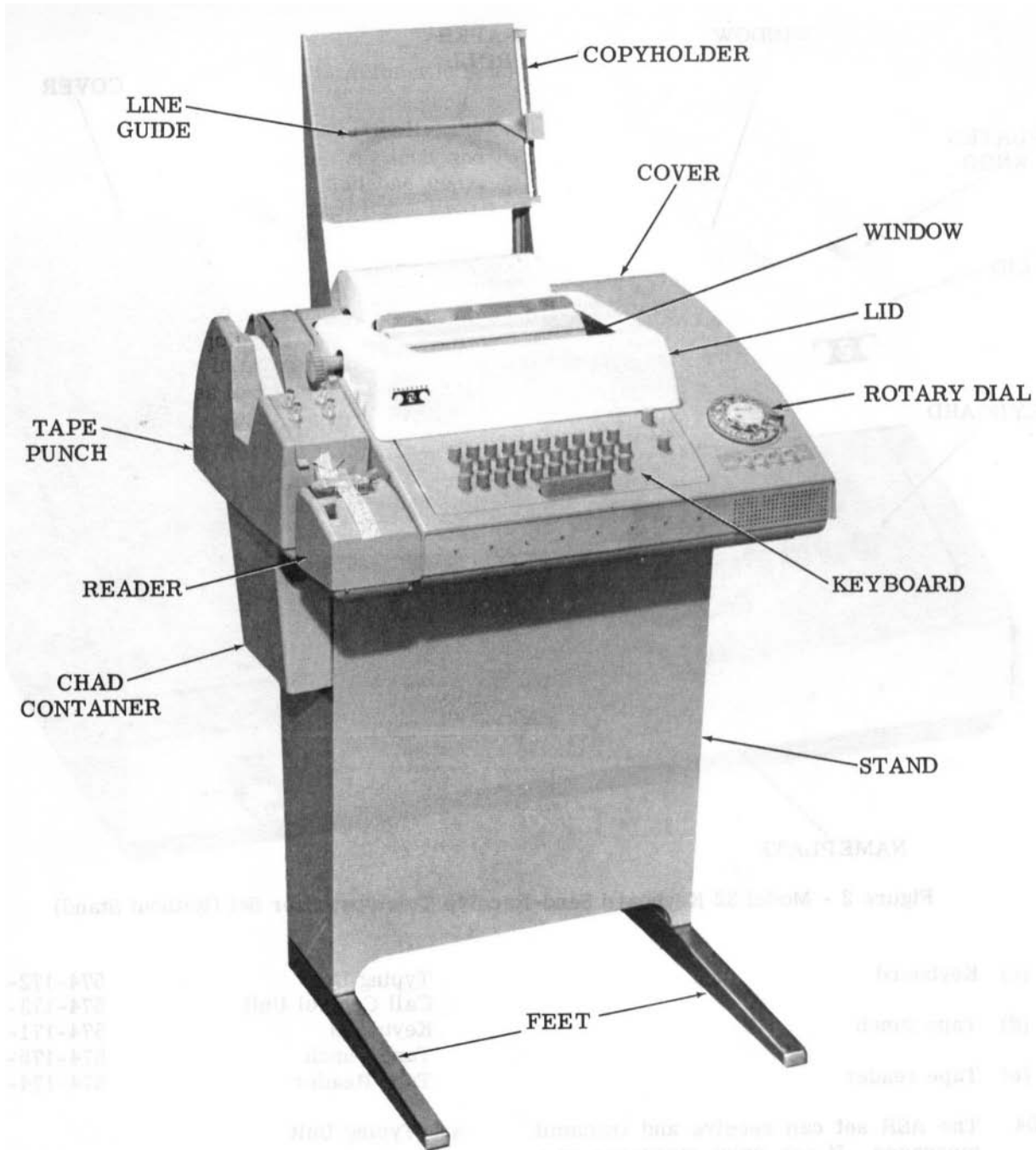


Figure 3 - Model 32 Automatic Send-Receive (ASR) Teletypewriter Set

line, 10 characters per inch. Vertically the friction feed set will print 6 lines per inch and will normally print one original and one copy.
 → If pressure sensitive paper is used, the set will
 → print one original and two copies.

B. Call Control Unit

3.03 The call control unit serves as a bridge to electrically join the set to the communication networks. In some applications the call control unit serves to initiate, accept, con-

trol, and complete the incoming calls. A power supply, local-remote control circuits, a selector magnet driver circuit, and a motor delay timer circuit are some of its basic elements.

C. Keyboard

3.04 The keyboard is the sending component of the set. Each of its keys controls an arrangement of levers which, in turn, position electrical contacts to represent the character. The keyboard output is a parallel output to the

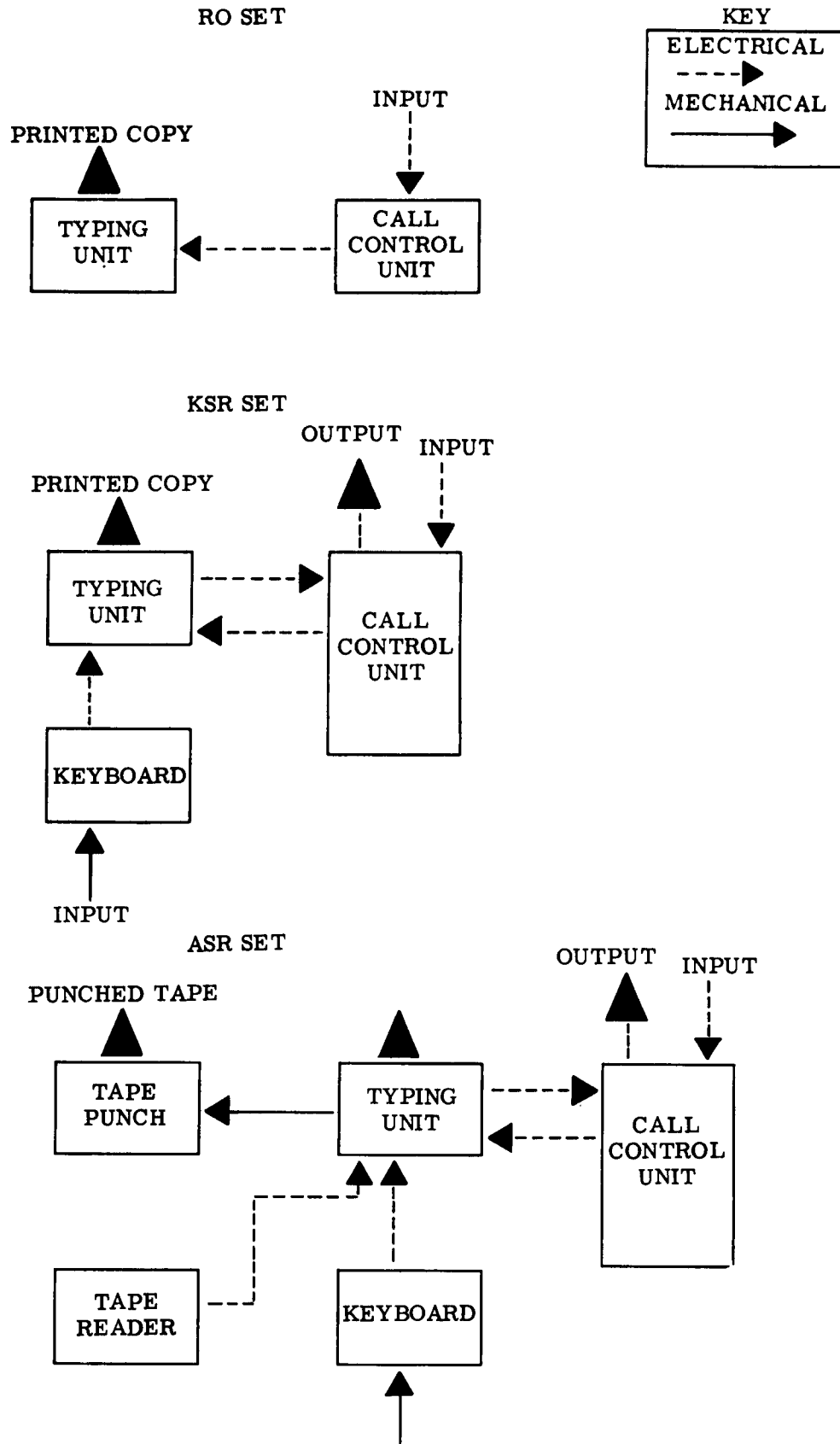


Figure 4 - Block Diagram of 32 Teletypewriter Sets

distributor of the typing unit. The distributor senses the keyboard output and sends it in a serial form to the selector magnet driver. From the selector magnet driver it then goes to the typing unit selector.

D. Tape Punch

3.05 The input to the tape punch is strictly mechanical. Extensions on the typing unit codebars position themselves in the tape punch to set up a similarly coded arrangement of punch pins. With drive motion from the typing unit main shaft, the tape punch drives the punch pins to perforate holes in paper tape.

E. Tape Reader

3.06 Sensing pins in the tape reader are driven upward every cycle. Where holes are present in the tape the sensing pins close a set of contacts. Where no holes are present in the tape the sensing pins are blocked and make no contact. These current, no-current conditions are duplicated on the typing unit distributor as a parallel output. The distributor senses the condition of each pulse and sends it serially to the selector magnet driver in the call control unit. From the call control unit the pulses go to the typing unit to print the character.

4. SET FEATURES

4.01 Standard Functions — Functions refer to nonprinting operations performed by the set which are supplementary to its basic purpose of printing characters. All sets are equipped with the following standard functions.

CARRIAGE RETURN

Upon command to carriage return, the movable printing mechanism returns to the left margin.

LINE FEED

Advances the paper or sprocket feed form one or two lines.

SPACE

Every character printed is spaced a certain distance from the previous one automatically. However, the set can accept a separate command to space in which case it will move the printing mechanism one character space to the right.

LETTERS/FIGURES SHIFT

The number of letters in the alphabet, plus the numerals 0 through 9, plus the standard functions total more than the code combinations available with the 5-level code used by 32 type sets. By means of a letters/figures shift mechanism, the set utilizes code combinations common to both letters and figures, except that the printing mechanism is positioned to print letters when the LTRS key is selected and figures when the FIGS key is selected. Each function has a separate code combination.

4.02 Answer-Back — Sets equipped with this feature are able to automatically identify themselves upon being called. The mechanism is coded with a predetermined sequence of characters and may be activated either locally or by the distant set.

4.03 Sprocket Feed — The sprocket feed sets print characters on a sprocket fed form. Although the forms are 8-1/2 inches wide they may be 6, 7, 8-1/2, 9, 10, or 11 inches in length. A total of 72 characters may be printed in a line on the form, with 10 characters per inch. The set will accommodate 6 lines of printed characters per inch. Varying with the weight of the carbon, the set will normally print one original and two copies. Also, the rate of form feed may be varied from 6 lines per main shaft rotation to 3 lines.

4.04 Form-Out (Sprocket Feed Only) — Sprocket feed sets equipped with this feature are able to advance the form to a predetermined length upon command. The mechanism is adjustable to various size form lengths.

4.05 Two-Color Printing — Sets equipped with this feature print black when transmitting and red when receiving. A shift mechanism automatically positions the two-color ribbon so that either its top or bottom portion is positioned in front of the type wheel to type either red or black.

4.06 End of Line Bell — Sets equipped with this feature alert the operator that the printing mechanism is approaching the end of the line at the right margin.

→ 4.07 Automatic Carriage Return-Line Feed — This feature is found only on friction feed sets; sprocket feed sets are unable to accommodate it. In sets equipped with this feature, when printing approaches the end of the line the

printing mechanism is automatically returned to the left margin and the paper is advanced one line.

4.08 **Print-Nonprint** — In sets equipped with this feature, a solenoid operated mechanism disables the sets from printing or performing functions when operated. When unoperated the sets can print and execute their functions in normal fashion.

4.09 **Paper-Out Alarm (Sprocket Feed Sets Only)** — A set equipped with this feature will activate an alarm when the supply of forms is exhausted. The set will also be disabled from accepting any other incoming calls.

4.10 **Low Paper Alarm (Friction Feed Sets Only)** — On sets equipped with this feature, when the amount of paper on the roll reaches a certain point, a switch will be activated which will sound an alarm, indicating to the operator that the paper supply is low.

4.11 **Four Row Keyboard** — The standard 32 keyboard has three rows of keys. A set may be equipped with a four row keyboard in which numerals are arranged separately in an additional upper row.

4.12 **Unshift On Space** — Sets equipped with this feature have a mechanism which changes the condition of the set from letters to figures, and vice versa, from figures to letters when the space code combination is received. Letters and figures refer to the 5-level operation of the 32 set where the same mechanism is used to print letters, and, once shifted, to print figures.

4.13 **Line Break** — Sets equipped with this feature can be placed in an open line condition by depressing the BREAK key on the keyboard.

4.14 **Repeat** — Sets equipped with this feature can print a character or perform a non-printing function continuously when the REPT key is depressed on the keyboard together with another key.

4.15 **Copyholder** — This feature consists of a metal frame equipped with a page indicator. The frame mounts on the back of the set, facing the operator. Messages to be transmitted may be placed on the copyholder for convenience during transmission.

4.16 **Accessories** — A number of accessories are available with the set, including the following:

(a) A sheet metal stand which supports the subbase and components at a convenient operating level. It consists of chrome feet, equipped with leveling screws or roller casters, and an enclosure to house auxiliary apparatus, such as a data set and the tape reader power pack.

(b) Call control facilities, such as buttons, indicator lamps, motor control relay, speaker, ringer, buzzer, and rotary, or TOUCH-TONE*, or card dialers.

(c) A tape guide to accommodate folded tape on the tape punch.

(d) A mechanism for locking the keyboard.

(e) A directory holder.

5. TYPICAL APPLICATION

5.01 The following is a brief description of how 32 teletypewriter sets equipped with call control and answer-back features, may be used in a typical communication system (Figure 5). When a call is to be made, an operator uses the controls on the teletypewriter set to gain access to the system switching and transmission facilities, which may be dial telephone or telegraph networks. The operator then dials the number of the called station.

5.02 The switching center selects the proper station and signals the receiving station, indicated by visual and/or audible indicators. Using the controls on the teletypewriter set, the operator of the called station completes the connection and conditions the equipment so that

*Registered trademark of Bell System.

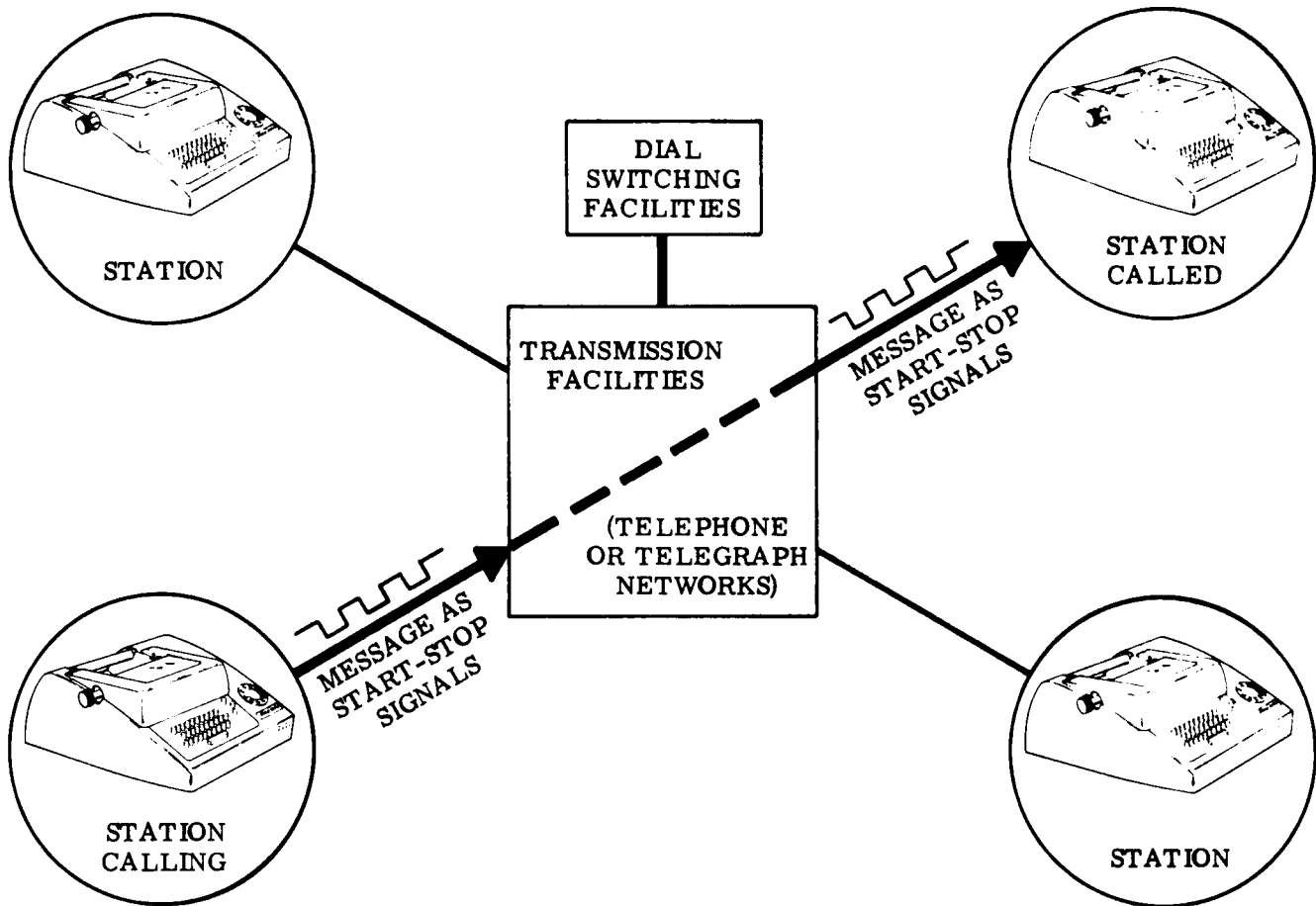


Figure 5 - Typical Applications

communication can proceed in either direction. This is indicated visually and/or audibly at the calling station.

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

5.03 Ordinarily the stations then identify themselves by the answer-back feature. The operator at the calling station can then type the message on the keyboard, or if it is an ASR set, can send it by perforated tape. In either case the teletypewriter set at the calling station translates the message to dc sequential start-stop signals which are applied 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 continuous 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.

5.04 Finally, the operator at either station can terminate the call and return the set to its idle condition by operating the OFF control. There are a variety of OFF controls, including the EOT key on the keyboard, a control knob, or a pushbutton on the call control unit. A set may be equipped with one or two of these controls. In the case of an RO set only one OFF control is necessary. In the case of a KSR and ASR set the EOT control on the keyboard or the pushbutton on the call control unit may be used.

6. TECHNICAL DATA

CAUTION: 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.

- 6.01 Speeds: 100 words per minute
- 75 words per minute
- 66 words per minute
- 60 words per minute

Note: The different speeds of a set are achieved by changing the driving gears.

6.02 Transmission Code: 5-level start-stop signals with 7.5 unit transmission pattern

6.03 Dimensions and Weights (approximate)

(a) RO Set

- Width 18-5/8 inches
- Depth 18-1/2 inches
- Height 8-3/8 inches
- Weight 39 pounds

(b) KSR Set

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

(c) ASR Set

- 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 at bottom of enclosure 6-1/2 inches
- Length of feet 17-3/4 inches
- Weight 12 pounds

6.04 Electrical

Power Requirements: 115 volts ac +10%
60 hertz +0.45 hertz, 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

6.05 Environment: Relative humidity 90% in a temperature range of 60° F to 100° F.

