

28 AUTOMATIC SEND-RECEIVE (ASR) TELETYPEWRITER SET

DESCRIPTION

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ELECTRICAL SERVICE UNIT	5	1.01 This section describes the general configuration and capabilities of the 28 Automatic Send-Receive (ASR) Teletypewriter Set. It includes a brief description of the ASR Set components, which are covered in detail in separate sections, the important variable features, a general description of operation, and the appropriate technical data. Because of the many variations possible, the ASR Set described in the text and illustrations is typical.	
MOTOR UNITS	5	1.02 The 28 ASR Set is an electromechanical apparatus capable of operating as a self-contained message originating and receiving center. It is used to exchange printed and tape perforated messages between two or more stations connected by appropriate transmission facilities (telegraph lines, telephone networks, and radio channels) (Figures 1 and 2).	
CABINET	5	1.03 Messages are received electrically via the transmission facility and are printed on page-size copy paper or continuous business forms. With page-printed monitoring, the ASR Set can electrically transmit messages which are originated by either perforated tape or keyboard operation. Messages may be perforated and printed on tape for separate transmission with or without simultaneous transmission and page-printed monitoring.	
4. VARIABLE FEATURES	6	1.04 Certain ASR Sets are equipped to receive messages in printed and perforated tape form and, at the same time, prepare tape off-line.	
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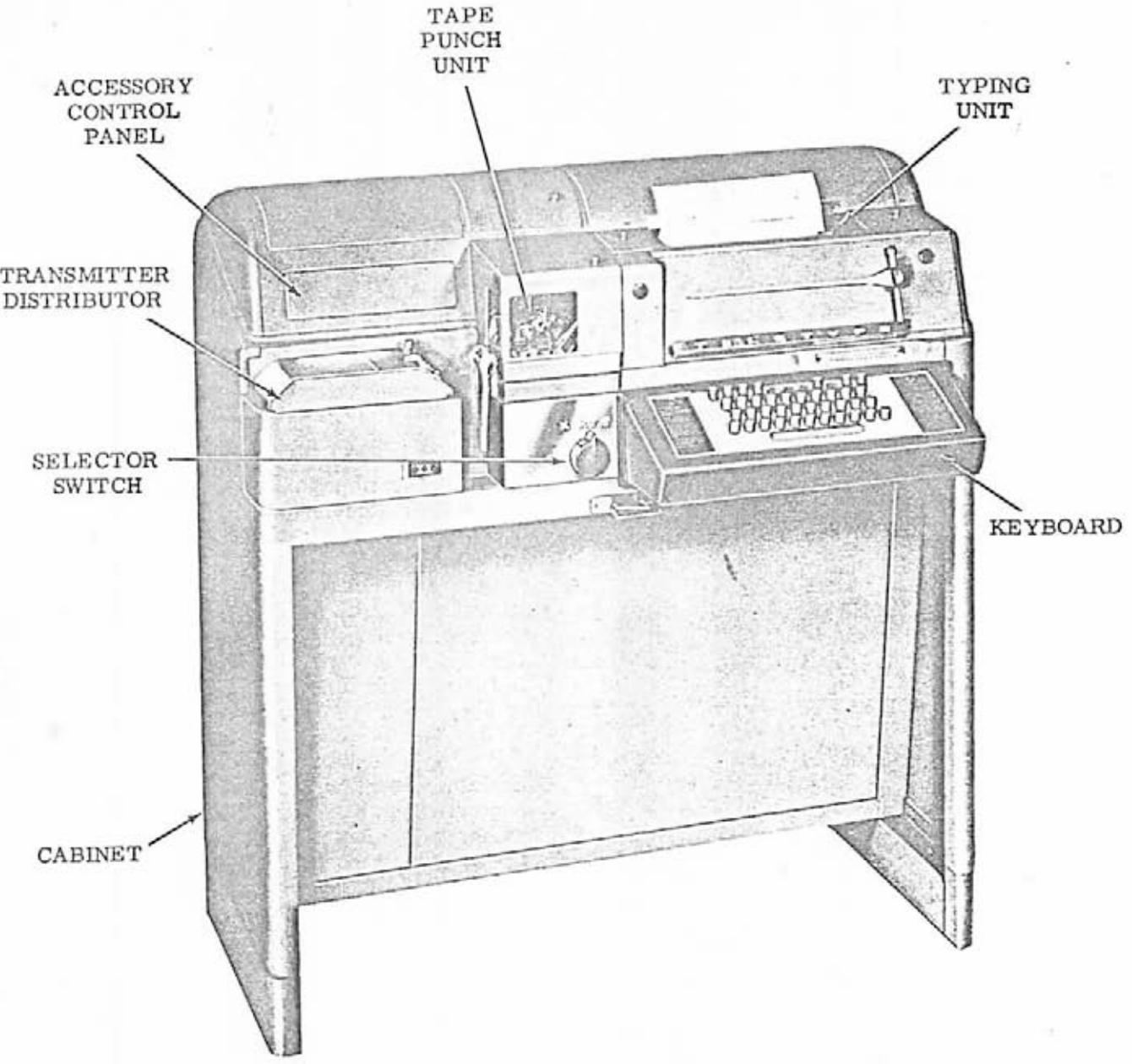


Figure 1 - Typical 28 Automatic Send-Receive (ASR) Teletypewriter Set

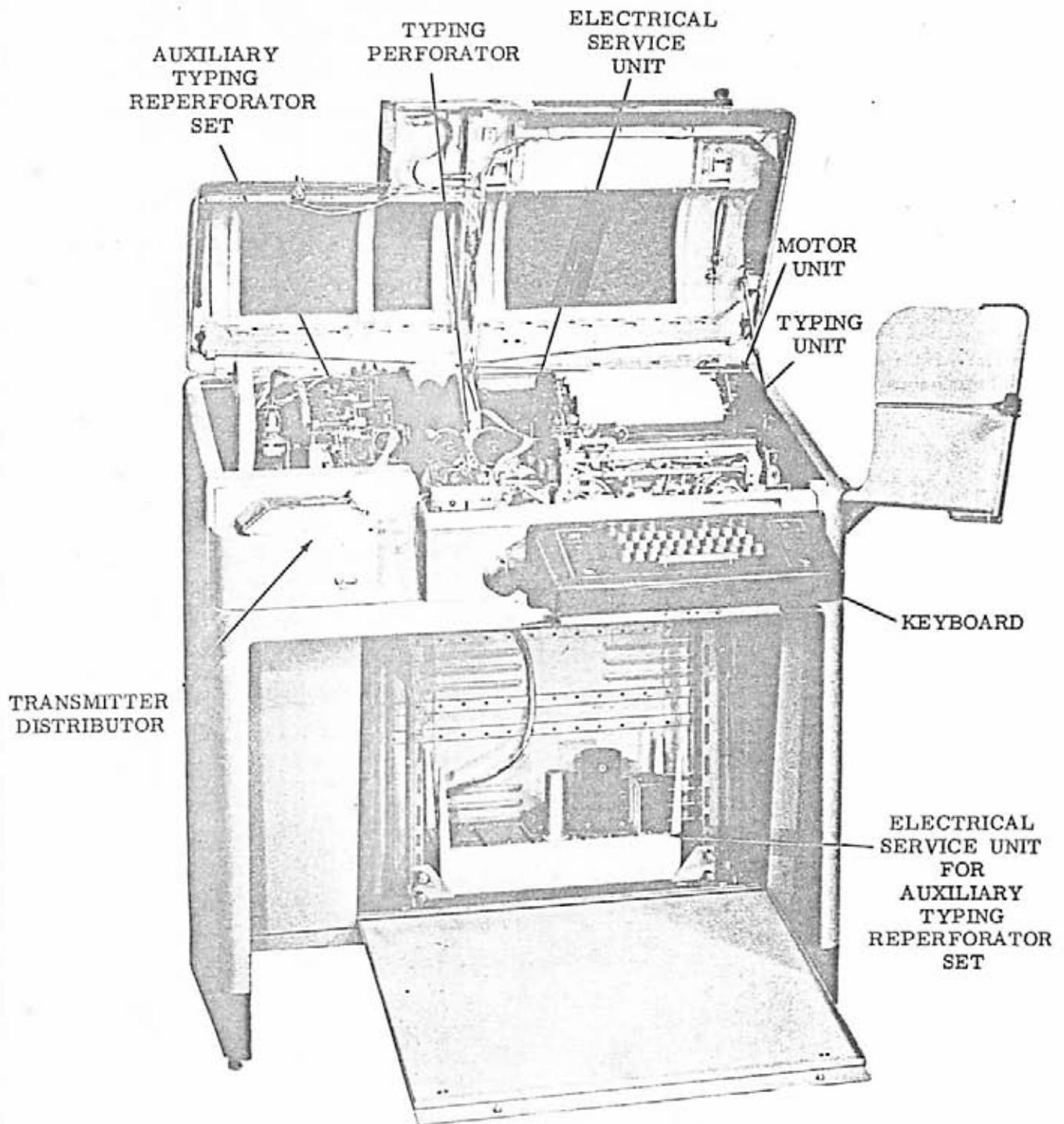


Figure 2 - Typical 28 Automatic Send-Receive (ASR) Teletypewriter Set (Interior View)

1.05 Transmission between stations is accomplished electrically using the Baudot teletypewriter signaling code. The ASR Set operates at speeds up to 100 words per minute.

1.06 Reference should be made to the appropriate sections which describe in detail the various ASR Set components.

1.07 References to left or right and front or rear views are made from a position in front of the ASR Set.

2. CONFIGURATION

2.01 The ASR Set is made up of a group of components using a basic arrangement. These components, described in Part 3, are:

- (a) Keyboard
- (b) Typing Unit
- (c) Perforator (tape punch)
- (d) Transmitter-Distributor
- (e) Electrical Service Unit
- (f) Motor Unit
- (g) Cabinet

2.02 To meet varying installation and operational requirements, the selection of the particular kind of component is often varied, but without changing the basic arrangement. The transmitter distributor, for example, may be any one of the following units:

- (a) Fixed Head Single Contact
- (b) Pivoted Head Multicontact
- (c) Fixed Head Multicontact
- (d) Pivoted Head and Fixed Head Multicontact

2.03 The perforator (or reperforator) used may be any one of the following four available units:

- (a) Nontyping Perforator
- (b) Typing Perforator
- (c) Nontyping Reperforator
- (d) Typing Reperforator

2.04 Variations in typing units include friction feed and sprocket feed units. Motor units are either ac synchronous or dc governed.

2.05 A number of special and optional features are available with the ASR Set. However, these do not affect the basic arrangement of components.

2.06 An addition to the basic component arrangement of the ASR Set is the inclusion of an Auxiliary Typing Reperforator Set. Space is provided in the cabinet for this completely independent receiving unit. Refer to Part 3 for a description of this set.

3. COMPONENTS

3.01 The ASR Set is made up of seven basic components which, because of operational requirements, may vary in features from one installation to another (Part 2). These components are briefly described in the following paragraphs. A complete description including principles of operation appears in the appropriate sections.

TYPING UNIT

3.02 The typing unit contains the mechanisms necessary for translating electrical input signals into printed, alphanumeric characters or functional control operations. The unit may be equipped to accommodate either friction or sprocket feed paper, in single or multicopy form, either rolled or fan folded. It includes a stunt box that provides nonprinting functions such as case shifting, carriage return and line feed and, in addition, switching facilities for remote controls, station selection, and other applications.

KEYBOARD

3.03 The keyboard contains the mechanisms for generating and transmitting a teletypewriter signal. It also provides mounting facilities for the typing unit, one of four tape punch units, a motor unit, and the necessary driving gears and cross-shafts. Typing and perforating functions originate from the operation of keytops.

TAPE PUNCH UNITS

3.04 One of four different tape punch units is available with the ASR Set. These receiving-only units contain the mechanisms that translate electrical or mechanical inputs into

perforations in the tape or both perforations and printed characters. The tape prepared by the units may be either fully perforated or partially perforated (chadless).

3.05 Two of the units are perforators and are operated and actuated mechanically by the keyboard. The nontyping perforator prepares only perforations in the tape. The typing perforator, in addition to perforating the tape, types messages on the tape.

3.06 The remaining two units available are reperforators, which are equipped with a selector mechanism to receive inputs electrically. The nontyping reperforator prepares only perforations in the tape. The typing reperforator produces perforations and types on the tape. They may also be actuated mechanically.

3.07 The ASR Set may be equipped with an Auxiliary Typing Reperforator Set. This completely independent set contains the following components:

- (a) Typing reperforator unit.
- (b) Base (with gears, terminal boards, controls; on some sets controls are on a panel mounted on the front of the cabinet).
- (c) Electrical service unit (installed in the lower right side of the cabinet).
- (d) Motor unit (a variable speed gear shift mechanism is available with some units. This allows selection of 60, 75, or 100 word per minute speeds).

TRANSMITTER-DISTRIBUTORS

3.08 A transmitter distributor contains the necessary mechanisms to advance the tape, read its perforations, and to convert these into teletypewriter signals. The transmitter distributor is installed on a separate base, but receives motive power from the keyboard-mounted motor unit. The unit is controlled by a three-position start-stop switch which is accessible to the operator. The ASR Set uses one of four available transmitter distributors:

- (a) Fixed Head Single Contact: Contains a stationary tape reading head and a single-contact distributor. Output is sequential.
- (b) Pivoted Head Multicontact: Tape reading head and signal distributor may be actuated independent of each other by local or

remote control. Unit is always used in conjunction with a punching unit because the pivoted reader can move along the tape, read and transmit the last character punched. This unit is used frequently with continuous tape loops. Output from the transmitter distributor is in sequential or parallel form.

(c) Fixed Head Multicontact: Tape reading head and signal distributor may be actuated independent of each other by local or remote control. Output from transmitter distributor is in sequential or parallel form. Signal distributor also accepts external parallel inputs and converts them to serial form.

(d) Pivoted and Fixed Head Multicontact: This consists of two tape reading heads (one stationary, the other pivoted) and a single-contact signal distributor. The pivoted head is mounted in line with and accepts tape directly from the ASR Set punch unit. The stationary tape head is accessible externally for manual insertion of tape from any source. This arrangement permits the combining of inputs, such as standard and variable data. Output from the signal distributor is in sequential form.

ELECTRICAL SERVICE UNIT

3.09 The electrical service unit serves as the area of concentration for the wiring of the ASR Set, and provides mounting facilities for various electrical assemblies and components. It may include such optional assemblies as a line (polar) relay, line shunt relay, and line test key. The set's main power switch, convenience outlet and fuse, terminal blocks, and interconnecting cables may also be included.

MOTOR UNITS

3.10 The motor units that provide mechanical motion for the ASR Set 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. The units operate at the same speed and are rated heavy-duty to accommodate the set's load requirements.

CABINET

3.11 The components of the ASR Set are enclosed in a floor mounted cabinet which includes space for an Auxiliary Typing Reperfo-

erator Set and other optional equipment, and for accessories such as paper and tape handling equipment.

4. VARIABLE FEATURES

4.01 A wide variety of optional features are available with the ASR Set. 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) Horizontal Tabulator: Permits rapid movement of the typing unit typebox to predetermined positions on the copy paper.
- (b) Vertical Tabulator: Advances a form to any predetermined position within the form.
- (c) Form Feed-Out: Advances a form to the first printing line on the succeeding form from any point on the previous form.
- (d) Automatic Carriage Return-Line Feed: These functions occur simultaneously should the sending station fail to initiate them, when the typebox reaches the right margin.
- (e) Contact Mechanisms: A number of electrical contact mechanisms are available to provide control of external equipment or for other special applications. These include code reading, timing, auxiliary, and letters-figures contact mechanisms.
- (f) Tape Feed-Out Mechanism: This mechanism may be installed on the tape punch units. It operates automatically or manually to feed out a length of blank or letters perforated tape for convenience in tape handling. Tape feeding may be either interfering or noninterfering.
- (g) Back Space Mechanism: This mechanism, operated manually or with power-drive, retracts tape back through the punch block to allow erroneously perforated data to be obliterated by replacement with the letters code combination.
- (h) Accessories: A number of accessories are available to facilitate paper, tape, and form handling, including low-supply indicator alarms, special trays and shelves, chad chutes, and paper winders.

5. OPERATION

GENERAL OPERATION

5.01 The components are interconnected electrically or mechanically to provide a wide range of possibilities for sending, receiving or storing teletypewriter messages. Electrical connections between the components are routed through the electrical service unit. Transmitted signals are initiated through the keyboard or the transmitter distributor (Figure 3).

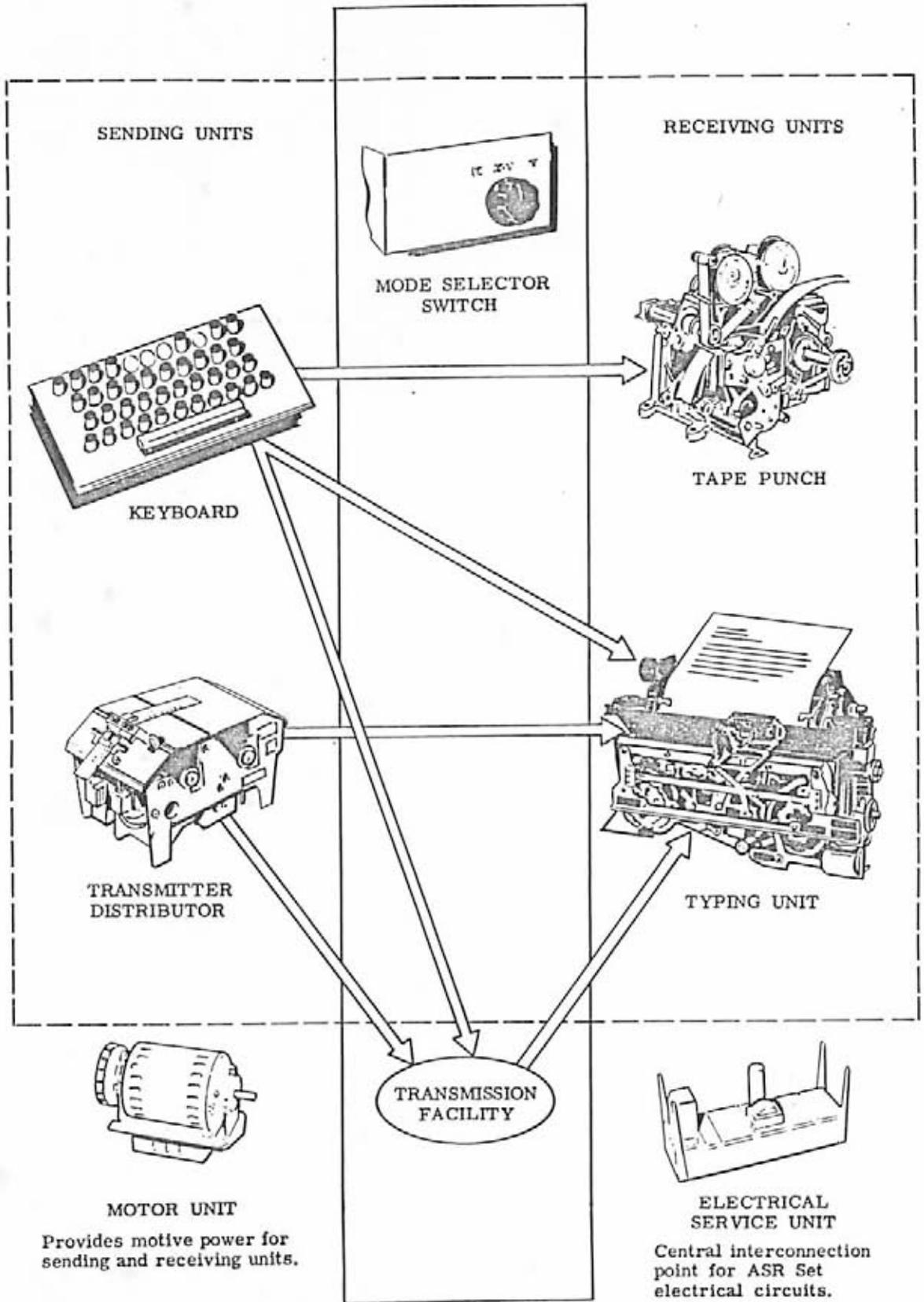
5.02 Received signals are recorded by the typing unit which also monitors local, off-line transmissions. The tape punch (typing or nontyping perforator or reperforator unit) prepares tape on which received or locally prepared messages may be stored for future transmission by the transmitter distributor.

5.03 The keyboard, tape punch unit, typing unit, and transmitter distributor receive their motive power from a single motor unit.

5.04 A three-position mode selector switch, mounted on the front panel of the cabinet, permits the operator to place the ASR Set into one of three operating conditions:

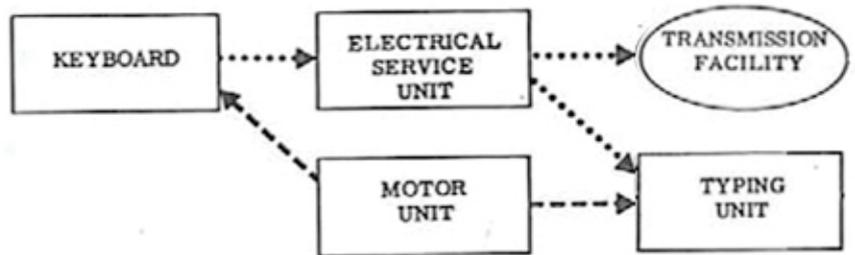
- (a) Keyboard (K): Placing the selector switch in the K (keyboard position) conditions the ASR Set so that messages may be transmitted from the keyboard. All messages transmitted are recorded on the typing unit.
- (b) Keyboard-Tape (K-T): Placing the selector switch in the K-T (keyboard-tape position) enables the ASR Set to transmit from its keyboard and, at the same time, record all transmission in both punched tape and page-printed form.
- (c) Tape (T): Placing the selector switch in the T (tape position) conditions the ASR Set so that operation of the keyboard produces punched tape only. No external transmissions occur. However, the typing unit is operable and will record all received messages.

5.05 The transmitter distributor is controlled by a start-stop switch which is accessible for operation by the operator. Transmissions are automatically stopped by tight-tape or tape-out devices, which are incorporated in the transmitter distributor, should these tape conditions occur.



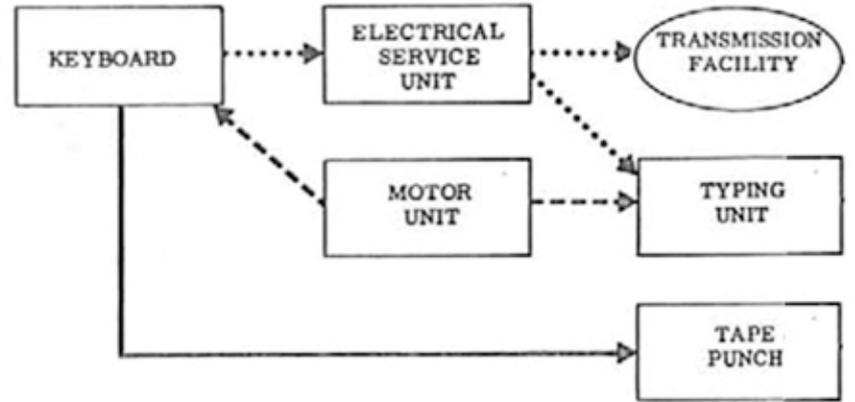
K

 Messages are transmitted from the keyboard and recorded on the typing unit. Received messages are recorded on the typing unit.



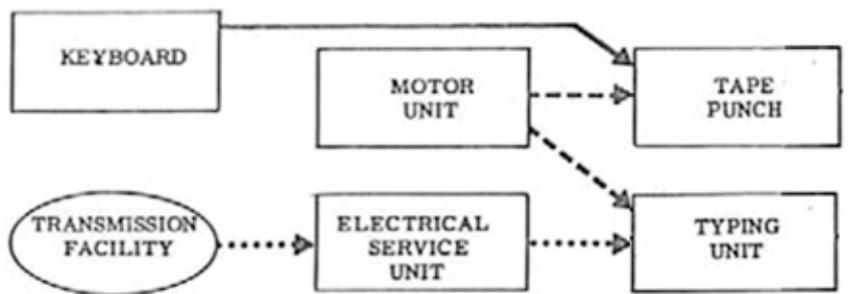
K-T

 Messages are transmitted from the keyboard and recorded on both the typing unit and tape punch unit (perforator or reperforator). Perforator (illustrated) is actuated mechanically; reperforator is actuated electrically and may be used, as can the typing unit, to record received messages. Reperforator may also be actuated mechanically.



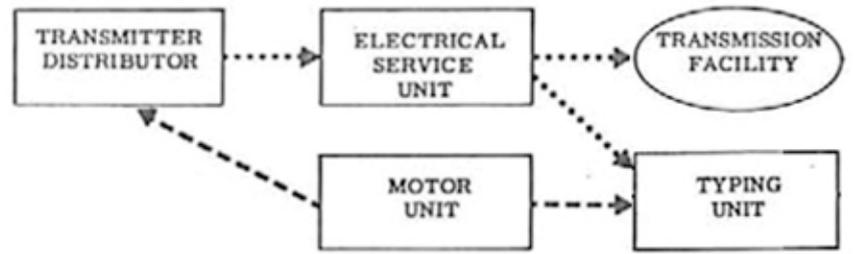
T

 No external transmissions occur. Messages typed on the keyboard are recorded by the tape punch unit. Received messages are recorded on the typing unit, and/or reperforator.



TRANSMITTER DISTRIBUTOR OPERATION

 The transmitter distributor, controlled by a start-stop switch, may be operated in place of the keyboard in all operating modes. Transmitted messages are recorded by the typing unit and reperforator-type tape punch unit.



Transfer of Intelligence		Transfer of Motive Power
Electrical→	Mechanical ————→	————→

Figure 3 - Typical 28 ASR Set Components and Operating Methods

5.06 Control of the optional Auxiliary Typing Reperforator Set is provided either by controls located on the accessory control panel on the front of the cabinet, or by controls located on the typing reperforator base and accessible through a cabinet access lid. The Auxiliary Typing Reperforator Set is connected to a separate signal line circuit and may therefore receive and record messages simultaneously with but independent of other ASR Set operations.

SELECTIVE CALLING

5.07 ASR Sets may be equipped to operate in a selective calling system. Selective calling operation is a method of message transmission control in which traffic is selectively directed only to those sets actually concerned with the information being transmitted. Each set in the circuit, which may be standard line or radio, is assigned an identification code. The code may be made up of any character or sequence of characters. Recognition of this code, and other selective calling codes, is made by the stunt box in the typing unit of each set. The typing unit, upon recognition of the proper code, will be placed in the select-nonprint condition. When this occurs, direct printing is suppressed while the selector mechanism and the stunt box remain active. In this way, the typing unit monitors signal line conditions but does not respond, either to print or to perform

a function, until it receives instructions in the form of selective calling code sequences.

6. TECHNICAL DATA

SIGNAL REQUIREMENTS

Code: Baudot (five level start-stop); sequential.

Input:

- (1) Neutral - Selector magnets directly connected to signal line, or through line relay.
- (2) Polar - Line relay or selector magnet driver required.

Line Current: 20, 30, or 60 milliamperes.

POWER REQUIREMENTS (TYPICAL)

Sets with Synchronous Motor Units - 115 v ac $\pm 10\%$, 60 $\pm .75\%$ cycles, single phase.

Sets with Governed Motor Units

- (1) 115 v ac $\pm 10\%$, 50-60 cycles, single phase.
- (2) 115 v dc with external resistance.

OPERATING SPEEDS

Characters or Operations	Per-Minute	600	460	428	404	400	390	368
	Per-Second	10.0	7.7	7.1	6.7	6.7	6.5	6.1
Unit Code		7.42	7.42	7.00	7.42	7.50	7.00	7.42
Bauds (Bits-per-second)		74.2	56.9	50.00			45.5	
Frequency (Cycles/Second)		37.1	28.4	25.00			22.8	
Length in Milliseconds	One Character	100	130	140	149	150	154	163
	Unit Pulse	13.5	17.6	20.0	20.0	20.0	22.0	22.0
	Stop Pulse	19.1	24.9	20.0	28.5	30.0	22.0	31.2

APPROXIMATE DIMENSIONS (INCHES)

Height	Width	Depth
39	36	18-1/2 (less keyboard which extends 4-1/2 inches)
(See Figure 4 for dimensional details.)		

APPROXIMATE WEIGHT (POUNDS)

Total Weight	260
Shipping Domestic	530
Export	600

SECTION 573-101-100TC

PRINTED CHARACTERS (TYPING UNIT)

Type Pallet Arrangements - Standard, Upper Case Arrangements Include:

- (1) Communications (punctuation symbols)
- (2) Fractions
- (3) Weather symbols

Individual pallets for upper and lower case characters are available separately for field installation.

Type Styles and Spacing (Typical)

Style	Character Height		Horizontal Characters Per Inch		Vertical Lines Per Inch	
	Caps	Fraction	Single	SPACE - Double	Single	FEED - Double
Murray	.103"	.162"	10	5	6	3
Gothic	.103"	none	10	5	6	3
Gothic	.103"	.162"	12	6	6	3
Long Gothic	.120"	.170"	10	5	6	3
Large Gothic	.180"	.180"	10	5	-	3

PLATENS

Physical Characteristics	Friction Feed	Sprocket Feed
Construction	Rubber covered cylinder, fixed to platen shaft.	Rubber covered cylinder, free on platen shaft.
Length	8-3/4"	Selected for desired form width.
Paper Width	Any width up to 8-1/2"	Minimum: 3-5/8" Maximum: 9"
Characters per line (10 per inch)	Margin is adjustable from 1 to 85 characters	Margin is adjustable from 1 to maximum number indicated in chart.

SPROCKET FEED PLATENS

Form Width in Inches	Maximum Characters* Per Line	Form Width in Inches	Maximum Characters* Per Line
9	77	5-3/4	44
8-1/2	72	5-1/2	42
8	67	5	37
7-1/2	62	4-1/2	32
7	57	4-5/16	30
6-1/2	52	4-1/4	29
6-3/8	51	4	27
6-1/4	50	3-5/8	23
6	47		

* Based on ten characters per inch with allowance of three characters for platen endplay.

TYPING UNIT RIBBON

Style Black record ribbon
 Length 33 feet
 Width 1/2 inch
 Thickness 0.0055 inch

TAPE SPECIFICATIONS

Type Standard communications
 Width 11/16 inch
 Code perforations. Chadless or fully perforated
 Characters or feed holes per inch 10

TYPING UNIT PAPER (FRICTION FEED)

Type Standard yellow paper roll
 Outside diameter 4-1/2 inch
 Width 8.45 inch
 Length 325 feet
 Core diameter 1 inch
 Core thickness 0.125 inch

PRINTED CHARACTERS (TAPE)

Height Chadless, 0.120 inch;
 fully perforated, 0.100 inch
 Width Chadless, 0.075 inch;
 fully perforated, 0.046 inch
 Location of Printing Along upper edge of
 chadless perforated tape;
 between feed holes on
 fully perforated tape

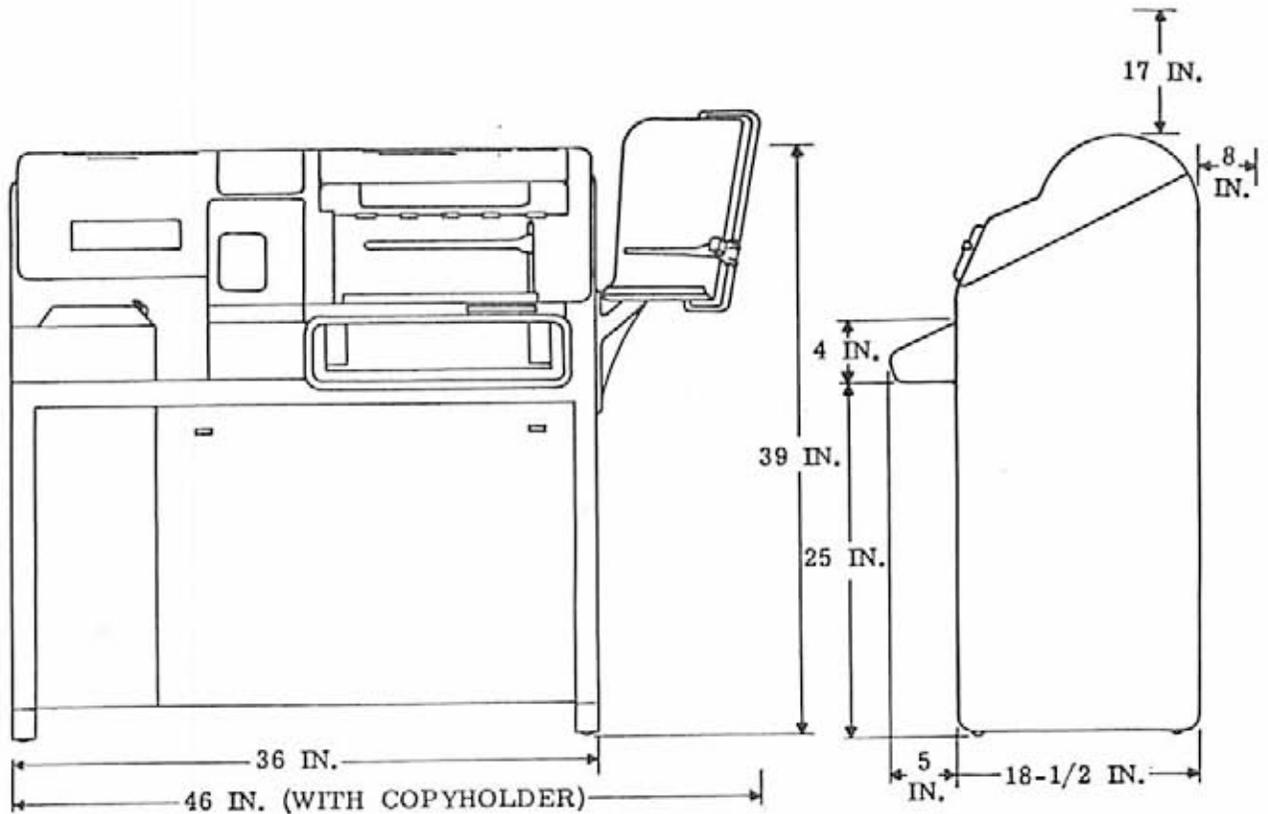


Figure 4 - ASR Set Dimensions

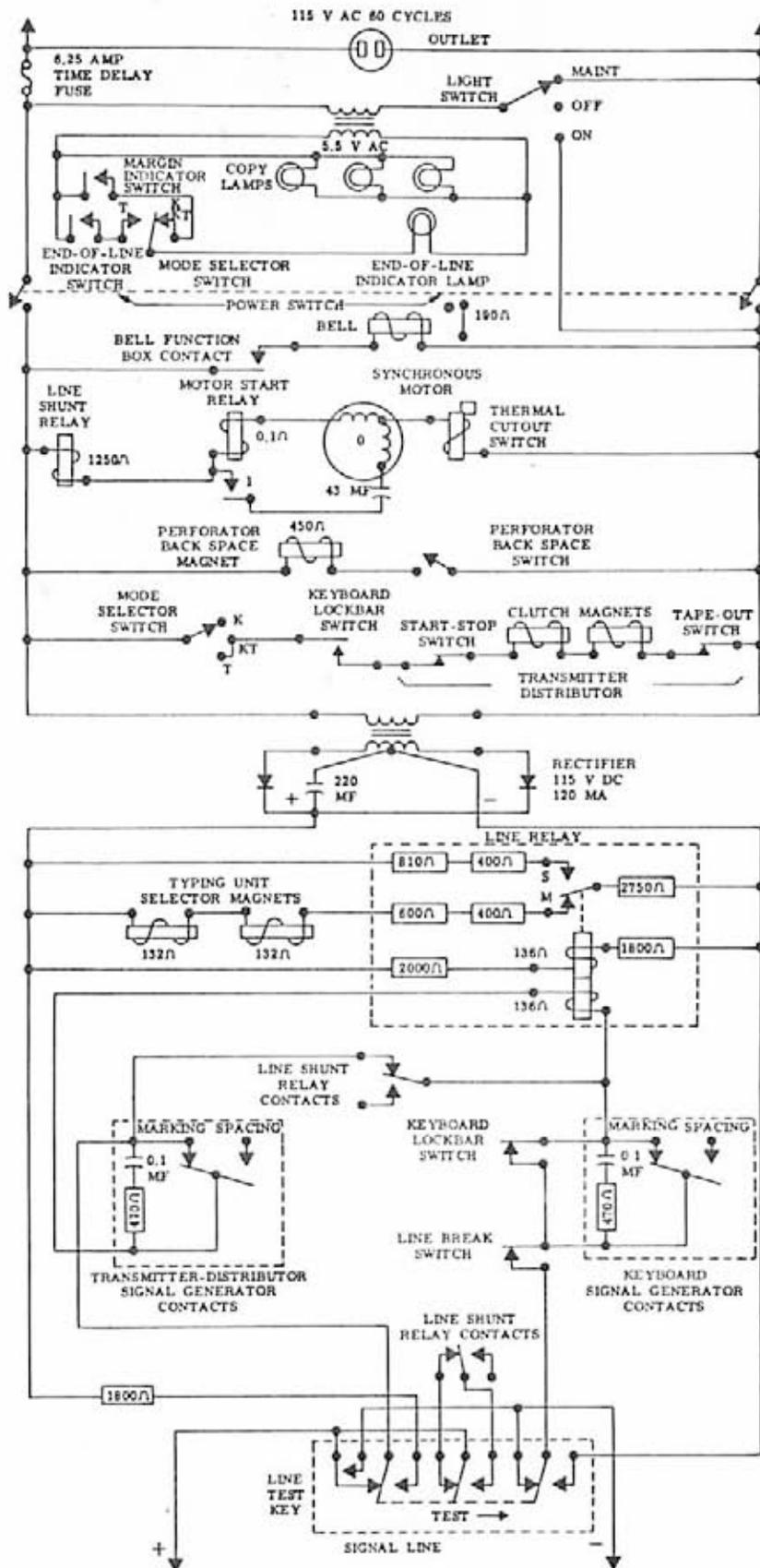


Figure 5 - Typical 28 Automatic Send-Receive (ASR) Teletypewriter Set, Schematic Diagram