

BELL SYSTEM PRACTICES
Teletypewriter and Data Stations

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AT&TCo Standard

28 AUTOMATIC SENDING AND RECEIVING SET

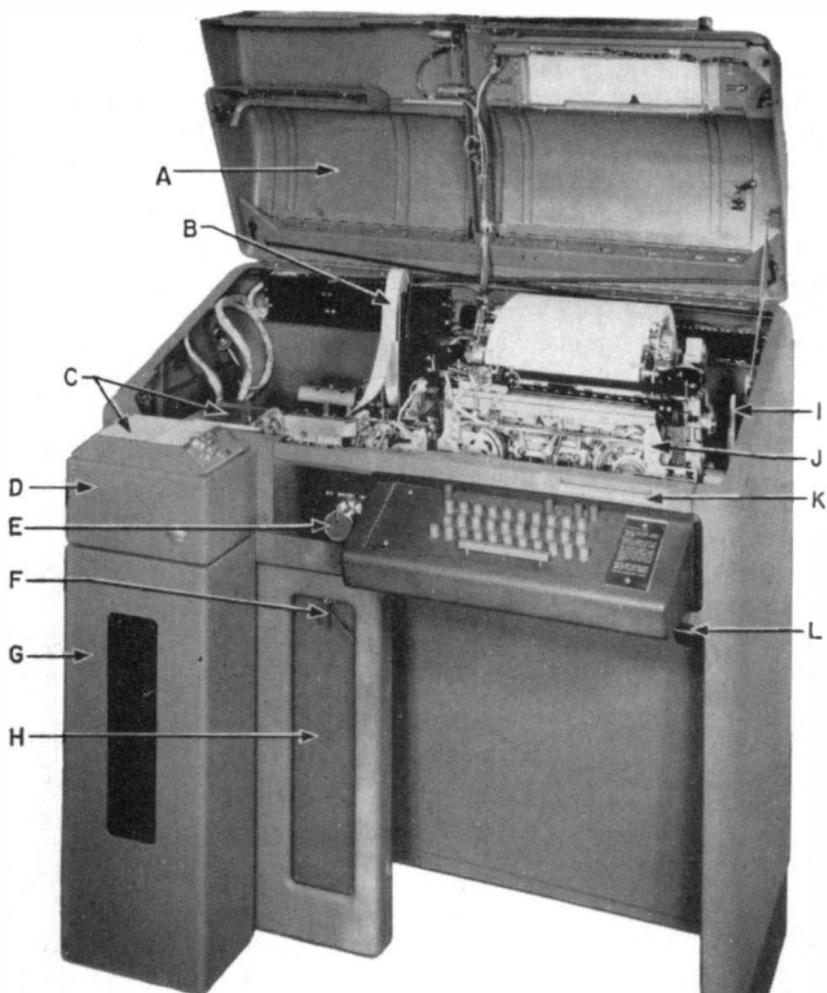
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1. GENERAL

1.01 This section gives descriptive information on the 28 automatic sending and receiving set (ASR) and lists the components which comprise it. **Figs. 1 & 2**

1.02 The ASR can fill a wide range of communication needs and, dependent upon the selection of components, may serve as a complete message center. The ASR is made up of combinations of the following basic mechanisms of the 28 line mounted in a single cabinet: a keyboard perforator-transmitter (perforator-transmitter-base), a page printer, a tape transmitter, a motor, and an electrical service unit together with required associated equipment.



- A-CABINET DOME
- B-TAPE CONTAINER
- C-28B TRANSMITTER DISTRIBUTOR UNIT
- D-28B TRANSMITTER DISTRIBUTOR HOUSING
- E-KEYBOARD CONTROL KNOB
- F-TAPE BEATER
- G-4A TAPE WINDER COMPARTMENT
- H-TAPE STORAGE BIN
- I-ELECTRICAL SERVICE UNIT CONTAINER
- J-PAGE PRINTER
- K-CHARACTER COUNTER
- L-POWER SWITCH

Fig. 1—28 ASR Set Using the 28F Teletypewriter Cabinet

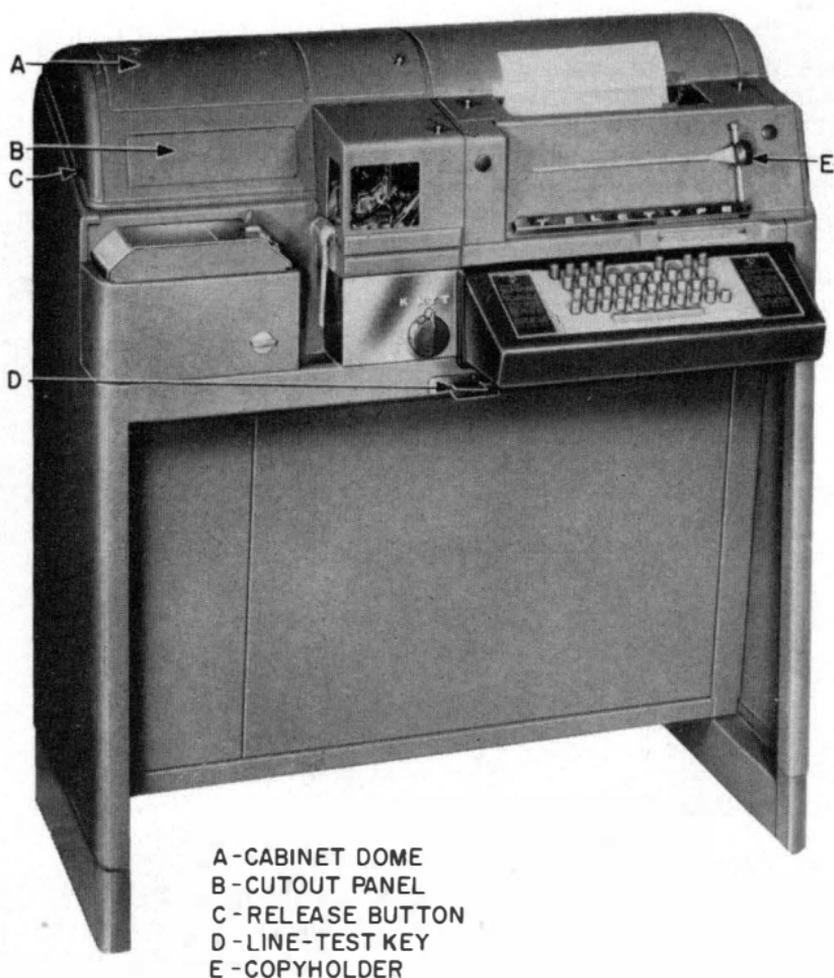


Fig. 2—28 ASR Set Using the 28G Teletypewriter Cabinet

1.03 The basic automatic sending and receiving set includes a nontyping perforator as part of the perforator-transmitter-base. The usefulness of the automatic sending and receiving set may be increased by adding or substituting other components. For example, the basic nontyping perforator (28A or 28B perforator-transmitter-base) may be replaced by a typing perforator, a nontyping reperforator, or a typing reperforator (28E, 28F, or 28D perforator-transmitter-base, respectively), and the basic single-contact transmitter-distributor (28E transmitter-distributor) may be replaced by one of the

following multicontact transmitter-distributors: (See Section P34.104.)

28B transmitter-distributor (a pivoted transmitter and a fixed transmitter using a distributor common to both)

28C transmitter-distributor (pivoted transmitter)

28F transmitter-distributor (fixed transmitter)

1.04 For an ASR set having a typing or nontyping **perforator** for the punch unit as in the 28A, 28B, or 28E perforator-transmitter-base, the following types of transmission or reception may be obtained by turning the keyboard control knob to one of its three positions—K (keyboard), K-T (keyboard-tape), or T (tape). (See Fig. 1 for location of keyboard control knob.)

Fig. 1

(a) K Position

- (1) Messages may be sent to the line by use of the keyboard and monitored on the page printer.
- (2) Page copy may be received from incoming line signals.

The transmitter-distributor and the perforator are non-operable in the K position.

(b) K-T Position—Using Option I

Option I Using 28F Electrical Service Unit

- (1) Message may be sent to the line from the keyboard while simultaneously punching the same message in tape at line speed and monitoring on the page printer.
- (2) Message may be sent to the line from the transmitter-distributor and monitored on the page printer.
- (3) Page copy may be received from incoming line signals.

(c) K-T Position—Using Option II

Option II using 28G Electrical Service Unit

- (1) Messages may be sent to the line from the transmitter-distributor (not monitored on the page printer). At the same time tape may be punched from the keyboard and monitored on the typing unit without sending to the line.

Under Option II messages cannot be sent from the keyboard to the line. However, when sending to the line on the transmitter-distributor, and as a separate operation preparing tape and monitoring it on the page printer, a break signal received from another station will operate a slow-release relay switching the page printer to the line and stopping the transmitter-distributor.

(d) **T Position**

(1) Tape may be punched by use of the keyboard. A maximum speed of 115 or 170 words per minute may be attained in this position, according to the perforator-transmitter-base used, independent of the gear speed used.

(2) Messages may be sent by the transmitter-distributor and monitored on the page printer, while punching tape off line.

(3) Page copy may be received from incoming signals.

In this position transmission from the keyboard is not possible.

1.05 For an ASR set using a typing or nontyping reperforator for the punch unit as in the 28D and 28F perforator-transmitter-bases, the following types of transmission or reception may be obtained.

(a) **K Position**

(1) Messages may be sent to the line from the keyboard and monitored on the page printer.

(2) Page copy may be received from the line.

(3) The reperforator may be operated from signals received from a second line which is incoming only, while the regular send-receive line is being utilized.

The transmitter-distributor cannot be operated with the keyboard control knob in this position, nor can tape be punched from the keyboard.

(b) **K-T Position—Using Option I**

Option I Using 28F Electrical Service Unit

(1) Tape may be punched and messages sent to the line from the keyboard while monitoring on the page printer.

(2) Messages may be sent to the line from the transmitter-distributor and monitored on the page printer.

(3) Messages may be received from the line on the page printer.

In the K-T position the reperforator cannot receive signals from the line.

(c) **K-T Position—Using Option II**

Option II Using 28G Electrical Service Unit

(1) Messages may be sent from the transmitter-distributor to the line without monitoring on the page printer. At the same time tape may be punched

from the keyboard using the page printer to monitor without sending to the line.

Under Option II messages cannot be sent from the keyboard to the line. If the ASR is operating as in (1) of this option, a break signal received from another station will switch the page printer to the line circuit and stop transmission from the transmitter-distributor.

(d) **Tape Position**

(1) Tape may be punched from the keyboard at a maximum speed of 115 or 170 words per minute according to the perforator-transmitter-base used, independent of the gear speed.

(2) The transmitter-distributor may be operated in this position and monitored on the page printer. At the same time tape may be punched from the keyboard without sending to the line.

Transmission from the keyboard is not possible in the T position, and tape cannot be punched from the incoming line.

1.06 Code numbers are not assigned to complete assemblies since the choice of components provides such a wide range of features that a coding arrangement would be impractical. Therefore, the individual components must be ordered with regard to the features for which they are coded in order that the entire assembly will provide the type of service desired.

1.07 A complete ASR set will weigh a maximum of approximately 260 pounds, this figure varying with the particular components used. When the set includes a 28F cabinet (3.02), the over-all measurements of the set are approximately 39 inches high, 36 inches wide, and 24 inches deep. When the set includes a 28G cabinet (3.03), it is the same size except for the depth which is 23 inches including the 4-1/2-inch extension of the keyboard.

1.08 To indicate the desired color of the finish of the ASR, the teletypewriter cabinet and transmitter-distributor housing for the set should be ordered using a Bell System number suffix from the following table.

<u>Finish</u>	<u>Bell System Code</u>	<u>Teletype Code</u>
Black Wrinkle	37	AA
Dark-brown Wrinkle	38	AD
Light-brown Wrinkle	39	AC
Gray-green Wrinkle	40	AB

(For the 82B1 switching system, the 28 equipment was provided in only gray-green finish.)

2. BASIC CODED COMPONENTS OF THE ASR SET

2.01 The following is a list of the components comprising the ASR set which must be ordered separately according to code for the particular functions desired: (See Table 1.)

Teletypewriter Cabinet

Typing Unit

Type Box

Perforator-Transmitter-Base

Electrical Service Unit

Transmitter-Distributor Base

Transmitter-Distributor Unit

Transmitter-Distributor Housing

Motor Unit

Set of Gears (for 60, 75, or 100-wpm speed)

Note: If a **4A tape winder** is desired for use in the 28F teletypewriter cabinet, it also must be ordered separately.

POSSIBLE COMBINATIONS OF TRANSMITTER-DISTRIBUTOR UNITS, BASES, AND HOUSINGS; ELECTRICAL SERVICE UNITS; AND CABINETS FOR USE IN THE 28 AUTOMATIC SENDING AND RECEIVING SET

Table 1
Combinations*

	Code	1	2	3	4	5	6	7	8	9	10
Transmitter-Distributor Units	28B	✓									
	28C		✓								
	28E			✓	✓	✓	✓	✓	✓	✓	✓
	28F										
Transmitter-Distributor Bases	28B	✓									
	28C		✓								
	28E			✓	✓	✓	✓	✓	✓	✓	✓
	28F-1					✓	✓	✓	✓	✓	✓
	28F-2							✓	✓	✓	✓
	28F										
Transmitter-Distributor Housings	28B	✓									✓
	28C		✓								
	28E			✓	✓	✓	✓	✓	✓	✓	
	28F										
	28C	✓	✓							✓	✓
Electrical Service Units	28F			✓	✓	✓	✓	✓	✓	✓	
	28G						✓	✓	✓	✓	✓
	28F		✓								
Cabinets	28G	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	28G										

*These combinations may be used with any of the perforator-transmitter-bases described in Part 5.

3. TELETYPEWRITER CABINETS FOR THE ASR SET

3.01 **General:** Each of the cabinets described in the following paragraphs is a console-type cabinet and combines the components of the ASR into a complete set. The dome of a cabinet may be raised by depressing a button on each side of the dome which releases the latches. A right front door in the dome provides access to the page copy. Two lamps are provided just below the door hinge to illuminate the paper copy. A door on the left in the top of the dome provides access to the tape reel for loading. A left front door in the dome provides access to the tape punch and ribbon spools of the tape printer and also enables the operator to thread the new tape over the tape twister into the punch.

Fig. 3

3.02 **The 28F teletypewriter cabinet** weighs approximately 185 pounds. An opening is provided in the left front surface of the 28F cabinet to allow the fixed transmitter of a 28B transmitter-distributor unit to project outside the cabinet. A 28A copyholder is provided. A cutout panel on the horizontal surface of the left front door of the dome may be removed to mount a control panel for additional functions. In the lower left corner of the cabinet is a compartment with a hinged door to hold the 4A tape winder. The description and use of this tape winder are given in Section P31.118.1. To the right of this compartment is a tape storage bin for temporary storage of tape between the punch block and the pivoted transmitter. The tape storage bin includes a tape beater or stuffer consisting of a motor with four blades attached to the motor hub. As the hub turns, the blades shove the tape into the bin. Suitable terminals are provided on the upper rear wall and the left wall of the cabinet for making connections to the internal circuits, control equipment, and power and signal lines. Copylights of the 6-volt type are provided in the typing-unit, tape-punch, and tape-reader areas. A mounting rack is provided in the lower portion of the cabinet which will accommodate as many as eight 19- or 23-inch mounting plates of 1-3/4- or 2-inch widths.

Figs. 1 & 3

3.03 **The 28G teletypewriter cabinet** differs from the 28F teletypewriter cabinet in that it does not have a tape-winder compartment or tape storage bin, and the openings in the left front surface of the cabinet are designed to accommodate fixed transmitter-distributor units such as the 28E and 28F. On the left side of the 28G cabinet the dome is offset toward the rear to allow space for access to the transmitter. A cutout panel on the left front door of this cabinet may be removed to mount a control panel for such use as selective calling. All apparatus and cabinet wiring terminates in a ter-

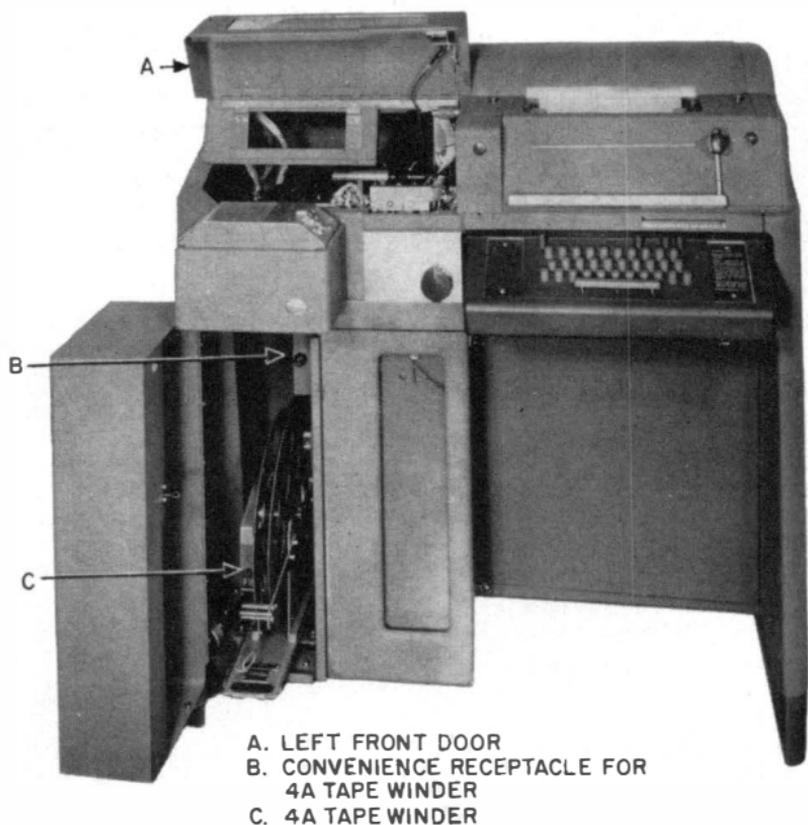


Fig. 3—28F Teletypewriter Cabinet With a 4A Tape Winder

minal board located in the upper part of the rear panel of the cabinet body to which the customer wiring is brought. When a multicontact transmitter-distributor is used, a terminal board is also provided on the left wall of the cabinet. **Fig. 2**

4. TYPING UNITS AND TYPEBOXES

4.01 The Bell System codes for typing units and typeboxes together with auxiliary features and conversion and maintenance parts for typing units are given in BSP Section P34.101. (See Fig. 1 for location of typing unit in the ASR.)

Fig. 1

5. PERFORATOR-TRANSMITTER-BASES

5.01 **General:** The perforator-transmitter-base is not only the frame on which the page printer, keyboard, perforator, tape container, and motor unit are mounted, but includes the following mechanisms and subassemblies: **Fig. 4**

(a) **Base:** The base consists of a reinforced sheet-metal box frame on which the various mechanisms are mounted.

(b) **Motor drive:** Includes an intermediate gear assembly which drives the typing unit and the signal generator. Power is furnished to this gear assembly by the motor unit which is mounted in but not a part of the perforator-transmitter-base unit.

(c) **Keyboard Assembly:** The keyboard assembly is similar to that of the 28 send-receive teletypewriter except for a newly designed clutch tripbar which permits disabling the signal generator clutch trip feature, serves as a reset link for the codebar reset bail in the tape position, and permits interconnection to trip the perforator clutch. It also has two additional codebars to operate the character counter. **Fig. 5**

(d) **Signal Generator:** The signal generator is also similar to that used on the 28 send-receive typing unit except that the reset bail and its latchlever, the reset roller assembly, and the reinforcing bracket for the rear plate assembly have been redesigned to enable them to take a greater mechanical load. **Figs. 5 & 6**

(e) **Reset Cam-follower Bracket Assembly:** This assembly provides the linkage between the clutch tripbar and the perforator cam assembly in the tape position to permit the keyboard to be reset at high speeds by the tape perforator.

(f) **Codebar Extension Basket Assembly:** This assembly is mounted between the keyboard assembly and the perforator. It transmits the character information from the keyboard codebars to the perforator, functions in providing the three modes of operation of the perforator-transmitter-base, drives the auxiliary electric switch, and when a selector is used on the perforator, an additional lever operated by the control cam provides the motion for stripping the last selection stored in the selector when switching from K to K-T or T positions.

(g) **Tape Perforator:** The tape perforator, according to customer choice, is a basic 28 typing or nontyping perforator, or a typing or nontyping reperforator modified for ASR mounting and use.

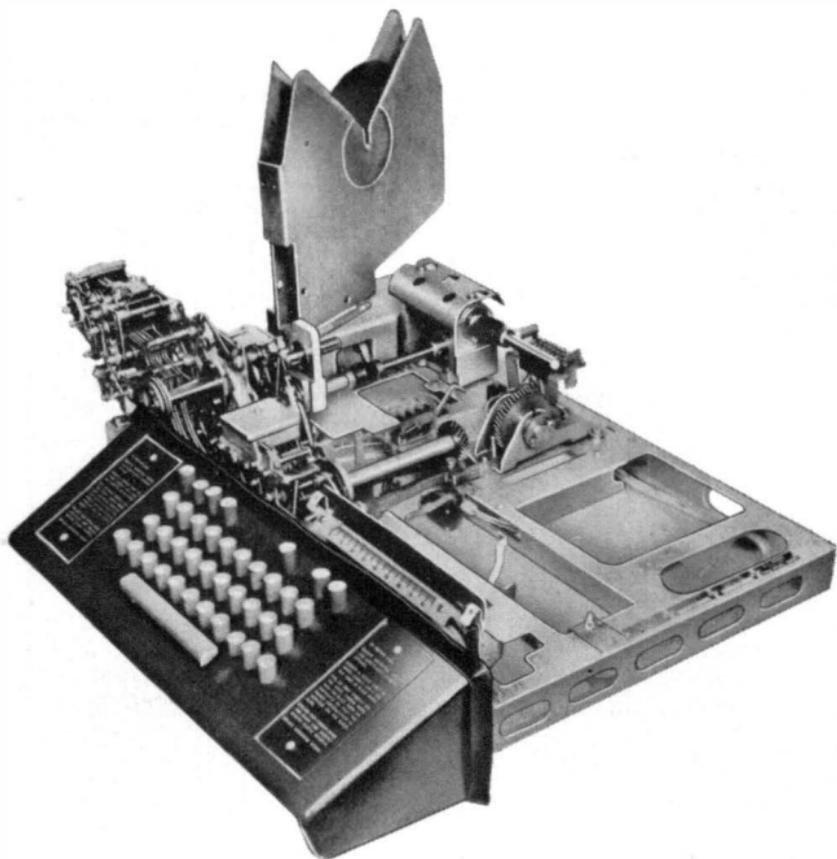
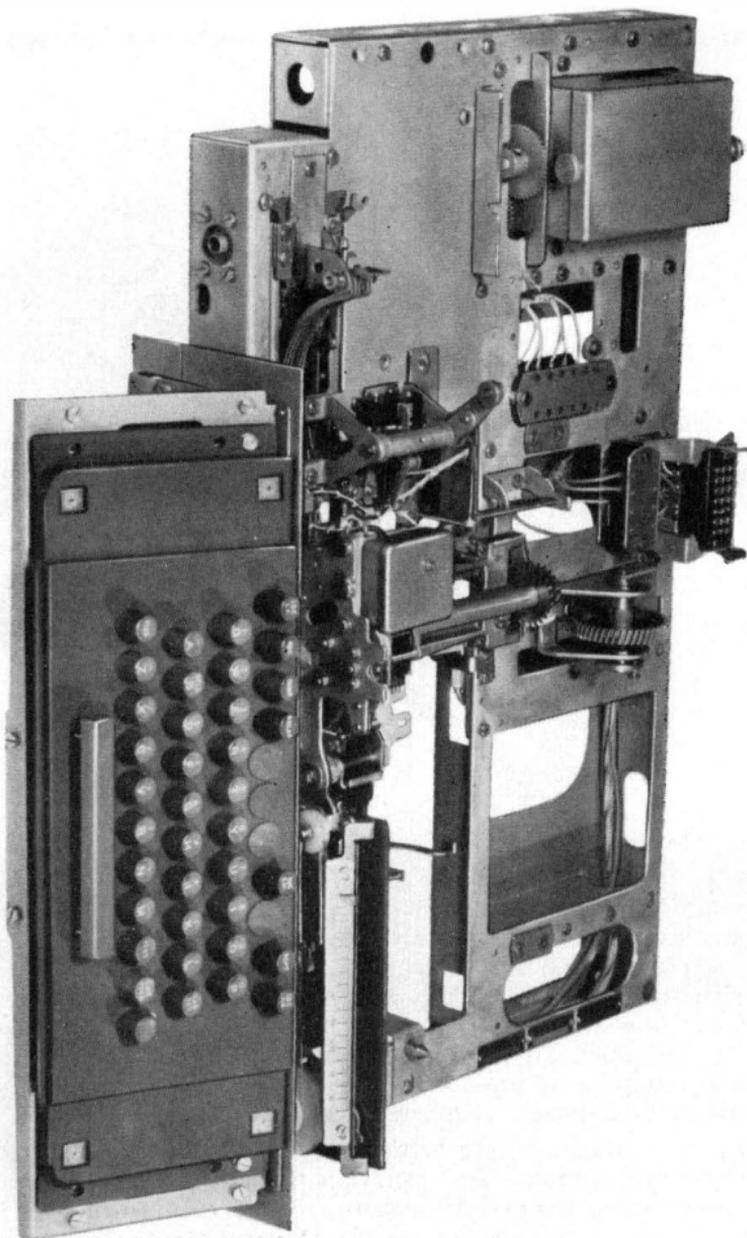


Fig. 4—28A Perforator-Transmitter-Base

Fig. 5—Keyboard Unit of Perforator-Transmitter-Base



(h) **Tape Container Assembly:** The tape container has a capacity of 1000 feet of tape and is welded to the base by means of a heavy bracket. It has a low-tape switch assembly. **Figs. 1 & 4**

(i) **Gearing and Shafting:** Power is supplied to the various mechanisms of the perforator-transmitter-base and the associated transmitter-distributor by means of suitable shafting, flexible rubber couplings, and gearing. **Fig. 4**

(j) **Character Counter:** The character counter is mounted on the right front of the base and is visible through a window in the cabinet. It is operated by codebars in the keyboard assembly and will step one scale division for any character plus space when the ASR is being operated in the T or K-T positions and will be reset when the CR key is depressed. In the T position the counter operates a switch which in turn operates an end-of-line indicating lamp.

Fig. 7

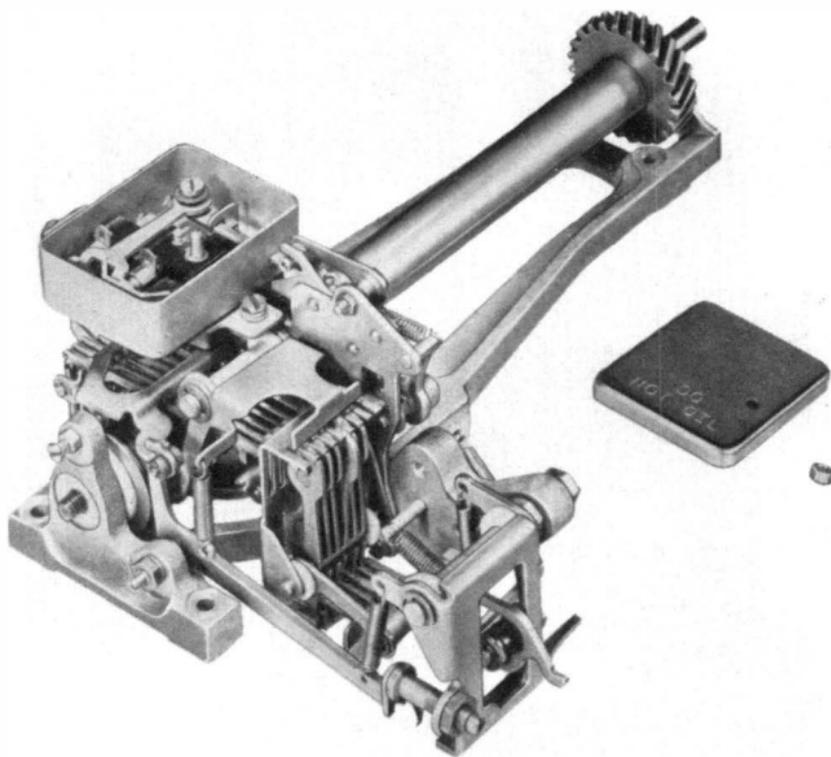


Fig. 6—Signal Generator Unit of Perforator-Transmitter-Base

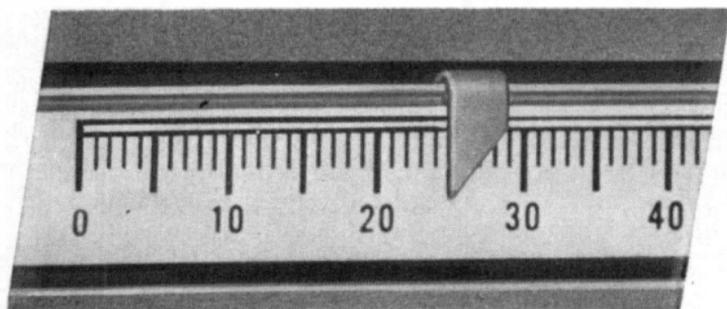


Fig. 7—Character Counter Indicator Used on 28F and 28G Teletypewriter Cabinets

(k) **Auxiliary Electric Switch and Control:** This switch is located under the tape container assembly and consists of a multiple circuit switch contained in a housing which acts as an electrostatic shield as well as a dust shield. The standard switch is a 4-pole, 3-position switch and controls the electrical connections between the three modes of operation (1.04).

All electrical wiring for the perforator-transmitter-base is brought in through a 20-pin receptacle mounted at the rear center of the base. The various electrical components are interconnected with this receptacle by a main cable, and an auxiliary cable is used between the auxiliary electric switch and a terminal board provided on the metal frame of the perforator-transmitter-base.

5.02 The **28A perforator-transmitter-base** originally was designed for use with the 82B1 switching system and has a nontyping perforator. Keyboard type arrangement A is used except that upper-case P is ϕ . It has an electrical tape-backspace key. The keyboard control knob is arranged to operate normally in the tape position or keyboard-tape position with provision for operation in the keyboard position during routing and testing. However, modifications can be made so that the control switch will not readily shift to the keyboard position. **Fig. 4**

5.03 The **28B perforator-transmitter-base** has a nontyping perforator, spring cushion keytops, type arrangement C, send and receive keys, an electrical tape-backspace key, and an electrical keyboard lock which is a switch operated through a lever by a modified lockbar in the keyboard. Operation of this switch is either manually from the keyboard or remotely by the page printer; it is used to shunt the signal generator,

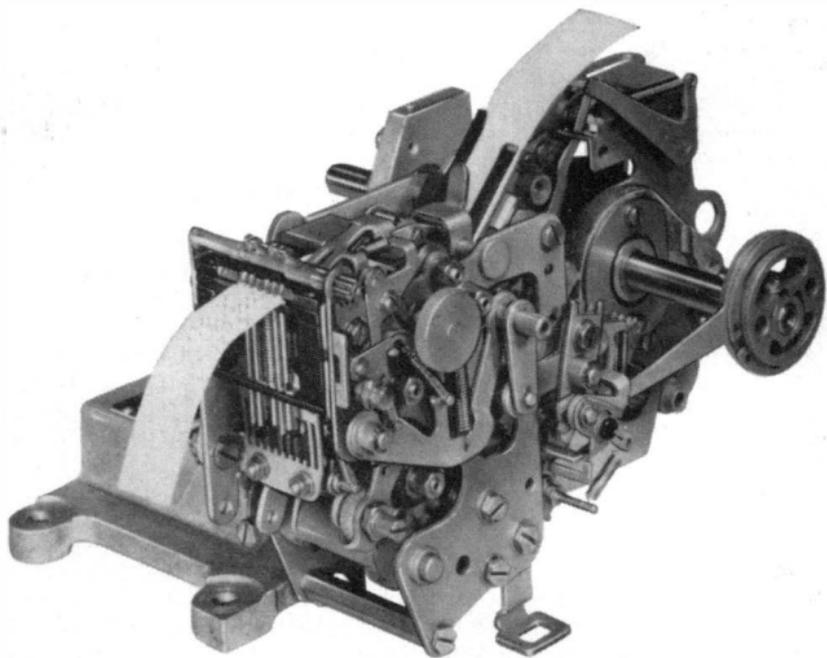


Fig. 8—Nontyping Perforator Unit of the 28B Perforator-Transmitter-Base

operate the slow-release relay in the 28G electrical service unit, and shut off the transmitter-distributor. **Fig. 8**

5.04 The **28D perforator-transmitter-base** is similar to the 28B perforator-transmitter-base, except that the perforator is replaced by a typing reperforator with type arrangement C, plus a signal-bell contact on upper-case S. In the tape position the typing reperforator may be operated through mechanical linkages from the keyboard at a maximum speed of approximately 115 words per minute.

5.05 The **28E perforator-transmitter-base** is similar to the 28B perforator-transmitter-base except that the perforator is replaced by a typing perforator with type arrangement C. In the tape position the typing perforator may be operated through mechanical linkages from the keyboard at a maximum speed of approximately 115 words per minute.

5.06 The **28F perforator-transmitter-base** is similar to the 28B perforator-transmitter-base except that the perforator is replaced by a nontyping reperforator. In the tape

position the nontyping reperforator is operated through mechanical linkages from the keyboard at a maximum speed of approximately 170 words per minute.

6. TRANSMITTER-DISTRIBUTOR UNITS, BASES, AND HOUSINGS

6.01 The Bell System code designations for the 28 transmitter-distributor units and bases and also transmitter-distributor housings are given in BSP Section P34.103.

7. 28C, 28F, AND 28G ELECTRICAL SERVICE UNITS

7.01 The 28C, 28F, and 28G electrical service units are used in the 28 automatic sending and receiving set. Information on the 28A, 28B, and 28E electrical service units is given in BSP Section P34.101, while information on the 28D electrical service unit is given in BSP Section P34.104.

7.02 The **28C electrical service unit** was used originally in the 82B1 switching system and mounts by two studs in the right rear of a 28F teletypewriter cabinet. It consists merely of the basic container including the necessary cables and terminal strips, a plate on the right-hand side of the container equipped with the power switch, convenience receptacle, and two fuse holders, and a plate on the left-hand side of the container equipped with receptacles for the punch reading contact plug and the tape-out contact plug. The power switch is operated from a lever on the front of the cabinet just below the right side of the keyboard. **Fig. 9**

7.03 The **28F electrical service unit** is for use with a 28G teletypewriter cabinet and has the following features:

- (a) The right-hand plate of the electrical service unit container has mounted on it the power switch, a convenience receptacle, a fuse holder, and provision for a second fuse holder. The left-hand plate has mounted on it a line shunt relay and the line-test key assembly.
- (b) A line relay mounting assembly.
- (c) A rectifier assembly.

The power switch and the line-test key are operated from levers on the front of the cabinet just below the right and left side of the keyboard, respectively. The wiring of 28F electrical service unit is arranged for use with any of the present TWX subscriber sets, private wire systems, or 83-type selective-calling systems.

7.04 The **28G electrical service unit** is similar to the 28F except it is equipped with a slow-release relay associated with the line circuit controlling the switching of the tele-

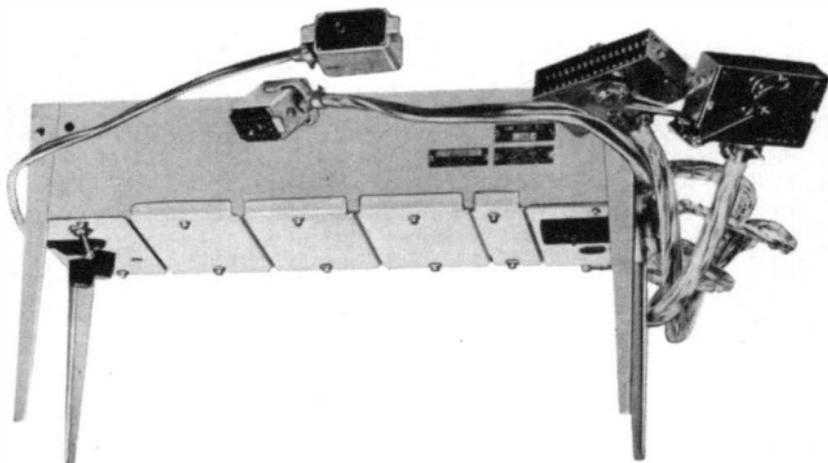


Fig. 9—28C Electrical Service Unit

typewriter portion to the line circuit when the transmitter-distributor is being operated, and tape is being punched and checked on the typing unit. When a break signal is received from the line, the relay switches the typing unit to the line circuit and stops transmission from the transmitter-distributor.

8. MOTOR UNIT

8.01 The Bell System code designations and auxiliary features and conversion parts are given in BSP Section P34.101 for the 28A and 28B motor units.

8.02 The **28C motor unit** is a synchronous motor designed for units which require more power than furnished by the 28A motor unit. Consequently it is equipped with a higher torque motor than the 28A and has a different capacitor (170 to 226 mf), starting relay, and thermal cutout.

9. GEARS

9.01 One of the following sets of gears (four gears per set) is required to operate the typing unit and the transmitter-distributor of the ASR at the desired speed.

Set of Gears	Operating Speed in Words per Minute
28D	60
28E	75
28F	100

10. REFERENCE BELL SYSTEM PRACTICES

10.01 In addition to the Bell System Practices listed below, virtually all of the P34 series of practices will be needed for use in connection with the ASR.

<u>Subject</u>	<u>Section No.</u>
Cleaning—General Requirements	P30.010
Lubrication—General Requirements	P30.011
Teletypewriter—General Requirements and Procedures	P30.012
Tools and Maintenance Supplies	P30.301
4A Tape Winder	P31.118.1
28 Teletypewriter—List of Units and Auxiliary Features	P34.101
28 Distributors and Transmitter-Distributor Units, Bases, and Housings—List of Units	P34.103
28 Typing Reperforator and Reperforator-Trans- mitter Sets—List of Units	P34.104