

DESCRIPTION OF 14-TYPE TAPE PRINTERS  
AND ASSOCIATED APPARATUS

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## DESCRIPTION OF 14-TYPE TAPE PRINTERS AND ASSOCIATED APPARATUS

### 0. Introduction

This bulletin describes the 14-type tape printers and certain accessory apparatus. Bulletin No. 345 described earlier models of these printers, but since its issuance important improvements have been made in the equipment as pointed out below. The present bulletin covers both the earlier and the later models and, therefore, replaces Bulletin No. 345. Revised ordering information, which is set up for the most part on what might be called a "unit basis," and information as to different arrangements and circuit connections, which may be employed to meet the more common service requirements are also given herein.

The improvements, which have been made in the 14-type printer equipment since the earlier bulletin, are as follows:

1. Each printer is provided with a relay connecting block and associated resistances so that a 215-A relay may be inserted in the printer to make it complete for relay operation. This relay is not normally furnished with the printer but may be ordered separately.
2. A "line-test" key with associated wiring and resistances is provided on all sending-receiving printers so that such printers may be tested locally without sending signals out on the line circuit. This "line-test" key is located just above the relay mounting, inside the cover, and the front section of the cover must be lifted to operate it. The key is of the 92-type and is in the "line" position when pushed in.
3. A new style cover with the front left portion cut away has been made available to permit cutting the printed tape nearer to the printing point. Covers have also been made available finished in walnut as well as black.
4. A printer table made of wood having a better appearance and with improved features has been made available to replace the older steel angle iron table. The new table is finished in walnut and is provided with convenient electrical fittings. A higher wooden table, finished in walnut for receiving only machines, and a wooden table, which may be used for gumming, have also been made available.
5. An improved "break" arrangement to give a very positive indication of a "break" has been provided.
6. A number of other improvements, such as the repeat space feature for the keyboard, a

more convenient unshift on space cutout for the typing unit, means for manually stopping the feeding of the tape where desired and guards for the switches to prevent accidental operation have been made available.

7. To provide sufficient terminals for making line connections, a six-terminal connecting block has been added. The line fuses and fuse blocks have been eliminated as they are not considered necessary.
8. To provide for greater flexibility of power connections, particularly where a motor-generator set is employed, a six-terminal connecting block has been used to replace the older four-terminal connecting block.

### 1. General Description of Printers

#### 1.0 General

The 14-type printers employ type-bars for printing on a narrow tape about  $\frac{3}{8}$ " wide and operate at speeds up to 368 o.p.m. (61 words per minute). These printers are quiet in operation and produce an evenly inked and neatly typed tape record. They operate on the start-stop principle, use the 5-unit code for selection and may be used on the same circuits with all other printer equipment previously standardized such as the 12, 13 and 15-type printer equipment.

For use where required any printer may be equipped with a control relay to provide for remote control of the power supply to the printer. Printers for sending and receiving are similar to those for receiving only except for the base castings; the casting for the former includes a keyboard. No automatic tape sending arrangement is built into any of the 14-type printers here described. Where tape sending is required with these printers, additional units to provide this feature are required.

Each printer is a self-contained unit about the size of an ordinary typewriter and designed so that it may be installed on an ordinary desk or table. It should, however, be used on a felt pad to minimize the noise of operation. The noise made by a complete printer, with its cover in place, is somewhat less than that of an ordinary typewriter. Specially designed printer tables are available to care for cases where it is necessary to install a table to support the printer.

The line relay mounting is arranged so that the relay cover can be removed where a relay is used



and the operation of the relay observed without removing the printer cover. The relay may also be removed and replaced if desired without removing the printer cover. By simple changes in the connections, as shown on the drawings, the printer magnet may be used directly in the line circuit, no relay being employed.

The general classes of 14-type printers and the various units of apparatus are described under headings below.

### 1.1 Sending-Receiving Printers

This printer is shown in the photographs on pages 101 and 103. It is a type-bar machine and is provided with a direct acting keyboard for sending. When connected in the usual manner, messages sent from the keyboard are printed on the tape of the sending printer as well as on the tapes of other printers connected to the circuit. Messages received are printed on the same tape as messages transmitted.

The printer may be set for operation at 240 o.p.m. or at 368 o.p.m. or at certain speeds intermediate between these two. All printers which are to operate together must be set for the same speed. The speed for which the printer is set determines the maximum speed at which the keyboard can be operated. In practice the actual speed will, of course, be lower than this maximum, owing to the impracticability of striking the keys continuously at exactly the maximum speed to which the operator is limited by the speed setting of the machine. Thus the actual speed attained will depend largely on the skill of the operator, a speed of 80 per cent. of the theoretical representing probably about the maximum which could be expected for a one-hour period or 90 per cent. for shorter periods, such as five or ten minutes.

Power for printing is supplied from a 110-volt motor arranged to operate from an electric light or power supply of this voltage. Either a-c. or d-c. motors may be obtained as required.

Page 101 shows a view of the sending-receiving printer with cover in place, mounted on a printer table. Page 103 shows a view of the printer alone with cover removed. The overall dimensions of the enclosed unit are about 15½" wide by 16½" deep by 12½" high. Its weight with cover is about 63 pounds and without cover about 48 pounds. The cover may be furnished in walnut or glossy black enamel as desired.

The height of characters printed on the tape is ⅛" and the spacing is eight characters per inch. The rolls of ⅜" wide tape normally used are about 8" in diameter and each roll contains about 950 feet of tape or enough for 15,000 words. Tape gummed on one side may be used when it is desired to paste the tape on pages or to fill in forms. Carbon copies may be made by using carbon-backed tape with an auxiliary tape reel, in conjunction with regular un-gummed or gummed tape.

Sending-receiving printers are equipped with a bell and "break" signal mechanism which gives a positive "break" indication upon the operation of the "break" key at any distant station on the circuit. The "break" device rings a bell and locks up the keyboard by short-circuiting it so as to prevent any further sending, until the device is manually restored by raising a small lever through an opening in the printer cover. This lever may be used as a keyboard lock to guard against accidental depression of keys when receiving, by throwing it to its "receive" or "down" position.

The printer is made up of three main units, the typing unit, the printer base and the cover. These units are described below and their wiring is shown on Drawing 172-A-45.

#### 1.11 Typing Units

This is the unit which contains most of the working parts of the printer. Its overall dimensions are about 10½" wide by 11½" deep by 7" high, and its weight about 29 pounds. This unit is mounted on a metal base plate and includes the following:

- Motor (with its governor and target, when required).
- Single magnet selector.
- Type-bars and their actuating mechanism.
- Break lock mechanism and bell.
- Signal bell.
- Inking ribbon and spools.
- Ribbon feed and reverse mechanism.
- Printing platen and tape feed mechanism.

Electrical connections between this unit and the printer base on which it rests are made through six clips which engage when the unit is placed in position. Felt washers are provided between the supporting feet at the corners of the typing unit base plate and the bosses on the base casting, on which it rests, to reduce the noise from the printing mechanism. The unit is positioned by dowel pins at two corners and held in place by thumb screws at the other two corners.

The motor and its accessories are mounted on a separate plate. By loosening one screw which

holds this plate, the assembly can be rotated about the vertical drive shaft as a center so as to make both the motor unit and other parts more accessible for inspection or maintenance. The electrical connections to the motor are through wires soldered to a connector block which makes contact with clip springs on the base. The motor unit may, therefore, be easily removed.

Orientation adjusting arrangements are provided at the top of the selecting mechanism. By loosening a thumb screw, the orienting handle may be moved to different positions. A scale graduated in per cent. of the length of a signal impulse is provided to facilitate making orientation adjustments and measurements of operating margins. Such adjustments or measurements can be made while the machine is operating.

A mechanically operated signal bell, which rings once for each upper case "S" signal combination, is provided in the front left-hand portion of the typing unit.

Underwood typewriter ribbons are employed and automatic ribbon reversing arrangements are provided. The ribbon spools are easily replaceable.

No ribbon oscillator is provided, and the ribbon tends to conceal to some extent the last character printed. By careful adjustment of the ribbon guide, however, it is usually possible to make the last character printed partially visible.

A sample of printing from a typing unit provided with normal type is shown below:

THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG  
1234567890                      - \$ ! & £ ' ( ) ,                      " / : ; ? , . . .

Note: Bell signal is provided on upper case "S."

A sample of printing from a typing unit provided with fractions type is shown below:

THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG  
1234567890                      - \$  $\frac{1}{4}$  & # '  $\frac{1}{2}$   $\frac{3}{4}$  ,                      " /  $\frac{1}{8}$   $\frac{3}{8}$   $\frac{5}{8}$  ? .

Complete printers or typing units equipped with either normal or fractions type may be obtained on order. If desired, the type can be ordered individually, as covered in the catalog of parts, and soldered to type-bars of machines in the field.

It will be advantageous from the standpoint of manufacturing and stocking, as well as uniformity of machines in service, if requirements for special type arrangements can, as far as practicable, be met by selection of a set or individual types from those shown above.

#### 1.12 14-B Printer Base

This unit is the base casting on which the typing unit of sending-receiving printers rests, and includes the following:

- Key caps and key levers.
- Sending cam drum, clutch and sending contacts.
- "Tape-out" bell signal.
- Governor resistances and condenser.
- Terminal clip springs to engage connector block on typing unit, and wiring to same.
- Line relay mounting and "line-test" key.

- Sockets for line resistances.
- Power control switch and "break" key.
- Break lock contacts.

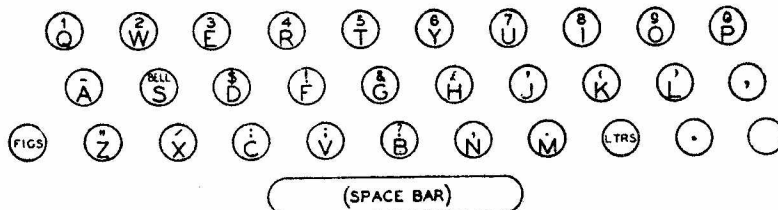
Either a-c. or d-c. typing units may be used on any printer base without any change in the wiring or in the arrangement of the base.

In Fig. 1 the key arrangements and designations are shown for normal keyboards and for fractions keyboards. The keyboard comes equipped with keycaps for the fractions arrangement but extra keycaps are also furnished in a bag, so that the keyboard may be easily changed to the other arrangement.

The sending cam drum is driven through a clutch from a gear which engages with a continuously rotating gear on the typing unit. The sending cam drum, clutch, contacts, and in fact the entire sending mechanism are mounted in the front right-hand corner of the printer base.

The tape reel mounts by machine screws on the right-hand side of the base casting outside of the printer cover. The tape can be renewed without

Normal Keyboard



Fractions Keyboard

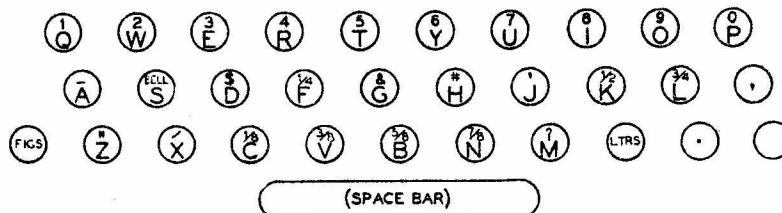


FIGURE 1

removing this cover, and the printer cover can be removed without disturbing the tape.

A "tape-out" signal is provided in the form of a bell which rings continuously when the tape supply becomes nearly exhausted. This bell is operated from a cam on the motor-driven shaft which operates the keyboard mechanism. The operation is controlled by a finger which bears on the periphery of the tape roll.

Governor resistances and a condenser are mounted underneath the base casting, for use when required. Space and mounting holes are provided here for mounting a control relay and also for a 206-type relay used in some motor control circuits. The control relay used requires only 50 milliamperes line current for its operation, and is provided with three spring contacts so that by suitable connections of the wires to these contacts it can be used either to open the motor circuit, when the relay is energized, or to close it. Drawing 172-A-46 shows the wiring of a printer employing a control relay.

A feature worthy of note is that contacts are provided in connection with the clips carrying the circuit to the printer magnet. These contacts are bridged across the circuit and so arranged that when the typing unit is removed the contacts automatically close and thus maintain the line circuit closed so that it may be used even though a typing unit has been removed for maintenance.

A plate is screwed to the under side of the printer base to protect the mechanical and electrical parts mounted underneath the top of the casting.

The line relay mounting, "line-test" key, line connecting block and sockets for line resistances are on the right-hand rear portion of the base. There are two sockets in which 18-type resistances may be inserted for adjusting the line current to the correct value to meet the operating conditions for certain cases.

The toggle switch, just to the left of the keys on the keyboard, normally controls the power supply to the motor. This switch is provided with a guard to prevent accidental operation. The "break" key just above and to the rear of the switch is for opening the line circuit to "break" or interrupt a sending station.

### 1.13 14-C Printer Base

This base is the same as the 14-B printer base except that it is equipped with an end-of-line indicator to indicate the end of a line when sending to page printers. The indicator consists of a magnet counting arrangement and contacts to light a lamp just before the end of a line. The lamp is located at the right of the keyboard in a protective housing. The mechanism counts on every operation except carriage return; on this combination it is restored so as to be ready to start counting for the next line. Direct current is required for the magnets and this necessitates the use of motor generators in many cases. Addition of the end-of-line indicator to 14-B printer bases is rather difficult and should not ordinarily be attempted unless there is available a 14-C printer base for reference.

### 1.14 Printer Covers

These are sheet metal covers which protect the

working mechanism and also silences the noise of the mechanism to a considerable degree. There are two types of cover, a regular cover to provide complete enclosure of the mechanism with rather effective silencing and a cut-away cover to provide greater accessibility to the printed tape with reasonable silencing. These covers may be obtained finished in either walnut or glossy black. The front and part of the top section of either type of cover fastens to a hinge at the rear so that this portion may be raised to insert tape, clean type and change ribbons. A check stop is provided to hold this portion of the cover when it is raised. With each cover there is furnished a tape reel, which is finished to match the cover.

A hole through the front of all covers provides access to a knurled knob on the end of the platen shaft by means of which the tape may be fed out by hand if desired. When printing upper case characters, a push on this knob will restore to lower case (or "letters") position. The platen cannot be manually moved from lower to upper case position by this means, however, as it is mechanically locked when in lower case position. Holes are provided in the sides of the covers near the top to give ventilation which is required particularly on units equipped with a-c. motors.

The regular cover which completely encloses the mechanism is provided with a glass window in the front to permit a good view of the printing. Slots are provided at the right and left-hand sides of the cover for the tape to enter and emerge. A photograph of the regular cover equipped with a copy-holder is shown on page 101.

The cut-away cover has its front hinged portion cut away at the left side so as to expose the printed tape and make it possible to cut the tape very near the printing point. With this construction, no glass window is required in the front portion of the cover. With this cover, there is supplied a left-hand tape guide slightly shorter than the guide normally provided. This should be substituted for the regular guide to permit cutting the tape closer to the printing point. This shorter guide is covered with transparent celluloid so that the tape will not lift out of place. A guard plate to prevent accidental unshifting of the platen when cutting the printed tape is also furnished with the cover to replace the exit chute employed with the regular cover. A photograph of a printer equipped with a cut-away cover and copy-holder is shown on page 104.

### 1.15 Copy-Holders

Copy-holders measure about 12½" wide by 6" high and are equipped with a message line guide, wooden back plate and screws for attaching to printer covers. Copy-holders may be furnished with walnut or glossy black finish. They are not furnished as part of printer covers but may be mounted on the front oblique surface of any cover. They are ordinarily required with sending-receiving machines.

### 1.2 Receiving-Only Printers

A photograph of a receiving-only printer with its cover in place is shown on page 102. This printer differs from the sending-receiving printer in that a 14-A printer base is employed instead of a 14-B printer base. The printer, therefore, has no sending mechanism. It measures about 14½" wide, 13½" deep and 10¾" high and weighs about 42 pounds without the cover and 56 pounds with the cover. For manufacturing reasons, the same cable form is used for wiring this printer as for the sending-receiving printer. A copy-holder is not required on the cover.

#### 1.21 14-A Printer Base

This printer base is used with receiving-only printers and differs from the 14-B printer base principally in being smaller and having the key bars, the transverse code bars, the sending contact assembly, the "break" key and the sending cam drum and clutch mechanism omitted. The power control switch is mounted in the front vertical wall of the casting and a guard is provided for the switch handle to prevent accidental operation of the switch. For cases where walnut covers are used, cover plates finished in walnut are available to cover the front of the printer base which is black.

### 1.3 14-A Printer Table

This table is of the older type and has a brown linoleum covered steel top about 22" wide and 19½" deep which is supported by four steel legs so that the table top is about 26¼" from the floor. The top of the table overhangs the framework about ¼" at the rear and 5¼" at the front. The metal work is finished in black enamel. Braces between the two rear legs of the table are drilled to mount brackets for supporting a small motor-generator or rectifier. Adjustable feet are provided to compensate for irregularities in the surface of the floor. Two power receptacles (one polarized) are provided under the top of the table. The top of the



table is provided with a bushed hole through which connecting wires may be run.

#### 1.4 14-B Printer Table

This is a walnut finished wooden table measuring 16" wide, 19" deep and 26½" high and is shown in the photograph on page 101. It is somewhat smaller than the older steel frame 14-A table. The top of the table is covered with ¾" felt for silencing and therefore no felt pad is required under the printer. The table is intended to support sending-receiving or receiving-only printers where a medium height printer table is required. Where a higher table is required for receiving-only printers the 14-H table described later may be used.

Underneath the table top are located a line jack, a trouble lamp receptacle and the necessary electrical fittings for connecting power to the printer and motor-generator or rectifier when used. A small hole is provided in the table top through which the wires between the printer and the apparatus on the table may be run. Holes are drilled in the rear legs for concealing the wires to the line jack and power receptacles. The line wires should be brought up through the hole in the right-hand leg and the power wires up through the hole in the left-hand leg. Drawing 242-B-86 shows the manner of making the wiring connections.

For a-c. stations where a motor-generator is required it will be necessary to use felt pads and a mounting plate for locating the motor-generator on the shelf of the table. Two such mounting plate accessories are available, one for 50 or 60-cycle motor-generators and the other for 25-cycle motor-generators.

#### 1.5 14-C Printer Table

This table is the same as the 14-B printer table in size and finish but is provided with a linoleum instead of a felt covered top. It is intended for use primarily as a table for supporting tape gumming equipment but may be used for other purposes. It is not provided with electrical fittings.

#### 1.6 14-H Printer Table

This is a high, walnut finished table intended for use with receiving-only printers. The table occupies less floor space than the 14-B printer table, being just wide enough and deep enough to accommodate the receiving-only printer. The top of the table is 36" from the floor and has a heavy felt covering for silencing the noise of the printer. The table is provided with a compartment for conveniently storing at least 12 extra rolls of printer tape.

It also has a shelf for mounting a motor-generator or rectifier for cases where these may be needed. The table is wired and provided with line and power receptacles so that the printer connections may be made easily by merely inserting plugs into these receptacles. The wiring of the table and the connections required to a printer are shown on Drawing 242-B-12. The two rear legs of the table have holes through them for almost their entire length so that line and power connections may be brought into the table in a concealed manner. A removable door with openings for the printer cables is provided in the top of the table so that the printer may be easily plugged into its receptacles. Page 105 shows a photograph of a 14-H table equipped with a 14-type receiving-only printer.

When a motor-generator is used on the table, accessories consisting of a motor-generator plate, a motor-generator cover and 2 felt pads are required.

#### 1.7 Miscellaneous Accessories

In some installations certain auxiliary apparatus may be required to meet the needs of the service. Some of these accessories are described below. They must be ordered separately where required.

##### 1.71 Tape Winder

This is a spring-driven tape winder for winding the printed tape into a roll. It is provided with a manual stop and start control, as well as an automatic control to stop the winding when the tape between the winder and the printer becomes taut. Ordering information for this winder is given later.

##### 1.72 Tape Moisteners and Thimble Cutters

A tape moistener may be used for wetting the gummed side of gummed tape where it is desired to paste the printed tape on sheets of paper or forms. A convenient moistener is available, consisting of a long barrel held in the right hand and containing a water reservoir which communicates with a wick over which the gummed tape passes. A thimble tape cutter which consists of a tearing edge soldered to a thimble to be used on the left hand is a convenient accessory for use with the moistener. These thimble tearing edges are available in various sizes.

A table moistener is also available consisting of a glass container with a glass cover over which there is a blotter covered with cheesecloth. The ends of the blotter and cloth hang inside the glass container which is kept partly filled with water. The tape is moistened by drawing it across the moist cheesecloth. This moistener is very often

used with the cutting scissors described in the next paragraph.

### 1.73 Tape Cutting Scissors

These scissors for cutting and pasting the printed tape have rather short cutting blades and are provided with a roller attached to one of the handles. After cutting and moistening the gummed tape, it may easily be rolled into contact with the paper to which it is to be pasted. The blades of the scissors are normally held apart by a spring and are closed for cutting tape by pressure between the fingers and the palm of the hand. The tape is moistened by drawing it across a tape moistener such as that described immediately above.

### 1.74 Auxiliary Tape Reel

An auxiliary tape reel to carry a second roll of tape, where it is desired to print two copies by having carbon backing on the tape on one roll, may be attached to the outside of the regular tape reel in place of the cover plate which should then be used as a cover for the auxiliary reel. If three printed copies are to be made, two auxiliary tape reels may be added in this way so as to accommodate a total of three rolls of tape, two of which will have tape with carbon backing.

In using multiple rolls of tape it should be noted that the "tape-out" signal functions on the inside roll only.

### 1.75 Extra Contacts for Bell and "Break" Signal Mechanism

Where desired, additional contacts may be added to the bell and "break" signal mechanism on the printer so that upon the reception of a "break" signal, any automatic tape transmitting equipment will be halted in addition to the short-circuiting of the keyboard.

### 1.76 Repeat Space Mechanism

Keyboards of 14-type printers are normally arranged to require a depression of a key for each character sent. Keyboards may be easily modified, however, so that when any key is held depressed, the character for that key will be sent out continuously at the maximum speed for which the machine is set. This arrangement requires more careful operation to avoid accidentally repeating characters; when this occurs with important characters, such as numbers, the disadvantage is apparent. Keyboards may be equipped with a mechanism which gives the repeat feature on the space bar and the non-repeat feature on all other keys. This per-

mits of spacing at the maximum rate for tabulating, paragraphing and the like, and at the same time avoiding the danger of accidentally repeating characters. The repeat space mechanism may be added to keyboards not provided with this feature. Instructions for doing this and ordering information for the parts required will be found later. The repeat space mechanism for 14-type printers allows space for filters to suppress disturbances to radio sets. (Where these filters are not required the repeat space mechanism of the 12-type keyboards may be used if desired.)

### 1.77 Tape Release Assembly

This mechanism permits of manually stopping the tape feed without stopping the printer motor. By moving a lever the tape feed mechanism is disengaged so that the tape is not moved ahead. The type-bars, however, are not prevented from striking the tape and for this reason a smudge is made on the tape. The feeding again begins when the lever is restored.

The device is installed by mounting the lever under the head of the 6746(M) mounting screw for the 6930(M) tape guide with the 6859(M) bearing collar (supplied in the assembly) as a bearing for the lever and the 7002(M) flat washer (supplied in the assembly) between the lever and the lock-washer under the head of the screw. The lever when operated should then cam the feed roll out of engagement with the feed roll gear and hold it in this position until the lever is restored.

### 1.78 Filters to Suppress Interference with Radio Sets

Some information for filters for use with printer sets has already been given in other instructions. Additional information is now under preparation and will be issued separately at a later date. No information on filters will, therefore, be given here.

## 2. Description of Operation of Mechanism

### 2.0 General

#### 2.01 Code

The signaling code employed to transmit the characters is the common start-stop code which employs five selecting impulses used in various combinations to select the characters to be printed, and start and stop impulses to maintain unison of all the stations on the circuit. The code is shown graphically in Fig. 2.



## CODE FOR NO. 14 TYPE TAPE-PRINTERS

Character		Signals in Magnet Circuit	Selection Set up	Character		Signals in Magnet Circuit	Selection Set up
Lower Case	Upper Case	Start 1 2 3 4 5 Stop		Lower Case	Upper Case	Start 1 2 3 4 5 Stop	
A	-		1 2	Q	1		1 2 3 5
B	? <sup>5</sup> / <sub>8</sub>		1 4 5	R	4		2 4
C	: <sup>1</sup> / <sub>8</sub>		2 3 4	S	Bell		1 3
D	\$		1 4	T	5		5
E	3		1	U	7		1 2 3
F	! <sup>1</sup> / <sub>4</sub>		1 3 4	V	; <sup>only</sup>		2 3 4 5
G	&		2 4 5	W	2		1 2 5
H	x #		3 5	X	/		1 3 4 5
I	8		2 3	Y	6		1 3 5
J	,		1 2 4	Z	"		1 5
K	( <sup>1</sup> / <sub>2</sub>		1 2 3 4	Space			3
L	) <sup>3</sup> / <sub>4</sub>		2 5	, ,			4
M	. ?		3 4 5	. .			2
N	' <sup>1</sup> / <sub>8</sub>		3 4	Figures			1 2 4 5
O	9		4 5	Letters			1 2 3 4 5
P	0		2 3 5				

## NOTE

Block Signal indicates that Circuit is closed.

FIGURE 2

## 2.02 Operation of Start-Stop System

In the start-stop system, when the distributor sending cams begin to rotate for the transmission of a character, the start signal, an open impulse, is sent out and starts the rotation of the selector receiving cams of all the printer sets connected to the circuit. The receiving mechanisms rotate in approximate synchronism with the transmitting mechanism so that when the latter is sending out any particular impulse, the former will have rotated to the proper position to receive that impulse. This synchronism between sending and receiving machines is obtained by using either synchronous driving motors or motors equipped with a speed regulating governor. When the impulses have been received and a selection set up in the printer, the printer mechanism is released and the character, corresponding to the selection set up, is printed. The stop impulse coming in over the line stops the rotation of the receiving shaft until the start impulse for the next character is received. This stopping of the receiving mechanism after each revolu-

tion and restarting from a signal sent over the line automatically corrects once in each revolution for any minor variations which may exist in the speeds of different printers. To make sure that the receiving mechanism will be stopped in this way, even when the motor speed is slightly slow, the receiving mechanism is geared to run at a higher angular velocity than the sending mechanism, and the receiving cams for the selecting impulses are correspondingly more widely spaced.

## 2.1 Operation of Keyboard Transmitting Mechanism

The keyboard transmitting mechanism of the sending-receiving tape-printer consists of a set of key levers, sending contacts, operating cams for these contacts, parts connecting the key levers with the operating cams and contacts and a clutch and gearing for driving these cams from the printer motor.

When a character is sent, the motor, acting through gearing and the clutch, rotates the key-

board sending cams which engage members for operating the sending contacts. In the stopped position the clutch is disengaged by the clutch stop arm and whenever a key is depressed, this arm is moved out of engagement with its notch, allowing the clutch to engage and rotate the cams.

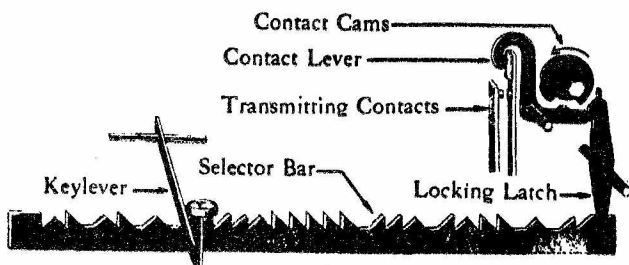


Figure 3.

Beneath the key levers are five transverse selector bars and a universal bar extending across the width of the keyboard. The selector bars are provided with saw-tooth shaped notches as shown in Fig. 3, according to the requirements of the signaling code, and they rest on rollers, so that they may be moved endwise easily. When a key is depressed, it strikes the slanting sides of the notches and moves the selector bars either to the right or to the left, depending upon whether the impulses corresponding to the bars are to be open or closed circuit impulses. The universal bar (see Fig. 4), which is connected to the clutch stop arm controlling the starting and stopping of the sending cams, is pivoted at its two ends in such a way that the depression of any key lever moves it downward to actuate the stop arm through the tripoff pawl and intermediate pawl. This allows the clutch teeth to engage, causing rotation of the sending cams.

Each selector bar engages a vertical lever or locking latch at its right-hand extremity (see Fig. 3), and positions it to correspond to the signal impulses

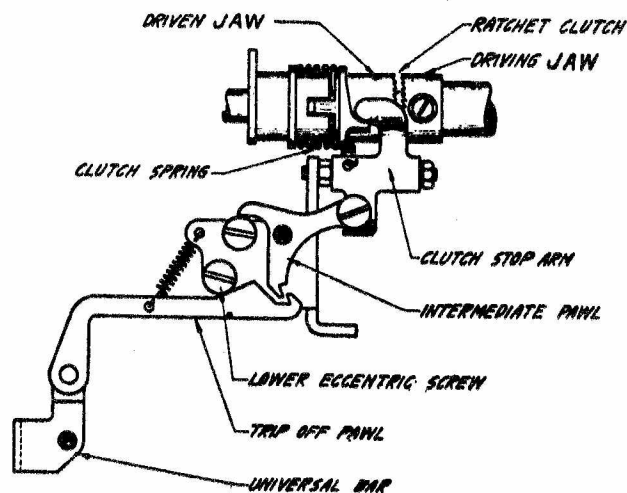


Figure 4.

to be transmitted. Each locking latch controls the motion of a contact lever by either allowing the contact lever to close its contact when the cams revolve, or restricting the motion of the contact lever. If the upper end of the locking latch is positioned to the right (see lower view of Fig. 3) corresponding to a closed circuit impulse, it does not interfere with the movement of the contact lever. Then, with the engaging of the clutch and the rotation of the cam, the contact lever rides on the cam surface and drops into the indent, thereby closing its contact and sending out a closed circuit impulse. However, if the locking latch is positioned to the left, corresponding to an open circuit impulse (see upper view of Fig. 3), it engages the contact lever and prevents it from dropping into the indent in the cam as it revolves, thereby holding the circuit open for that impulse. As the cam rotates further, the impulses, either open or closed, are transmitted in succession. A sixth contact lever controls the starting and stopping impulses. At the end of the revolution of the cam, the stop controlled by the universal bar again enters its notch and prevents the cam from rotating further until the next key is depressed.

A locking bail which engages the upper ends of the locking latches at the beginning of each revolution prevents any change in the selection set up, until the revolution has been completed and the signals have been transmitted. The bail is raised by a cam near the end of each revolution. This arrangement also makes it impossible to depress another key until the signals for the previous character have been sent out.

2.2 Operation of Receiving and Printing Mechanism

2.2.1 Operation of Selecting Mechanism

The selector mechanism is shown in Figs. 5 and 6.

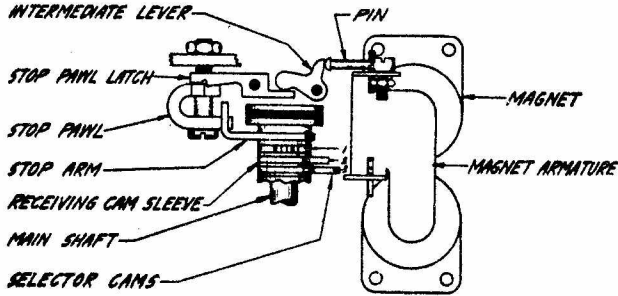


Figure 5.

When the open start impulse is received, the magnet armature is released and the pin shown in Fig. 5 acts through the intermediate lever to trip the stop pawl latch. The stop pawl latch normally engages the stop pawl, which blocks the stop arm from rotating. When the latch is tripped, the stop pawl rotates slightly due to the pressure of the stop arm against it. The stop arm and the receiving cams rotate through power transmitted by the friction clutch at the top end of the main shaft. A better view of one of the selector cams is shown in Fig. 6. When this cam rotates sufficiently, it strikes the end of the code bar operating lever, or selector lever. At this time the armature is either operated or unoperated, depending on whether the particular selecting pulse received is closed or open. Let us assume that it is a closed circuit impulse. The armature and armature extension will then oc-

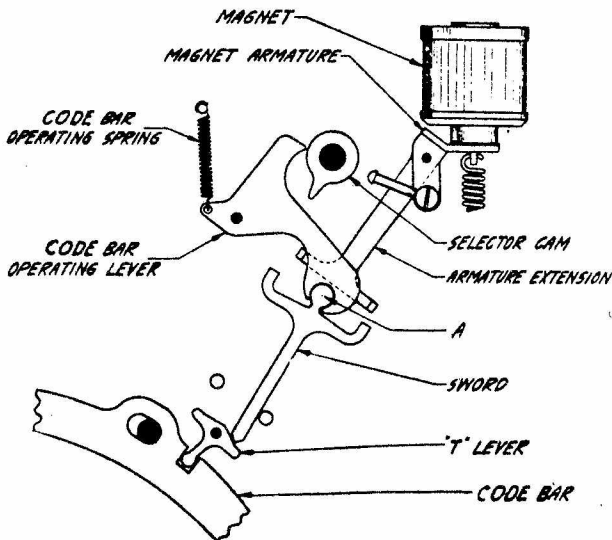


Figure 6.

copy the positions shown in the figure. As the cam passes its selector lever, the latter is rotated slightly in a counter-clockwise direction carrying back with it the sword, the right-hand end of which will strike the right-hand end of the armature extension. The sword will be rotated clockwise in its pivot "A" and when the cam projection moves to clear the operating lever, the sword will move against the left end of the "T" lever in its motion forward and move the code bar to the right. In the case of an open circuit impulse, the magnet armature and the armature extension will be in their unoperated positions. The sword, when pulled back by the action of the selector cam rotating the selector lever, will strike the left end of the armature extension and be moved counter-clockwise so as to engage the right end of the "T" lever and move the code bar to its non-selected position. In this manner each of the five code bars is made to occupy either a selected or non-selected position as a part of the operation of printing each character.

2.2.2 Operation of Printing Mechanism

The five code bars are slotted to correspond to the signaling code shown in Fig. 2. For each operation of the printer the 32 pull bars corresponding to the different typebars and printer functions to be operated are permitted to move into contact with the edges of the code bars (see Fig. 7). In front of one of these pull bars (the one to be operated) there will be a "line-up" of slots in the code bars, permitting this pull bar to move further forward. All

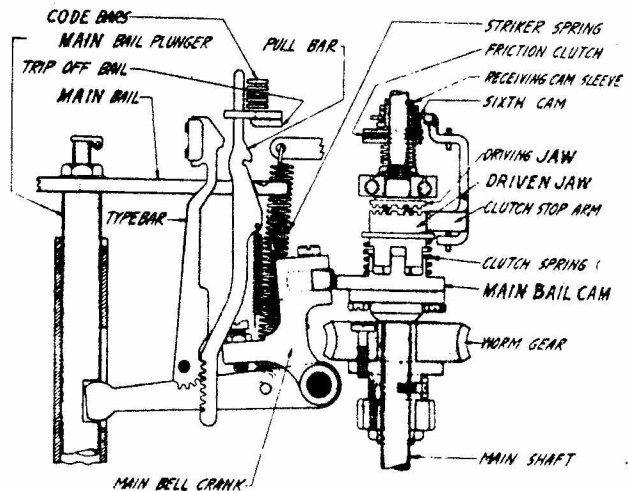


Figure 7.

the other pull bars will be restrained by striking an unslotted portion of one or more of the code bars. Thus one and only one pull bar of the group will be selected and because of its additional forward move-

ment the main bail in its upward movement will engage the notch of this pull bar. The main bail receives its motion through the main bell crank which is moved by the main bail cam driven from the main shaft through a clutch.

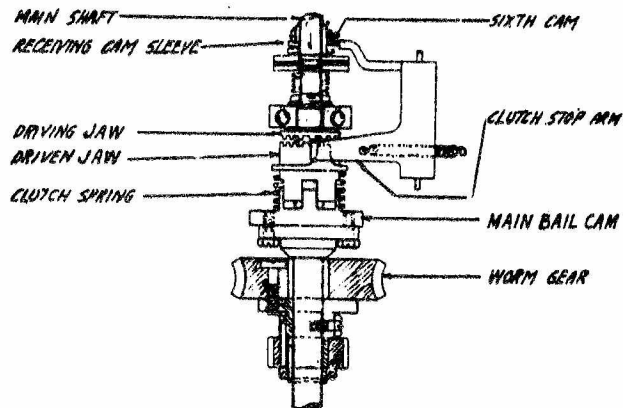


Figure 8.

Fig. 8 shows the mechanism whereby the sixth cam releases the clutch which operates the main bail when the selecting impulses have been set up. The upper part of the clutch labeled "driving jaw" is rigidly attached to the main shaft and revolves with it at all times. When the selecting impulses have been received and the sixth cam trips the clutch stop arm the driven jaw engages the driving jaw and the main bail cam is caused to rotate. One end of the main bell crank (see Fig. 7) rolls on the operating cam and controls the motion of the main bail plunger and the main bail. When the cam revolves, the bell crank allows the plunger through the action of the striker spring to pull the bail upward and the pull bar with it. The type-bar, through the gear arrangement at its lower end, is pulled downward and the type forced against the platen, thereby printing the letter for the combination selected. As the pull bar nears the end of its stroke the back edge of the hook, engaged by the bail, strikes the trip off bail and the pull bar is forced out of engagement with the main bail and returns to its normal position under the action of the pull bar spring. During the last portion of the main bail cam cycle, the cam returns the main bail to its normal position against the tension of the striker spring. In the normal downward position the main bail holds the pull bars away from the selector bars.

### 2.23 Feeding the Tape

It will be seen from Fig. 9 that the tape is fed over the platen and under the feed roll which is geared to the platen. The feed roll is held against

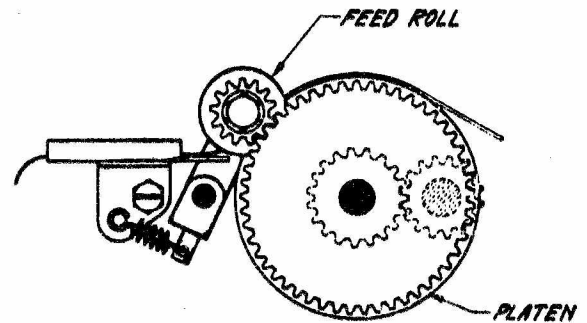


Figure 9.

the platen and in mesh with the gears by a spring. The tape is moved forward during the downward motion of the main bail as will be seen by referring to Fig. 10. As the main bail plunger and bail move upward the upper end of the space operating lever is cammed to the right (as viewed in the figure) and the lower end, with the spacing pawl is moved downward so that the pawl will engage the next tooth on the spacing ratchet. On the return downward motion of the main bail plunger the spacing spring pulls the spacing pawl upward as the roller enters the depression in this plunger, thereby spacing the ratchet one tooth. The motion of the

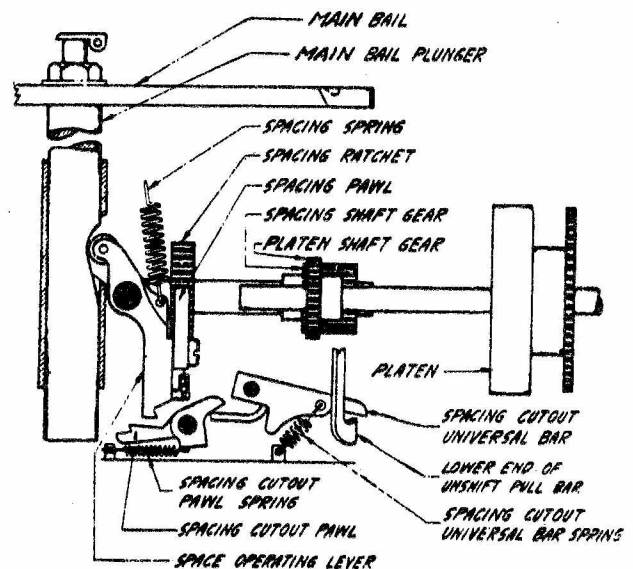


Figure 10.

ratchet is imparted to the platen through the gears and shafting so that the tape is fed forward one space.

### 2.24 Spacing Cutout

During the normal printing of characters the spacing cutout pawl (see Fig. 10) is held out of engagement with the space operating lever by the spacing cutout universal bar spring which has suffi-

cient tension to overcome the tension of the spacing cutout pawl spring. Certain pull bars, such as "Shift" and "Unshift," for which spacing of the tape is not desired, have their lower ends arranged to engage the spacing cutout universal bar when they are pulled upward by the main bail. When this occurs the spacing cutout universal bar is rocked so that its extension does not restrict the space cutout pawl from moving and the latter latches up the space operating lever during the upward travel of the main bail plunger. On the return stroke of this plunger, spacing will not occur since the space operating lever is prevented from moving and feeding the ratchet until the spacing cutout pawl is disengaged from the space operating lever. This will occur when the main bail plunger rises during the next succeeding operation which requires a space.

**2.25 Shifting and Unshifting**

The platen may occupy one of two positions: for the printing of lower case characters it is mechanically locked in its rear position and for upper case characters it is spring held in its front position. When the shift pull bar is selected and moved upward it releases the mechanical latch holding the platen in its rear position and allows the spring to move it to its front position. In this position the upper case characters will make their impression on the platen when the type-bars strike. In order to shift back to lower case either the "Letters" pull bar or the "Unshift-on-Space" pull bar is selected and when this is moved upward by the main bail the platen is mechanically moved against the action of the spring to the lower case position where it is locked by the engagement of the latch.

**2.26 Ribbon Feeding and Ribbon Reverse**

During the upward travel of the main bail plunger the ribbon feed lever (see Fig. 11) which bears on the cam surface of the plunger is moved forward so that its pawl engages the next tooth of the ribbon feed ratchet. As the main bail plunger moves downward the ribbon feed lever and pawl are pulled by the ribbon feed spring and the ratchet is moved one tooth. This motion is imparted to the ribbon spool through the ribbon feed shaft and the ribbon spool shaft, and the ribbon is fed along.

In Figs. 12 and 13 it will be seen that the ribbon feed shaft can move slightly in the direction of its axis so as to occupy either of two positions. In one position the right-hand bevel gear engages the bevel gear on the right ribbon spool shaft and in the other position the left-hand bevel gear engages the bevel gear on the left ribbon spool shaft. In the former case the ribbon will be wound on the right-hand spool and in the latter case on the left-hand spool. Assuming that the ribbon is winding on the left spool, as shown in Fig. 12, and that the ribbon on the right spool is nearly exhausted, the rivet in the ribbon near its right-hand end, in moving, will move the ribbon reverse arm about its pivot. The shaft arm and ribbon reverse pawl will be moved to the left as shown in the figure. On the next downward motion of the main bail plunger to which the ribbon reverse bail is fastened, this bail will engage the ribbon reverse pawl and move it downward. By means of the ribbon reverse lever, the ribbon feed shaft will be moved to the right as shown in Fig. 13.

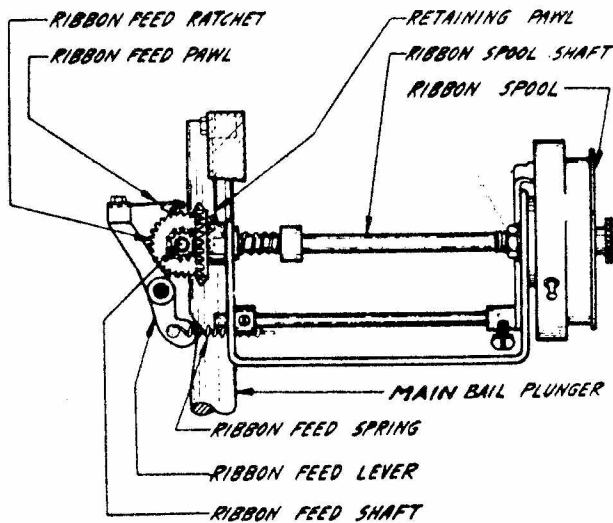


Figure 11.

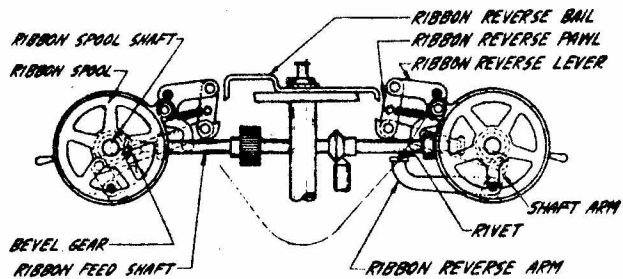


Figure 12.

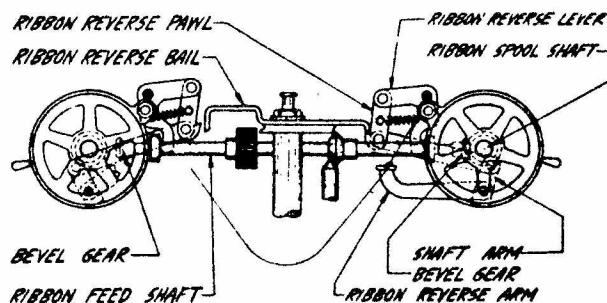


Figure 13.



In this position the bevel gear on the right end of the ribbon feed shaft will mesh with the bevel gear on the right ribbon spool shaft and the ribbon will then begin to wind up on the right-hand spool. When the ribbon is unwound from the left-hand spool the rivet near the left end of the ribbon will actuate the left-hand ribbon reverse arm and cause the feeding to shift to the left ribbon spool.

### 3. Operating Characteristics of Printers

#### 3.1 Operating Features

##### 3.10 General

The keyboard of 14-type printers is similar to the keyboard of a typewriter and any typist, after a period of practice on the printer keyboard, can become a printer operator.

When the keyboard of the machine is operated to send, the message is automatically printed on tape at all stations connected to the circuit. It is also printed on the tape of the printing unit associated with the sending keyboard. Lower case characters are capital letters, and upper case characters are figures, punctuation marks, etc., as shown by the key markings. The key marked "Figs." shifts the mechanism to print upper case characters. Upper case characters will normally continue to be printed until the mechanism is again shifted back to the lower case position by depressing the key marked "Ltrs." or the "Space" bar. The machine can be arranged to unshift on the Letters signal only, where this is desired. By first depressing the "Figs." key and then the "S" key, a bell signal will be transmitted for each depression of the "S" key.

##### 3.11 Non-Repeat and Repeating Keyboards

With the keyboard as furnished, when a key is depressed the signals for the corresponding character are immediately sent out but are not repeated even if the key is held depressed. However, the keyboard may be modified so that when any key is depressed and held down the signals for that character will be sent out continuously as long as the key is held depressed. The keyboard may also be modified so that this repeat feature operates only on the space bar. This is convenient for feeding tape out of the machine or for inserting spaces in the printed material.

##### 3.12 "Break" Feature

The operator at any station provided with a keyboard may "break" or interrupt the sending from another station and take control of the circuit in

single or half-duplex working by merely holding the "break" key depressed for a short interval. This opens the line and operates the "break" mechanism at all sending stations. The "break" mechanism rings a single stroke bell to indicate the "break," and short-circuits the keyboard contacts so as to render the keyboards ineffective. Control of the circuit may then be taken by the "breaking" station.

For cases where a 14-type printer has associated with it an automatic transmitter (14-type transmitter-distributor) so as to provide for transmission from perforated tape, additional contacts (which open on the "break") may be added to the "break" mechanism to stop the automatic transmitter. Since the "break" mechanism is associated with the typing unit of the 14-type printer, it is possible to use an automatic transmitter with a receiving-only printer and still retain the "break" feature if such an arrangement should be desired.

##### 3.13 Inserting the Tape

A continuous ringing of the "tape-out" signal bell whenever the motor is running indicates there is very little tape left on the roll and that a new roll should be inserted at the first opportunity.

To insert a new roll of tape, the cover should be removed from the tape reel and the new roll placed on the spindle in such a way that it will unwind from the top, care being taken to pull out the "tape-out" signal lever so that the roller on its end will bear against the periphery of the roll. The free end of the tape should then be fed out through the hole at the front and the tape reel cover replaced. It should then be passed around the roller and through the long chute (which passes under the sending contacts on sending-receiving printers). Raise the front of the printer cover. Then holding the free end of the tape in the right hand and pushing the feed roller away from the platen with the left, push the tape under the ribbon and between the feed roller and the platen. Then release the feed roller and turn the platen knob to feed the tape out, guiding it somewhat if necessary to prevent catching on the celluloid cover to the exit chute. Depress the tape into the chute just ahead of the platen and straighten the tape under the feed roller if necessary.

##### 3.14 Inserting the Inking Ribbon

When the old ribbon requires replacement, this can be easily done by raising the front of the printer cover. First turn off the power. Then remove the spool having the greater portion of the old ribbon



on it by pulling it forward off the split shaft on which it is carried. Unwind the remainder of the old ribbon from the other spool, moving the ribbon feed shaft if necessary to disengage the driving gears so as to permit this spool to rotate freely. Before trying to put the new spool and ribbon in place, observe the position of the small driving pin on the spool shaft. Turn the spool so that as it is pushed on the shaft, this pin will enter the small hole in the side of the spool and then thread the ribbon through the guides. Fasten the free end to the hub of the vacant spool making sure that the rivet in the ribbon is between the ribbon reverse lever and the spool hub.

### 3.15 Operation on Circuits with Page Printers

When a tape printer is operated on a circuit to which page printers are connected, it should be remembered that the page printer requires signals for feeding up the paper and returning the carriage at the end of each line. These signals (carriage return and line feed) are sent out from the keyboard of the tape printer by depressing the keys at the right, marked comma and period, respectively. These characters are additional to the regular upper case comma and period and will be printed for all carriage return and line feed signals sent out by page printers unless these type-bars are removed from the tape printer. When this is done a space will appear on the tape for these signals.

Sending from page to tape printers on the same circuit is quite practicable and can be done without change in page printer operating methods. Sending from tape to page printers is feasible when sending line for line from a typed page or where an end-of-line indicator is used, the operator depressing the keys which return the carriage and feed up the paper at the end of each line. For other cases, sending from tape to page printers is not ordinarily considered practicable except for brief conversations or for making corrections.

## 3.2 Features Affecting Circuit Layout

### 3.21 Speed of Operation

As covered rather fully earlier in this bulletin, the 14-type printers may be set for operation at various machine speeds from 240 to 368 o.p.m. The speed setting determines the maximum speed at which the keyboard can be operated. Intermediate speed settings which can be made with the standard 10-A tuning fork and a suitable target are 263, 290, 307 and 335 o.p.m. except where synchronous motors are employed. Synchronous motors when used

with suitable gears give speeds of 240 and 368 o.p.m. only.

### 3.22 Use on Different Types of Telegraph Circuits

Telegraph circuits may be divided into two general classes: (1) short line circuits where the telegraph instruments can be directly connected to the line circuit and operated over it without requiring telegraph repeaters and (2) long line circuits where it is necessary to use telegraph repeaters to properly pass the signals over the line.

In the case of short line circuits, 14-type printers can be directly connected to the line at either terminal or intermediate points, and several of them may be operated in series if desired. By using standard telegraph repeating arrangements these printers may be operated over long line circuits, either open wire or cable. In such cases the printer is usually connected in a loop circuit from the nearest telegraph repeater, in exactly the same manner as the standard page printers or manual telegraph sets. The connections to the printers for these different cases are described in detail in Division 5 of this bulletin.

In the 14-type printer the sending and receiving circuits are normally connected in series so that the printer can be used for either sending or receiving, but not for both simultaneously. These circuits can be separated, however, as explained later if it is desired to use one printer for full duplex working, that is, for simultaneous sending and receiving. Long line circuits are sometimes arranged for full duplex operation. In operating full duplex, if it is desirable to have a record copy of what has been sent, a sending-receiving printer may be used for sending and a receiving-only printer for receiving.

### 3.23 Accuracy of Signals Sent from Keyboard

The keyboard mechanism is very similar to that used in 12 and 15-type printers. In inspecting the 14-type printers at the factory the range when receiving from 14-type printers is compared with the range when receiving accurate signals from a 5-type distributor. The range receiving from a 14-type printer is required to coincide with that obtained with the very accurate signals within  $\pm 5$  per cent. at each limit as measured on a 5-type distributor with the standard orientation scale.

### 3.24 Margins of Operation on Distorted Signals

In tests made under ideal conditions, 14-type printers will, without readjustment, satisfactorily

print signals having from 40 per cent. marking to 40 per cent. spacing bias. Many individual printers will handle larger amounts of bias up to about 45 per cent. Under actual service conditions, however, variations in speed between different printers, and other variations would prohibit operation with signals as badly distorted as this. Where distortion of the wave shape of the signals is involved, such as on composited circuits, line relays should be used.

### 3.25 Number of Printers Operable in Series

On a local circuit of pure resistance of one or two hundred ohms as many as six 14-type printers can be operated in series without the use of line relays when the line current supply voltage does not drop much below 120 volts direct current. If the line current is supplied by +120 volts direct current at one end of the circuit and -120 volts direct current at the other end, then under similar conditions as many as 12 of these printers can be operated in series, and will withstand bias in the signals from the sending machine of approximately  $\pm 20$  per cent. (other conditions being ideal), indicating that there is a satisfactory working margin. In working on actual cable or open-wire circuits a number of factors will tend to decrease these working margins and will have to be taken into account in trying to predict the workability of any particular circuit layout. For short single-wire cable or for open-wire circuits which are not composited, it is believed that results nearly as good as obtained on the local circuit can be anticipated, provided, of course, that a line current of at least .060 ampere can be obtained.

In case it is desired to operate more 14-type printers in series on one circuit than can be satisfactorily operated by the method outlined above, line relays can be used with some or all of the printers and materially increase the number workable in series. If it is desired to connect together more than can be operated in this way, the use of a repeater of some sort will be required. By using repeaters practically any number of printers desired can be operated together.

### 3.26 Resistance of Printer Magnet

The printer magnet is designed to have a resistance of 210 ohms  $\pm 10$  per cent. when cold. When hot, such as after being in use for a time, the resistance may go up as high as 300 ohms, in an extremely warm room.

## 4. Ordering Information

Each unit of the 14-type printer equipment has

been assigned a code designation and may be ordered from the Western Electric Company. In order to meet the various service requirements, the units may be assembled in different combinations to make up complete printers. For convenience in ordering, certain combinations, which it is anticipated will be most frequently used, have been assigned simple code designations. These designations with the designations for the individual units and certain accessories are given below.

### 4.1 Typing Units

These units may be furnished with normal or fractions type, with d-c. motors, a-c. series motors or 60-cycle synchronous motors and for speeds of 368 or 240 o.p.m. They are equipped with the "Bell and Break Signal Mechanism." Code numbers as follows have been assigned to the typing units.

Code Designation	Description (not to be used when ordering)		
	Type	O.P.M.	Motor
14-A Typing Unit	Normal	368	60-Cycle Synchronous
14-B " "	" "	240	60-Cycle Synchronous
14-C " "	Fractions	368	60-Cycle Synchronous
14-D " "	" "	240	60-Cycle Synchronous
14-E " "	Normal	368 & 240	D-C. Shunt with Targets
14-F " "	Fractions	" "	D-C. Shunt with Targets
14-G " "	Normal	" "	A-C. Series with Targets
14-H " "	Fractions	" "	A-C. Series with Targets

When typing units with a-c. series motors are ordered for use on 25-cycle supplies it will be necessary to also order a 50-ohm resistor unit as follows:

Catalog 80912(M) Resistor Unit.

### 4.2 Printer Bases and Relay

Three bases are available, one for receiving-only printers and two for sending-receiving printers as follows:

Code Designation	Description (Not to be used when ordering)
14-A Printer Base	This is for receiving-only printers.
14-B Printer Base	This is for sending-receiving printers and includes a keyboard, "break" contacts and sufficient key caps to suit either regular or fractions type.
14-C Printer Base	This is the same as a 14-B printer base except that it is equipped with the end-of-line indicator.

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These bases are provided with a mounting bracket and associated parts for accommodating a 215-A relay. The 14-B and 14-C printer bases are provided with a local test key and associated resistances. The 215-A relay when required must be ordered separately as follows:

**215-A Relay.**

**4.3 Printer Covers, Cover Plates and Copy-Holders**

The covers listed below include a tape reel assembly of corresponding color and screws to mount the assembly. The cut-away covers include a guard which replaces the tape chute on the typing unit and a shorter left tape guide. No copy-holders are furnished with any of the covers.

Code Designation	Description (Not to be used when ordering)
14-A Printer Cover	Completely enclosing cover, walnut, with tape reel.
14-B Printer Cover	Completely enclosing cover, black, with tape reel.
14-C Printer Cover	Cut-away cover, walnut, with tape reel, guard, and left-hand tape chute.
14-D Printer Cover	Cut-away cover, black, with tape reel, guard, and left-hand tape chute.

To cover the front of the casting of receiving-only bases when using walnut covers, walnut cover plates should be used. The front of the casting would otherwise show black.

Code Designation	Description (Not to be used when ordering)
14-A Cover Plate	Walnut cover plate for receiving-only printers.

This plate includes a walnut finished switch guard for the power switch and screws for mounting to the base casting.

Copy-holders (not supplied with printer covers) are usually required at sending-receiving printers. They are coded as follows:

Code Designation	Description (Not to be used when ordering)
14-A Copy-holder	Walnut copy-holder.
14-B Copy-holder	Black copy-holder.

**4.4 Speed Checking Targets**

The following targets are used with 10-A tuning forks to check speeds where synchronous motors are not used.

Code Designation	Description (Not to be used when ordering)
1-G Target	10 Black Spots—For 368 o.p.m. with 14-E, 14-F, 14-G and 14-H typing units.
1-J Target	23 Black Spots—For 240 o.p.m. with 14-E, 14-F, 14-G and 14-H typing units.

**4.5 Printer Tables**

The following tables are suitable for mounting 14-type printers in cases where it is necessary for the telephone company to furnish tables.

Code Designation	Description (Not to be used when ordering)
14-A Printer Table	Old style, steel table with linoleum covered top, line jack and two power receptacles. (Manufacture discontinued.)
14-B Printer Table	Walnut finished wooden table with felt covered top and equipped with electrical fittings for printer and rectifier or motor-generator.
14-C Printer Table	Walnut finished plain wooden table with linoleum covered top. No electrical fittings. Designed primarily to carry tape gumming equipment.
14-H Printer Table	High, walnut finished wooden table for receiving-only printers; equipped with electrical fittings.

**4.6 Miscellaneous Accessories**

A number of miscellaneous accessories have been coded as follows, and should be ordered separately when required:

Code Designation	Description (Not to be used when ordering)
14-A Printer Pad	A felt pad for use under the printer when used on an ordinary desk.
81023(M) Set of parts for double tape	For mounting a second roll of tape so that a carbon copy of the message may be made. Finished in walnut.
73394(M) Set of parts for double tape	Same as walnut parts for double tape except finished in black.
206-AH Relay	Used for polar motor control.
72484(M) Control Relay	For motor control. Includes screws for mounting.
76382(M) Relay Bracket	For mounting 206-AH relay.
78385(M) Contact Parts	Extra "break lock" contacts for controlling tape transmitter.

Code Designation	Description (Not to be used when ordering)	Code Designation	Description (Not to be used when ordering)	
80152(M) Auto-matic Space Repeat Assembly	Parts for equipping key-boards with repeat space feature.	77576(M) Set of Motor-Generator Accessories	Includes mounting plate, felt pads and cover for 50 or 60-cycle motor-generators on 14-H printer tables.	
7625(M) Tape Winder	Spring driven tape winding reel.	Printer Rectifier per KS-5300 List 1	This is a copper oxide rectifier for 105-125 volt, 60-cycle supplies.	
77376(M) Tape Release Assembly	Parts to provide for stopping tape feed manually.	<b>4.7 Tape</b>		
70169(M) Hand Tape Gummer	Old style gummer to moisten gummed tape.	Tape $\frac{3}{8}$ " wide for 14-type printers may be ordered by specifying any of the following:		
"Only" Sanitary Moistener, $3\frac{1}{2}$ " x $5\frac{1}{2}$ "	A table moistener for gummed tape.	(Quantity) Rolls $\frac{3}{8}$ " Ungummed—white tape for 14-type printers.		
Printer Tape Scissors per KS-6416	Scissors equipped with roller.	(Quantity) Rolls $\frac{3}{8}$ " Gummed—white tape for 14-type printers.		
73581(M) Thimble Tape Cutter Size 5	Thimbles equipped with small, metal plates for tearing tape and pressing it in contact with blanks. (Size 5 is the smallest size.)	(Quantity) Rolls $\frac{3}{8}$ " Ungummed—yellow tape for 14-type printers.		
73582(M) Thimble Tape Cutter Size 6		(Quantity) Rolls $\frac{3}{8}$ " Gummed—yellow tape for 14-type printers.		
72636(M) Thimble Tape Cutter Size 7		(Quantity) Rolls $\frac{3}{8}$ " Carbon-Backed—white tape for 14-type printers.		
72637(M) Thimble Tape Cutter Size 8		Gummed tape is ordinarily packed in metal cans each holding 25 rolls and each roll is enclosed in a glassine envelope to exclude moisture. Ordering tape in lots of 25 rolls, or multiples thereof, makes it possible to ship the tape in these containers. The containers are useful for storing unused tape and keeping it in good condition.		
72638(M) Thimble Tape Cutter Size 9		<b>4.8 Complete Printer Sets</b>		
72639(M) Thimble Tape Cutter Size 10		A number of the more common combinations of the various units which make up 14-type printer sets have been given simple code designations for convenience in ordering. These designations are given in the table on the following page. For other combinations, the various units composing the sets must be ordered separately.		
72640(M) Thimble Tape Cutter Size 11		<b>5. Installation Arrangements</b>		
73583(M) Thimble Tape Cutter Size 12		<b>5.1 Power Supply Required</b>		
71508(M) Motor-Generator with Accessories.		Motor is for 50-cycle a-c. Accessories are for 14-A printer table.	For operating the printer motor, a power supply preferably of 110 to 120 volts, either direct or alternating current, is required. Satisfactory operation, however, can ordinarily be obtained if the voltage does not exceed the limits of 100 to 130 volts. Printers may be equipped with a $\frac{1}{17}$ h.p. d-c. shunt motor, a $\frac{1}{25}$ h.p. a-c. series motor or a $\frac{1}{50}$ h.p. a-c. synchronous motor.	
71510(M) Motor-Generator with Accessories		Motor is for 60-cycle a-c. Accessories are for 14-A printer table.	The a-c. series motors are suitable for frequencies of 25 cycles or about 50 to 60 cycles. When operating the a-c. printers with series motors on 25 cycles, it is necessary to connect a resistance of 50 ohms in one of the supply lines to the motor, in order to maintain the best speed regulation and	
71522(M) Motor-Generator with Accessories		Motor is for 25-cycle a-c. Accessories are for 14-A printer table.		
71507(M) Motor-Generator		For 50-cycle a-c.—no accessories.		
71509(M) Motor-Generator	For 60-cycle a-c.—no accessories.			
71521(M) Motor-Generator	For 25-cycle a-c.—no accessories.			
14-A Set of Motor-Generator Accessories	Includes mounting plate and felt pads for 50 or 60-cycle motor-generators on 14-B printer tables.			
14-B Set of Motor-Generator Accessories	Includes mounting plate and felt pads for 25-cycle motor-generator on 14-B printer tables.			

## Unit Composition

Code Designation for Ordering	Typing Unit	Printer Base	Printer Cover	Cover Plate	Copy-Holder	Descriptive Information (Not to be used for ordering)				
<b>Coding for Walnut Finish Printers</b>										
14-C	Printer	14-A	14-A	14-A	14-A	368 o.p.m.	A-C. Syn. } D-C. }	Normal Type	All Enclosing Cover	Receiving- Only Walnut Finish
14-D	"	14-B	"	"	"	240 "				
14-E	"	14-E	"	"	"	368 "	A-C. Syn. } D-C. }	Fractions Type		
14-F	"	14-C	"	"	"					
14-G	"	14-D	"	"	"	240 "	A-C. Syn. } D-C. }	Fractions Type		
14-H	"	14-F	"	"	"					
14-J	"	14-A	"	14-C	"	368 "	A-C. Syn. } D-C. }	Normal Type	Cut-Away Cover	
14-K	"	14-B	"	"	"	240 "				
14-L	"	14-E	"	"	"	368 "	A-C. Syn. } D-C. }	Fractions Type		
14-M	"	14-C	"	"	"					
14-N	"	14-D	"	"	"	240 "	A-C. Syn. } D-C. }	Fractions Type		
14-P	"	14-F	"	"	"					
14-R	"	14-A	14-B	14-A	14-A	368 "	A-C. Syn. } D-C. }	Normal Type	All Enclosing Cover	Sending- Receiving Walnut Finish
14-S	"	14-B	"	"	"	240 "				
14-T	"	14-E	"	"	"	368 "	A-C. Syn. } D-C. }	Fractions Type		
14-U	"	14-C	"	"	"					
14-W	"	14-D	"	"	"	240 "	A-C. Syn. } D-C. }	Fractions Type		
14-Y	"	14-F	"	"	"					
14-CA	"	14-A	"	14-C	"	368 "	A-C. Syn. } D-C. }	Normal Type	Cut-Away Cover	
14-CB	"	14-B	"	"	"	240 "				
14-CC	"	14-E	"	"	"	368 "	A-C. Syn. } D-C. }	Fractions Type		
14-CD	"	14-C	"	"	"					
14-CE	"	14-D	"	"	"	240 "	A-C. Syn. } D-C. }	Fractions Type		
14-CF	"	14-F	"	"	"					

## Coding for Black Finish Printers

14-EC	Printer	14-A	14-A	14-B		368 o.p.m.	A-C. Syn. } D-C. }	Normal Type	All Enclosing Cover	Receiving- Only Black Finish
14-ED	"	14-B	"	"	"	240 "				
14-EE	"	14-E	"	"	"	368 "	A-C. Syn. } D-C. }	Fractions Type		
14-EF	"	14-C	"	"	"					
14-EG	"	14-D	"	"	"	240 "	A-C. Syn. } D-C. }	Fractions Type		
14-EH	"	14-F	"	"	"					
14-EJ	"	14-A	"	14-D	"	368 "	A-C. Syn. } D-C. }	Normal Type	Cut-Away Cover	
14-EK	"	14-B	"	"	"	240 "				
14-EL	"	14-E	"	"	"	368 "	A-C. Syn. } D-C. }	Fractions Type		
14-EM	"	14-C	"	"	"					
14-EN	"	14-D	"	"	"	240 "	A-C. Syn. } D-C. }	Fractions Type		
14-EP	"	14-F	"	"	"					
14-ER	"	14-A	14-B	14-B	14-B	368 "	A-C. Syn. } D-C. }	Normal Type	All Enclosing Cover	Sending- Receiving Black Finish
14-ES	"	14-B	"	"	"	240 "				
14-ET	"	14-E	"	"	"	368 "	A-C. Syn. } D-C. }	Fractions Type		
14-EU	"	14-C	"	"	"					
14-EW	"	14-D	"	"	"	240 "	A-C. Syn. } D-C. }	Fractions Type		
14-EY	"	14-F	"	"	"					
14-FA	"	14-A	"	14-D	"	368 "	A-C. Syn. } D-C. }	Normal Type	Cut-Away Cover	
14-FB	"	14-B	"	"	"	240 "				
14-FC	"	14-E	"	"	"	368 "	A-C. Syn. } D-C. }	Fractions Type		
14-FD	"	14-C	"	"	"					
14-FE	"	14-D	"	"	"	240 "	A-C. Syn. } D-C. }	Fractions Type		
14-FF	"	14-F	"	"	"					

Notes: 1—Where 215-A relays are desired with any of the printers listed above or with any of the individual units, these relays should be ordered as separate items since they are not supplied as parts of any of the printer units.

2—Where complete printers other than those coded above are desired, the various units making up the particular combination should be ordered separately.



keep sparking at the governor contacts a minimum. A Ward-Leonard Vitrohm Resistor Unit mounted in a perforated metal box and provided with a heat insulator and a length of flexible conduit for making connections to the other units of apparatus is available for machines for operation on 25-cycle supplies. This unit, which must be ordered separately, may be mounted on the printer table. The installer should check the tightness of the mounting of the "D" type resistor unit in the box at the time of installation in order to insure that the resistance cannot be turned to such a position as to ground the terminals. A-c. series motors on 50 or 60-cycle supplies require no external resistance.

Synchronous motors do not cause radio interference and do not require speed checking. They may be employed on 60-cycle supplies for cases (a) where all the printers on the circuit operate from the same power supply, (b) where the line signal distortion is not likely to be very large and all the printers do not operate from the same power supply, and (c) where the line distortion may be considerable but the power frequency is held within the limits of about  $\pm .75$  per cent. A synchronous motor is available at the present time for speeds of operation of 240 and 368 o.p.m. on 60-cycle 110-volt supplies. Suitable gears are required in each case. Where a-c. supplies are available and synchronous motors cannot be used, typing units with a-c. series motors will be required.

The power required for 14-type printers on 115 volts is about 45 watts for direct current and 65 watts for alternating current using either series motors or synchronous motors. If there are other current drains such as for line current or operation of a line relay, these drains will have to be added to the figures given above in computing the total power consumption.

### 5.2 Direct Current Required

Direct current is required in the printer for operation of the printer magnet, for the local test circuit and for the biasing circuit of the line relay when one is used in a neutral circuit. The printers are designed to use approximately 115 volts direct current for this supply and in cases where the power supply is direct current of about this voltage, it may be used. Where the power supply is alternating current, however, it will be necessary to supply direct current for these circuits. This may be done by employing a rectifier or one of the small standard motor-generators. The current required by the magnet is .060 to .065 ampere, by the local

test circuit, .060 ampere, and by the biasing circuit for the relay, .030 ampere. Values of magnet current up to .070 ampere should not be objectionable, but if the current becomes less than .060 ampere rather rapid loss of operating margin is likely to result. In checking these currents it should be noted that the resistance of the printer magnet hot is appreciably more than when cold and the current should be so regulated that it will not be less than .060 ampere after the magnets in the line circuit have reached their maximum resistance.

Direct current is not required if the printer magnets can be connected in the line or loop circuit, and the local test feature is not required, the printer motor being operated on alternating current.

When operating in a neutral telegraph circuit, the line current required is .060 to .065 ampere. When a control circuit is employed, the current through the control relay should be adjusted to approximately .050 ampere. When the printer is operated from polar signals, the line current should be adjusted to a value of approximately .035 ampere under normal conditions.

### 5.3 Installation Connections

The connections of the 14-type printers as furnished from the factory are shown on Drawing 172-A-45. This drawing also shows the connections to line and power for a number of typical installations. Drawing 172-A-46 shows the connections of 14-type printers when equipped with control relays. This drawing also shows some typical connections to line and power. In the section of each drawing which shows the wiring of the printer as furnished, the six-terminal power connecting block is shown in the lower left-hand corner of the figure, the six-terminal line connecting block in the upper right-hand corner of the figure and the six terminals on the resistance mounting brackets are shown in the upper left-hand corner of the figure. The resistance mounting bracket terminals and the line connecting terminals are shown in their correct relative positions as viewed from the rear of the printer.

The various power connections which may be used with each printer are illustrated in Figs. A, B, C, etc., on the drawings. The various line connections are illustrated in Figs. 1, 2, 3, etc., on the drawings and the various control relay connections in Figs. U, V, W, X, Y and Z. The modifications of the wiring required when the printer is to be used without a line relay are shown in Fig. XR.



Drawings 242-B-12 and 242-B-86 show the wiring of printer tables and how the 14-type printer may be connected to these tables using separable connectors. A number of drawings rated "Manufacture Discontinued" are included to take care of printers of the earlier type which are still in the field.

### 5.31 Connection of Resistances on D-C. Motor

In making installations of d-c. printers, it should be noted that the motor carries a resistance mounting bracket equipped with a 200-ohm Ward-Leonard resistance having a center tap to make available two 100-ohm units.

These resistances are intended for use to improve motor governing and to decrease sparking at the governor contacts in cases where the voltage differs appreciably from 115 to 120 volts or where the machines are to be operated at low speeds. In such cases resistance is connected either in the armature or field circuits by cutting the loops provided for this purpose and connecting to the terminals of the resistance. The table below shows the resistance values which should give best results for various conditions and also shows whether the resistance is to be inserted in the armature or field circuits. The loop of deltabeston wire is in the armature circuit and the loop of braid covered wire is in the field circuit.

Speed in Oper. per Min.	Supply Voltage	Resistance Required in Field	Resistance Required in Armature
239-290	100-124	0	50 ohms
239-290	125-130	0	100 "
307-368	100-111	200 ohms	0
307-368	112-124	0	0
307-368	125-130	0	50 ohms

Note: For 50 ohms connect to the middle terminal of the resistance and to either outside terminal which should be strapped to the other outside terminal, putting the two sections in parallel. For 100 ohms connect to the middle and either outside terminal. For 200 ohms connect to the outside terminals.

### 5.32 Connection to Line or Loop Using Jack and Plug

Printer tables are provided with a jack for connection to the line or loop circuit and this may be used in conjunction with a plug attached to the printer to provide quick interchangeability of printers and flexibility. Where a printer table is not employed the jack and plug arrangement may be wired in by the installer. Such an arrangement is shown in Fig. 8 of Drawing 172-A-45. Th:

73610(M) Jack Box Assembly indicated on the drawing consists of a jack mounted in a metal box and arranged for mounting to a table or other support.

### 5.33 Separable Connection to A-C. Supply at Printer

Printer tables provide separable connections between the power supply and the printer. Where these connections have to be wired in by the installer, Figs. D and E of Drawing 172-A-45 will serve as a guide. Two separable power plugs and other material are required as shown in the figures.

### 5.34 Remote Motor Control Over Second Wire

Where a second wire is used for starting and stopping the motors of a number of printers on a circuit, each printer is ordinarily equipped with a control relay and all the control relays are connected in series in the control circuit. Drawing 172-A-46 shows a number of typical connections at the printer sets when control relays are used.

Control relays for starting and stopping printer sets are arranged with both front and back contacts so that the relay may be used to start the motor either when the relay is energized or deenergized depending on what contacts are connected in the motor power circuit. When the relay is connected for "Break Control," the printer motor starts upon the opening of the control circuit and stops when this circuit is closed. For the "Make Control" connection, the printer starts when the control circuit is closed and stops when this circuit is opened. With the "break control" arrangement, any number of printers may be associated with each other and each may start and stop all the sets. With the "make control" arrangement, any number of printers may be connected in the circuit but only one station may act as the controlling station.

### 5.35 Polarity of Power and Line Connections

When a line relay is employed in the 14-type printers, it is very important that the polarity of the connections both for the line and for the d-c. supply to the relay be correct. This polarity is indicated on the drawings and should receive special attention.

### 5.36 Station Receiving Polar Signals

Fig. 7 of Drawing 172-A-45 shows the connections required at the line relay where the printer is to receive polar signals. The line relay repeats the signals and converts them into neutral signals for

the printer magnet. The two windings of the relay are connected in series aiding and the line current should be adjusted to a value of about .035 ampere.

### 5.37 Printer Used Without Line Relay

Fig. XR or Drawings 172-A-45 or 172-A-46 shows the modifications to be made in the printer wiring when the printer is to be used without a line relay.

### 5.38 Use of Single Line for Printing and Power Control

For cases where an installation of one controlling station and one or more controlled stations is desired a second wire for controlling the starting and stopping of the printer sets will not be required provided a three-wire supply of 110-volt direct current is available at the controlling station. The controlling of the sets can be accomplished over the signaling wire by employing a 206-AH polar relay at each controlled station as shown on Drawing 244-B-31. Negative polarity from the three-wire supply is used on the line for starting the machines and for the signaling pulses and positive polarity for stopping the machines. A control relay adjusted to start the sets on "no current" is employed. At the controlled station this relay is shorted by the contacts of the polar relay in the line circuit when negative polarity is connected to the line. When the open pulses of the signals are received, the polar relay contacts remain closed because of the bias adjustment of this relay. When the polarity is reversed, the polar relay allows the control relay to be connected into the line circuit and the control relay in pulling up disconnects the power from the printer. A three-way switch is used at the controlling station to reverse polarities. Provision is made in the printer for mounting the control relay and also the 206-AH relay on a bracket.

### 5.39 Information Furnished with Printers by Manufacturer

Arrangements have been made to have the manufacturer furnish with each printer, a circuit diagram showing in detail the exact wiring of the printer as furnished and also detailed instructions for the unpacking and assembling of the units.

### 5.4 Unshift on Space Cutout

Ordinarily 14-type printers are arranged to unshift on the "space" as well as the "letters" selection but they may be easily modified so as to unshift on "letters" only where this is desired. The unshift on space cutout is made possible by a small

auxiliary slot for the space pull bar adjacent to the working slot in the pull bar guide. To prevent unshift on space it is merely necessary to lift the pull bar out of its working slot and move it to the auxiliary slot where it will be inoperative.

### 5.5 Addition of Repeat Space Mechanism

To add the space-repeat mechanism to keyboards of 14-type printers the following work should be done:

1. Remove the three screws which pivot the space bar in the three bearing posts and unloosen the nuts on the under side of the casting so as to loosen the bearing posts.
2. Remove the space bar loop and bearing posts; if necessary insert a screw-driver into the slots of the bearing posts and twist the screw-driver so as to break the sides of the posts. The space bar loop and bearing posts may then be discarded.
3. Place the new "space repeat" space bar loop into position with the extension for giving the repeat feature to the right. Slide the new bearing posts along the space bar loop arms to the holes in the casting. The two left-hand bearing posts should be placed so that the heads of the pivot screws will be to the left and the two right-hand bearing posts should be placed so that the heads of the screws will be to the right. Insert the pivot screws and tighten them (removing the power switch if necessary to gain access to the left screws). The bearing posts should be mounted to the casting in such a way as not to bind the space bar loop.
4. Remove the right-hand screw from the bracket directly behind the cam cylinder. Place the pull rod guide and pull rod in position so that the pull rod will move freely in the guide and the end of the pull rod will engage the lower end of the clutch lever pawl. Mount the pull rod guide by replacing the bracket screw.
5. Attach the pull rod to the space bar loop extension. Then with the space bar held operated, adjust the position of the sleeve and nuts so that the clutch lever will just completely clear the throw-out cam of the driven jaw of the clutch. When the proper position of the sleeve is determined the locknuts should be tightened.

### 5.6 Addition of "Break" Contacts for Transmitter Distributor

Sending-receiving printers are regularly equipped with "break" contacts which short-circuit the keyboard upon the reception of a "break" signal. Supplementary contacts may be mounted beside the

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regular contacts to open the control circuit of a 14-type transmitter distributor associated with the printer, so as to stop the transmission from the distributor when a "break" is received. Sending from either the keyboard or the transmitter distributor cannot take place until the "break" mechanism is manually restored.

To install the supplementary contacts on the later model printers, it is merely necessary to order the necessary contact assembly as, "Catalog 78385(M) Contact Parts" and mount it on the keyboard slip connection guard to the right of the regular contacts using the holes provided in the guard and the screws which hold together the pile-up of springs and insulators.

For the earlier printers with the old style single contact "break" mechanism and without line relays, it will be necessary to order the following in order to add the supplementary contacts:

Catalog 78385(M) Contact Parts (complete).  
" 77188(M) Contact Arm.  
" 7257(M) Keyboard Slip Connection Guard.

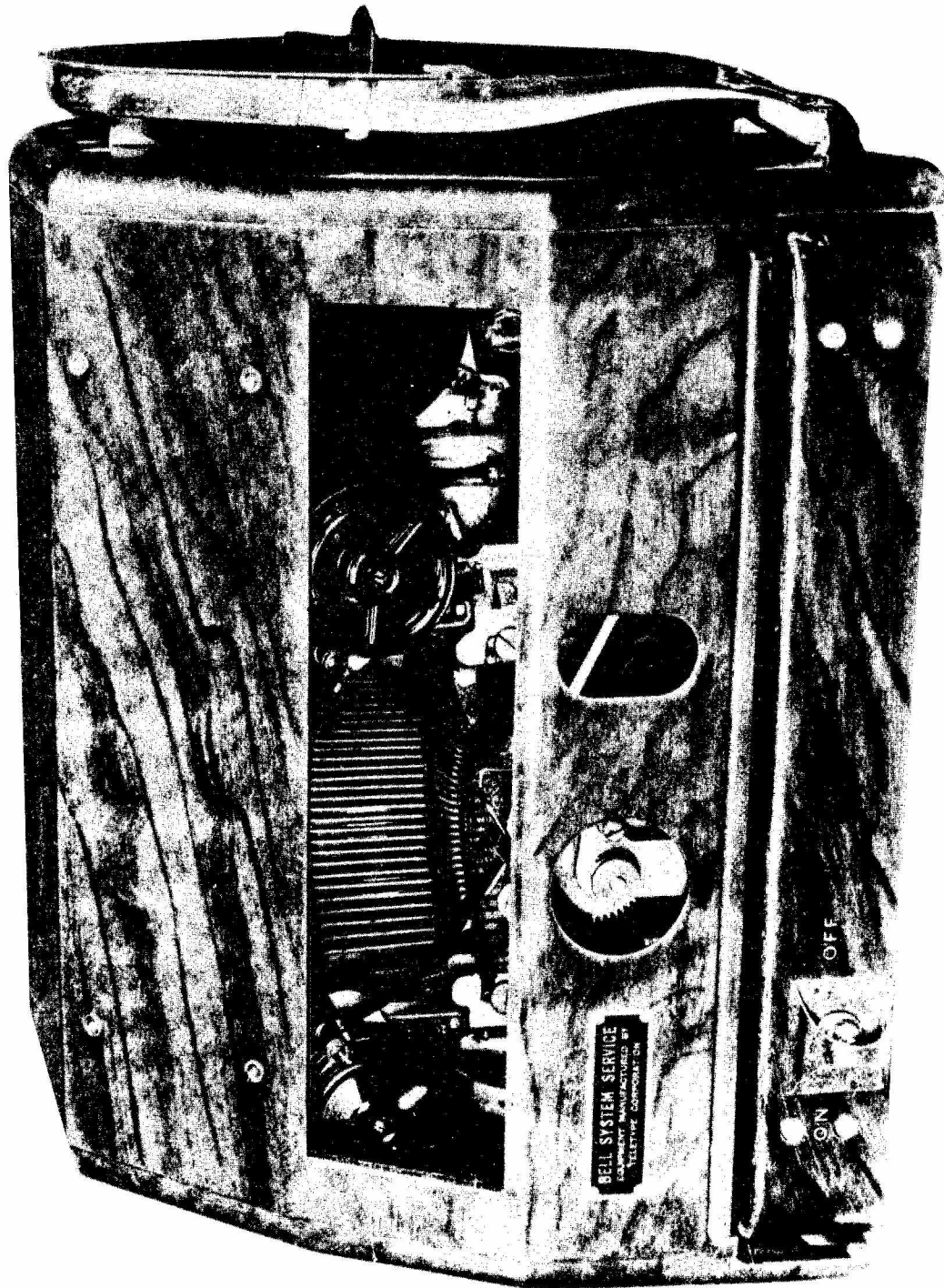
In this case the new contact arm should be substituted for the old arm and the new contact parts together with the old contacts mounted on the new keyboard slip connection guard which should be substituted for the old guard.

Where the printers have line relay mountings but the line relay brackets are not drilled for both sets of contacts a new bracket, "Catalog 75431(M) Relay Bracket," will be required unless the old bracket can be drilled, and also a new "Catalog 77188(M) Contact Arm," in addition to the supplementary contacts.

The supplementary contacts are provided with screw terminals for easy connection into the circuit to the transmitter distributor.

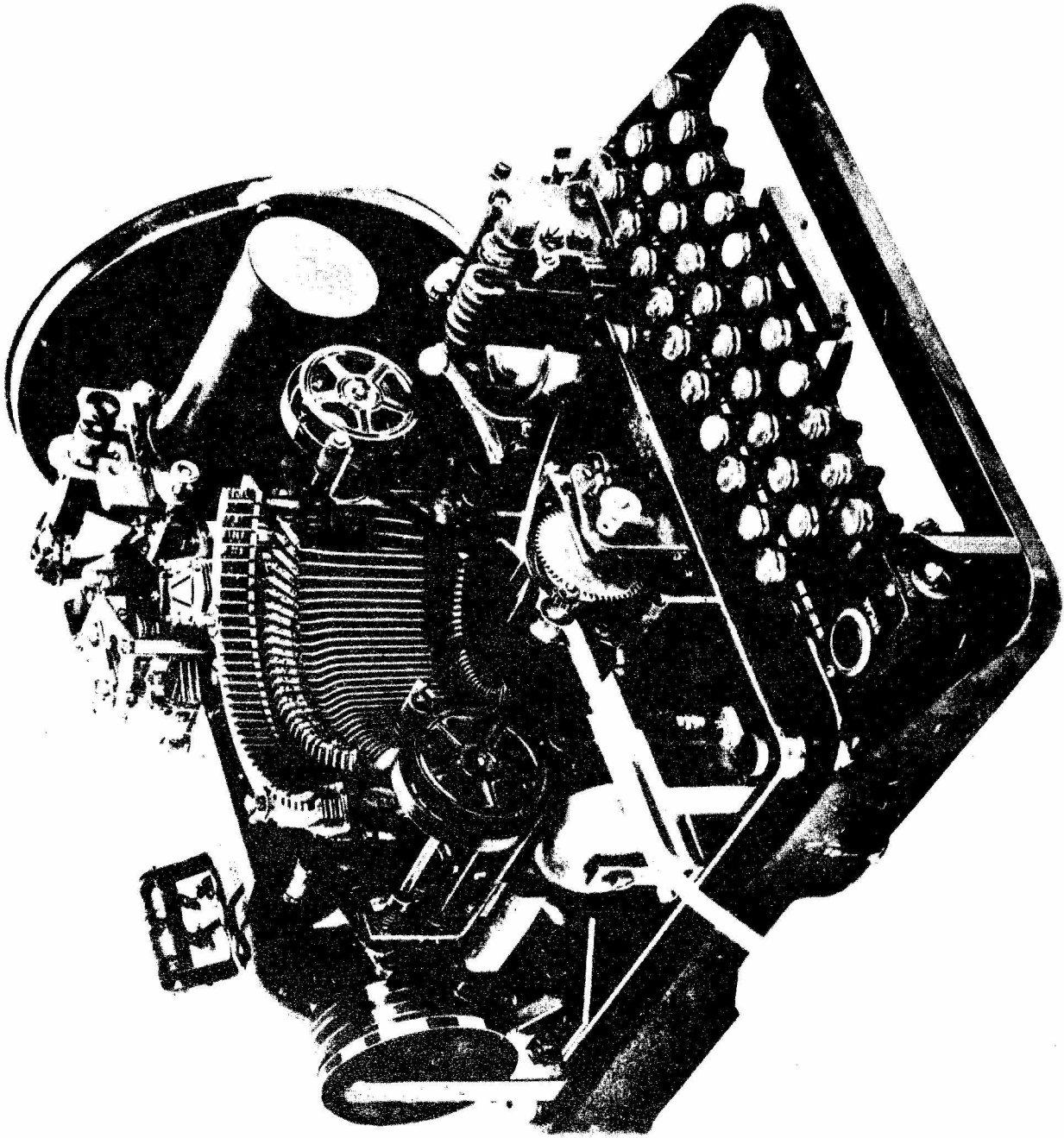


NO. 14-TYPE SENDING-RECEIVING PRINTER  
(MOUNTED ON 14-B PRINTER TABLE)



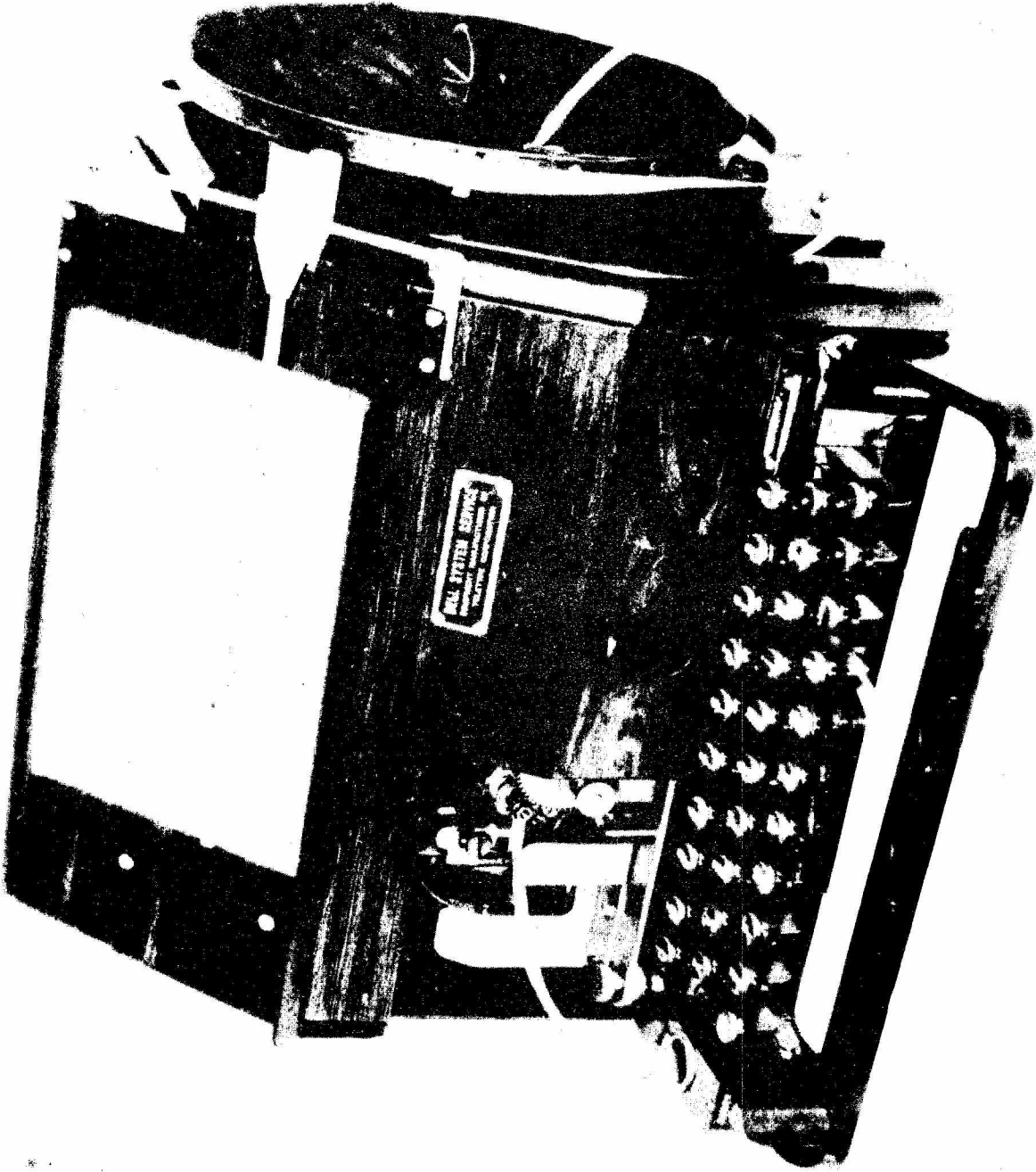
NO. 14 - TYPE RECEIVING ONLY PRINTER



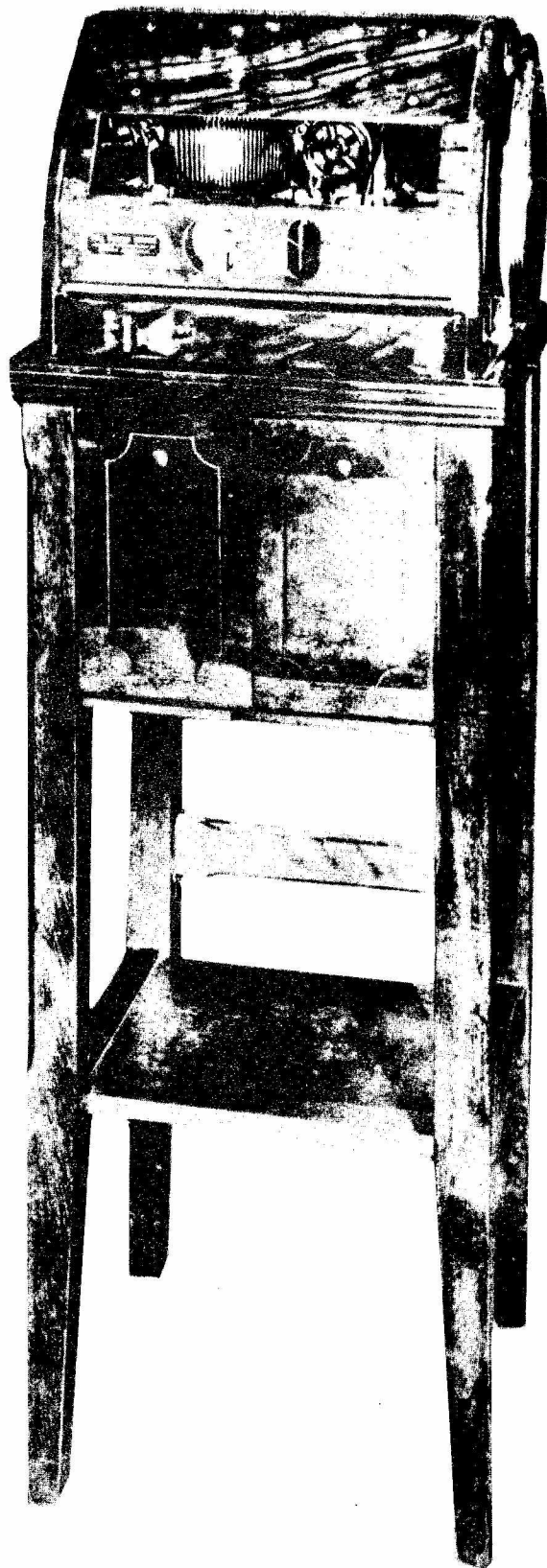


NO. 14 - TYPE SENDING - RECEIVING PRINTER  
WITH COVER REMOVED





NO. 14 - TYPE SENDING - RECEIVING PRINTER  
WITH CUT - AWAY COVER



NO. 14 - TYPE RECEIVING ONLY PRINTER  
(MOUNTED ON 14-H TABLE)





Engineer  
Draftsman  
Checked by

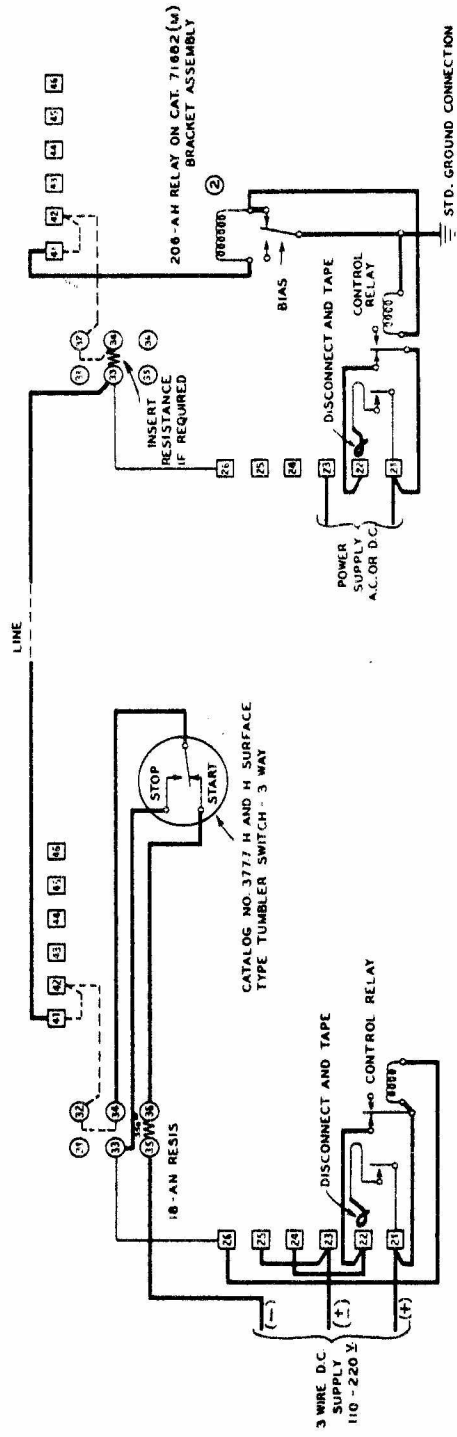
Log No. P-2350 6 17 30  
ISSUE 1

Was Provisional  
rated Standard  
Log No S 13343 10 23 30  
ISSUE 2

244-B-31  
Standard

AMERICAN TELEPHONE & TELEGRAPH CO.  
Department of  
Development and Research

**PRINTING TELEGRAPH STATION EQUIPMENT**  
USE OF SINGLE LINE FOR BOTH PRINTING AND POWER CONTROL WITH I4-TYPE PRINTERS  
POWER SUPPLY AT CONTROLLING STATION, THREE - WIRE 110 - 220 VOLT D.C.  
(NEW TYPE APPARATUS WITH LINE RELAY MOUNTING)



NOTES

- ① CONNECTIONS SHOWN BY HEAVY LINES, REPRESENT CHANGES OR ADDITIONS TO BE MADE BY INSTALLER.
- ② POLAR RELAY ON BRACKET MAY BE MOUNTED UNDER BASE OF PRINTER USING MOUNTING HOLES PROVIDED.



Engineer *REL*  
 Draftsman  
 Made Standard 11/4/29.  
 Log No. P. 2285, 6.14.32  
 ISSUE 1  
 Was provis., Rated Std.  
 Log No. S. 13495, 11/4/29.  
 ISSUE 2  
 Title changed.  
 Reference to 14-A &  
 14-B printers omitted.  
 Log No. S. 13922, 6.16.31.  
 ISSUE 3

**242-B-12**  
 Standard

**PRINTING TELEGRAPH STATION EQUIPMENT AND CIRCUITS**  
 14-H PRINTER TABLE WIRING AND  
 INSTALLATION CONNECTIONS TO NO. 14-TYPE PRINTERS.

AMERICAN TELEPHONE & TELEGRAPH CO.  
 Department of  
 Development and Research

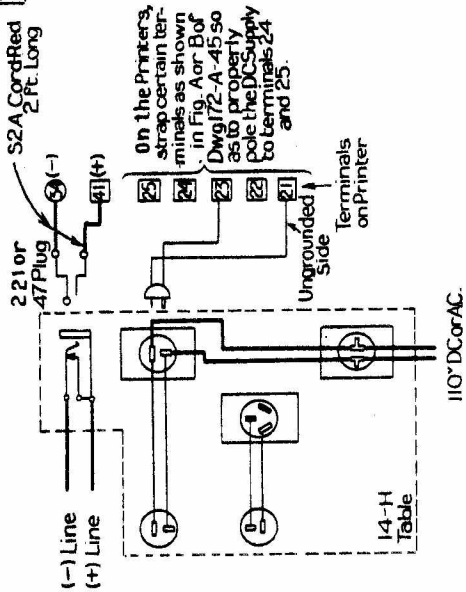


Fig 1  
 Wiring for use with No. 14 Printer and AC Power Supply

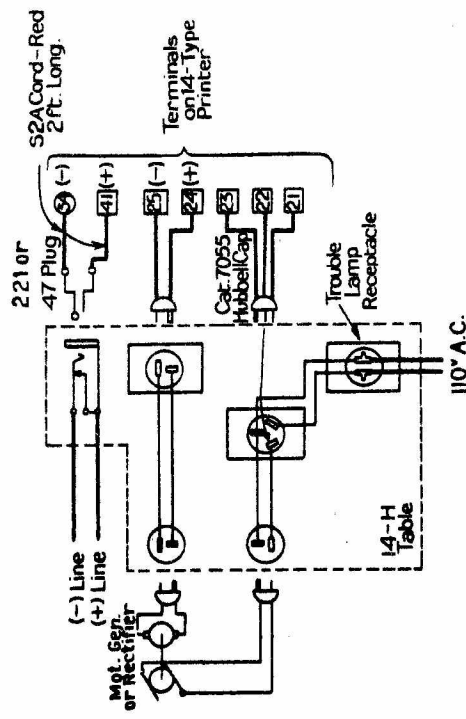


Fig 2  
 Wiring for use with No. 14 Printer and DC Power Supply

NOTE: Connections shown by heavy lines are to be made by installer.

Engineer <b>A. E. A.</b>
Drawn by Checked by Log No. P-22586 7.7.50
ISSUE 1
Approved by Log No. S-43774 8.14.50
Second Jack added Note added Log No. S-13923 6.16.51
ISSUE 3

**242-B-86**  
Standard

**PRINTING TELEGRAPH STATION  
EQUIPMENT AND CIRCUITS.**

14-B PRINTER TABLE.  
Diagram of Connections.

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Development and Research

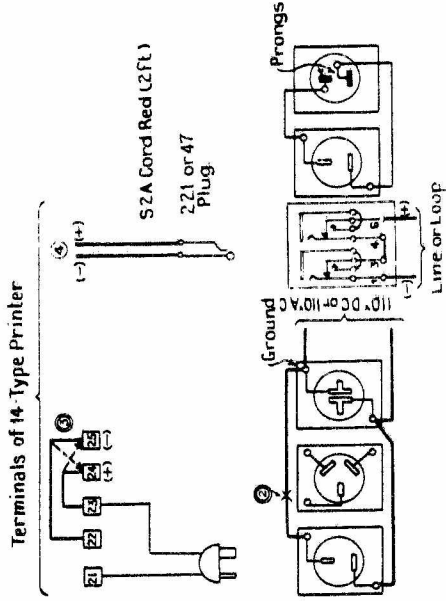


Fig 2  
110V D.C. Power Supply or 110V A.C.  
Power Supply when Line Relay is not used

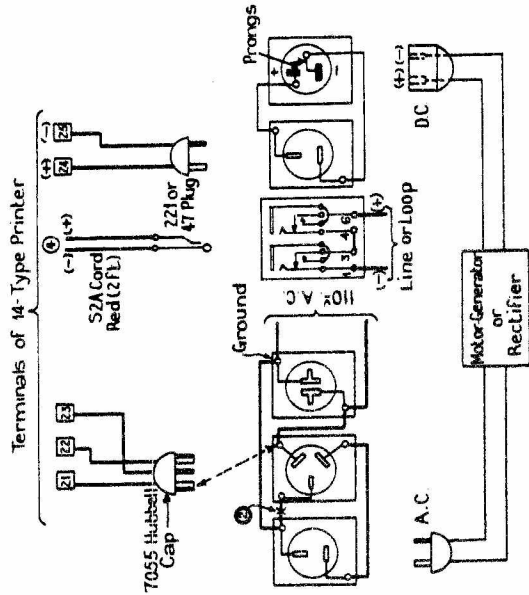


Fig 1  
110V A.C. Power Supply when  
Line Relay is used.

Notes

- ① Heavy lines indicate wires to be run by installer
- ② When power is 110V A.C.-25 cycles insert proper resistance here
- ③ When line relay is used strap to obtain indicated polarities
- ④ When line relay is not employed and local test feature is not desired, omit these straps
- ⑤ To proper line terminals. See Drawing 172-A-45 or 172-A-46 for wiring of 14-type printer.

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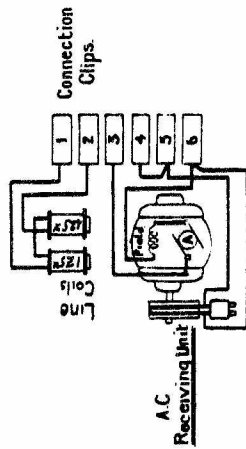
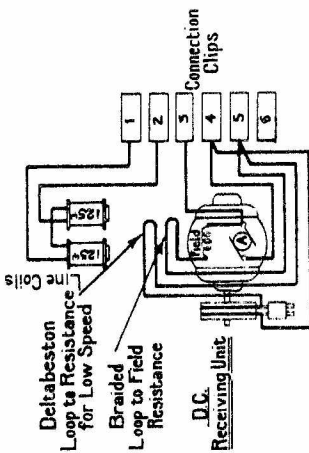
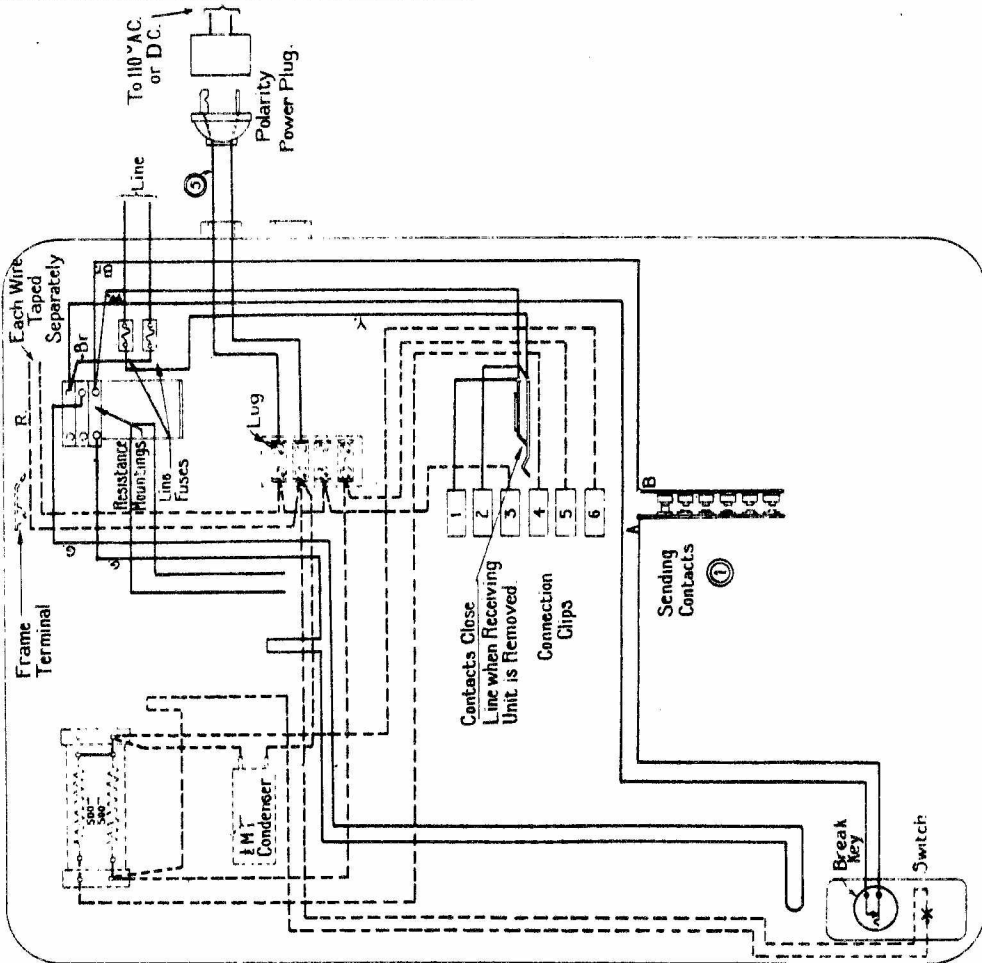
PRINTING TELEGRAPH EQUIPMENT

Circuit Diagrams of No. 14-A Printers as Furnished from Factory Showing Connections to Line and Power, where  
Line is Not Terminated at Printer.

235-B-10

Replacing 208-B-75  
Mfr. Disc.

Engineer: <b>1345</b> C. H. Shea Jr. Made Standard 12-28-27 Log No. P-20310-5-9-27 ISSUE 1	Color Code Guided. Log No. P-20555-8-16-27 ISSUE 2	Wiring to resistance block and fuses changed. <i>psb</i> Log No. P-20686-9-25-27 ISSUE 3	Note added. <i>psb</i> Log No. P-20846-12-7-27 ISSUE 4	was "Provisional" rated "Standard" marked "Replacing 208-B-75" <i>psb</i> Log No. S-12014-12-28-27 ISSUE 5	was "Standard" rated "Mfr. Disc." <i>psb</i> Log No. S-13926-6-19-31 ISSUE 6
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- NOTES -

- ① Wiring shown is for Sending-Receiving Printer. In Receiving-Only Printer, sending contacts are omitted and wires A and B are spliced together and taped.
- ② Units shown dotted are underneath base.
- ③ Wiring shown dotted is in separate cable.
- ④ Key to Color Code  
Br = Brown    R = Red  
G = Green  
W = White  
Y = Yellow
- ⑤ Wires not marked are black.
- ⑥ This wire should connect to grounded side of supply.

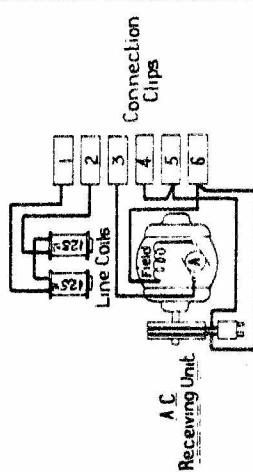
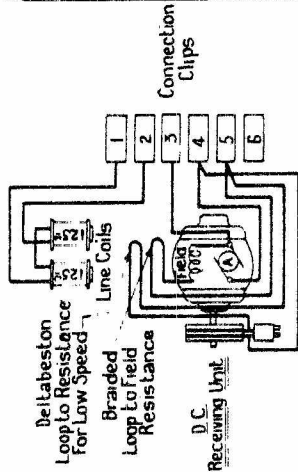
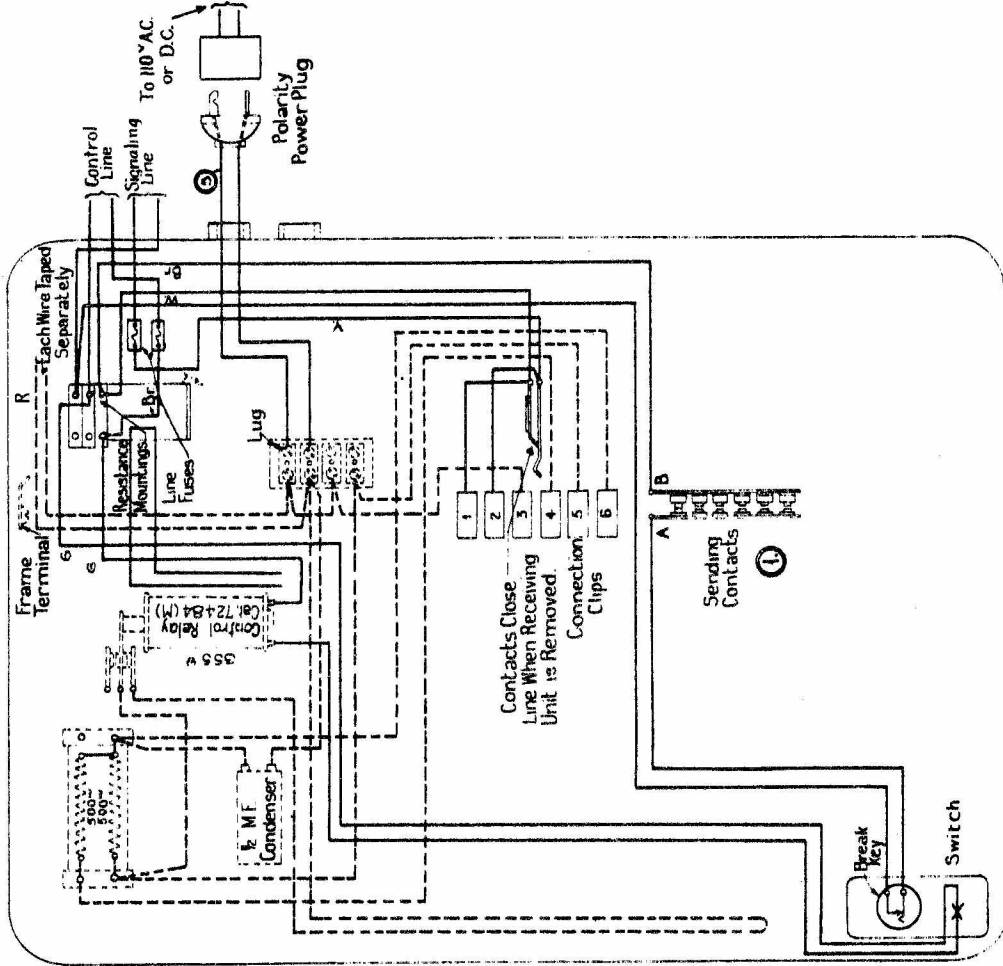
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**PRINTING TELEGRAPH EQUIPMENT**

**235-B-12**  
 MFR. DISC  
 Replacing 197-B-59

Circuit Diagrams of No 14-B Printers as furnished from factory showing connections to line and power where line is not terminated at Printer

Engineer Draftsman Checked by Made Standard 12-20-27	Log No. P-20335 5-10-27 ISSUE 1	Color Code added Log No. P-20616 8-16-27 ISSUE 2	Wiring to resistance mounting block and fuses changed. PJA Log No. P-20605 9-23-27 ISSUE 3	Note 5 added Log No. P-20847 12-7-27 ISSUE 4	Was "Provisional" listed "Standard" marked Replacing 197-B-59. Log No. S12015 12-28-27 ISSUE 5	Was "Standard" rated "MFR. DISC." Log No. S13924 6-18-31 ISSUE 6
---	------------------------------------	--	--	--	--	--



NOTES -

- ① Wiring shown is for Sending-Receiving Printer. In Receiving - Only Printer, sending contacts are omitted and wires A and B are spliced together and taped.
- ② Units shown dotted are underneath base.
- ③ Wiring shown dotted is in separate cable.
- ④ Key to Color Code  
 Br. Brown R. Red  
 G. Green  
 W. White  
 Y. Yellow
- ⑤ Wires not marked are black.
- ⑥ This wire should connect to grounded side of supply.

**PRINTING TELEGRAPH EQUIPMENT**  
TYPICAL CIRCUIT CONNECTIONS FOR 14 TYPE TAPE PRINTERS

**235-B-69**  
Mfr. Disc.

Replacing 208 B-38  
208 B-75  
208 B-76  
208 B-78

File No. 235	12-28-27
Made Standard 12-28-27	9-12-27
Log No. P-20856	ISSUE 1
Note (R) added	
Resistances checked	
Log No. P-20792-11-11-27	ISSUE 2
Was Provisional	
Rated Standard	
Replacing 208 B-38	12-28-27
" 208 B-75	"
" 208 B-76	"
" 208 B-78	"
Log No. S-12016	ISSUE 3
Was Standard	
Rated Mfr. Disc.	
Log No. S-13925	ISSUE 4

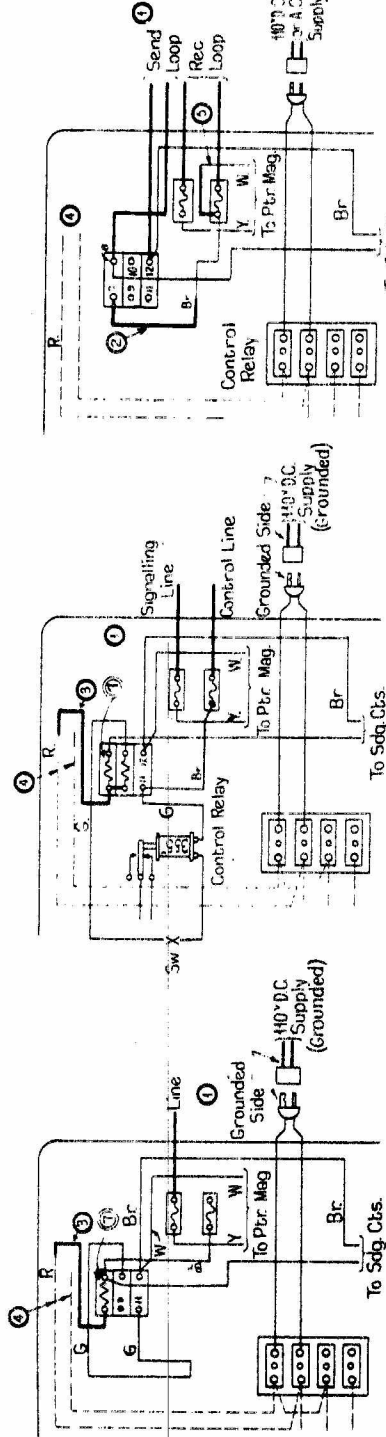


Fig. 1- Local Motor Control-Line Current From 40 Volt D.C. Motor Supply or From Distant Office.

Fig. 2- Remote Motor Control over 2 mile Line- Line Currents from 40 Volt D.C. Motor Supply or From Distant Office.

Fig. 3- Local Motor Control Separate sending and receiving circuits.

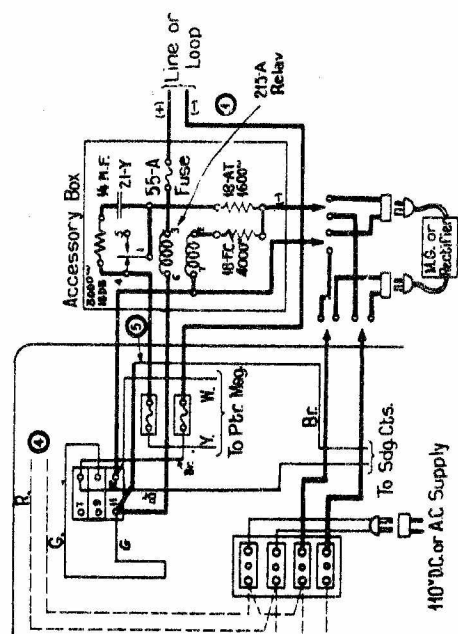


Fig. 4- Local Motor Control-Line Current From Distant Office Line Relay used to improve Operation

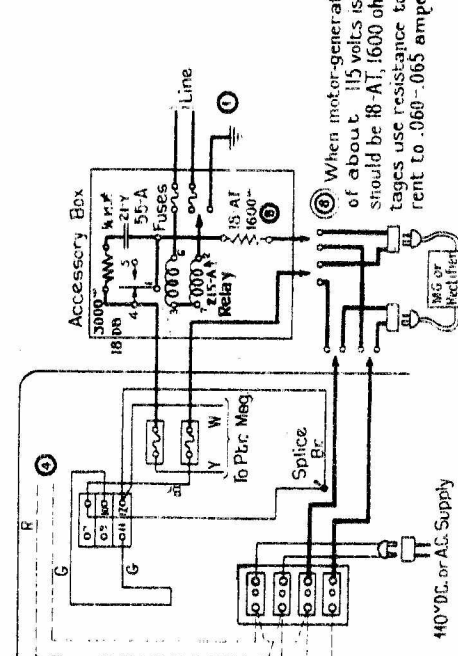


Fig. 5- Local Motor Control-Line Current From Distant Office Line Relay used to receive Polar Signals.

- NOTES -
- Connections shown by heavy lines are to be made by installer.
  - This wire originally ran to resistance mounting block terminal 8.
  - This wire is to connect to grounded or ungrounded side of supply (either black or red wires) depending on whether line current is to be supplied from distant or home end of circuit.
  - The end of each of these wires is taped separately.

- NOTES CONTINUED
- This wire originally ran to resistance mounting block terminal marked 1.
  - key to color code: R-Red G-Green Br-Brown W-White Y-Yellow
  - Wires not marked are black.
  - Insert resistance to give correct line current - At least 420 $\Omega$  should be used when connecting to Red wire.

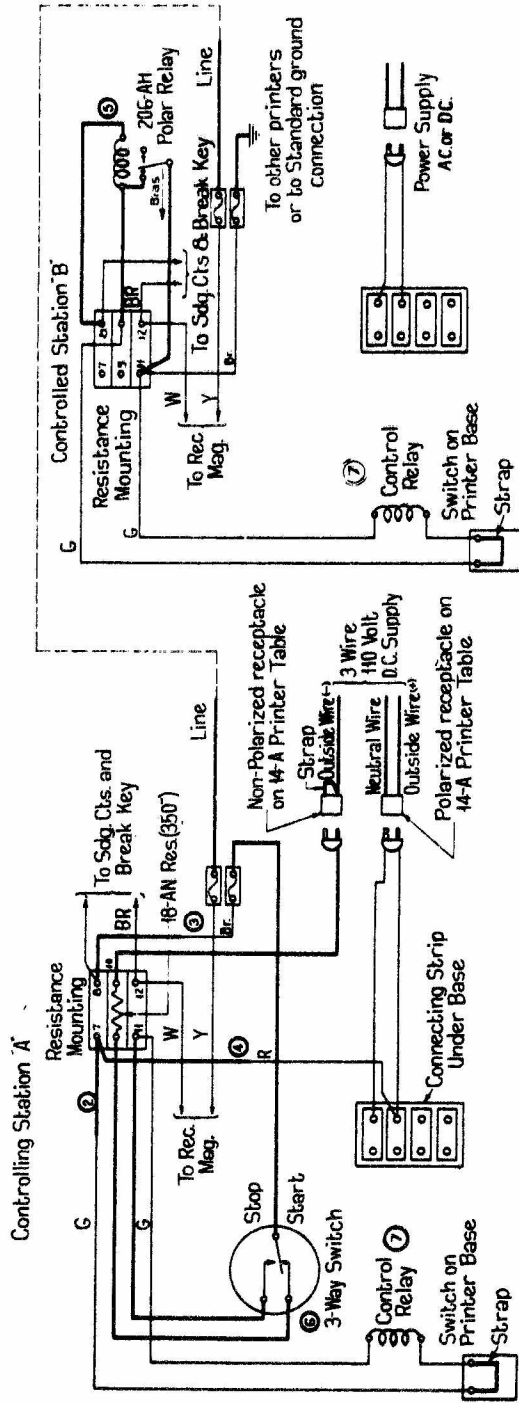
When motor-generator or direct current of about 115 volts is used, this resistance should be 18-AT, 1600 ohms. For other voltages use resistance to limit magnet current to .065 ampere.



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**PRINTING TELEGRAPH STATION EQUIPMENT**  
 USE OF SINGLE LINE FOR BOTH PRINTING AND POWER CONTROL WITH 14-TYPE PRINTERS  
 Mfr. Disc. 236-B-31  
 Power supply at controlling station three-wire 110-220 Volt D.C.  
 (Old Type without Line Relay Mounting)

Engineer  
 Draftsman  
 Checked by  
 Made Standard 12, 28, 27  
 Log No. P. 20895 4-18-27  
 ISSUE 1  
 Was Provisional  
 rated Standard  
 Log No. S. 12017 12, 28, 27  
 ISSUE 2  
 Title Changed  
 Was Standard  
 Mfr. Disc. 236  
 Log No. S. 13327 6-18-31  
 ISSUE 3



**- APPARATUS -**

- At Station 'A'  
 +14-B Sending-Receiving Printer  
 +14-A Printer Table  
 +18-AN Resistance (350)  
 +Cat. No. 3777 H and H Surface  
 Type Tumbler Switch - 3 way  
 +Power Plug to fit non-polarized  
 table receptacle

- At Station 'B'  
 +14-B Sending-Receiving or  
 Receiving only Printer  
 +206-AH Polar Relay  
 +71682 (M) Bracket Assembly  
 (for 206-AH relay)

**- NOTES -**

- ① Connections shown by heavy lines represent changes or additions to be made by installer.
- ② This wire originally connected to middle right terminal of resistance mounting \* 10.
- ③ This wire originally connected to front left terminal of resistance mounting \* 11.
- ④ Red wire with end taped may be used for making this connection.
- ⑤ Polar relay to be mounted under base of printer in holes provided, by using a Catalog 71682 (M) Bracket Assembly. Spare wires running from resistance mounting to under side of base may be used for connecting to relay.
- ⑥ Three-way switch for starting and stopping the sets may be mounted on top of 14-A table. Hole may be drilled through table underneath switch for making wiring connections.
- ⑦ Relay to be connected for 'Break' control that is relay closes working contacts when un-energized.