



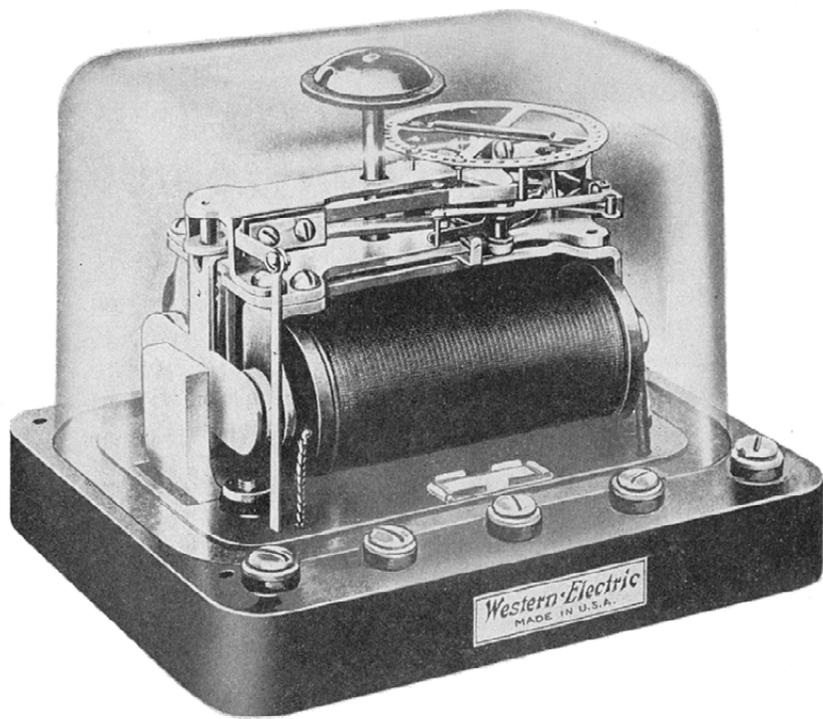
RAILWAY DISPATCHING AND COMMUNICATION EQUIPMENT

Western Electric

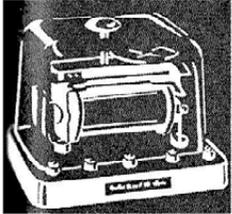
Leadership through Teamwork

The equipment described in this catalog was designed by Bell Telephone Laboratories—world's largest organization devoted exclusively to research and development in all phases of electrical communications. It is made by Western Electric Company, manufacturing unit of the Bell System and the nation's largest producer of communications equipment, and is available through our distributors (see page 172). You can depend upon this team to give you the best in quality and performance.

QUALITY COUNTS



RAILWAY DISPATCHING AND COMMUNICATION EQUIPMENT

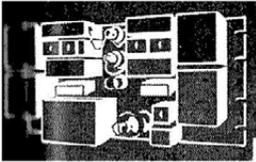


RAILWAY TRAIN DISPATCHING TELEPHONE SYSTEMS

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indispensable for quick, reliable communication between the dispatcher and way station operators. The dispatcher can call selectively any one of a number of way stations on the same telephone line without producing a signal at any of the other stations.

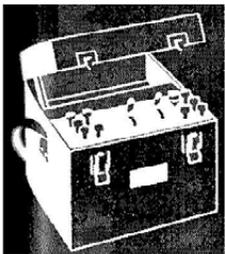
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CARRIER SYSTEMS, TELEPHONE AND TELEGRAPH REPEATERS AND MOUNTING FRAMEWORKS

Page 133

single or multi-channel carrier systems that provide facilities for superimposing additional telephone and telegraph channels upon an existing voice frequency telephone circuit. Repeaters designed for application to circuits where it is desired to extend the range of speech transmission or telegraph signals. Frameworks for supporting cable and wired equipment units.



MISCELLANEOUS TESTING EQUIPMENT

Page 155

test equipment for use with the above systems as well as equipment for general application.

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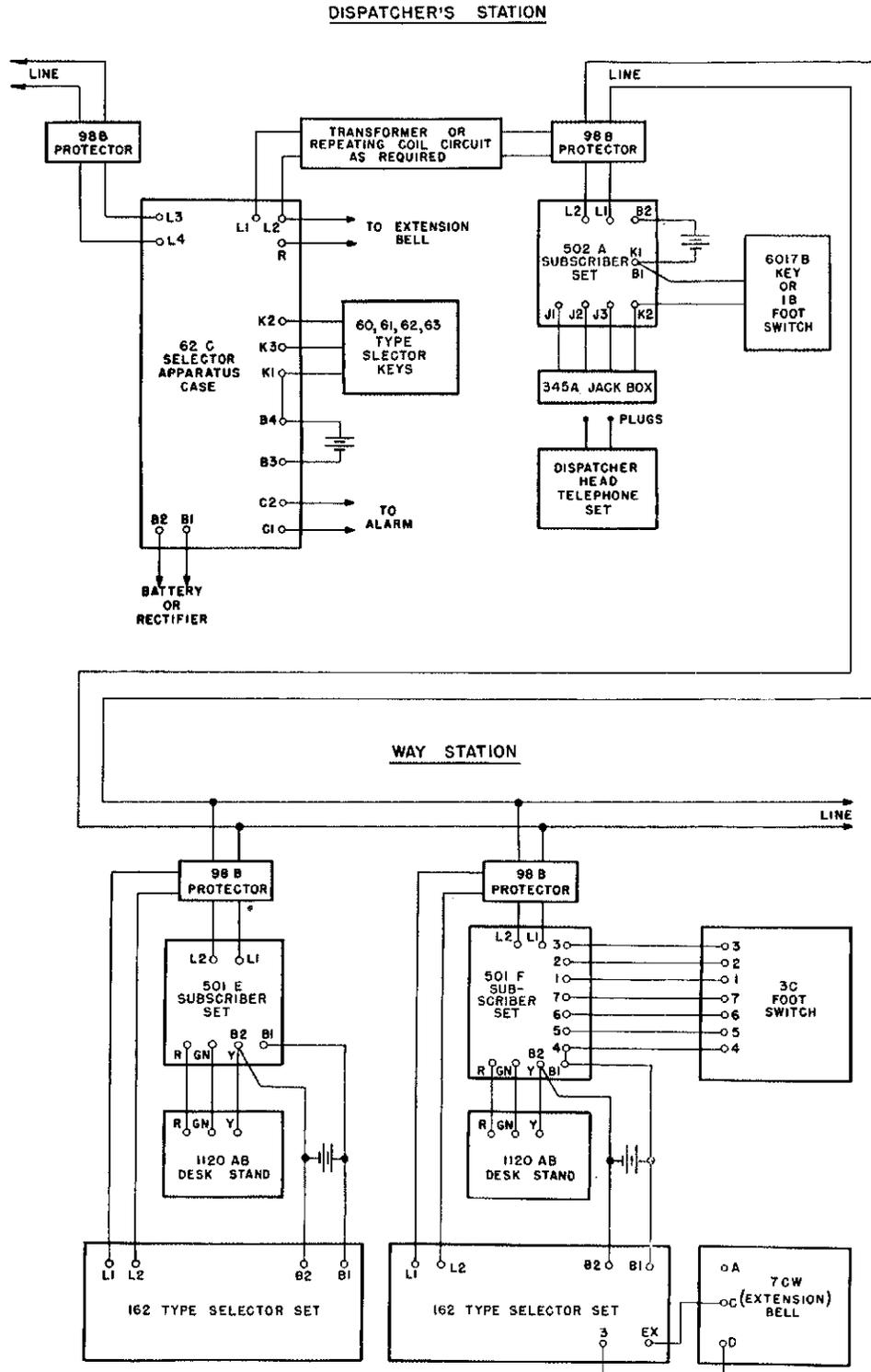


Fig. 1. Typical Railway Train Dispatching Telephone System

RAILWAY TRAIN DISPATCHING TELEPHONE SYSTEMS

GENERAL DESCRIPTION

By means of a railway train dispatching telephone system, a train dispatcher can control the movement of trains on his division by telephone orders to "way stations". The length of railway he can control varies with traffic density and geography; a division may extend 200 miles or more.

The importance of reliable communications between the dispatcher and the way stations of his division has been well established. Along with reliability, the dispatcher must be able to signal to any one way station without disturbing the others. A way station operator cannot listen constantly because of the other duties he must perform. Selective calling, as used in the Western Electric dispatching systems, gives positive control to the dispatcher for calling the station he wants.

Other important provisions of the telephone system include:

1. Simultaneous calling by the dispatcher of all way stations in emergencies or to issue general orders;
2. Monitoring the line by all way stations at any time and permitting each way station to communicate with the dispatcher without disturbing the other stations.

Normally, the dispatcher listens continuously on the line by means of a loudspeaker or head receiver. He talks to the way stations by means of a desk or a chest type transmitter. Several basic combinations of equipment are possible to fulfill the operating requirements of a particular system. A typical system is shown in the block diagram, Figure 1.

Equipment at a dispatcher's station

The dispatcher's station, which controls a group of way stations, utilizes several components of equipment to make possible fulfillment of the various uses of the telephone system. The components include:

1. Protectors
2. Selector Apparatus Case
3. Selector Keys
4. Subscriber Set
5. Key or Foot Switch
6. Telephone Set
7. Power Supplies

Several varieties of some of these units are available to fit the needs of a particular installation.

A brief description of these components follows:

1. 98B PROTECTOR

This unit is required to protect the telephone and signalling equipment against lightning or abnormal potential and current.

2. SELECTOR APPARATUS CASE

This case contains all the calling apparatus at the dispatcher's station except the selector keys and power supply for ordinary installations. An alarm circuit is provided which is energized when the circuit breaker in the power supply lead is tripped. Any convenient alarm may be connected, such as a bell, buzzer, or a light.

3. SELECTOR KEYS

Selector keys are used in conjunction with the selector apparatus case. Their function is to send out coded signals for the operation of the selectors at the way stations. Selector keys are available in several types. Choice of a particular type of selector key must be made to meet the operating requirements of each individual installation. A description of the various selector keys follows:

The 60 type Selector Key is an individual unit used to call only one station, the number of keys required depending on the number of stations to be called. All that is required of the operator in using these keys is to rotate the key one-quarter turn. The rest of the operation is automatic.

The 61 type Key is a master key which can be

Western Electric

used to call any station in the system. For its operation, the setting of three number levers to the code to be called is required in addition to the operation of the master key. While this key is flexible (any number of way stations may be called) it does not permit rapid calling of several numbers in quick sequence. It is best used in test installations, and at way stations on intercall systems, where calls are not frequently made.

The 62 and 63 type Selector Keys have been designed for rapidly calling any code, by operating 2 or 3 push buttons, which set up the codes and cause a motor to transmit the call. In addition, these keys may be used for sending time signals to all way stations and for calling all way stations in the system simultaneously. A call to any way station may be repeated by simply pressing one key. By pressing another key the period of ringing of the bell at the called way station may be extended. In general, this type of key provides the most flexible operation on large installations. On small installations, serving a few way stations, the 60 type Selector Key has proven adequate.

4. 502A SUBSCRIBER SET

This set contains an anti-sidetone circuit which is especially desirable at the dispatcher's station since local noises are kept out of the head receiver. Equipment is contained in this set which reduces "thumps" due to signalling impulses.

5. KEY OR FOOT SWITCH

These switches are used to connect the battery to the transmitter. The switch is pressed to talk and released to listen. Several types are available and are described in the "Components" section.

6. TELEPHONE SET

A head telephone set is generally used. It provides the transmitter and receiver for the dispatcher. Several other types are available. These include desk sets similar to a standard telephone, and loudspeaker combinations.

7. POWER SUPPLIES

The power supplies required for the operation of the telephone and selective signalling system at a dispatcher's office are:

- a. A 150 to 400 volt direct current supply for operating the selectors on the line. The magnitude of the voltage depends upon the loop resistance of the line wires and number of selector sets on the line. The location of the selector sets may also influence this voltage;

- b. A 12 or 24 volt direct current supply for operating the relays associated with the selector calling apparatus;
- c. A 4½ volt direct current supply for operating the dispatcher's telephone transmitter.

Types of selective signalling circuits

Two types of selective signalling circuits can be used, one known as the standard circuit and the other, the inductive circuit. In the standard circuit the dispatcher's selector calling equipment is connected directly to the line. In this case the line consists of a pair of conductors extending over the entire division. The associated apparatus such as telephone sets, selector sets, etc. are each bridged across the line wires through a condenser. In the case of the inductive circuit, the dispatcher's selector calling equipment is connected to the line wires through a transformer. Some of the advantages of operating the selective signalling system through a transformer, follow:

- a. A simplex telegraph leg can be obtained through a low resistance circuit;
- b. Two or more selective signalling circuits equipped with simplex telegraph legs can be operated from a common power supply at the dispatcher's office;
- c. One or more branch selector circuits can be operated from the main selector circuit without any metallic connection to it;
- d. Two selector circuits may be used as side circuits for obtaining a composited or simplex phantom circuit with the physical and phantom telephone and telegraph circuits terminated at the same or different points.

Way stations

Each way station is equipped with telephone apparatus for receiving and transmitting messages, and also a selector set for signalling. This selector set responds to the coded signal sent from the dispatcher's station. When a signal corresponding to the code of the selector set is received a bell rings to alert the operator. A 4½ volt direct current supply is required for the telephone transmitter and also the signal bell of the selector set.

A bell which indicates an incoming call is included in the selector set. There are many occasions when it is advantageous to have a second bell. Such a signal may be required to call the operator's attention to an incoming call when he is away from his desk. Extension bells are described on page 37.



Other considerations

LOUDSPEAKERS

Loudspeaker sets may be used in railroad signal towers, way offices and train dispatchers' offices to supplement usual telephone outfits. They are designed to amplify the incoming speech and reproduce it through the loudspeaker at a volume adequate for listening at distances of several feet.

MESSAGE CIRCUIT

A message circuit also extends along a division of the railroad and is generally operated on a line adjacent to the line wires of the dispatching circuit. The message circuit may be used for various purposes:

1. It may be equipped for operation of selectors and terminated at either end with telephone PBX boards;

2. It may be equipped with code ringing magneto telephones for intercommunication between office attendants along the division;
3. A simplex telegraph circuit may be superimposed on it;
4. It may be used for a selector intercall system.

SPECIAL ADJUNCTS

Train dispatching telephone circuits can be arranged to provide for the following features:

1. A simplex telegraph circuit can be obtained between two or more places along a line without interfering with telephone service. This circuit can be operated either manually or by means of a teletypewriter;
2. Branch or spur lines can be connected;
3. Wayside telephones in pole boxes or portable telephones with a line pole for making connections to line wires can be used at points along a line for telephoning the dispatcher.

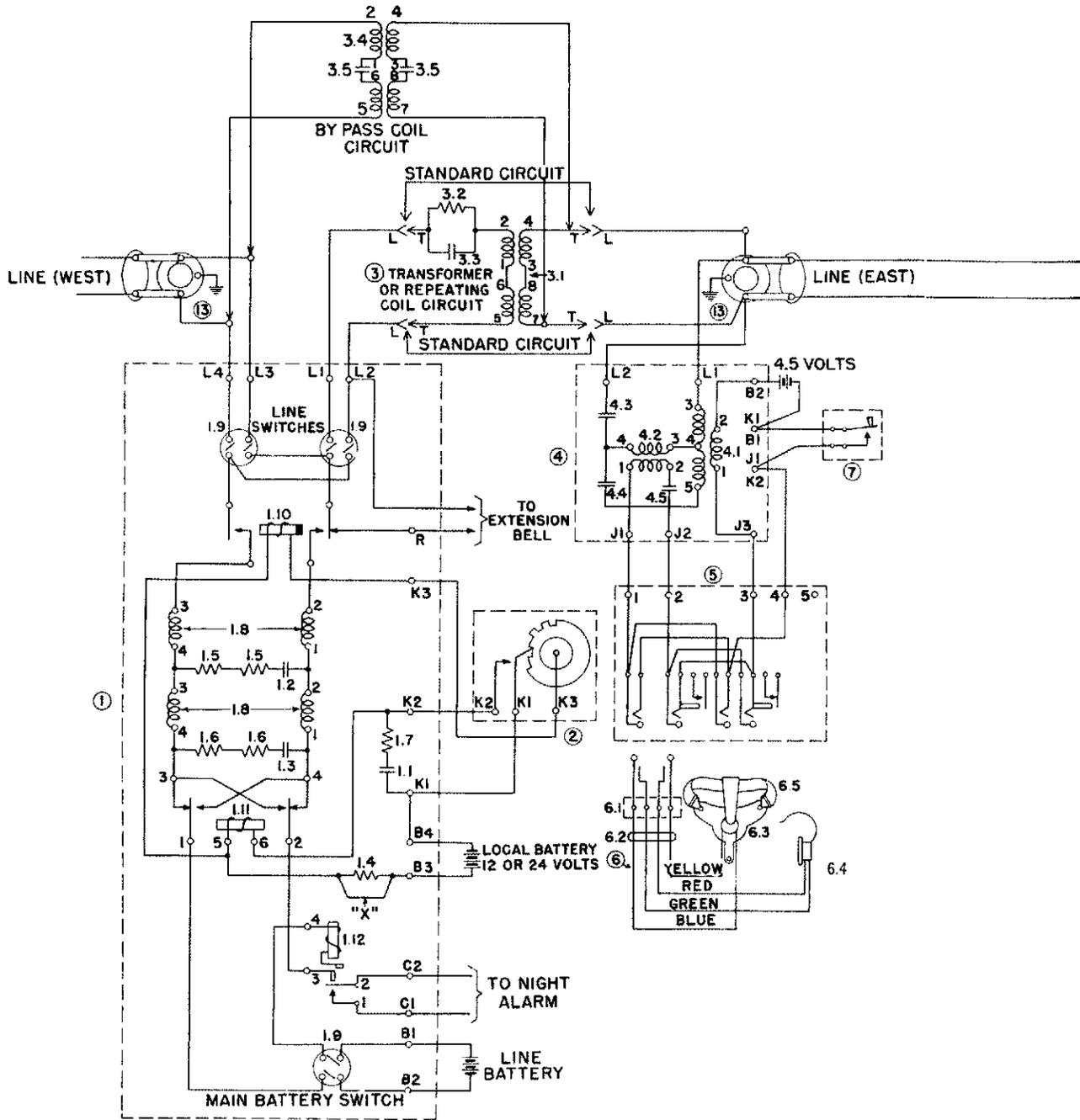
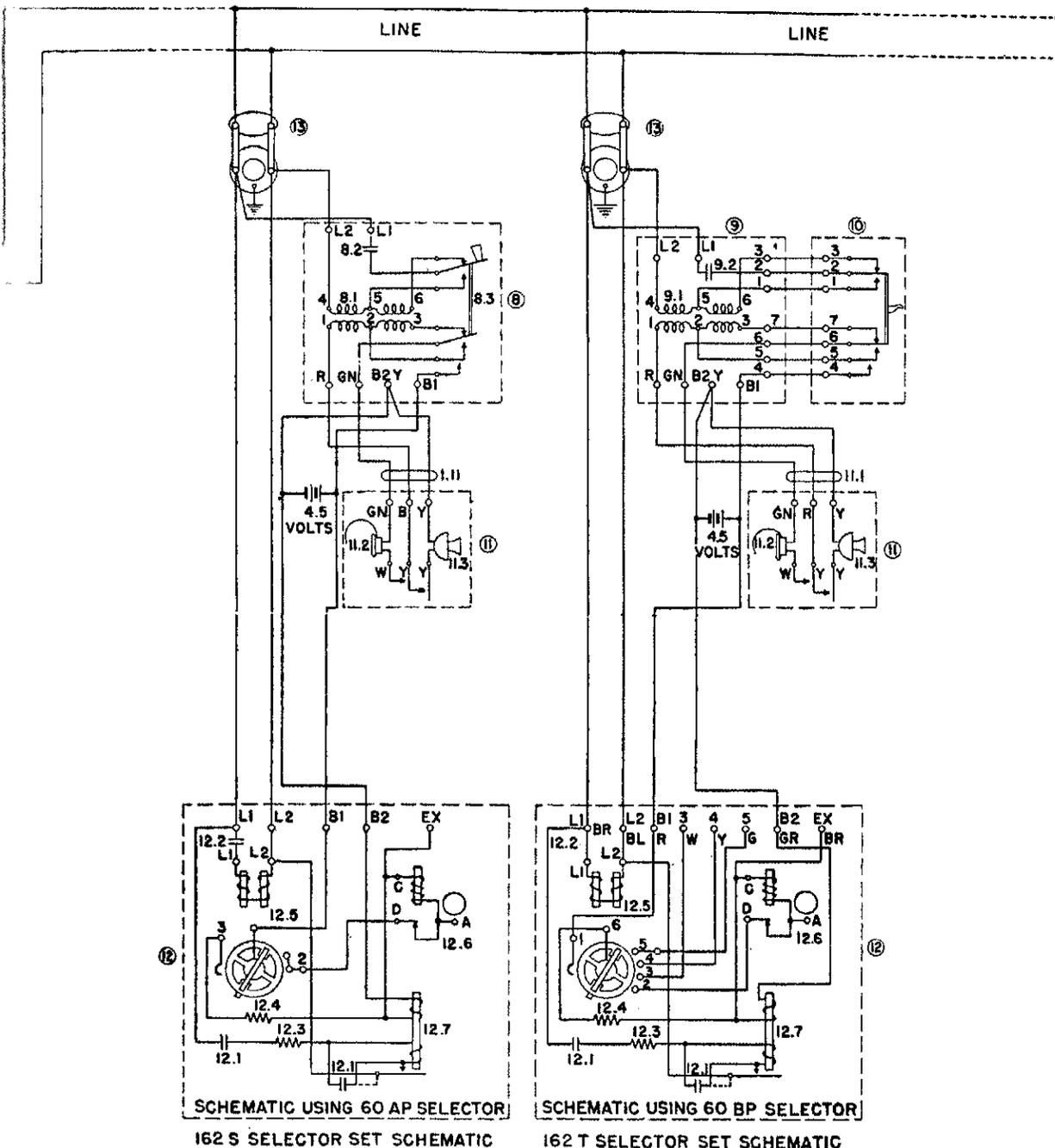


Fig. 2. Schematic of a Railway Train Dispatching Telephone System

- | | | | |
|--|--|--|---|
| <p>1. 62C Selector Apparatus Case (supersedes 62B Selector Apparatus Case)</p> <p>1.1 No. 441A Condenser</p> <p>1.2 KS-1354L2 Capacitor</p> <p>1.3 KS-1354L10 Capacitor</p> <p>1.4 25 ohms, $\pm 10\%$, Type MW3, IRC Resistor</p> <p>1.5 200 ohms, $\pm 10\%$, Type GB Resistor, Allen-Bradley Company or Type BW1, IRC Resistor</p> <p>1.6 27 ohms, $\pm 10\%$, Type GB Resistor, Allen-Bradley Company or Type BW1, IRC Resistor</p> | <p>Replacement Parts for 62B Selector Apparatus Case***</p> <p>1.1 No. 441A Condenser</p> <p>1.2 Four No. 440A Condensers</p> <p>1.3 No. 440A Condenser</p> <p>1.4 MW3 Resistance</p> <p>1.5 200 ohm, 1 watt resistor (1 resistor used instead of 2 in series)</p> <p>1.6 47 ohm, 1 watt resistor (1 resistor used instead of 2 in series)</p> | <p>1.7 51 ohms, $\pm 5\%$, Type GB Resistor, Allen-Bradley Company or Type BW1, IRC Resistor</p> <p>1.8 No. 241F Retardation Coil</p> <p>1.9 Pass-Seymour No. 1312 DPST Switches</p> <p>1.10 No. 221JB Relay</p> <p>1.11 No. 61A Telegraph Relay</p> <p>1.12 No. 2B Circuit Breaker</p> | <p>1.7 51 ohm, 1 watt resistor</p> <p>1.8 No. 241F Retardation Coil</p> <p>1.9 Pass-Seymore No. 1312 DPST Switches</p> <p>1.10 No. 221JB Relay</p> <p>1.11 D142204 Relay</p> <p>1.12 No. 2B Circuit Breaker</p> |
|--|--|--|---|



SCHMATIC USING 60 AP SELECTOR
162 S SELECTOR SET SCHEMATIC

SCHMATIC USING 60 BP SELECTOR
162 T SELECTOR SET SCHEMATIC

- | | | |
|---|--|--|
| <p>2. 60, 61, 62 or 63 type Selector Key</p> <p>3. Use when Transformer Circuit is required by connecting the "T" Leads to the "L" Leads</p> <p>3.1 No. 341A Transformer, or 70A Repeating Coil (or coils, as required)</p> <p>3.2 Resistor, 2000 ohms (100 watts rating)</p> <p>3.3 Condensers, as required</p> <p>3.4 No. 94E Repeating Coil*</p> <p>3.5 Two No. 440A Condensers*</p> <p>4. 502A Subscriber Set</p> <p>4.1 No. 43 Induction Coil</p> <p>4.2 No. 44 Induction Coil</p> <p>4.3 No. 442A Condenser</p> <p>4.4 No. 441B Condenser</p> <p>4.5 No. 441A Condenser</p> <p>5. 345A Jack Box</p> | <p>6. Dispatcher Head Telephone Set**</p> <p>6.1 No. 298B Plug</p> <p>6.2 L4P Cord</p> <p>6.3 No. 650B Transmitter</p> <p>6.4 No. 716E Receiver (consisting of 716B Receiver and 11A Headband)</p> <p>6.5 No. 3A Transmitter Attachment</p> <p>7. No. 6017B Key or 1B Foot Switch</p> <p>8. 501E Subscriber Set</p> <p>8.1 No. 42B Induction Coil</p> <p>8.2 No. 442B Condenser</p> <p>8.3 No. 1014A Push Button</p> <p>9. 501F Subscriber Set</p> <p>9.1 No. 42B Induction Coil</p> <p>9.2 No. 442B Condenser</p> <p>10. 3C Foot Switch</p> <p>11. 1120AB Desk Stand</p> <p>11.1 D3AK-9 Cord</p> <p>11.2 No. 716B Receiver</p> <p>11.3 No. 635B Transmitter</p> | <p>12. 162S Selector Set or 162T Selector Set (supersedes 162C and 162R Selector Sets, respectively)</p> <p>12.1 No. 441G Condenser</p> <p>12.2 No. 440F Condenser (furnished with 162S Selector Set, only)</p> <p>12.3 15,000 ohms $\pm 10\%$ Type BTS IRC Resistor or Type EB Allen-Bradley Resistor</p> <p>12.4 47 ohms $\pm 10\%$ Type BTS IRC Resistor or Type EB Allen-Bradley Resistor</p> <p>12.5 No. 60AP, or 60BP Selector (not part of set)</p> <p>12.6 No. 7CW Bell</p> <p>12.7 R512 Relay</p> <p>13. 98B Protector, consisting of</p> <p>1—P375820 Base</p> <p>1—P375462 Cap</p> <p>2—26 Protector Blocks</p> <p>2—30 Protector Blocks</p> <p>2—11C Fuses, 7 ampere</p> |
|---|--|--|

* Required for minimum loss only if dispatcher talks both east and west, as shown, using a transformer circuit.

** See page 118 for ordering information.

*** 62C Selector Apparatus Case replaces 62B Selector Apparatus Case. Information furnished for 62B components is for reordering of parts only.

MAJOR UNITS

The major units of a typical Railway Train Dispatching Telephone System are described on pages 12 through 34. Components and accessories are described on pages 35 through 131.

As indicated previously in "General Description", a Railway Train Dispatching Telephone System consists of a Dispatcher's (sending) station and a number of way or receiving stations, Figure 2.

The dispatcher's station is equipped primarily with telephone apparatus for receiving and transmitting messages. A selector key for originating a signal and an apparatus case containing the necessary components are required to transmit this signal to each way station on the circuit.

Each way station is equipped with telephone apparatus for receiving and transmitting messages, and also a selector set for receiving signals.

General sequence of operations

The selector calling circuit arrangement is shown in Figure 4; the selector receiving circuit arrangement is shown in Figure 18, page 24.

The sequence of operations of the various parts of the system, when a call is made, is as follows: A selector key operated by the dispatcher causes three groups of impulses to be sent over the line in such a manner that only the selector at the station called will be advanced to its ringing position. On operating the selector key, contact

K1 (B4)-K3 is closed continuously and the No. 221JB Relay is operated, connecting the main battery through the contacts of the 61A Relay and the two No. 241F Retardation Coils to the line wires L1 and L2; also, the key contact K1 (B4) -K2 is closed intermittently, operating the pole-changer relay (61A) to send a sequence of reverse impulses to the line. This sequence of impulses, while operating all selectors on the line, will advance only the code wheel of the selector at the station called so as to close its local bell circuit. The bell at that station will ring for about two seconds, then another impulse from the calling key will release the selector and open the bell circuit. While the bell is ringing a tone or answer-back will be heard in the receiver notifying the dispatcher that the signal is operating.

The 2B Circuit Breaker is incorporated in the main battery supply lead to prevent the flow of an excessive amount of current. Suitable filters are included to eliminate objectionable sharp clicks in the receiver and for spark "take-up".

Dispatcher's selector equipment

62C SELECTOR APPARATUS CASE

This case, Figure 3, contains all the calling apparatus at the dispatcher's station except the selector keys in ordinary installations, see schematic, Figure 4. It is a metal cabinet approximately 15" high by 12" wide by 6-11/16" deep arranged for wall mounting. It is completely wired and provided with terminals for connecting the battery lines and selector keys.

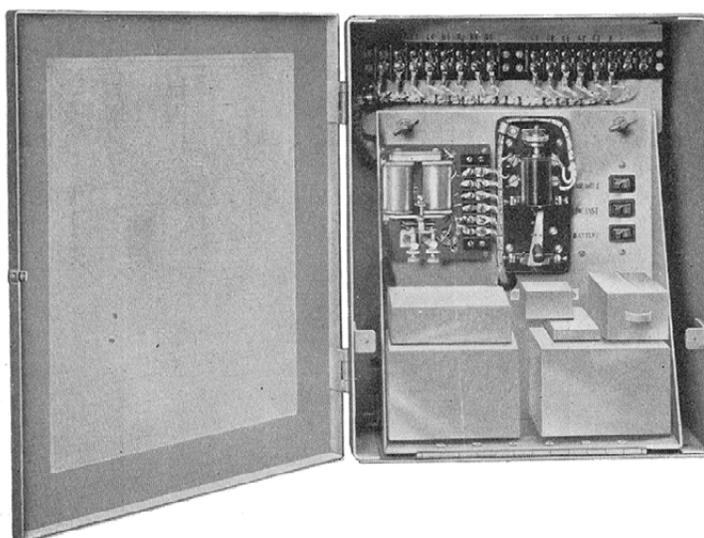


Fig. 3. No. 62C Selector Apparatus Case

NO. 98B PROTECTORS

The No. 98B Protectors (see page 96), which are used with this apparatus case should be used to protect the inside apparatus against damage from high voltages by providing a shunt path from each side of the line through an air gap

between the blocks to a ground connection. The spacing between the blocks of the protector is such that a breakdown will occur on an average of 700 volts, thus a low impedance path is provided to lead the high voltages off to ground rather than through the calling or telephone apparatus. Seven ampere fuses are generally used.

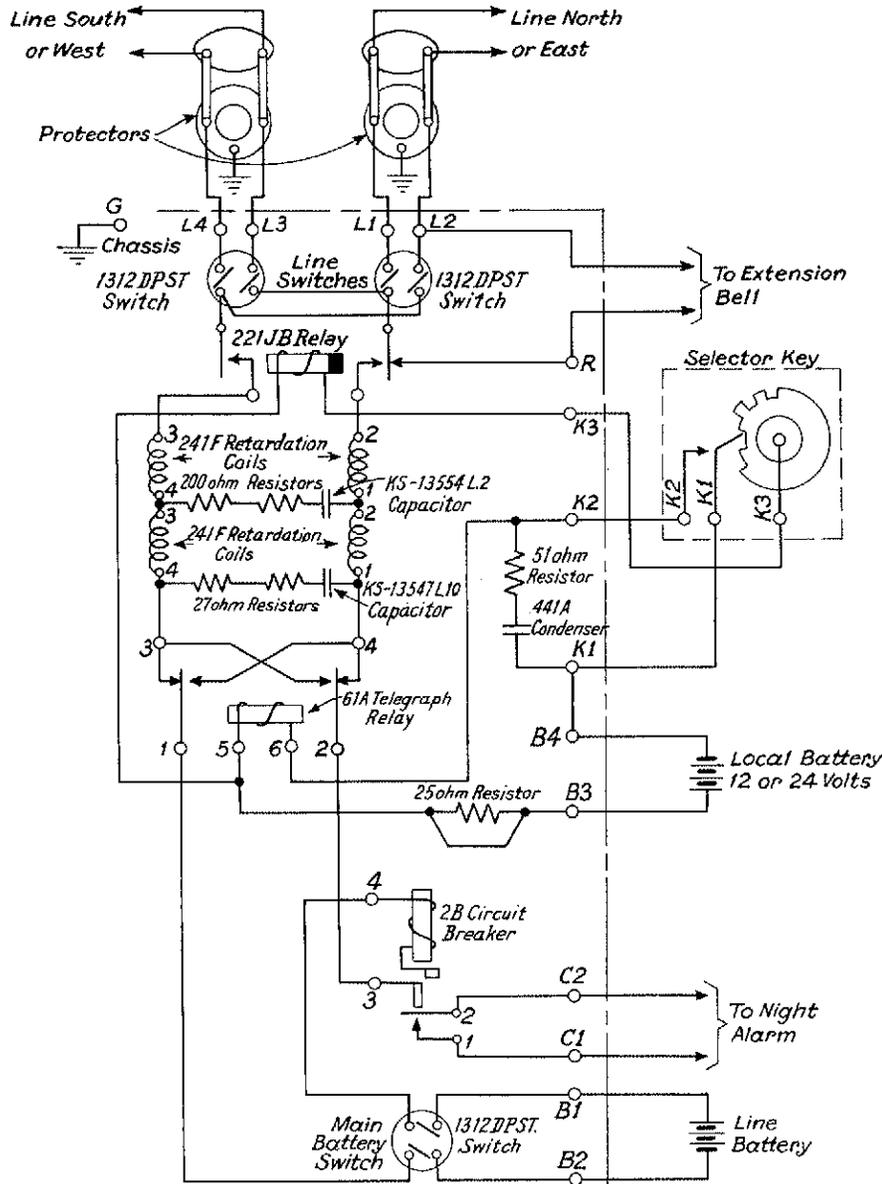


Fig. 4. No. 62C Selector Apparatus Case Schematic

Selector Keys

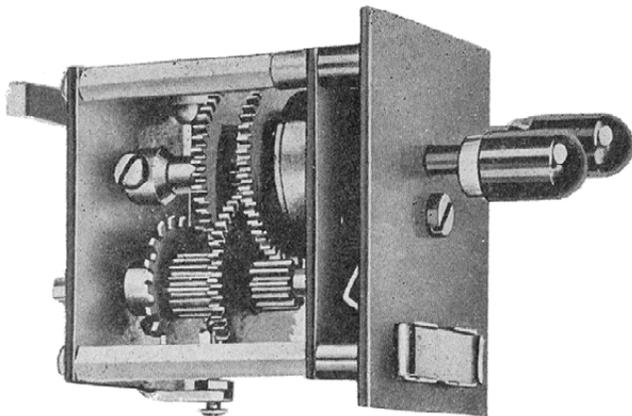


Fig. 5. No. 60A Selector Key

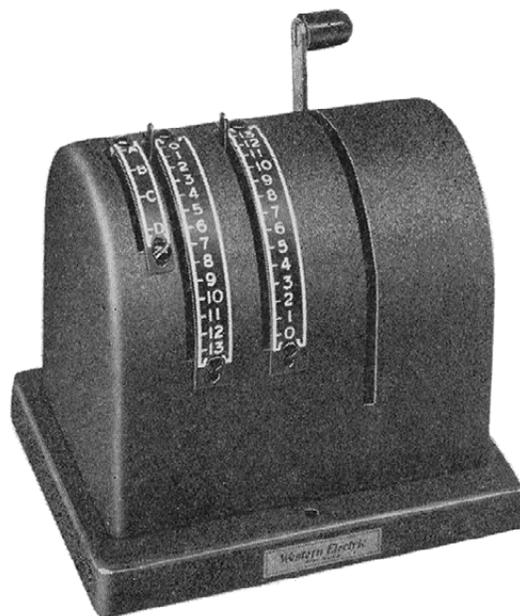


Fig. 6. No. 61A Selector Key

The function of the selector key is to control the operation of the stick relay (No. 221JB) and the pole-changer relay (No. 61A), so that the necessary sequence of current impulses to operate the selector at the station desired will be transmitted to the main line wires, see Figure 2, page 10.

There are three types of keys that may be used, (1) the 60 type Selector Key requiring an individual key for each selector, (2) the 61 type Selector Key provided with lever arms for setting the code as required when making a call, and (3) the 62 and 63 type Selector Keys provided with small button keys for setting the code as required when making a call.

NO. 60 TYPE SELECTOR KEYS

The 60 type are individual keys having a clock spring operating an impulse wheel through a train of gears, with the speed controlled by a governor.

The keys are mounted in a No. 60A Selector Key Case, Figures 9, 10.

The No. 60 type Selector Keys mount in the No. 60 Type Selector Key Case and can easily be removed with a screw driver by turning the screw under the handle counter clockwise. The keys, when mounted, make contact with the springs in the back of the key case. When a key is operated by turning the handle one-quarter turn and then releasing, it should return automatically to its normal position. The speed at which it returns can be increased or decreased by bending in or out the springs which carry the weights of the regulating governor.

NO. 60A SELECTOR KEY

The No. 60A Selector Key is for use with the No. 60AP Selector when set for the code numbers given in Table No. 1 (page 26). It may be set for any of the code numbers given in Table No. 1 by adjusting its segments as described in detail hereafter. In this series of settings the total number of current impulses for any code is seventeen. The governor springs for the No. 60A Selector Key are so adjusted that the impulse wheel will make one revolution in not less than 7½ seconds and not more than 8 seconds.

NO. 60B SELECTOR KEY

The 60B Selector Key is for use with the No. 60AP Selector when set for the code numbers in Table No. 2 (page 26), and with the No. 60BP Selector when set for the code numbers given in Table No. 1 for the No. 60BP Selector. It may be set for any of the code numbers given in Table No. 2 or 1, by the adjustment of its segments in a manner similar to that explained in detail for the No. 60A Selector Key, with the exception that the total number of impulses is increased by 10 for the 27 step code settings of the No. 60AP Selector and that a flat segment is used to reduce the total number of impulses to 17, 19, 21 or 23 for the A, B, C and D contacts for the 17 step No. 60BP Selector. The governor springs for the No. 60B Selector Key are so adjusted that the impulse wheel will make one revolution in not less than 9 seconds and not more than 9½ seconds.

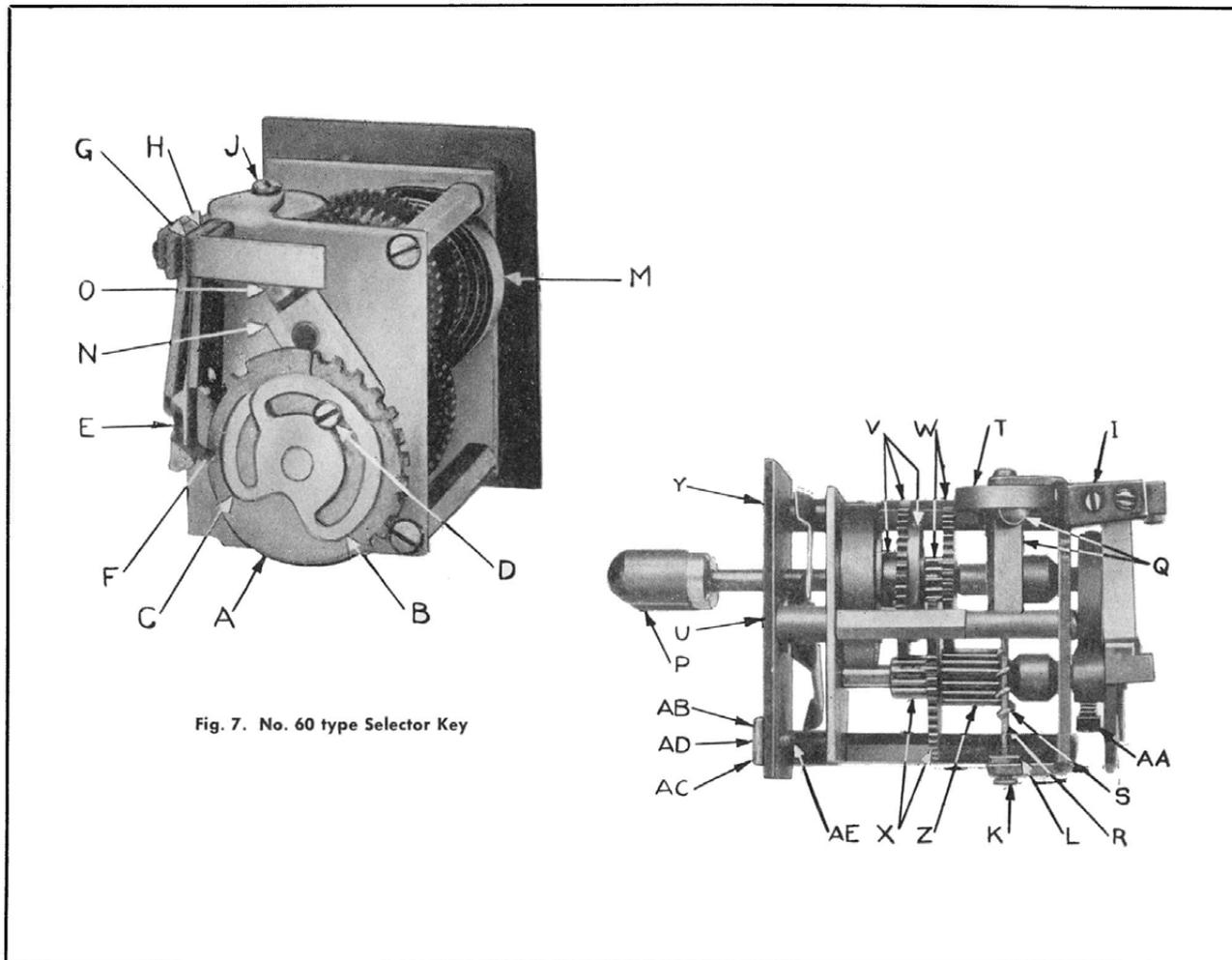


Fig. 7. No. 60 type Selector Key

MAINTENANCE PARTS FOR NO. 60 TYPE SELECTOR KEYS

Symbol	Item	60A Selector Key	60B Selector Key	Symbol	Item	60A Selector Key	60B Selector Key
A	Impulse Wheel	P-140790	P-140943	R	Governor Shaft	*{P-93020	P-93020
B	Bent Up Segment	P-140789	P-140942	S	Governor Worm	{P-93021	P-93021
C	Flat Segment	P-140788	P-140941	T	Governor Cup	P-92113	P-92113
D	Segment Screw	P-115851	P-115852	U	Mounting Screw	P-92132	P-92132
E	Contact Spring	P-140782	P-140782	V	Ratchet Gear	P-93033	P-93033
F	Contact Spring	P-140784	P-140784	W	Gear and Pinion	P-93036	P-93036
G	Insulator Bushing	P-140787	P-140787	X	Gear and Pinion	P-93050	P-93050
H	Insulator	P-93019	P-93019	Y	Face Plate	P-98914	P-98914
I	Pileup Screw	P-115587	P-115587	Z	Worm Wheel	P-93024	P-93024
J	Oval Filister Head Screw	P-93028	P-93028	AA	Screw	P-93487	P-93487
K	Oval Filister Head Screw	P-93044	P-93044	AB	Card	P-92152	P-92152
L	Pivot Lock Nut	P-92122	P-92122	AC	Designation Strip	A-13426 Det. 3	A-13426 Det. 3
M	Main Spring	P-93040	P-93040	AD	Face Strip	A-13426 Det. 2	A-13426 Det. 2
N	Stop	P-219298	P-219298	AE	Retaining Screw Large Flat Segment	P-107474	P-107474
O	Stop Screw	P-219300	P-219300				P-142175
P	Handle	P-94751	P-94751				
Q	Governor	P-93393	P-93393				

* To be assembled.

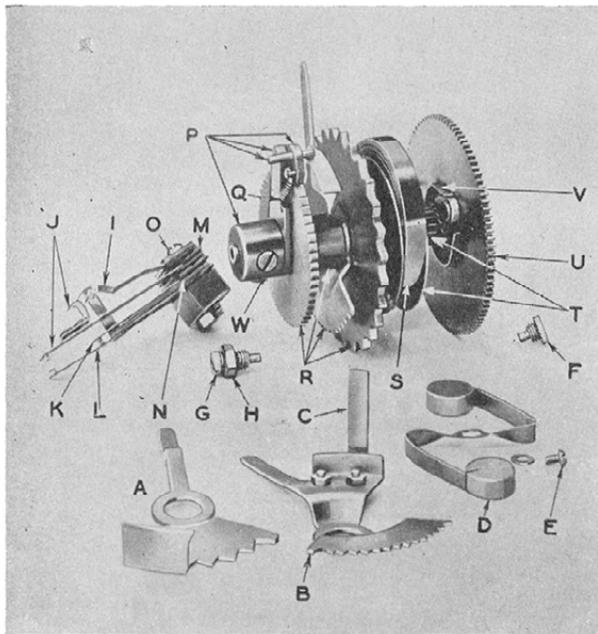
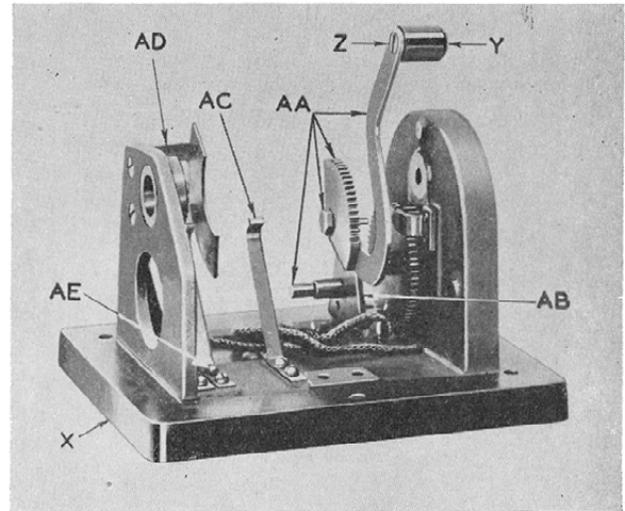


Fig. 8. No. 61 type Selector Key



MAINTENANCE PARTS FOR NO. 61 TYPE SELECTOR KEYS

Symbol	Item	61A Selector Key	Symbol	Item	61A Selector Key
A	Code Lever	Det. 49, A-121562	V	Ratchet Spring	P-93030
B	Code Lever	Det. 34, A-121560	W	Hub Screw	.138"-32 x 5/32", A-121569
C	Interlock Arm	Det. 61, A-121563	X	Base	Det. 1, A-124869
D	Governor	*Det. 2 & 4, A-121555	Y	Handle	P-101504
E	Governor Screw	P-115577	Z	Handle Screw	P-101482
F	Pivot Screw	Det. 55A, A-121562	AA	Operating Lever	*Det. 12, 13, 14, 16, 17, 18, 19, A-121557
G	Pivot Screw	Det. 55, A-121562	AB	Latch Spring	P-93203
H	Pivot Nut	P-95329	AC	Position Spring	Det. 50, A-121562
I	Locking Spring	Det. 47, A-121561	AD	Fixed Segment	Det. 51, A-121562
J	Contact Spring	*Det. 39 & 46, A-121561	AE	Spring Screw Cover	P-115578 Det. 1-A, A-124867
K	Contact Spring	*Det. 40A, A-121561			
L	Contact Spring	*Det. 38, A-121561	Symbol	Item	**61B Selector Key
M	Insulator	Det. 41, A-121561	A	Code Lever	Det. 49, A-121566
N	Bushing	Det. 43, A-121561	B	Code Lever	Det. 34, A-121565
O	Pileup Screw	P-116861	R	Impulse and Ratchet Wheels	*Det. 34, 35, 36, 37, A-121565
P	Pawl Assembly	*Det. 28, 29, 30, 32, A-121559	AD	Fixed Segment Cover	Det. 51, A-121566 Det. 1-A, A-124868
Q	Pawl Spring	P-93204			
R	Impulse and Ratchet Wheels	*Det. 34, 35, 36, 37, A-121560		Other parts same as for 61A Selector Key.	
S	Main Spring	Det. 21, A-121558		* To be assembled as per drawing A-121569.	
T	Spring Holder and Ratchet	*Det. 19, 20, 22, 23, 25, A-121558		** Parts same as for No. 61A Selector Key except as noted above.	
U	Governor Gear	*Det. 8, 9, 10, 11, 10A, A-121556			



METHOD OF SETTING CODES FOR NO. 60 TYPE KEYS

In setting the segments on the impulse wheel of the key, each closure and each opening of the contacts count one. Two styles of segments are provided, one a flat segment which closes the contacts while the inner spring passes over it; the other segment with a bent-up part which engages with the insulated piece on the outer spring, raising this spring sufficiently to keep the contacts open while the outer spring passes over.

Each key requires two segments to give the three sets of impulses. If the first number in the code is odd, a flat segment is required, while a segment with the bent-up part is required if the first number is even. If the last number in the code is even, a flat segment is required, while a segment with the bent-up part is required if the last number is odd. Thus two like segments or one of each kind may be required to give the code setting. The first segment is set so that the inner contact spring, in passing over the first set of teeth on the impulse wheel gives the number of closures and openings of the contacts represented by the first number in the code. The other segment is set so that the contact springs, in passing over the third set of teeth on the impulse wheel, give the number of closures and openings of the contacts as represented by the last number in the code. Since the total number of impulses for any three digit code combination is always the same in the same table, it follows that if the first and the last numbers are set the middle one will be automatically determined.

For example, to set the No. 60A Selector Key for selecting station 8-5-4, begin at the first tooth and count 8 (first number in code) in a clockwise direction, counting one for each tooth and one for each space, in this case 4 teeth and 4 spaces. As the last count was a space, take a segment with the bent-up part and place it so as to keep the contact in the same position while passing over the segment, as on the last count. This segment is set approximately flush with the edge of the next tooth, so that the outside contact spring will be off this segment before the inner contact spring strikes the next tooth.

To set the other segment, begin at the ringing position and count 4 (last number in code) in a counter-clockwise direction, counting one for each space and one for each tooth, in this case two spaces and two teeth. As the last count was on a tooth, set the edge of a flat segment on the center of this tooth. The number of closures and openings of the contact while the inner contact spring passes between the two segments, is the middle number in the code (5 in this case).

NO. 60A SELECTOR KEY CASE

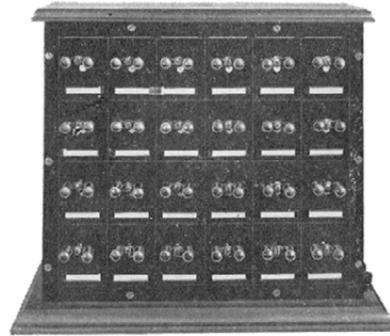


Fig. 9 No. 60A Selector Key Case with
Selector Keys Mounted in Position

The 60A Selector Key Case, Figures 9 and 10, is an oak cabinet (golden oak finish) for mounting a maximum of 24 No. 60 type Selector Keys. The keys are arranged in four rows of six per row. Where less than 24 keys are required, the mounting positions for the selector keys omitted are covered by No. 50A Selector Key Spaces. The dimensions of the 60A Case are approximately 12-39/64" x 15-1/4" x 5-5/8".

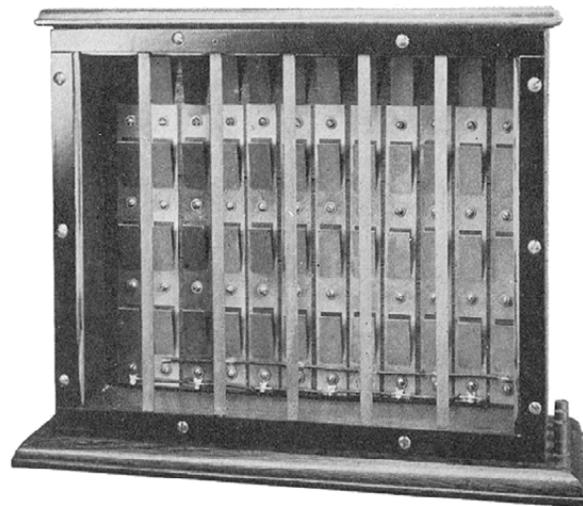


Fig. 10. No. 60A Selector Key Case (without Selector Keys)

NO. 61A SELECTOR KEY

The No. 61A Selector Key is for use as a master key at test boards and switchboards; also at way stations on intercalling circuits. It may be set for any of the code numbers given in Table No. 1, page 26, for all selectors set for the 17 step code by moving the levers, extending through the cover, to the code desired. As in the case of the No. 60 type Keys, the middle number of the code is automatically determined by setting the first and the third numbers.

The first lever on the left side is used only with the No. 60BP Selector and normally is placed for station "A" and should be left in this position when used in connection with the No. 60AP Selectors. When used with the No. 60BP Selectors it should be moved to the B, C and D position, corresponding with the code of the station desired.

To make a call, the second lever is placed opposite the first number of the code of the selector desired. The third lever is placed opposite the last number of the code of the selector desired. The right lever is then moved down to the bottom of its slot and released. The key then operates to give the same sequence of impulses as the No. 60A Key.

The No. 61A Selector Key may be set to call all stations on the line equipped with No. 60AP Selectors (17 step) and all stations connected to the "A" contact of the No. 60BP Selectors (17 step) by setting the second and third levers each on zero. The key then sends out 17 consecutive impulses to step all selectors to the first ringing contact.

The No. 61A Selector Key makes one complete operation in $7\frac{1}{2}$ to 8 seconds. The speed is changed by bending the governor springs, at the right end, in to increase and out to decrease the speed.

Three terminals on the bottom, designated K1, K2 and K3, connect to the corresponding terminals in the No. 62C Selector Apparatus Case shown in Figure 2.

NOS. 62 AND 63 TYPE SELECTOR KEYS

These selector keys are master calling keys arranged to operate any or all selectors on a line to their ringing position by pushing one small locking key in each of the two groups of keys.

The No. 62A Selector Key is arranged for desk or table mounting, and the main apparatus unit is arranged so that it can be removed from its base by means of a jack connection. The overall dimensions are approximately $12\frac{1}{2}$ " high, $10\frac{1}{4}$ " wide, $6\frac{1}{2}$ " deep. The metal frame and cover are finished in black.

The No. 63A Selector Key is arranged for mounting in the face equipment of a 604 PBX Switchboard between the stiles ($10\frac{1}{4}$ " face mounting) and are arranged so that they may be

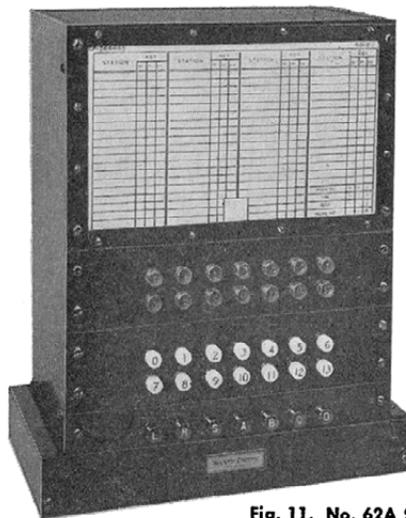


Fig. 11. No. 62A Selector Key

removed from the face equipment of the switchboard either from the front or rear. The metal frame and cover are finished in aluminum. The overall dimensions of the keys are approximately $10\frac{5}{8}$ " high, $9\frac{3}{4}$ " wide, $6\frac{1}{4}$ " deep.

The Nos. 62A and 63A Selector Keys provide means for calling all selectors in the 17 step selector code as given in Table No. 1, page 26. These keys have two groups of 14 keys each and one group of 7 keys.

The above keys are normally furnished with a 15 tooth pinion (see Figures 14 and 15) for 8 second operation, which is more suitable for transformer or repeating coil type circuits. If the key is intended for use on the standard circuit (i.e., 162S or 162T Selector Sets), the order should specify a 12 tooth pinion for 10 second operation.

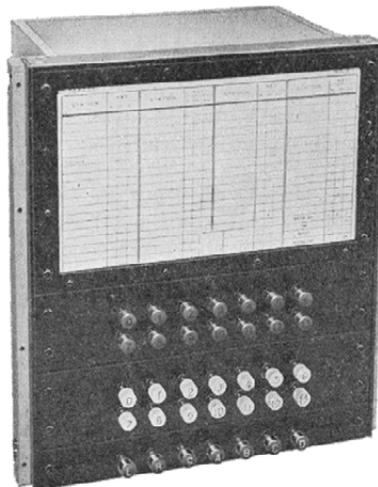


Fig. 12. No. 63A Selector Key



OPERATION

The operating principle is the same for each type and capacity. With the manually operated selector keys, a separate key is used to call each selector. With the Nos. 62A and 63A Keys, it is possible to call every selector within the capacity of the unit by depressing combinations of push keys in the face of the key cabinet. The process of calling any given selector consists of depressing a button in the top (red) group of push keys corresponding to the first number in the desired code, and a second push key in the middle (white) group corresponding to the last number in the selector code. Upon depressing the second push key, circuits are set up which cause a motor-driven brush to sweep around a series of segments arranged in a circle. Figures 14 and 15 show this mechanism clearly. The operation of the push keys further establishes connections to certain segments so that as the brush revolves the correct sequence of impulses is sent out for operating the selector whose code number is being called.

A small lamp located behind the square space in the lower center of the designation card remains lighted while the key is in operation.

The black keys designated A, B, C and D in the bottom row of both key units make it possible to produce selective ringing at the called selector. In other words, by depressing one of the four "letter" keys in question, the called selector will ring independently one of four annunciator bells local to the selector.

A schematic diagram of the Nos. 62A and 63A Keys is shown in Figure 13.

DRIVE

Each selector key also has a distributor panel with a small motor driving a brush arm, carrying a brush which wipes over a commutator consisting of 70 small segments. On the front of this panel a designation card is provided for listing the keys to be operated to make the selector call for each station.

105-120 volts, 50-60 cycles is required for the operation of the small motor used in these selector keys. This current is connected directly to the terminals in the base of the No. 62A Selector Key, and through a suitable transformer for the No. 63A Selector Key. For the No. 63A Selector Key, the 115:24 volt bell ringing type transformer must be ordered separately and is used to step down the voltage to 24 volts so as not to require special insulation in the wiring for the keys in the PBX switchboard. The selector keys are arranged to use either 12 or 24 volts d-c for the local operation of the relays and lamp. When a 24 volt battery is used, the strap shunting the 45 ohm resistor must be removed.

FEATURES AND ADVANTAGES

1. All selectors may be set for receiving time signals by depressing key No. 1 in the first (red) group and key No. 1 in the second (white) group.
2. All selectors may be operated for a master call by depressing key No. 0 in the first (red) group and key No. 0 in the second (white) group.
3. Selectors may be called in groups by depressing corresponding keys in the first and second groups of keys.
4. Since the keys used for calling are of the locking type, the last keys operated indicate the last call made.
5. If it is desired to repeat the call on any given selector, it may be accomplished by depressing the black key "S."
6. Should the operator for any reason wish to prolong the ringing of the bell at a station, this can be accomplished by holding the "L" and "R" keys in the operated position as soon as the "answer back" tone is heard.
7. If, after a call is started, it is desired to break it up, this may be done by pushing the "R" key which will prevent the impulses from going out.
8. The selector key unit is extremely flexible in that only one unit is necessary to call any number of selectors within the capacity of the unit. When, in the course of time, additional selectors, within the capacity of the unit, are added to the system they are handled by the original key without any changes or additions.
9. The selector key is interchangeable with the Western Electric Nos. 60 and 61 type Selector Keys and may be connected in multiple by connecting like terminals together, or may be substituted entirely for them.
10. One dispatcher, from a given position using a single key unit, may operate two or more systems during light load since the same key need simply be switched from one system to another as desired.
11. Uniformity of impulse sending is insured by the use of a synchronous motor sweeping a brush arm over uniformly spaced contact segments.
12. The key is entirely self-contained, all relays and other mechanism being mounted compactly within its housing.

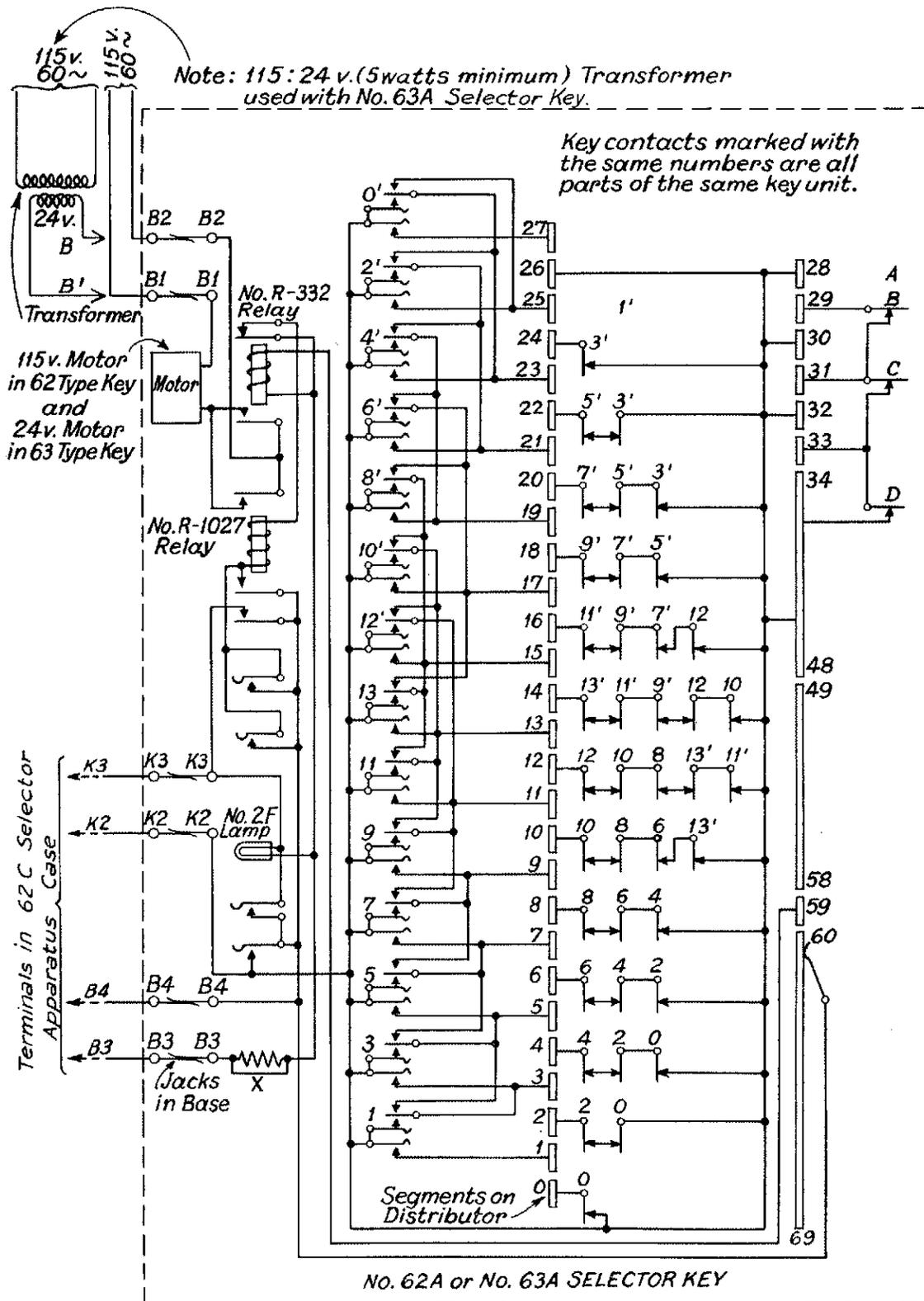


Fig. 13. No. 62A or 63A Selector Key, Schematic

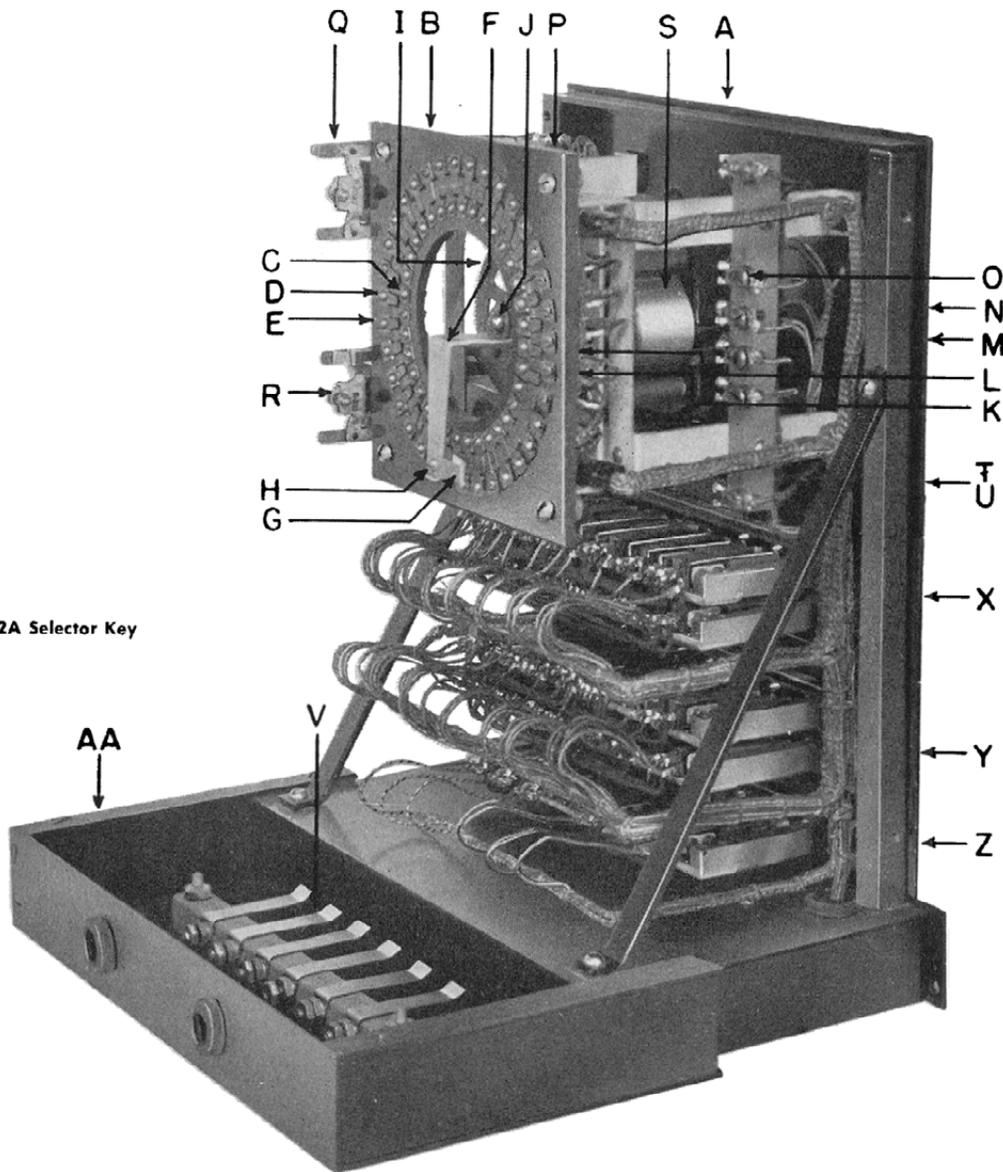


Fig. 14. No. 62A Selector Key

MAINTENANCE PARTS FOR 62 TYPE SELECTOR KEYS

Symbol	Item	62A Selector Key	62B Selector Key**	Symbol	Item	62A Selector Key	62B Selector Key**
A	Distributor Panel, Complete	P-235881	P-235881	Q	Relay—Start	R-1027	R-1027
B	Terminal Plate, Complete	P-235864	P-235864	R	Relay—Stop	R-332	R-332
C	Inner Segment	P-235866	P-235866	S	Telechron Motor— Type B3, 1 RPS	60 cycles 110 volts	60 cycles 110 volts
D	Outer Segment	P-235865	P-235865	T	Lamp	No. 2F	No. 2F
E	Segment Screw	P-115586	P-115586	U	Lamp Socket	No. 49A	No. 49A
F	Contact Arm	P-235868	P-235868	V	Base Terminal Spring	P-235856	P-235856
G	Contact Spring	P-235869	P-235869	X	Key Panel—Red Buttons	542A Key	543A Key
H	Contact Spring Screw	P-114485	P-114485	Y	Key Panel—White Buttons	542B Key	543B Key
I	Gear	P-235867	P-235867	Z	Key Panel—Black Buttons	541A Key	541A Key
J	Gear Mounting Screw	P-119251	P-119251	AA	Base—Complete Cover Circuit Label	P-235859 P-235843 P-244441	P-235859 P-235843 P-244442
K	Pinion Mounting Screw	P-157519	P-157519				
L	Pinion*	ESO- 678677-1	ESO- 678677-1				
M	Designation Card	P-244445	P-244445				
N	Window	P-235883	P-235883				
O	Terminal	P-124619	P-124619				
P	Resistance—Ward Leonard	Type O— 45 Ohms	Type O— 45 Ohms				

* Key is normally furnished with 15 tooth pinion ESO-678677-1 for 8 second operation. For a 12 tooth pinion order P-235870.

** Parts shown for maintenance purposes only.

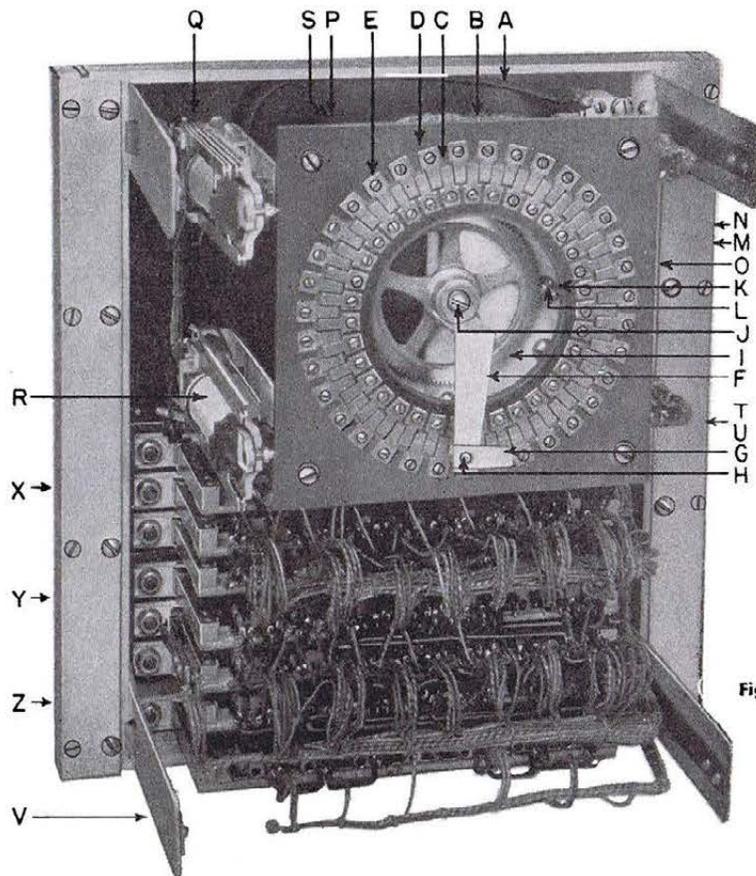


Fig. 15. No. 63A Selector Key

MAINTENANCE PARTS FOR 63 TYPE SELECTOR KEYS

Symbol	Item	63A Selector Key	63B Selector Key**	Symbol	Item	63A Selector Key	63B Selector Key**
A	Distributor Panel, Complete	P-235880	P-235880	Q	Relay—Start	R-1027	R-1027
B	Terminal Plate, Complete	P-235864	P-235864	R	Relay—Stop	R-332	R-332
C	Inner Segment	P-235866	P-235866	S	Telechron Motor— Type B3, 1 RPS	60 cycles 22 volts	60 cycles 22 volts
D	Outer Segment	P-235865	P-235865	T	Lamp	No. 2F	No. 2F
E	Segment Screw	P-115586	P-115586	U	Lamp Socket	No. 49A	No. 49A
F	Contact Arm	P-235868	P-235868	V	Cover Support	P-235850	P-235850
G	Contact Spring	P-235869	P-235869	X	Key Panel—Red Buttons	542A Key	543A Key
H	Contact Spring Screw	P-114485	P-114485	Y	Key Panel—White Buttons	542B Key	543B Key
I	Gear	P-235867	P-235867	Z	Key Panel—Black Buttons	541A Key	541A Key
J	Gear Mounting Screw	P-119251	P-119251		Cover	P-235842	P-235842
K	Pinion Mounting Screw	P-157519	P-157519		Circuit Label	P-244443	P-244444
L	Pinion*	ESO- 678677-1	ESO- 678677-1				
M	Designation Card	P-244445	P-244445				
N	Window	P-235883	P-835883				
O	Terminal	P-124619	P-124619				
P	Resistance—Ward Leonard	Type O— 45 Ohms	Type O— 45 Ohms				

* Key is normally furnished with 15 tooth pinion ESO-678677-1 for 8 second operation. For a 12 tooth pinion order P-235870.

** Parts shown for maintenance purposes only.



Dispatcher's telephone equipment

No. 502A Subscriber Set

The No. 502A Subscriber Set is a high efficiency set, designed with an anti-sidetone feature arranged so that the dispatcher is at all times insulated from the line.

As the dispatcher wears his receiver continuously, his battery circuit is closed a large portion of the time. With the anti-sidetone feature, the dispatcher's voice and other noises in the dispatcher's office are kept out of his receiver.

The two induction coils in the set insulate the dispatcher's telephone equipment from the line. These coils have a break-down test of approximately 1000 volts a-c.

The arrangement of the condensers keeps down the thumps from signalling impulses, thus protecting the dispatcher's ears.

(For additional Subscriber Sets, see page 110.)

NO. 345A JACK BOX

The No. 345A Jack Box permits the use of two operators' telephone sets in parallel.

(For additional Jack Boxes, see page 87.)

Way station selector equipment

NOS. 162S AND 162T SELECTOR SETS

The No. 162S Selector Set replaces the Nos. 160C and 162C Selector Sets; the No. 162T Selector Set replaces the Nos. 160R and 162R Selector Sets, formerly furnished.

These sets which weigh 11 pounds each (including the selector) are arranged to hold the selector and are completely wired and provided with terminals for connecting the line and local battery wires, as shown in Figure 16. Approximate dimensions: height 9 $\frac{1}{4}$ "", width 6 $\frac{3}{4}$ "", depth 6 $\frac{7}{8}$ ". The 162S and 162T Sets do not include the 60AP or 60BP Selectors as part of the equipment. The selector desired must be ordered separately.

The 162S Selector Set is for use on standard circuits where condensers are required in series with the 60AP or 60BP Selector.

The 162T Selector Set is for use in a repeating coil circuit where no condenser is required in

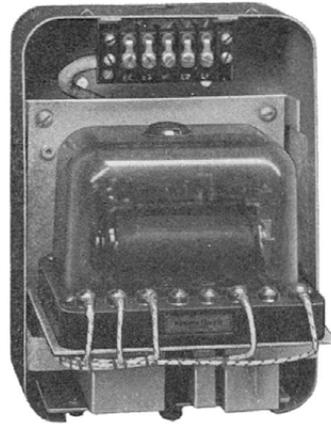


Fig. 16. No. 162 type Selector Set

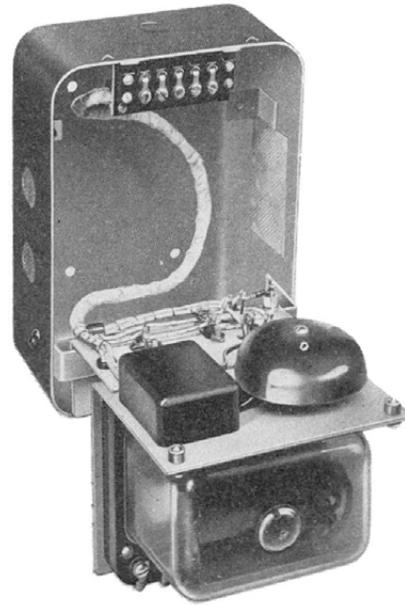
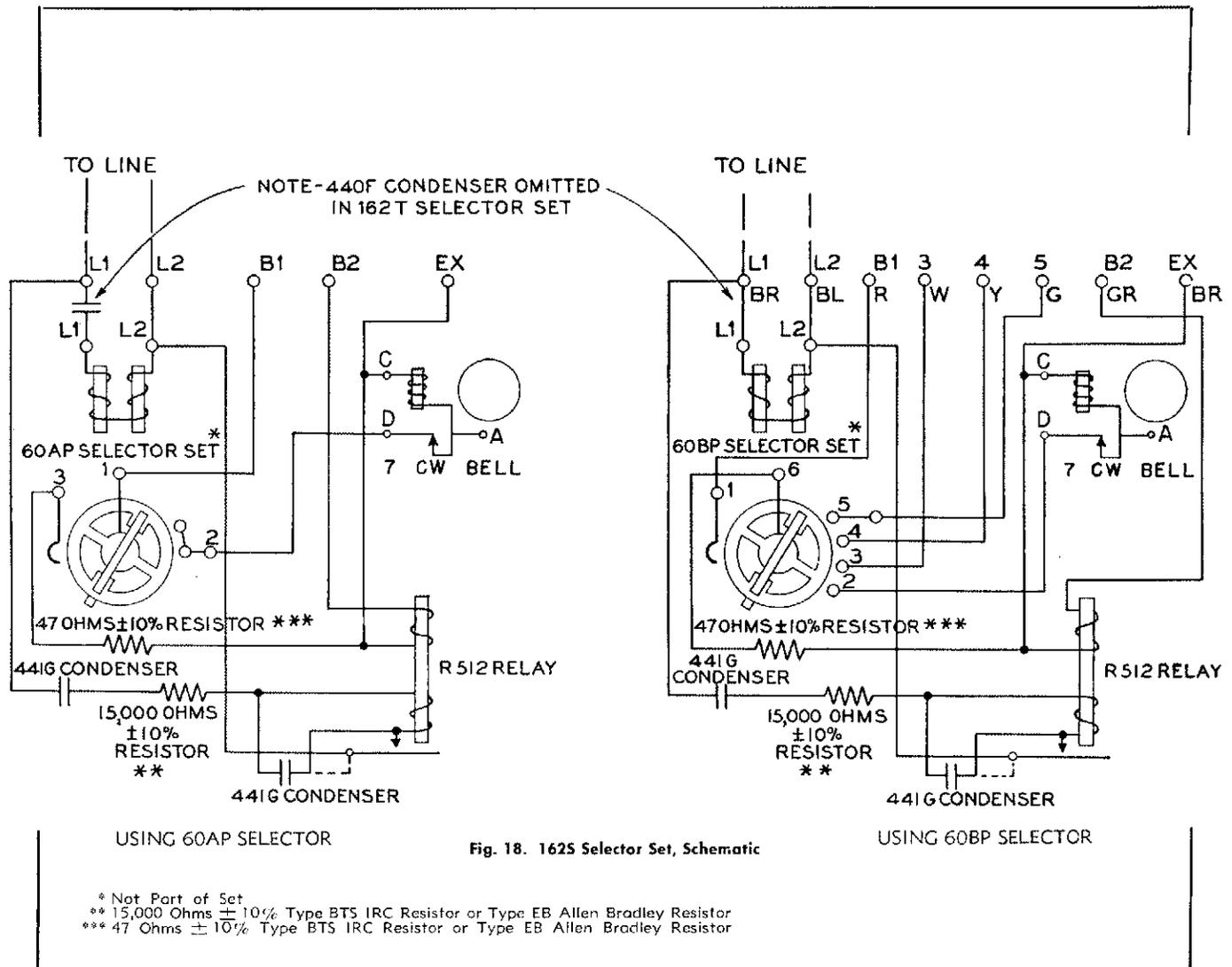


Fig. 17. No. 162 type Selector Set, showing Bell and Hinging Action

series with the selector. This set is the same as the 162S Selector Set except that the 440F Condenser is omitted, as shown in Figure 18. When using the 60BP Selector, the wires are connected to the selector set, as shown. When using the 60AP Selector, wires from terminals 3, 4 and 5 are not used and are left taped up in the cable form.

The use of R512 Relay permits a common battery to be used for two selectors on different circuits without introducing a metallic connection between the two circuits. When the selector is stepped to its ringing position, the 7CW Bell is operated in series with one of the relay windings. A 47 ohm resistance, at the same time, holds the relay operated while the ringer contact makes and breaks.



The electrical disturbance created by the vibrating bell is imposed on the lines as an answer-back signal, through the other winding of the relay acting as a transformer and through a filter network consisting of a 15,000 ohm resistor and 441G Condenser. The use of the relay as a transformer avoids the metallic connections which would otherwise result if a common battery were used for selectors on two different lines. The filter network reduces the interference from the answer-back signal into superimposed carrier channels.

The Nos. 162S and 162T Selector Sets are also designed for use on lines on which H1 Carrier is superimposed as well as on normal lines.

NO. 7CW BELL

The function of the No. 7CW Bell, which is a part of the above selector sets, is to signal the way station operator and also to give the time signals. This bell is a vibrating direct current type, operating from the transmitter battery and is provided with contact springs for opening its own circuit intermittently.

The effective resistance of each spool is approximately 8 ohms and the bell is adjusted to operate on the same battery as the telephone equipment.



NO. 60 TYPE SELECTORS

The function of the selector is to provide a quick and reliable means of receiving a call selectively at one of a large number of way stations on the same telephone line without producing a signal at the other stations.

The d-c resistance of the No. 60 type Selector is 21,000 ohms. The selector may be operated in series with a $1\frac{1}{4}$ or $1\frac{1}{2}$ mf condenser or through a No. 341A Transformer or No. 70A Repeating Coil without a condenser. The impedance of the selector and condenser at the operating frequency of $3\frac{1}{2}$ cycles is approximately 35,000 ohms. The impedance of the selector at talking frequency (800 cycles per second) is approximately 2 meg-ohms. Thus the loss in telephone transmission due to the selector bridge on the line is negligible.

NO. 60AP SELECTOR

(Not included with selector sets)

The No. 60AP Selector, Figure 19, is of the step-by-step type and is operated by a definite code or sequence of alternating or reverse current impulses. It consists of a mechanism unit mounted on a magnet unit with a bakelite base and a transparent molded plastic cover.

The code wheels are set so that the same total number of steps is necessary to advance the code wheel to the ringing position on all selectors that are to be used on the same line. With the number of holes provided in the code wheel, this number of total steps may be any number from 8 to 32, which number would give a total of 6 to 378 code settings, respectively. The No. 60AP Selector, however, is normally set for a total of 17 steps which number gives a total of 78 code settings. Unless selectors are ordered for some other code setting than those given in Table No. 1, page 26, the selector is not stepped up by 17 consecutive impulses when selecting a station but by 3 sets of successive impulses totalling 17 in number as indicated in Table No. 1. (This number of impulses, 17, does not count the restoring impulse.)

The code pins on each selector are located so that after the first set of impulses the code wheel will be in position for the holding spring to engage with the first code pin. The second code pin is located so that after the second set of impulses the code wheel will be in position for the holding spring to engage with the second code pin. The third set of impulses then advances the code wheel so that the permanent code pin is in position to engage with the holding spring and at the same time the contact spring is directly over and makes contact with the first ringing terminal thus completing the bell circuit. Each selector is capable of being set for any station number given in Table No. 1, without any change other than the location of the two code pins in the code wheel.

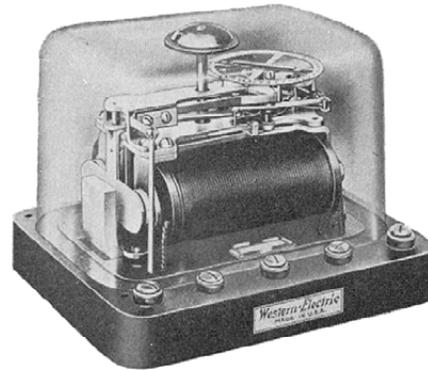


Fig. 19. No. 60AP Selector

In order to take care of cases where a greater number of code settings are required than those given in Table No. 1, the code settings for a No. 60AP Selector for 27 total steps in each code are given in Table No. 2, page 26, which gives a total of 241 code settings.

NO. 60BP SELECTOR

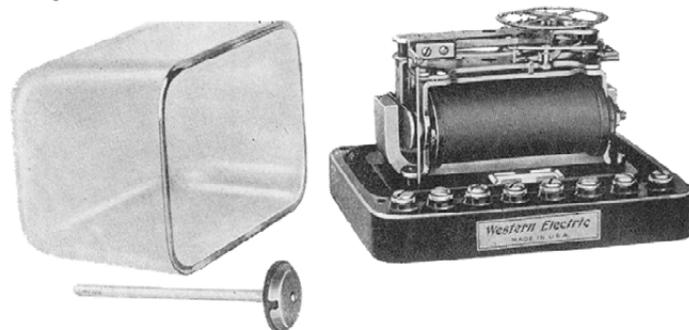
(Not included with selector sets)

The No. 60BP Selector, Figure 20, is known as the multiple contact selector and differs from the No. 60AP Selector in that it is equipped with four selector ringing contacts instead of one so that any one of four local signal circuits can be closed by the same selector independently.

The method of setting the code numbers and the method of operation are the same as described for the No. 60AP Selector.

The ringing contacts on the No. 60BP Selector are known by the letters A, B, C and D. Contact A is the first stud engaged by the contact spring on the code wheel as the code wheel is advanced. The last group of impulses in the code setting for selecting the first or A contact, is increased by two impulses to select the B contact, four impulses to select the C contact, and six impulses to select the D contact. The numbers marked on the code card on the selector indicate the code setting for the A contact. For example, a selector having a code setting of 8-5-4 for the first contact will be marked 8-5-4 A, 8-5-4 B, 8-5-4 C and 8-5-4 D.

Fig. 20. No. 60BP Selector



CODE SETTINGS FOR SELECTORS

TABLE NO. 1

Total Steps in Each Code—17. Total code settings for the No. 60AP Selector—78. Code settings for the No. 60BP Selector with No. 60AP Selectors on the same line are marked with a star—28. Additional code settings for the No. 60BP Selector with no No. 60AP Selectors on the same line are marked with a dot—18.

2-2-13								
2-3-12	3-2-12							
2-4-11	3-3-11	4-2-11						
2-5-10	3-4-10	4-3-10	.5-2-10					
2-6-9	3-5-9	4-4-9	.5-3-9	6-2-9				
2-7-8	3-6-8	4-5-8	.5-4-8	6-3-8	*7-2-8			
2-8-7	3-7-7	4-6-7	.5-5-7	6-4-7	*7-3-7	*8-2-7		
2-9-6	3-8-6	4-7-6	.5-6-6	6-5-6	*7-4-6	*8-3-6		*9-2-6
2-10-5	3-9-5	4-8-5	.5-7-5	6-6-5	*7-5-5	*8-4-5		*9-3-5
2-11-4	3-10-4	4-9-4	.5-8-4	6-7-4	*7-6-4	*8-5-4		*9-4-4
2-12-3	3-11-3	4-10-3	.5-9-3	6-8-3	*7-7-3	*8-6-3		*9-5-3
2-13-2	3-12-2	4-11-2	.5-10-2	6-9-2	*7-8-2	*8-7-2		*9-6-2
*10-2-5								
*10-3-4		*11-2-4						
*10-4-3		*11-3-3		*12-2-3				
*10-5-2		*11-4-2		*12-3-2		*13-2-2		

TABLE NO. 2

Total Steps in Each Code—27. Total code settings for the No. 60AP Selector—241. Code settings for the No. 60BP Selector with No. 60AP Selectors on the same line are marked with a star—147. Additional settings for the No. 60BP Selector with no No. 60AP Selectors on the same line are marked with a dot—38.

2-5-20	3-4-20	4-3-20	.5-2-20					
2-6-19	3-5-19	4-4-19	.5-3-19	6-2-19				
2-7-18	3-6-18	4-5-18	.5-4-18	6-3-18	*7-2-18			
2-8-17	3-7-17	4-6-17	.5-5-17	6-4-17	*7-3-17	*8-2-17		
2-9-16	3-8-16	4-7-16	.5-6-16	6-5-16	*7-4-16	*8-3-16		
2-10-15	3-9-15	4-8-15	.5-7-15	6-6-15	*7-5-15	*8-4-15		
2-11-14	3-10-14	4-9-14	.5-8-14	6-7-14	*7-6-14	*8-5-14		
2-12-13	3-11-13	4-10-13	.5-9-13	6-8-13	*7-7-13	*8-6-13		
2-13-12	3-12-12	4-11-12	.5-10-12	6-9-12	*7-8-12	*8-7-12		
2-14-11	3-13-11	4-12-11	.5-11-11	6-10-11	*7-9-11	*8-8-11		
2-15-10	3-14-10	4-13-10	.5-12-10	6-11-10	*7-10-10	*8-9-10		
2-16-9	3-15-9	4-14-9	.5-13-9	6-12-9	*7-11-9	*8-10-9		
2-17-8	3-16-8	4-15-8	.5-14-8	6-13-8	*7-12-8	*8-11-8		
2-18-7	3-17-7	4-16-7	.5-15-7	6-14-7	*7-13-7	*8-12-7		
2-19-6	3-18-6	4-17-6	.5-16-6	6-15-6	*7-14-6	*8-13-6		
2-20-5	3-19-5	4-18-5	.5-17-5	6-16-5	*7-15-5	*8-14-5		
2-21-4	3-20-4	4-19-4	.5-18-4	6-17-4	*7-16-4	*8-15-4		
2-22-3	3-21-3	4-20-3	.5-19-3	6-18-3	*7-17-3	*8-16-3		
2-23-2	3-22-2	4-21-2	.5-20-2	6-19-2	*7-18-2	*8-17-2		
*9-2-16								
*9-3-15	*10-2-15							
*9-4-14	*10-3-14	*11-2-14						
*9-5-13	*10-4-13	*11-3-13	*12-2-13					
*9-6-12	*10-5-12	*11-4-12	*12-3-12	*13-2-12				
*9-7-11	*10-6-11	*11-5-11	*12-4-11	*13-3-11	*14-2-11			
*9-8-10	*10-7-10	*11-6-10	*12-5-10	*13-4-10	*14-3-10	*15-2-10		
*9-9-9	*10-8-9	*11-7-9	*12-6-9	*13-5-9	*14-4-9	*15-3-9		
*9-10-8	*10-9-8	*11-8-8	*12-7-8	*13-6-8	*14-5-8	*15-4-8		
*9-11-7	*10-10-7	*11-9-7	*12-8-7	*13-7-7	*14-6-7	*15-5-7		
*9-12-6	*10-11-6	*11-10-6	*12-9-6	*13-8-6	*14-7-6	*15-6-6		
*9-13-5	*10-12-5	*11-11-5	*12-10-5	*13-9-5	*14-8-5	*15-7-5		
*9-14-4	*10-13-4	*11-12-4	*12-11-4	*13-10-4	*14-9-4	*15-8-4		
*9-15-3	*10-14-3	*11-13-3	*12-12-3	*13-11-3	*14-10-3	*15-9-3		
*9-16-2	*10-15-2	*11-14-2	*12-13-2	*13-12-2	*14-11-2	*15-10-2		
*16-2-9								
*16-3-8	*17-2-8							
*16-4-7	*17-3-7	*18-2-7						
*16-5-6	*17-4-6	*18-3-6	*19-2-6					
*16-6-5	*17-5-5	*18-4-5	*19-3-5	*20-2-5				
*16-7-4	*17-6-4	*18-5-4	*19-4-4	*20-3-4				
*16-8-3	*17-7-3	*18-6-3	*19-5-3	*20-4-3				
*16-9-2	*17-8-2	*18-7-2	*19-6-2	*20-5-2				

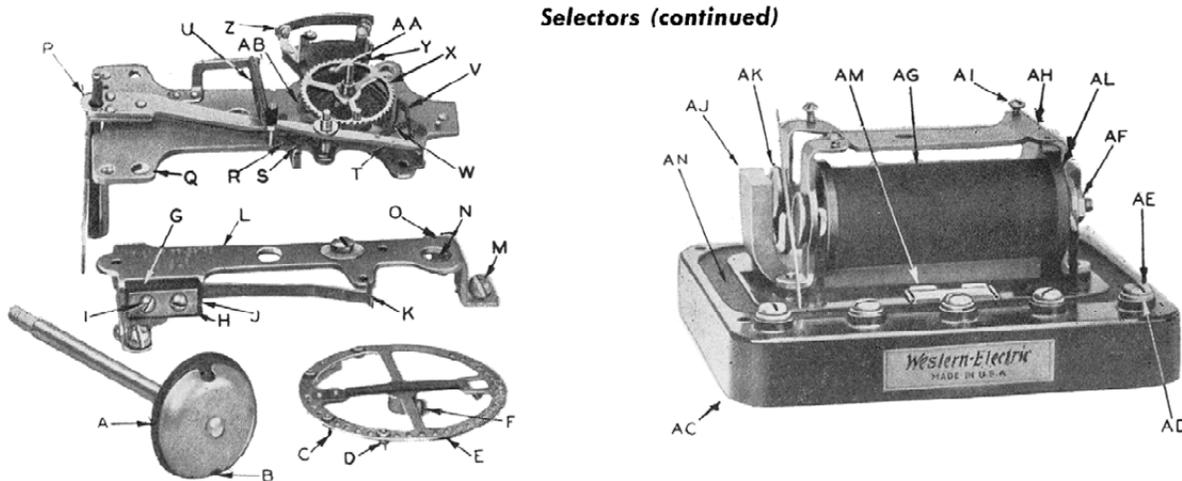


Fig. 21. No. 60 type Selector

MAINTENANCE PARTS FOR 60 TYPE SELECTORS

Symbol	Item	60AP Selector	60BP Selector	Symbol	Item	60AP Selector	60BP Selector
A	Felt Washer	P-91966	P-91966	W	Stepping Pawl Spring	P-93202	P-93202
B	Clamping Stud	P-207899	P-207899	X	Ratchet	P-137678	P-137678
C	Code Pin	P-137652	P-137652	Y	Terminal Plate	P-137658	P-137658
D	Code Nut	P-137651	P-137651	Z	Terminal Bridge	P-94505	P-94505
E	Code Wheel	P-146196	P-146199		Screw		
F	Code Wheel Screw	P-137650	P-137650	AA	Terminal Plate Screw	P-93836	P-93836
G	Insulator Bushing	P-207896	P-207896	AB	Spiral Spring	P-137649	P-137649
H	Clamping Plate	P-146610	P-146610	AC	Base	P-207897	P-207898
I	Clamping Plate Screw	P-93833	P-93833	AD	Base Terminal	P-137683	P-137683
J	Insulator	P-137632	P-137632	AE	Terminal Screw	P-137685	P-137685
K	Holding Spring	P-137636	P-137636	AF	Core Lock Nut	P-121772	P-121772
L	Upper Plate	P-146308	P-146308	AG	Coil	P-228520	P-228520
M	Upper Plate Screw	P-147796	P-147796	AH	Frame	P-146145	P-146145
N	Adjusting Screw	P-92642	P-92642	AI	Frame Screw	P-121770	P-121770
O	Hexagon Nut	P-137686	P-137686	AJ	Magnet	P-145918	P-145918
P	Armature	P-146148	P-146148	AK	Core	P-147431	P-147431
Q	Middle Plate	P-146306	P-146306	AL	End Play Washer	P-137641	P-137641
R	Holding Pawl	P-137643	P-137643		Card	P-92152	P-92152
S	Holding Pawl Spring	P-137648	P-137648	AM	Card Holder	8H designation strip 1 3/8" long	
T	Rocker Arm	P-146152	P-146152		Face Strip	P-101964	P-101964
U	Rocker Arm Spring	P-137692	P-137692		Retaining Screw	P-223064	P-223064
V	Stepping Pawl	P-146149	P-146149		Plexene Cover	P-162258	P-162258
				AN	Gasket	BA112637	BA112637

NO. 7CW BELL

This bell is used as an extension signal in connection with the No. 60BP Selector. The 7CW Bell in the 162S or T Selector Set in which the 60BP Selector is mounted, gives a signal for the first or A ringing contact. One of these extension bells is required for each signal desired in addition to the one in the selector set.

The No. 7CW Bell may be connected as shown in the schematic, Figure 18. Three extension bells, therefore, can be connected: one to terminals 3 and Ex and one to terminals 4 and Ex, and the third to terminals 5 and Ex of terminal strip in the selector set. See page 37 for additional information on bells.

Way station telephone equipment

NO. 501 TYPE SUBSCRIBER SETS

The Nos. 501E and F Subscriber Sets are high efficiency sets designed for use on lines where a large number of sets are required. The secondary of the induction coil, in series with the condenser is permanently bridged across the line, so that the characteristics of the line do not materially change whether one or all of the stations are listening in at the same time. This also insulates the operator from the line as the telephone equipment is connected to the primary of the induction coil. The induction coil has a breakdown of approximately 1000 volts a-c between the windings.

When the switch of the desk set box is closed to the transmitting position, the receiver is not cut out entirely, but is left across part of the winding of the induction coil so that the dispatcher can, in case of error, break in on an operator repeating an order.

In the No. 501E Set, the key for switching from listening to talking position is included in the box. The No. 501F Set is the same as the No. 501E, except that the key is omitted, the wiring being brought to terminals in the set so that a foot switch or separate key can be used.

For additional information on subscriber sets, see page 110.

The 1120AB Desk Stand must be ordered separately (see page 119).

NO. 98B PROTECTOR

The function of the protector is to protect the inside apparatus against damage from high voltages by providing a shunt path from each side of the line through an air gap between the blocks to a well established ground connection. It is important that this ground connection be well and permanently made. A fuse in each side of the line is also provided to guard the drop wires against abnormal currents. Seven ampere fuses are generally used.

For additional information on protection equipment, see page 96.

100F Loudspeaker set

The No. 100F Loudspeaker is an efficient set of modern design. Its acoustic output is higher than that of the No. 100E which it replaces.

The No. 100F Loudspeaker Set may be used in way stations, train dispatchers' offices and in signal towers. It is designed to amplify the incoming speech and, by the use of a preset control, the speaker volume is governed and the operator is relieved of the necessity of wearing a head receiver.



Fig. 22. No. 100F Loudspeaker Set

The set consists of a two stage resistance coupled amplifier and a small speaker mounted in a walnut finished cabinet, Figures 22 and 23, and when used at a dispatcher's station should be connected per schematic Figure 24. When the 100F Set is connected at a way station a 3D Foot Switch is required replacing the 3C Foot Switch and connected as shown in Figure 2, page 10, Item 10 with added terminal Numbers 8 and 9 of foot switch connected to Terminals 1 and 2 of 100F Loudspeaker Set.

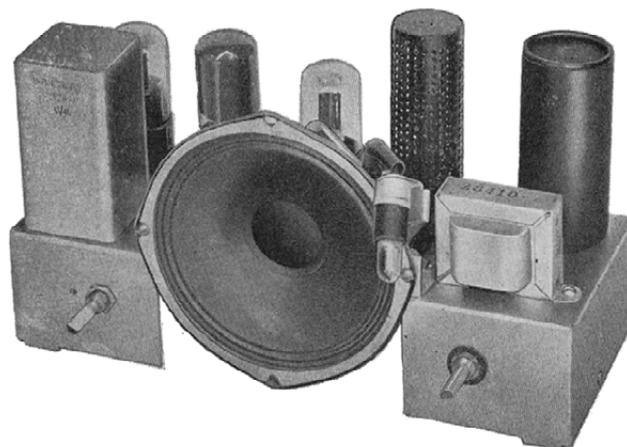


Fig. 23. No. 100F Loudspeaker Set, Interior View

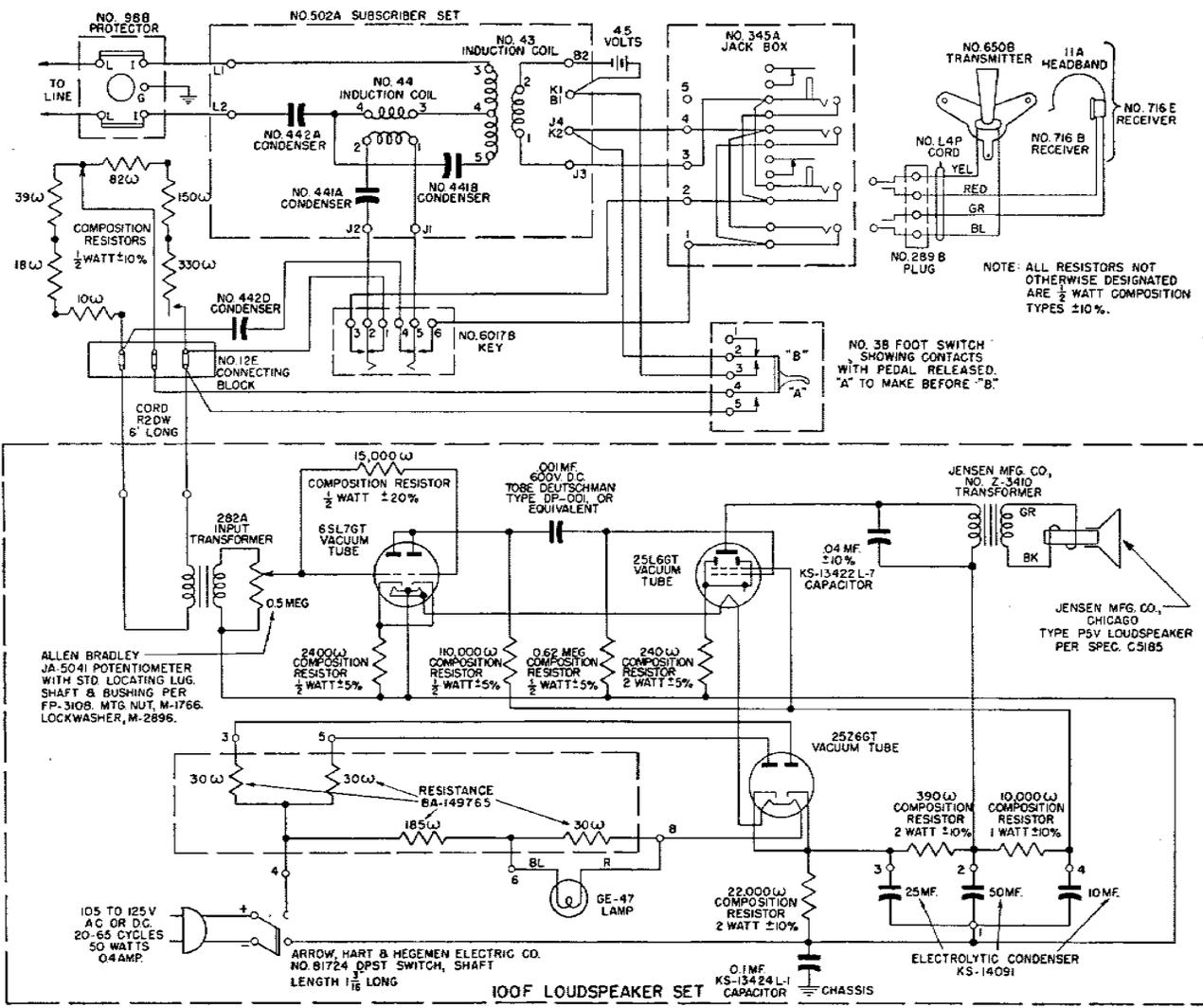


Fig. 24. No. 100F Loudspeaker Set and Dispatcher's Station Telephone Equipment

Power requirements

The current supply for a railway train dispatching system consists of a main d-c battery of 150 to 400 volts capable of supplying 0.2 to 0.5 ampere respectively and a local battery of 12 or 24 volts at the dispatchers' stations and a 4.5 volt battery at each way station.

The main battery furnishes the current for operating the selectors at the way stations. The voltage required depends on the loop resistance of the line wires and the location and number of selector sets on the line. For standard circuits using No. 162 type Selector Sets with condensers in the sets, the voltage required for normal operation can be determined from the voltage line selector curves shown in Figure 25. For transformer or repeating coil circuits the voltage required for normal operation can be determined from the curves shown in Figures 26 or 27. These curves show the voltage required for different length lines of No. 9 B. & S. copper wires—8.3 ohms per loop mile—equipped with selector sets uniformly distributed. The voltage specified for normal operation is higher than the minimum operating voltage required. This insures the operation of the selectors when the line insulation is low during wet weather and allows for a slight decrease in the potential for any reason. The potential should in no case be allowed to decrease more than 15%.

Dry cells, storage cells, a motor-generator set, or a suitable rectifier may be used for this main current source. When dry cells are used, frequent measurements should be made to determine the potential of the battery when the current is flowing under operating conditions. This is necessary because the gradual increase in internal resistance of the dry cells will lower the voltage available for operating the selectors. (For Battery Boxes see page 40.)

When a rectifier is used as the battery supply with the circuit connections shown in Figure 4, page 13, the line contacts of the No. 221JB Relay in the No. 62C Selector Apparatus Case should be closed permanently by short circuiting the contacts, and the lead to terminal K3 of the selector apparatus case not connected, unless the rectifier operates continuously with voltage available from its output. If the rectifier is started from a non-operating condition and energized only for the duration of a selector call, the operation of the No. 221JB Relay would result in two preliminary pulses being transmitted instead of one, the first when No. 221JB Relay contacts are closed due to the condensers in the selector apparatus case and rectifier being left in a charged condition from a previous call, and the second, when the rectifier comes up to voltage.

VOLTAGE-LINE SELECTOR CURVES

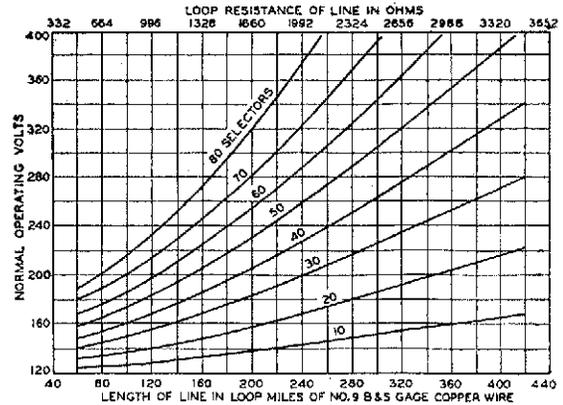


Fig. 25
Voltage-Line Selector Curves
for No. 162 type Selector Set

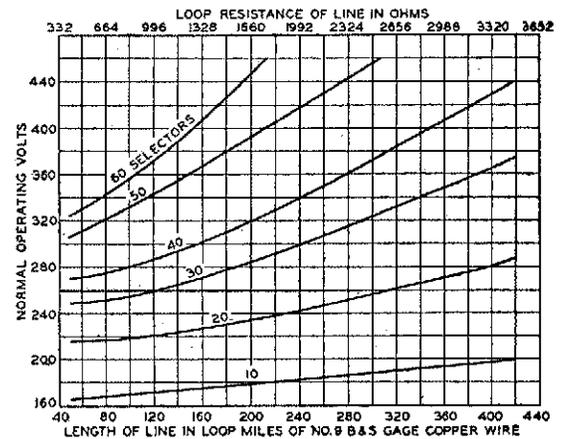


Fig. 26
Curves for No. 162 type Selector Sets
Operated through a No. 341A
Transformer

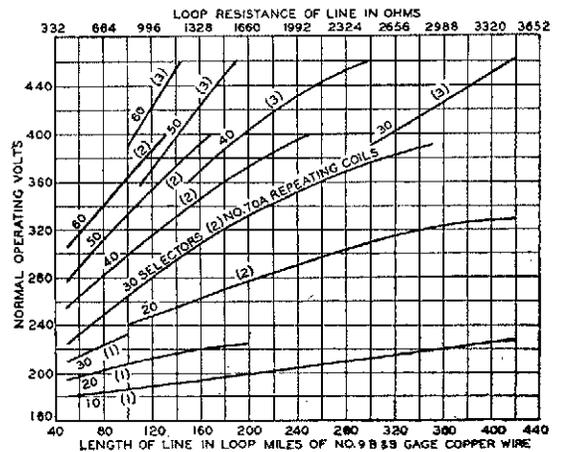


Fig. 27
Voltage-Line Selector Curves for No. 162
type Selector Sets Operated through
No. 70A Repeating Coils

LOCAL BATTERY

The local battery at the dispatcher's station furnishes current for operating the Nos. 61A and 221JB Relays. Dry cells or sufficient storage cells to give a voltage of 12 or 24 volts should be used. In no case should the voltage of this battery be allowed to decrease by more than one-third. A suitable rectifier may also be employed.

WAY STATION BATTERY

The way station battery furnishes current for operating the No. 7CW Bell. It may consist of primary or secondary cells. The voltage of this battery should be from 3 to 5 volts. The transmitter battery of the way station telephone sets may be used as a common battery for the telephone transmitter and for the bell of one or two selector sets.

Operation of selector circuits through transformers and repeating coils

In many cases it is of advantage to operate train and message circuits with No. 60 type Selectors through transformers or repeating coils to:

- (1) Obtain a low resistance in the simplex telegraph leg;
- (2) Operate two or more simplex selector circuits from the common battery supply;
- (3) Operate one or more branch selector circuits from the main selector circuit without any metallic connection to it;
- (4) Allow two selector circuits to be used as side circuits for obtaining a composite or simplex phantom with the physical and phantom telephone and the telegraph circuits terminated at the same or different points.

NO. 341A TRANSFORMER

The No. 341A Transformer has a shell type silicon steel core clamped between angle iron brackets which also provide a mounting for the transformer and for the terminal connecting block. The transformer is approximately 6" long x 5½" wide x 5¾" deep, and weighs approximately 20 pounds. It has four windings brought out to separate terminals. The primary windings (1-2 and 5-6) each have a resistance of approximately 90 ohms and the two secondary windings each have a resistance of approximately 175 ohms. The primary windings and the secondary windings are each balanced from a resistance, inductance and capacity standpoint to within 200 crosstalk units

to permit the coil to be used on simplex telephone circuits arranged for duplex telegraph without interference from the telegraph on the side or phantom telephone circuits.

The transformer is especially designed for use only at the dispatcher's or sending station to transmit the low-frequency (3½ cycles) selector impulses on long lines with a large number of selectors. The impedance at 1,000 cycles of the two secondary windings connected in series aiding is approximately 6,000 ohms and of the two primary windings in series aiding is approximately 12,000 ohms. The loss of bridging the transformer on a line as a simplex bridge is, therefore, very small.

The loss in telephone transmission due to inserting a No. 341A Transformer in the center of a long line of No. 9 B. & S. gauge non-loaded open copper wire is approximately 5 decibels. Accordingly, this coil is intended for use at the dispatcher's station where it is not required to transmit voice frequencies.

NO. 70A REPEATING COIL

The No. 70A Repeating Coil is a toroidal type coil mounted on a wood base. The complete coil is approximately 8½" wide x 11" deep x 5" high, and weighs approximately 26 pounds.

The coil has four windings brought out to separate terminals. The two secondary windings (3-4 and 7-8) each have a resistance of approximately 40 ohms, and the two primary windings (1-2 and

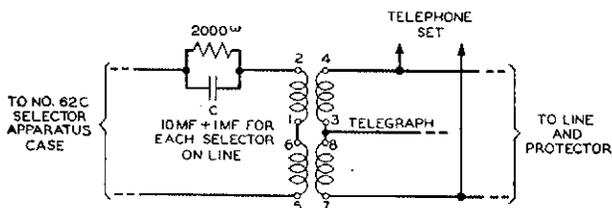


Fig. 28. Schematic of the Selector Circuit Operated through No. 341A Transformer

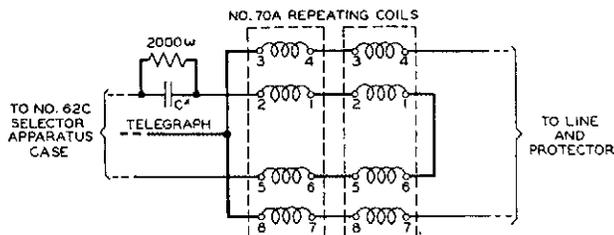


Fig. 29. Schematic of the Selector Circuit Operated through Two No. 70A Repeating Coils in Series Aiding

5-6) each have a resistance of approximately 45 ohms. The primary windings and the secondary windings are balanced from a resistance, inductance and capacity standpoint to within 200 cross-talk units to permit the coil to be used on simplex telephone circuits arranged for duplex telegraph without interference from the telegraph.

The No. 70A Repeating Coil is designed for operation at frequencies ranging from the low-frequency selector impulses through the voice frequency telephone band. The loss in telephone transmission, due to inserting a No. 70A Repeating Coil between two 1,000-ohm impedance lines of No. 9 B. & S. gauge copper non-loaded open wire, is approximately 3/4 db. The impedance at 1,000 cycles of either the two primary or the two secondary windings of the coil connected in series aiding is approximately 8,000 ohms. The loss in telephone transmission caused by employing it on a line as a simplex bridge is small.

When the entire selector circuit is to be operated through a transformer, the No. 341A Transformer should be employed to couple the selector apparatus case to the line. The connections should be as shown in Figure 28. The telephone set should be connected to the line side of the transformer as indicated in Figure 28. The location of the protection as shown on this drawing should be noted. In any case the telephone set should not be connected in the primary side of the transformers associated with the dispatcher's selector calling equipment. If the circuit requires the location of the dispatcher at an intermediate point and a simplex telegraph drop is necessary, two No. 341A Transformers will be required as shown in Figure 30. In this case the transformers should be con-

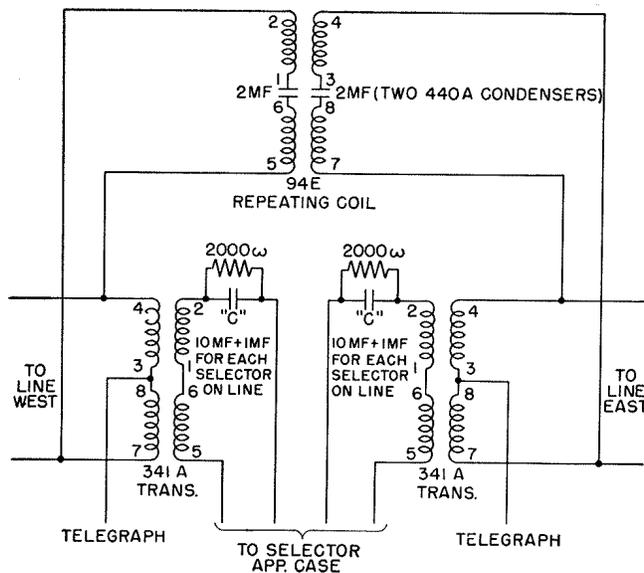


Fig. 30. Two No. 341A Transformers at Dispatcher's Station Arranged for Simplex Telegraph and Voice Frequency By-pass

nected to the east and west terminals of the selector apparatus case. This figure shows the connections of a voice frequency by-pass circuit employing a No. 94E Repeating Coil and associated 2 mfd. condensers.

The capacity of the condenser shown at "C", Figure 30, should not be less than 10 mf plus 1 mf for each selector on the circuit. A resistance of 2000 ohms, having a rating of about 125 watts, should be connected in parallel with the condensers to prevent oscillatory discharges of the condensers from interfering with the operation of the selector.

A No. 160B Condenser, Figure 31, has been especially designed for use for the condenser at "C", Figure 33.

The No. 160B Condenser is a black metal box approximately 7 1/2" long x 6" wide x 5" deep, equipped with 16 No. 440F Condensers connected in parallel giving a normal capacity of 20 mf. As many of these condenser units connected in parallel should be used as required to give the total capacity required at "C", Figures 28, 29, 30, 33 and 34.



Fig. 31. No. 160B Condenser

INTERMEDIATE SIMPLEX TELEGRAPH STATION

When an intermediate simplex telegraph station is required, the No. 70A Repeating Coil may be connected in the line circuit as shown in Figure 32, and the main selector line at the dispatcher's station should be operated through a No. 341A Transformer as shown in Figure 28. If the voltage at the intermediate point exceeds 220 volts, two or more 70A Repeating Coils should be used.

BRANCH LINE

When a branch circuit is required without any metallic connection to the main line and when the main line is not operated through a transformer, it should be connected as shown in Figure 33. The capacity of the condenser at "C" should be not

Fig. 32. Intermediate Simplex Telegraph Station

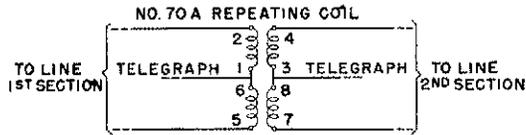


Fig. 33. Branch Line Operated through Repeating Coil

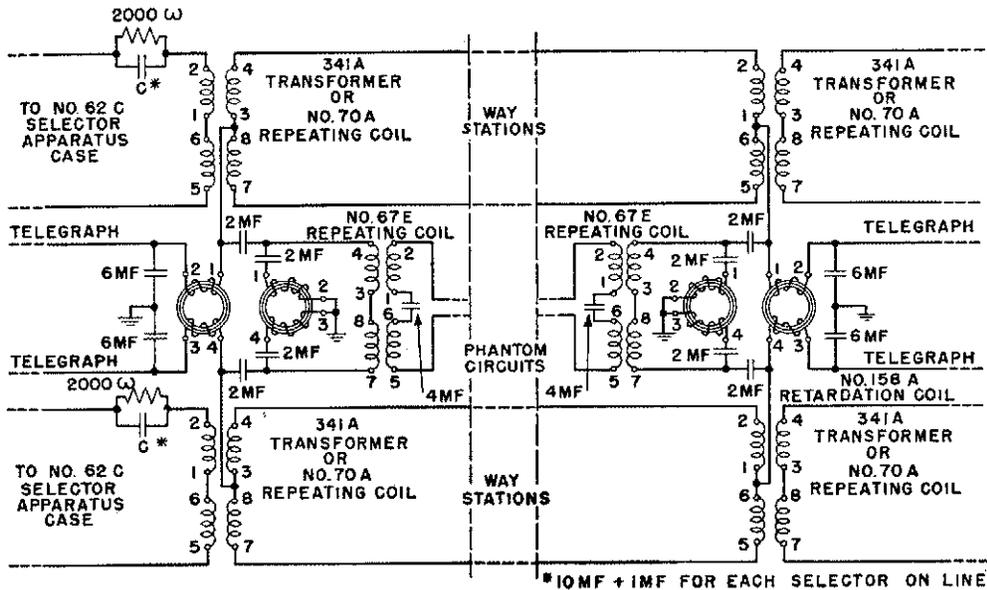
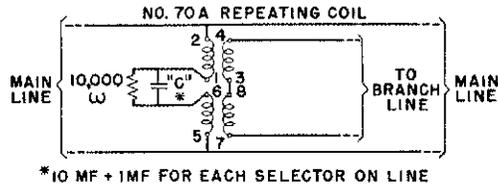


Fig. 34. Composite Phantom Circuit

less than 10 mf plus 1 mf for each selector on the branch line. It should be noted that for a branch line, the condenser is shunted by a 10,000 ohm resistance instead of the 2000 ohm resistance used at the dispatcher station. When the main line is operated through a transformer as shown in Figure 29, the primary of the 70A Repeating Coil should be connected directly to the main line without any condensers or resistances in series.

If the selector voltage at the branch point exceeds 220 volts, two or more 70A Repeating Coils should be used.

SIMPLEX BRIDGE

For a simplex bridge at the far end of a train or message line operated through a transformer, a No. 70A Repeating Coil should be connected as shown at the far end of each side circuit. Note composite phantom circuit, Figure 34.

When the selector circuit is not operated through a transformer at the dispatcher's station, a 1000 to 2000 ohm resistance should be connected between each side of the simplex coil and the line wires at both the near and far end of the line. The wattage rating of this resistance will depend upon the selector voltage employed.

COMPOSITE PHANTOM

A general arrangement for using a train and message line for side circuits of a composite phantom, to give two simplex telegraph circuits and a through telephone circuit in addition to the two selector circuits is shown in Figure 34.

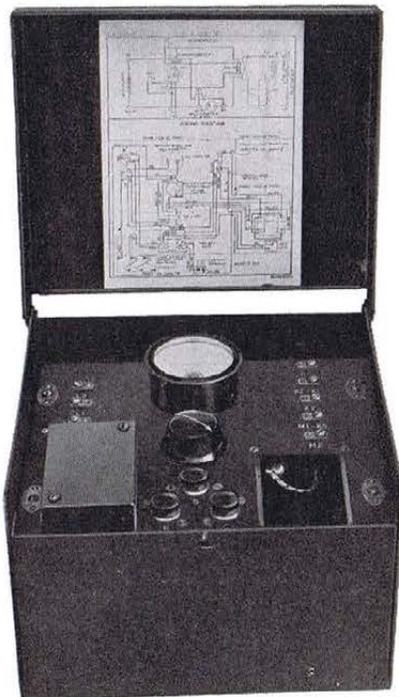


Fig. 35. No. 60B Test Set

No. 60B test set

The No. 60B Test Set, Figure 35 is a small portable set suitable for testing selectors or selector sets for their electrical operation. The set consists of a relay for reversing the current through the selector, a potentiometer for varying the current through the selector, three small keys to give test conditions, a meter and a condenser, all mounted on a removable panel in a black finished sheet steel box 8 1/8" long, 7 1/4" wide, and 5 3/4" deep. The box is equipped with a carrying handle.

It contains a fibre panel on which are mounted the following:

- 1 Weston No. 506 Milliammeter.
- 1 Polynet Type VC 1946 Wire Wound Volume Control.
- 3 No. 92 type Keys.
- 1 No. R323 Relay.
- 1 No. 440F Condenser.
- 8 Terminal Punchings.

The panel is arranged to mount a No. 60 type Selector Key for operating the selector under test and there is space in the bottom of the box for mounting three No. 768 Eveready batteries to be connected in series and to the B1 and B2 terminals. These batteries must be ordered separately. The complete set including batteries weighs 14 pounds.

The schematic circuit of the No. 60B Test Set is shown in Figure 36.

Other test sets for various purposes can be furnished, depending upon the requirements; see page 155.

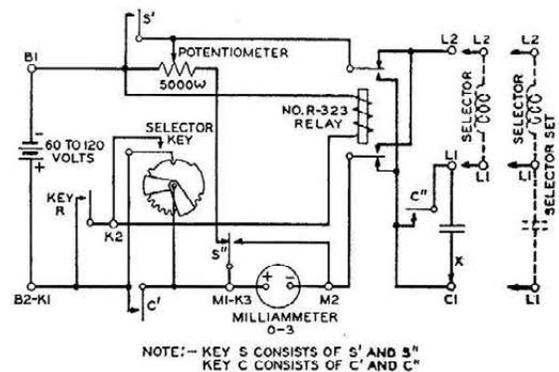


Fig. 36. Schematic of No. 60B Test Set

COMPONENTS AND ACCESSORIES

	<i>Page</i>		<i>Page</i>
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Bells	37	Jack Boxes	87
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Blocks, Protector	39	Keys	89
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NOTE: A complete index can be found on page 170.

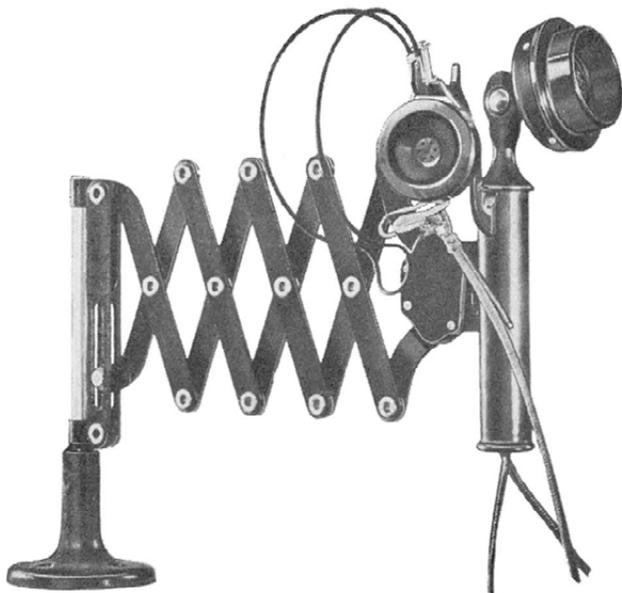
Arms, transmitter

The Nos. 1248D and 1348D Transmitter Arms are intended for use at way stations and consist of assemblies including transmitters, receivers and cords, mounted on the No. 48D Transmitter Arm. The No. 48D Transmitter Arm is a folding gate type arm arranged for use with the Nos. 2A, 2B and 2C Transmitter Arm Brackets.

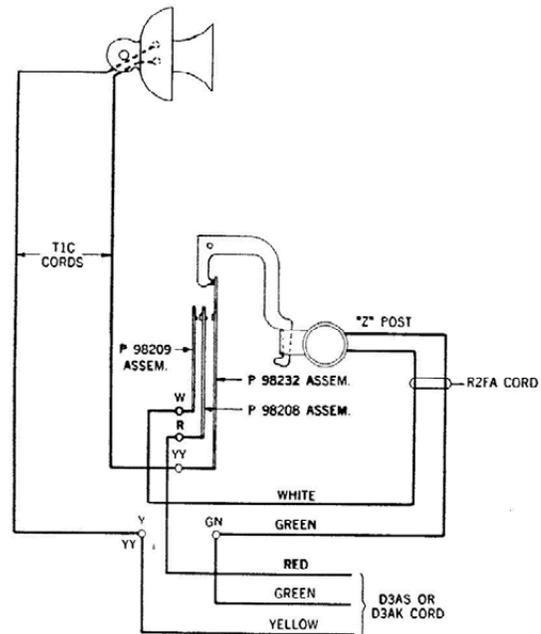
The No. 1248D Transmitter Arm is equipped with the No. 716C Receiver including the No. HA4 Receiver Unit having an impedance of 2000 ohms at 800 cycles and a d-c resistance of 275 ohms. This transmitter arm is intended for use

with the 295 type Subscriber Sets and in combination with either the Nos. 2A, 2B or 2C Transmitter Arm Bracket, replaces the Nos. 1048DA, DB or DC Transmitter Arms. The transmitter arm brackets must be ordered separately.

The No. 1348D Transmitter Arm is equipped with the No. 716B Receiver including the No. HA2 Receiver Unit having an impedance of 257 ohms at 800 cycles and a d-c resistance of 57 ohms. This transmitter arm is intended for use with the No. 501 type Subscriber Sets and in combination with the Nos. 2A, 2B or 2C Transmitter Arm Brackets, replaces the Nos. 1148DA, DB or DC Transmitter Arms. The transmitter arm brackets must be ordered separately, see page 40.



No. 1248 Type Transmitter Arm
Mounted on No. 2C Transmitter Arm Bracket



Wiring Diagram Nos. 1248D and 1348D Transmitter Arms

1248D AND 1348D TRANSMITTER ARMS

Tr. Arms Code No.	Rec. No.	Head Band No.	Rec. Cord No.	Trans. No.	Trans. Cord No.	Trans. Arm Cord No.	Used With
1248D	716C	3B	R2FA	635B	2-T1C	D3AS	No. 295 type Sub. Set
1348D	716B	3B	R2FA	635B	2-T1C	D3AS	No. 501 type Sub. Set



Bells

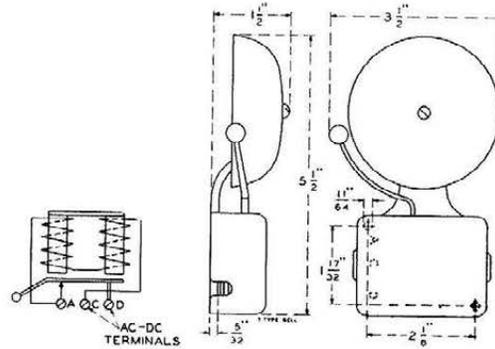
NO. 7 TYPE—A-C OR D-C OPERATION

The No. 7 type Bell consists essentially of two coils connected in series on a reed mounted armature and a clapper provided with a circuit interrupting member, and having a separate cantilever type retractile spring and three screw terminals. These are all mounted on a black finished base and enclosed by a black finished metal cover fastened to the base by spring clips. The base is provided with two holes for mounting purposes and has a projection on which a No. 26A 3-inch black finished gong is mounted.

Connections for either a-c or d-c operation should be made at the terminals marked "C" and "D". These bells are equipped with heavy silver contacts.

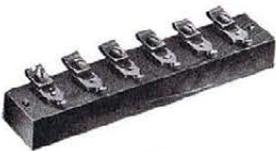


No. 7 Type Bell

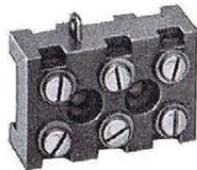


Bell Code No.	Total Approx. Resistance Ohms	Operating Voltage D-C		Operating Voltage 60 Cycles A-C	
		Min.	Max.	Min.	Max.
7AW	247.8	14	40	25	50
7CW	2.6	2	5	4	9
7DW	15.8	3	10	6	18
7EW	105	10	20	18	30
7FW	682	24	60	35	60

Blocks, connecting



No. 8A



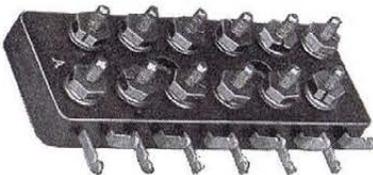
No. 12E



No. 42A-9
Cover off



No. 42A-9



No. 31A



No. 30A



No. 44A

Blocks, connecting (continued)

Connect. Bl. Code No.	No. of Connectors	Description	Size of Base (Inches)			Material (Base)
			Length	Width	Thickness	
8A	6	One screw and cord tip terminal on each connector.	5	1	5/8	Ebonized wood
11A (a) 11B (b) 11C	2 2 2	{ Two screw terminals on each connector. Opposite terminals are electrically connected.	1 5/8	1 5/8	7/8	Composition
12E (c) 12F	3 3	{ Two screw terminals on each connector. Has 3 slots in under-side of base. Opposite terminals are electrically connected. Replace Nos. 12C and D, respectively.	1 1/2	1 3/8	1 1/8	Composition
18A	15	{ Adapted to mount on mounting plates of No. 823 or similar type and arranged to engage with the guide posts of the associated relay and hold the relay in position by spring tension. For use with 209A and 209FA Relays.	2 1/2	2 3/8	1 1/2	.....
18B	8	Same as 18A except for use with No. 215A and 209FB Relays.	2 1/2	2 3/8	1 1/2	.....
18F	10	Same as 18A except for use with No. 228A and 228B Relays.	2 1/2	2 3/8	1 1/2	.....
25B	5	{ Consists of a retaining spring for holding a No. 34 type dial mounting and a terminal strip having 5 terminals for making contact with transfer springs on the dial mounting. Provided with mounting screws. Part of the Nos. 6000D, E, F, G, H and J Dial Mountings.	3 1/4	3/4	1/8	.....
29A	2	{ Provided with two metal sleeves arranged at one end to be attached to a No. L4G, L4T or L4AP Cord, and at the other end to connect to two No. 29 Cord Tips by means of plug connections. For use on No. L4G, L4T or L4AP Cords to permit a chief operator to plug in with a supervisor by the use of a receiver and a No. R2DM Cord.	1	1 1/2	1/2	Composition
30A 30B (d) 30C (e) 30D	12 22 32 52	{ Binding posts have lock nuts, with posts spun over to prevent loss of lock nuts. Intended for use with No. 102 type Adapters in No. "GA", "GB" and "GC" type Cable Terminal Boxes.	4 1/8 7 7/8 10 7/8 16 1/2	1 1/2 1 1/2 1 1/2 1 1/2	1/2 1/2 1/2 1/2	Composition Composition Composition Composition
31A 31B (d) 31C (e) 31D	12 22 32 52	{ Each connector has one lock nut binding post and one soldering terminal, brought out on the side. Intended for use with No. 102 type Adapters in No. "GA", "GB" and "GC" type Cable Terminal Boxes.	4 1/8 7 7/8 10 7/8 16 1/2	1 1/2 1 1/2 1 1/2 1 1/2	1/2 1/2 1/2 1/2	Composition Composition Composition Composition
35A	16	{ For grouping together the cord circuits of adjacent positions in No. 511 PBX Switchboard. Consists of a "B1" type Key Base and mounting stud assembly. Arranged for mounting in a universal type keyshelf with "B" type keys and "B" type key spaces. Consists of 8 pairs of terminals.	4 1/8	1 1/2		



Connect. Bl. Code No.	No. of Connectors	Description	Size of Base (Inches)			Material (Base)
			Length	Width	Thickness	
42A-4	4	For use with combined handset mountings for fastening the handset mounting cord and the inside wire. Has a removable metal cover. Color, ivory.	1 $\frac{1}{8}$	1 $\frac{1}{8}$	$\frac{3}{8}$	Plastic
42A-9	4		Same as 42A-4 except color, brown.	1 $\frac{1}{8}$	1 $\frac{1}{8}$	$\frac{3}{8}$	Plastic
44A	10	For use with telephone sets in installations having special wiring plans and for other installations needing more terminals than the four available in the No. 42 type above. Arranged for No. 101 type Covers.	3 $\frac{5}{8}$	1 $\frac{3}{4}$	$\frac{3}{8}$	Plastic
1044A-4	10		Same as No. 44A except includes a No. 101A-4 Cover. Color, ivory.	.....	.....	....	Plastic
1044A-9	10	Same as No. 1044A-4 except equipped with No. 101A-9 Cover. Color, brown.	.....	.....	....	Plastic

- (a) The No. 11B consists of a No. 11A equipped with a black finished metal cover.
 (b) The No. 11C is the same as No. 11B except that the under-surface of the top of the cover is provided with an insulating strip to protect the terminals from short circuits.
 (c) The No. 12F consists of a No. 12E equipped with a black finished metal cover.
 (d) Used with No. 15H Fanning Strip.
 (e) Used with No. 15B Fanning Strip.

Blocks, protector

The following Protector Blocks are made to rigid specifications and when used together without a separator (protector mica), form an open space cut-out which will afford the highest grade of protection against high potentials due to lightning. They thus provide better telephone service with fewer interruptions of operation and reduce maintenance costs.

The No. 26 Protector Block is a solid piece of hard non-dusting carbon. The face of the block is especially ground to present a smooth surface. The No. 26 Protector Block is mounted on the ground side of the protector mounting.

The No. 27 Protector Block consists of a porcelain frame with a countersunk hard carbon plug which is fastened in place with low temperature fusing cement. The surface of the frame which bears against the No. 26 Block, when assembled in a mounting, is finished by grinding. The air gap between the carbon insert in the No. 27 Block and the face of the No. 26 Block is held to close limits by this grinding process and the consistent operation of the cut-outs at the proper voltage is thereby insured.

Ordinary lightning discharges will cause an arc across the air gap between the carbon blocks but will not heat them sufficiently to melt the cement used for holding the carbon plug in place. A cross with an electric light or power line, however, will cause a discharge or repeated discharges of such

duration that the heating of the carbon insert of the No. 27 Blocks will melt the cement holding it in place and allow the mounting spring to push it into direct contact with the No. 26 Block, thus permanently grounding the line.

The Nos. 26 and 27 Protector Blocks are interchangeable with the old combinations of Nos. 1 and 2 Protector Blocks and No. 3 Protector Mica both at subscribers' stations and central offices, and are therefore available for improving protective equipment already in service. This practice will result in fewer visits of the trouble man. All orders for replacements of Nos. 1 and 2 Protector Blocks and No. 3 Protector Micas should specify the Nos. 26 and 27 Protector Blocks; no separator (protector mica) is needed for these protector blocks.

The Nos. 28 and 29 Protector Blocks are similar in construction to the Nos. 26 and 27 except that they are arranged for use in central office protectors with $\frac{3}{8}$ inch centers instead of $\frac{1}{2}$ inch.

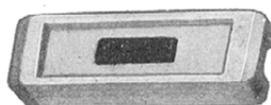
In addition to the above replacements, tests on cable protection have shown that Nos. 26 and 30 Protector Blocks require less attention and replacement due to grounded blocks than the Nos. 19 and 20 Blocks with the regulation .010-inch mica separators; therefore, the Nos. 26 and 30 Protector Blocks can be used advantageously wherever metal (Nos. 19 and 20) blocks were formerly used.

Blocks, protector (continued)

Pr. Bl. Code No.	Description	Color	Used with Protectors
26	Carbon block	.....	Nos. 12AP, 58AP, 60AP, 76AP, 98A, 98B, 1079AP, 1268A and 1269A. No. 83A Protector Mounting.
27	Porcelain frame with carbon insert	White	Same as No. 26, except No. 83A Protector Mounting.
28	Carbon block	.....	With No. 29 Protector Blocks.
29	Porcelain frame with carbon insert	White	In central office protectors on $\frac{3}{8}$ " centers.
30	Porcelain frame with carbon insert	Blue	No. 98B and No. 83A Protector Mounting.



No. 26
Protector Block



No. 27
Protector Block



Nos. 26 and 27
Protector Blocks

Boxes, battery



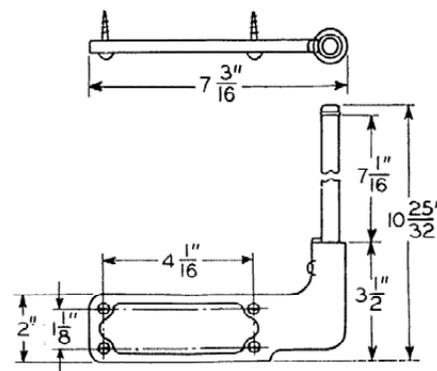
No. 1A Battery Box

Batt. Box Code No.	Dry Cell Capacity	Dimensions, Inches
1A	3 No. 6 Cells	$3\frac{1}{4} \times 7\frac{1}{8} \times 9\frac{7}{8}$
2A	4 No. 6 Cells	$3\frac{3}{8} \times 7\frac{3}{8} \times 12\frac{1}{8}$
2B	9 No. 6 Cells	$5\frac{1}{8} \times 7\frac{5}{8} \times 14\frac{3}{8}$

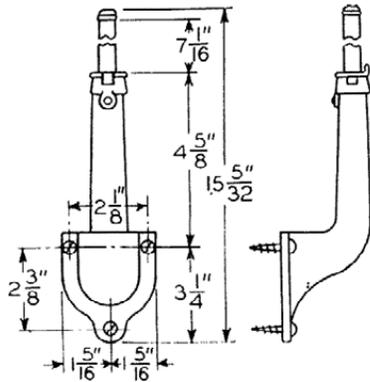
The Nos. 1 and 2 type Battery Boxes provide a neat and convenient means of mounting dry cells and protecting them from injury. These boxes are made of sheet metal with black finish. The No. 1A Battery Box is furnished with a lining of insulating paint and the Nos. 2A and 2B Battery Boxes are furnished with a lining of insulating material. Pear shaped mounting slots in the back of the

boxes provide an easy means of mounting on vertical surfaces and in such a way that they are readily removable. This feature permits of their being located at the sides or under desks and in other places where they will be out of the way yet adjacent to the telephone or other apparatus to which they are connected and accessible for maintenance purposes.

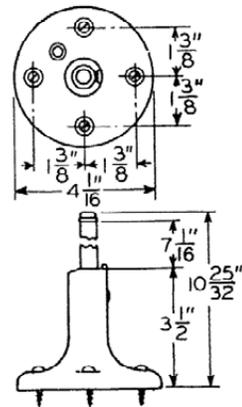
Brackets, transmitter arm



2A Transmitter Arm Bracket



2B Transmitter Arm Bracket



2C Transmitter Arm Bracket

The No. 2A Transmitter Arm Bracket mounts on the side of a desk and consists of an iron base equipped with a steel rod about which the arm rotates. The transmitter arm may be rotated 360°.

The No. 2B Transmitter Arm Bracket mounts on the side of a desk or on the wall and is similar to the No. 2A Transmitter Arm Bracket except that it is equipped with a collar assembled on the rod for the purpose of stopping the rotation of the transmitter arm at any one of four predetermined positions, 90° apart.

The No. 2C Transmitter Arm Bracket mounts on the top of a desk and provides for 360° rotation of the transmitter arm.

Breaker, circuit

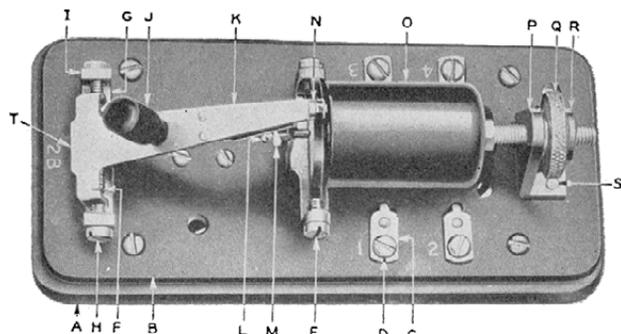
The No. 2B Circuit Breaker used in the dispatcher's selective calling equipment is to open the main current supply lead if an excessive amount of current flows from the main battery, such as is caused by a short on the line or in any part of the sending circuit. The resistance of the

Replacement Parts for No. 2B Circuit Breaker

Letter	Subject	2B Circuit Breaker
A	Sub-base	P-95346
B	Base	P-227865
C	Binding Post	P-229128
D	Screw	P-228895
E	Trunnion Screw	P-95320
F	Helical Spring	P-95336
G	Screw	P-95337
H	Pivot Screw	P-95335
I	Trunnion Bracket	P-95334
J	Handle	P-132717
K	Arm	* P-227867
		P-95338
		P-95339
		P-95340
L	Adjusting Screw	P-95321
M	Adjusting Nut	P-95322
N	Armature	* P-95326
		P-95327
O	Coil	P-95316
P	Adjusting Bracket	P-95330
Q	Adjusting Nut	P-95333
R	Tension Bracket	P-95331
S	Bracket Screw	P-95332
T	Alarm Stud	P-227868
	Spring Pileup	
	Screw	P-139931
	Insulator	P-133451
	Clamping Plate	P-107040
	Bushing	P-13549
	Upper Contact Spring	P-166669
	Lower Contact Spring	P-148240

* To be assembled.

circuit breaker is 2 ohms and it is normally adjusted to operate on 0.6 ampere and to non-operate on 0.4 ampere. These values can be increased or decreased by adjusting the air gap between the armature and the magnet by means of a knurled nut at the extreme end of the magnet. The circuit breaker when operated closes a local contact



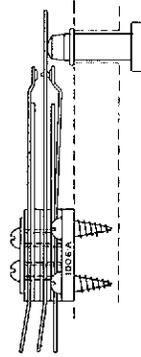
No. 2B Circuit Breaker

Breaker, circuit (continued)

C1-C2. Any local alarm circuit can be connected as desired to terminals C1-C2.

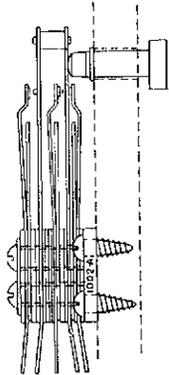
It consists of a coil, armature and circuit breaker arm mounted on a black phenol fibre base, the overall dimensions being approximately 3¾" x 6", and extending out from the wall approximately 4", when the arm is in the open or operating position. The best setting for the circuit breaker will depend somewhat on the local conditions for each installation.

The No. 2B Circuit Breaker is similar to the No. 2A Circuit Breaker formerly furnished except that it has a black phenol fibre base instead of a slate base, coin silver contacts instead of platinum contacts, and is equipped with alarm contacts.

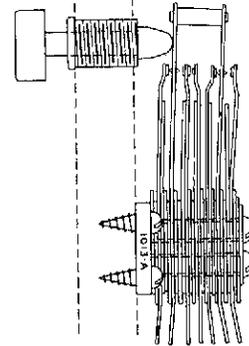


No. 1006A Push Button

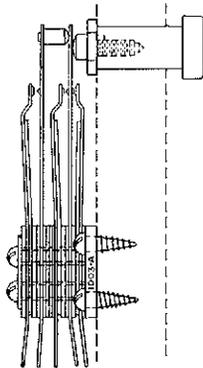
Button, push



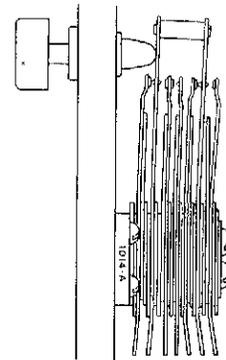
No. 1002A Push Button



No. 1013A Push Button



No. 1003A Push Button



No. 1014A Push Button

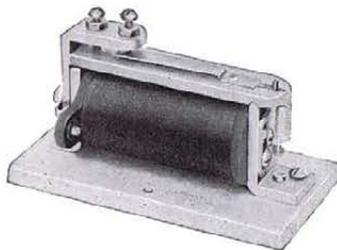


Button, push (continued)

<i>Push Button Code No.</i>	<i>Spring Combination</i>	<i>Buttons Furnished for Woodwork Thickness</i>	<i>Principal Use</i>
1002A	Five springs arranged for one break two make contacts.	$\frac{3}{16}$, $\frac{1}{2}$ or $\frac{1}{8}$ inch as specified.	Used in magneto telephones for central office signaling.
1003A	Breaks one and makes two contacts.	$\frac{3}{16}$, $\frac{1}{2}$, $\frac{1}{8}$ or $\frac{5}{8}$ inch as specified.	Nos. 1293AD, AE, AK, AL, 1317W, AD, AE, AW and 1336F Telephone Sets.
1006A	Breaks one and makes one contact.	$\frac{3}{16}$, $\frac{1}{2}$ or $\frac{1}{8}$ inch as specified.	No. 1317BA Telephone Set
1013A	One break before make and one break before two make contacts are operated.	$\frac{1}{8}$ inch.	No. 1317BU, DU, CW, CY, D-175004 and D-175005 Telephone Sets.
1014A	One set of break before make-make contacts and one set of break before make contacts.	$\frac{3}{8}$ inch.	No. 501A, E and D-175002 Subscriber Sets.

Buzzers

BUZZERS FOR ALTERNATING CURRENT



No. 4C, Cover Removed



No. 5A Buzzer

<i>Buzzer Code No.</i>	<i>Resistance Ohms</i>	<i>Type</i>	<i>Dimensions, Inches</i>	<i>Principal Use</i>
4B	1200	Not Polarized	$3\frac{1}{16}$ x $1\frac{1}{16}$ x $2\frac{1}{4}$	P.B.X. Switchboards. Operates on a-c ringing current of $16\frac{2}{3}$ cycles.
4C	1200	Not Polarized	$3\frac{3}{4}$ x $2\frac{1}{8}$ x $2\frac{1}{4}$	P.B.X. Switchboards. Operates on a-c ringing current of $16\frac{2}{3}$ cycles, also on 24 volts d-c. Has a dustproof cover.
5A	2150	Polarized	2 x $2\frac{1}{16}$ x $1\frac{1}{16}$	Operates on 90 volts. 375B Subscriber Set.

NO. 7 TYPE BUZZER



No. 7 Type, Open View



No. 7 Type, Closed View

Buzzers (continued)

The No. 7 type Buzzers are equipped with silver contacts and reed mounted armature with a flat retractile spring and stop. Black finished.

They are intended for either d-c or 50-60 cycle a-c operation. For a-c operation connections are made directly to the coils eliminating the make and break contact and thus the need for contact maintenance. Will normally operate without re-adjustment on the voltage ranges listed below. The minimum effective resistance to d-c or impedance to 60 cycle a-c of these buzzers should be assumed to be approximately 3 times the nominal d-c resistance.

Buzzer Code No.	Approx. Resistance Ohms	Operating Voltage D-c		Operating Voltage 60 Cycles A-c	
		Min.	Max.	Min.	Max.
7AW	270.0	14	40	15	21
7BW	10.5	2	6	4	9
7CW	2.6	2	8	3	8
7DW	15.8	4	15	4	15
7EW	105.0	10	20	10	20
7FW	682.0	20	60	20	60

Dimensions overall, 2 1/8" x 1 3/8" x 1 1/8".

each and are used for connecting distant points or to bring circuits from open wire toll lines through cities. Toll entrance cables are suitable for bringing carrier and voice telephone circuits from open wire lines. Available in a variety of sizes and gauges.



2121 Pair No. 26 Gauge Exchange Area Unit Type Telephone Cable

Cable

The Western Electric Company manufactures a wide variety of Lead Covered Telephone Cables to meet the requirements imposed by the many ways in which it is used. Special cables can also be furnished to meet the specifications prepared by the Association of American Railroads and various customers.

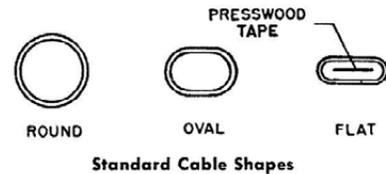
Cables are furnished with quadded or non-quadded conductors as described below or with a combination of quadded and non-quadded conductors and with a high or low dielectric breakdown. In non-quadded cable the conductors are insulated with either paper ribbon or paper pulp and stranded either in units or in concentric layers. Cables are also available with protective coverings such as tape, armored cable for underground or aerial use, jute protected, corrosion protected or wire armored for submarine use.

EXCHANGE CABLE (Lead Covered)

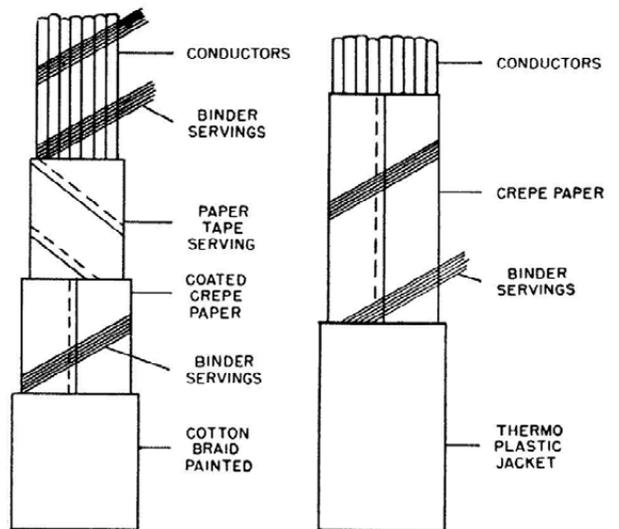
Non-quadded paper insulated local loop or exchange cables having conductors twisted in pairs. These cables are produced in 16 to 26 gauge and in sizes from 26 pairs to 2121 pairs, depending on the gauge of the conductor.

PAPER INSULATED TOLL AND TOLL ENTRANCE CABLES (Lead Covered)

These cables are paper insulated having the conductors arranged in quads of two twisted pairs



Standard Cable Shapes



Cable with Treated Crepe Paper and Cotton Braid

Cable with Plastic Cover

Type "CL" Switchboard Cable



TEXTILE INSULATED TERMINATING CABLE (Lead Covered)

Textile insulated cables are insulated with cotton and acetate yarn and are used to terminate paper insulated cables in buildings where sealed chamber terminals are not required. Cables are furnished in 22 gauge from 6 to 606 pairs.

SWITCHBOARD CABLE

Western Electric "CL" type switchboard cable consists of copper conductors either tinned or tinned and enameled with two servings of cellulose acetate rayon yarn and one serving of cotton coated with cellulose acetate lacquer. The core of the cable is bound with a binder serving of cotton, a serving of paper tape, a moisture resistant treated paper tape over which is applied a close braiding of cotton. The completed cable is painted with a gray cable paint. Round cables are furnished with a covering of slate colored thermoplastic extruded over the paper tape in place of the treated paper and cotton braid. This cable is available in a variety of sizes of pairs of 22 and 24 gauge conductors and quads of 22 gauge.

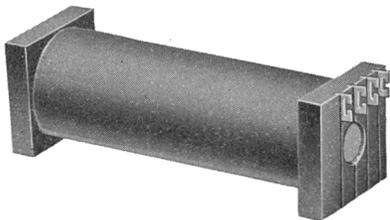
NO. 1450CL TYPE CABLE

This cable is recommended for use as interior cable at way stations. It consists of tinned enameled conductors covered with two reversed cellulose acetate rayon yarn servings and a cotton braid coated with cellulose acetate lacquer. The core is bound with a cotton binder. It is then covered with an overlapping longitudinal layer of crepe paper and a slate colored thermoplastic jacket.

Cable Code No.	No. of Conductors	AW Gauge	Approx. Diameter Inches
1450CL	6	20	.28
1451CL	12	20	.37
1452CL	16	20	.43
1453CL	22	20	.47

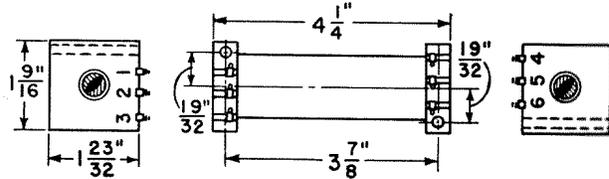
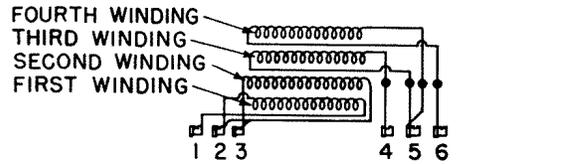
In view of the large number of types and sizes of cables which can be furnished, it is not practical to list them all in this catalog. Further information may be obtained from the nearest distributor.

Coils, induction



No. 5 Induction Coil

Induct. Coil Code No.	Description	Resistance	
		Winding	Ohms
5	For use in Nos. 1312 and 1314 Type Telephone Sets and the No. 311A Subscriber Set. Dimensions 4 3/8" x 1 9/16" x 1 9/16".	(P-P) (S-S)	0.42 162.0



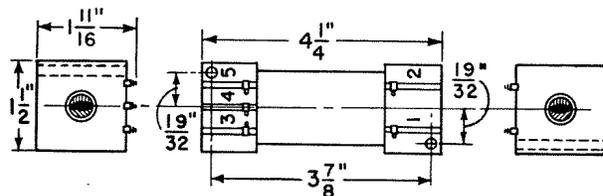
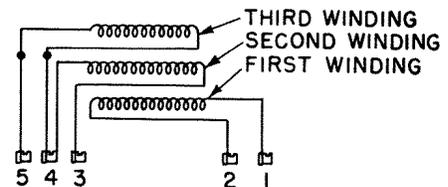
No. 42B Induction Coil

Induct. Coil Code No.	Description	Resistance	
		Winding	Ohms
42B	Same as D-159716 and replaces No. 42 and D-159716 Induction Coils. For use in Nos. 501A, B, E, F, D-175002 and D-175003 Subscriber Sets and Nos. 1293BC, 1317BU, DU, CW, CY, D-157004 and D-157005 Telephone Sets.	(1-2)	0.41
		(2-3)	7.5
		(4-5)	31.0
		(5-6)	290.0

The table below indicates the Way Station filter arrangements required when sets with the No. 42B Induction Coil are bridged across a line having a superimposed carrier system:

Carrier System Superimposed	Filter
Type C	No. 129A
Type C (Booth Telephones used infrequently)*	None*
Type H	No. 87A
Interchangeable Types C and H	No. 87A

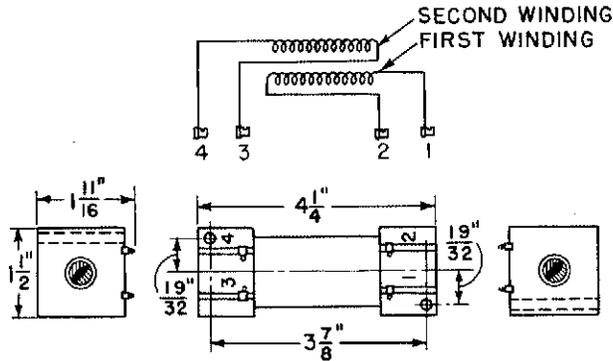
* For booth telephones, where one set at a time is in use and set when idle is disconnected from the line.



No. 43 Induction Coil

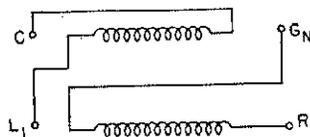
Coils, induction (continued)

Induct. Coil Code No.	Description	Resistance	
		Winding	Ohms
43	For use in transmitter circuit of No. 502A Subscriber Set.	(1-2)	0.6
		(3-4)	18.1
		(4-5)	900.0



No. 44 Induction Coil

Induct. Coil Code No.	Description	Resistance	
		Winding	Ohms
44	For use in receiver circuit of No. 502A Subscriber Set.	(1-2)	5.5
		(3-4)	26.0
		(4-5)	163.0
76A	For use in No. 1528A Portable Telephone Set. For general design and dimensions see No. 42B.	(1-2)	3.1
		(2-3)	1.6
		(4-5)	163.0

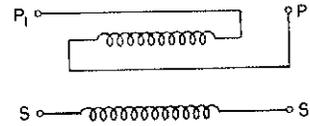


Winding Diagram, No. 77A Induction Coil

Induct. Coil Code No.	Description	Resistance	
		Winding	Ohms
77A	The 77A Induction Coil is a closed core local battery coil for use in the No. 301A Portable Telephone Set. It is also recommended to replace the No. 29 or No. 32 Induction Coils in the following sets:	(L1-C)	143.0
		(GN-R)	2.8
		(GN-C)	19.0

- 295AK Subscriber Set
- 1317W Telephone Set
- 1317AD Telephone Set
- 1317AE Telephone Set
- 1317AW Telephone Set
- 1336F Telephone Set
- 1293AD Telephone Set
- 1293AE Telephone Set
- 1293AK Telephone Set
- 1293AL Telephone Set

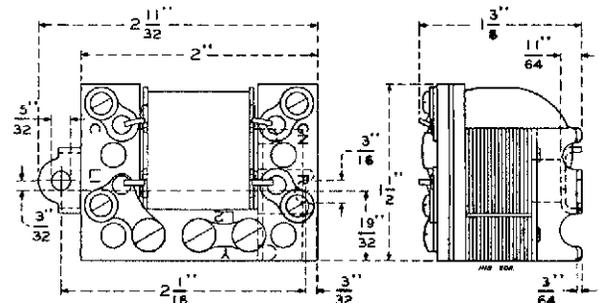
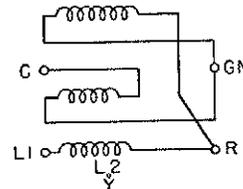
See note ** below relative to installation. For general design and dimensions see No. 101A.



Winding Diagram, No. 77C Induction Coil

Induct. Coil Code No.	Description	Resistance	
		Winding	Ohms
77C	The 77C Induction Coil is a closed core local battery side tone coil for use in subscriber and telephone sets. The 77C Induction Coil is recommended as a replacement for the Nos. 13, 29, 31 or 32 Induction Coils in the following sets:	(P-P1)	2.3
		(S-S1)	9.4
295AJ	Subscriber Set	1336E	Telephone Set
1330A	Telephone Set	1526B	Telephone Set
1330E	Telephone Set	1317N, P, R, S, AH, BA,	
1330F	Telephone Set	CG, CH, CN, CP, CR,	
1331E	Telephone Set	and CS	Telephone Sets
1331F	Telephone Set	1305AC	Telephone Set
1332A	Telephone Set	1017C	Test Set
1332E	Telephone Set	1017E	Test Set

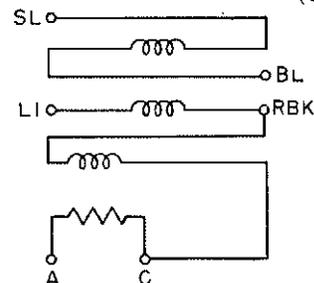
See note ** below relative to installation. For general design and dimensions see No. 101A.



No. 101A Induction Coil

Also General Design and Dimensions of 77A and 77C Induction Coils

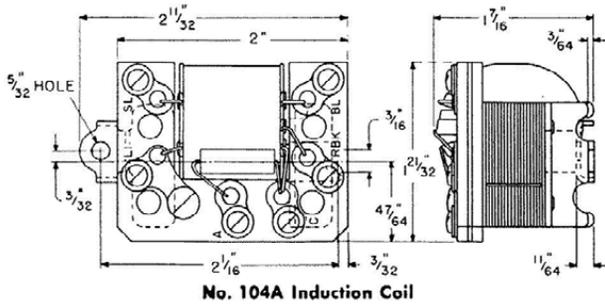
Induct. Coil Code No.	Description	Resistance	
		Winding	Ohms
101A	For use in common battery anti-side tone Subscriber Sets.	(L1-R)	22.0
		(GN-R)	75.0
		(GN-C)	19.0



104A Induction Coil Winding Diagram



Coils, induction (continued)

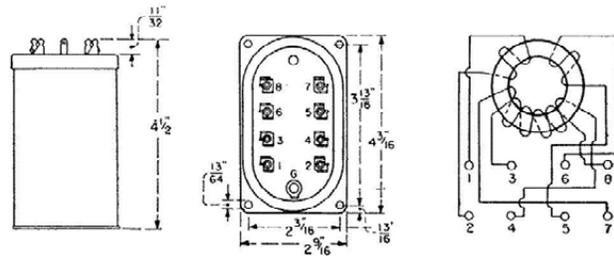


No. 104A Induction Coil

open core coils such as the 13, 29, 31, 32 and 113D Induction Coils, additional mounting holes will be required and, in some cases, minor modifications or special brackets may be necessary. The use of the P-236668 Mounting Plate will facilitate mounting the replacement coils, wherever space is available. This mounting plate has a lug and screw for securing the coil and holes for mounting. Additional holes, if required, may be readily drilled in the plate. Where the 77, 101 or 104 type Coil is mounted directly, one #6 x 1/2" and one #8 x 3/8" long R.H. wood screws, or one 3/8" long No. 6-32 and one 1/4" long No. 6-32 R.H. machine screws are required.

Induct. Coil Code No.	Description	Resistance	
		Winding	Ohms
104A	The 104A Induction Coil is a closed core local battery anti-side tone coil with choice of network resistances for the side tone balancing winding. For use in telephone set mountings and subscriber sets in connection with local battery talking-common battery signaling and magneto anti-side tone service. Used in 400K Subscriber Set. The 104A Induction Coil is recommended to replace the 113D Induction Coil in the 1417P Telephone Set. See note ** relative to installation.	(BL-SL)	2.3
		(L1-RBK)	9.4
		(RBK-C)	200.0
		(C-A)	300.00

Coils, repeating

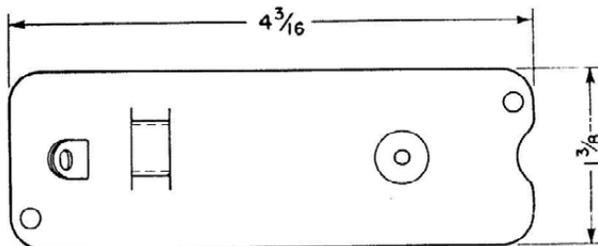


No. 67E Repeating Coil

** The winding terminal designations of the 77A and 77C Induction Coils are marked differently from the 13, 29, 31 and 32 Induction Coils for which the 77 type is the recommended replacement for maintenance purposes. The winding of the 77 type coil having the lower resistance should be wired in the same manner as the P-P (primary) winding of the coil they are used to replace and the higher resistance winding, as the S-S (secondary) winding.

For mounting information see Induction Coil Adapter Mounting Plate.

INDUCTION COIL ADAPTER MOUNTING PLATE



P-236668 Mounting Plate

While the 77 and 104 type Induction Coils may be mounted directly in most telephone and subscriber sets as replacements for the older style

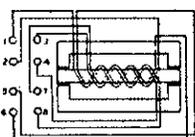
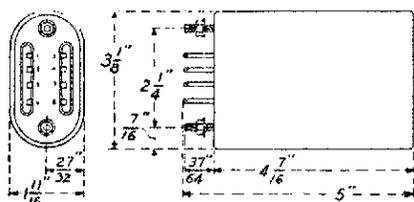


No. 70A Repeating Coil

The 67E is a toroidal type ring-through phantom terminating coil in a steel case for relay rack mounting.

The 70A is a large toroidal type coil in a steel case mounted on a wooden base. It is intended for transmitting selector pulses as well as voice, and is suitable for phantom terminating.

Coils, repeating (continued)



No. 94E Repeating Coil

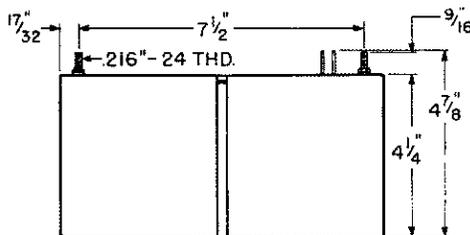
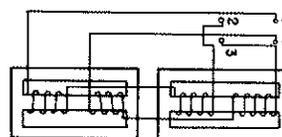
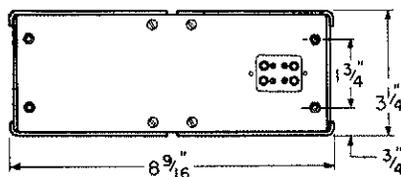
The 94E is a shell type coil in a metal case for panel mounting. It is intended for non-ring-through and battery supply use.

Repeat. Coil Code No.	No. of Wdgs.	Resistance, Ohms		Impedance Ratio	Dimensions of Mounting Surface, Inches
		Primary	Secondary		
67E	4	2 of 20	2 of 21	1:1	4 1/8 x 2 1/8 *
70A	4	2 of 45	2 of 40	1:1	8 5/8 x 1 1/2
94E	4	2 of 20	2 of 20	1:1	1 1/2 x 3 1/8

* The 67E Repeating Coil can be used in place of the 67C and 77A Repeating Coils.

Two 67E Repeating Coils can be used in place of the 76A Repeating Coil.

Coils, retardation



No. 158A Retardation Coil

Retard. Coil Code No.

Description

Use

158A

Potted in a sheet steel case, arranged for stud mounting. Core and windings are divided in two parts and the winding parts so interconnected as to obtain two independent inductive windings having substantially the same electrical characteristics and very low mutual coupling. Average d-c resistance of windings (1-2) and (3-4) is 73 ohms each. Effective inductance of windings (1-2) and (3-4) connected in parallel ranges between 1.345 and 1.555 henries.

Intended for use in place of Nos. 5AA and 77A Retardation Coils in stud mounted d-c Telegraph Composite Sets.

241F

A shell type with a silicon steel core potted in a rectangular metal case, arranged for stud mounting. Approximate d-c resistance windings (1-2) and (3-4) 24 ohms. Size approximately 4 1/2 x 3 3/4 x 3 3/4 inches.

Intended for use in Nos. 62B and C Selector Apparatus Cases. May be used as a replacement for the No. 158A Retardation Coil in the No. 60B Selector Apparatus Case if mounted by means of suitable adapter brackets.

257A

A toroidal type coil having a permalloy core enclosed in a metal case. D-c resistance windings (1-2) and (3-4) are approximately 2.5 ohms each. Closest recommended mounting centers are 1 3/4 x 3 1/2 inches. Size approximately 1 1/2 x 3 3/4 x 4 3/8 inches high including the terminals and studs.

Intended for use as a drainage coil for reducing lightning interference in open wire carrier telegraph systems.



Condensers

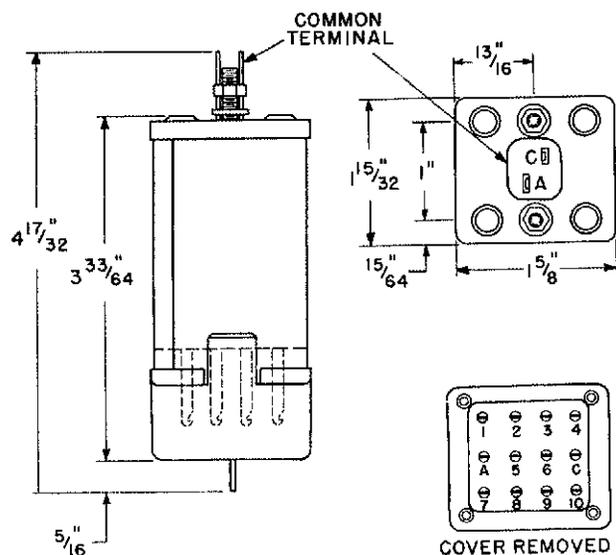
Western Electric telephone condensers are of the aluminum foil and paper type. The paper dielectric, aluminum foil and the impregnating compound are prepared under rigid specifications, and their high and uniform quality contributes materially to the excellence of the product obtained. These condensers include the following features:

1. *High Insulation Resistance:* The aluminum foil and paper units are very well dried and impregnated with a high grade wax compound, and the can in which the units are assembled is entirely filled with waterproofing compound and sealed, thus effectively preventing the entrance of moisture.
2. *High Dielectric Strength:* Each individual condenser is tested to the voltage given in the tables.
3. *Durable Terminals:* Bending and heating of the terminals, such as may occur in installing and wiring, will not loosen them or the connections between the terminals and the connecting strips which make contact with the foil electrodes.

NO. 187 TYPE CONDENSER

The No. 187 type Condensers consist of ten small paper units potted in a metal can having a metal cover. One side of each unit is connected to a common terminal, the other side being connected to one of ten terminals.

These condensers are arranged to mount on $1\frac{3}{4}$ inch horizontal and $1\frac{1}{2}$ inch vertical centers and are furnished with two nuts and washers for mounting. They are tested on 1000 volts a-c and



No. 187 Type Condenser

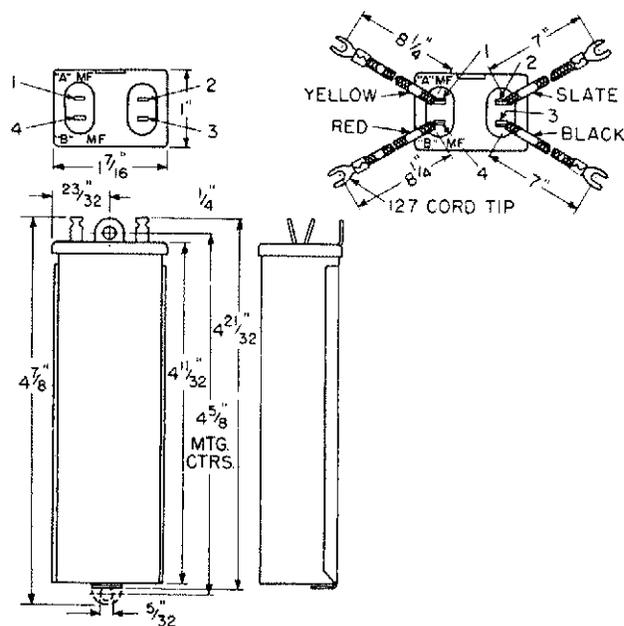
are suitable for use on continuously applied potentials not exceeding 300 volts d-c or a-c (60 cycles or less) and at operating temperatures not exceeding 120° F.

Con- denser Code No.	Capacity Obtainable	Capacity of Units in M.F.			
		Term. No.	Max.	Marked on Condenser	Min.
*187A	0 to .346 MF to within .00133 MF	1	.00266	.002	.00133
		2	.00266	.002	.00133
		3	.0048	.004	.0032
		4	.0084	.007	.0056
		5	.0141	.012	.0094
		6	.0235	.020	.0165
		7	.0400	.034	.0280
		8	.0882	.058	.0478
		9	.115	.100	.085
		10	.200	.174	.148
187B	0 to .069 MF to within .00066 MF	1	.00133	.001	.00066
		2	.00133	.001	.00066
		3	.00266	.002	.00133
		4	.00266	.002	.00133
		5	.0048	.004	.0032
		6	.0048	.004	.0032
		7	.0096	.008	.0064
		8	.0096	.008	.0064
		9	.0240	.020	.0168
		10	.0412	.035	.0288
†187C	0 to .00584 MF to within .000084 MF	1	.000166	.00012	.000084
		2	.000166	.00012	.000084
		3	.00033	.00025	.000166
		4	.00033	.00025	.000166
		5	.00066	.0005	.00033
		6	.00066	.0005	.00033
		7	.00133	.001	.00066
		8	.00133	.001	.00066
		9	.00266	.002	.00133
		10	.004	.003	.002

* Together with No. 25A Bracket replaces Nos. 57AK and 57E on equipments arranged for lug mounting.

† Together with No. 25B Bracket replaces No. 134A on equipments arranged for lug mounting.

NO. 194 TYPE CONDENSER



No. 194 Type Condenser

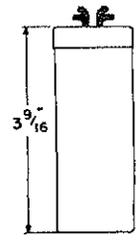
Condensers (continued)

The No. 194 type Condenser is a paper insulated condenser tested on 500 volts d-c. Suitable for use on continuously applied potentials not exceeding value specified in table, either d-c or a-c (60 cycles or less) and at operating temperatures not exceeding 120° F.

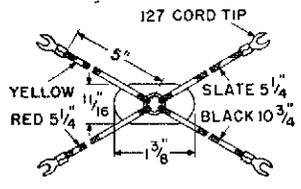
Condenser Code No.	Capacity (M.F.)		(*) Stamped		Max. Operating Voltage
	Max.	Min.	A	B	
194A	1.25	1.00	1.	—	180
	2.50	2.00	—	2	180
194B	.625	.5	.5	—	180
	2.50	2.00	—	2	180
(a) 194C	1.25	1.00	1.	—	180
	2.50	2.00	—	2	180
(b) (c) 194AB	1.25	1.00	1.	—	180
	2.50	2.00	—	2	(†)
(b) (c) 194BB	.625	.5	.5	—	180
	2.50	2.00	—	2	(†)
(b) (c) (d) 194DB	.625	.5	.5	—	180
	2.50	2.00	—	2	(†)

- (*) Values stamped at "A" are measured between terminals 1 and 2 and values stamped at "B" are measured between terminals 3 and 4.
- (†) 130 volts d-c or 100 volts effective a-c.
- (a) Same as No. 194A except equipped with flexible leads.
- (b) Tested at 300 volts d-c between terminals of the 2 M.F. unit.
- (c) Stamped with marking "L" on end opposite terminal and for identification purposes.
- (d) Same as No. 194BB except equipped with flexible leads.

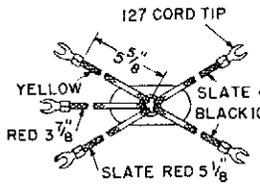
NO. 195 TYPE CONDENSER



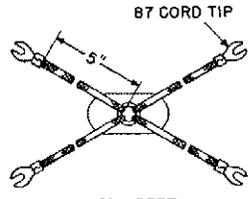
No. 195A, also general design and dimensions of No. 195 type Condensers



No. 195C



No. 195B



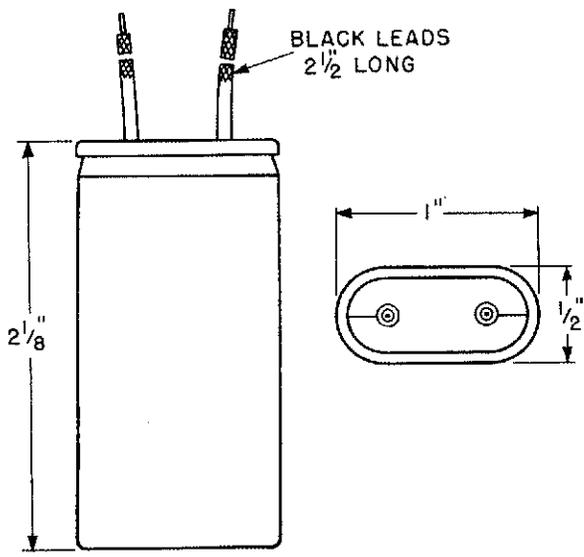
No. 195D

The No. 195 type Condenser is a paper condenser potted in wax in lead cans and designed for use in combined telephone sets.

Condenser Code No.	Capacity (M.F.)		Test Voltage (D-c)	Between Leads
	Max.	Min.		
195A	(a) 2.5	2.0	300	Red and Black
	(b) 0.63	0.5	500	Yellow and Slate
(c) 195B	(a) 2.5	2.0	300	Red and Black
	(b) 0.63	0.5	500	Yellow and Slate
195C	(a) 2.5	2.0	300	Red and Black
195D	(a) 2.5	2.0	300	Red and Black
	(b) 0.63	0.5	500	Yellow and Slate

- (a) Suitable for use on continuously applied potentials not exceeding 130 volts d-c or 100 volts a-c (60 cycles or less) and at operating temperatures not exceeding 120° F.
- (b) Suitable for use on continuously applied potentials not exceeding 200 volts d-c or 180 volts a-c (60 cycles or less) and at operating temperatures not exceeding 120° F.
- (c) The can on the 195B Condenser is provided with an insulating coating and the slate-red lead is connected to the can.

NO. 198 TYPE CONDENSER



No. 198A Condenser

The No. 198A Condenser is a paper condenser potted in wax in an aluminum can and tested on 500 volts d-c.

Capacity M.F.			Use
Max.	Min.		
0.625	0.500		In the No. 592AW Subscriber Set

The No. 198B Condenser is a wound paper condenser potted in a metal can and tested on 500 volts d-c.

Capacity M.F.			Use
Max.	Min.		
0.625	0.500		In the 531 Type Subscriber Set



NO. 226A CONDENSER

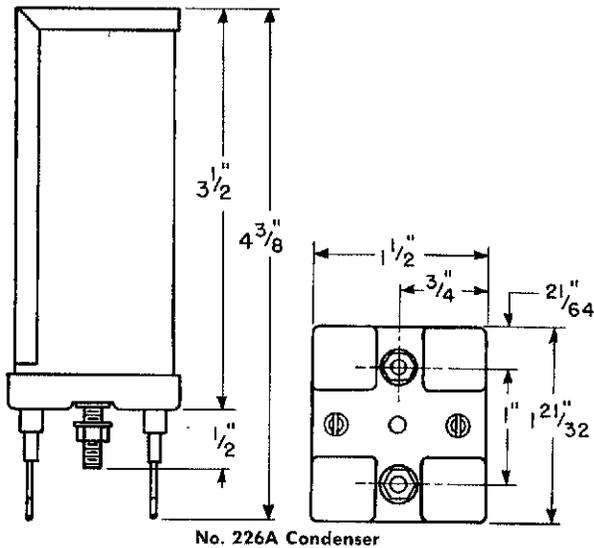
NO. 437 TYPE CONDENSER

NO. 437-449 TYPE CONDENSERS

As this information is being printed, the production of paper condensers is in the process of changing to make use of extruded aluminum cans with a corresponding change in codes. These condensers are described under Code Nos. 437, 439, 440, 441, 442, 447 and 449 types. The transition period may extend over several months during which time all condensers in this series may not be available. When orders are received for condensers which are not yet available, the Western Electric Co. will request permission to furnish condensers of the Nos. 137, 138, 139, 140, 141, 142, 147 and 149 type having corresponding electrical and mechanical characteristics.



NO. 226A CONDENSER



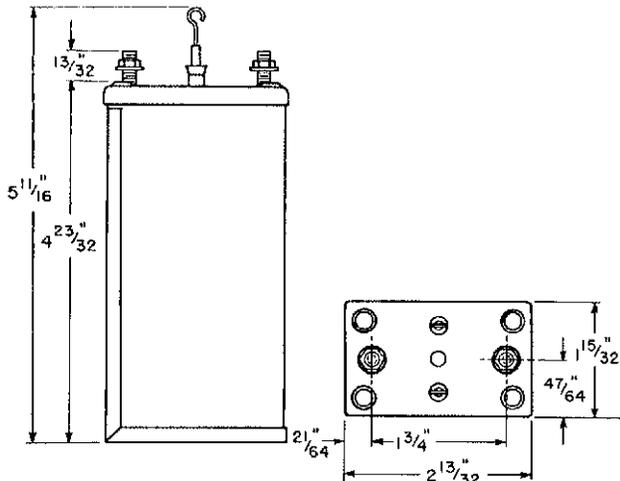
No. 226A Condenser

The No. 226A Condenser is a hermetically sealed paper condenser tested on 2000 volts d-c with working voltage rating of 600 volts d-c up to temperature of 150° F.

Capacity M.F.	
Max.	Min.
1.15	0.85

Closest recommended mounting centers are 1-9/16 inches by 1-23/32 inches.

NO. 267A CONDENSER



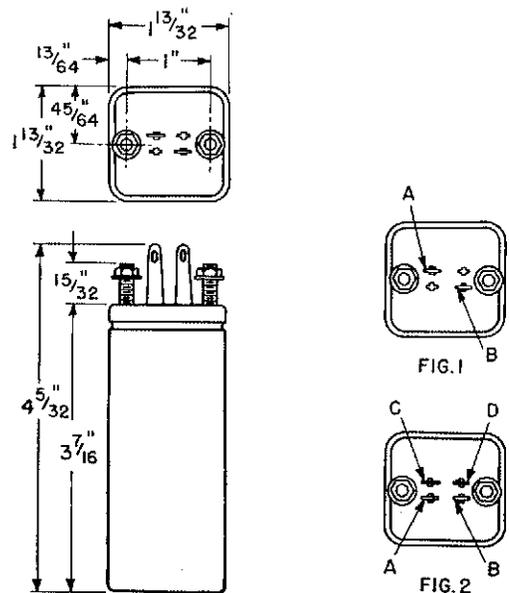
No. 267A Condenser

The No. 267A Condenser is a hermetically sealed paper condenser tested on 1800 volts d-c with working voltage rating of 600 volts d-c up to temperature of 150° F.

Capacity M.F.	
Max.	Min.
2.87	2.13

Closest recommended mounting centers are 1-17/32 inches by 2-15/32 inches.

NO. 437 TYPE CONDENSER



No. 437 type Condenser

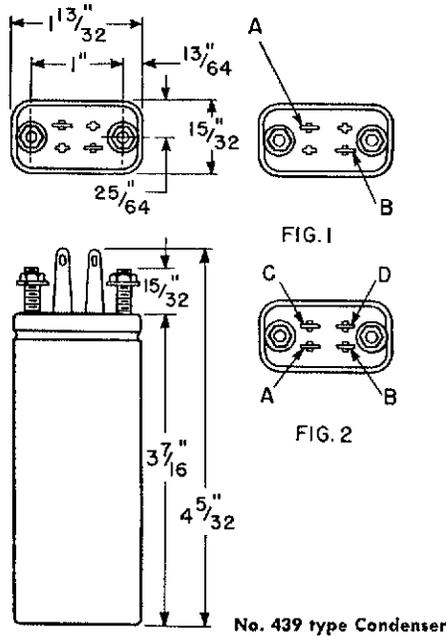
The No. 437 type Condensers are paper condensers potted in aluminum cans and tested on 500 volts d-c. Arranged to mount on $1\frac{1}{2}$ in. x $1\frac{1}{2}$ in. mounting centers. Suitable for use on continuously applied potentials not exceeding 200 volts d-c or 180 volts a-c (60 cycles or less) and at operating temperatures not exceeding 120° F. Require No. 24 type Brackets when mounted in place of No. 57 or similar type Condensers. One mounting stud is connected electrically to the can.

Condenser Code No.	Fig. No.	(c) Capacity (M.F.) Between Terminals				Replaces
		(A-B)		(C-D)		
		Max.	Min.	Max.	Min.	
437A	1	5.00	4.00	—	—	137A
(a) 437B	2	5.00	4.00	.03	.02	137B
(a) 437C	2	2.50	2.00	2.50	2.00	137C
(a) 437D	2	5.00	4.00	.06	.05	137D
(b) (a) 437E	2	2.50	2.00	2.50	2.00	137E
437QA	1	4.36	4.28	—	—	137QA
(a) 437QB	2	4.36	4.28	.03	.02	137QB

- (a) Consists of two separate condensers insulated but not shielded from each other. These condensers should not be used bridged off or across two separate transmission circuits and should not be used in the same circuit where the effect of the capacity between the separate units will be detrimental to transmission.
- (b) Same as No. 437C except that the two units are matched so that they do not differ by more than 0.11 M.F.
- (c) Minimum capacity values, unless otherwise noted, are stamped on the end of the can. Terminal letters are also stamped on the end of cans of condensers having three or more terminals.

Condensers (continued)

NO. 439 TYPE CONDENSER



The No. 439 type Condensers are paper condensers potted in aluminum cans and tested on 500 volts d-c. Arranged to mount on $\frac{7}{8}$ in. x $1\frac{1}{2}$ in. mounting centers. Suitable for use on continuously applied potentials not exceeding 200 volts d-c or 180 volts a-c (60 cycles or less) and at operating temperatures not exceeding 120°F. Require No. 24 type Brackets when mounted in place of No. 57 or similar type Condensers. One mounting stud is connected electrically to the can.

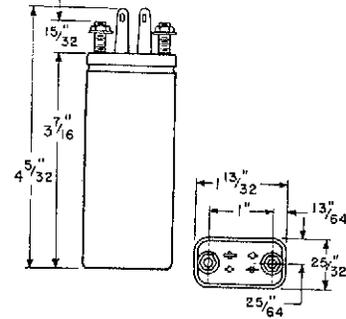
(c) Capacity (M.F.)
Between Terminals

Condenser Code No.	Fig. No.	(A-B)		(C-D)		Replaces
		Max.	Min.	Max.	Min.	
439A	1	2.50	2.00	—	—	139A
(a) 439B	2	2.50	2.00	.03	.02	139B
(a) 439C	2	1.25	1.00	1.25	1.00	139C
(a) 439D	2	2.50	2.00	.06	.05	139D
(a) 439E	2	1.50	1.20	1.50	1.20	139E
(b) (a) 439H	2	1.25	1.00	1.25	1.00	139H
439QA	1	2.18	2.14	—	—	139QA
439QB	1	2.16	2.10	—	—	139QB
439QC	1	2.22	2.16	—	—	139QC
439QD	1	2.24	2.08	—	—	139QD
439QE	1	2.16	2.04	—	—	139QE
439QF	1	2.28	2.16	—	—	139QF
(a) 439QG	2	2.28	2.16	.03	.02	139QG
(a) 439QH	2	1.08	1.05	1.25	1.00	139QH

- (a) Consists of two separate condensers insulated but not shielded from each other. These condensers should not be used bridged off or across two separate transmission circuits and should not be used in the same circuit where the effect of the capacity between the separate units will be detrimental to transmission.
- (b) Same as No. 439C except that the two units are matched so that they do not differ by more than .055 M.F.

(c) Minimum capacity values, unless otherwise noted, are stamped on the end of the can. Terminal letters are also stamped on the end of cans of condensers having three or more terminals.

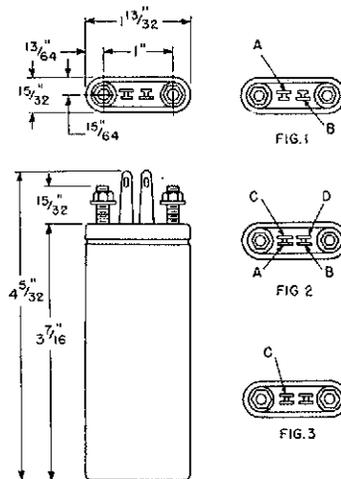
NOS. 440 AND 441 TYPE CONDENSERS



No. 440 Type Condenser

The No. 440 type Condensers are paper condensers potted in aluminum cans and tested on 1000 volts a-c. Arranged to mount on $\frac{7}{8}$ in. x $1\frac{1}{2}$ in. mounting centers. Suitable for use on continuously applied potentials not exceeding 300 volts d-c or 300 volts a-c (60 cycles or less) and at operating temperatures not exceeding 120°F. Require No. 24 type Brackets when mounted in place of No. 57 or similar type Condensers. One mounting stud is connected electrically to the can.

Condenser Code No.	(c) Capacity (M.F.)		Replaces
	Max.	Min.	
440A	1.25	1.00	138A
(e) 440C	.62	.50	140C
440F	1.57	1.25	138B
440QA	1.09	1.07	138QA
440QB	1.12	1.04	138QB



No. 441 Type Condenser



Condensers (continued)

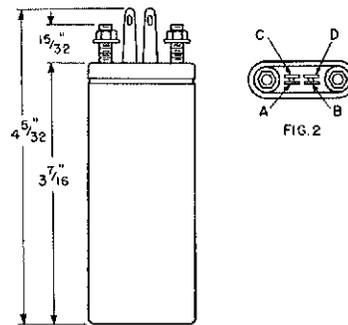
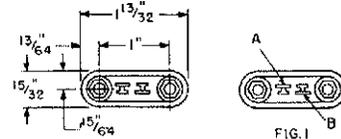
Con- denser Code No.	Fig. No.	(c) Capacity (M.F.) Between Terminals				Replaces
		(A-B)		(C-D)		
		Max.	Min.	Max.	Min.	
441A	1	1.25	1.00	—	—	141A
441B	1	.625	.50	—	—	141B
(a) 441C	2	.625	.50	.625	.50	141C
441D	1	.32	.25	—	—	141D
(a) 441E	2	.32	.25	.32	.25	141E
(a) 441F	2	.625	.50	.32	.25	141F
(a) 441G	2	.16	.125	.085	(g) .065	141G
(a) 441H	2	.03	.02	.03	.02	141H
441J	1	.16	.125	—	—	141J
441K	1	.135	.10	—	—	141K
441L	1	.085	(g) .065	—	—	141L
441M	1	.06	(h) .04	—	—	141M
441N	1	.03	.02	—	—	141N
441P	1	.006	(j) .004	—	—	141P
(a) 441R	2	.013	.010	.013	.010	141R
441S	1	1.6	1.3	—	—	371A
(a) 441T	2	.135	.10	.135	.10	141T
441U	1	.04	.03	—	—	141U
(f) 441W	3	—	—	—	—	141W
441QA	1	1.09	1.07	—	—	141QA
441QB	1	1.08	1.05	—	—	141QB
441QC	1	1.11	1.08	—	—	141QC
441QD	1	1.12	1.04	—	—	141QD
441QE	1	1.08	1.02	—	—	141QE
441QF	1	1.14	1.08	—	—	141QF
441QG	1	.545	.535	—	—	141QG
441QH	1	.54	.525	—	—	141QH
441QJ	1	.555	.54	—	—	141QJ
441QK	1	.56	.52	—	—	141QK
441QL	1	.54	.51	—	—	141QL
441QM	1	.57	.54	—	—	141QM
441QN	1	.275	.265	—	—	141QN
441QP	1	.28	.26	—	—	141QP
441QR	1	.27	.25	—	—	141QR
441QS	1	.29	.27	—	—	141QS
441QT	1	.115	.105	—	—	141QT
441QU	1	.11	.10	—	—	141QU
441QW	1	.12	.11	—	—	141QW

- (a) Consists of two separate condensers insulated but not shielded from each other. These condensers should not be used bridged off or across two separate transmission circuits and should not be used in the same circuit where the effect of the capacity between the separate units will be detrimental to transmission.
- (c) Minimum capacity values, unless otherwise noted, are stamped on the end of the can. Terminal letters are also stamped on the end of cans of condensers having three or more terminals.
- (e) Intended for use as a plate blocking condenser in repeater circuits where a high insulation resistance is required.
- (f) Consists of three 0.1 M.F. units having a common terminal "C". Stamped C, .1, .1, .1, on wide sides of can adjacent to the corresponding terminals.
- (g) Stamped .075 M.F. on the end of can.
- (h) Stamped .05 M.F. on the end of can.
- (j) Stamped .005 M.F. on the end of can.

The No. 441 type Condensers are paper condensers potted in aluminum cans and tested on 500 volts d-c. Arranged to mount on 1/2 in. x 1 1/2 in. mounting centers. Suitable for use on continuously applied potentials not exceeding 200 volts d-c or 180 volts a-c (60 cycles or less) and at operating temperatures not exceeding 120°F. Re-

quire No. 24 type Brackets when mounted in place of No. 57 or similar type Condensers. One mounting stud is connected electrically to the can.

NO. 442 TYPE CONDENSER



No. 442 Type Condenser

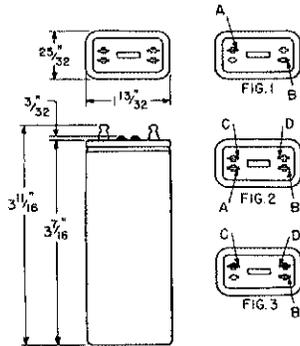
The No. 442 type Condensers are paper condensers potted in aluminum cans and tested on 1000 volts a-c. Arranged to mount on 1/2 in. x 1 1/2 in. mounting centers. Suitable for use on continuously applied potentials not exceeding 300 volts d-c or 300 volts a-c (60 cycles or less) and at operating temperatures not exceeding 120° F. Require No. 24 type Brackets when mounted in place of No. 57 or similar type Condensers. One mounting stud is connected electrically to the can.

Con- denser Code No.	Fig. No.	(c) Capacity (M.F.) Between Terminals				Replaces
		(A-B)		(C-D)		
		Max.	Min.	Max.	Min.	
442A	1	.62	.50	—	—	140B
442B	1	.32	.25	—	—	142B, 21Y, AL, BN, 57C and AL
442C	1	.125	.1	—	—	142C
442D	1	.06	.05	—	—	142D and 21U
(a) 442E	2	.03	.02	.03	.02	142E
(a) 442F	2	.0065	.005	.0065	.005	142F

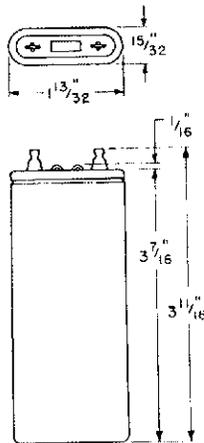
- (a) Consists of two separate condensers insulated but not shielded from each other. These condensers should not be used bridged off or across two separate transmission circuits and should not be used in the same circuit where the effect of the capacity between the separate units will be detrimental to transmission.
- (c) Minimum capacity values, unless otherwise noted, are stamped on the end of the can. Terminal letters are also stamped on the end of cans of condensers having three or more terminals.

Condensers (continued)

NOS. 447 AND 449 TYPE CONDENSERS



No. 447 Type Condenser



No. 449 Type Condenser

The Nos. 447 and 449 type Condensers consist of a wound paper unit potted in a seamless extruded aluminum can. The can has a knurled ridge near the top to hold a phenol fabric terminal plate. This plate has a small formed wire clip fastened to it which provides means for mounting.

They are tested on 500 volts d-c, except for the 0.04 mf unit of the No. 447G and the No. 449J which are tested at 1000 volts a-c. All except No. 449J are suitable for use on continuously applied potentials not exceeding 200 volts d-c or 180 volts a-c (60 cycles or less) and at operating temperatures not exceeding 120° F. The No. 449J is suitable for use on potentials not exceeding 300 volts d-c or a-c (60 cycles or less) and at operating temperatures not exceeding 120° F.

When a 447 type Condenser must fill the space of a 21 type in a pileup or if this 447 type is to replace a 147 type adapted to the space of a 21 type Condenser, one P-431343 Adapter will be required for

each replacing condenser. If the 447 type Condenser is to replace a 147 type mounted on edge with other 147 type under a common clamp, one P-431345 Adapter will be required for every 147 type Condenser that is to remain under the common clamp with the new condenser.

Adapters must be ordered separately.

Con- denser Code No.	Fig. No.	(c) Capacity (M.F.) Between Terminals						Replaces
		(A-B) Max.	Min.	(C-D) Max.	Min.	(C-B) Max.	Min.	
447A	1	2.50	2.00	—	—	—	—	147A, 21D, E and L
(a) 447B	2	1.25	1.00	1.25	1.00	—	—	147B and 21BG
(b) 447C	3	—	—	1.25	1.00	1.25	1.00	147C and 21AD
(b) 447D	3	—	—	1.25	1.00	.62	.50	147D and 21N
(a) (d) 447E	2	1.25	1.00	1.25	1.00	—	—	1147B
(b) (e) 447F	3	—	—	1.25	1.00	.62	.50	1147D
(a) 447G	2	.048	(f) .032	2.50	2.00	—	—	147E

- (a) Consists of two separate condensers insulated but not shielded from each other.
- (b) Consists of two condensers having one common terminal.
- (c) Minimum capacity values, unless otherwise noted, are stamped on the end of the can. Terminal letters are also stamped on the end of cans of condensers having three or more terminals.
- (d) Same as No. 447B except equipped with 7/8 in. flexible leads, having No. 127 Cord Tips, at the following terminals: (A-RD-GN), (B-YEL) and (D-BLK).
- (e) Same as No. 447D except equipped with 7/8 in. flexible leads, having No. 127 Cord Tips, at the following terminals: (B-RD), (C-YEL) and (D-BL).
- (f) Stamped .04 M.F. on the end of can.

When a 449 type Condenser must fill the space of a 21 type in a pileup or if the 449 is to replace a 149 type adapted to the space of a 21 type Condenser one P-431344 Adapter will be required for each replacing condenser.

If the 449 type is to replace a 149 type mounted on edge with other 149 type condensers under a common clamp, one P-431345 adapter will be required for every 149 Condenser that is to remain under the common clamp with the new condenser.

Condenser Code No.	(c) Capacity (M.F.)		Replaces
	Max.	Min.	
449A	1.25	1.00	149A
449B	.62	.50	149B
449C	.13	.10	149C
449D	.80	.65	149D
(t) 449E	1.25	1.00	149E
(u) 449F	.80	.65	149F
(w) 449G	1.25	1.00	1149A
(w) 449H	.62	.50	1149B
449J	.05	.04	149G

- (c) Minimum capacity values, unless otherwise noted, are stamped on the end of the can. Terminal letters are also stamped on the end of cans of condensers having three or more terminals.
- (t) Equipped with two 8 in. yellow flexible leads having No. 127 Cord Tips.
- (u) Equipped with two 5 1/2 in. flexible leads, one yellow and one black, having No. 127 Cord Tips.
- (w) Equipped with two 6 in. yellow flexible leads having No. 127 Cord Tips.

Condenser straps

- P43065 A straight galvanized iron strap, overall dimensions $4\frac{1}{8}'' \times \frac{1}{2}''$
- P43121 A galvanized iron clamp, overall dimensions $5\frac{5}{16}'' \times \frac{9}{16}''$
- P48022 A straight galvanized iron strap for mounting two condensers, overall dimensions $9\frac{5}{8}'' \times \frac{1}{2}''$

Cords

Western Electric telephone cords are the result of more than sixty-five years experience in the manufacture of telephone apparatus. They are of the same high quality that has characterized all Western Electric telephone equipment and caused it to be recognized as standard by the leading telephone authorities throughout the world.

CODING

So that a cord may be easily identified as to its application in the telephone field, the following letter-number-letter codes have been assigned, which have the following significance.

The first character of the code, a letter, designates principle use as follows:

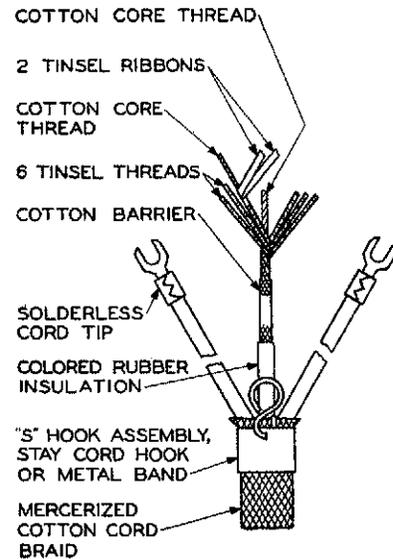
- D—Desk Stand Cord (includes telephone set mounting cords, dial cords and switch cords used between the switchhook and the base of desk stands).
- H—Handset Cords (cords connected directly to handsets).
- L—Operator's Telephone Set Cord.
- M—Miscellaneous Cords, which are not classified under the other designations.
- P—Patching Cord (distinguished from switchboard cords by being arranged for a plug at each end).
- R—Receiver Cord.
- S—Switchboard Cord (distinguished from patching cords by having one end arranged for connecting to a switchboard).
- T—Transmitter Cord.
- W—Test Cord (includes cords used with test sets and in connection with central office testing).

The second character of the code, a number, corresponds to the number of conductors.

The third and fourth characters of the code, a letter or letters, have no special significance and are arbitrarily assigned to indicate variation in physical structure, such as insulation, cord tips, etc.

In some cases where a cord is furnished in various colors, a dash number is added to designate the color; for example, the D3AK-9 indicates a brown cord and D3AK-4 an ivory colored cord.

RUBBER INSULATED TINSEL STATION CORDS



Construction of Rubber Insulated Cords

Rubber insulated tinsel cords are designed for general station use and include desk stand, handset and handset mounting cords, cords for the combined telephone sets, receiver cords and transmitter cords.

These cords have tinsel conductors consisting of six tinsel threads wound around a strong cotton twine to form a conductor. Each of the tinsel threads is made up of two metal ribbons wound around a strong cotton thread. The conductors are then covered by a knitted barrier of purified cotton and insulated with non-corrosive rubber compounds.

The conductors are distinguished by the use of different colored rubber compounds, and double tracer colors are indicated by the use of four longitudinal ridges along the length of the conductor of the same color as the base color of the conductor. In the case of some receiver cords where the free conductors may be exposed to perspiration, cotton conductor braids are used over the rubber insulation.

In general the conductors are laid parallel and covered by a mercerized cotton cord braid which, in the case of many of the cords coded in the "D" or "H" series, may be obtained in several different colors other than the standard brown.



NEOPRENE JACKETED STATION CORDS

Station cords with neoprene jackets are designed for use at stations where the service conditions are unusually severe from the standpoint of mechanical abuse or where excessively severe moisture conditions exist or exposure to chemical fumes or solutions is to be expected. They are also recommended for use at public coin collector stations. These cords employ the standard colored rubber insulated tinsel conductors. The conductors for use in receiver cords are twisted together, and the spaces between the conductors are filled with cotton thread. The whole is then bound with a close binder serving (wrapping) of multiple end cotton and covered with a tough neoprene jacket.

The conductors for use in hand set and desk stand cords are laid parallel without either filler threads or binder serving, and covered directly by the neoprene jacket.

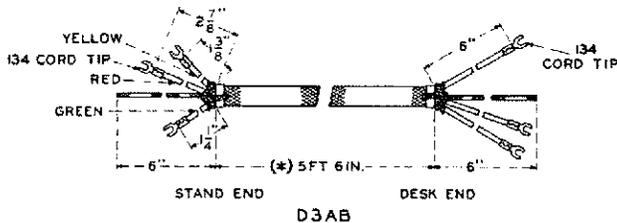
DISPATCHERS' AND OPERATORS' HEAD SET RECEIVER CORDS

Telephone set cords intended for use by dispatchers and telephone operators are composed of the same high grade tinsel described above and insulated with either one of the following types of insulation, depending upon the service for which the particular cord is designed.

1. Two braids of purified cotton.
2. Cotton barrier covered by rubber insulation and a cotton conductor braid for use at humid locations.
3. Thermoplastic tape covered by a mercerized cotton conductor braid for cords intended for the new operators' head telephone set.
4. A single cotton braid for retractile operators' cords.

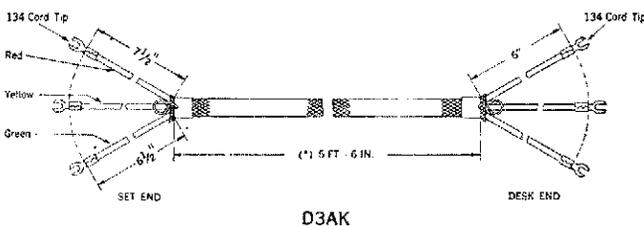
An external braid of black or brown mercerized cotton is applied over the insulation.

DESK STAND, HAND TELEPHONE SET AND TRANSMITTER ARM CORDS, WATER PROOF (Rubber Insulation)



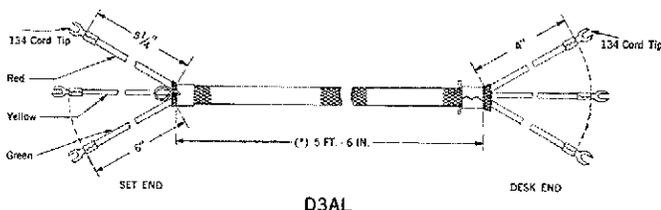
No. D3AB Cord

3 Conductors.
Brown cotton outer covering.
Used with No. 40P Transmitter Arm.
Replaces Nos. 541 and 550 Cords.



No. D3AK-9 Cord

3 Conductors.
Brown cotton outer covering.
Used with Nos. 1020AB, 1020AL, 1042AB, 1120AB, and 1142AB Desk Stands, Nos. 1020C and 1020CC Transmitter Arms, B1 Hand Set Mountings.



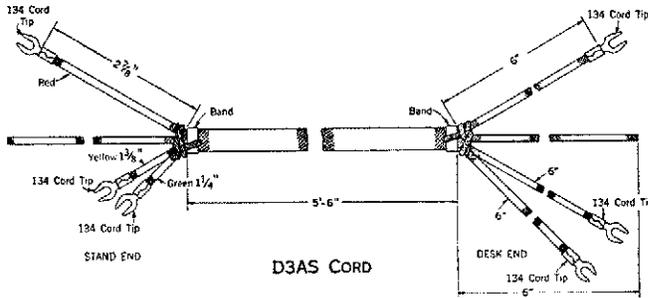
No. D3AL-9 Cord

3 Conductors.
Brown cotton outer covering.
Used with No. 302 type Telephone Sets.

* 9', 13' and 25' cords can also be obtained when specified.

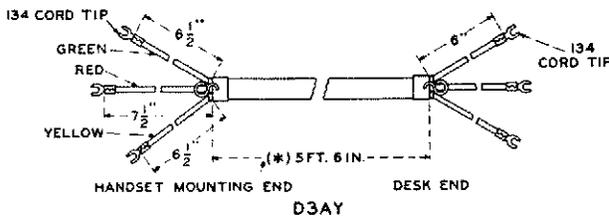
Cords (continued)

Desk Stand, Hand Telephone Set and Transmitter Arm Cords (Continued)



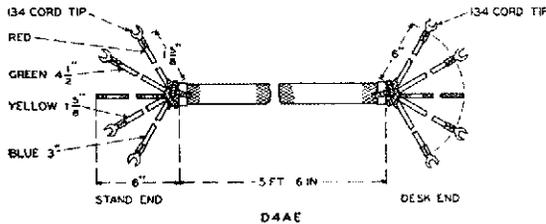
No. D3AS Cord

3 Conductors.
Brown cotton outer covering.
8' Cords used with Nos. 1048, 1148, 1248 and 1348 type Transmitter Arms.



No. D3AY Cord

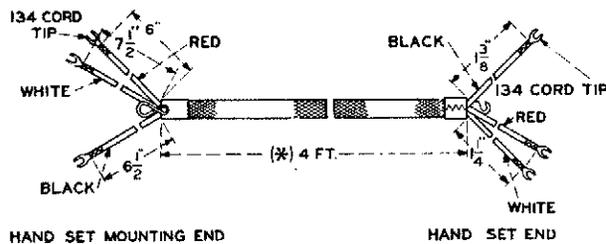
3 Conductors.
Black water-proof jacket.
Intended for use in place of D3AK type Cords where service conditions are unusually severe.
* 9', 13' and 25' cords can also be obtained when specified.



No. D4AE Cord

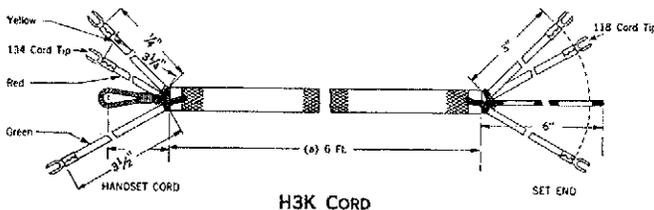
4 Conductors.
Brown cotton outer covering.
Used with Nos. 1048GA, GB, GC and GD Transmitter Arms.

HAND SET CORDS



No. H3C-9 Cord

3 Conductors.
Brown cotton outer covering.
Used with Nos. F1AW-3, F1DW-3, F1FW-3 Hand Sets, Nos. 250 and 302 type Telephone Sets.
* 1', 9' and 13' can also be obtained when specified.



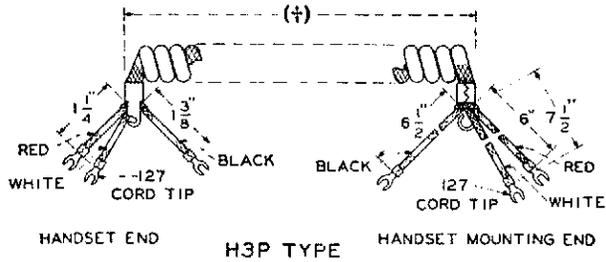
No. H3K Cord

3 Conductor.
Brown cotton outer covering.
Used with Nos. 1012C, 1012H Hand Sets, Nos. 1330, 1331, 1332, 1278G, 1375B, 1398A Telephone Sets.
(a) 3' cords can also be obtained when specified in the order.



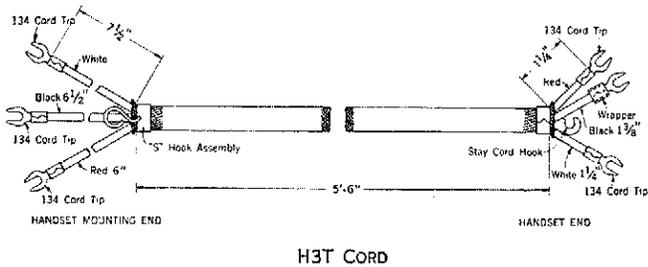
Cords (continued)

Hand Set Cords (Continued)



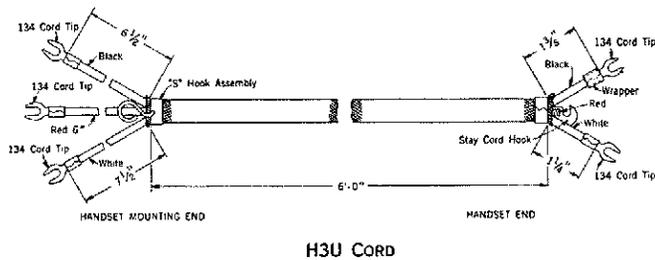
No. H3P-9 Cord

3 Conductors.
Brown cotton outer covering.
Used with retractile type cord for use with hand sets.
† Retracted 9", usable length 4'.



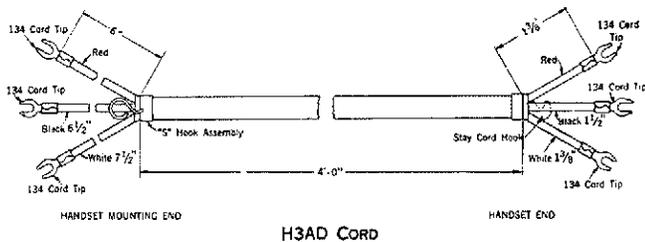
No. H3T Cord

3 Conductors.
Brown cotton outer covering.
Used with No. F3CW-3 Hand Set, No. 301 type Telephone Sets.



No. H3U Cord

3 Conductors.
Brown cotton outer covering.
Used with No. F3DW-3 Hand Set, No. 1332 type Telephone Sets.

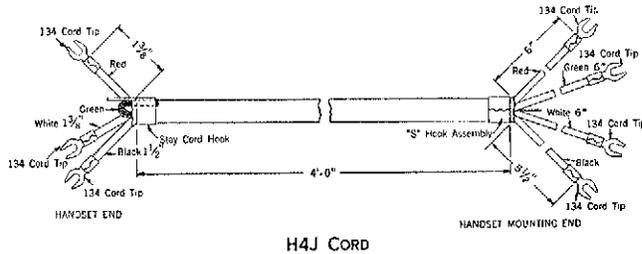


No. H3AD Cord

3 Conductors.
Black water-proof jacket.
Intended for use in place of H3C type Cords where service conditions are unusually severe.
Replaces No. H3H Cord.
1' and 9' lengths can be obtained when specified in the order.

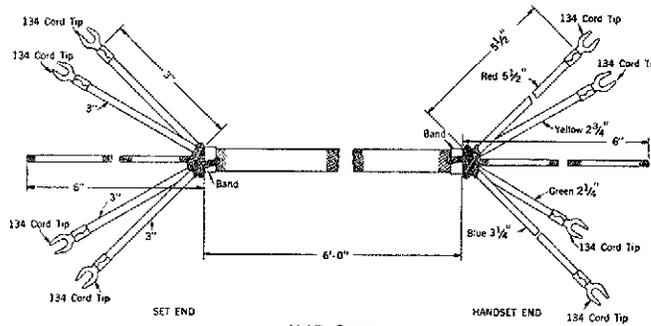
Cords (continued)

Hand Set Cords (Continued)



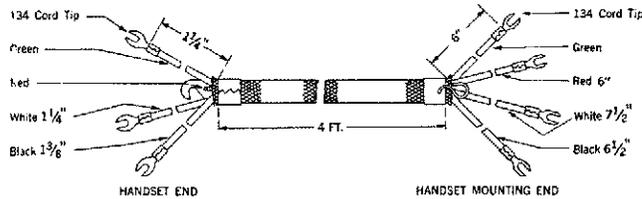
No. H4J Cord
 4 Conductors.
 Black water-proof jacket.
 Used with No. F3AW-3 Hand Set.

H4J CORD



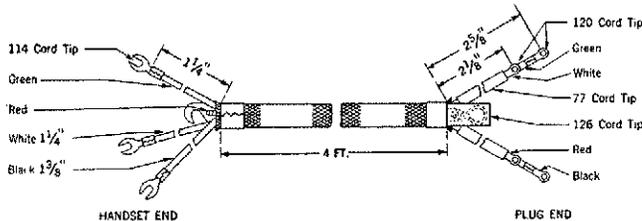
No. H4S Cord
 4 Conductors.
 Brown cotton outer covering.
 Replaces 502 Cord.

H4S CORD



No. H4T-9 Cord
 4 Conductors.
 Brown cotton outer covering.
 Used with No. F2BW-3 Hand Set.

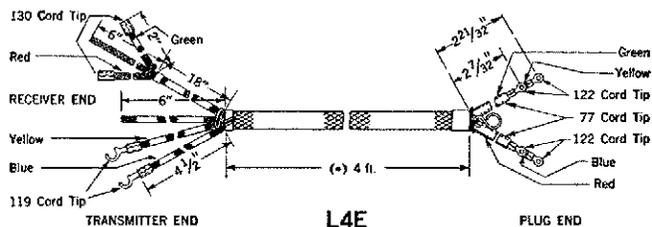
H4T TYPE



No. H4U Cord
 4 Conductors.
 Brown cotton outer covering.
 Used with No. F2AW-3 Hand Set.
 Arranged for 289 type Plug.

H4U

DISPATCHERS' AND OPERATORS' HEAD SET CORDS



No. L4E Cord
 4 Conductor.
 Brown cotton outer covering.
 Used with No. 528 Receiver, No. 234 Transmitter and
 No. 137 Plug.

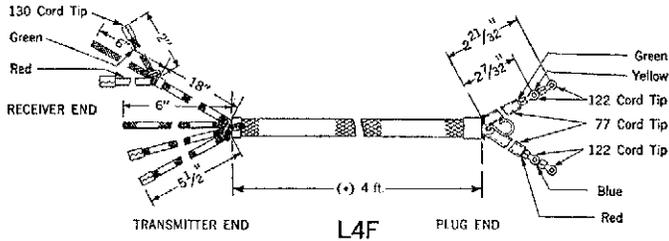
* 6' and 10' cords can be obtained when specified in order.

L4E



Cords (continued)

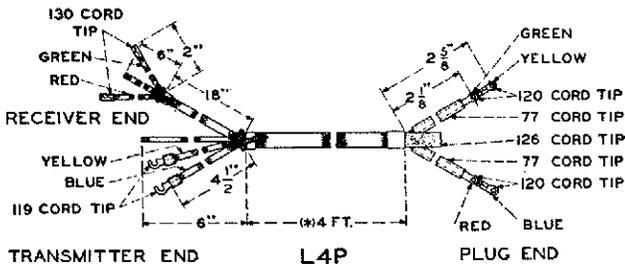
Dispatchers' and Operators' Head Set Cords (Continued)



No. L4F Cord

4 Conductor.
Brown cotton outer covering.
Used with No. 528 Receiver, No. 396A Transmitter and No. 137 Plug.

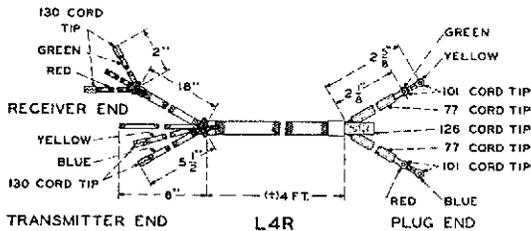
* 6' and 10' cords can be obtained when specified in order.



No. L4P Cord

4 Conductor.
Brown cotton outer covering.
Used with Nos. 525, 528 or 716 Receivers, No. 234, 648B or 650 Transmitters and No. 289 type Plug.

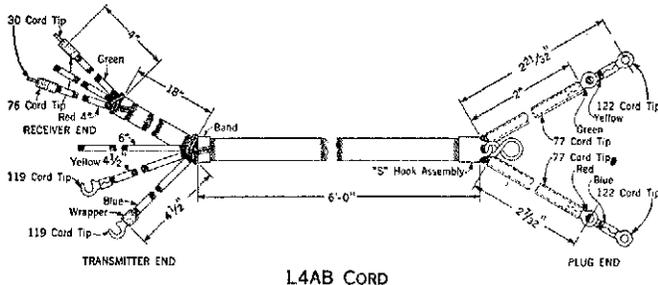
* 6' and 10' cords can be obtained when specified in order.



No. L4R Cord

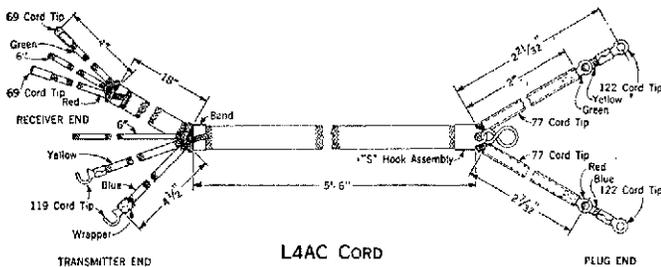
4 Conductor.
Brown cotton outer covering.
Used with Nos. 525, 528 or 716 Receivers, No. 396A Transmitter and No. 289 type Plug.

† 6', 10', 12' and 20' cords can also be obtained when specified in order.



No. L4AB Cord

4 Conductor.
Brown cotton outer covering.
Water-proof with rubber insulated conductors.
Used with No. 148W Receiver, No. 386 Transmitter and No. 137 Plug.
Replaces No. 375 Cord.

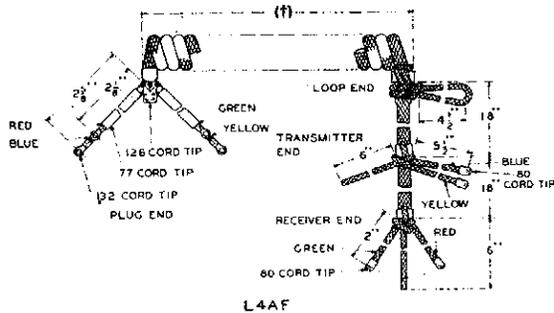


No. L4AC Cord

4 Conductor.
Brown cotton outer covering.
Water-proof with rubber insulated conductors.
Used with No. 189 Receiver, No. 386 Transmitter and No. 137 Plug.
Replaces No. 565 Cord.

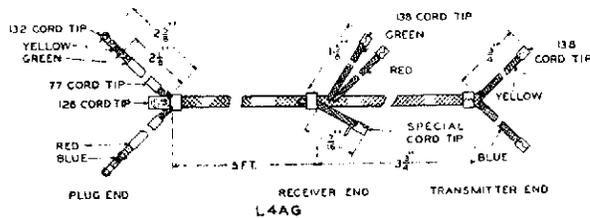
Cords (continued)

Dispatchers' and Operators' Head Set Cords (Continued)



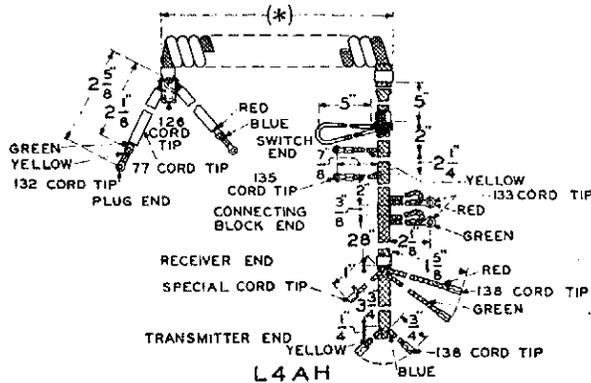
No. L4AF Cord

4 Conductors.
Brown cotton outer covering.
Used in place of No. L4R Cord when a retractile cord is desired.
† Retracted 3' usable length 15'.



No. L4AG Cord

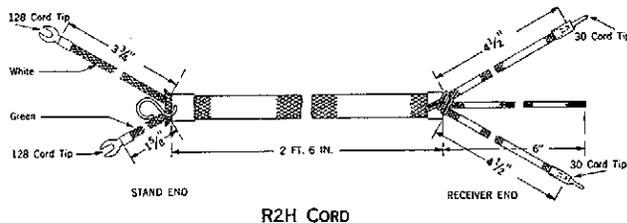
4 Conductor.
Black cotton outer covering.
Used with No. 52A Head Telephone Set and No. 289 type Plug.



No. L4AH Cord

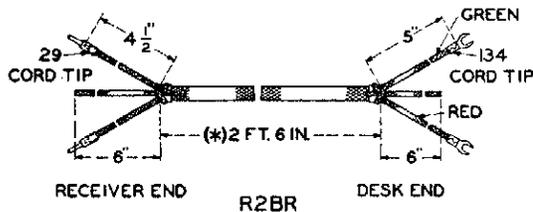
4 Conductors.
Brown cotton outer covering.
Used with No. 52B Head Telephone Set.
Switch end is finished for a KS8010 switch and connecting block end is finished for a No. 29A connecting block.
Plug end arranged for No. 289 type Plug.
* Retracted 3' usable length 10'.

RECEIVER CORDS



No. R2H Cord

2 Conductors.
Brown cotton outer covering.
Water-proof with rubber insulated conductors and cotton conductor braid.
Used with Nos. 122, 128, 146 and other types of receivers requiring No. 30 Cord Tip.
Replaces No. R2J.



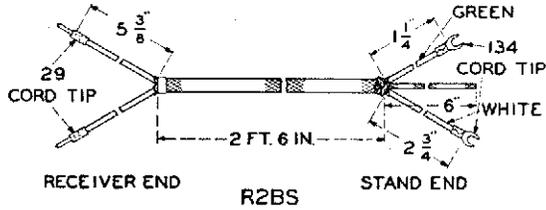
No. R2BR Cord

2 Conductors.
Brown cotton outer covering.
Replaces No. 391.
* 1' 3" and 5' 6" cords can be obtained when specified in the order.



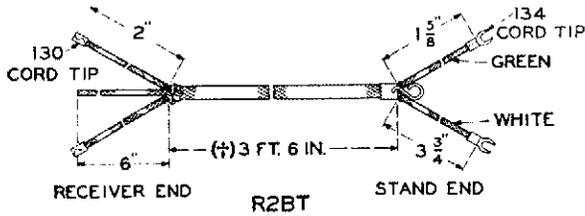
Cords (continued)

Receiver Cords (Continued)



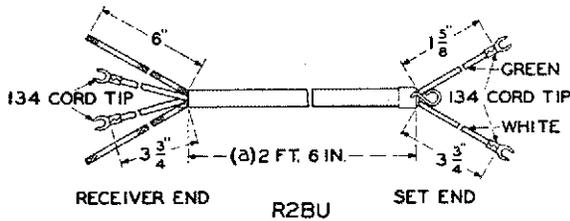
No. R2BS Cord

2 Conductors.
Brown cotton outer covering.
Water-proof with rubber insulated conductors.
Used with No. 50 type Desk Stands.
Replaces Nos. 542B and 549B.



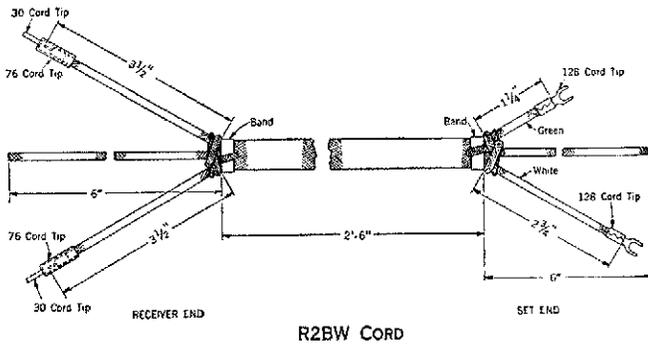
No. R2BT Cord

2 Conductors.
Brown cotton outer covering.
Used with No. 528 Receiver and No. 52AB Desk Stand
and with No. 559A Receiver on the No. 525A Sub-
scriber Set.
Replaces R2AH.
† 2' 6" cords can be obtained when specified in order.



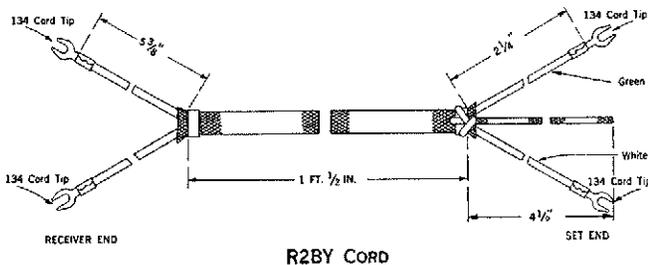
No. R2BU Cord

2 Conductors.
Black water-proof jacket.
Water-proof with rubber insulated conductors.
(a) 1' 10" cords can be obtained when specified in the
order.



No. R2BW Cord

2 Conductors.
Brown cotton outer covering.
Water-proof with rubber insulated conductors.
Used with Desk Stands and Transmitter Arms.
Replaces No. 408.

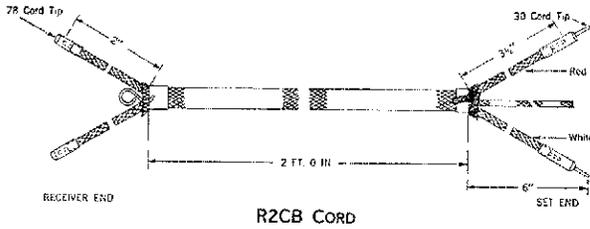


No. R2BY Cord

2 Conductors.
Brown cotton outer covering.
Water-proof with rubber insulated conductors.
Replaces No. 384.

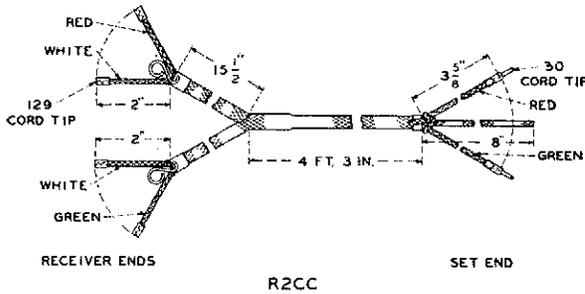
Cords (continued)

Receiver Cords (Continued)



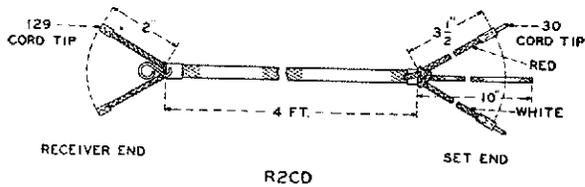
No. R2CB Cord

2 Conductors.
Brown cotton outer covering.
Water-proof with rubber insulated conductors.
Used with No. 515 Receiver in the No. 1017 type Test Set.
Replaces No. 572.



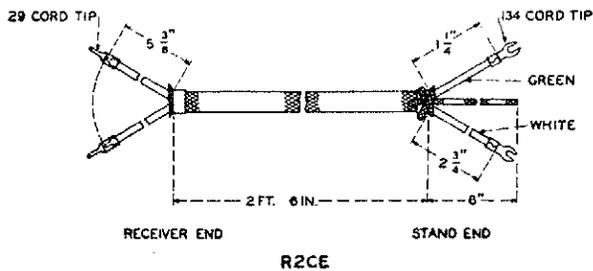
No. R2CC Cord

2 Conductors.
Brown cotton outer covering.
Water-proof with rubber insulated conductors and cotton conductor braid.
Used with No. 19 type Test Sets.
Arranged to connect two No. 528 Receivers in series.
Replaces No. 584.



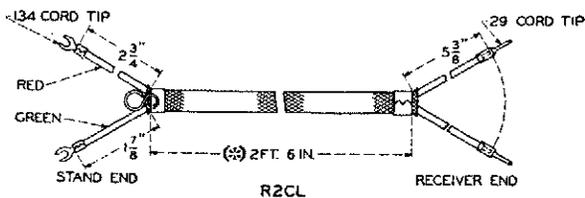
No. R2CD Cord

2 Conductors.
Brown cotton outer covering.
Water-proof with rubber insulated conductors and cotton conductor braid.
Used with No. 528 Receiver and Nos. 17D, 17E and 19C Test Sets.
Replaces No. 747.



No. R2CE Cord

2 Conductors.
Brown cotton outer covering.
Water-proof with rubber insulated conductors.
Used with No. 40P Transmitter Arm.
Replaces Nos. 542 and 549.



No. R2CL Cord

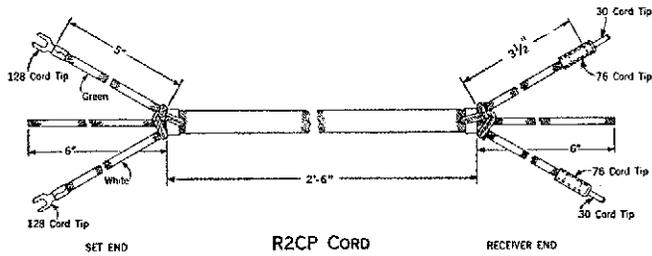
2 Conductors.
Brown cotton outer covering.
Water-proof with rubber insulated conductors.
Used with various Desk Stands.
Replaces Nos. R2S, R2W and R2AB.

* 5' 6" cords can also be obtained when specified in order.



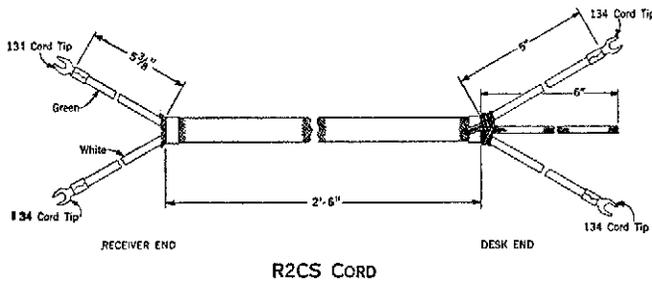
Cords (continued)

Receiver Cords (Continued)



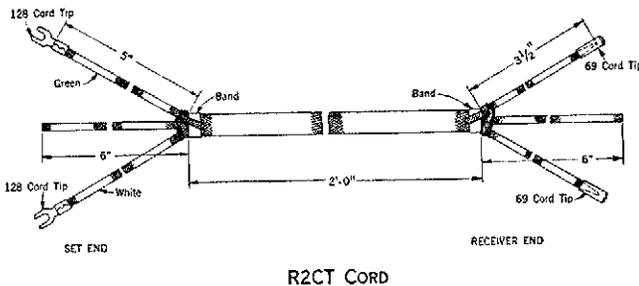
No. R2CP Cord

2 Conductors.
Brown cotton outer covering.
Water-proof with rubber insulated conductors.
Replaces No. 446.



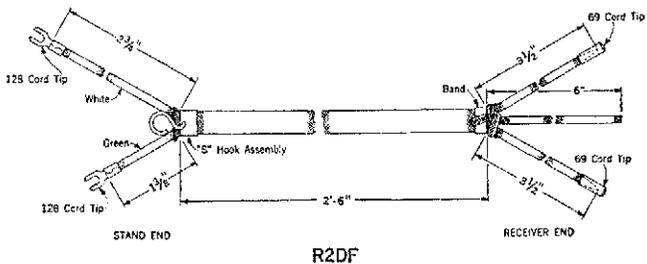
No. R2CS Cord

2 Conductors.
Brown cotton outer covering.
Water-proof with rubber insulated conductors.
Replaces No. 521.



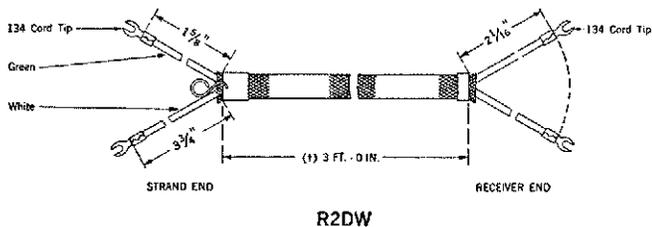
No. R2CT Cord

2 Conductors.
Brown cotton outer covering.
Water-proof with rubber insulated conductors.
Replaces No. 546.



No. R2DF Cord

2 Conductors.
Brown cotton outer covering.
Water-proof with rubber insulated conductors.
Replaces No. R2U.



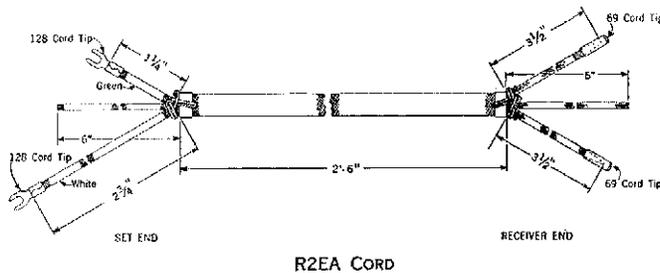
No. R2DW Cord

2 Conductors.
Brown cotton outer covering.
Water-proof with rubber insulated conductors.
Used with Nos. 144 and 706 type Receivers.
Replaces No. R2B.

† 1' 3" cords can be obtained when specified in order.

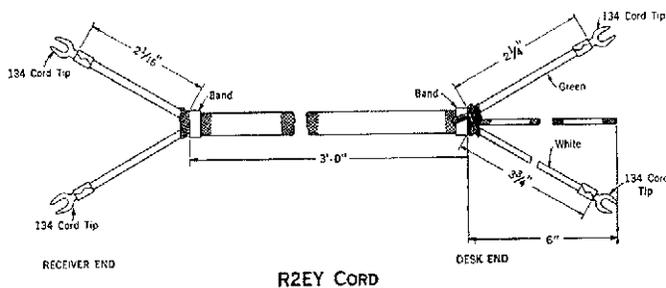
Cords (continued)

Receiver Cords (Continued)



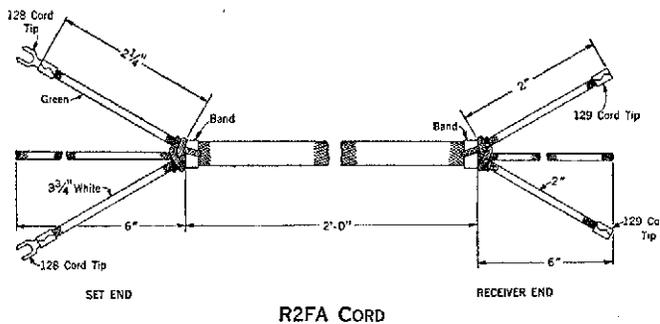
No. R2EA Cord

2 Conductors.
Brown cotton outer covering.
Water-proof with rubber insulated conductors.
Used with No. 186 Receiver on desk stands and transmitter arms.
Replaces No. 554.



No. R2EY Cord

2 Conductors.
Brown cotton outer covering.
Water-proof with rubber insulated conductors.
Replacement Cord to be ordered when a No. 706 Receiver is used in a No. 1317W, No. 1305AC or No. 1312A Telephone Sets.



No. R2FA Cord

2 Conductors.
Brown cotton outer covering.
Water-proof with rubber insulated conductors.
Replacement Cord to be ordered when a No. 716 Receiver is used in the following apparatus:
1317BU, DU, AE, AW Telephone Sets
1293BC, AL Telephone Sets
1048DA, DB, DC, DD, GA, GB, GC, GD
Transmitter Arms
1148DA, DB, DC, DD Transmitter Arms
1020E Transmitter Arm
1020AB, 1120AB Desk Stands

TRANSMITTER CORDS

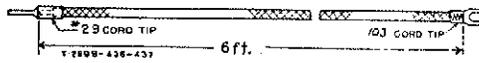


No. T1C Cord

1 Conductor.
Yellow cotton outer covering
Water-proof insulation.
Used on Desk Stands, Wall Telephone Sets and Transmitter Arms.
* 6", 7", 8" and 1' cords can be obtained when specified in the order.

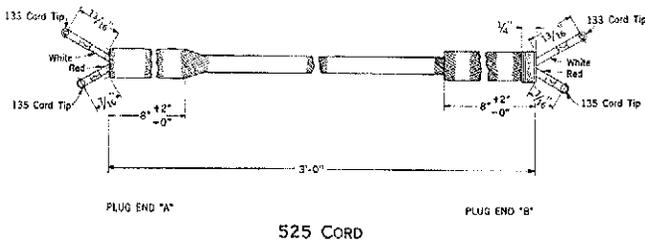


MISCELLANEOUS CORDS INCLUDING CORDS FOR USE WITH LINE POLES AND CORDS INTENDED FOR PATCHING AND TESTING PURPOSES



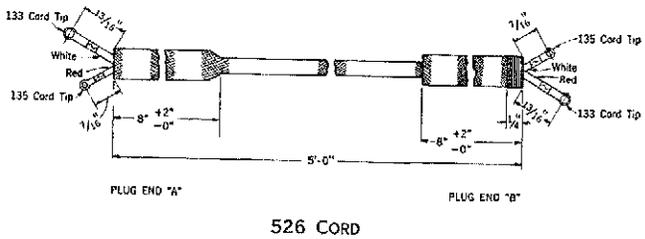
No. 437 Cord

1 Conductor.
Brown cotton outer covering.



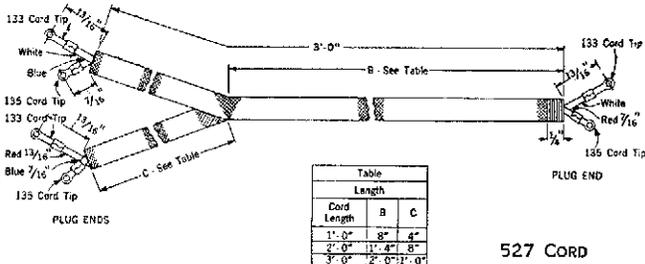
No. 525 Cord

2 Conductors.
Green glazed cotton outer covering.
Water-proof insulation.
Each end arranged for No. 347A Plug.
4", 1', 2' and 5' cords can be obtained when specified in the order.



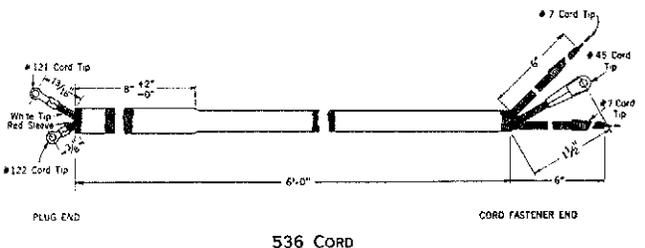
No. 526 Cord

2 Conductors.
Red glazed cotton outer covering.
Water-proof insulation.
Each end arranged for No. 347A Plug.
1' and 3' cords can be obtained when specified in order.



No. 527 Cord

2 Conductors.
Green glazed cotton outer covering.
Arranged for three No. 347A Plugs.



No. 536 Cord

2 Conductors.
Green glazed cotton outer covering.
Moisture-proof insulation.
Plug end arranged for No. 347 Plug.

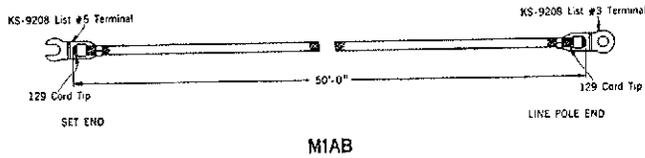
Cords (continued)

Miscellaneous Cords (Continued)



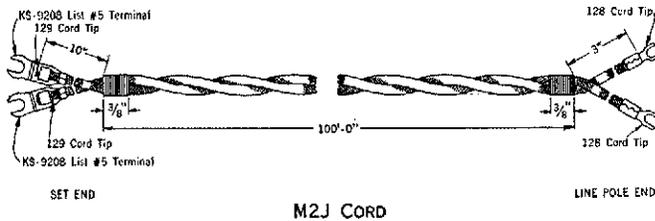
No. 540 Cord

1 Conductor.
Brown cotton covered stranded conductor.
Intended to connect dry cells equipped with spring or screw terminals.



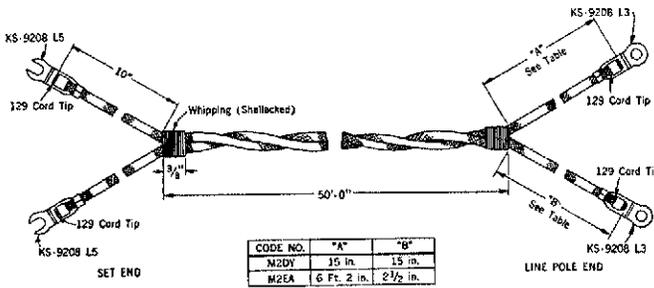
No. M1AB Cord

1 Conductor.
Black glazed cotton outer covering.
Water-proof rubber insulated.
Intended for use with No. 7A Line Pole.



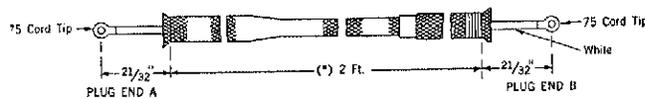
No. M2J Cord

2 Conductors.
Black glazed cotton external braid.
Water-proof rubber insulated.
Intended for use with No. 3 Line Pole.



No. M2DY and No. M2EA Cords

2 Conductors.
Black glazed cotton external braid.
Water-proof rubber insulated.
No. M2DY intended for use with No. 6B Line Pole.
No. M2EA intended for use with No. 8A Line Pole.



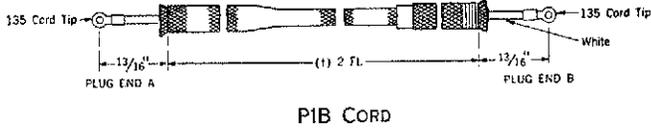
No. P1A Cord

1 Conductor.
Slate glazed cotton outer covering.
Water-proof rubber insulated.
Patching cord arranged for No. 116 Plug.
* 1', 4' or 6' cords can be obtained when specified in order.



Cords (continued)

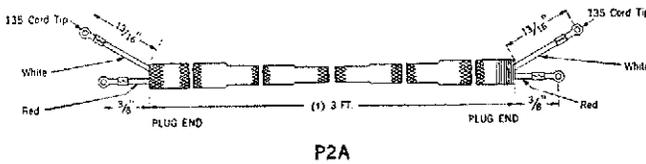
Miscellaneous Cords (Continued)



No. P1B Cord

1 Conductor.
Slate glazed cotton outer covering.
Water-proof rubber insulated.
Patching cord arranged for No. 47 Plug (Tip connection only).
†1', 3', 4' or 6' cords can also be obtained when specified in order.

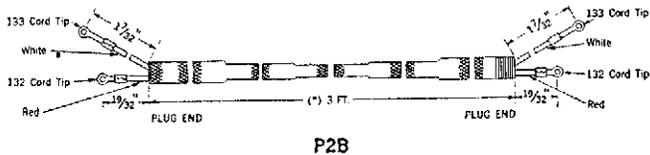
P1B CORD



No. P2A Cord

2 Conductors.
Red glazed cotton outer covering.
Water-proof rubber insulated.
Patching cord arranged for No. 47 Plug.
†6", 1', 2', 4' and 6' cords can be obtained when specified in order.

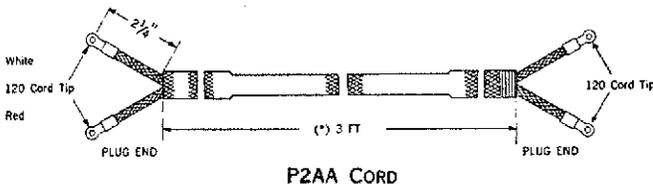
P2A



No. P2B Cord

2 Conductors.
Green glazed cotton outer covering.
Water-proof rubber insulated.
Patching cord arranged for No. 310 Plug (Tip and Ring connections only).
*1', 2', 4' and 6' cords can be obtained when specified in order.

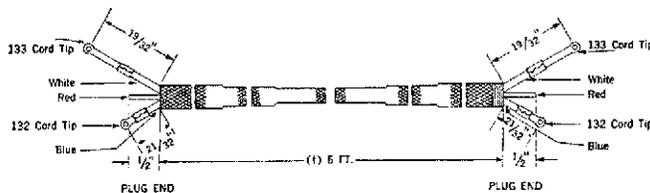
P2B



No. P2AA Cord

2 Conductors.
Slate glazed cotton outer covering.
Moisture-proof.
Patching cord arranged for two No. 241 type Plugs (Tip connections only).
*1', 2', 4', 6' and 15' cords can also be obtained when specified in order.

P2AA CORD



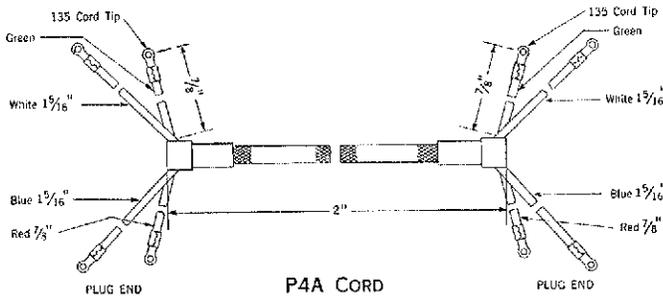
No. P3E Cord

3 Conductors.
Slate glazed cotton outer covering.
Water-proof rubber insulated.
Patching cord arranged for No. 310 Plug.
†1', 2', 3', 4', 8', 10' and 12' slate cords and 8' green cords can be obtained when specified in order.

P3E CORD

Cords (continued)

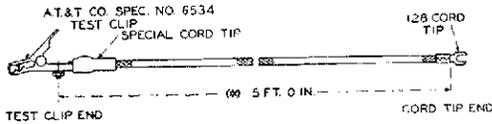
Miscellaneous Cords (Continued)



No. P4A Cord

4 Conductors.
Slate glazed cotton outer covering.
Moisture-proof.
Patching cord arranged for No. 154 Plug.

4' and 6' cords can be obtained when specified in the order.
Black cords can be obtained when specified.
Replaces No. 659.



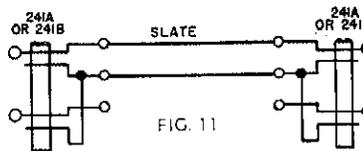
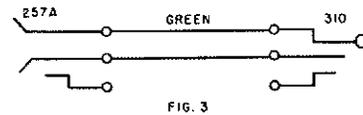
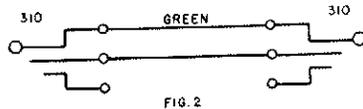
No. W1T Cord

1 Conductor.
Black glazed cotton outer covering.
Water-proof rubber insulated.
Intended for use with a hand set handle for lineman's testing.

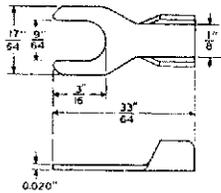
* 3' cord can also be obtained when specified in order.

TWO CONDUCTOR PATCHING CORD ASSEMBLIES

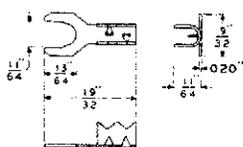
Cond. Code No.	Fig.	Length in feet	Consists of	
			Cord	Plugs
2P1A	1	1/2	P2A	two No. 347A
2P1B	1	2	P2A	two No. 347A
2P1C	1	4	P2A	two No. 347A
2P1D	1	6	P2A	two No. 347A
2P2A	1	3	P2A	two No. 47A
2P2B	1	6	P2A	two No. 47A
2P3A	1	3	P2A	two No. 47B
2P3B	1	6	P2A	two No. 47B
2P4A	2	3	P2B	two No. 310
2P4B	2	4	P2B	two No. 310
2P4C	2	6	P2B	two No. 310
2P5A	3	3	P2B	310 & 257A
2P13A	11	3	P2AA	two 241A
2P13B	11	6	P2AA	two 241A
2P13C	11	15	P2AA	two 241A
2P13D	11	2	P2AA	two 241A
2P14A	11	3	P2AA	two 241B



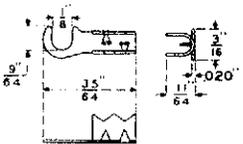
Cord tips (continued)



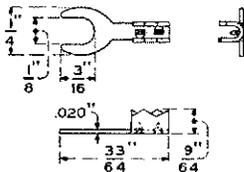
No. 105
Tinned; for use on station cords.
Slotted for No. 6 screw.



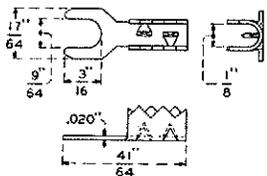
No. 118
Tinned; solderless tip having two tangs for making contact with tinsel conductor.
Slotted for No. 6 or 8 screw.
Replaces No. 92.



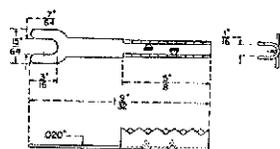
No. 119
Tinned; solderless tip having two tangs for making contact with tinsel conductor.
Slotted for No. 4 screw.
Replaces No. 98.



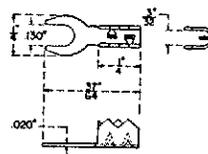
No. 127
Solderless, nickel-finished. Intended for use on stranded wire in combined hand telephone sets.



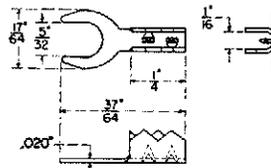
No. 128
Tinned; solderless tip having two tangs for making contact with tinsel conductor.
Slotted for No. 6 screw.



No. 131
Tinned; solderless tip having two tangs for making contact with tinsel conductor.
Slotted for No. 4 screw.

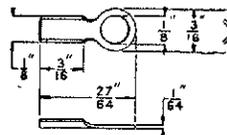


No. 134
Tinned; solderless tip having two tangs for making contact with tinsel conductor.
Slotted for No. 4 or 6 screw.
Replaces Nos. 114 and 115.

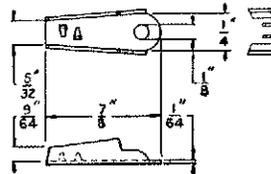


No. 136
Tinned; solderless tip having two tangs for making contact with tinsel conductor.
Slotted for No. 6 screw.

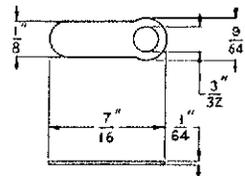
EYELET TYPE CORD TIPS



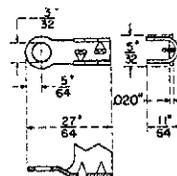
No. 38
Tinned, eyelet tip; for use on plug end of switchboard cords.
Replaces No. 41.



No. 45
Eyelet tip; for use on stay cord end of switchboard cords.



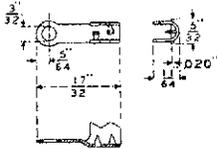
No. 47
Tinned, eyelet tip; for use on plug end of switchboard cords.
Replaces Nos. 23 and 27.



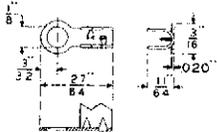
No. 120
Tinned; solderless tip having two tangs for making contact with tinsel conductor.
Replaces No. 101.



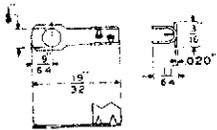
Cord tips (continued)



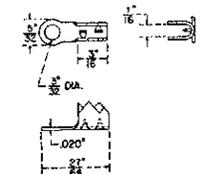
No. 121
Tinned; solderless tip having two tangs for making contact with tinsel conductor.
Replaces No. 102.



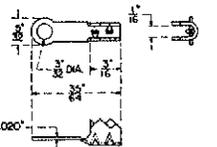
No. 122
Tinned; solderless tip having two tangs for making contact with tinsel conductor.
Replaces No. 104.



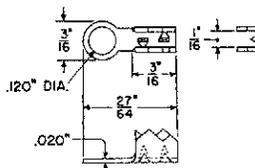
No. 123
Tinned; solderless tip having two tangs for making contact with tinsel conductor.
Replaces No. 109.



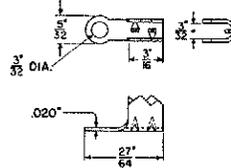
No. 132
Tinned; solderless tip having two tangs for making contact with tinsel conductor.
Slotted for No. 2 screw.



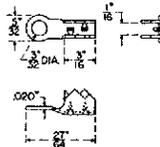
No. 133
Tinned; solderless tip having two tangs for making contact with tinsel conductor.
Slotted for No. 2 screw.



No. 135
Tinned; solderless tip having two tangs for making contact with tinsel conductor.
Slotted for No. 4 screw.

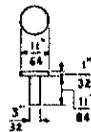


No. 139
Tinned; solderless tip having two tangs for making contact with tinsel conductor.
Slotted for No. 2 screw.

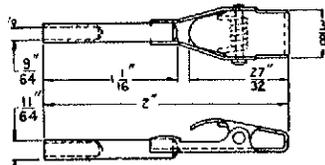


No. 140
Tinned; solderless tip having two tangs for making contact with tinsel conductor.
Slotted for No. 2 screw.

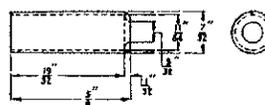
MISCELLANEOUS CORD TIPS



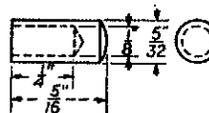
No. 55
Tinned, for use with transmitter cords.



No. 59
Nickel-plated, brass spring tip with one-piece shank.

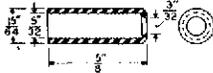


No. 76
Synthetic resin sleeve intended to cover the exposed portion of the No. 30 Cord Tip.



No. 80
Nickel-plated; for use with high efficiency receivers.

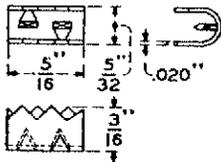
Cord tips (continued)



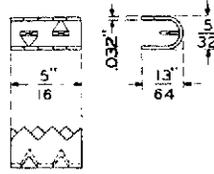
No. 106
Synthetic resin sleeve intended to cover the exposed portion of the No. 29 Cord Tip.



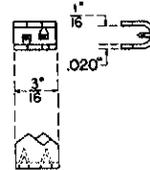
No. 110
Flexible neoprene tubing for protecting the conductors on the plug end of cords arranged for use with No. 289A Plug.



No. 129
Solderless nickel-plated, for use on rubber insulated tinsel conductors covered by a conductor braid.



No. 130
Solderless nickel-plated. The length of the cord tip is such that it can be concealed in a receiver leaving no part exposed which would permit an operator to come in contact with the current.



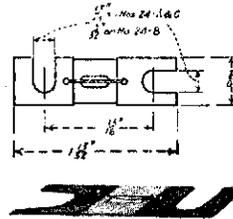
No. 138
Tinned; solderless tip having two tangs for making contact with tinsel conductor.

Fuses

NON-ALARM TYPE FUSES

These fuses will mount on 1 inch centers by means of fuse posts or individual porcelain mounting as in the No. 62D Protector. The overall dimensions are: length $1\frac{1}{2}$ inch, width $\frac{1}{2}$ inch. The current carrying capacities and operating current values are given in the table below.

In ordering it is necessary that both the code number and rated capacity be given.



No. 24 Type Fuse

Fuse Code No.	Rated Capacities (Amperes)	Operates in Less Than One Minute on (Amperes)	Terminals		Replaces
			Finish	Size of Screw Slotted for	
24C	2	3	Tinned	No. 10	No. 24B—2 amp.
24D	3/4	1 1/4	Copper	No. 6	
24E	1/2	1	Tinned	No. 10	Nos. 24A and B—1/2 amp.
24F	5	7 1/2	Copper	No. 6	No. 24B—5 amp.
24G	1 1/2	2	Tinned	No. 10	Nos. 24A and B—1 1/2 amp.



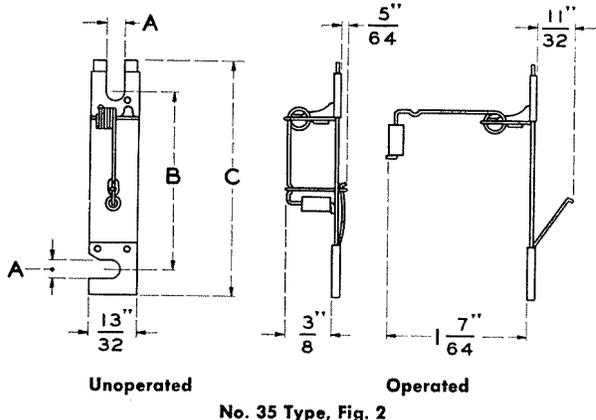
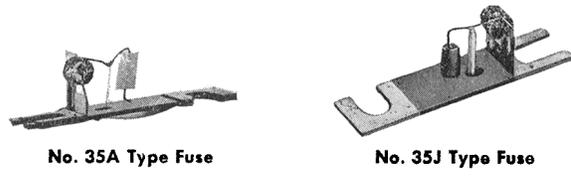
INDICATOR ALARM TYPE FUSES

These fuses have the fuse wire so mounted that one end is fastened to a coiled spring and the other to a flat spring on the opposite side of the base. The terminal ends have a copper tinned finish.

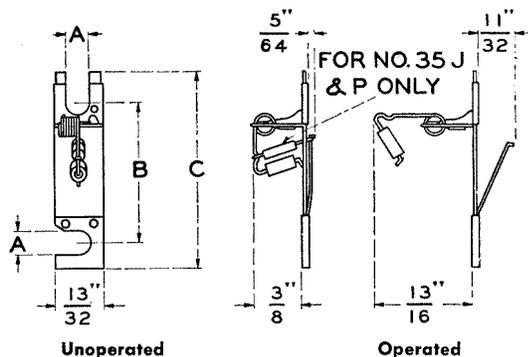
When the fuse operates, the coiled spring causes a glass bead to be brought into a prominent position where it acts as a visible indication of the blown fuse. The mounting of the fuse may be so arranged as to cause the flat spring on the bottom of the fuse to make contact with an alarm circuit when the fuse wire is broken.

No. 35 type Fuses operate on currents fifty per cent in excess of those for which they are rated.

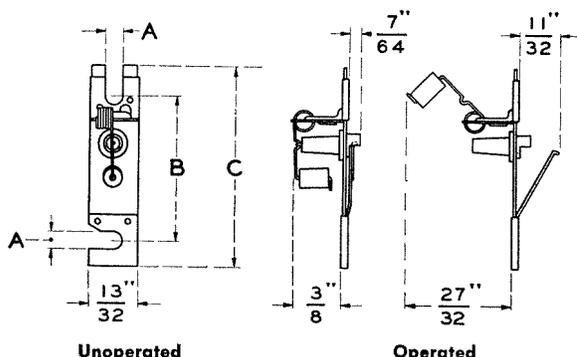
When ordering, both the code number and rated capacity should be specified.



No. 35 Type, Fig. 2



No. 35 Type, Fig. 1



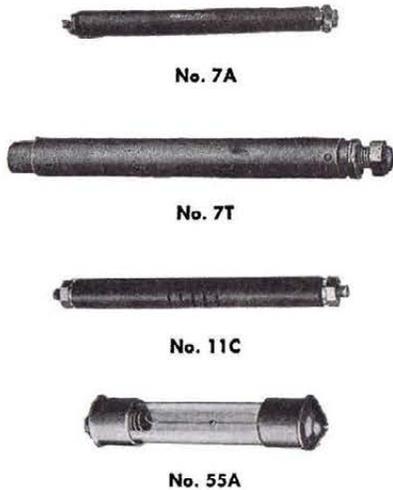
No. 35 Type, Fig. 3

Fuse Code No.	Fig. No.	Rated Amperes	Operates on		Color of Bead	Slotted for Screw	Dimensions (Inches) (See Illustration)		
			Amperes	In Less Than			A	(*B)	C
35A	1	1 1/3	2	1 1/2 Min.	White	No. 10	1 1/8	1 1/4	1 1/8
35B	1	1 1/3	2	1 1/2 Min.	White	No. 6	5/8	1 1/4	1 1/8
35C	1	2	3	3 Min.	Orange	No. 10	1 1/8	1 1/4	1 1/8
35D	1	1 1/3	2	1 1/2 Min.	White	No. 6	5/8	1 3/8	1 5/8
35E	2	3	4	5 Min.	White	No. 6	5/8	1 9/16	1 1/8
35F	1	1/2	3/4	1 1/2 Min.	Red	No. 10	1 1/8	1 1/4	1 1/8
35G	1	3	4 1/2	5 Min.	Blue	No. 6	5/8	1 1/4	1 1/8
35H	1	5	6 1/2	5 Min.	Green	No. 6	5/8	1 1/4	1 1/8
(a) 35J	1	1/2	3/4	1 1/2 Min.	Red	No. 10	1 1/8	1 1/4	1 1/8
(b) 35K	3	1 1/3	2	3 Min.	White	No. 10	1 1/8	1 1/4	1 1/8
(b) 35L	3	2	3	3 Min.	Orange	No. 10	1 1/8	1 1/4	1 1/8
(b) 35M	3	3	4 1/2	5 Min.	Blue	No. 6	5/8	1 1/4	1 1/8
(b) 35N	3	5	6 1/2	5 Min.	Green	No. 6	5/8	1 1/4	1 1/8
(a) 35P	1	3/4	1 1/8	1 1/2 Min.	Brown	No. 10	1 1/8	1 1/4	1 1/8
(c) 35R	1	.180	.270	1 1/2 Min.	Yellow	No. 10	1 1/8	1 1/4	1 1/8
(a) 35S	1	1/4	3/8	1 1/2 Min.	Milk-White	No. 10	1 1/8	1 1/4	1 1/8

- (a) For repeater plate supply circuits, or in similar circuits using 100 to 160 volts. Fuse wire enclosed in glass tube to prevent side flash.
- (b) For use in 150 volt circuits. Fuse wire enclosed in porcelain tube to prevent side flash.
- (c) Satisfactory for use in circuits operating up to 160 volts if current is limited as covered in standard information on fuse boards.
- (*) Mounting centers shown allow for 1/16" clearance.

Fuses (continued)

TUBULAR FUSES



The Nos. 7A, 7T and 11C Fuses are fibre shell type fuses made from carefully selected materials. The use of lead fuse wire in these fuses prevents any possible overheating of the shell.

The No. 55A Fuse consists of a glass tube equipped at both ends with tinned caps to which the fuse element is attached.

These fuses will carry their rated currents indefinitely without injury and will act reliably on one and one-half times their rated current values. Fuses of the same code number and rated capacity will give consistent performance as to rated and operating current values.

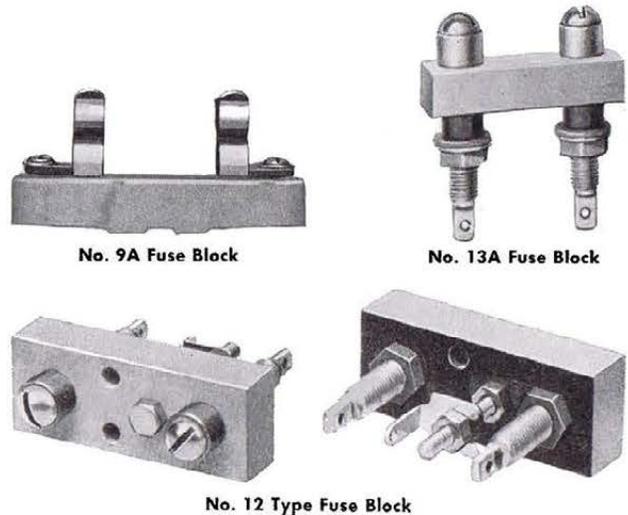
Fuse Code No.	Rated Capacity Amperes	Used With
7A	1, 2, 3, 4, 5 or 7 as specified	Nos. 77, 98A, 98B, 1074A, 1075A and 1078A, 1093 Protectors
7T	7	"B" Cable Terminals and Fuse Chambers
11C	7	Nos. 58AP and 1079AP Protectors
55A	0.4	No. 9A Fuse Block

DUMMY FUSES

These fuses are composed of black insulating material and are for use on fuse panels not equipped with fuses.

Fuse Code No.	Fuses Used in Place of	Overall Dimensions Inches
63A	35A, B, C or F	1 1/8 x 1/2 x 3/4
64A	24 or 44 Type	1 3/8 x 1/2 x 3/4

Fuse blocks



NO. 9A TYPE FUSE BLOCK

A porcelain block provided with clips for holding one No. 55A Fuse.

NOS. 12, 13 AND 15 TYPE FUSE BLOCKS

The 12 and 13 type Fuse Blocks are blocks of insulating material equipped with two fuse posts. They are arranged for use on 3/2" mounting plates. To permit insertion and removal of fuses, the following clearances are necessary between the centers of the fuse posts and the adjacent surface of the apparatus:

When mounted vertically (top post for transverse slot of Fuse)—3/8" to left of post, 3/4" above top post.

When mounted horizontally (right post for transverse slot of Fuse)—3/4" to right of post, 7/8" above posts.

The No. 12 Type Fuse Block is equipped with an alarm stud and terminal. When mounted either horizontally or vertically will mount on 9/16" centers when placed side by side, or 2-1/16" centers when placed end to end. Fuse Posts are attached for mounting and are provided with insulating bushings, washers and nuts.

The No. 13A Fuse Block when mounted either horizontally or vertically will mount on 1/2" centers when placed side by side, or 1-11/16" centers when placed end to end. Provided with insulating bushings and washers.



Fuse Bl. Code No.	Equipped with Fuse Post Nos.	Arranged for Fuses
12E	{ 1-5E } { 1-5F }	35A, 35C, 35F or 35J
12F	{ 1-6C } { 1-6E }	35B, 35D, 35G, or 35H
13A	2-5E	24A or 24C

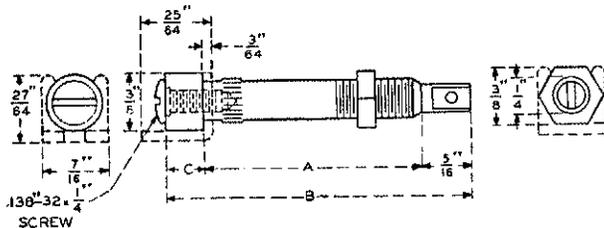
Closest recommended mounting centers are $\frac{9}{16}$ ". To permit insertion and removal of fuses, the following clearances are necessary between the centers of the fuse posts and the adjacent surface of other apparatus (top post for transverse slot of fuses): $\frac{3}{4}$ " above top post, $\frac{7}{8}$ " to left of posts, $\frac{3}{8}$ " below lower post.

NO. 15 TYPE FUSE BLOCK

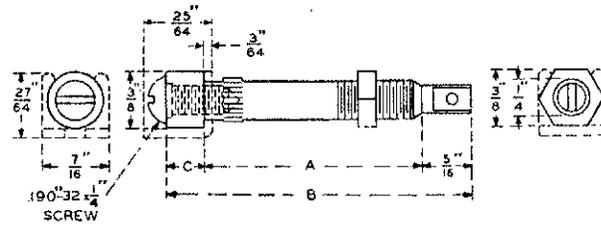
The No. 15 type Fuse Block consists of a block of insulating material with two fuse posts and an alarm stud terminal. Intended for vertical mounting only on $1\frac{3}{32}$ " wide mounting plates, $\frac{3}{32}$ " or $\frac{7}{32}$ " thick.

Fuse Bl. Code No.	Equipped with Fuse Post Nos.	Arranged for Fuses
15A	1-5E and 1-5F	35A, C, F, J, K, L, P or R
15B	1-6C and 1-6E	35B, D, E, G, H, M or N

Fuse posts



No. 5 Type Fuse Post



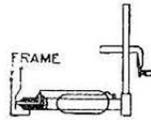
No. 6 Type Fuse Post

The Nos. 5 and 6 type Fuse Posts will mount on $\frac{1}{2}$ " centers except Nos. 5D, 5F and 6D which mount on $\frac{9}{16}$ " centers.

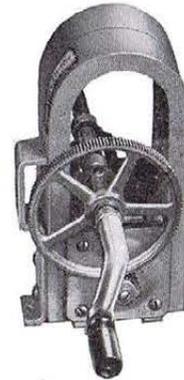
Fuse Post Code No.	Overall Dimensions (Inches)			Finish	Screw No.	Used with Fuse No.
	Length	Width	Depth			
5A	2	$\frac{7}{16}$	$\frac{1}{8}$	Nickel Dip	10	Nos. 24 and 35 Types
5C	2 $\frac{3}{4}$	$\frac{7}{16}$	$\frac{1}{8}$	Nickel Dip	10	Nos. 24 and 35 Types
*5D	2	$\frac{7}{16}$	$\frac{1}{8}$	Nickel Dip	10	Nos. 24 and 35 Types
5E	1 $\frac{5}{8}$	$\frac{7}{16}$	$\frac{1}{8}$	Nickel Dip	10	Nos. 24 and 35 Types
*5F	1 $\frac{5}{8}$	$\frac{7}{16}$	$\frac{1}{8}$	Nickel Dip	10	Nos. 24 and 35 Types
6B	2	$\frac{7}{16}$	$\frac{1}{8}$	Nickel Dip	6	Nos. 24 and 35 Types
6C	1 $\frac{5}{8}$	$\frac{7}{16}$	$\frac{1}{8}$	Nickel Dip	6	Nos. 24 and 35 Types
*6D	2 $\frac{3}{4}$	$\frac{7}{16}$	$\frac{1}{8}$	Nickel Dip	6	Nos. 24 and 35 Types

* Provided with a clip to prevent engagement of the transversely slotted ends of No. 35 Type Fuses.

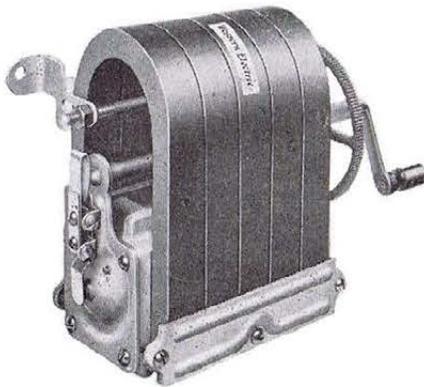
Generators



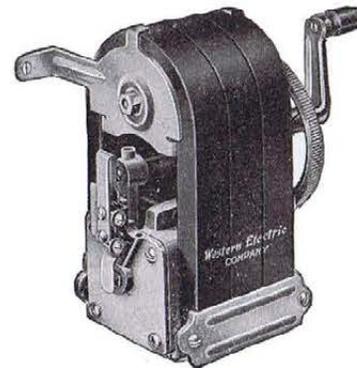
No. 22A Generator



No. 29E Generator



No. 48A Generator



No. 50A Generator

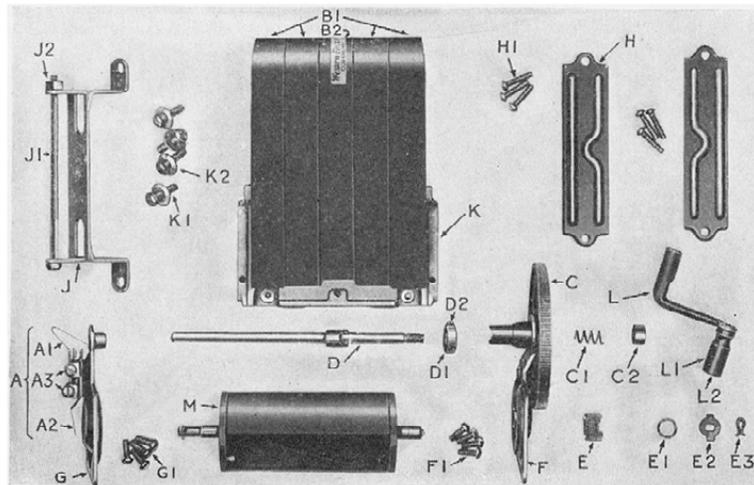
The following generators are used with subscriber sets and telephone sets as indicated. All of these generators are open circuit type.

Code No.	No. of Bars	Voltage and Current	Used With
22A	3	60 a-c	No. 303A, No. 315H Subscriber Sets; No. 1317AH, No. 1331E and F Telephone Sets
29E	2	65 a-c	No. 1375B and No. 1398A Telephone Sets
29F	2	60 a-c	Nos. 1017C, D and E Test Sets
48A	5	80 a-c	Nos. 300K, L, M, N, and 400K Subscriber Sets; Nos. 1317P, S, W, AD, AE, AW, BU, CW, Nos. 1330E, F and 1417P Telephone Sets
48C	5	80 a-c	Nos. 1278G and H, Nos. 1336E, F and H Telephone Sets
48R	5	80 a-c	No. 1317BK Telephone Set
50A	3	60 a-c	Magneto Telephone Sets where a more efficient generator than the No. 22 Type is required
*50F	3	60 a-c	Nos. 1317CG, CN, CP, CS and 301A Telephone Sets

* When the No. 50F Generator is required for maintenance purposes for the No. 301A Telephone Set, the order should specify No. 50F Generator less 1—P158949, 1—P136811, 1—P140909, 2—P101794 and 2—#10 x 3/4" R.H.W. Screws.



Hand Generator Replacement Parts



HAND GENERATOR REPLACEMENT PARTS

Part	Name of Part	22A	29E	29F	48A	48C	48R	50A	50F
A	Contact Spring Assembly	P-290217	A-107157	*	P-290216	P-290216	*	P-290216	P-290216
A-1	Shaft Contact Spring	P-46968	P-113335	P-113335	P-101468	P-101468	P-101468	P-101468	P-101468
A-2	Armature Contact Spring	P-46969	P-122967	P-122967	P-103130	P-103130	P-103130	P-103130	P-103130
A-3	But. H.M. Screw	P-128913	P-122982	P-369304	P-369304	P-369304	P-369304	P-369304	P-369304
B-1	End Magnet		P-128889	P-121728	P-139286	P-139286	P-139286	P-139286	P-139286
B-2	Center Magnet	P-139279	P-128889	P-121728	P-139293	P-139293	P-139293	P-139286	P-139286
C	Gear and Sleeve	P-139879	P-139891	P-139891	P-139889	P-139889	P-139889	P-139889	P-139889
C-1	Main Shaft Spring	P-141097	P-135611	P-135611	P-18377	P-18377	P-18377	P-141097	P-141097
C-2	Shaft Nut or Coupling	P-18378	P-149750	P-101492	P-101492	P-101492	P-158815	P-101492	P-101492
D	Shaft	P-139882	P-139862	P-139862	P-139864	P-139864	P-139864	P-139866	P-139866
D-1	Shaft Nut or Collar	P-18379	P-113451	P-113451	P-113451	P-113451	P-113451	P-113451	P-113451
D-2	Shaft Collar Screw	P-295807	P-295807	P-295807	P-295807	P-295807	P-295807	P-295807	P-295807
E	Pinion	†P-221359	P-122957	P-121699	P-101493	P-101493	P-101493	P-101493	P-101493
E-1	Pinion Spring	†P-42972		P-42972	P-42972	P-42972	P-42972	P-42972	P-42972
E-2	Pinion Washer and Pinion Cap	†P-42977	P-122964	P-103717	P-42977	P-42977	P-42977	P-42977	P-42977
E-3	Cotter Pin or R.H.M. Screw	†P-108254	P-122979	P-108955	P-108254	P-108254	P-108254	P-108254	P-108254
F	Bearing Bracket		P-131593	P-131593	P-106290	P-106290	P-106290	P-106290	P-106290
F-1	R.H.M. Screw	P-146134	P-124483	P-124482	P-250817	P-250817	P-250817	P-250817	P-250817
G	Bearing Bracket	P-18367	P-131592	P-131592	P-106289	P-106289	P-106289	P-106289	P-106289
G-1	R.H.M. Screw	P-146134	P-124483	P-124482	P-250817	P-250817	P-250817	P-250817	P-250817
H	Clamping Plate	P-5863			P-111330	P-107914	P-111330	P-113427	P-113427
H-1	R.H.M. Screw	P-41383			P-30443	P-218126	P-30443	P-30443	P-30443
J	Mounting Bracket			P-121710	P-121753	**	P-121753	P-113428	P-140909
J-1	R.H.M. Screw			P-121774	P-107906	P-107906	P-107906	P-113429	P-113429
J-2	Nut			P-121711	P-101556	P-101556	P-101556	P-101556	P-101556
K	Pole Piece		P-140483	P-131600	P-108260	P-108261	P-108260	P-113410	P-113410
K-1	Mounting Screw					P-94447	P-22779	P-22779	P-22779
	Lower	P-22779			P-22779				
	Upper	P-14943							
K-2	Washer	P-284154			P-284154	P-284154	P-284154	P-284154	P-284154
L	‡Crank Assembly	P-158949	P-135306	P-297856	P-158950	P-158950	P-158950	P-158950	P-158949
L-1	‡Crank Handle	P-18372	P-18372	P-297855	P-18372	P-18372	P-18372	P-18372	P-18372
L-2	‡Crank Stud	P-129823	P-129823	P-10172	P-129823	P-129823	P-129823	P-129823	P-129823
M	‡Armature		P-121693	P-121693	P-156430	P-156431	P-156430	P-155522	P-155522

* Order as follows: (Example) 1 Contact Spring Assembly for 48R Generator.

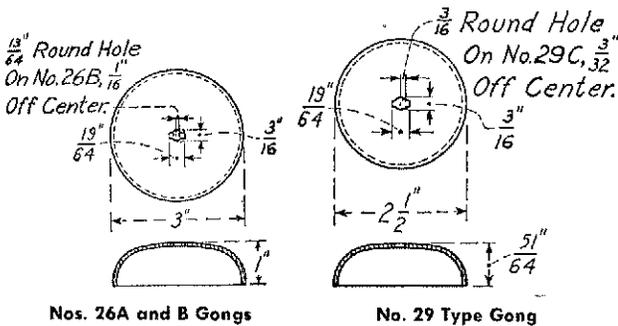
** P-106177 Left Hand Bracket P-106176 Right Hand Bracket.

† Parts listed are for use on No. 22A Generators having pinion held by means of cotter pin P-108254. If generator is an earlier type No. 22A Generator having pinion held by screw P-32588, the following parts should be ordered:

(E) Pinion Assembly P-21624 (E-1) Spring P-18375 (E-2) Pinion Cap Assembly P-21625 (E-3) Screw P-32588 plus all other parts marked † in 22A Column.

‡ Parts listed are those specified as standard equipment for the respective generators.

Gongs

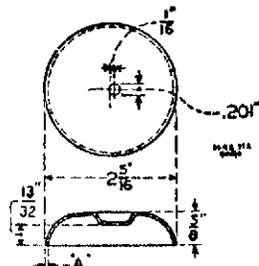


NOS. 26 AND 29 TYPE GONGS

The Nos. 26 and 29 type Gongs are brass and are furnished finished or unfinished as indicated below. The Nos. 26B and 29C have mounting holes which are located eccentrically so as to permit of adjusting the location of the gong with respect to the clapper ball by turning the gong on the gong post.

Gong Code No.	Finish	Used With Subsets
26A	Black	No. 317 type
26B	Black	Nos. 592AW, BW, CW
29A	Black	Exposed Gong type
29C	None	Nos. 533, 534, 553, 554, 634 and 653 types

NOS. 40, 41 AND 42 TYPE GONGS



Nos. 40 and 41 Type Gongs

The 40 type Gongs are intended for use on the B1A Ringer used in the H1-3 Telephone Set mounting. These gongs are unfinished. The Nos. 41A and B are ordinarily used on this type of set and the 40C, D and E are provided when gongs having a different pitch are desired.

Gong Code No.	Material	Dimensions (Inches)		
		Diameter	Height	Thickness of Metal
40C	Brass	1 3/4	1 3/8	.064
40D	Aluminum Alloy	1 3/4	1 3/8	.050
40E	Aluminum Alloy	1 3/4	1 3/8	.064

The 41A Gong is made of brass and has an eccentric mounting hole. It is designed so that a

101A Gong Attachment may be used with it when it is desired. Intended for use on B1A and similar type Ringers. Dimensions are as follows: Diameter 1 3/4", height 27/32", thickness of metal .040". Replaces No. 40A.

The 41B Gong is the same as the 41A except for tone. Dimensions are as follows: Diameter 1 3/4", height 27/32", thickness of metal .051". Replaces No. 40B.

The No. 42A is intended for use with the No. 592AW Subscriber Set when an increased sound output is desired. Dimensions are as follows: Diameter 4", height 1-13/64", thickness of metal .114". Finish, black.

No. 101A Gong attachments

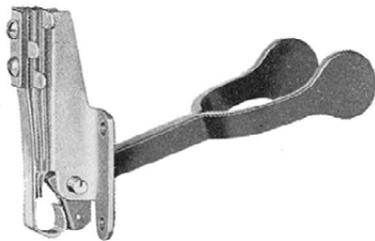
Intended for use with the 41A Gong on B1A type Ringers where greater sound output is required. Consists of a dome-shaped punching having a non-integral cap. Provided with two orifices, one on either side. When the gong attachment is mounted in a 41A Gong and the gong is hit by the ringer clapper, the air trapped inside the dome causes the gong attachment to resonate at a frequency most audible to the human ear. Consists of a brass shell and cover which are assembled when attached to the gong. Mounting washer is furnished.

Headbands

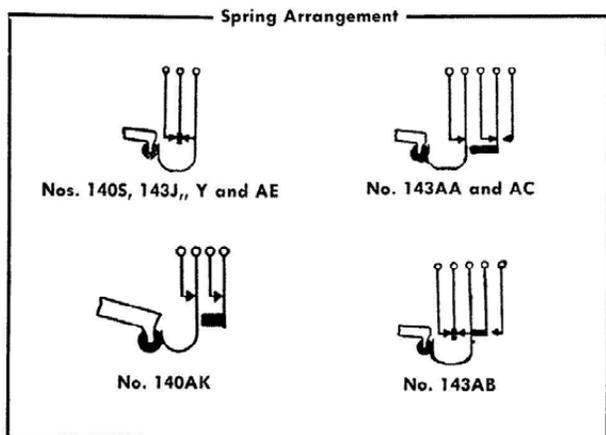
Code No.	Description
1B	Consists of a wire Headband with black artificial leather textile covering, equipped with adjustable yokes for holding two No. 525 or 528 Receivers (less the No. 3A or 11A Headbands ordinarily furnished), also for holding two No. 509 Receivers.
3B	Wire Headband covered with black sleeving and a yoke for holding the receiver. The yoke is shaped so that it will fit head receivers provided with two holes drilled in the side of the case. Intended primarily for use with the 186 Type Receiver.
3D	Imitation leather covered wire Headband of flat cross section for use with a single receiver. Used in place of No. 3A Headband with No. 528 Receiver in conjunction with No. 52AB Desk Stand.
11A	A single wire Headband arranged to hold one No. 528 or No. 716 Receiver. Made of one piece nickel finished wire. A P-204166 Pad is furnished as part of this Headband but is not assembled to it.
15A	A lightweight, adjustable, wire Headband, with fibre, single layer Pad P-477139. This Headband is a component of the No. 52 type Head Telephone Set.



Hooks, switch



No. 143Y Switch Hook



NOS. 140 AND 143 TYPE SWITCH HOOKS

The Nos. 140 and 143 type Switch Hooks are simple, compact and self-contained. The switch hook lever is made of brass with black finish and is designed to withstand rough usage. The bracket is made of steel and is extremely rigid. All iron and steel parts are finished to resist rusting. The movement of the lever is limited by stops, making it impossible for the springs to be damaged. The switch lever pivots on a fulcrum pin which is normally locked in position by means of a retaining spring. This pin may be readily removed with the fingers when desired.

The No. 140 type Switch Hooks are intended for use in metal telephones (No. 1653 type) and, therefore, no escutcheons are provided.

The No. 143 type Switch Hooks mount by means of four machine screws which pass through clearance holes in the escutcheon and thread into tapped holes in the switch hook bracket. Screws of suitable length for mounting in 1/2 inch woodwork are furnished unless otherwise specified.

The Nos. 143AC and 143AE Switch Hooks are equipped with a lever for use with the headband type of receivers such as the No. 716 type. The

other switch hooks have levers for use with standard hand receivers.

† Code Nos.

140S, 140AK, 143J*, 143Y, 143AA, 143AB, 143AC, 143AE.

† Refer to spring contact arrangements above.

* No. 143J is specially treated to resist action of moisture and fumes.

No. 1C Howler



No. 1C Howler

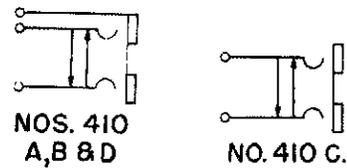
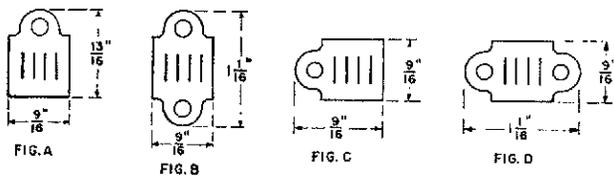
The No. 1C Howler is equipped with a bi-polar magnet structure of the same general construction as in Western Electric receivers. It is wound to 1,000 ohms resistance. The diaphragm of the howler may be accurately adjusted in relation to the pole pieces by rotating the front half of the case. When the correct position is obtained the case may be locked in position by means of a ring nut. For Morse calling in signal circuit. It is mounted on a wooden base, and is 6 1/4" x 6" x 3 1/16", overall.

Jacks

SINGLY MOUNTED—WELDED FRAME JACKS

Singly mounted, electrically welded frame type jacks are intended to be mounted with the springs in a vertical plane as indicated in Figures A, B, C and D. The letters A, B, C and D as used in the code numbers of the jacks listed below, indicate the number of mounting lugs and their arrangement with respect to the plane of the springs. Figures A, B, C and D illustrate the four arrangements of lugs and springs as indicated in the code numbers by the letters A, B, C and D respectively. The terminals of the jacks are regularly arranged to accommodate two No. 19 B&S gauge wires unless otherwise specified. Mounting screws are furnished.

Jacks (continued)



JACKS FOR USE WITH PLUGS NOS. 47, 116, 144, 151, 163, 209, 217, 221, 241, 289, 305

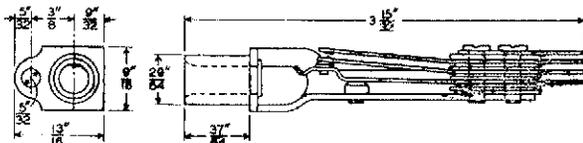
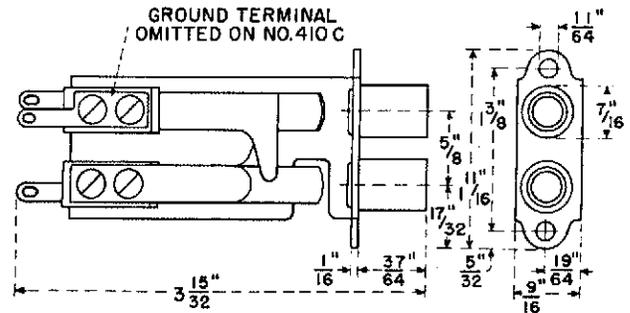
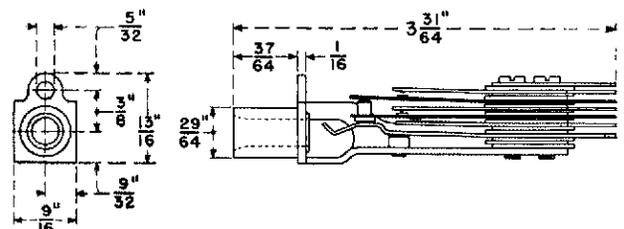
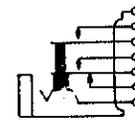
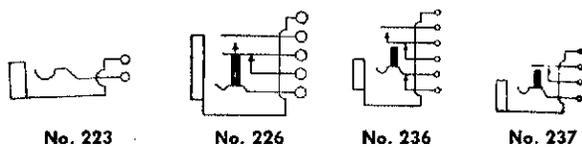
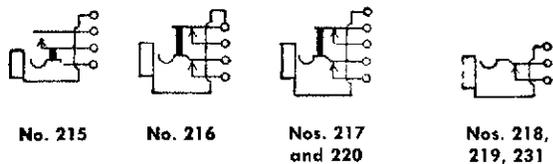


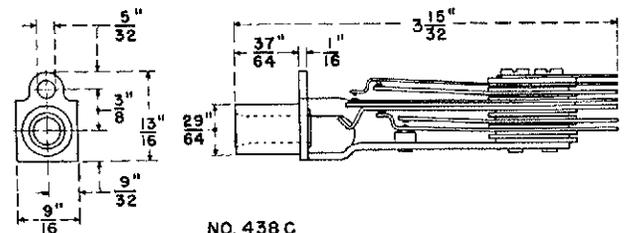
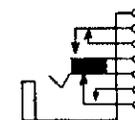
Fig. 1



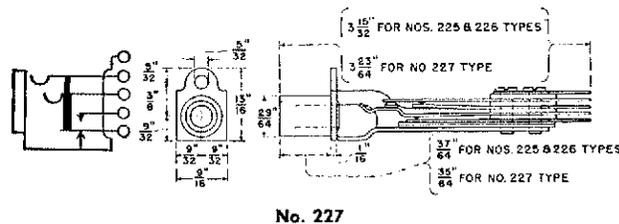
No. 410A. Also General Design and Dimensions of No. 410 Type



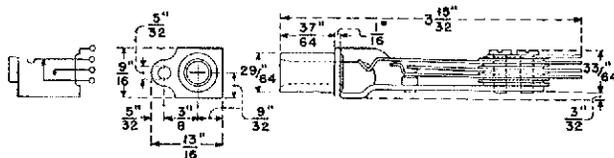
NO. 411 C



NO. 438 C



No. 227



No. 303A

The first code letter, A, B, C or D of the code numbers of jacks listed below, indicates the number of mounting lugs (single or double) and their arrangement with respect to the plane of the springs (horizontal or vertical) as illustrated in Figures A, B, C and D, above.

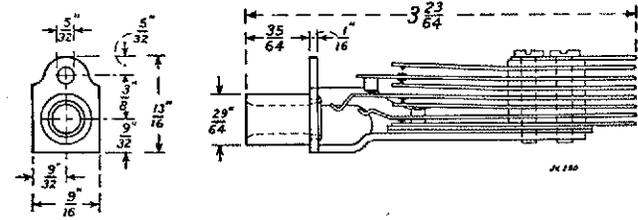
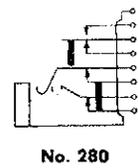
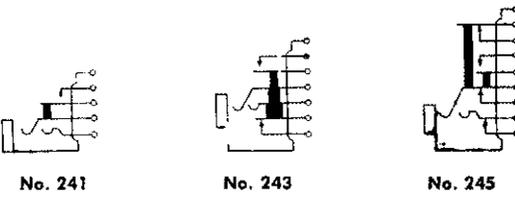
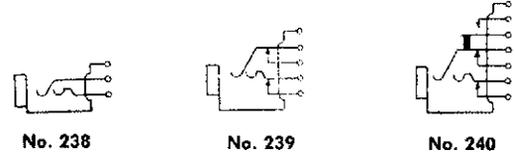
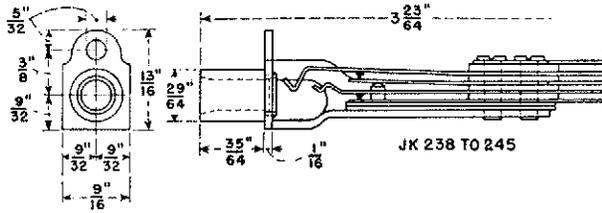
JACKS FOR USE WITH PLUGS NOS. 47, 116, 144, 151, 163, 209, 217, 221, 241, 289, 305

JACKS FOR USE WITH PLUGS NOS. 150, 184, 202, 213, 310

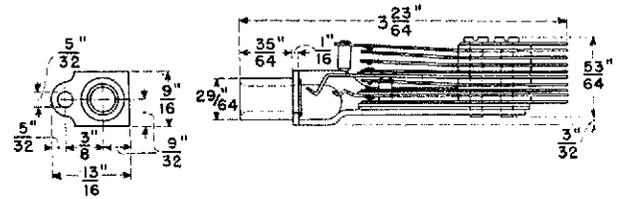
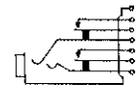
Code No.	Mounting Centers (Inches)		Replaces Jack No.
	Horizontal	Vertical	
(a) 215A	5/8	(k) 7/8	215
(a) 215B	5/8	1 1/8	
(a) 215C	7/8	5/8	
(b) 216A	5/8	(k) 7/8	216
(b) 216B	5/8	1 1/8	
(b) 216C	7/8	5/8	204
(b) 217A	5/8	(k) 7/8	217
(b) 217C	7/8	5/8	209
(c) (b) 217E	5/8	(k) 7/8	
(b) 218A	5/8	(k) 7/8	218
(b) 218C	7/8	5/8	
(b) (d) 218E	5/8	(k) 7/8	
219A	5/8	(k) 7/8	219
219B	5/8	1 1/8	
219C	7/8	5/8	155
219D	1 1/8	5/8	175
220A	5/8	(k) 7/8	220
220C	7/8	5/8	154
220D	1 1/8	5/8	176
(a) 223A	5/8	(k) 7/8	221A & C, 223
(a) 223B	5/8	1 1/8	221B & D
(a) 226A	5/8	(k) 7/8	226
(a) 226C	7/8	5/8	
(e) 227A	5/8	(k) 7/8	227
(f) 231A	5/8	(k) 7/8	
(f) 231B	5/8	1 1/8	
(f) 231C	7/8	5/8	147
(f) 231D	1 1/8	5/8	168
236A	7/8	(k) 7/8	
(g) 236B	7/8	1 1/8	
236C	7/8	5/8	189
236D	1 1/8	5/8	188
237A	5/8	(k) 7/8	
237C	7/8	5/8	185
303A	5/8	(k) 7/8	
410A	5/8	1 3/4	
(h) 410B	5/8	1 3/4	
(i) (j) 410C	5/8	1 3/4	
(i) (j) 410D	5/8	1 3/4	
411C	7/8	5/8	
438C	7/8	5/8	281A

NOTES

- (a) The Terminal of the Tip Spring is arranged to accommodate two No. 16 B & S Gauge Wires.
- (b) The Terminal of the Tip Spring and the Terminal of the Spring which makes contact with it are arranged to accommodate two No. 16 B & S Gauge Wires.
- (c) Same as No. 217A except it has a nickel-silver sleeve.
- (d) Same as No. 218A except it has No. 2 metal contacts.
- (e) The Terminals of the Tip and Ring Springs are arranged to accommodate two No. 16 B & S Gauge Wires.
- (f) Local contacts not designed for use in talking circuits.
- (g) Cannot be used with the Nos. 209, 217, and 241 Plugs.
- (h) Equipped with nickel-silver sleeve.
- (i) Tip Springs are gold plated for a distance of 3/16 inch from the end of the lips.
- (j) Contact Springs are equipped with No. 2 metal contacts.
- (k) Vertical dimensions for mounting centers shown apply when jacks are mounted with lugs in same direction; when jacks are mounted with lugs in opposite directions, the vertical mounting centers are 5/8 inch.

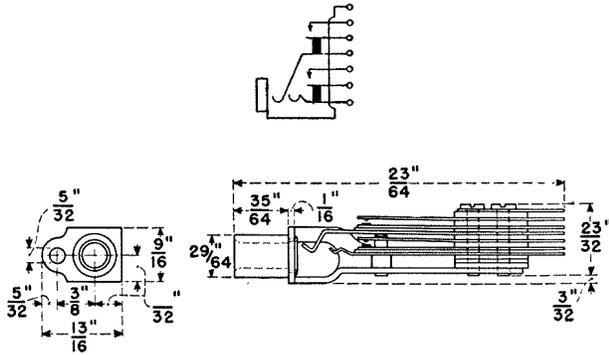


No. 280A



No. 284A

Jacks (continued)



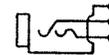
No. 285A

JACKS FOR USE WITH PLUGS NOS. 150, 184, 202, 213, 310

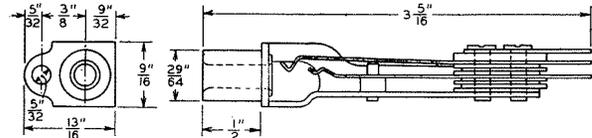
Mounting Centers (Inches)

Jack Code No.	Horizontal	Vertical	Replaces Jack No.
238A	5/8	(c) 7/8	159, 238C
238B	5/8	1 1/8	178, 238D
(a) 238E	5/8	1 1/8	
239A	5/8	(c) 7/8	160
239B	5/8	1 1/8	179
239C	7/8	5/8	260
239D	1 1/8	5/8	
(b) 239E	5/8	(c) 7/8	
240A	3/4	(c) 7/8	161
240B	3/4	1 1/8	180
240C	7/8	5/8	
241A	3/4	(c) 7/8	162
241B	3/4	1 1/8	181
241C	7/8	5/8	
241D	1 1/8	5/8	
243A	3/4	(c) 7/8	165
243B	3/4	1 1/8	184
245A	3/4	(c) 7/8	
245B	3/4	1 1/8	
245C	3/4	5/8	
280A	7/8	(c) 7/8	
280B	7/8	1 1/8	
280C	7/8	5/8	
284A	1	(c) 7/8	
284B	1	1 1/8	
285A	1 3/8	(c) 7/8	
285B	1 3/8	1 1/8	
285C	7/8	5/8	

- (a) Same as the No. 238B except equipped with a nickel-silver sleeve.
- (b) Same as the No. 239A except equipped with a nickel-silver sleeve.
- (c) Vertical dimensions for mounting centers shown apply when jacks are mounted with lugs in same direction; when jacks are mounted with lugs in opposite directions the vertical mounting centers are 5/8 inch.



No. 246



No. 246 Type

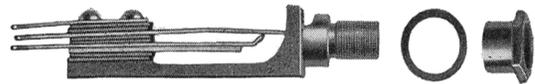
JACKS FOR USE WITH NO. 309 TYPE PLUG

Mounting Centers (Inches)

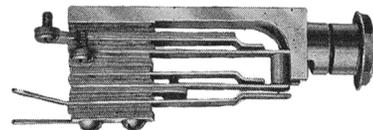
Jack Code No.	Horizontal	Vertical
246A	5/8	(b) 7/8
246B	5/8	1 1/8
(a) 246E	5/8	(b) 7/8

- (a) Same as the No. 246A Jack except equipped with nickel-silver sleeve.
- (b) Vertical dimensions for mounting centers shown apply when jacks are mounted with lugs in same direction; when jacks are mounted with lugs in opposite directions, the vertical mounting centers are 5/8 inch.

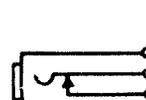
SINGLY MOUNTED— MISCELLANEOUS TYPE JACKS



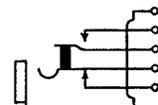
No. 200 Jack



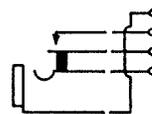
No. 224 Jack



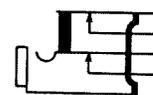
No. 200



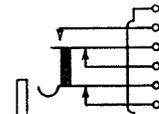
No. 203



No. 208



No. 202



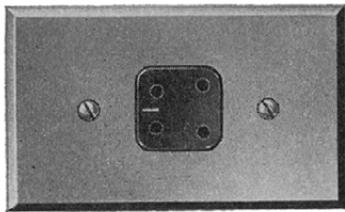
No. 224



The Nos. 200, 202, 203, 208 and 224 are phenol fibre insulated jacks. They will mount on any thickness of wood from 3/4 to 7/8 inch, the jack shank being threaded and the jack held in place by means of a nut.

Jack Code No.	Mounting Centers (Inches)*		Used with Plugs	Used in Jack Boxes
	Horizontal	Vertical		
200	1 3/8	1	47, 116	.....
202	1 5/8	1 1/8	47	.....
203	1 3/8	1 1/4	47, 116	.....
208	1 3/8	1 1/8	1A	385, 386, 389
224	1 3/8	1 3/8	47, 116	385, 386, 389

*Mounting centers specified apply when jacks are mounted with springs in the horizontal plane.



No. 403B Jack

NO. 403 TYPE JACK

The No. 403B is intended for use in connection with portable telephones on subscribers' premises and are to take care of two, three and four wire service requirements. Intended for use with No. 283B type Plugs and the jacks are arranged so that the associated plugs can be inserted in one position only.

The No. 403B type Jacks are four conductor jacks consisting of a phenol plastic mounting block with four inter-meshed coil spring contacts embedded therein, mounted on a bracket and fastened to a flush type switch plate 2 3/4" wide x 4 1/2" long. The bottom of the mounting block is provided with holes for cord connections. Switch plate, mounting screws and washers are furnished as loose parts.

The No. 403B type Jacks are designed to mount in standard electrical outlet boxes having 3-9/32" mounting centers.

Jack Code No.	Color
403B-4	Ivory
403B-6	Old Brass
403B-9	Brown
403B-14	Brushed Brass

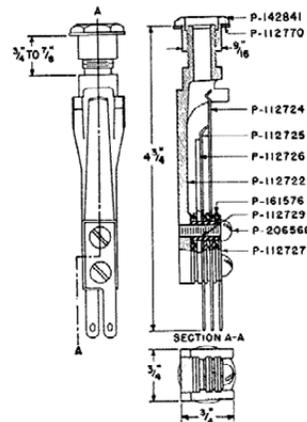
NO. 404B TYPE JACK



No. 404B Jack

Wall Type Non-Flush Mounted Jack. Otherwise same as No. 403B type.
Dimensions 1 3/4" x 1 3/4" x 1" deep.

Jack Code No.	Color
404B-4	Ivory
404B-9	Brown

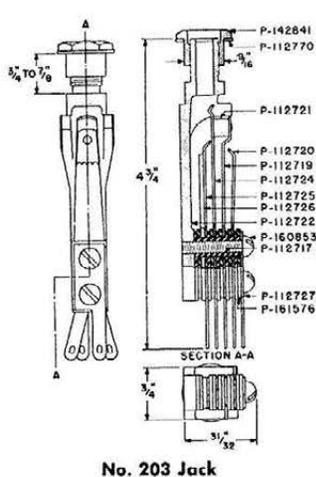


No. 200 Jack

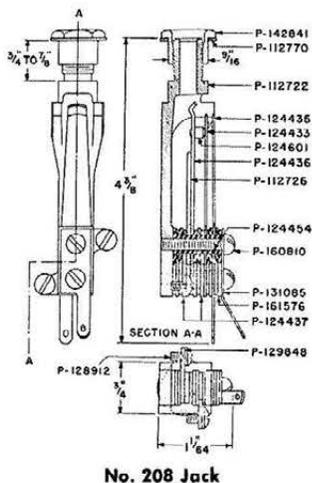
REPLACEMENT PARTS

No. 200 Jack		
Piece Part No.	No. Req.	Name
P142841	1	Sleeve Nut
P112770	1	Washer
P112724	1	Tip Spring
P112725	1	Contact Spring
P112726	1	Stop Spring
P112722	1	Frame
P161576	6 and as req.	Insulator
P112729	2	Bushing
P206568	2	R.H.M. Screw
P112727	1	Terminal

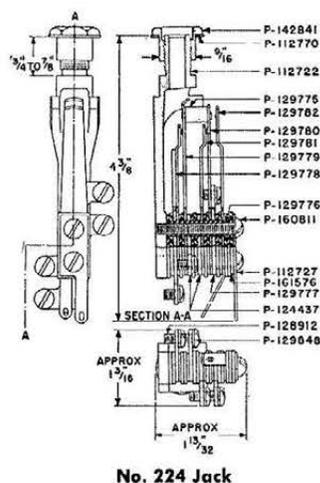
Jacks (continued)



No. 203 Jack



No. 208 Jack



No. 224 Jack

REPLACEMENT PARTS

No. 203 Jack

Piece Part No.	No. Req.	Name
P142841	1	Sleeve Nut
P112770	1	Washer
P112721	1	Bushing
P112720	1	Contact Spring
P112719	1	Contact Spring and Stud
P112724	1	Tip Spring
P112725	1	Contact Spring
P112726	1	Stop Spring
P112722	1	Frame
P160353	2	R.H.M. Screw
P112717	2	Bushing
P112727	1	Terminal
P161576	10 and as req.	Insulator

REPLACEMENT PARTS

No. 224 Jack

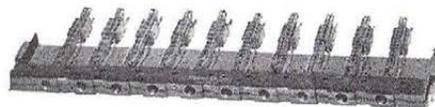
Piece Part No.	No. Req.	Name
P142841	1	Sleeve Nut
P112770	1	Washer
P112722	1	Frame
P129775	1	Bushing (Separator)
P129782	1	Contact Spring
P129780	1	Contact Spring
P129781	2	Contact Spring
P129779	1	Tip Spring
P129778	1	Terminal
P129776	2	Bushing
P160811	2	R.H.M. Screw
P112727	1	Terminal
P161576	13	Insulator
P129777	1	Terminal
P124437	2	Terminal
P128912	4	Button H.M. Screw
P129848	4	Washer

REPLACEMENT PARTS

No. 208 Jack

Piece Part No.	No. Req.	Name
P142841	1	Sleeve Nut
P112770	1	Washer
P112722	1	Frame
P124435	1	Contact Spring
P124433	1	Contact Spring
P124601	1	Separator
P124436	1	Tip Spring
P112726	1	Stop Spring
P124454	2	Bushing
P160810	2	R.H.M. Screw
P131035	1	Terminal
P161576	9 and as req.	Insulator
P124437	2	Terminal
P129848	2	Washer
P128912	2	Button H.M. Screw

JACKS FOR MOUNTING IN STRIPS

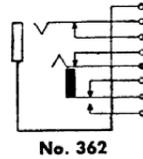
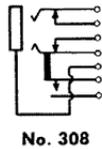
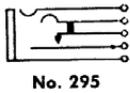
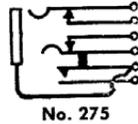
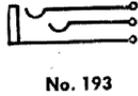
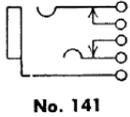
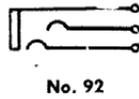
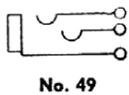


No. 137 Jack Mounting with No. 141 Jack

These jacks are designed for mounting in groups in jack mountings, a few of which are listed under "Jack Mountings." In ordering, the code number of the jack and the code number of the jack mountings should be given as well as the total number of jacks and mountings required.

The number of jacks to be mounted per strip should be specified and the numbering desired, or they will otherwise be furnished unnumbered.

These jacks are not supplied unmounted.



Jack Code No.	Used with Plug No.	Used with Jack Mounting*	No. per Strip
49	310	{114-141-142}	10 and 20
92	309	{167-168}	10 and 20
141	310	{112-115-116}	10 and 20
275	310	{136-137}	10 and 20
295	310	{112-115-116-136}	10 and 20
308	310	{137}	10
362	310	{112-115-116-136 or 137}	10
		{116-136-137}	10
		{116-136-137}	10

* For details see page 88.

Jack boxes

345A JACK BOX

Consists essentially of two 223A Jacks, two 237C Jacks and five terminal connectors mounted in an oak box. The jacks are arranged for use with two 289 type Plugs and the jacks and connectors are connected so as to permit two dispatchers to connect their head sets to the line at the same time.

Approximate overall dimensions are 5⁵/₈" high by 4³/₄" wide by 1⁷/₈" deep.

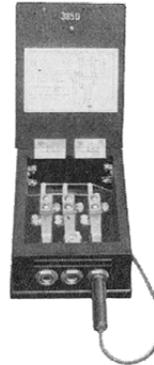
385 TYPE JACK BOXES

The 385A and B Jack Boxes are used in connection with telephone lines and the 385C and D with telegraph lines.

The 385A and C are arranged to connect an instrument to any one of two lines and the 385B and D to any one of three lines.

Woodwork oak, metal parts nickel finished.

Overall dimensions are 6¹/₄" long, 4¹/₂" wide and 2³/₄" high.



No. 385D Jack Box

Equipped With

Jack Box Code No.	Jacks	Apparatus Blank	Plug	Designation Strip (and Length)
385A	2—208,			
	Pos. 1 and 3	1—17B, Pos. 2	(*) 1A	8H (2 ¹ / ₈ ")
385B	3—208		(*) 1A	8H (2 ¹ / ₈ ")
385C	2—224,			
	Pos. 1 and 3	1—17B, Pos. 2	(*) 1A	8H (2 ¹ / ₈ ")
385D	3—224		(*) 1A	8H (2 ¹ / ₈ ")

(*) Equipped with a dummy cord.

386 TYPE JACK BOXES

The 386A and C Jack Boxes are used in connection with telephone lines and the 386D and F with telegraph lines.

The 386A is arranged to connect an instrument to any one of four lines, and the 386C and F to any one of six lines.

Woodwork oak, metal parts nickel finished.

Overall dimensions are 6¹/₄" long, 7-5/16" wide and 2³/₄" high.

Equipped With

Jack Box Code No.	Jacks	Apparatus Blank
386A	4—208	2—17B
386C	6—208	
386D	4—224	2—17B
386F	6—224	

In addition to the above listed equipment each of these Jack Boxes also has a 1A Plug with a dummy cord, and an 8H Designation Strip (5⁵/₈" long).



No. 386C Jack Box



No. 389A Jack Box

389A JACK BOXES

The 389A Jack Box is used to connect a telephone set to any one of twelve telephone lines.

Woodwork is oak and the trimmings are nickel finished.

Jack boxes (continued)

Overall dimensions are 6¼" long, 7-5/16" wide, and 4⅝" high.

Jack Box Code No.	Equipped With			Designation Strip (and Length)
	Jacks	Plug		
389A	12—208	(*) 1A		8H (5⅝")

(*) Equipped with a dummy cord.

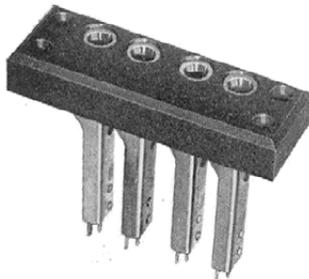
Jack mountings

For central battery exchanges it is customary to have the multiple jack strips in each panel separated into groups of five rows by thin white holly strips. Each group consists of one hundred jacks numbered 0 to 99. Each strip has 20 jacks

and is divided into four smaller groups (each having five jacks) by a distinctive mark so that an operator may readily choose the proper jack. Some of the jack mountings have a groove on the lower edge for marking the jacks for various purposes such as signifying that several adjoining jacks are connected to one private exchange, etc.

In ordering, specify the number of jacks and the Code No., the Code No. of the jack mounting with the number per strip, together with the numbering desired. If the holly strips are to be attached to the upper edge of any of the jack mountings the order should specify which ones.

Mountings will be furnished unnumbered unless otherwise specified.



No. 30 Jack Mounting Equipped with Jacks



No. 80 Jack Mounting Equipped with Jacks



No. 199A Jack Mounting

Jack Mounting Code No.	Used with Jack No.	Ordinarily Used with Plug No.	No. of Jacks per Strip	Arranged for Number Plate No.	Mounting Face Dimensions (Inches)	
					Length	Width
21	70 or 359	310	10	—	9 1/8	1 1/8
(c) 30	234		4	—	3 3/4	1 1/4
(*) 80	99 or 234	347A & B	2	—	2 3/8	1 1/4
(a) 114	49	310	20	—	9 3/8	7/8
(a) 116	141, 275, 295, 308, 362	310	10	—	10 1/2	1 1/8
135	236C	347A & B	30	21B	21 3/4	1 3/8
(a) 136	141, 275, 295, 308 or 362	310	10	—	11 1/8	1/2
(a) 137	141, 275, 295, 308 or 362	310	10	5B	11 1/8	1/2
(a) 141	49 and 50	310	10	—	9 3/8	7/8
(b) (a) 142	49 and 50	310	10	31, 32, 59	9 3/8	7/8
143	238A	310	10	—	9 3/8	1
144	238A, 239A, 240A	310	8	—	9 3/8	1
145	229	309	10	—	7 3/8	1 1/8
185	218		48	2—127A	16 1/8	2 1/8
189A	240A	310	10	—	11 1/8	1 5/8
(b) 189C	284B	310	10	—	11 1/8	1 1/8
(b) 199A	364 or 396	289B, 347A & B	4	—	3 3/4	1 1/4
207A	284B	310	10	—	11 1/8	1 3/8
(b) 230A	218A	347A & B	52	153A & B	17 1/8	1 3/8
(b) 230B	218A	347A & B	26	153A & B	17 1/8	1 3/8

NOTES

- (*) The No. 80 Jack Mounting is so designed that the twin plug of an operator's headset may be inserted in each pair of jacks.
- (a) Lower edge of face is grooved.
- (b) Not obtainable with numbering.
- (c) The No. 30 Jack Mounting is equipped with 2 No. 223A Jacks and 2 No. 237C Jacks for use in the No. 345A Jack Box. Two dispatchers headsets may thus be connected to the line through the use of 2 No. 289 type Plugs.



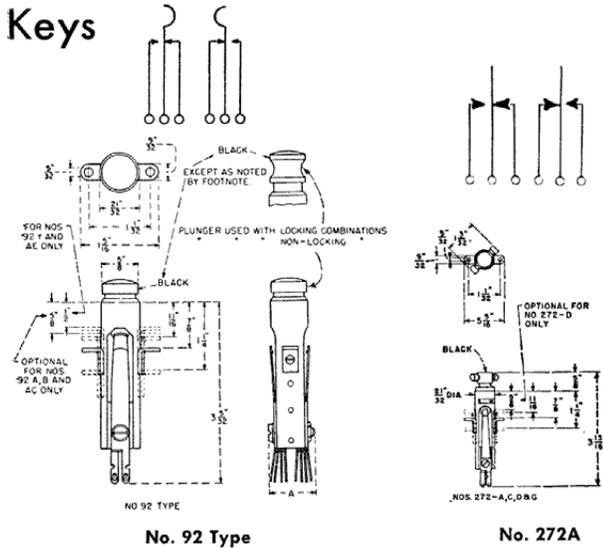
NO. 148 JACK MOUNTING



No. 148 Jack Mounting

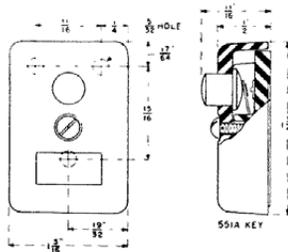
This ebony finished wood box is primarily designed for mounting a No. 218A or similar type Jack on the side of a desk. Two wood screws with washers are provided for fastening it in place. The overall dimensions are length 5 inches, width $2\frac{5}{16}$ inches and depth $1\frac{2}{3}\frac{1}{2}$ inches.

Keys



No. 92 Type

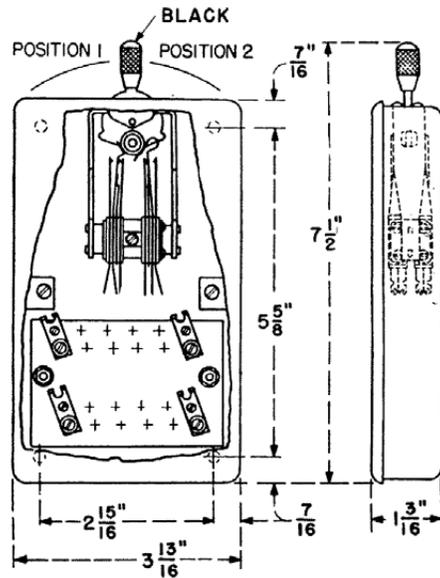
No. 272A



No. 551A Key

Key Code No.	Description	Used
92A	Single mounted push button key. Non-locking. For $\frac{7}{8}$ or $1\frac{1}{4}$ inch shelf. Has two sets of one break before make contact springs.	As a ringing key.
92B	Same as No. 92A except that it is a locking key.	As a listening key.
272A	Single mounted locking key. Has two sets of one break before make contact springs. Key is operated by a turning movement of button. For $\frac{7}{8}$ and $1\frac{1}{4}$ inch shelf.	In Nos. 1A and 1B Test Boards.
551A	Single mounted push button key. Non-locking. Enclosed in a black case. Push button is black. Provided with a window having a transparent face strip for mounting a designation card.	Where one push button is required.

NOTE—When ordering keys Nos. 92A, 92B, or 272A unmounted, specify the thickness of the shelf or table top in which key is to be mounted.



No. 6017E—Cover Removed

Keys (continued)

KEYS—BOX TYPE



Fig. A
One Make

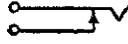


Fig. B
One Break



Fig. C
One Break Before Make

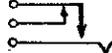
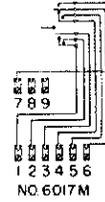
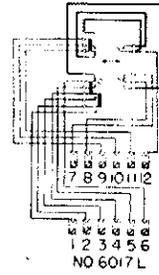
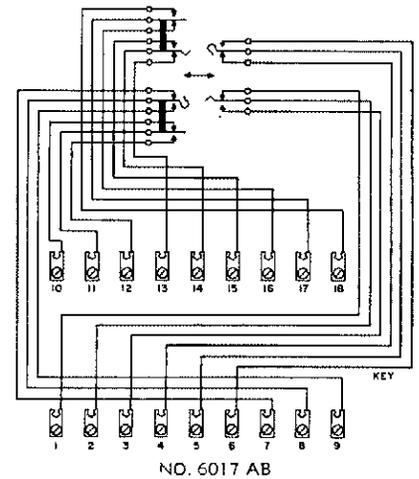
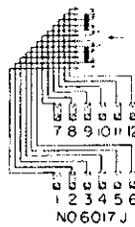
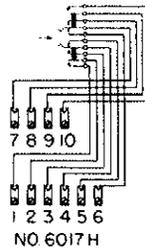
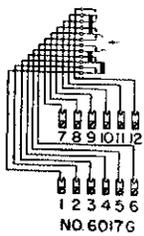
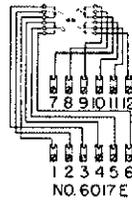
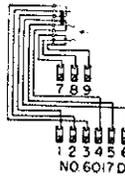
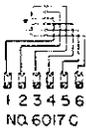
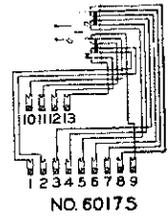
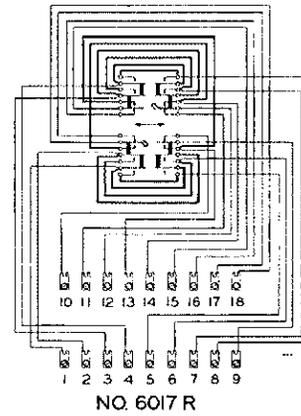
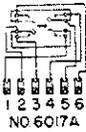


Fig. D
One Make Before Break



The above contact spring arrangements represent the normal or unoperated contact spring position of the keys listed below.



No. 6017 Type Key Wiring Diagram Spring Combinations



The No. 6017 type Key consists of a key unit and connecting block, mounted in a black finished metal box. Overall dimensions: length 7½ inches; width 3-13/16 inches; depth 1-3/16 inches.

Key Code No.	No. of Contact Springs	Key Unit No.	Spring Combination	Contact Spring Arrangement		Intended for Use as
				Position 1	Position 2	
(a) 6017A	8	2BF	Locking-Locking	2 sets Fig. A	2 sets Fig. A	Switching key to connect a telephone instrument on either one or both of two lines.
(b) 6017B	6	2GP	Locking	2 sets Fig. C	.....	Switching key to connect a telephone instrument on either one of two lines.
(c) 6017C	6	2F	Non-locking	2 sets Fig. C	.....	Ringing key at substations.
(d) 6017D	9	2CL	Locking	.....	3 sets Fig. C	Switching key. Makes three and breaks three contacts (acts same as a 3 pole, double throw switch)
(e) 6017E	12	2GR	Locking-Locking	2 sets Fig. C	2 sets Fig. C	Switching key. Makes two and breaks two contacts when the lever is thrown to the left or to the right.
6017G	12	2AKE	Locking	.....	{ 2 sets Fig. C 3 sets Fig. B	
6017H	10	2WB	Locking	{ 2 sets Fig. C 2 sets Fig. A	.....
6017J	12	2GE	Locking	.....	4 sets Fig. C	
(f) 6017K	6	2GP	Locking	2 sets Fig. C	.....
6017L	17	2AND	Locking-Locking	{ 1 set Fig. C 1 set Fig. A	{ 2 sets Fig. C 3 sets Fig. A }	
6017M	7	2ANJ	Non-locking	(g)	.....
6017P	6	2EE	Non-locking	.....	2 sets Fig. C	
6017R	28	2ANP	Non-locking	{ 2 sets Fig. C 4 sets Fig. A	{ 2 sets Fig. C 4 sets Fig. A }	
6017S	13	2APR	Locking	3 sets Fig. C 1 set Fig. A 1 set Fig. B	..... ..... .....
6017Y	4	2AAR	Locking- Non-Locking	1 set Fig. A	1 set Fig. A	
6017AA	7	2ATN	Non-Locking	1 set Fig. C 1 set Fig. C (plus a make on outer contact)	.....	Replaces 465A and 465E
6017AB	18	2RF	Locking-Locking	2 sets Fig. C	4 sets Fig. C	

(a) Replaces No. 6002A.

(b) Replaces No. 6002B.

(c) Replaces No. 6002C.

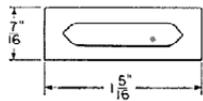
(d) Replaces No. 6002D.

(e) Replaces Nos. 6002E and 6000B.

(f) Nos. 6017B and K are the same except that on No. 6017B the No. 2GP Key Unit is adjusted for break-before-make whereas on No. 6017K the No. 2GP Key Unit is adjusted for make-before-break.

(g) Has one set Fig. D and a four spring set consisting of a make preceding a break-before-make.

Micas, protector



No. 10 Protector Mica

Code No.	Used with Protector Blocks	Used with Protectors
10	Nos. 19 and 20	Nos. 60B and 80A
*11	Nos. 19 and 20	No. 17B

* No. 11 Mica is twice as thick as the No. 10.



No. 347A and B



No. 151

Plugs



No. 309



No. 310



No. 283B-4



FIG. 1

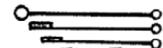


FIG. 3

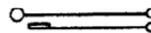


FIG. 2

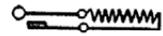
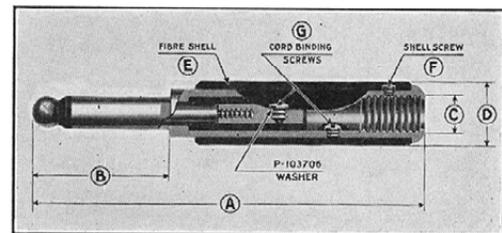


FIG. 4



Dimensions and Replacement Parts

PLUGS

DIMENSIONS AND REPLACEMENT PARTS

Plug Code No.	Conductors	Dimensions (Inches)				Used with Jack Nos.	Used with Cords	Notes	Replacement Parts (See Cut)		
		A	B	C	D				E	F	G
1A	Fig. 1	3 1/8	1 1/8	1/8	1/8	Same as for 347 type Plug	S1A	{Shell Frame {Fully Insulated	P-146711	P-284008	P-84662
116	Fig. 1	3 1/8	1 1/8	1/8	1/8	Same as for 347 type Plug	P1A, S1A	*Has Red Shell	P-81335	P-284008	P-84662
136	Fig. 2	3 1/8	1 1/8	3/8	1/8	99, 152	R2CM	Has Red Shell	P-81335	P-284008	P-284007
144	Fig. 1	3 3/8	1 1/8	3/4	1/8	Same as for 347 type Plug	W1A	Has Cord Bushing	P-81335	P-284008	P-84662
145	Fig. 2	3 1/4	1 3/8	1 1/4	1/8	32C Comb. J and S	S2D	.....	P-81200	P-285371	P-82341
150	.....	3 3/2	1 3/4	.....	3/4	Same as for 310 Plug	None Required	{For plugging out {signals in lines {in trouble	P-141633	P-284008	.....



PLUGS
DIMENSIONS AND REPLACEMENT PARTS

Plug Code No.	Conductors	Dimensions (Inches)				Used with Jack Nos.	Used with Cords	Notes	Replacement Parts (See Cut)		
		A	B	C	D				E	F	G
151A) 151B}	.....	3 1/4	1 1/8	.....	3/4	Same as for 347 type Plug	None Required	**For plugging out signals in lines in trouble	P-141307 P-203133	P-284107 P-284107	.....
153D) 153E) 153F}	Fig. 4	5 3/4	1 1/8	.....	3/4	Same as for 347 type Plug	None Required	See Note 1	P-236705 P-236706 P-231940	P-284106	.....
165C) 165D}	.....	2 3/4	1 1/4	.....	1/8	Same as for 116 and 347 type Plug	.....	See Note 2	.....	.....	.....
221	Fig. 2	3 3/4	1 1/8	1/8	3/4	Same as for 347 type Plug	Same as for 347 type Plug	Has large red insulating shell	P-203388	P-284008	P-284007
258C) 258D}	.....	1 3/4	1 1/4	.....	3/4	Same as for 310 Plug	.....	{258C has black insulating material. 258D has red insulating material	.....	.....	.....
274A-4) 274A-9}	.....	1 1/4	3/4	.....	1 3/4	391A and 392A	.....	{Eight contact plugs for use with portable telephones at subscribers stations	P-298650 P-298704	P-298651 P-299033	.....
283B-4) 283B-6) 283B-9}	Two Fig. 2's	1 3/8	3/4	.....	1 3/2	403 and 404 type	D2E, D3AM, D3AP, D4W, D4AJ	{Ivory Finish Old Brass Finish Brown Finish	P-372121 P-372120 P-372119	P-335616	P-242852
309	Fig. 3	3 1/8	1 3/2	3/2	3/8	92, 229 and types 246, 248, 249, 323, 445	S3A, S3B, P2B, W3C, W2C, S2B	*Long Red Shell	P-475817	P-284106	P-284007
310	Fig. 3	3 3/4	1 1/4	1/8	3/4	49, 50, 70, 138, 141, 275, 295, 308, 347, 359, 362, 365 and types 238 to 245, 267, 280, 284, 285, 289 to 291, 293, 324, 326, 360, 363, 372, 382, 387, 446	S1B, P1C, P3E, S3A, S3B, P2B, W3C, W2C, S2B, S1B, P1C, P3E	*Long Red Shell	P-475860	P-285371	P-284007
347A) 347B}	Fig. 2	3 1/2	1 3/2	1/8	1/8	99 and types 215, 216, 217, 218, 219, 220, 221, 223, 225, 226, 227, 230, 231, 232, 233, 234, 235, 236, 237, 281, 297, 303, 309, 327, 353, 355, 361, 364 and 396	P2A, W2F, P1B, P2T, R2DA, W2CG	{Long Red Shell Long Black Shell	P-243875 P-243875}	P-284008	P-284007

Note 1. The No. 153 type Plug has a resistance unit connected so that when the plug is inserted in a jack the resistance unit is bridged across the tip and sleeve spring. The values are as follows: No. 153D Plug, 400 ohms, No. 153E Plug, 600 ohms, No. 153F Plug, 800 ohms. Intended for limiting the current in telegraph circuits. Equipped with a thermostatic device which short-circuits the tip and sleeve if the current becomes too great, thus operating the protective device in the circuit. The butt ends of the plugs are colored red, white or blue so that the different plugs can be readily identified.

Note 2. The No. 165C and D type Plugs are the same except that the No. 165C is made of black insulating material and No. 165D is made of red insulating material. Dummy plugs for use with jacks which take the No. 116 or No. 347 type plugs.

* The following shells can be furnished for the Nos. 116, 309 and 310 Plugs when specified in order:

Plug No.	Gray Shell	Black Shell
116	.....	P-110576
309	P-294650	P-474886
310	P-237246	P-237245

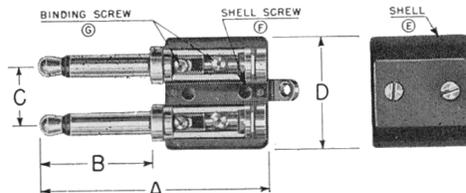
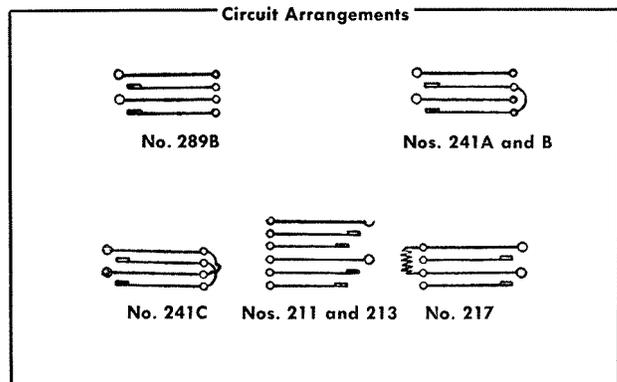
** No. 151A has red shell. No. 151B has black shell.

Plugs (continued)

TWIN PLUGS

When an operator's headset is to be used at a switchboard, it is convenient to wire two adjacent jacks for providing the necessary connections into the switchboard circuit and to use a twin plug in these two associated jacks in order that the necessity for the operator handling two separate plugs may be avoided. This practice is now standard and jack mountings are designed for use with jacks so mounted that a twin plug may be inserted only in those jacks which are to be used together.

These plugs include a self-adjusting or flexible feature which allows sufficient movement of each plug in the shell to take up any slight off-centering present in the jacks.



TWIN PLUGS
DIMENSIONS AND REPLACEMENT PARTS

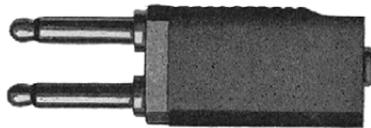
Plug Code No.	Conductors (Each Plug)	Dimensions (Inches)				Used with Jack Nos.	Used with Cords	Used for	Replacement Parts (See Cut)		
		A	B	C	D				E	F	G
186	2	1 3/8	3/8	7/16	1 1/4	—	R2CD	19C Test Set	P-205776	P-158989	.....
211	3	3 3/8	1 3/4	7/16	1 1/8	49	.....	.....	P-218333	P-284106	P-284007
213	3	3 3/8	1 3/4	1/8	1 3/8	49, 50, 70, 141, 238-245, 259, 260, 274, 275, 295	.....	.....	P-218335	P-284106	P-284007
217D	2	4 1/8	1 3/8	5/8	1 3/4	215, 216, 217, 218, 223, 225, 226 and 227 types	.....	See Note 1	P-167708	P-284008	P-82239
241A } 241B } 241C }	2	3 1/8	1 1/4	5/8	1 3/8	215, 297 and similar types	P3N, S3F, P2AA, P2T, P3J (See Note 2)	Black Shell Red Shell Black Shell	P-286061 P-206010 P-286061	P-229777 P-229777 P-229777	...............
*289B	2	2 7/16	1 3/8	5/8	1 1/4	364 or similar types	L2K, L4P, P4L, P4N, L4R, L6E, L2P or similar	Operators' Telephone Sets	**	P-238143	P-284007
327A	2	3 3/8	1 1/4	5/8	1 3/8	99, 236A, 236C, 236D, 438C and types 215, 216, 217, 218, 219, 220, 223, 225, 226, 227, 230, 231, 232, 233, 234, 235, 237 and 297	W2CA, P2AL, P2AM and P4H	Grooved to mark proper way of inserting Plug in Jack	P-474988 P-239573	P-238861	P-284007

Note 1. The No. 217D has a resistance bridged across the tip springs. Approximate resistance 600 ohms ± .85. Engraving on end "600 NL."

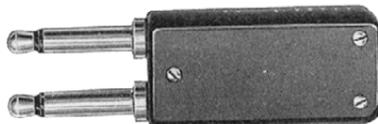
Note 2. The No. 241 type Plug has brass frames of the two plugs electrically connected to the two plug sleeves. No. 241A and B Tips separately insulated. No. 241C Tip Conductors connected electrically.

* The No. 289B Plug replaces and is interchangeable with Nos. 137, 152, 246A and 289A Plugs so far as use with jacks is concerned, but cannot be used on cords arranged for these plugs. Used with No. 364 or similar type Jacks mounted on No. 199A or similar Jack Mountings.

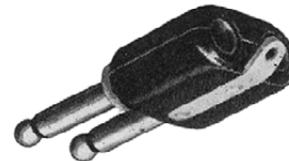
** Shell half (grooved) P-371708; Shell half P-371707.



No. 241 Plug



No. 327A Plug

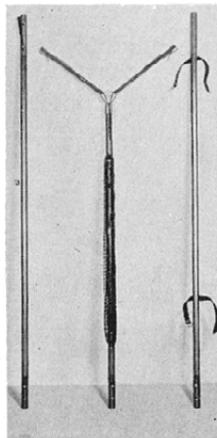


No. 289B Plug

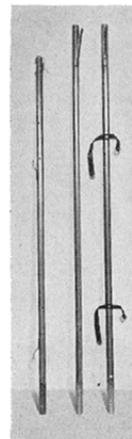
Poles, line

The line poles here listed are intended primarily for connecting portable telephones to open wire lines. They are made of hardwood and are in three sections, each approximately 6 feet in length. The joints are made of seamless brass tubing and are arranged so that the sections are securely locked together when the line pole is in use. The poles are so designed that the middle joint may be omitted if desired, thereby reducing the length of the line pole from 18 to 12 feet.

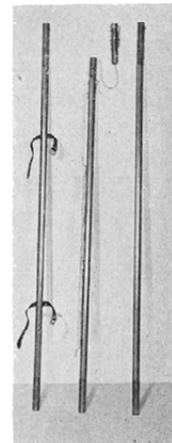
Contact with the line wires is made by means of a connecting clamp which consists of a phosphor bronze spring hook and threaded rod. When the spring is hooked over the line wire it forces the wire into contact with the threaded rod which scrapes the wire slightly so that a good contact is obtained.



6C Line Pole



7A Line Pole



8B Line Pole

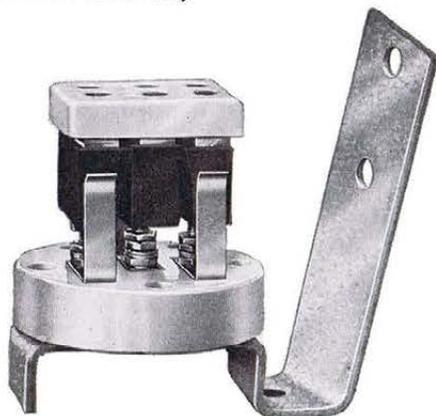
Line Pole Code No.		Cord	Description
6C	For making contact with 2 metallic conductors.	M2DY two conductor cord, 50 feet long.	The top section is equipped with two arms hinged at the lower end. These are each equipped with a connecting clamp and are of such length that they will span wires spaced up to 2 feet horizontally.
6B	For making contact with 2 metallic conductors.	Without cord.	Same as 6C, less cord.
7B	1 metallic conductor (grounded line).	M1AB single conductor cord, 50 feet long.	The top section has one connecting clamp only.
7A		Without cord.	Same as 7B, less cord.
8B	2 metallic conductors	M2EA two conductor cord, 50 feet long.	The top section is equipped with two connecting clamps. One of these is fixed to the pole and the other free but under control of the user by means of a long cord. This is intended for making connections between two line wires spaced up to 5½ feet, either horizontally or vertically.
8A		Without cord.	Same as 8B, less cord.

Protectors

Protection of central office and telephone sets against lightning and abnormal electric currents is an important feature of telephone practice. The Protector must be simple in construction so that the parts can be easily replaced when necessary, and reliable in operation in order that it may give the desired protection when needed. Western Electric fuses act at one and one-half times their rated current values and open space cut-out Protectors will discharge across their air-gaps at a definite voltage value because of the accurate manufacture of the Protector Blocks.

The wide application of carbon block cut-out (air-gap) Protectors makes particularly important the use of Protector Blocks requiring minimum attention for renewal and cleaning. The following types of Protectors are designed to reduce maintenance and give the highest grade of protective service.

86 TYPE PROTECTOR (LARGE CARBON BLOCK)



No. 86B Protector
Cover Removed

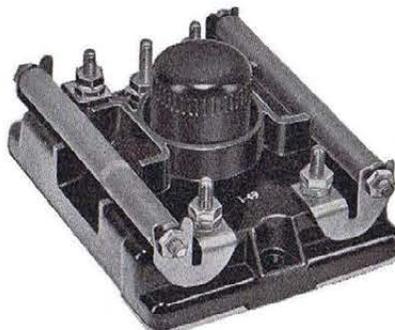
The No. 86B (Large Carbon Block) Protector consists of a porcelain base having two-line terminals and one ground terminal, three large carbon blocks (which are so placed as to form a high voltage protector) and a metal cover. It is designed to protect telephone lines against high potential and abnormal currents.

98 TYPE PROTECTOR

The 98A Protector is intended to provide abnormal voltage and current protection for one pair of wires at subscriber stations.

The 98B Protector is intended to provide high potential and abnormal current arrestors for protection of one pair of wires at dispatcher and way stations.

The 98C Protector is intended to provide high potential and abnormal current arrestors for protection of one pair of wires in railway signaling sets.



No. 98A Protector

Protector Code No.	Line Protection	Consists of		
		Protector Blocks	Fuses	
98A	2-Wire	{ 2 No. 26 2 No. 27 }	2 No. 11C	Replaces No. 58AP
98B	2-Wire	{ 2 No. 26 2 No. 30 }	2 No. 11C	Replaces No. 58BP
98C	2-Wire	{ 2 No. 19 2 No. 20 }	2 No. 11C	(Includes 2 No. 11 Protector Micas)

NO. 99A PROTECTOR



No. 99A Protector

The No. 99A Protector consists of three carbon electrodes mounted on a porcelain base and enclosed in a metal case. It is intended for use with open wire subscriber lines on higher voltage joint use poles, or as lightning protection for one pair of conductors having high dielectric insulation such as "U" bridle wire.

NO. 101A PROTECTOR

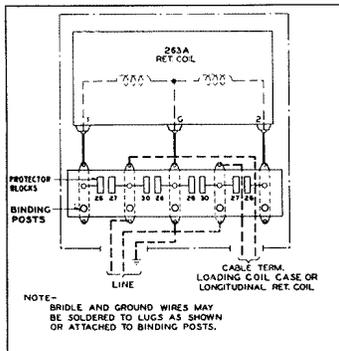
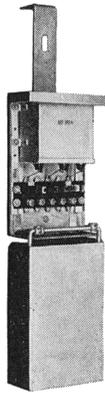
The No. 101A Protector is intended to provide protector drainage on Type C Carrier Systems and to minimize lightning interference with super-imposed voice frequency telegraph.

The No. 101A Protector consists of a sheet metal housing in which are mounted the apparatus indi-



cated below and the necessary terminals. The lower end of the housing is arranged for the entrance of bridle and ground wires.

This protector is intended for crossarm mounting.



No. 101A Protector

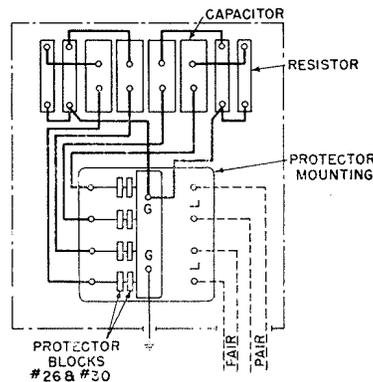
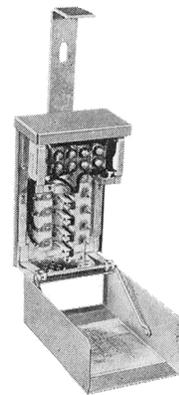
Protector Code No.	Furnished Equipped with			Retardation Coil
	Protector Blocks			
101A	No. 26 4	No. 27 2	No. 30 2	263A

NO. 104A PROTECTOR

The No. 104A Protector is a drainage device for reducing electrostatic voltages that are induced on open wire telephone circuits as the result of exposure to nearby power circuits. By providing balanced drainage paths from the two sides of a telephone circuit to ground, the No. 104A Protector reduces the electrostatic voltages to safe values, without interfering appreciably with the normal operation of the telephone circuit. Each

No. 104A Protector provides drainage for two open wire pairs. As shown in the wiring diagram the drainage path provided from each line wire to ground consists of a capacitor and a resistor in series.

A No. 79B Protector Mounting, equipped with 26-30 protector blocks, serves to protect the components from damage by lightning or other high voltages. The capacitor is an oil filled condenser having a capacitance of 0.25 microfarad (+20 per cent, -10 per cent) and is rated at 1,000 volts d-c. The resistors have a resistance of 10,000 ohms (± 10 per cent) and are rated at 40 watts. The galvanized steel housing is approximately $8\frac{3}{16}$ " x $2\frac{7}{8}$ " x $5\text{-}7\frac{32}{32}$ " and is arranged for cross arm or pole mounting.



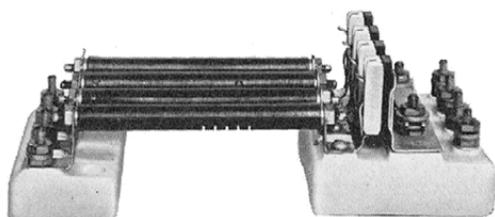
No. 104A Protector

NOS. 1074A AND 1079AP PROTECTORS

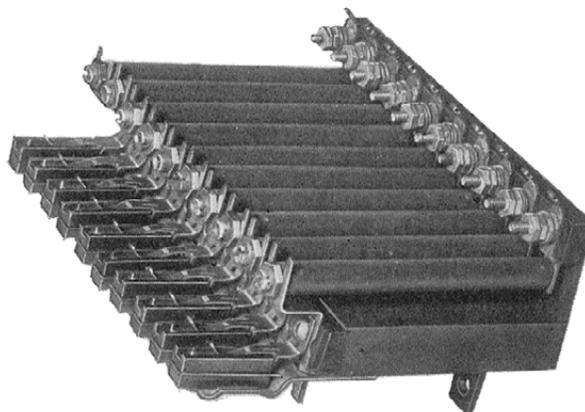
The No. 1074A Protector provides protection for one wire against high potential and abnormal currents. This protector is generally furnished in strips of 10 protectors. It is necessary to specify the number per strip when ordering.

Protectors (continued)

The No. 1079AP Protector provides protection for two pairs of wires against high potential and abnormal currents. It is intended to be mounted in an asbestos lined terminal box. These protectors consist of the following items:



No. 1079AP Protector



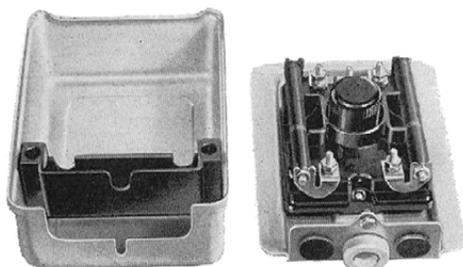
No. 1074A Protector

Protector Code No.	Line Protection	Consists of			Protects Against
		Protector Mountings	Protector Blocks	Fuses	
1074A	As required	74A	1 No. 19 1 No. 20 1 No. 11 (mica)	1 No. 7A (7 amp.)	High potential and abnormal currents.
*1079AP	4-Wire	1 No. 79A 1 No. 80A	4 No. 26 4 No. 27	4 No. 11C (7 amp.)	High potential (lightning) and abnormal currents for group mounting. Fuses mount on 7/8 inch centers. Common ground strips are furnished for inter-connecting two or more units.

* Four No. 60A Fuses and one No. 80 Protector Mounting may be used with the No. 1079AP Protector as a sneak current arrester for private branch exchange protection.

NO. 1093CW PROTECTOR

The No. 1093CW Protector consists of a 98A Protector assembled in a 93CW Protector Mounting for outdoor installation. This protector will provide protection for a telephone station (one pair of wires) against high potential (lightning) and abnormal current. The No. 1093CW Protector replaces the No. 1093AW Protector.



No. 1093CW Protector

PROTECTOR DRAINAGE

Drainage coil equipment is available to reduce lightning interference with carrier telegraph signals and is intended for use on lines on which type C Carrier Telephone Systems with superimposed voice frequency carrier telegraph are operated.

During thunder storms substantial voltages to ground may be induced on the conductors of an open wire line. The usual protectors provided at the ends of the line serve to relieve these high



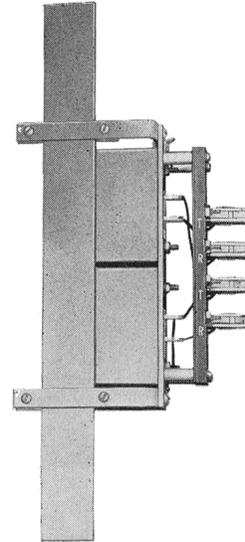
voltages by discharging them to ground. There is always, however, a certain amount of dissymmetry between the two protectors on a pair of wires, either in their initial breakdown voltages, discharge characteristics, or in both. Because of these dissymmetries, when the lightning currents discharge through the protectors, a pulse appears in the metallic circuit whose magnitude depends upon the size of the voltage induced by the lightning and the degree of dissymmetry between the protectors. These resultant surges may cause false operation of carrier telegraph equipment (referred to as "hits") and clicks in telephone circuits. Much effort has been directed toward the development of protector blocks which operate in pairs without dissymmetrical characteristics, but it has not been found possible to accomplish this without impairing their ability to protect the plant.

The drainage coil is a two winding retardation coil bridged across a line pair, the two windings being in series as regards the bridged circuit and with their junction point connected to ground. The two windings are coupled inductively and are so poled that they offer very low impedance to equal discharges to ground from the two line wires. The coils are separated from the line by protectors. The action of the coil is such that lightning discharges which are not so great as to permanently ground the protectors ordinarily take place across the protector blocks in series with the drainage coil and in sufficiently close balance so that their effect upon telegraph signals is reduced to a minimum.

In order to obtain the desired benefits from the application of protector drainage, it is essential that the drainage (retardation) coils should be installed at all points on that section of a carrier circuit where experience indicates that lightning is severe or frequent and where arresters are provided for the protection of a cable or for the protection of office equipment.

Where the cable protector blocks are located within the cable box, the No. 257A Retardation Coil should be located within the same box if space is available or within an additional and adjacent cable box. The protector blocks and mounting assemblies, P264042 or P453543, that are in series between each line wire of the carrier pair and its associated portion of a coil, must be as close as physically practicable to the coil itself and, in addition, should be equally as close as practicable to the cable protector blocks on which the line wires terminate. These protector blocks which are required to provide what is known as back-up protection for the protector blocks in series with the coil, should be connected directly to ground and to the same ground wire which is connected to the midpoint of the retardation coil. Both in this case as well as in office installations, the back-up protector block protection must have a normal breakdown rating of at least 300 volts

d-c higher than that of the protector blocks in series with the coil windings. It is important that not only the two groups of protector blocks and coils be physically and electrically close to each other, but also that the same ground wire should be used for both and be as short as feasible.



J-68738A Drainage Coil Assembly

In offices, the No. 257A Retardation Coil should be mounted as close as practicable to the protector blocks on which the carrier circuit terminates. It will be found preferable in many cases to remove the existing office protector blocks and place therein the back-up protector blocks mentioned above, and to extend a connection to the low voltage protector blocks which are in series with the windings of the retardation coil. If frames are located in the office, assembly per J68738A is recommended. This assembly consists of either one or two coils on a mounting detail which is also used to mount the springs for two protector units for each of two coils. The springs and protector blocks for the four protector units are provided on the mounting detail regardless of whether it is equipped with one or two coils.

The coil mounting detail is attached by means of four screws to assembly mounting details for mounting on the vertical ground bar on the vertical side of a main or combination distributing frame. If it is desired to mount the drainage coil assembly in place of a terminal strip on the vertical side of a main or combination distributing frame the above four screws should be removed and the assembly mounting details discarded.

Particular care must be paid to the use of the same ground wire for both sets of protector blocks and to maintaining at least a 300-volt differential between the ratings of the two protector blocks. In those cases where the entering cable is underground, it may be found more convenient to place

Protectors (continued)

the drainage coil equipment on the carrier circuit involved at the outer end of the underground cable. Where the entering cable is aerial, the arrangements outlined above shall be followed.

Where carrier circuits to be equipped with protector drainage are subject to high induced potentials from faults on paralleling power circuits, special arrangements are available for reducing the likelihood of permanent grounding of the protector blocks in the drainage circuit. When this or other special situations are encountered, consult your distributor for further information.

Receivers



No. 558B Receiver

The No. 558B Receiver is intended for use in the No. 1536E Telephone Set in mines where explosive gases are present. It consists of a case and cap with a No. HA2 Receiver Unit and a R2FE Cord. The receiver unit is held in place by a molded cap. The receiver cord is rigidly attached to the case by means of a clamping nut, and the internal cord conductor connections are soldered to the receiver unit.

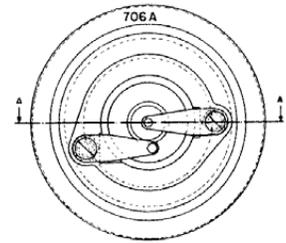
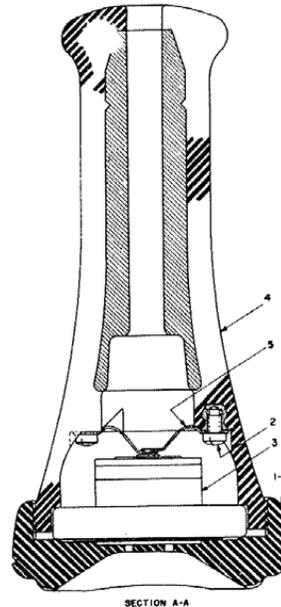
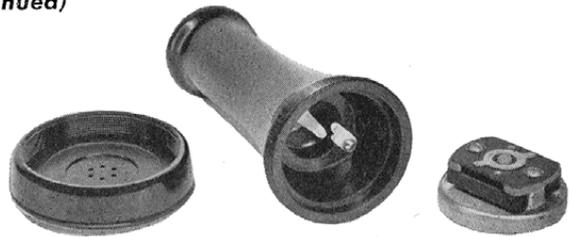
NO. 706 TYPE RECEIVER

The No. 706A Receiver consists of a case provided with contact springs and terminal screws, an HA1 Receiver Unit and a cap for holding the receiver unit in place. The HA1 Receiver Unit has an impedance of approximately 116 ohms at 800 cycles and is of the control diaphragm, magnetic type used in the combined hand telephone sets. It provides higher quality speech reproduction than former desk stand types of receivers and is arranged so that the receiver units are easily replaceable.

The No. 706B Receiver is similar to the No. 706A except that it includes the HA2 Receiver Unit having an impedance of approximately 257 ohms at 800 cycles.

The No. 706C Receiver is also similar to the No. 706A Receiver except that it includes the HA4 Receiver Unit having an impedance of approximately 2000 ohms at 800 cycles.

The HA1, HA2, HA3 and HA4 Receiver Units should not be used in circuits permitting d-c to flow through receiver.



END VIEW WITH CAP (ITEM 1) AND HA1 RECEIVER UNIT (ITEM 3) REMOVED

No. 706 Type Receiver

RECEIVER STOCK LIST			Number of Parts Required		
Item	Piece Part	Piece Name	706A	706B	706C
1	P456521	Cap	1	1	1
2	P132056	Fil. H.M. Screw	2	2	2
3	—	HA1 Receiver Unit	1	—	—
3	—	HA2 Receiver Unit	—	1	—
3	—	HA4 Receiver Unit	—	—	1
4	P456520	Case Assembly	1	1	1
5	P470125	Contact Spring	2	2	2
—	P290526	Case and Spring Assembly Items 4 & 5	—	—	—

NO. 716 TYPE RECEIVER



No. 716 Type Receiver Equipped with No. 11A Head Band



The No. 716A Receiver consists of an HA1 Receiver Unit assembled in a No. 11A Receiver Holder involving a phenol plastic cap and case having terminal and cording facilities which accommodate the same cords as the No. 528 Receiver. This Receiver is arranged for use with a No. 11A Head Band.

The No. 716B Receiver is similar to the No. 716A Receiver except that it includes an HA2 Receiver Unit.

The No. 716C Receiver is also similar to the

No. 716A Receiver except that it includes an HA4 Receiver Unit and is intended for use in train dispatching way stations and in subscribers' stations.

The No. 716D Receiver consists of the No. 716A Receiver equipped with the No. 11A Head Band.

The No. 716E Receiver consists of the No. 716B Receiver equipped with the No. 11A Head Band.

The No. 716F Receiver consists of the No. 11A Receiver Holder, HA3 Receiver Unit and No. 11A Head Band.

RECEIVER REPLACEMENT DATA

Receiver Code No.	Rec. Unit	Rec. Cap.	Rec. Case	Head Band Code No.	Rec. D-C Res.	Rec. Imp. at 800 Cycles	Replaces Code No.	Rec. D-C Res.	Rec. Imp. at 800 Cycles	Used With	Head Band
Loose Parts	HA2	P-456236	P-284711	—	57	257	131	71	248	Hand Sets 1001C, 1001H and 1001P	—
Includes											
558B	HA2	P-456521	P-335563	—	57	257	558	(R2FE Cord Included)		Telephone Set 1536E	—
Includes											
706A	HA1	P-456521	P-456520 (A)	—	57	257	144	83	215	Telephone Sets 1317P, S, AH, CN, CG, CP, CR, CS, BK, R, N, CH, BA, 1336H, 1305AC, 1312A	—
706B	HA2	P-456521	P-456520 (A)	—						Desk Stands 1020AL, 1040U, 1040AL, 1051AL Transmitter Arm 1020CC	—
706C	HA4	P-456521	P-456520 (A)	—	275	2000	508	520	1860	Telephone Sets 1317W, AD, 1336F, 1293AD, AK	—
716A	HA1	P-458946 (B)	P-371844 (B)	3B or 11A (C)	26	115	562A	60	188	1526B Telephone Set (Port.)	—
716B	HA2	P-458946 (B)	P-371844 (B)	3B or 11A (C)	57	257	133	70	254	1314A Telephone Set (Port.)	—
							189	45	241	501 and 502 type Subscriber Sets	3B
										Telephone Sets 1317BU, DU, 1293BC	—
										Desk Stands 1120AB, 1142AB	—
										Transmitter Arms 1120C, 1148DA, DB, DC, DD	—
							528	84	260	Railroad Way Stations	11A
							565A	45	241	1010A and 1010B Head Sets	1C
716C	HA4	P-458946 (B)	P-371844 (B)	3B or 11A (C)	275	2000	186	400	2350	295 type Subscriber Sets	3B
										Telephone Sets 1317AE, AW, 1293 AE, AL	—
										Desk Stands 1042AB, BR, 1020AB	—
										Transmitter Arms 1020C, E, 1048DA, DB, DC, DD, 1048GA, GB, GC, GD	—
							565B	400	2350	1010B Head Set	1C
716D		(716A Receiver and 11A Head Band)									
716E		(716B Receiver and 11A Head Band)									
716F	HA3	(11A Receiver Holder and 11A Head Band)									

(A) Does not include screws and contact springs.

(B) Components of 11A Receiver Holder.

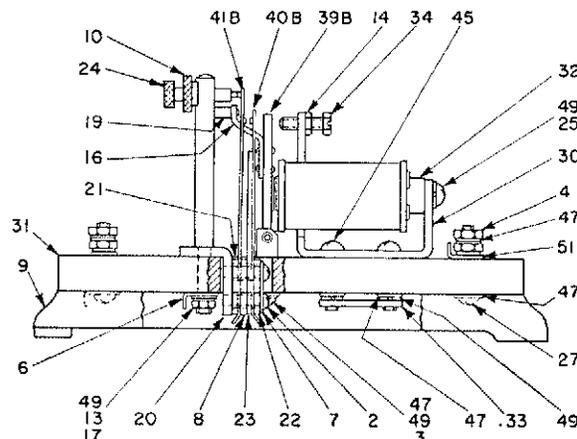
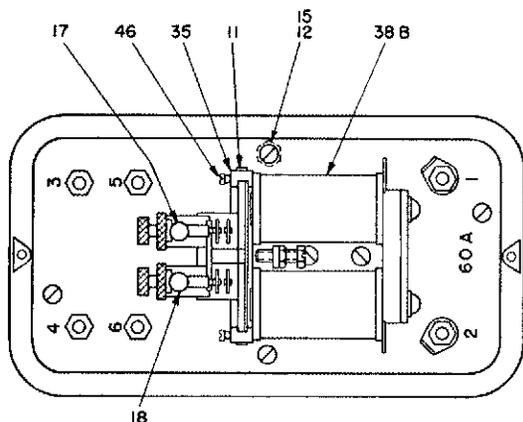
(C) Head Band must be ordered separately.

Relays

Relay Code No.	Resistance (Ohms)	Description	Use
F11	2 windings 55 ohms each	.....	No. 60B Vacuum Tube Rectifier
M3	.....	Two "R" type Relays mounted on an individual mounting	By railways in selector circuits.
R323	3600	.....	No. 60B Test Set
R332	375	.....	Nos. 62 and 63 type Selector Keys
R512	.33 Primary 325. Secondary	.....	No. 162 type Selector Sets
R1027	95	.....	Nos. 62 and 63 type Selector Keys
221JB	335	Holding relay	Nos. 60B, 62B and 62C Selector Apparatus Cases

TELEGRAPH RELAYS

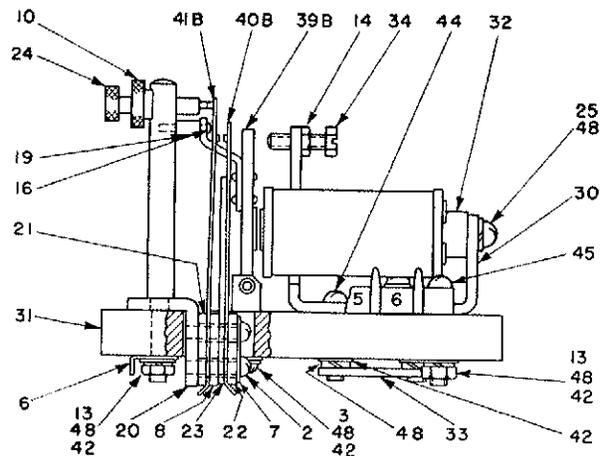
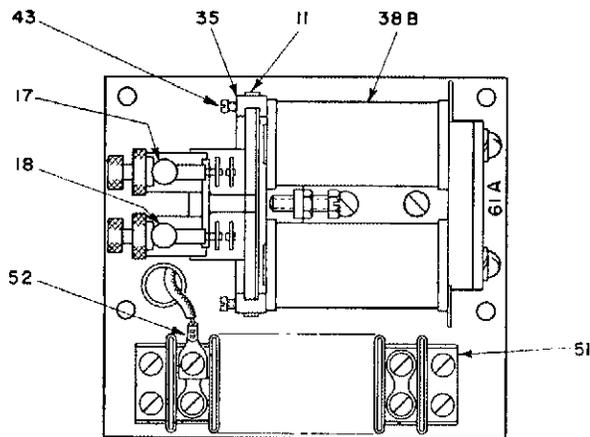
60A	30	Replaces 26A Relay	No. 60B Selector Apparatus Case
61A	30		No. 62C Selector Apparatus Case
D-142204	30	Special 60A Relay	No. 62B Selector Apparatus Case (Sub-base item 9, Terminal Post Assemblies items 4, 47, 51 and wiring omitted)



No. 60A Relay

No. 60A RELAY REPLACEMENT PARTS

Item No.	Subject	Item No.	Subject	Item No.	Subject
2	R.H.M. Screw	P-116879	18	Contact Post	P-477474
3	R.H.M. Screw	P-218126	19	Stud	P-477476
4	Hex. Nut	P-218127	20	Bracket	P-477477
5	Contact Point	P-297899	21	Insulator	P- 97477
6	Clip	P- 91308	22	Insulator	P- 97478
7	Clamping Plate	P- 92343	23	Stop Spring	P-477478
8	Bushing	P- 93293	24	Contact Screw	P-477472
9	Sub Base	P- 95884	25	R.H.M. Screw	P-131216
10	Check Nut	P-477473	27	R.H.M. Screw	P-283263
11	Bearing	P- 95930	30	Bracket	P-459092
12	Hex. Nut	P- 95942	31	Base	P-459093
13	Hex. Nut	P- 95943	32	Pole Piece	P-477367
14	Hex. Nut	P- 93823	33	Clamping Piece	P-477368
15	OHM Screw	P- 95306	34	Hex. Hd. Screw	P-477369
16	Stud	P- 97471	35	Bracket	P-477370
17	Contact Post	P-477475	38B	Coil	P-174035
					39B Armature Assem- bly P-477366
					40B Contact Spring } P-247792
					41B Assembly } P-247793
					45 Scr. RHM-BR- .164-32 x 7/8 P-283238
					46 Scr. Fil. HM. Stl. .086-64 x 3/16 P-283237
					47 Washer-BR-3/16 x 7/16 x .0508 P-283236
					49 Non-Tangling Lock Washer Steel—No. 8 (.164) x 5/64 x 3/64 P-283567
					51 Lock Washer P-283592



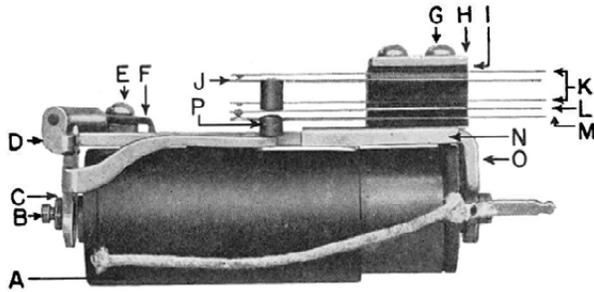
No. 61A Relay

No. 61A RELAY REPLACEMENT PARTS

Item No.	Subject	Item No.	Subject
2	R.H. BR.M. Screw	32	Pole Piece
3	R.H. BR.M. Screw	33	Clamping Plate
5	Contact Point	34	Hex. HD. Screw
6	Clip	35	Bracket
7	Clamping Plate	38B	Coil Assembly
8	Bushing	39B	Armature Assembly
10	Check Nut	40B	Contact Spring Assembly
11	Bearing	41B	Contact Spring Assembly
13	Hex. Nut	42	Washer-BR-3/16 x 7/16 x .0508
14	Hex. Nut	43	Scr. Fil. HM. Stl.-.086-64 x 3/16
16	Stud	44	Scr. RHM-BR-.164-32 x 7/8
17	Contact Post	45	Scr. RHM-BR-.164-36 x 1 1/8
18	Contact Post	48	Non-Tangling Lock Washer Steel-No. 8 (.164) x 5/64 x 3/64
19	Stud	51	Terminal Strip (No. 6-141-H. B. Jones)
20	Bracket	52	Terminal (No. 31666-Aircraft Marine Products Co.)
21	Insulator		
22	Insulator		
23	Stop Spring		
24	Contact Screw		
25	R.H. STL.M. Screw		
30	Bracket		
31	Base		

Relays (continued)

No. 221JB RELAY REPLACEMENT PARTS

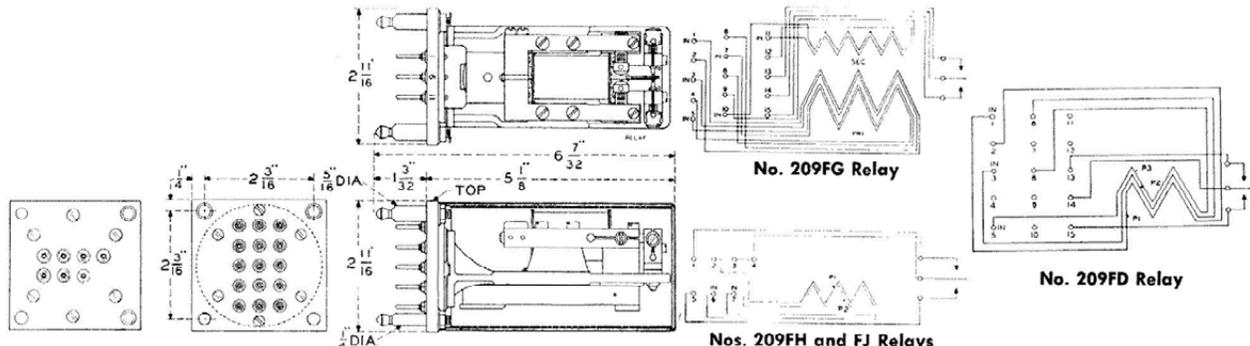


No. 221JB Relay

Item No.	Subject	
A	Coil	P-250737
B	Armature Travel Screw	P-250207
C	Armature Travel Nut	P-250211
D	Armature	P-252502
E	Armature Screw	P-252599
F	Clamping Washer	P-252089
G	Pileup Screw	P-250715
H	Clamping Plate	P-251737
I	Insulator	P-250212
J	Contact Spring	* P-252113 * P-252110 * P-250310
K	Contact Spring	P-252112
L	Contact Spring	P-252115
M	Contact Spring	P-252114
N	Armature Stop	P-250206
O	Pole Piece	P-250260
P	Armature Plug	P-252109

* To be assembled.

NO. 209 TYPE RELAYS



Nos. 209FH and FJ Relays

GENERAL DESIGN AND DIMENSIONS OF NO. 209 TYPE

Nos. 209FH and FJ Relays

No. 209FD Relay

Highly sensitive polarized relays equipped with dust covers and intended for use in telegraph circuits.

Current values shown are for reliable operation in telegraph circuits. Equipped with No. 4 metal contacts unless otherwise indicated.

Mount on Nos. 823, 884 or similar type Mounting

Plates. Require a connecting block for mounting and connecting purposes as indicated.

Will mount mechanically on 2 3/4 inch centers, but due to sensitiveness to magnetic interference, the mounting centers with respect to other No. 209 type relays or any other magnetic apparatus should be given special consideration in each case.

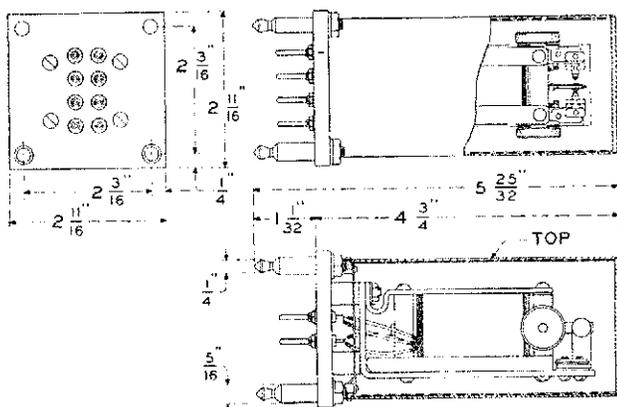


General Design and Dimensions
of No. 209 Type Relays

Relay Code No.	Connecting Block Required	Resistance (Ohms)		Operate (Ampere) Minimum
		Primary Winding	Secondary Winding	
209FD	18A	(†) 675 each (3 Wdgs.)	—	(d) .00175
(j) 209FG	18A	(r) 185 each (4 Wdgs.)	(*) 115 each (2 Wdgs.)	(b) .001
(j) 209FH	18B	(*) 136 each (2 Wdgs.)	—	(c) .00125
(j) 209FJ	18B	(*) 85 each (2 Wdgs.)	—	(c) .0038

(*) Plus or minus 10%.
 (†) Plus or minus 15%.
 (b) Through four primary windings in series aiding.
 (c) Through P1 and P2 in series aiding.
 (d) Through each one of the three parallel windings.

(j) Equipped with extra heavy contacts of tungsten on contact screws and extra heavy contacts of No. 4 metal on armature.
 (r) Approximate resistance.



General Design and Dimensions
of No. 255 Type Relay

NO. 255 TYPE RELAYS

Polarized relays each equipped with reed type permalloy armature and anti-chatter contacts.

Armatures are equipped with extra heavy No. 4 metal contacts and contact screws are equipped with extra heavy tungsten contacts.

Mount on No. 823, No. 884 or similar type Mounting Plates through the medium of a No. 18B Connecting Block.

Insulated from mounting plate.

Will mount mechanically on 2 3/4 in. vertical and horizontal centers, but due to sensitiveness to magnetic interference the mounting centers with respect to other No. 255 type Relays or any other magnetic apparatus should be given special consideration in each case.

Relay Code No.	Windings	Resistance (Ohms)	Operate (Ampere)
255A	Parallel	(o) 136 ea.	(*)
255B	{ Primary	(oo) 200	{ (ap) (bf) .0025 }
	{ Secondary	(oo) 1000		{ (ap) (bf) .0005 }

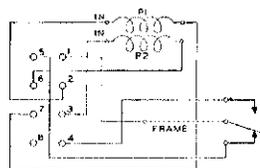
(*) For reliable operation in teletypewriter circuits, should receive not less than .005 ampere d-c through the windings connected in series aiding.

(o) Plus or minus 10%.

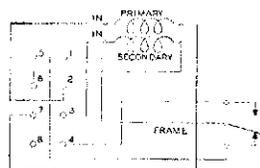
(oo) Plus or minus 1%.

(ap) For adjustment purposes only. The current for operating in service should be approximately 2 1/2 times the operate value shown.

(bf) In either direction after soak of .0125 ampere d-c in opposite direction to the operating current.



No. 255A Relay



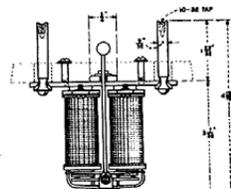
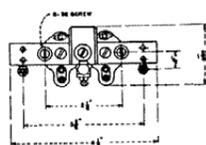
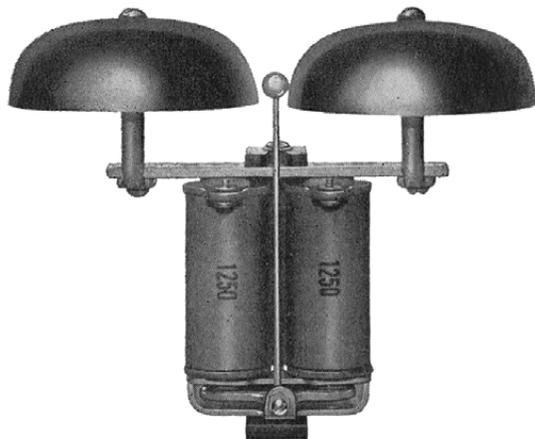
No. 255B Relay

Ringers

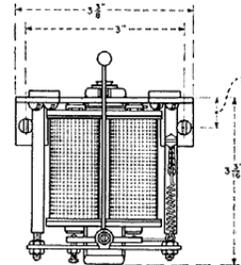
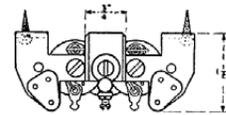
NOS. 32, 38, 45, 51, 53 AND 60 TYPE RINGERS

Ringer Code No.	Resistance in Ohms	Gong No.	Used In
32BG	2500	13	Nos. 1130E and F Telephone Sets
38BG	2500	26A	Nos. 127F and 400K Subscriber Sets; Nos. 1317P, S, W, AW and BK and No. 1417P Telephone Sets
45BG	2500	26A	Nos. 1336E, F, H and 1305AC Telephone Sets. Moisture-proofed
*51FG	1620	29A	Telephone Sets and Nos. 300L and N Desk Set Boxes
53AG	1000	29A	No. 1317CG Telephone Set
53BG	2500	29A	Nos. 1317CP and CS Telephone Sets
53FG	1600	29A	Nos. 1317CN and CR Telephone Sets
60CG	16	26A	Nos. 160C, R, AC, AR, BC and BR Selector Sets

* The No. 51 Type Ringers have bent gong posts which permit of their use in woodwork drilled for ringers having three inch gongs; for example, drilled for the No. 38 type Ringer.

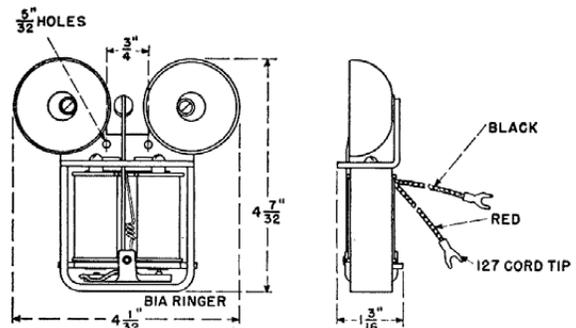


Nos. 38, 45 and 51 Type Ringers



No. 32 Type Ringer

NOS. B1AL AND D-157363 RINGERS



No. B1AL Ringer

NO. B1AL RINGER

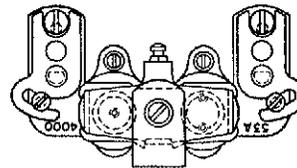
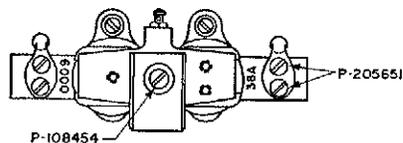
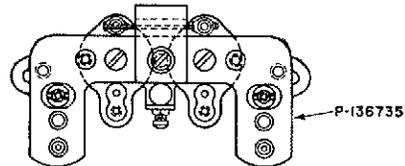
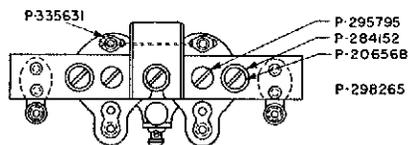
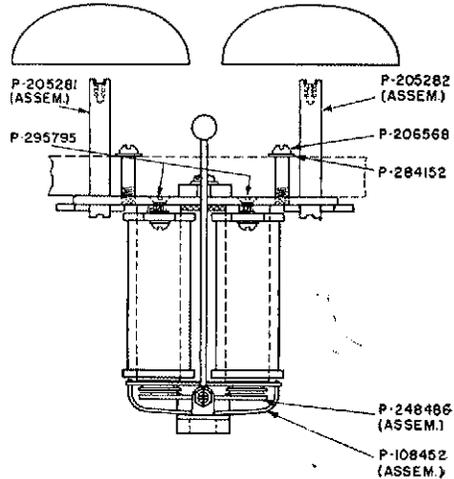
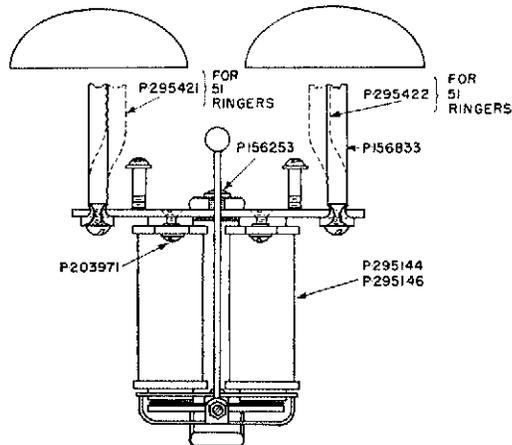
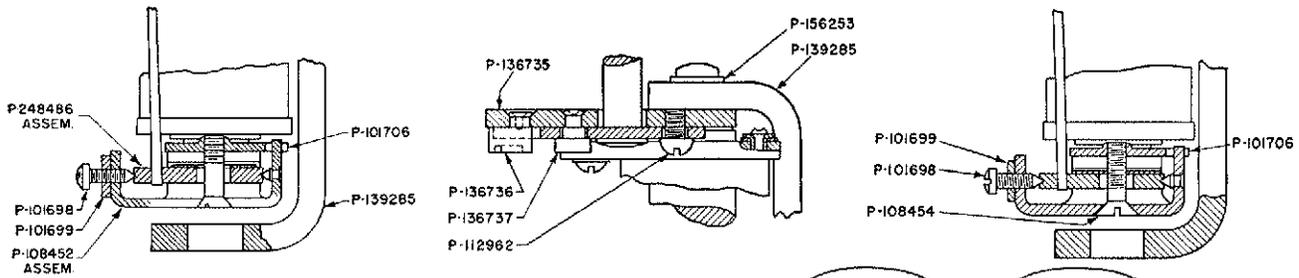
The No. B1AL Ringer is a unit type biased ringer used in telephone set mountings and in telephone sets. It has a cantilever type biasing spring arranged for three settings and a stroke adjusting stop for adjusting the sound output.

The Ringer is equipped with one No. 41A and one No. 41B Gong. It can also be obtained equipped with two No. 40C or one No. 40D and one No. 40E Gong when specified in the order.

The No. B1AL Ringer has two coils having a total d-c resistance of 4600 ohms \pm 10%. The 900 cycle inductance is minimum 20 henries.

NO. D-157363 RINGER

The No. D-157363 Ringer is the same as the B1AL except that it is equipped with a D-157360 Condenser ($\frac{1}{2}$ mfd.) having a bracket arranged to mount between the gongs and the gong mounting of the B1AL. The condenser is connected in series with the ringer coils and is intended to block the selector pulses when the ringer is used in portable telephone sets, such as the No. 301A, on train dispatching lines.



Nos. 38BG, 45BG and 51FG Ringers

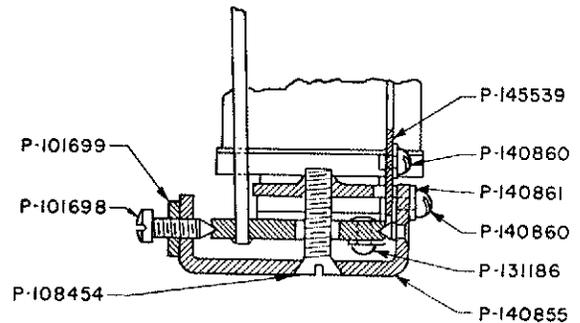
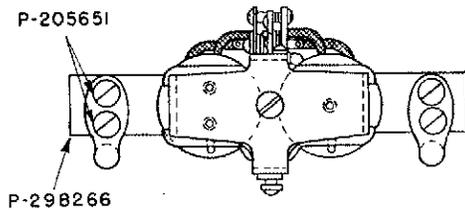
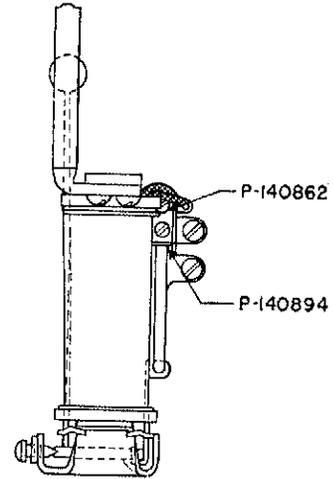
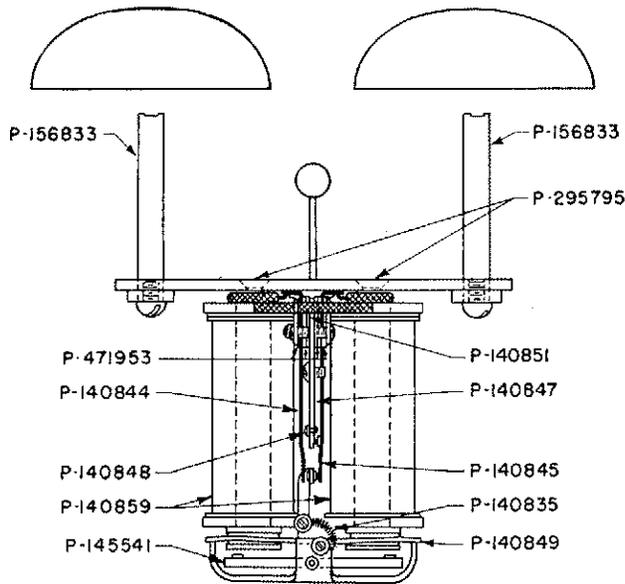
Nos. 53AG, BG and FG Ringers

RINGER REPLACEMENT PARTS

P-108452	Armature Adjuster	P-139285	Magnet { 38BG, 51FG, 53AG, BG, FG
P-108454	Adjusting Screw	P-107896	Magnet { 45BG
P-101698	Pivot Screw	P-156253	Washer Head Screw
P-101699	Set Nut	P-284152	Washer
P-248486	Armature and Clapper Assem.	P-206568	Mounting Screw
P-101706	Clamping Plate	P-205651	Gong Post Screw
P-295144	Coil { 38BG, 53BG	26A	Gong for Nos. 38BG and 45BG Ringer
P-247797	Coil { 45BG	29A	Gong for Nos. 51FG, 53AG, BG, FG Ringer
P-295146	Coil { 51FG, 53F	P-107918	Gong Screw*
P-295143	Coil { 53AG		
P-205654	Coil Mounting Screw		

* Gong Screws not shown.

Ringers (continued)



No. 60CG Ringer

NO. 60CG RINGER REPLACEMENT PARTS

P-140855	Armature Adjuster	P-140845	Contact Spring
P-108454	Adjusting Screw	P-140848	Rubber Separator
P-101698	Pivot Screw	P-140847	Contact Terminal
P-101699	Set Nut	P-298266	Heel Iron
P-140835	Spring	P-156833	Gong Post
P-145539	Contact Arm	P-140894	Clamping Plate
P-145541	Clapper and Armature	P-140862	File-up Screw
P-140849	Clamping Plate	P-140851	Bushing
P-140859	Coil Assembly	P-471953	Insulator
P-295795	Coil Mounting Screw	26A	Gong
P-140844	Contact Spring	P-107918	Gong Screw*

* Gong Screws not shown.



Sets, hand

The 1011 type Hand Sets are intended for installers' and repairmen's use. They consist of a soft rubber handle containing a talking and monitoring switch, a 361C Condenser, a cord equipped at the free end with test clips, in addition to the apparatus listed. The switch is connected so as to short circuit the condenser when in the talking position.

The 1011AW Hand Set is for use in manual areas. The 1011BW is for use in dial areas and includes the 103A Dial. The 1011CW Hand Set is for use in dial central offices for routine testing purposes and includes the 5JB Dial.

The 1012 type Hand Sets are intended for use in train dispatching systems and for linemen's use. They are black finished hand sets consisting of the apparatus listed below.

The F1AW-3 Hand Set is intended for general use at common battery subscriber stations and at local battery stations for talking circuits of not more than 3 volts. It is a component of the 302 type Telephone Sets and consists of the apparatus listed below.

The F2AW-3 Hand Set is intended for use in central offices and PBX systems. It is similar to the F1AW-3 Hand Set except that it is equipped with a 4-conductor cord terminating in a twin plug.

The F2BW-3 Hand Set is intended for use in anti-sidetone, local battery talking, common battery signalling, subscriber stations in manual and dial areas and in key cabinets. It is similar to the F1AW-3 Hand Set except that it employs a 4-conductor cord. The talking circuit should be limited to 3 volts.

The F3AW-3 Hand Set is similar to the F2AW except that it is equipped with a switch in the center of the hand set handle which cuts out the transmitter circuit when not in operated position.

Hand Set Code No.	Transmitter Unit No.	Receiver Unit No.	Hand Set Handle No.	Cord No.	For Use in Circuits	Replaces
1011AW	F1	HA1	—	W2BT	Manual Areas	
1011BW	F1	HA1	—	W2BT	Dial Areas	
1011CW	F1	HA1	—	W2DB	Dial Areas	
*1012A	F1	HA2	1D	2-W1T	Common Battery	1001A
*1012B	F2	HA2	1D	2-W1T	Local Battery	1001A
*1012C	F2	HA2	1J(a)	1-H3K	Local Battery	1001C & 1001H
*1012H	F1	HA2	1J(a)	1-H3K	Common Battery	1001H
F1AW-3	F1	HA1	F1W-3	H3C-9(b)	Common Battery	
F1CW-3	F1	HA1	F1W-3	H3AD	300 and 325 Type Tel. Set	
F1DW-3	F2	HA2	F1W-3	H3C-9	Local Battery	
F1FW-3	F2	HA1	F1W-3	H3C-9	Train Dispatching	
F1GW-3	F1	HA1	F1W-3	H3AD	Rural Power Line	
F2AW-3	F1	HA1	F2W-3	H4U	Includes 289B Plug	
F2BW-3	F1	HA1	F2W-3	H4T-9(b)	Local Battery Talking Common Battery Signaling	
F3AW-3	F1	HA1	F3-3	H4J	Includes switch in handle	
F3BW-3	F1	HA1	F3-3	H4AA	Includes 289B Plug and Switch in Handle	
F3CW-3	F1	HA1	F3-3	H3T	301A Tel. Set, includes Switch in Handle	
F3DW-3	F2	HA2	F3-3	H3U	Includes Switch in Handle, Portable Tel. Set in Train Dispatching Services	
F3WW-3	F1	HA6	F3-3	H5D	Mobile Radio Telephone Systems	
F3ADW-3	F1	HA6	F3-3	None	Mobile Radio Telephone Systems	

Handset Handles types F1W, F2W and F3-3 include the 129F Condenser as a component.

(*) The 1012A and B Handsets are connected in series while those of the 1012C and H Handsets may be separately connected through three conductors, one of which is common.

(a) Handle is equipped with a push button switch for cutting the transmitter and receiver into the circuit.

(b) When used on local battery, talking circuit should be limited to 3 volts.

Sets, hand (continued)



No. 1011 type Hand Set



No. 1012 type Hand Set

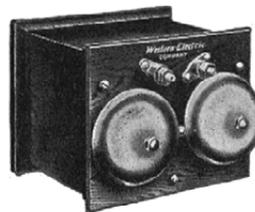


No. F1AW-3 type Hand Set

Sets, subscriber

The Nos. 127F, 531AW-3 and 592 type Subscriber Sets contain ringers which are intended for auxiliary use as extension ringers in connection with wall, desk and transmitter arm telephones or for use instead of regular ringers furnished in the telephone.

NO. 127F SUBSCRIBER SET



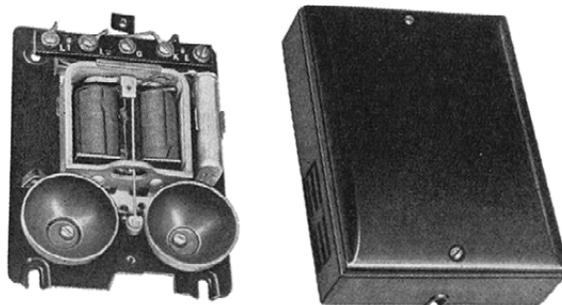
**No. 127F
Subscriber Set**

This Subscriber Set is an extension ringer for magneto lines. It consists of a wood box with a ringer mounted on the cover. Approximate overall dimensions 6½" wide x 5⅞" high x 4⅞" deep. The standard finish is golden oak.

NO. 127J SUBSCRIBER SET

The No. 127J Subscriber Set is used as an extension signal in connection with the No. 60BP Selector and the Nos. 160 and 162C and R type Selector Sets. It consists of a wood box with a No. 60CG Ringer mounted on the cover. This is a direct current type of ringer designed to operate from one or two dry cells.

NO. 531AW-3 SUBSCRIBER SET

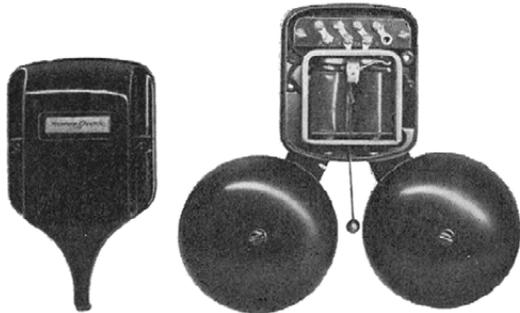


**No. 531AW-3
Subscriber Set**

This Subscriber Set is an extension ringer set for use on non-polarized ringing lines. The apparatus is mounted on a steel base and the cover is made of a black thermoplastic material. Approximate overall dimensions are 4⅞" wide x 6⅞" high x 1⅞" deep.



NO. 592 TYPE SUBSCRIBER SET

No. 592 Type
Subscriber Set

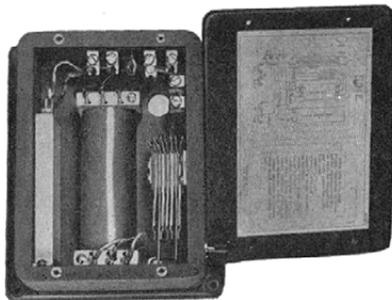
The No. 592 type Subscriber Sets are intended for use as extension, loud ringing bells. They consist of a die-cast housing enclosing what is essentially the mechanism of a B1A ringing motor, the apparatus listed below and suitable terminals for connecting the Subscriber Set in the telephone circuit. The No. 592AW Subscriber Set may be used on manual or dial lines in individual, two-party selective and four-party semi-selective line services. The 592BW Subscriber Set is intended for use on magneto non-polarized ringing lines. The No. 592CW Subscriber Set is intended for use in four-party full selective and eight-party semi-selective service.

For outdoor installations, a No. 169AW Back-board should be used.

Sub. Set Code No.	Ringer No.	Approx. Resistance (Ohms)	Gongs No.	Condenser No.	Vacuum Tube	Operating Current	Replaces
127F	38B	2500	Two 26A			A-c not biased	
127J	60CG		Two 26A	21BA			
531AW-3	B1AL	4600		198B		A-c biased to prevent tapping	127A, 584DE, 584DF
592AW		4600 $\pm 10\%$	*Two 26B	198A			392L
592BW		4600 $\pm 10\%$	*Two 26B			A-c not biased	392B
592CW		2000 $\pm 10\%$	*Two 26B		359A		392K & M

* When specified in the order, can be obtained with two No. 42A Gongs (4" diameter) instead of two No. 26B Gongs.

WAY STATION SUBSCRIBER SETS

No. 501E Subscriber Set
Cover Removed

The 501 type Subscriber Sets are used on train dispatching circuits in way station telephone sets with desk stand or transmitter arm, equipped with No. 635B Transmitter and No. 716B Receiver. These sets include the following:

Sub. Set Code No.	Condenser No.	Induction Coil No.
501E	442B	42B*
501F	442B	42B†

* Equipped with one No. 1014A Push Button. Replaces Nos. 501A and D-175002.

† Arranged for No. 3C Foot Switch. Replaces Nos. 501B and D-175003. For complete new installations the Nos. 501E or F replace the No. 295AK Subscriber Set.

The table below indicates the Way Station filter arrangements required when sets with the No. 42B Induction Coil are bridged across a line having superimposed carrier system:

Carrier System Superimposed	Filter
Type C	No. 129A
Type C (Booth Telephones used infrequently)*	None*
Type H	No. 87A
Interchangeable Type C and H	No. 87A

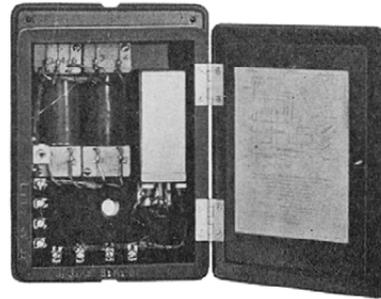
* For booth telephones where one set at a time is in use and set when idle is disconnected from the line.

Sets, subscriber (continued)

DISPATCHERS' STATIONS SUBSCRIBER SETS

The No. 502A Subscriber Set is used on train dispatching circuits in dispatchers' telephone sets, with headset telephone equipments consisting of the No. 650B Transmitter and the No. 716B Receiver. This set includes the following:

Sub. Set Code No.	Condenser No.	Induction Coil No.	Remarks
502A	1—No. 442A 1—No. 441A 1—No. 441B	43 and 44	Replaces No. 295AJ



No. 502A Subscriber Set

**Sets, telephone—
central and local battery**

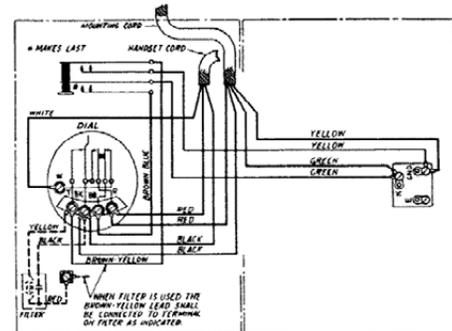
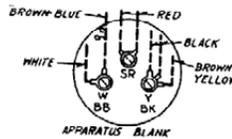
NO. 250 TYPE TELEPHONE SETS

The No. 250 type Telephone Sets are intended for use in individual line, regular P.B.X. extensions and bridged stations.

Each set consists of a hand set, a telephone set mounting and the necessary cords and wiring. The telephone set mounting coded AA1-3 is the same as the No. H1-3 Telephone Set Mounting except that the condenser, ringer and induction coil have been omitted. Each set, therefore, requires a suitable subscriber's set associated with it in order to complete the station equipment.

If desired, the No. 250 type Telephone Sets can be readily converted to the No. 302 type Telephone Set simply by adding the condenser, ringer and induction coil.

Consists of the following apparatus:



Wiring Diagram No. 250 Type Telephone Set



No. 250-AW Telephone

Tel. Set Code No.	Tel. Set Mounting	Hand Set	Dial No.	Dial Adapter No.	Apparatus Blank No.	*Cords
250AW-3	AA1-3	F1AW-3	—	—	82A-3	D4U-9
(a) 250BW-3	AA1-3	F1AW-3	5HA-3	59A	—	D4U-9

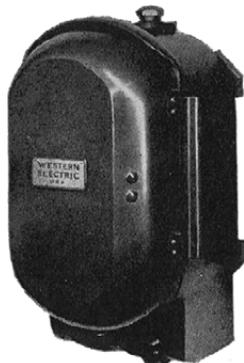
NOTE—Since the magnetization of the receivers in these sets is affected by d-c current, they should not be associated with equipments which permit d-c current to flow through the receivers such as the No. 634Y Subscriber's Set arranged for local battery talking on long subscriber loops and long P.B.X. extensions.

* Cords 5' 6" in length will be furnished unless otherwise specified. Cords in 9', 13' and 25' lengths, if desired, must be ordered separately and installed by the customer. When a plug terminated cord is desired, the D4W-9 Cord assembled with a No. 283B type Plug should be ordered separately.

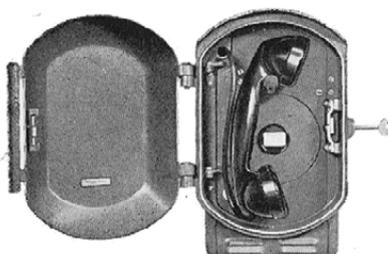
(a) When required to suppress dialing induction into radio receiving sets, a 61P Filter may be used. This filter must be ordered separately and installed by the customer.

Sets, telephone (continued)

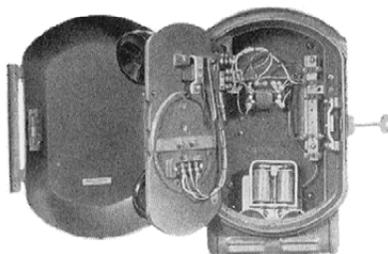
NO. 325 TYPE TELEPHONE SET FOR OUTDOOR USE



Closed View



Outer Door Open



Inner Door Open

The No. 325 type Telephone Sets are common battery telephone sets for outdoor use, intended for individual line, regular P.B.X. station and non-selective party line services. These telephone sets can be used for other services with slight connection changes.

Each set consists of a gray finished aluminum housing having an aluminum inner door and a steel outer door and containing a 195A Condenser,

a 101A Induction Coil and a B1A1L Ringer, together with the necessary wiring enclosed behind the inner door. A moisture-proofed hand set is hung on a switch hook which is assembled to the inner door. The inner door is arranged for mounting the dial or apparatus blank. The outer door is equipped with a spring latch and a self-locking lock.

The 325JW Telephone Set is arranged for manual service and the 325LW Telephone Set is arranged for dial service.

A No. 29A Bracket is required for use in mounting each of these telephone sets on buildings, fences, poles, etc., and must be ordered separately.

When it is desired to eliminate interference with radio reception where a dial is used, a No. 61L Filter is required. This filter must be ordered separately and mounted by the customer.

The No. 325 type Telephone Sets are arranged to mount a No. 85N Relay when required for auxiliary signaling. These telephone sets are not thus equipped at the factory. When required, the relay and bracket must be ordered separately.

Tel. Set Code No.	Dial No.	Number Plate No.	Dial Adapters No.	Apparatus Blank No.	Hand Set
325JW	—	—	—	80B	F1CW-3
325LW	5HH-3	147B	56A & 58A	—	F1CW-3

NO. 354 TYPE TELEPHONE SETS



No. 354CW-3 Telephone Set

The No. 354 type Telephone Sets are common battery telephone sets which incorporate combined set features for wall mounting and are intended for use on individual lines, regular P.B.X. extensions, No. 755A P.B.X. keyless sta-



tions, non-selective party stations, divided code ringing, four-party semi-selective and two-party selective station services. The No. 354AW-3 Telephone Set is for use in manual systems and the No. 354CW-3 is for use in dial systems. They are furnished connected for divided code ringing, four party semi-selective and two-party selective flat rate services party on tip. These telephone sets can be used for other services with slight connection changes.

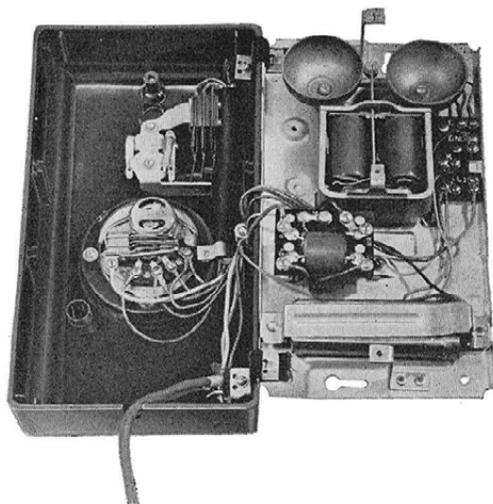
These sets are attractive in appearance and have an extensive field of use where hang-up mountings and wall type subscriber sets have heretofore been used or where it is not always convenient to use the No. 302 type combined telephone set (desk type), such as in kitchens and some special locations in residences; and in storerooms, garages, etc., for business installations.

The telephone set mounting consists of a plastic housing and a metal base on which are mounted a No. B2A Ringer, a No. 101B Induction Coil, a No. 195A Condenser and other apparatus so that the telephone set mounting and a hand set form the complete telephone set.

Tel. Set Code No.	Tel. Set Mounting	Dial No.	Dial Adapter No.	Apparatus Blank No.	Hand Set No.
354AW-3	M3-3	—	—	94A-3	F1AW-3
354CW-3	M3-3	5HB-3	59A	—	F1AW-3

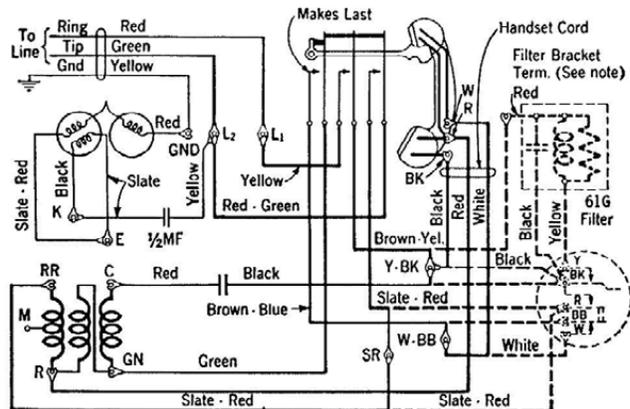
The No. 354CW-3 Telephone Set is arranged to mount a 61G Filter to suppress dialing induction into radio receiving sets. If a filter is required it must be ordered separately and installed by the customer.

To mount the No. 354 type sets on masonry walls a No. 172A Backboard can be used, and when required, must be ordered as a separate item.



Interior View of No. 354CW Telephone Set

The circuit arrangement as the No. 354 type Telephone Sets are shipped from the factory are as follows:



NOTE: When filter is not used, connect brown-yellow lead from switch contacts to Y of dial instead of to filter bracket terminal.

NO. 1293 TYPE TELEPHONE SET

The No. 1293AL Telephone Set is intended for use at sidings in connection with train dispatching. It is a wall type telephone set for local battery service and includes the following apparatus:

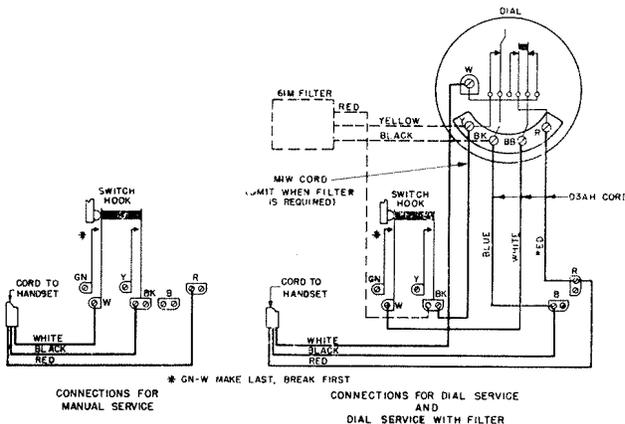
- 1 No. 143AC Switchhook
- 1 No. 77A Induction Coil
- 1 No. 3E Transmitter Bracket
- 1 No. 24A Bracket
- 2 No. T1C Cords
- 1 No. 440A Condenser
- 1 No. 51A Retardation Coil
- 1 No. 1003A Push Button
- 1 No. 30G Apparatus Blank
- 1 No. 635B Transmitter
- 1 No. R2FA Cord
- 1 No. 716C Receiver
- 1 No. 3B Headband

NO. 1293BC TELEPHONE SETS

The No. 1293BC Telephone Set is intended for use in train dispatching systems, on lines where a large number of sets are required. It is a wall type telephone set for central battery service and includes the following apparatus:

- 1 No. 143AE Switchhook
- 1 No. 42B Induction Coil
- 1 No. 3E Transmitter Bracket
- 1 No. 24A Bracket
- 2 No. T1C Cords, 6 inches long
- 1 No. 442B Condenser
- 1 No. 1013A Push Button
- 1 No. 635B Transmitter
- 1 No. R2FA Cord
- 1 No. 716B Receiver
- 1 No. 3B Head Band

Sets, hand telephone



No. 211AW
Hand Telephone Set

No. 211BW
Hand Telephone Set



No. 211AW-3
Hand Telephone Set

NO. 211 TYPE HAND TELEPHONE SETS

The following No. 211 type Hand Telephone Sets are intended for use in individual lines, P.B.X. extensions, two-party selective (except tip party dial message rate), four-party selective and semi-selective and multi-party sidetone or anti-sidetone common battery service.

The No. 211AW-3F Hand Telephone Set may also be used for manual, anti-sidetone, local battery talking and common battery signaling service.

When used for this service, the red and white handset cord conductors should be interchanged.

The No. 211BW-3F Hand Telephone Set is arranged to mount a No. 61M Filter to suppress dialing induction into radio receiving sets. If a filter is required, it must be ordered separately and installed by the customer.

No. 211AW-3F—For use at manual stations.

No. 211BW-3F—For use at dial stations.

Finished in black.

Tel. Set Code No.	Hand Set Mounting No.	Dial No.	Dial Mounting No.	Cord No.	Hand Set No.	Replaces
*211AW-3F	G1-3	—	—	—	F1AW-3	201A-3
211BW-3F	G1-3	5HA-3	43A-3	{D3AH} {M1W}	F1AW-3	201B-3

* Equipped with Card Retainer Group P-298106. This consists of Card Holder Frame P-220057, Reinforcing Ring P-172045, Card Retainer P-164442 and Window P-137593.

Set, 52 type head telephone



No. 52AW Head Telephone Set

A new type of head telephone set has been made available for use by operators, which provides greater comfort for the wearer and better transmission than the present chest type transmitter, receiver and head band. The new set is of a one-piece type with the transmitter mounted on an arm attached to the back of the receiver case. While the entire set is, therefore, carried on the head by means of the head band, its total weight on the head is about 6 oz., excluding the cord. The receiver impedance at 1000 cycles is approximately 300 ohms, and its d-c resistance approximately 65 ohms. The transmitter unit is designed for common battery applications and when used with a local battery a series resistance must be employed.



DETAILED DESCRIPTION

The No. 52AW set consists of the following components:

- 1 No. 55AW Transmitter Arm
- 1 N-1 Transmitter Unit
- 1 No. 10A Receiver Holder
- 1 HC3 Receiver Unit
- 1 No. 15A Head Band and P-477139 Head Band Pad
- 1 L4AG Cord
- 1 No. 289B Plug
- 1 P-478356 Cord Fastener

The transmitter and receiver cases and the transmitter terminal plug are made of black thermoplastic material, and the transmitter and receiver caps are made of the same material but are transparent.

FIELD OF USE

For Common Battery Switchboard Application: The No. 52 type Head Telephone Set is suitable for operator use at all switchboards, desks and PBX positions. It is a satisfactory replacement for the 396-716 transmitter-receiver combination currently used.

For the range of operating room noise and circuit noise conditions usually encountered, effective transmission and reception gains are obtained. These result from improved frequency response characteristics of the new instruments and elimination of the mouthpiece on the transmitter.

There are four models of the new head telephone set, namely, the No. 52AW which is suitable for all operators; the No. 52BW for supervisors; the No. 52DW for night operators; and the No. 52CW for special airport use. Where both operators and supervisors are employed, it is recommended that they all be equipped with the new sets at the same time because the resistance of the new transmitter is considerably lower than that of the No. 396 and excessive losses would, therefore, be encountered if the two types were bridged together on the same circuit.

For Local Battery Switchboards or Railway Train Dispatching Application: While the No. 52 type Head Telephone Set was primarily designed for common battery service, it may be used by operators of local battery switchboards or at railway train dispatcher positions. In the latter case, its performance should be equal, or superior to

that of the 650B-716B transmitter-receiver combination under ordinary operating conditions, with greater comfort to the wearer. A definite transmission improvement will be noticeable where dispatchers are accustomed to holding their transmitter mouthpiece further than two inches from their lips, since the new set, when properly adjusted, will not permit such a separation.

An exact comparison of the No. 52 type set with the 650B-716B transmitter-receiver combination on train dispatching lines is not feasible since overall transmission depends not only on the comparative frequency response of the instruments and their relative efficiency, but also on the telephone circuit, and, since the transmitter of the No. 52 type set can be adjusted for optimum talking distance, it depends on talking habits.

On the average, however, about equal loudness at the receiving station will be obtained when the distance from the speaker's lips is about ¼" from the transmitter of the No. 52 type set, as when this distance is about 2" to the mouthpiece of the No. 650B Transmitter. Hence, on long and heavily loaded circuits and where it is necessary to talk closer than about 2" from the No. 650B Transmitter to deliver adequate receiving level at way stations, the adequacy of the No. 52 type set may be questioned, and it should be tried in such cases before its use is adopted. On short and lightly loaded circuits or circuits well equipped with repeaters it should give improved transmission.

For local battery operation, it will be necessary to connect a resistance in series with the battery supply to prevent overheating and damage to the transmitter. To neutralize the slight loss of transmission introduced by this resistance, an electrolytic condenser wired across it is recommended where heavy loading of a dispatching line would make any loss objectionable. The resistance and capacity values recommended for various voltages are as follows:

Talking Battery Voltage	Resistance	Condenser Capacity
3.0 V	10 ohms	300 mfd.
4.5 V	15 ohms	200 mfd.
24.0 V	200 ohms	20 mfd.

The higher battery voltages are preferable to the lower battery voltages. If electrolytic condensers are employed, correct polarity with respect to the battery should be observed. The current through the transmitter, under the above conditions, is approximately 0.1 ampere.

Sets, head telephone (continued)

The No. 52BW Set, which is for use of supervisors, is the same as the No. 52AW Set except that it is equipped with an L4AH retractile brown mercerized cotton covered cord. This cord has a normal extended length of 10 feet which closes into a uniform helix approximately 3 feet long. It is finished at the plug end for a No. 289B Plug. Near the other end it is equipped with a No. 29A Connecting Block, a KS-8010 Transmitter Cut-out Switch and a sleeving which acts as a wrist loop. The No. 29A Connecting Block is designed to permit a second listener to plug in by the use of an R2DM Cord and a receiver.

The No. 52DW Set is for use of night operators and is similar to the No. 52AW Set except that it is equipped with an L4AK retractile brown mercerized cotton covered cord. This cord has a normal extended length of 15 feet which closes into a uniform helix approximately 3 feet long. It is finished at the plug end for a No. 289B Plug. Near the other end a sleeving is attached to form a wrist loop.

The No. 52CW Set is designed for special installations at airports or where a high impedance receiver unit is required. It is similar to the No. 52AW Set except that it is equipped with an HC-4 Receiver Unit whose impedance is approximately 600 ohms at 1000 cps. and d-c resistance about 140 ohms.

The No. 55AW Transmitter Arm consists of a transmitter case and a stainless steel tube on which the transmitter terminal plug is mounted. Contact with the transmitter unit is made by springs inside the case. Leads are carried inside the arm from these springs to the transmitter terminal plug.

The N-1 Transmitter Unit is of the direct action type and is held in the case by the cap. Concentric rings at the base make electrical contact with the springs in the case.

The No. 10A Receiver Holder consists of a receiver case with contact springs inside for the receiver unit, terminal accommodations for the receiver leads, and a friction joint. The friction joint allows the tube of the transmitter arm to turn and to slide lengthwise when adjusting the distance between the transmitter and receiver.

The HC3 Receiver Unit is similar to the HA1 unit (Bell System Hand Set Receiver Unit) but is smaller, lighter and more efficient. These features were accomplished by several improvements in design which were made possible by the development of new alloys having special magnetic properties. The impedance of this unit is approximately 300 ohms at 1000 cps. and its d-c resistance is about 65 ohms.

Set, dispatcher's head telephone



Dispatcher's Head Telephone Set

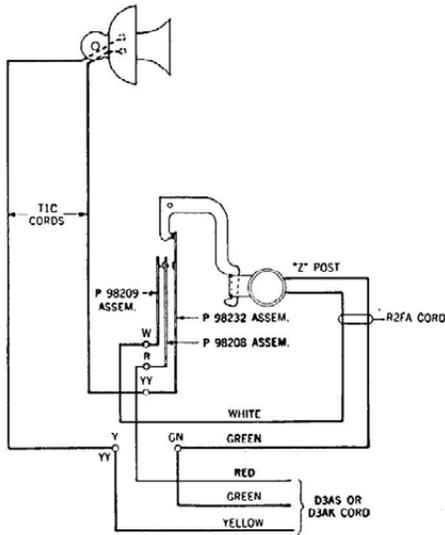
The Dispatcher's Head Telephone Set intended for use with the No. 502 type Subscriber Sets consists of the apparatus listed. These items should be ordered separately and assembled by the customer.

- 1 No. 650B Transmitter
- 1 No. 3A Transmitter Attachment
- 1 No. 716E Receiver* (Consists of No. 716B Receiver and No. 11A Head Band)
- 1 No. L4P Cord, 4 ft., 6 ft. or 10 ft. (Specify length)
- Equipped with
- 1 No. 289B Plug

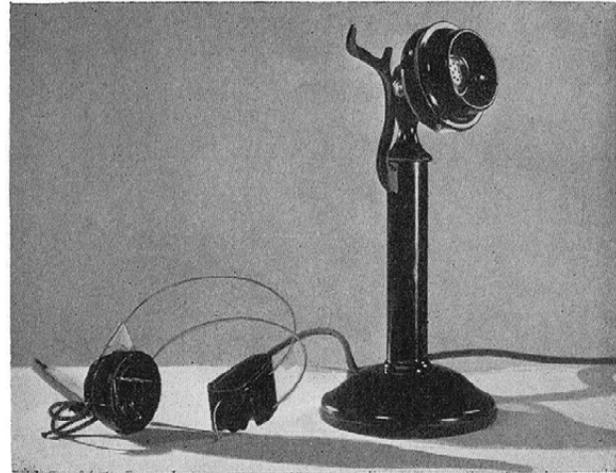
* When Dispatcher's Head Telephone Set is required for use with No. 295 type Subscriber Sets, the No. 716C Receiver and No. 11A Head Band should be specified. The No. 716C Receiver includes the No. HA4 Receiver Unit having an impedance of 2000 ohms at 800 cycles.



Stands, desk



Wiring Diagram
Nos. 1020AB and 1120AB Desk Stands



No. 1020AB Desk Stand

The following Desk Stands are for use with the various train dispatching telephone circuits. The No. 1020AB Desk Stand is equipped with the No. 716C Receiver which includes the No. HA-4 Receiver Unit having an impedance of 2000 ohms at 800 cycles and a d-c resistance of 275 ohms.

The No. 1120AB Desk Stand is equipped with the No. 716B Receiver which includes the No.

HA-2 Receiver Unit having an impedance of 257 ohms at 800 cycles and a d-c resistance of 57 ohms.

The entire terminal plate and switch hook assemblies of these stands may be withdrawn from the stem and base assembly for inspection without disconnecting the cords or interrupting the service in any way. This is accomplished by removing one screw from the bottom of the base plate. The bottom and edge of the base plate is covered with felt. All current carrying parts are insulated from the frame.

Desk Stand Code No.	Trans. No.	Rec. No.	Head Band No.	Cords			Used With
				Rec.	Trans.	Desk Stand	
1020AB	635B	716C	3B	R2FA	2-T1C	D3AK-9	No. 295 Type Subscriber Sets (Replaces No. 1042AB)
1120AB	635B	716B	3B	R2FA	2-T1C	D3AK-9	No. 501 Type Subscriber Sets (Replaces No. 1142AB)

REPLACEMENT PARTS FOR NOS. 1020AB AND 1120AB DESK STANDS

Transmitter	635B	Stand Cord	D3AK-9—5' 6"	Contact Spring	P-98209
Receiver	716C (1020AB)	Switch Hook	P-98884	Contact Spring	P-98232
	716B (1120AB)	Hook Stop	P-93377	Cushion	P-97994
Head Band	3B	Lugholder	P-92251	Clamping Nut	P-87530
Transmitter Cord	T1C—9 ⁷ / ₈ "	Terminal Plate	P-98247	R.H.M. Screw	P-92619
Receiver Cord	R2FA	Contact Spring	P-98208		

Strips, designation

These consist of a black finished metal retaining strip. The No. 8 type also has a transparent face strip for protecting a strip of printed figures. Mounting screws are furnished.

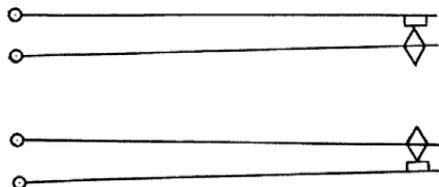


No. 8G Designation Strip

Des. Strip Code No.	Width (Inches)	Length (Inches)	Use
8G	$\frac{7}{16}$	Specified (not exceeding 36")	General
8H	$\frac{3}{8}$	Specified (not exceeding 36")	General
8K	$\frac{5}{8}$	$6\frac{1}{8}$	General
8L*	$\frac{7}{16}$	Specified (not exceeding 36")	General
8M*	$\frac{3}{8}$	Specified (not exceeding 36")	General
8U*	$\frac{5}{8}$	Specified (not exceeding 36")	General
8AA*	$\frac{7}{16}$	$15\frac{3}{4}$	General
8AB	$\frac{7}{16}$	(a)	On keys $\frac{1}{8}$ " wide "A10" or similar type
43B	$\frac{3}{4}$	$1\frac{1}{2}$	General
43C	$\frac{3}{4}$	$1\frac{1}{4}$	General
43D	$\frac{3}{4}$	$1\frac{1}{4}$	General
90A	$\frac{7}{16}$	$15\frac{1}{8}$	Intended to mount on Nos. 184, 185 and 194A Jack Mountings and No. 262 Lamp Socket Mountings and is arranged to accommodate a designation card for each pair of jacks or lamps.
90B	$\frac{5}{8}$	$6\frac{3}{8}$	Intended to mount on Nos. 128 and 129 Jack Mountings and is arranged to accommodate a designation card for each pair of jacks.

* Ends of metal retaining strip are turned up to prevent strips from slipping out.
 (a) Lengths suitable for any number of keys from 3 to 48 inclusive.

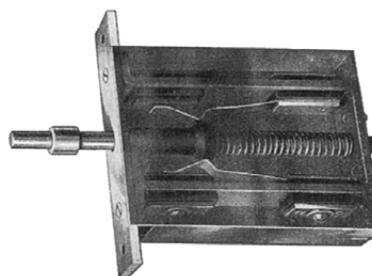
Switch, booth



Spring Combination for 1A Booth Switch

The No. 1A Booth Switch is used for disconnecting siding telephones from the line when the telephone is located in a locked booth. Operates

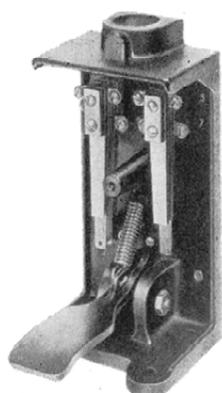
when hasp is placed over the staple and held in place by padlock.



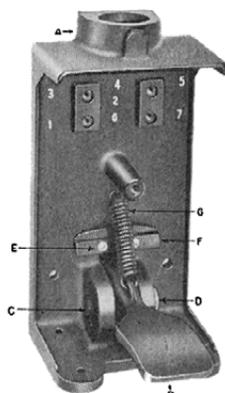
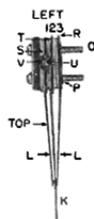
No. 1A Booth Switch



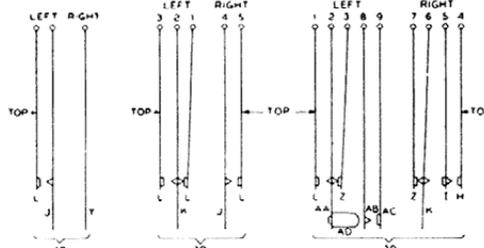
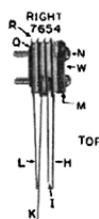
Switches, foot, Nos. 1B, 3B, 3C and 3D



3B Foot Switch



3C Foot Switch



Nos. 1B, 3B, 3C and 3D Foot Switches

ORDERING CODE FOR FOOT SWITCHES REPLACEMENT PARTS

No.	Subject	No. 1B	No. 3B	No. 3C	No. 3D
A	Case	P-94438	P-94438	P-94438	P-94438
B	Pedal	P-94440	P-94440	P-94440	P-94440
C	Pivot Pin	P-44441	P-94441	P-94441	P-94441
D	Pivot Pin Nut	P-94442	P-94442	P-94442	P-94442
E	Pedal Screw	P-94445	P-94445	P-94445	P-94445
F	Pedal Insulator	P-94444	P-94444	P-94444	P-94444
G	Pedal Spring	P-94443	P-94443	P-94443	P-94443
H	Contact Spring			P-98590	P-98590
I	Contact Spring			P-98588	P-98588
J	Contact Spring	P-94460	P-94460		
K	Contact Spring		P-94461	P-94461	P-94461
L	Contact Spring	P-94458	P-94458	P-94458	P-94458
M	Top Insulator	P-94454	P-94454	P-94454	P-94454
N	Pile-up Screw	P-94467	P-94448	P-94448	P-94448
O	Pile-up Screw	P-94448	P-94448	P-94448	P-209711
P	Left Bushing	P-94449	P-94449	P-94449	P-209714
Q	Right Bushing	P-94463	P-94449	P-133268	P-133268
R	Spring Insulator	P-94453	P-94453	P-94453	P-94453
S	Terminal	P-94451	P-94451	P-94451	P-94451
T	Terminal		P-94452	P-94452	P-94452
U	Terminal Washer	P-103706	P-103706	P-103706	P-103706
V	Terminal Screw	P-128912	P-128912	P-128912	P-128912
W	Clamp Plate	P-94450	P-94450	P-94450	P-94450
Y	Contact Spring	P-94462			
Z	Contact Spring				P-94458
AA	Contact Spring				P-209716
AB	Contact Spring				P-209713
AC	Contact Spring				P-209712
AD	Separator				P-209715
	Cover Screw	P-94446	P-94446	P-94446	P-94446
	Cover	P-94439	P-94439	P-94439	P-94439
	Complete Left Spring Assembly			P-290256	P-290279
	Complete Right Spring Assembly			P-290280	P-290280

Switches, foot (continued)

Foot switches are used for disconnecting the transmitter from the line, and also for changing the value of the shunting resistance across the output of the amplifier. The switch must be depressed to talk and released to receive, although at the dispatcher's station reception for "break in" purposes at a reduced volume may be had while the switch is depressed.

Each switch consists of a black finished metal case with a foot pedal and a set of contact springs. Approximate dimensions are 7½" high x 3¾" wide x 5⅜" deep, including foot pedal.

- 1B—Used with the No. 502A Subscriber Set at the dispatcher's station. Equipped with a single make contact for connecting the battery to the transmitter for talking. Replaces the No. 1A Foot Switch.
- 3B—Used with the No. 502A Subscriber Set at the dispatcher's station. Equipped with one break and two make contacts and is used when a loud speaker set is connected to the subscriber set. Replaces the No. 3A Foot Switch.
- 3C—Used with the Nos. 501B and 501F Subscriber Sets at way stations. Equipped with two break and three make contacts for connecting the battery to the transmitter for talking and for changing the turns ratio of the induction coil to increase the efficiency of the subscriber set when transmitting and receiving.
- 3D—Used with the Nos. 501B and 501F Subscriber Sets at way stations. Equipped with two break and four make contacts and is used when a loud speaker set is connected to the subscriber set.

**FOOT SWITCH ATTACHMENTS
NOS. 1A, 1B AND 2A**



No. 1A Foot Switch Attachment

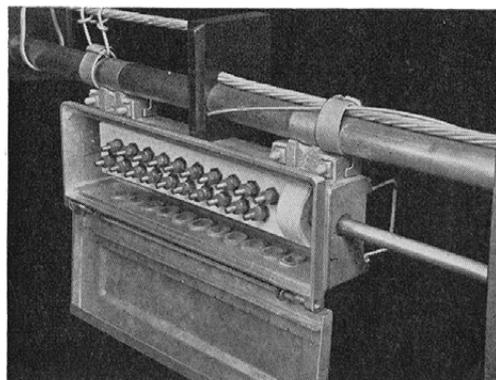
1A—Black finished, "U" shaped metal lever 12 inches long, ⅜ inches in diameter and 3 inches wide, supported by bearings (2 inches from floor line) at each end. Bearings are intended to be fastened to the floor in such location that the center of the lever rests upon the pedal of a train dispatcher's foot switch (such as Nos. 1 and 3 type) and operates it when pressure is applied at any point along the entire length of the lever. Furnished with wood screws for mounting.

1B—Same as 1A except that the lever is 24 inches long.

2A—Black finished metal conduit, ¾ inches in diameter and 23 inches long. Intended for use

in connection with the Nos. 1 and 3 type Foot Switches for protecting the wires entering the foot switch. Equipped at one end with a ¾ inch bushing. Furnished with a pipe strap and wood screws for mounting.

Terminals, cable



"NA" Type Cable Terminal

Cable terminals used to terminate all or a part of the paper-insulated conductors in lead-covered cables should include means to prevent the entrance of moisture into the cable core. Experience indicates that the most satisfactory results are obtained by the use of cable terminals that include a stub cable having one end sealed in a moisture-proof chamber with the conductors connected to terminal posts mounted in a face plate of dielectric material that forms the front of the sealing chamber. It is then only necessary to splice the stub cable to the cable in the field to obtain a moisture-proof termination. The Western Electric Company manufactures a complete line of cable terminals that embody this feature, as well as the best electrical and mechanical qualities. The terminals for out-of-door use include housings that effectively retard the entrance of dirt and moisture to the face plates in order to maintain adequate insulation resistance between the terminal posts. For indoor installations, a series of cable terminal boxes and sections are provided to protect the sealed chambers from dirt and accidental damage.

The selection of Cable Terminals for use at various points in the plant may involve provision of suitable protection against lightning and crosses with neighboring power circuits. Proper cross-connecting facilities should be provided where required for plant flexibility, and provision made for future changes and additions. The cable terminals described in the succeeding pages offer these features in a number of combinations.



"NA" TYPE CABLE TERMINAL (Unprotected)

The NA type Cable Terminal is a newly designed terminal intended for use in the aerial cable plant and will replace the 10 and 16 pair sizes of the F type Cable Terminal for most installations. This terminal which consists of a cast aluminum alloy housing provided with a door which opens downward and containing a removable porcelain binding post chamber, is arranged to mount on its associated cable by means of clamps provided for this purpose.

Each binding post chamber is provided with a 24 gauge paper-insulated cable stub. The standard assembly of the binding post chamber in the housing is such that the cable stub will appear to the right when the terminal is viewed from the front. The terminal is so designed, however, that should it be necessary to bring the stub out at the left, the binding post chamber can be reversed in the field.

Cable stubs can be furnished in either 3 or 5 foot lengths, the shorter being supplied unless otherwise specified in the order.

Wiring holes are provided in the bottom of the housing for drop wires and three distributing rings of corrosion resistant material are attached to the rear of the housing.

Overall Dimensions (Inches)

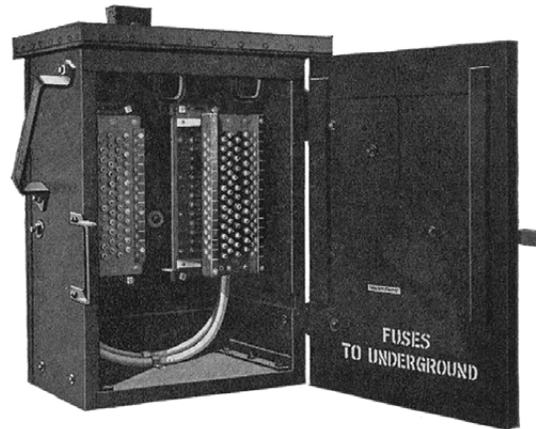
Cable Term. Code No.	Capacity Pairs	Height (Door Open)	Width	Depth
NA 10	10	8 ³ / ₈	12 ¹ / ₂	3 ¹ / ₈
NA 16	16	8 ³ / ₈	17	3 ¹ / ₈

TYPE "B" CABLE TERMINALS (Protected)

The B type Cable Terminal was primarily designed for use at junctions of aerial and underground cables where 7 ampere fuses are required.

Each complete B Cable Terminal consists of a B Cable Terminal Box in which are assembled one or more B fuse chambers and an equal number of B binding post chambers. The fuse chambers provide mountings for the 7 ampere fuses. The circuits are completed by installing fuses and running cross-connecting wires between the fuse chamber and binding post chambers. The following tabulation lists the B Cable Terminals and shows their component parts. The B26 Cable Terminal will terminate both a 26 pair underground cable and a 26 pair aerial cable. Other sizes have similar capacity ratings.

Pole seats may be used with the two smaller sizes of B Cable Terminals and these together with balconies for the large terminals can be obtained.

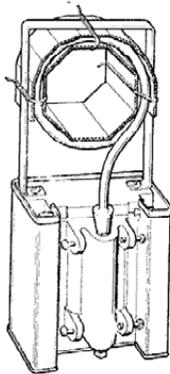


B26 Cable Terminal

Cable Term. Code No.	Capacity Pairs	Cable Terminal Box No.	Includes
B26	26	B26	1 B26A Fuse Chamber and 1 B26A Binding Post Chamber
B51	51	B51	1 B51A Fuse Chamber and 1 B51A Binding Post Chamber
B76	76	B76	1 B76A Fuse Chamber and 1 B76A Binding Post Chamber
B101	101	B101	1 B101A Fuse Chamber and 1 B101A Binding Post Chamber
B152	152	B152	2 B76B Fuse Chamber and 2 B76B Binding Post Chamber
B202	202	B202	2 B101B Fuse Chamber and 2 B101B Binding Post Chamber
B304	304	B304	{ 2 B76C Fuse Chamber and 2 B76C Binding Post Chamber
B404	404	B404	{ 2 B101C Fuse Chamber and 2 B101C Binding Post Chamber

NOTE: "B" Fuse Chambers do not include the No. 7T Fuses which must be ordered separately. Two fuses are required for each pair.

**"F" TYPE CABLE TERMINALS
(Unprotected)**



"F" Type Cable Terminal
(with packing detail
for cable stub)



"F" Type
Cable Terminal
(Open)

The F type Cable Terminals are intended for use in the exchange cable plant as a distribution cable terminal. They may also be used at junctions of cable and toll or exchange open wire lines. Lightning protection for the cable pairs connected to open or drop wires may be obtained by installing an 83A Protector Mounting near the cable terminal. The F Terminals consist essentially of a sealed chamber of cast iron having an insulating face plate equipped with terminal posts for the drop or bridle wire connections. The face plate is protected against the weather and dirt by a galvanized iron slip cover. A detachable mounting plate is supplied for installing the terminal on poles or walls.

F Cable Terminals are equipped with 24-gauge paper insulated stub cables. The normal stub length is 5½ feet, but stubs 8, 10 and 12 feet in length can be furnished when specified on orders. The terminals are furnished ready to install with the stubs at the top; they can be installed with stubs at the bottom by reversing, in the field, the catches that hold the cover in the raised position. Terminals with 8 foot stubs out of the bottom may be specified.

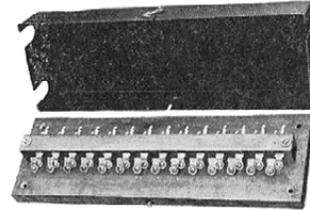
Cable Terminal	Capacity Pairs	Overall Dimensions (Inches)		
		Height	Width	Depth
F10	10	8½	7½	4 ⅞
F16	16	10 ⅞	7½	4 ⅞
F26	26	15½	7½	4 ⅞

**NO. 12 TYPE CABLE TERMINALS
(Unprotected)**

The No. 12 type Cable Terminal is for interior distribution, and consists of a wooden base and an olive green finished metal cover. They are equipped with terminals having soldering connec-

tions at one end and screw connections at the other. Cable forms may be brought in from either end.

Cable Terminal	Capacity Pairs	Overall Dimensions (Inches)
12A	13	11 ⅞ x 4 ⅞ x 1 ⅞
12B	23	11 ⅞ x 4 ⅞ x 2 ⅞
12C	33	11 ⅞ x 4 ⅞ x 3 ⅞



No. 12A Cable Terminal

Tools



No. 144 Tool



No. 145 Tool

Tool Code No.	Description
144	Used for changing Nos. 60A, 60B, 60AP and 60BP Selectors to call different stations. Consists of a socket wrench and screw driver.
145	Used for changing Nos. 60A and 60B Selectors to call different stations. Small double ended tool, one end consisting of a wrench for ⅛ inch hexagonal nut; the other end a small wire hook.

Transmitters

NOS. 635A AND 635B TRANSMITTERS



No. 635 Type Transmitter



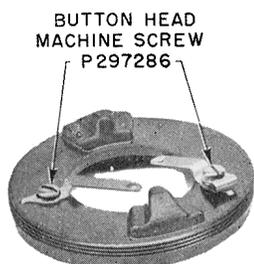
No. 635 Type Transmitter Unit



Nos. F1 or F2 Transmitter Unit



Transmitter Mouthpiece P371174



Transmitter Contact Spring Assembly
No. P-290333

The No. 635 type Transmitter is a high efficiency transmitter which provides for the use of the No. F type Transmitter Units on desk stands and wall telephone sets in place of the transmitters (mounting lug type) formerly used.

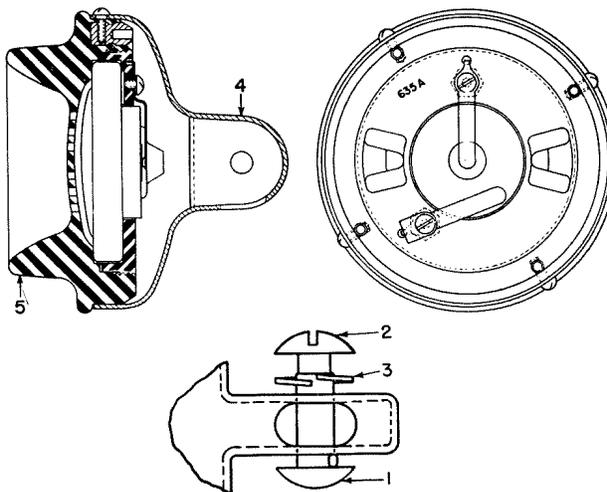
The No. 635A Transmitter is intended for central battery service and consists of a No. 635A Transmitter Unit mounted in a transmitter backcase by means of four rim mounting screws, a machine screw, nut and lock washer for assembling the transmitter to a desk stand or the Nos. 3E or 8A Transmitter Brackets mounted on wall telephone sets.

The No. 635A Transmitter Unit consists of a No. F1 Transmitter Unit mounted on a combined faceplate and mouthpiece, equipped with four rim mounting screws. The No. F1 Unit is held to the faceplate by means of a contact spring assembly.

The No. 635B Transmitter is intended for local battery service and is similar to the No. 635A Transmitter except that it consists of a No. 635B Transmitter Unit which includes a No. F2 Transmitter Unit.

The No. 635 type Transmitter Units may be ordered separately to replace the mouthpiece,

faceplate and carbon button of various older type transmitters.

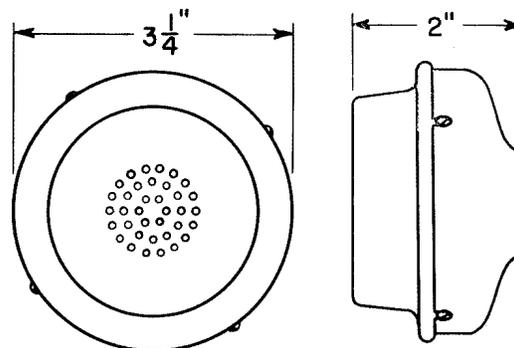


Replacement Parts for No. 635 Type Transmitters

Symbol	Name of Part	Code No.
1	Bolt	P-92375
2	R.H. Machine Screw	P-92378
3	Washer	P-92381
4	Backcase or Bell	P-222386
5	No. 635A or B Transmitter Unit	.....

The above layout shows the component parts of the No. 635 type Transmitters for identification purposes.

NO. 645 TYPE TRANSMITTER



No. 645 Type Transmitter

The No. 645 type Transmitter consists of No. 635 Transmitter Units and backcase or bell which is designed for mounting the transmitter to a transmitter arm or bracket.

The No. 645A Transmitter includes the No. 635A Transmitter Unit and is intended for use in common battery circuits. When used in conjunction with the No. 57A Transmitter Arm, the No. 645A

Transmitter replaces the No. 353 Transmitter. However, the No. 645 type Transmitter will mount on the arm which was a part of the No. 353 Transmitter.

The No. 645B Transmitter includes the No. 635B Transmitter Unit and is intended for use in local battery circuits. The No. 645B Transmitter replaces the No. 354 Transmitter for local battery use and with the addition of the No. 57A Transmitter Arm also replaces the No. 353 Transmitter and the No. 603A Transmitter. The No. 645B Transmitter plus the No. 56A Transmitter Arm replaces the No. 604A Transmitter for local battery use, and with the addition of the No. T1H Cord also replaces the No. 606A Transmitter.

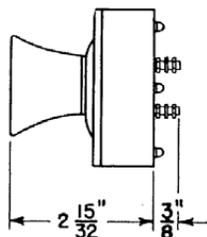
NO. 646 TYPE TRANSMITTER



No. 646A Transmitter

The No. 646A Transmitter consists of a No. F1 Transmitter Unit and a No. 129F Condenser mounted in a case which is provided with a clip for attaching the instrument to clothing. This transmitter replaces the No. 608A Transmitter and is intended for use in connection with a head set by linemen, test men, and repairmen.

NO. 647 TYPE TRANSMITTERS



No. 647A Transmitter

The No. 647A Transmitter consists of a No. K1 Transmitter Unit enclosed in a case of insulating

material and having a mouthpiece attached to a face plate. This transmitter is intended for use in the No. 1336E and similar type telephone sets and replaces the No. 312 Transmitter. A spacer, P-480115, and three screws, P-116857, are required in making this replacement. They are not furnished as parts of the No. 647A Transmitter and must be ordered separately.

The No. 647B Transmitter consists of a No. K1 Transmitter Unit enclosed in a case of insulating material and is intended for use as a part of the No. 1526B Telephone Set. This transmitter is similar to the No. 647A Transmitter except that it is equipped with a mounting bracket, has a shorter mouthpiece, and the insulating compound is omitted. This transmitter is electrically interchangeable with the No. 398A Transmitter.

NO. 648 TYPE TRANSMITTER

The No. 648 type Transmitters consist of operators' chest type instruments. The No. 648A is equipped with a No. F1 Transmitter Unit and the No. 648B is equipped with a No. F2 Transmitter Unit.

The No. 648B Transmitter replaces the No. 234 Transmitter in local battery circuits.

NO. 649 TYPE TRANSMITTER

The No. 649A Transmitter consists of a No. F1 Transmitter Unit assembled in a metal case and intended for use in the No. 1017C and E Test Sets. This transmitter replaces the No. 266 Transmitter.

NO. 650B TRANSMITTER



No. 650B Transmitter Equipped With No. 3 Type Transmitter Attachment

The No. 650B Transmitter consists of a chest type instrument containing a No. F2 Transmitter Unit and is intended for use in local battery circuits for train dispatching.



Transmitters (continued)

Transmitter Code No.	Trans. Unit	Trans. Res.	Replaces		Used With	
			Trans. Code No.	Resistance		
Trans. Cap P-456235 Trans. Case P-284713 Trans. Term. Screw (2) P-297286	} (A)	F1	28	244	40	1001H Hand Set
		F2	28	285	14	1001C and 1001P Hand Sets
635A	F1	28	323	40	For Common Battery Operation	
635B	F2	28	323	40	For Local Battery Operation	
					Telephone Sets 1305AC, 1317P, S, AH, BK, CN 1305BA, 1317CG, CP, CR, R, N, CH	
					Desk Stands 1020AL, 1040U, 1040AL, 1051AL	
					Transmitter Arm 1020CC	
635B	F2	28	349	14	Telephone Sets 1317BU, DU, AE, W, AD, AW, 1293AD, AK, AE, AL, BC	
					Desk Stands 1042AB, BR, 1020AB, 1120AB, 1142AB	
635B	F2	28	359	30	Magneto and Local Battery Tel. Sets	
645A	F1	28	353	40	For Common Battery Operation	
645B	F2	28	353	40	For Local Battery Operation	
			603A	14	Railroad Train Disp. Systems	
			604A	30	1312A Telephone Set	
			606A	30	1314A Telephone Set (Portable)	
646A	F1	28	608			
647A	K1	28	312		1336E and Similar Type Telephone Sets Spacer P-480115 and three screws P-116857 required	
	K1	28	601A		1336F and H Telephone Sets, Bracket P-109455 required	
647B	K1	28	398A		1526B Telephone Set	
648B	F2	28	234		Operators' chest type instrument in- tended for use in local battery cir- cuits	
649A	F1	28	266		1017C and E Test Sets	
650B	F2	28	386	14	295AJ and 502A Subscriber Sets	

(A) To be assembled by customer.

Transmitter attachments



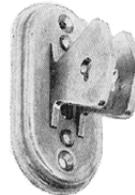
No. 3A Transmitter Attachment

Trans. Att. Code No.	Strap	Description
2A	.....	Nickel plated buckle used in connection with the No. 3 type Transmitter Attachments
3A	P-85537 Slate	These transmitter attachments consist of a tape strap 20 inches long equipped with two No. 2A Transmitter Attachments. They are used for supporting operator's chest type transmitters. Overall length, adjustable, approximately 20 inches maximum. (Used with Nos. 648 and 650 and similar type Transmitters.)
3B	P-85538 Black	
3C	P-87437 White	

Transmitter brackets



No. 7A Transmitter Bracket



No. 8A Transmitter Bracket

These transmitter brackets will mount any Western Electric transmitter that is equipped with a mounting lug and screw, as for example the No. 635 Transmitter.

Trans. Br. Code No.	Finish	Description
3D	Black	For mounting old style grounded transmitters on wooden telephones. Has a stud for making the ground connections.
3E	Black	For mounting insulated transmitters. Used principally on wooden telephone sets such as the Nos. 1293 and 1305 type.
7A	Nickel Plate	For mounting insulated transmitters in a semi-flush position on metal telephone sets such as No. 1533 type and similar telephone sets.
8A	Black	For mounting insulated transmitters on wooden telephone sets such as Nos. 1317 and 1417 type Telephone Sets.

Wire

The following types of wire are especially adapted for use in apparatus wiring and in local and toll switchboards. They are for the most part lacquer treated. This lacquer treatment has many advantages over wax impregnation, some of which are as follows:

1. Eliminates wax as a fire hazard;
2. Eliminates insulation fraying at terminals;
3. Does not collect dirt;
4. Colors remain brighter for long periods of service.

Unless otherwise stated, all solid wires are in American wire gauge; all stranded wires are in American wire gauge equivalents.

C TYPE WIRE

Designed for use in local cable forms, in local, toll and telegraph circuits.
 Solid tinned conductors, double cellulose acetate yarn and single cotton servings, lacquer coated.
 Obtainable in Nos. 22 and 24 gauges; singles, pairs, triples and quads and in various colors.



Wire (continued)

Weight 2.627 pounds per 1000 ft. for No. 22 gauge single and 1.815 pounds per 1000 ft. for No. 24 gauge single.

D TYPE WIRE

Designed primarily for use in circuits above 48 volts in moisture-proof installations.

Solid tinned enameled conductors, double cellulose acetate yarn and single cotton servings, lacquer coated.

Obtainable in Nos. 20 and 22 gauges; singles, pairs, triples and quads and in various colors.

Weight 4.040 pounds per 1000 ft. for No. 20 gauge single and 2.732 pounds per 1000 ft. for No. 22 gauge single.

G TYPE WIRE

Designed primarily for use in surface wiring.

Solid tinned conductors, double cellulose acetate yarn serving and cotton braid, wax impregnated.

Obtainable in Nos. 22 and 24 gauges; singles only and in various colors.

Weight 3.094 pounds per 1000 ft. for No. 22 gauge and 2.313 pounds per 1000 ft. for No. 24 gauge.

H TYPE WIRE

Designed primarily for wiring telephone sets and for miscellaneous apparatus strapping.

Tinned stranded conductors, double cellulose acetate yarn servings, cotton braid, lacquer coated.

Obtainable in No. 22 gauge; singles only and in various colors.

Weight 3.192 pounds per 1000 ft. for No. 22 gauge.

J TYPE WIRE

Designed primarily for use as strap wire.

Solid tinned conductors, double cotton braid, asphaltic or wax impregnation.

Obtainable in Nos. 18, 20, 22 and 24 gauges; singles only; black only.

Weight per 1000 ft. for Wire various gauges:

No. 18—6.636 pounds	No. 22—3.381 pounds
No. 20—4.664 pounds	No. 24—2.559 pounds

K TYPE WIRE

Designed primarily for cross-connecting relay frames.

Solid tinned conductors, double cellulose acetate yarn servings and cotton braid, lacquer coated.

Obtainable in Nos. 22 and 24 gauges; singles, pairs and triples and in various colors.

Weight 2.766 pounds per 1000 ft. for No. 22 gauge single and 2.341 pounds per 1000 ft. for No. 24 gauge single.

M TYPE WIRE

Designed primarily for wiring carrier terminating equipment.

Solid tinned conductors, double cellulose acetate yarn servings and cotton braid, lacquer coated.

Obtainable in No. 22 gauge; singles, pairs and triples and in various colors.

Weight 3.229 pounds per 1000 ft. for No. 22 gauge single.

P TYPE WIRE

Designed primarily for use where a shielded wire is required in high grade transmission circuits.

Solid tinned enameled conductors, double cellulose acetate yarn and single cotton servings, lacquer coated.

Obtainable in No. 22 gauge; singles, pairs and triples and in various colors.

A No. 22 gauge tinned copper ground wire is laid longitudinally with the insulated single, pair or triple conductors and the combination is covered with a braided shield of tinned copper wire, paper tape and slate colored cotton braid.

Weight 10.832 pounds per 1000 ft. for No. 22 gauge single.

AA TYPE WIRE

Designed primarily for wiring rectifiers.

Tinned stranded conductors, double nylon yarn and single cotton servings, cotton braid, lacquer coated.

Obtainable in Nos. 12, 14, 16, 18, 20 and 22 gauges; singles and pairs and in various colors.

Weight per 1000 ft. for single wire various gauges:

No. 12—25.73 pounds	No. 18—8.65 pounds
No. 14—17.19 pounds	No. 20—6.30 pounds
No. 16—11.95 pounds	No. 22—5.41 pounds

AB TYPE WIRE

Designed primarily for wiring amplifiers and lead out wire for coils.

Tinned stranded conductors, double nylon yarn and single cotton servings, cotton braid, wax impregnated.

Obtainable in Nos. 12, 14, 16, 18, 20 and 22 gauges; singles and pairs and in various colors.

Obtainable unimpregnated when specified.

Paired impregnated wire obtainable with a cotton braid and a braided copper shield, when specified.

Western Electric

Weight per 1000 ft.. for single wire various gauges:

No. 12—26.49 pounds	No. 18—9.18 pounds
No. 14—17.85 pounds	No. 20—6.79 pounds
No. 16—12.54 pounds	No. 22—5.41 pounds

AC TYPE WIRE

Designed primarily for use as quadded switch-board wire.

Solid tinned conductors, double cellulose acetate yarn and single cotton servings, lacquer coated.

Obtainable in No. 22 gauge; multiple twin quads and in various color combinations.

Weight per 1000 ft. No. 22 gauge 11.21 pounds.

AD TYPE WIRE

Designed primarily for use as quadded switch-board wire.

Solid tinned enameled conductors, double cellulose acetate yarn and single cotton servings, lacquer coated.

Obtainable in No. 22 gauge; multiple twin quads and in various color combinations.

Weight per 1000 ft. No. 22 gauge 11.529 pounds.

AF TYPE WIRE

Designed primarily for use in transmission networks.

Solid tinned conductors, double cellulose acetate yarn servings, cotton braid, wax impregnated.

Obtainable in Nos. 20, 22 and 24 gauges; singles and pairs in various colors.

Weight per 1000 ft. for single wire various gauges:

No. 20—4.68 pounds
No. 22—3.40 pounds
No. 24—2.57 pounds

AG TYPE WIRE

Designed primarily for use in filter networks and as lead-out wire for coils.

Tinned stranded conductors, double cellulose acetate yarn servings, cotton braid, wax impregnated.

Obtainable in No. 22 gauge; singles only, and in various colors.

Weight per 1000 ft. No. 22 gauge 3.43 pounds.

AK TYPE WIRE

Designed primarily for use in carrier telephone systems.

Solid tinned enameled conductor, double cellulose acetate yarn servings, cotton braid, lacquer coated.

Obtainable in No. 16 gauge; singles only and in various colors.

The conductor is covered with a braided shield of tinned copper wire.

Weight per 1000 ft. No. 16 gauge 17.090 pounds.

AM TYPE WIRE

Designed primarily as a slow burning wire for use as battery leads in local cables.

Solid tinned enameled conductors, double cellulose acetate yarn servings, cotton braid, lacquer coated.

Obtainable in Nos. 14, 16, 18, 19, 20 and 22 gauges; singles, pairs, triples, quads and 5-wire and in various colors.

Weight per 1000 ft. for single wire various gauges:

No. 14—14.68 pounds	No. 19—5.49 pounds
No. 16— 9.74 pounds	No. 20—4.61 pounds
No. 18— 6.62 pounds	No. 22—3.31 pounds

AP TYPE WIRE

Designed primarily for use as a support in local cable forms.

Solid galvanized iron wire, black cotton braid, wax impregnated.

Obtainable in No. 12BWG, black only. Not intended to be used as an electrical conductor.

Weight per 1000 ft. 34.94 pounds.

AR TYPE WIRE

Designed primarily for use in bank wiring in mechanized assembly.

Tinned stranded conductors, double cellulose acetate yarn and single cotton servings, lacquer coated.

Obtainable in No. 24 gauge; singles only, in red and blue colors.

Weight per 1000 ft. No. 24 gauge 1.918 pounds.

BD TYPE WIRE

Designed primarily for use in telephone set wiring and key telephone set cords.

Tinned stranded conductors, colored cotton serving for color designation and transparent thermoplastic covering.

Obtainable in No. 22 gauge; singles only and in various colors.

Weight per 1000 ft. No. 22 gauge 3.6 pounds.



Wire (continued)

BF TYPE WIRE

Designed primarily for use where a shielded wire is required in carrier installations.

Solid tinned conductors, extruded covering of colored polyethylene.

Obtainable in No. 22 gauge; singles, pairs or triples in the following solid colors:

Blue, Orange, Green, Brown, Slate, White, Red and Black.

The single, pair or triple polyethylene conductors are covered with a braided shield of tinned copper wire, paper tape and slate colored cotton braid.

Weight per 1000 ft. for No. 22 gauge single 10.915 pounds.

BG TYPE WIRE

Designed primarily for surface wiring.

Solid tinned conductors, thermoplastic, single cotton serving, lacquer coated.

Obtainable in Nos. 20, 22 and 24 gauges; singles, pairs, triples and quads in various colors.

Weight per 1000 ft. for single wire various gauges:

No. 20—4.742 pounds

No. 22—3.068 pounds

No. 24—2.242 pounds

BH TYPE WIRE

Designed primarily for lead-out wire.

Solid tinned conductors, thermoplastic, cotton braid, lacquer coated.

Obtainable in Nos. 20, 22 and 24 gauges; singles, pairs, triples and quads in various colors.

Weight per 1000 ft. for single wire various gauges:

No. 20—5.205 pounds

No. 22—3.617 pounds

No. 24—2.777 pounds

BK TYPE WIRE

Designed primarily for use where a shielded wire is required for power equipment.

Solid tinned enameled conductors, double cellulose acetate yarn servings, cotton braid, lacquer coated.

Obtainable in Nos. 16 and 20 gauge; singles, pairs or triples and in various colors.

A No. 22 gauge tinned copper ground wire is laid longitudinally with the single, pair or triple insulated conductors and the combination is covered with a braided shield of tinned copper wire, paper tape and slate colored cotton braid.

Weight per 1000 ft. for single wire various gauges:

No. 16—21.022 pounds

No. 20—16.513 pounds

BM TYPE WIRE

Designed primarily for use in filter networks.

Tinned stranded conductors, double nylon yarn servings and cotton braid.

Obtainable in No. 27 gauge; singles only and in various colors.

Obtainable wax impregnated when specified.

Weight per 1000 ft. No. 27 gauge 1.493 pounds.

CROSS-CONNECTING OR DISTRIBUTING FRAME JUMPER WIRE

"L" Type

Designed primarily for use as distributing frame wire, usually referred to as "jumper wire."

Solid tinned enameled conductors, double cellulose acetate yarn and single cotton servings, lacquer coated.

Obtainable in Nos. 20 and 22 gauges; singles, pairs, triples and quads, in the colors shown below. Furnished in 1500-foot coils.

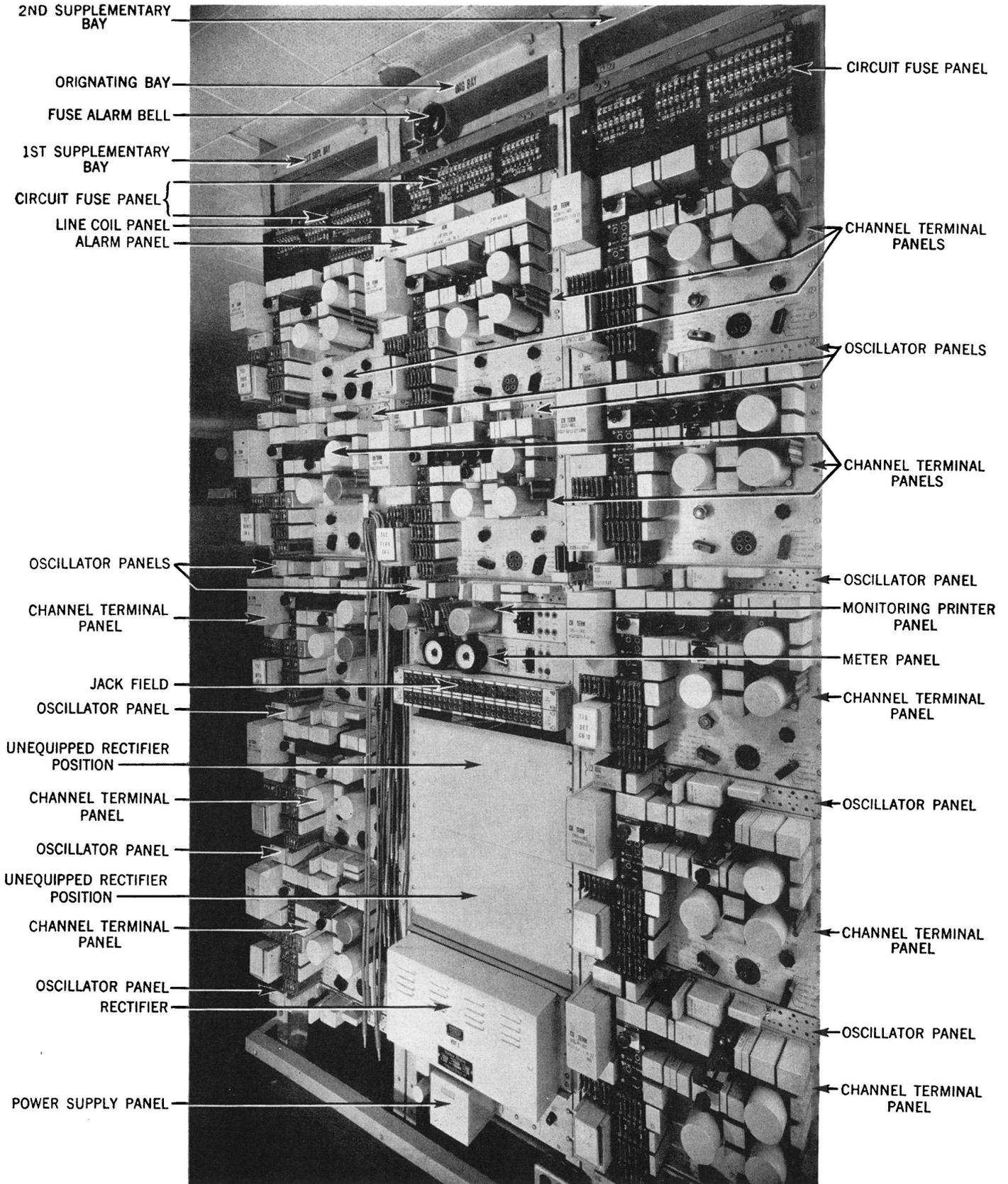
Wire Code No.	Size (AWG Gauge)	No. of Conductors	Weight (Pounds) Per 1000 Ft.	Colors	Replaces
L20S	20	1	4.018	Brown	E20S and E22S
L20P	20	(a) 2	8.052	Brown, *Black	.....
L22M	22	(b) 4	10.940	Black, Black-White, Red, Green	L20F
L22P	22	(a) 2	5.459	White, Black	E22P and L20P
L22T	22	(a) 3	8.197	White, Black, Red	E22T and L20T
L22F	22	(a) 4	10.940	White, Red, Black, Green	E22F

* Has a single thread brown tracer.

(a) Conductors are twisted together in a spiral.

(b) The black and black-white conductors form one twisted pair; the red and green conductors form another twisted pair and the two pairs are twisted together to form a quad.

Western Electric



12 Channels of No. 40AC-1 Carrier Telegraph Installed

CARRIER SYSTEMS, TELEPHONE AND TELEGRAPH REPEATERS AND MOUNTING FRAMEWORKS

Carrier systems, telephone and telegraph repeaters and mounting frameworks suitable for railroad and related industries are described in the following pages:

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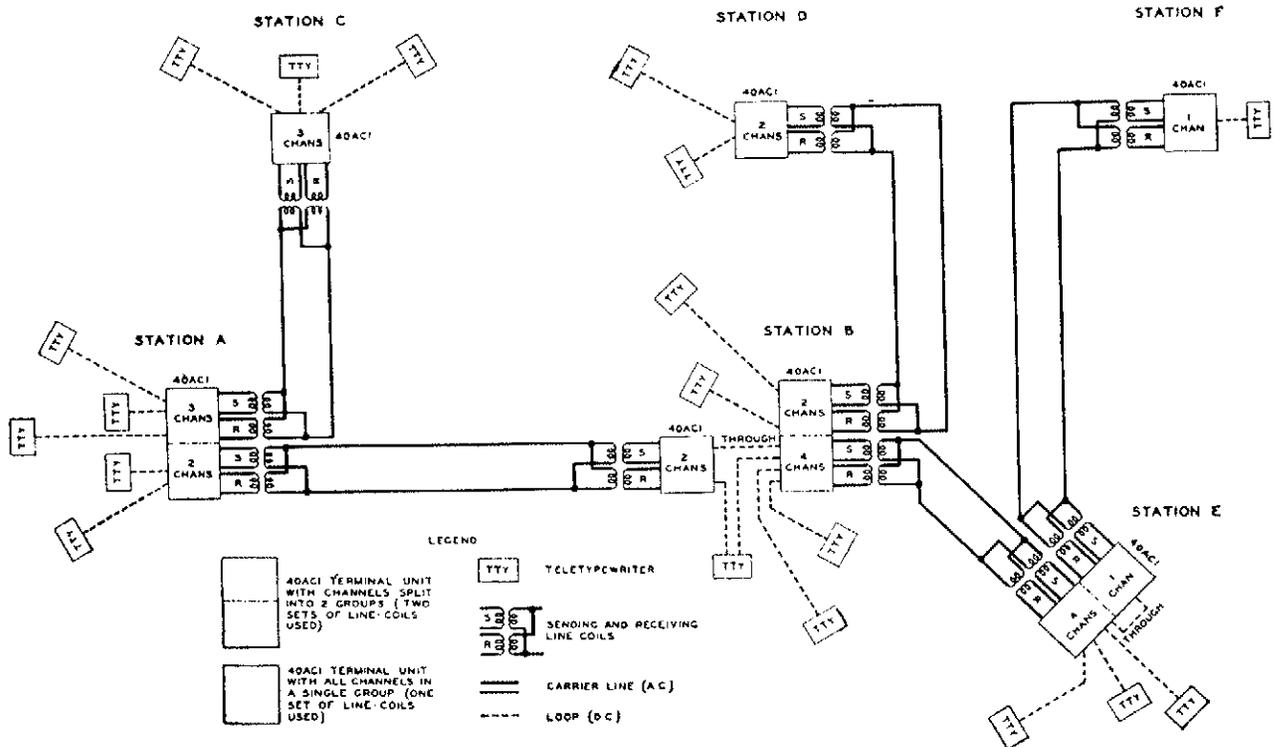
CARRIER SYSTEMS, TELEPHONE AND TELEGRAPH REPEATERS AND MOUNTING FRAMEWORKS

No. 40AC1 voice frequency carrier telegraph system

GENERAL DESCRIPTION

The No. 40AC1 Voice Frequency Carrier Telegraph System has been developed to meet a demand for increased telegraph facilities on communication lines where a direct current power source is not available and to permit a maximum utilization of communication facilities where only a relatively small number of circuits radiate from a given point. A complete system terminal consists

of 12 voice frequency telegraph channels but any smaller number may be installed, if desired. Where more than 12 channels are desired at a given point, two or more system terminals are required. Operation is from a 115 or 230 volt 50 to 60 cycle power source. Existing signal battery supply may be utilized or, if desired, rectifiers forming an integral part of the system may be provided as a source of such supply.



40AC1 Carrier Telephone System Terminal



APPLICATION

When applied to 4-wire circuits on which the operation is at voice frequency or on circuits employing a carrier telephone system similar to the Western Electric Type C, a maximum of 12 telegraph channels may be obtained with this equipment. On non-carrier, 2-wire circuits, only 6 channels are obtainable. On carrier facilities similar to those afforded by the Western Electric Type H1, from 5 to 11 channels are obtainable depending on the particular circumstances.

Should it be desirable, the channel facilities provided for in a given installation may be divided into two groups to permit operation over two separate lines from the same power, testing and other auxiliary equipment. The total number of channels in the groups should not exceed 12, but the division may be made in any manner desired, e.g., if 5 channels are installed at Station A (see illustration), 2 of these may be associated with a line to a second Station B, and 3 with another line terminating at a third Station C.

The teletypewriters are connected to their respective carrier channel-terminals by means of d-c extensions referred to as loops. Other carrier channel terminals or d-c telegraph repeaters may be connected to these loops instead of teletypewriters to form multi-section systems (see illustration, Section B). Several methods of operating these loops are provided for in the equipment and are as outlined below.

LOOP OPTIONS

Any one of the following loop options may be selected by simply turning a dial:

1. Full-duplex polar.
2. Full-duplex to ground.
3. Full-duplex to negative battery.
4. Half-duplex to negative battery.
5. Full-duplex to positive battery.
6. Half-duplex to positive battery.

EQUIPMENT

Complete equipment of a No. 40AC1 System terminal consists of three bays and provides for a maximum of twelve channels. These bays are known as the "Originating" bay, "First Supplementary" bay and "Second Supplementary" bay.

The Originating bay, which is required in all cases, has a total capacity of two channels and in addition, contains all the common equipment such as power supply, line coils, etc., needed for a twelve channel installation. The two supplementary bays are similar to each other and each provides for a maximum of five additional channels.

The supplementary bays, if required, are installed to the left and right of the Originating bay, thereby giving a compact equipment arrangement.

In the event that there is no telegraph battery at the terminal location, facilities can be provided to supply the required power by means of rectifiers. Space is provided on the Originating bay for mounting the latter.

ADVANTAGES

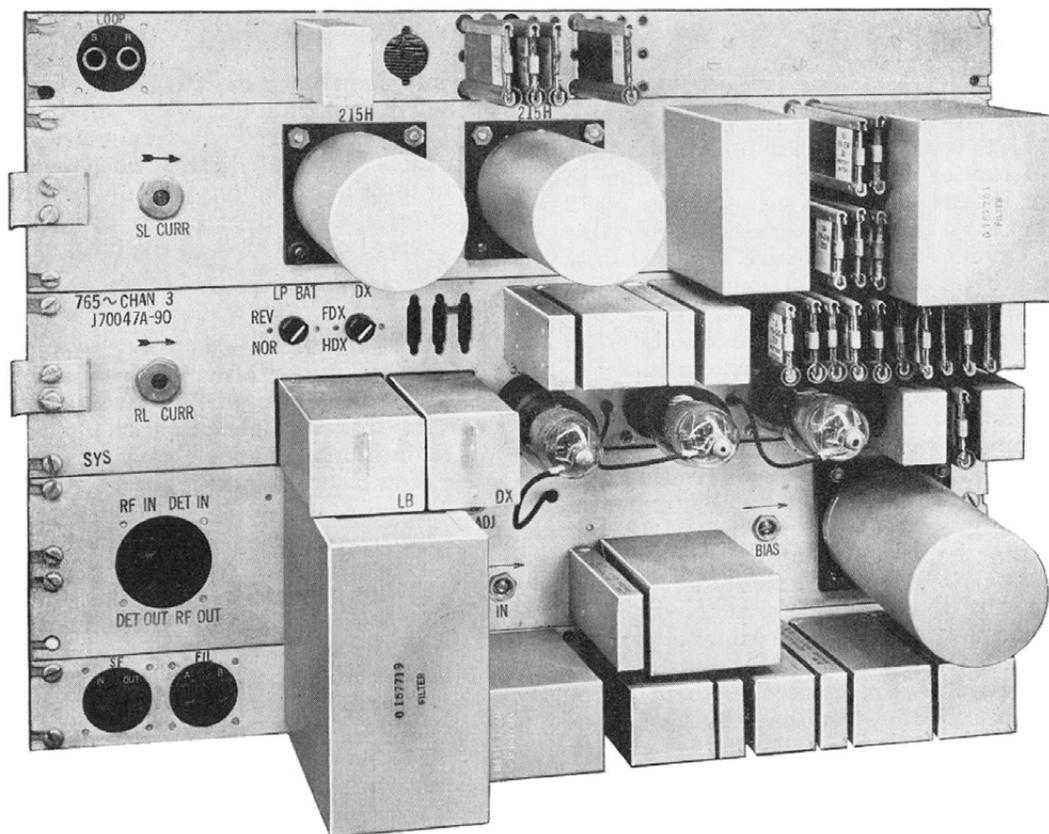
1. Any number of voice frequency telegraph channels from one to twelve, operating at full or half duplex, may be installed initially. Additional channels may be installed from time to time to meet future requirements.
2. In general, any circuit which is satisfactory for telephone operation may be used for the transmission of the carrier signals produced by this system. In particular, the No. 40AC1 System may be used in conjunction with the carrier facilities provided by the Western Electric's Types C and H1 Carrier Telephone Systems.
3. Economical operation from a 115 volt or 230 volt, 50 to 60 cycle power supply.
4. Existing signal battery supply may be utilized, or rectifiers forming an integral part of the System may be provided for this purpose.
5. Operates with unusual freedom from earth currents induced by the Aurora Borealis.
6. A compact, self-contained, easily installed unit.

Further details of this system may be readily obtained from your nearest distributor.

No. 40C1 voice frequency carrier telegraph system (J-70047B)

For communication companies and other large users of telegraph facilities, Western Electric has available a rack mounted carrier telegraph system similar to the No. 40AC1 but which is not self-contained and requires external sources of filtered positive 130 volt d-c for the vacuum tube plate supply, positive and negative 130 volt d-c for the loops which are on a polar basis and a negative 24 volt d-c for energizing the vacuum tube filaments and for other purposes. A separate carrier-current supply is also required; the No. 140A1 Carrier Supply Equipment, or its equivalent, being usually employed for this service. Testing facilities must also be provided separately and

No. 40C1 voice frequency carrier telegraph system (J-70047B) (continued)



40C1 Carrier Telegraph Channel Terminal Panel

consist of a portable unit coded the No. 160A1 Carrier Telegraph Test Set.

The use of carrier supply and testing facilities leads to considerable economies in large installations but tends to increase the cost per channel terminal in small offices. This system is capable of providing a maximum of 14 channels when operated over a channel of a Western Electric Type C Carrier Telephone System, and as many as 18 channels over facilities which have suitable transmission-frequency characteristics.

Operation is on a 4-wire basis, no provision being made for 2-wire operation.

Commercial speeds of up to 100 words per minute may be had over suitable circuits.

The level compensation features are identical with those of the No. 40AC1 System but have a somewhat smaller range of compensation, as it is expected that this system will be operated over more stable circuits.

The carrier frequencies employed are odd multiples of 85 cycles and extend from 255 to 3145 cycles at 170 cycle intervals and thus include all the carrier frequencies employed by the No. 40AC1 System. It therefore follows that, when desirable, No. 40C1 Terminal Equipment can be

employed at one end of a carrier circuit and No. 40AC1 Terminal Equipment at the other end.

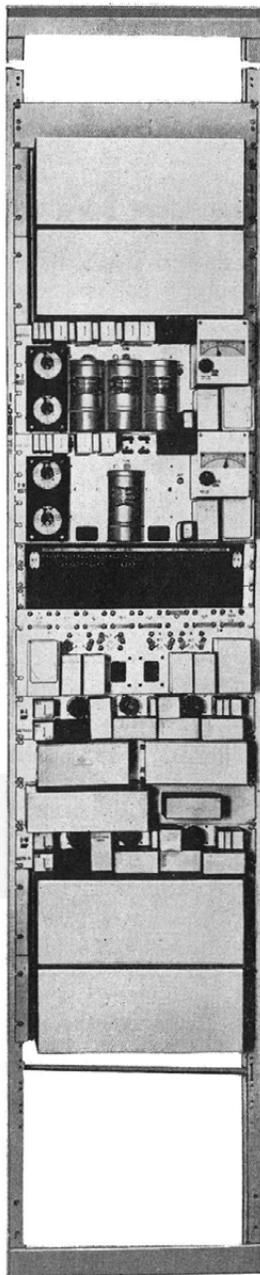
All vacuum tubes used in this system are of Western Electric manufacture and are of the filament type.

C carrier telephone system (J-68756 and J-68757)

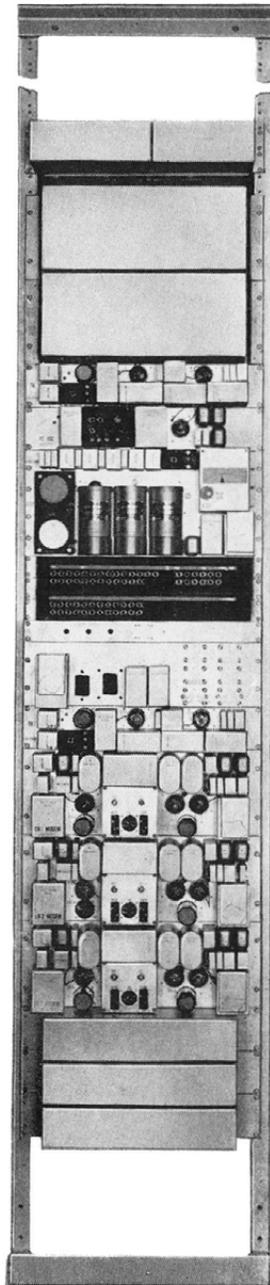
GENERAL

The Western Electric Type C Carrier Telephone System is a multi-channel system operating in the frequency range from approximately 6 to 30 kc which provides facilities for superimposing three additional telephone circuits upon an existing open-wire voice frequency telephone circuit. When used with the Western Electric 40AC-1 Voice Frequency Carrier Telegraph Equipment, each channel of the type C system will provide 12 carrier telegraph channels.

The C5 Carrier Telephone Terminal is used at each end of a type C system and the C1 Carrier



C1 Repeater



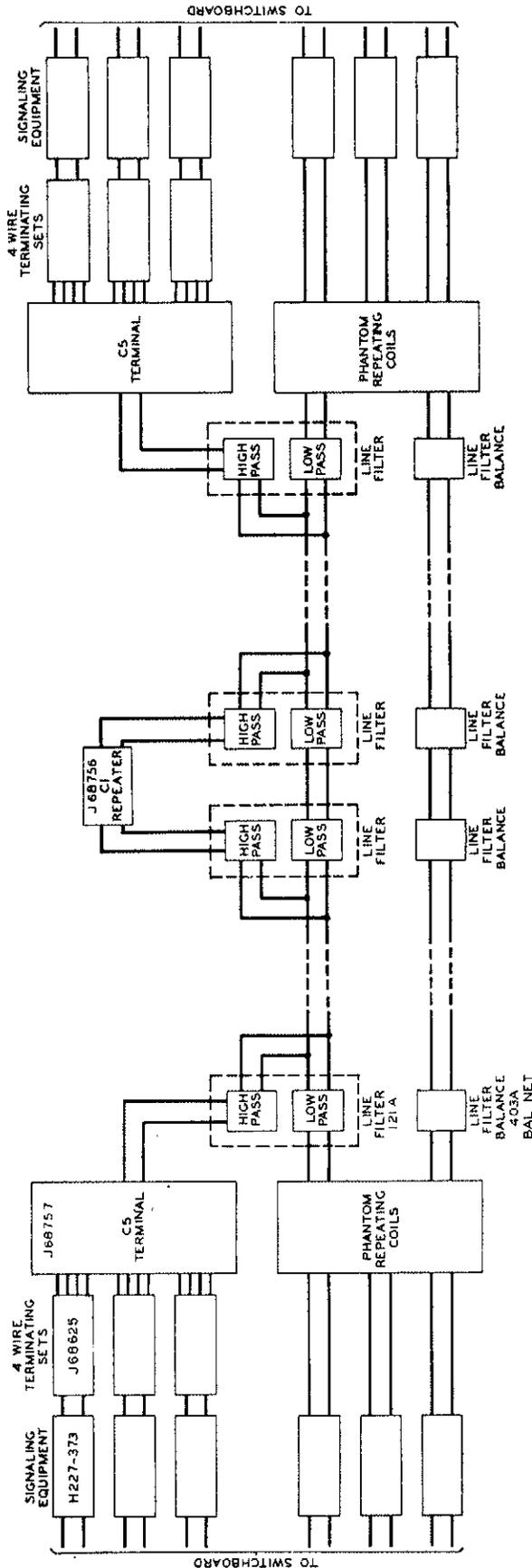
C5 Carrier Terminal

Telephone Repeater is used at intermediate points when additional amplification is required. Where the total length of entrance or intermediate cable involved is relatively short, a type C system employing two C5 Terminals without repeaters can be operated under average conditions over lines up to about 150 to 200 miles in length. By using intermediate C1 Repeaters and spacing them approximately 150 miles apart, the length of such a system can be extended almost indefinitely, provided the transmission and cross-talk characteristics of the line are satisfactory.

The telephone channels associated with a type C system are ordinarily operated at an overall frequency loss between switchboards (circuit net loss) of from 3 to 9 db. However, sufficient gain is available in the equipment to provide a circuit net loss of 0 db, provided the switchboards are located at the same points as the carrier terminals. Because the system operates over long lines, the C5 Terminal and C1 Repeater are provided with equipment for equalizing transmission over the frequency range employed and for regulating the circuit net loss. With the aid of the equalizing equipment, each channel is capable of transmitting an overall frequency band of from 250 to 2750 cycles with relatively little distortion. The regulating equipment changes the receiving gain to care for variations in line attenuation due to changes in weather, temperature, etc. When repeaters are not employed, the regulating equipment may be either of the automatic or manual type. Automatic regulation is always used when a system is equipped with one or more repeaters.

Different frequency bands are employed in the type C system for each direction of transmission. In one direction the three channels are grouped in the frequency range from 6 to 16 kc and in the opposite direction the frequencies from 17.5 to 30 kc are used. Single sideband transmission is employed, the carrier frequencies and unwanted sidebands being suppressed at the transmitting terminal by the use of balanced modulators and band filters.

The equipment is manufactured in any of four frequency allocations designated CA, CB, CS and CU respectively. In the lower frequency group the same frequency bands are employed for all allocations but the transmitted sidebands for the CA and CB allocations lie below the carrier frequencies while the sidebands for the CS and CU allocations are above the carrier frequencies. In the upper group the CA and CB allocations employ the same frequency bands. The CS and CU allocations also utilize the same frequency bands, but these bands are located in a slightly lower portion of the frequency spectrum than are



Schematic of an Overall type C Carrier Telephone System, with One Repeater

the CA and CB bands. This results in the upper bands for the CA and CB allocations being staggered with respect to the corresponding bands for the CS and CU allocations.

In addition, the CA and CS bands are below the carrier frequencies and the CB and CU bands are above the carrier frequencies. These arrangements provide an important aid in the operation of more than one type C system on the same pole since by choosing the most favorable allocations, inter-system crosstalk can be minimized and, in most cases, rendered unintelligible.

RINGING

The C5 terminal operates with 1000-cycle ringer equipment. Any standard 1000-cycle terminal or intermediate ringer can be used. A satisfactory ringer for this purpose is the Western Electric 1000-cycle ringer-oscillator unit. The ringing equipment is not an integral part of the terminal, and should be ordered as a separate item. One unit per channel is required.

POWER

The C5 Terminal and the C1 Repeater are operated either from 24 and 130 volt office batteries or, by the addition of power supply equipment, from a 105 to 125 volt 50-60 cycle a-c source. In battery operated systems a small amount of 55 volt 50-60 cycle power is required for a repeater and also for a terminal if automatic regulating equipment is employed.

USE WITH VOICE-FREQUENCY CARRIER TELEGRAPH SYSTEM

Any or all of the telephone channels of a Type C System can be employed for transmitting voice-frequency carrier-telegraph signals. The band width of each channel when used for this purpose is sufficient to carry 14 duplex telegraph channels capable of operation at a speed of 60 words per minute. The Western Electric No. 40AC-1 Carrier Telegraph System may be used to provide 12 telegraph channels on each of the Type C telephone channels. For larger offices, where the necessary power supply is available, use of the 40C-1 Carrier Telegraph System would make possible the operation of 14 instead of 12 telegraph channels on each telephone channel.

When one or more voice-frequency carrier telegraph systems are superimposed on the channels of a C5 Carrier Telephone System, provision should be made to add volume limiters to the channels used for telephone. These volume limiters are needed to reduce the high talking volumes which might cause interchannel modulation (in the channels carrying the telegraph circuits) of sufficient magnitude to impair the telegraph signals.



SPACE REQUIREMENTS

The equipment is designed to mount on standard 19 inch relay racks and may be arranged on 8 foot 8 inch, 10 foot 6 inch or 11 foot 6 inch bays, according to the conditions existing in a particular installation. Special arrangements may be made for mounting this equipment on 7 foot bays where this is necessary.

WEIGHT

The approximate average weight of a C5 Carrier Terminal or a C1 Repeater together with the required relay rack is 500 pounds.

The approximate weight of the auxiliary bay at a terminal location is 600 pounds. This represents the weight of maximum equipment based on an 11 foot 6 inch bay equipped with 4-wire terminating networks, ringers, volume limiters, power packs, filter panel and balancing network.

The approximate weight of the corresponding auxiliary bay at repeater stations is in the order of 300 pounds and this contemplates maximum equipment in an 11 foot 6 inch bay with power pack, filter panel and balancing network.

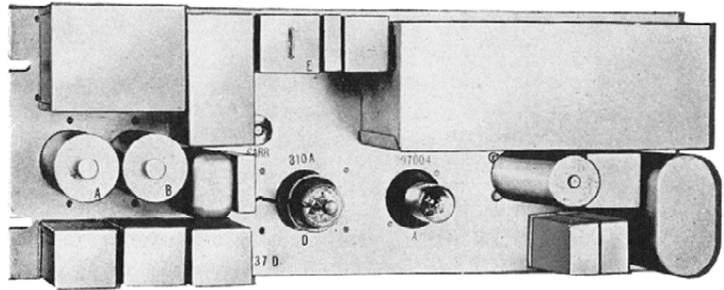
Further details of this system may be readily obtained from your nearest distributor.

G1 carrier telephone system (J-68737)

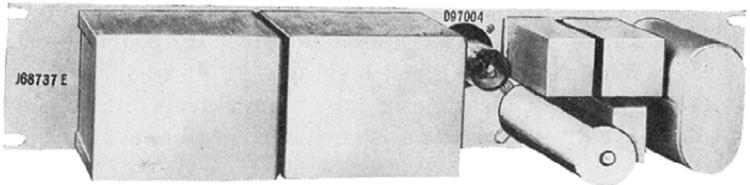
The G1 Carrier Telephone System is a relatively simple and inexpensive single-channel system designed for short-haul use on open-wire lines. It is a carrier-transmitted double-sideband system, with a carrier frequency of 10.3 kilocycles. One terminal, which is designated the active terminal, operates from an a-c source of 105-125 volts, 50-60 cycles. The other terminal, referred to as the inert terminal, requires no power supply.

The application of this system is limited in that ordinarily not more than one type G system can be operated on a pole line, and it cannot be operated on the same line with type H or type C carrier systems. Also, the maximum line loss over which the system can be operated is about 8 db. The system introduces no gain, and the net loss of the circuit which it provides is greater than that of the wire circuit of the same length.

Further details of this system may be readily obtained from your nearest distributor.



Active Terminal Panel, G1 Carrier—Front View



Inert Terminal, G1 Carrier

H1 carrier telephone system (J-68747)

GENERAL

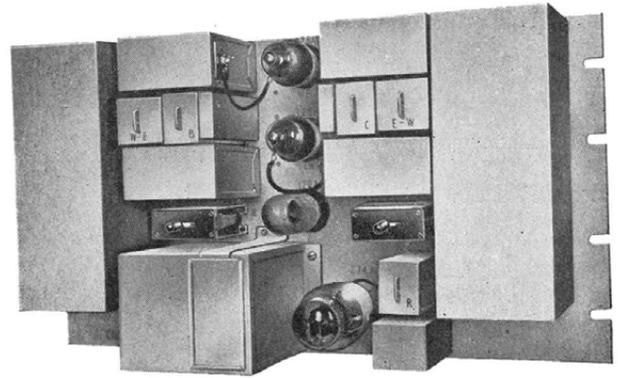
The H1 Carrier Telephone System is a single-channel system which provides for superimposing an additional telephone circuit upon an existing voice-frequency telephone circuit working over an open wire line. The carrier equipment includes provision for operation on a ringdown basis and can be applied on a line without the loss of any existing service. It is suitable for use as a permanent installation and also for temporary or emergency circuits. Without an intermediate repeater, the system will find its widest application on open wire circuits of about 50-200 miles in length; with one or two intermediate repeaters it will be applicable on circuits up to as much as 500 or 600 miles in length (depending on the gauge of the open wire conductors, the amount of intermediate cable in the line, the number of bridged way stations, etc.).

H1 carrier telephone system (J-68747) (continued)

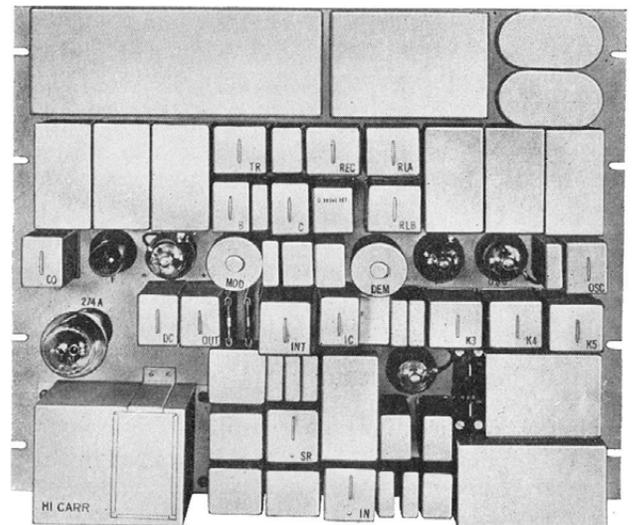
The H1 system employs copper-oxide modulators and demodulators, heater type pentode tubes, and improved filters made possible by new magnetic alloys. The copper-oxide varistors used as modulators, demodulators and rectifiers in the power supply are of smaller size than the customary vacuum-tube devices, have the advantage of long life and small power consumption, and provide better balanced and more stable modulation. The high-frequency transmitting amplifier, used in both the terminal and the repeater, employs a single heater-type pentode tube to provide a nominal transmission level of +16 db at the output jacks. Grid biases are obtained from the voltage drop across a resistance in the cathode circuit.

The terminal unit and the repeater may be operated either directly from a 115-volt 50-60 cycle alternating current source or from 24-volt and 130-volt batteries. This system employs the same carrier frequency, 7150 cycles, for both directions of transmission. The carrier frequency is generated locally at each terminal and only the sidebands are passed over the circuit. The upper sideband is used for transmission in one direction and the lower sideband for the other.

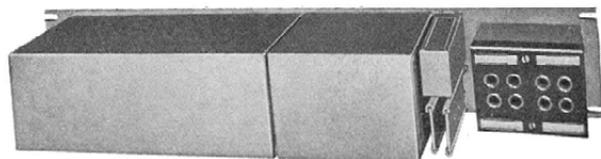
Because of the relatively short distances over which the system is designed to operate, no equalization is provided and no automatic regulation of the circuit net loss is employed. However, for the longer systems a manual compensating adjustment has been included in each terminal whereby the receiving gain may be changed in three steps of 2 db each. Similar arrangements are also provided to control the gain of a repeater, two steps of 4 db each being provided. These



H1 Carrier Telephone Repeater Panel—Front View



H1 Carrier Telephone Terminal Panel—Front View



H1 Carrier Telephone Line Filter and Balancing Panel—Front View

adjustments will compensate for changes in loss due to weather and temperature changes in the line.

VOICE FREQUENCY CARRIER TELEGRAPH

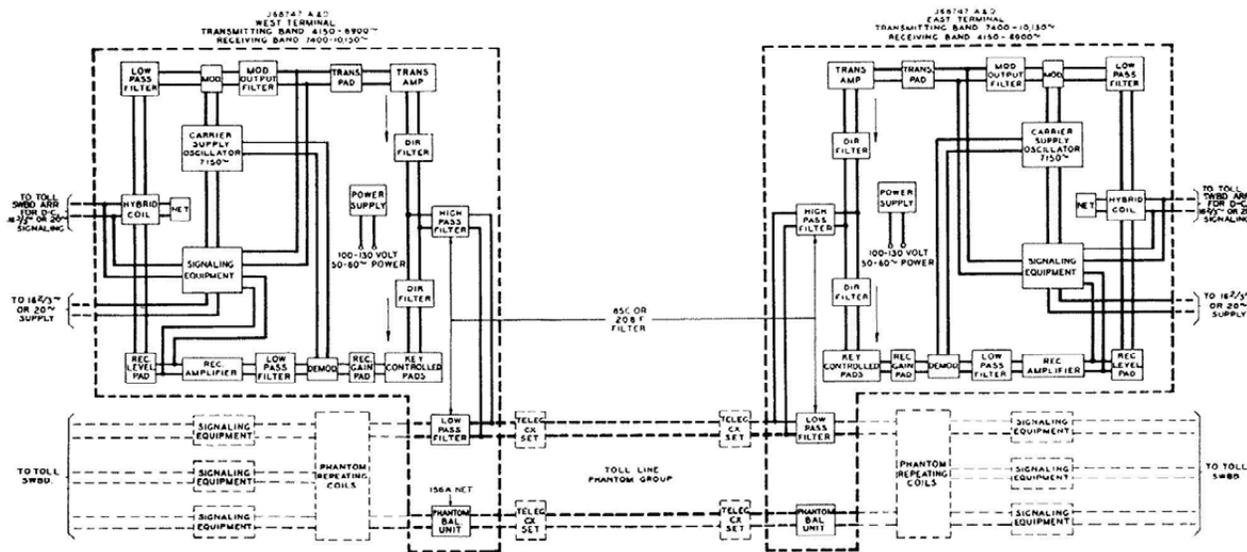
If it is desired to operate telegraph circuits over an H1 Carrier Telephone System, as many as eleven two-way channels of voice frequency telegraph may be superimposed by the use of No. 40AC-1 Voice Frequency Telegraph Equipment described in this catalog. For details regarding such applications, please consult your nearest distributor.

MOUNTING

The equipment is designed for relay rack mounting, but where desirable may be obtained mounted in a metal apparatus cabinet. The overall dimensions of the sheet metal apparatus cabinet are 2 feet 6³/₈ inches high, 1 foot 9³/₁₆ inches wide and 1 foot 3¹/₈ inches deep. The cabinet un-equipped weighs approximately 75 pounds. The dimensions of the panels used in the H1 Carrier Telephone System are as follows:

- Terminal Panel —1 foot 7 inches x 1 foot 3³/₄ inches
approximate weight—78 pounds
- Line Filter and Balancing Panel —1 foot 7 inches x 3¹/₂ inches
approximate weight—20 pounds
- Repeater Panel —1 foot 7 inches x 10¹/₂ inches
approximate weight—50 pounds

Further details of this system may be readily obtained from your nearest distributor.

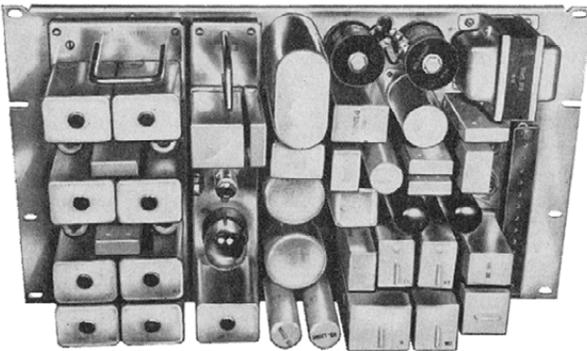


General Schematic of H1 System Without Intermediate Repeaters

M type carrier telephone systems

The M type Carrier Telephone Systems designed at Bell Telephone Laboratories are now available from Western Electric Company for providing subscriber service and added trunk circuits in short distance applications.

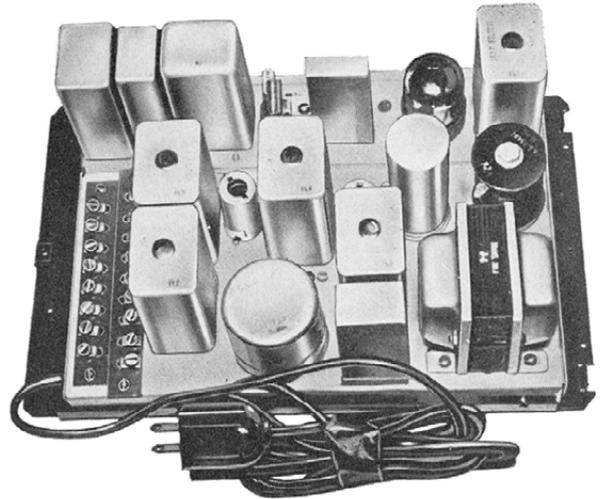
These systems can provide as many as five additional channels of communication over existing facilities. They are basically low-powered, double sideband, amplitude modulated, carrier transmitted systems employing three operating frequencies per channel. Of particular interest is the fact that one channel may be installed initially and the other channels may be added later as required.



Common Carrier Terminal for M Type Carrier Telephone Systems

Most existing power distribution lines and open-wire telephone lines may be used as carrier paths for the M type Carrier System. There are, of course, limitations in any communication system, and the feasibility of installing M type Systems will depend upon the characteristics of the circuit to which the system is applied.

There are three M type Systems available. The M1 is the basic carrier telephone system and is used to provide subscriber service over power lines of up to 8700 volts to ground or over open-wire telephone circuits. The M1A System is a modification of the M1 System and is designed to provide additional short distance 20-cycle ring-down trunk circuits between two attended offices. The M1B System, also a modification of the M1 System, is designed to provide additional circuits between an attended office and a community dial office.



Subscriber Carrier Terminal for M Type Carrier Telephone Systems

CARRIER FREQUENCIES

The carrier frequencies used in the M type Systems are in the 150-425 kc band and are divided into channels in accordance with the following table:

TABLE I

Channel	Common Terminal	Transmitting Frequencies	
		Subscriber Terminal Normal	Reverting*
1A	155kc	410kc	420kc
3	185	290	300
4	200	320	330
5	215	350	360
6	230	380	390

* Applies to the M1 System, and is used for transmitting switchhook signals in the M1B Systems; not normally used in the M1A System, but can be used instead of normal frequency where radio interference or absorption peaks prevent use of normal frequency.

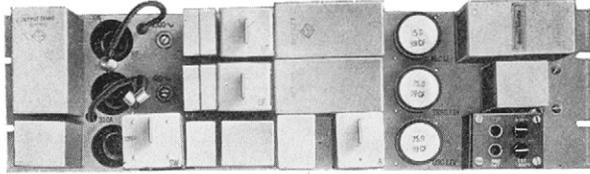
USABLE DISTANCES

The M type System is designed to work over a circuit having a maximum loss of 53 db. Taking into account the effects of wet weather and making an average allowance for noise due to static, satisfactory operation can be generally expected over suitable power lines of up to 20 miles in length and up to 40 miles over open-wire copper or copper steel telephone circuits. Absorption from adjacent circuits and other irregularities may introduce losses which will not allow operation up to these maximum distances in some cases. These figures presume that the lines are in good condition and properly maintained.

Further details of this system may be readily obtained from your nearest distributor.

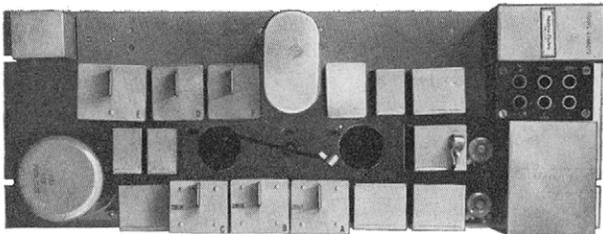


Panels, 3½ cycle signal sending and receiving



Signal Sending Panel

The Signal Sending Panel H327-325 together with the Signal Receiving Panel H327-326 provide facilities for extending the scope of dispatchers' operation for signaling between a dispatcher's station and way stations over a voice frequency telephone circuit derived from a C-5 or H-1 Carrier Channel. Signaling from a dispatcher's station to way stations is obtained by converting dispatchers' signals to voice frequency signals for transmission over the carrier link to a terminating point, where the signals are reconverted to dispatchers' signals for selecting the way stations on the connected open wire link. Signaling in the reverse direction is obtained in the normal manner by converting 20 cycles to 1000 cycles for transmission over the carrier link.



Signal Receiving Panel

Racks, cable

Cable Racks are ladder like steel structures consisting of two rectangular bar side rails called "stringers" between which are welded on 9" centers channel shaped cross members known as "straps." The stringers are 1½" x ¾" or 2" x ¾" bars as shown in Fig. 1. The straps are 1" x ½" channel, spaced 9" on centers and welded to the stringers. Straight sections of cable rack are 9' 8½" long and are made different widths as indicated.

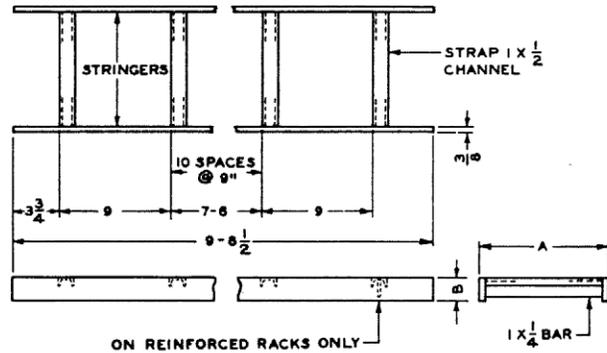


TABLE OF DIMENSIONS		
STANDARD WIDTHS DIM. A	SIZE OF STRINGER DIM. B	PIECE PART NUMBER
5	1½	P-4 01700
1-0	1½	P-4 20634
1-3	2	P-4 01702
1-6	2	P-4 01703

Fig. 1. Straight Sections of Cable Rack

The location of cable racks should be such that the clearance required for the proper installation and maintenance of the ultimate equipment will be maintained as specified for the particular equipment. Cable racks should be located so as not to interfere with future equipment.

Cable racks should not be located close to pipes, radiators, windows, doors, or any other equipment which may subject the cabling to possible damage by exposure or other detrimental conditions.

For horizontal cable runs, the cable racks are usually placed with the cross straps upwards. Cable racks for inverted cable runs and for the so-called "basket" runs are placed with the cross straps downward.

Cable racks should be securely supported and fastened, as necessary, to safely carry the ultimate cabling and other equipment supported by the cable racks. Cable racks should be braced where necessary to prevent sway.

Cable racks should be installed so that no excessive load or binding will be imposed on switchboard sections, frames, racks, or other equipment attached or adjacent to the cable racks, unless such equipment is arranged to support the cable racks. Cable racks should not be supported from the cross straps.

Horizontal cable racks should be supported on approximately 5' 0" centers and in no case should the spacing between supports exceed 6' 0". A support should be provided within 3' 0" of a free end of a cable rack.

Racks, cable (continued)

Where the cable rack is supported by means of expansion shields, the center to center distance should not exceed 5' and the load per expansion should not exceed 500 lbs.

The permissible pileup of cabling for the normal and maximum spacing of supports is as follows:

Width of Cable Rack	*Cable Pileup in Terms of Switchboard Cable	
	Supports on 5' 0" Centers	Supports on 6' 0" Centers
5" to 2' 1", incl.	12"	10"
2' 6"	10"	7"

* The maximum cable pileup for a cable run is, in general, limited by good cabling practice to a height not exceeding the width of the run on cable rack 12" or less in width and to a height of 12" on wider racks.

Clamping details used for the assembly of cable rack are shown in Figs. 2 to 12, inclusive.

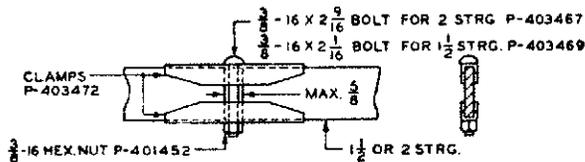


Fig. 2. Straight Clamp for Stringers of Same Width

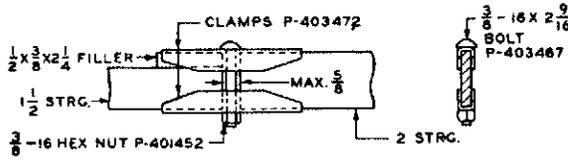


Fig. 3. Straight Clamp for Stringers of Different Widths

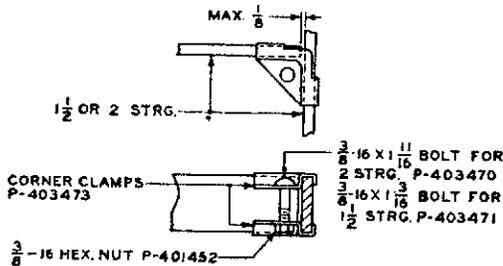


Fig. 4. Corner Clamp for Stringers of Same Width

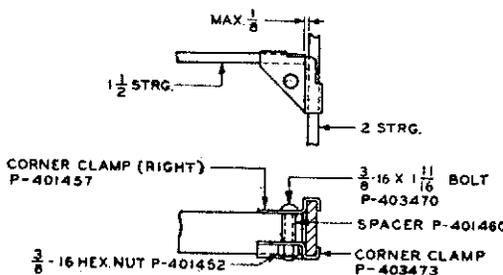


Fig. 5. Corner Clamp for Stringers of Different Widths (Left)

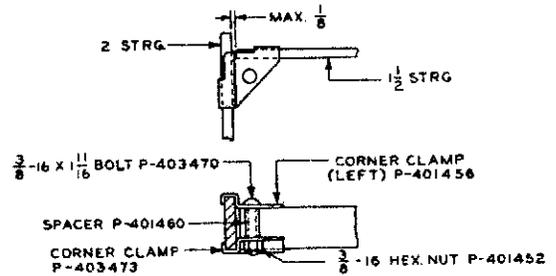


Fig. 6. Corner Clamp for Stringers of Different Widths (Right)

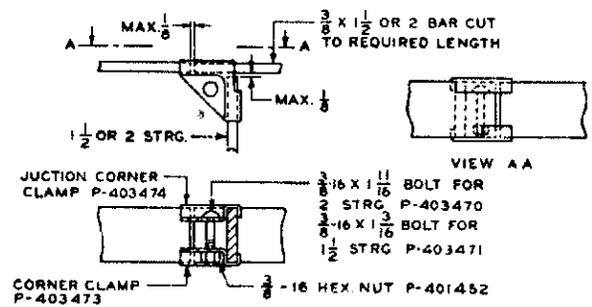


Fig. 7. Junction Corner Clamp for Stringers of Same Width (Left)

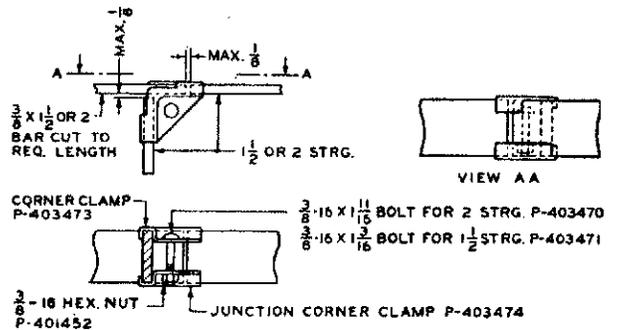


Fig. 8. Junction Corner Clamp for Stringers of Same Width (Right)

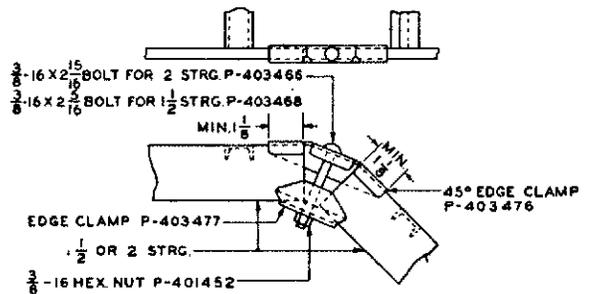


Fig. 9. 45-degree Edge Clamp for Outside Turn

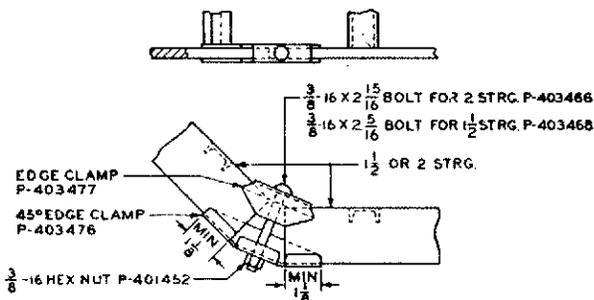


Fig. 10. 45-degree Edge Clamp for Inside Turn

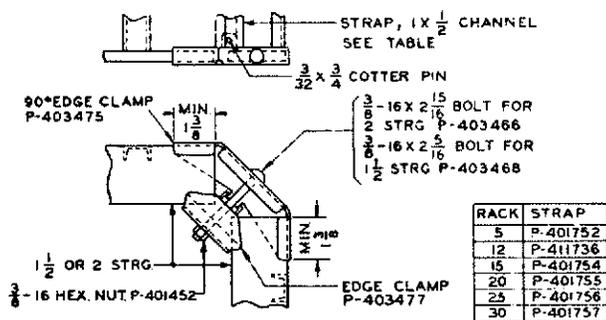


Fig. 11. 90-degree Edge Clamp for Outside Turn

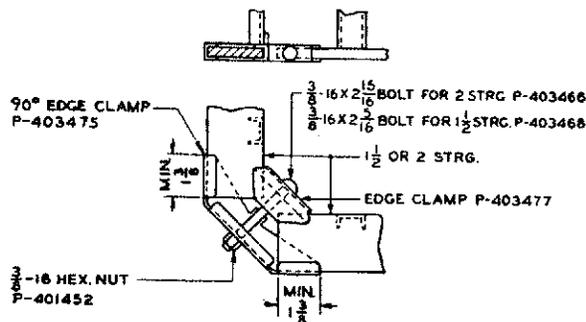


Fig. 12. 90-degree Edge Clamp for Inside Turn

The joining of sections of cable rack for the usual conditions encountered are shown in Figs. 23, 24, and 26 to 43, inclusive. Fig. 39 covers various arrangements for making small vertical offsets in horizontal racks. In cases where a small cable rack passes closely under a low beam, girder, or similar obstruction leaving insufficient clearance for the cabling, an offset in the cable rack can be avoided by the use of U shaped brackets as shown in Fig. 39E.

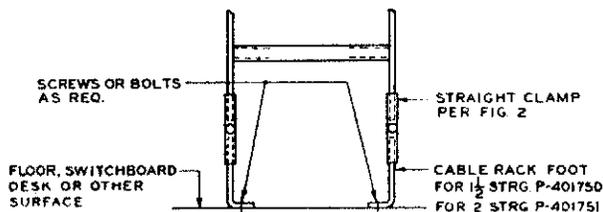


Fig. 13. Securing End of Vertical Rack

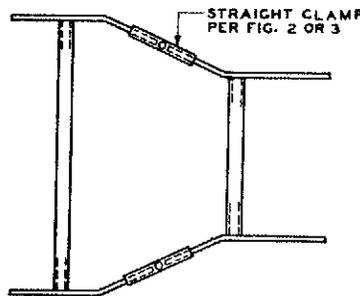


Fig. 23. Joining 10" to 1'-0" or 1'-0" to 1'-3" Cable Racks in Same Plane Using Straight Clamps--Smaller Rack Approximately in Center

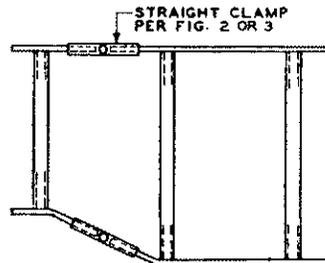


Fig. 24. Joining 10" to 1'-0" or 1'-0" to 1'-3" Cable Racks in Same Plane Using Straight Clamps--Smaller Rack at One Side

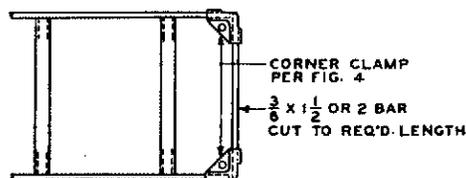


Fig. 25. Closing End of Rack

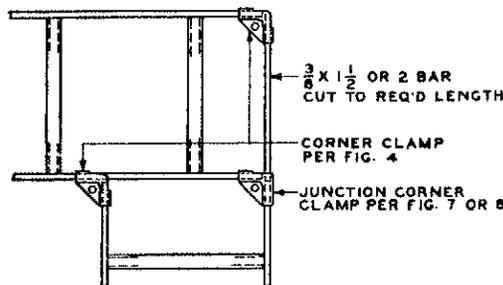


Fig. 26. 90-degree Turn in Same Plane

Racks, cable (continued)

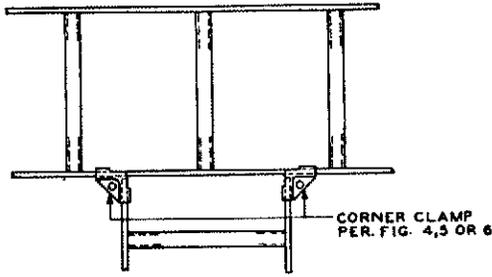


Fig. 27. T Intersection

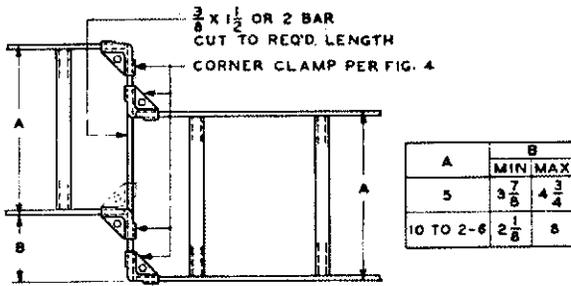


Fig. 28. Small Offset Less Than Width of Rack and in Same Plane

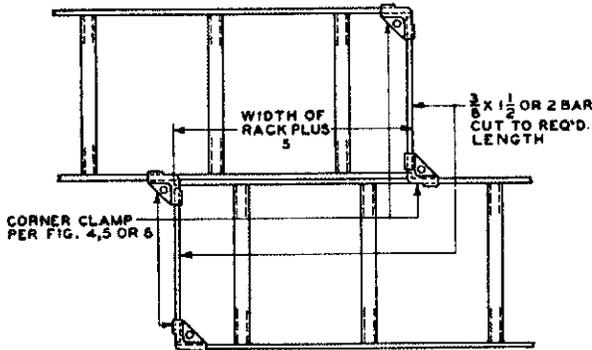


Fig. 29. Offset Same as Width of Rack and in Same Plane

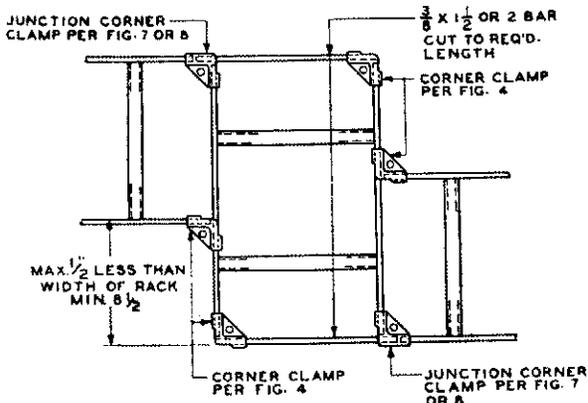


Fig. 30. Large Offset Less Than Width of Rack and in Same Plane

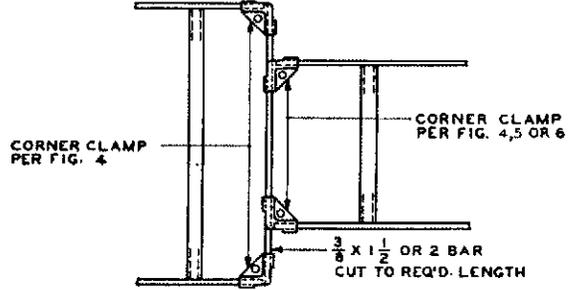


Fig. 31. Joining Racks of Different Widths in Same Plane—Smaller Rack Approximately in Center

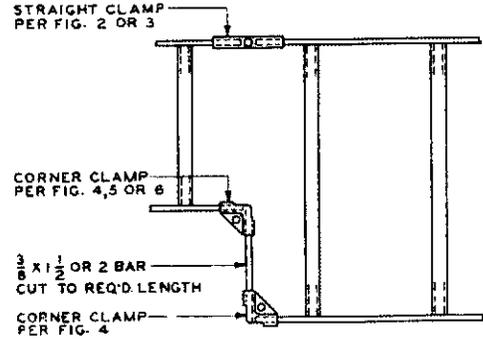


Fig. 32. Joining Racks of Different Widths in Same Plane—Smaller Rack at One Side

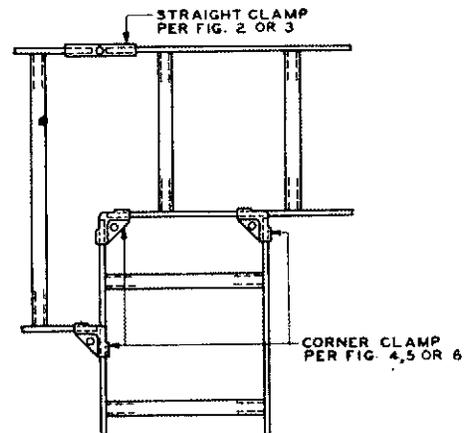


Fig. 33. Joining Three Racks of Different Widths in Same Plane

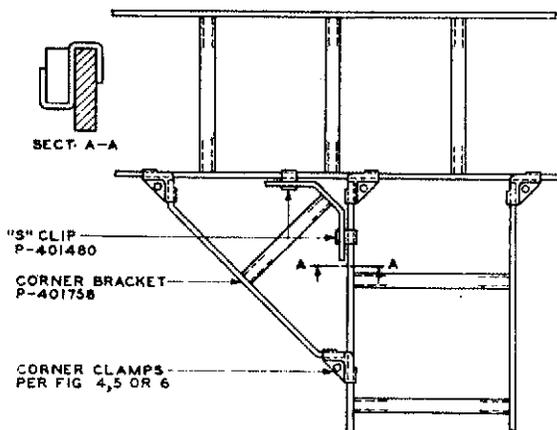


Fig. 34. Corner Bracket at Turn or Intersection

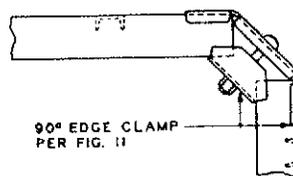


Fig. 38. 90-degree Outside Turn for Radius of 6" or Less

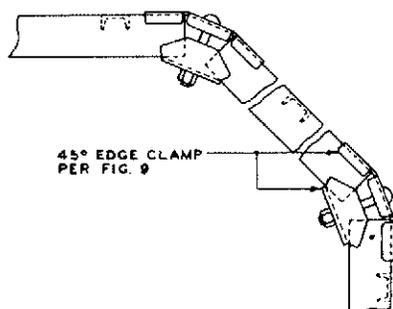


Fig. 35. 90-degree Outside Turn for Radius More Than 6"

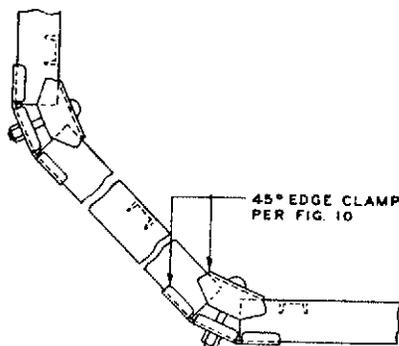


Fig. 36. 90-degree Inside Turn for Radius More Than 6"

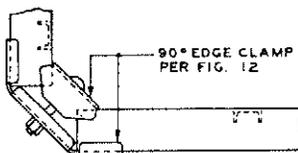


Fig. 37. 90-degree Inside Turn for Radius of 6" or Less

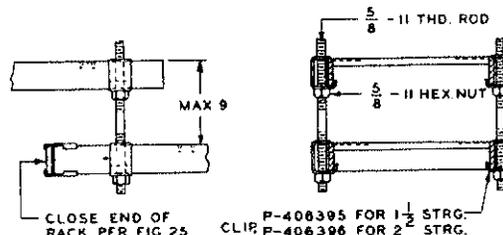


Fig. 39. Small Vertical Offsets in Horizontal Rack—View A

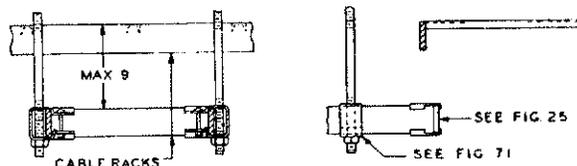


Fig. 39—View B

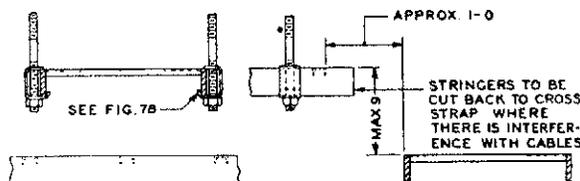


Fig. 39—View C

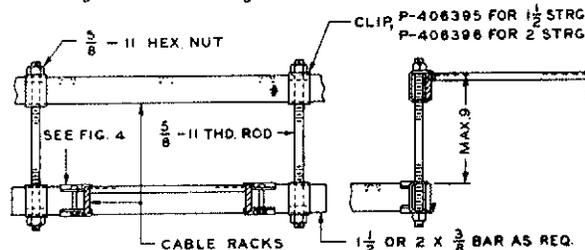
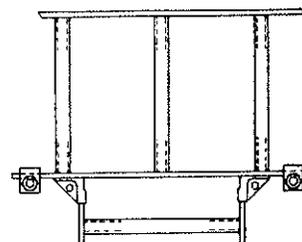


Fig. 39—View D

Racks, cable (continued)

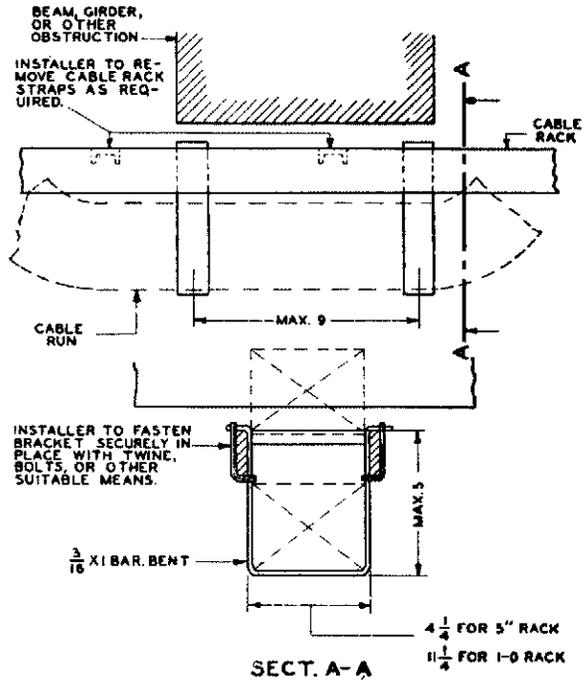


Fig. 39—View E

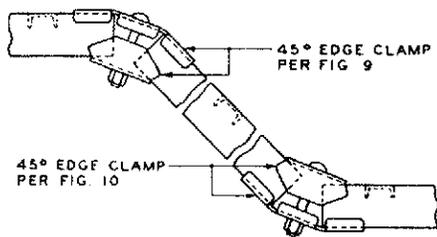


Fig. 40. Offset Greater than 9" in Parallel Planes Using 45-degree Edge Clamps

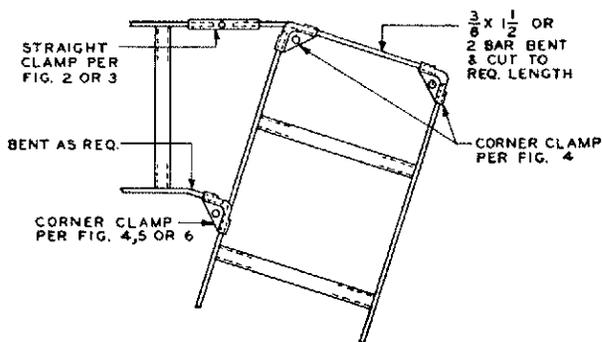


Fig. 41. Acute Angle Turn in Same Plane

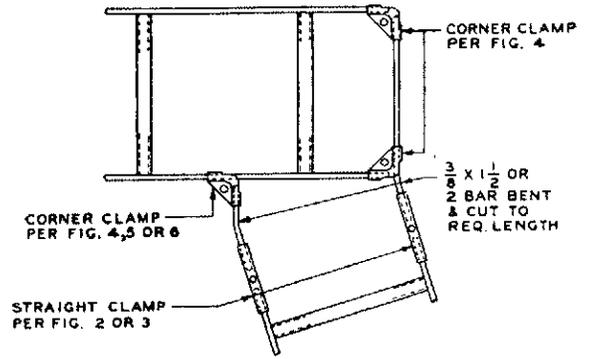


Fig. 42. Obtuse Angle Turn in Same Plane

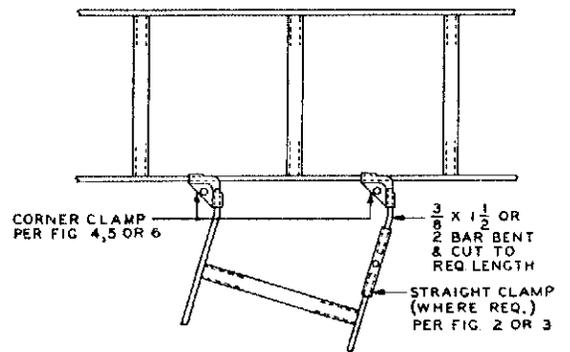
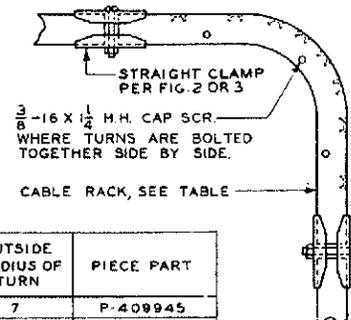


Fig. 43. Acute or Obtuse Angle Intersection



WIDTH OF RACK	OUTSIDE RADIUS OF TURN	PIECE PART
10	7	P-409945
12	7	P-411664
15	7	P-409946
10	14	P-407798
12	14	P-411681
15	14	P-407799

Fig. 53. Cable Rack Turn for Power Cable Runs

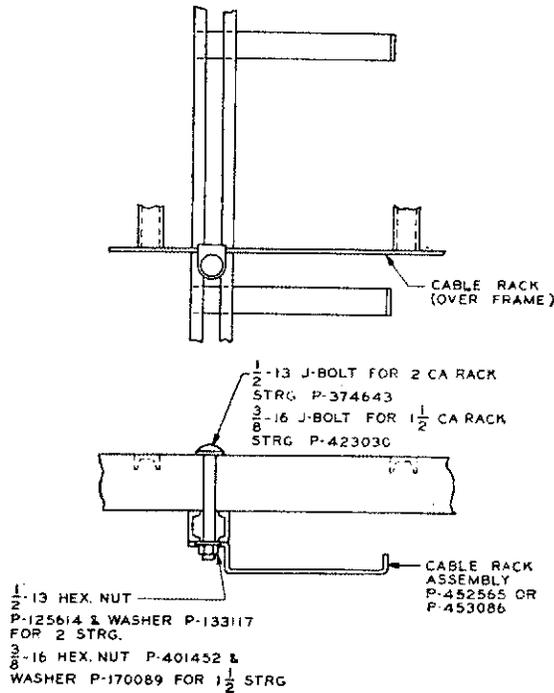


Fig. 56. Cable Racks for Power Cables Without Main Aisle or End Aisle Cable Racks

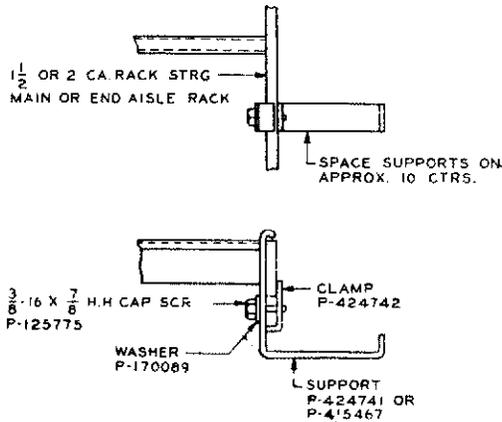


Fig. 57. Cable Racks for Power Cables With Main Aisle or End Aisle Cable Racks

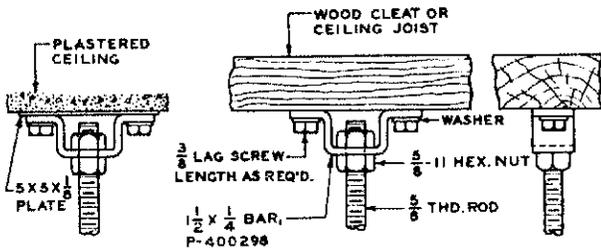


Fig. 73. Hanger Rod Attached Direct to Ceiling

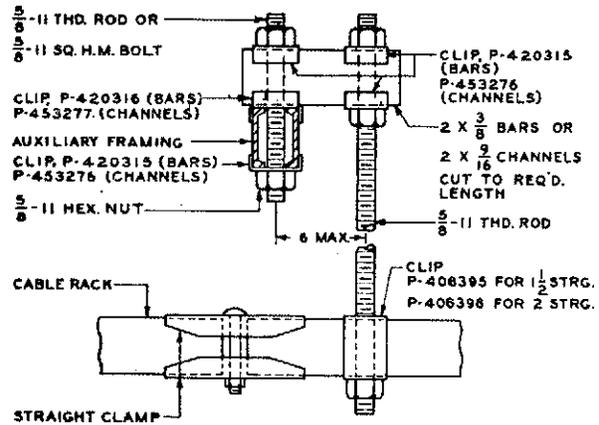


Fig. 74. Hanger Rod Offset to Clear Cable Rack Clamp, Cable Rack Strap, or Other Obstruction

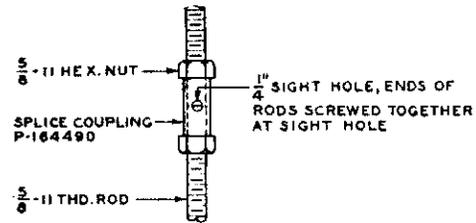


Fig. 75. Hanger Rod Extended with Splice Coupling

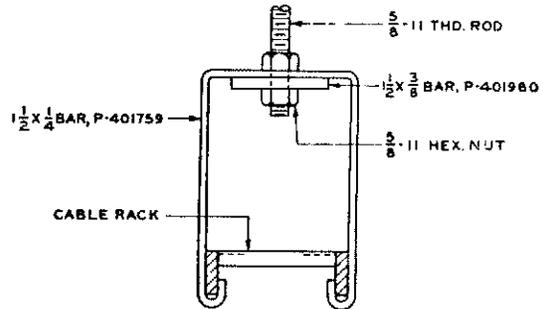


Fig. 76. Supporting Racks 5" Wide

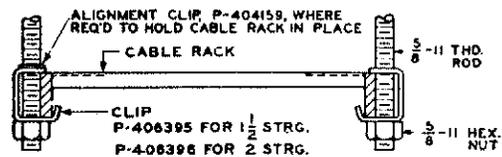


Fig. 77. Supporting Racks 1'-0" or More Wide

Racks, cable (continued)

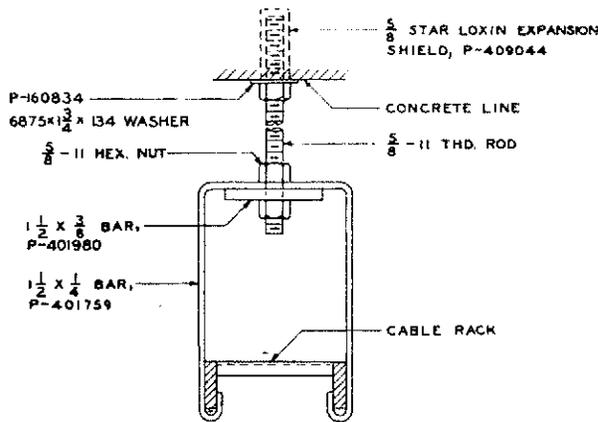
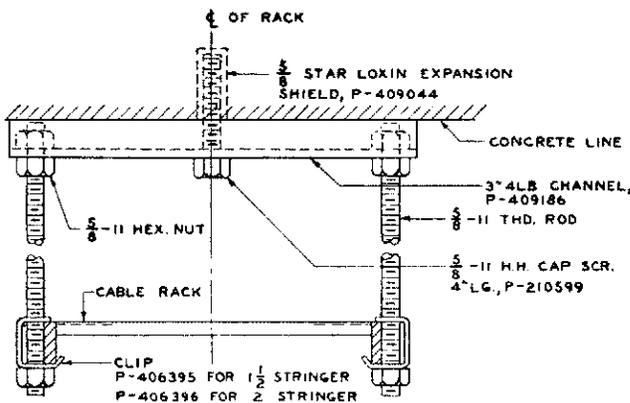


Fig. 85. Supporting 5" Cable Rack from Expansion Shield in the Ceiling



NOTE
WHERE THE CEILING IS PLASTERED THE CHANNEL MAY BE ALLOWED TO REST ON THE PLASTER. THE EXPANSION SHIELD, HOWEVER, SHALL BE EMBEDDED ITS FULL LENGTH IN SOLID CONCRETE.

Fig. 86. Supporting 12" and 15" Cable Racks from Expansion Shields in the Ceiling

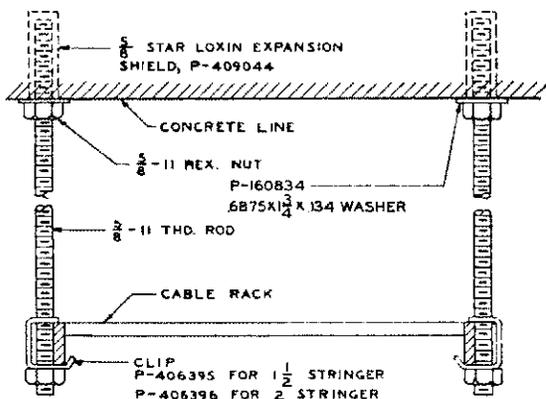


Fig. 87. Supporting Cable Racks 1'-8" or Wider from Expansion Shields in the Ceiling

Racks, relay

Relay Racks are intended for use as a supporting framework on which are mounted wire equipment units or individual mounting plates. They are made with 3-inch 4-pound channel iron uprights welded in single bay units and are available in various capacities as indicated.

ED-60686-30

G-1 Material for one bay 10 ft. 6 in. high drilled for 19 in. mounting plates, less guard rails.

ED-90370-73

- G-1 Material for one bay 5 ft. 2 3/8 in. high, drilled for 31-1 3/4 in. x 19 in. mounting plates, less guard rails.
- 2 Material for one bay 5 ft. 2 3/8 in. high, drilled for 31-1 3/4 in. x 23 in. mounting plates, less guard rails.
- 3 Material for one bay 7 ft. 0 in. high, drilled for 43-1 3/4 in. x 19 in. mounting plates, less guard rails.
- 4 Material for one bay 7 ft. 0 in. high, drilled for 43-1 3/4 in. x 23 in. mounting plates, less guard rails.

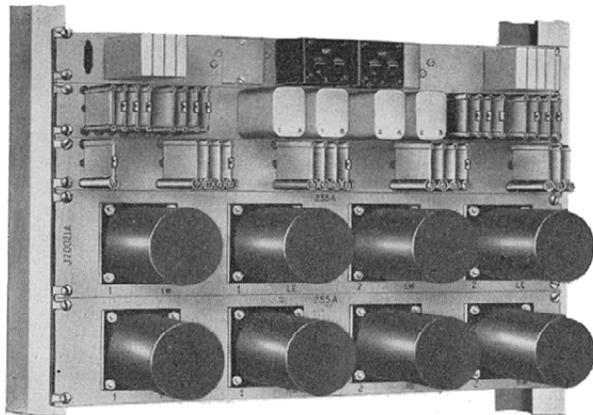
ED-90672-70

- G-1 Material for one bay 8 ft. 8 in. high, drilled for 48-1 3/4 in. x 19 in. mounting plates, less guard rails.
- 2 Material for one bay 8 ft. 8 in. high, drilled for 48-1 3/4 in. x 23 in. mounting plates, less guard rails.
- 3 Material for one bay 11 ft. 6 in. high, drilled for 68-1 3/4 in. x 19 in. mounting plates, less guard rails.
- 4 Material for one bay 11 ft. 6 in. high, drilled for 68-1 3/4 in. x 23 in. mounting plates, less guard rails.

Repeaters

NO. 10E1 SINGLE-LINE REPEATER (J70021A)

The No. 10E1 Single-Line Repeater is designed to operate as a reversible, one-way telegraph repeater using 60 milliamperere neutral telegraph signals. The repeater may be used to connect branch circuits to a main-line circuit. It may interconnect two subscriber loop circuits, two "toll line" repeater loop circuits, or a toll line repeater loop circuit and a subscriber loop circuit. These repeaters may be used also to set up circuits extending form a repeater point in three or more directions. This repeater has a maximum working limit of 12 miles of 19 gauge cable for loops equipped with



No. 10E1 Single-Line Repeater—Front View

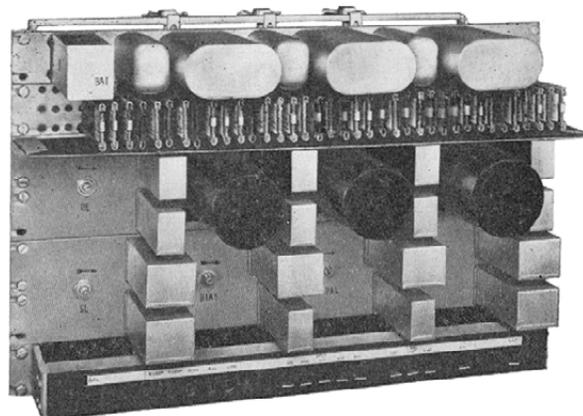
wave-shaping sets at the subscriber end and 3 miles of 19 gauge cable not so equipped at the subscriber end. An arrangement may be provided whereby the addition of a hit suppressor circuit will protect the main line telegraph circuits against short interval hits or interruptions that may occur in the east loop. Positive and negative 130-volt battery is used for transmission.

The equipment for two No. 10E1 Single-Line Repeater Circuits is arranged on a unit for mounting on a bay of standard 19" relay rack. Battery keys to control the 130-volt potentials are provided for on the unit. The unit occupies the space of seven 1¾" mounting plates. Nine units may be mounted on one 11' 6" relay rack bay.

Four No. 255A Polar Relays are required for each repeater circuit.

NO. 16B1 TELEGRAPH REPEATER (J70037B)

The No. 16B1 Telegraph Repeater is a simplified and compact telegraph repeater for operation over grounded circuits, either open wire or non-



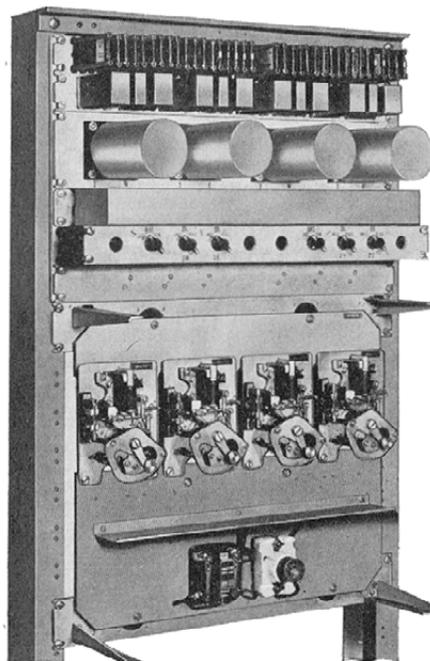
No. 16B1 Telegraph Repeater

composited cable conductors. It provides half-duplex service as furnished and full-duplex service for circuits, the balance of which is not critical. With minor modifications it may be adapted for general full duplex operation. The circuit of this repeater can be arranged by means of cross connections at the unit terminal strips for any of the following types of operation:

1. Differential duplex
2. Upset differential duplex
3. Polarential Type A
4. Polarential Type B

The repeater is designed for relay rack mounting and occupies a space of eight 1¾ inch mounting plates 19 inches long. Eight repeaters may be mounted in an 11 foot 6 inch relay rack bay.

NO. 106A2 REGENERATIVE REPEATER (J70015C)



No. 106A2 Regenerative Repeater—Front View—Cover Removed

The No. 106A2 type Regenerative Repeater is designed to receive teletypewriter signals which have become distorted by transmission over long circuits, and to reconstruct them into substantially their original wave form. The repeater then retransmits the regenerated signals into the succeeding line section. These repeaters are equipped with holding magnets and will operate satisfactorily on any signals which will operate the receiving mechanism of a teletypewriter. The regenerative

Repeaters (continued)

type of repeater differs from the ordinary telegraph repeater in that the latter repeats signal distortion from one line section to the next, with the result that the accumulated distortion in a long circuit may reach the point where the receiving apparatus will refuse to operate, or will operate falsely.

The No. 106A2 Regenerative Repeater is arranged for neutral loop operation, and .060 ampere loop current. However, it can be used on .020 ampere loop current by making a minor wiring change in the relay unit.

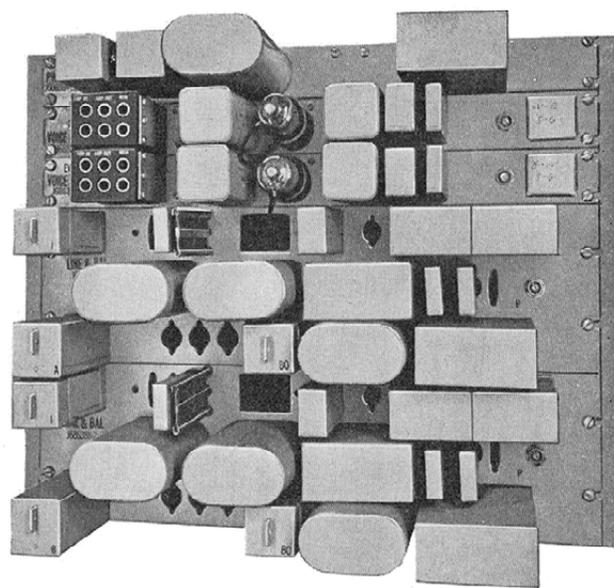
The relay equipment for two repeater circuits is mounted on a 19" relay rack unit requiring the space of seven 1 3/4" mounting plates. One circuit provides a 2 way repeater for use between two line sections operated on either the single or duplex basis. Two regenerator units are required for each repeater circuit. Four of these units are mounted on a regenerator panel with a motor and driving mechanism common to all units on the panel. The relay unit, the regenerator units, and the regenerator panel constitute two complete repeaters. The regenerator panels are available for use with 115V. a-c, 115V. d-c and 130V. d-c, and each requires the space of nine 1 3/4" mounting plates on a 19" relay rack bay. The panel with its driving motor and the regenerator units is floated on shock absorbing mountings in order to insulate the relay unit from motor vibration. Connections between the regenerator panel and the relay unit are made by means of small local cables furnished with the panel. The complete equipment requires the space of sixteen 1 3/4" mounting plates. Four complete No. 106A2 Repeater Units can be mounted on an 11' 6" relay rack bay, or three such units in a 10' 6" bay.

V1 telephone repeater (J-68638F)

GENERAL

The Western Electric Company V1 Telephone Repeater is a voice frequency repeater designed for application to open-wire or cable circuits where it is desired to extend the range of speech transmission. Arrangements are available to provide operation on alternating current from a commercial 50- or 60-cycle power-supply circuit. This feature makes the repeater particularly adapted to locations where a small number of repeaters is required.

When used as a trunk-line repeater it may be equipped for various kinds of signaling (20, 135 or 1000 cycles). Telegraph circuits may be derived by the use of a composite set or the simplex connection. The repeater is provided with precision



V1 Telephone Repeater—Rack Mounted

line-balancing networks for use with uniform lines (such as loaded cable pairs) or with adjustable networks for use with lines having non-uniform impedance characteristics.

A dispatch repeater is one combination of options arranged for operation on railway train dispatching circuits. This repeater is equipped with a by-pass for the 3 1/2 cycle selector signals. The presence of the by-pass circuit prevents operation of the repeater with telegraph or on a phantom-group basis. Dispatch repeaters are always provided with adjustable line-balancing networks because the impedance characteristics of the line are greatly affected by the number of way-station sets connected and an approximate balance is all that can be obtained. A dispatch repeater will normally be operated on an open-wire circuit, sometimes with sections of cable, either entrance, intermediate, or both.

The repeater and its associated equipment can be furnished in a steel cabinet or assembled on a framework and relay rack mounting. The items included in the cabinet or on the framework depend upon the requirements of the particular installation. The associated equipment consists of a power supply unit, a line and line balancing unit, a two-wire terminating unit, ringer units and a signal battery, and ringing supply unit, as required. The individual panels or units are assembled and wired together before shipment. A fully equipped cabinet weighs approximately 225 pounds, and the cabinet alone weighs approximately 75 pounds. The approximate dimensions are 19 inches in width and 26 inches in height.

In those cases where standard dispatch type repeaters are not applicable, or where recom-



mendations are desired for the application of the trunk type repeater, please consult your nearest distributor.

POWER CONSUMPTION

The repeater power supply unit consumes a maximum of 25 watts when operated from a 100 to 125 volt 50 to 60 cycle source. The rectifier of the signal battery and ringing supply unit operates on a 105 to 125 volt 50 to 60 cycle source and consumes 60 watts. The 20-cycle static ringer generator of the same unit operates on a 105 to 125 volt 60 cycle source and consumes 60 watts at full load.

1. Single wire loop
2. Two wire loop magnet receiving
3. Two wire polar relay receiving

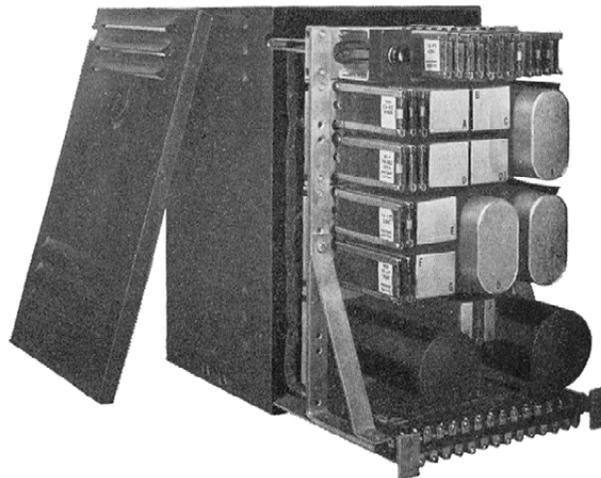
The components of this subscriber set are mounted on a panel which in turn is housed in a metal cabinet provided with louvres to facilitate the dissipation of heat.

The cabinet is approximately 9 inches wide, 8 inches deep and 16 inches high.

No. 128B2 teletypewriter subscriber set (J-70027A)

The No. 128B2 Teletypewriter Subscriber Set is a terminal telegraph repeater assembled in a box suitable for mounting in a teletypewriter station. It is designed for operation over line facilities into a No. 16B1 Repeater, or equivalent equipment. It may be arranged for either Type A or B polar operation on a single or two-wire basis.

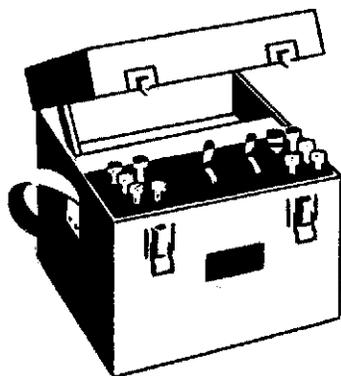
This set may be connected to the teletypewriter in the following ways:



No. 128B2 Teletypewriter Subscriber Set (J-70027A)

EQUIPMENT RECOMMENDED FOR TESTING AND MAINTENANCE OF CARRIER SYSTEMS AND TELEPHONE AND TELEGRAPH REPEATERS

	Code	Carrier Systems			V-1 Telephone Repeaters	16B-1 Telegraph Repeaters
		C-5	H-1	40AC-1		
Oscillators	17B	x				
Transmission Measuring Set	12B	x	x		x	
	13A	x				
	30A	x				
	32A	x				
	Vacuum Tube Test Sets	KS-5727	x		x	
Attenuator	5A		x		x	
Relay Test Panels	116BX1			x		
	116CX1					x
	111A2					x
1000 Cycle Generator	KS-5472-01	x	x		x	



MISCELLANEOUS TESTING EQUIPMENT

Various test apparatus and equipment are available,
and can be found on the following pages in this catalog:

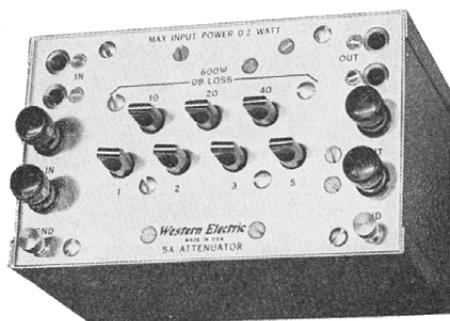
	<i>Page</i>
Attenuator, 5A	156
Machine, 1000-cycle	156
Oscillator, 17B	157
19C and D-175136.....	158
Polar Relay Test Panel, 111A2.....	158
116B1, 116BX1.....	159
116C1, 116CX1.....	159
Test Set: 20C	159
35F	160
52A	161
55A	161
62A	161
75A	161
75B	161
76C	161
81AW	162
117B1	162
161A1	163
1017C	163
1017E	163
D86418	164
90510, 90511, 90512, 90530.....	164
D162269 Current Flow	164
Tester, Vacuum Tube, KS-5727	165
Test Unit, 163A2 and 163C1	165
163E1	166
Transmission Measuring Set, 12B	166
13A	166
30A	167
31B	168
32A	168
118C2	169

NOTE: A complete index can be found on page 170.

MISCELLANEOUS TESTING EQUIPMENT

Attenuator

5A ATTENUATOR



5A Attenuator—Top View

The No. 5A Attenuator is an instrument which is useful for general testing work where a 600-ohm balanced attenuator is required, such as for certain carrier applications and for miscellaneous telephone repeater and radio applications.

The attenuator is well shielded, making it suitable for use up to frequencies of approximately 100 kilocycles.

The circuit of the No. 5A Attenuator is shown on a circuit label fastened inside the box which houses the attenuator.

The attenuator is made up of seven balanced resistance pads of the "O" (square) type. These pads are of 600 ohms impedance and provide a total loss range of 0 to 81 db in steps of one db under the control of seven turn-button keys.

The accuracy of the attenuator settings is ± 0.2 db for frequencies up to 50 kc and is approximately ± 0.3 db of nominal for frequencies up to 100 kc.

The set will dissipate 200 milliwatts continuously and, for short periods, will dissipate 500

milliwatts, without impairing the accuracy after cooling.

The attenuator is contained in a metal box with a metal panel and is approximately $6\frac{3}{4}$ inches long by $4\frac{1}{8}$ inches wide by 5 inches high, and weighs about 5 pounds. There is no cover for this set. It is equipped with suede leather feet so that it will not mar finished surfaces.

From the photograph showing the top of the attenuator, it will be noted that the seven turn-button keys are arranged in two rows and that the input and output are carried through both binding posts and double jacks. Binding posts marked GND are provided at the input and output sides of the panel and are connected to the grounded parts of the set, which consist of the case and the internal shield. These ground binding posts serve as connections for the grounded terminations of apparatus or lines between which the attenuator is connected.

The jacks are of the type to take telephone type plugs such as the Western Electric No. 241 type plug commonly employed in test rooms.

Machine, 1000-cycle

MACHINE, 1000-CYCLE FOR TESTING (KS-5472-01)

A 1000-Cycle Machine for generating testing power for the sending circuits of transmission measuring systems should be ordered in accordance with the following lists of Specification KS-5472-01. This machine consists of an a-c motor and a single-frequency inductor alternator. The alternator is mounted in a separate housing attached to the drive motor. The motor is of the capacitor type and the alternator is of the permanent magnet type. No speed regulator or alternator field rheostat are required. Padding resistances, when furnished, are mounted on the alternator terminal board. A carrying case is obtainable when the machine is required for portable use.

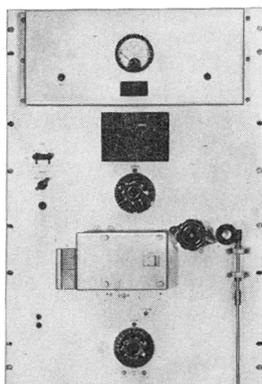


List No. KS-5472-01

		Motor Volts	Power Cycles	Service Phases
11	Machine, temperature compensating coil, capacitor, and padding resistances	105-125	60	1
12	Machine, temperature compensating coil, capacitor, padding resistances and fustat mounted in carrying case, complete with extension cord	105-125	60	1
13	Machine, temperature compensating coil, and capacitor, without padding resistances	105-125	60	1
14	Machine, temperature compensating coil, capacitor, and padding resistances	105-125	50	1
15	Machine, temperature compensating coil, capacitor, padding resistances, and fustat mounted in carrying case, complete with extension cord	105-125	50	1
16	Machine, temperature compensating coil, and capacitor, without padding resistances	105-125	50	1

Oscillators

17B OSCILLATOR



No. 17B. Face View of Oscillator

The No. 17B Oscillator is a heterodyne type vacuum tube oscillator which provides a source of testing current for transmission measurements of telephone transmission lines, amplifiers, telephone terminal, radio transmitting, radio receiving and other equipment. It is capable of delivering an alternating current of any single frequency from about 50 cycles to 150 kilocycles per second. The output is substantially constant with frequency except in the range below about 1000 cycles where it falls off as the frequency is reduced. The output is also adjustable to any value between 1 milliwatt and approximately 1 watt or +30 db with respect to 1 milliwatt. One control serves to vary the frequency continuously over the full range. The frequency calibration appears

on a 300 inch length of motion picture film and is direct reading. The frequency scale divisions are 50 cycles apart throughout. Another control dial serves to vary the frequency over a range of plus or minus 50 cycles from any setting of the first control dial.

This oscillator operates from a 105-125 volt, 50-60 cycle power supply. It employs 10 vacuum tubes and has an output impedance of either 135 or 600 ohms, depending on the position of a lever type key.

The No. 17B Oscillator is contained on a panel designed for relay rack mounting 19 inches wide by 28 inches high, and is complete with the exception of the vacuum tubes and power supply cord.

When the oscillator is to be used on a portable or semi-portable basis, it should be mounted on either a self-supporting or mobile rack which can be made available when specified in the order. It is important from the standpoint of frequency stability that the oscillator panel be rigidly mounted.

The following Western Electric vacuum tubes and lamps and other accessories are required for each oscillator:

Quantity Used	Code No.
1	274A Vacuum Tube
1	300B Vacuum Tube
5	310A Vacuum Tubes
2	311A Vacuum Tubes
1	313C Vacuum Tube
1*	122A Ballast Lamp
1*	3-watt 120-volt S6 Mazda Lamp Candelabra Base
1*	A1 Lamp
2*	Bryant 3-ampere plug Fuses
1*	2BN Lamp Cap

* Supplied with the oscillator; listed for reference only.

Oscillators (continued)

A power cord required for the oscillator should be specified as follows:

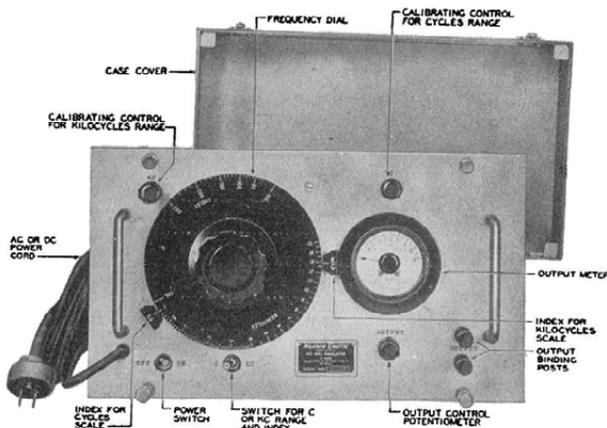
(length) Cord and Parallel-Polarized Plug Cap Assembly KS-7993.

Patching cords equipped with shields required for connecting the oscillator output should be specified as follows:

P-3-P Cord—(length 4, 6 or 8 ft.) equipped with two 305A Plugs.

For shipping, the oscillator mounted on the portable rack may be placed in a trunk per KS-5328. The oscillator panel assembly weighs approximately 80 pounds. With the rack and the trunk, the weight for shipping purposes is approximately 200 pounds. The rack alone weighs about 48 pounds.

NOS. 19C OSCILLATOR AND D-175136 OSCILLATOR



Nos. 19C Oscillator and D-175136 Oscillator

The No. 19C Oscillator is a heterodyne type vacuum tube oscillator which provides a source of testing current for transmission measurements, for the purpose of testing the operating condition of telephone transmission lines, amplifiers, telephone terminal, radio transmitting, radio receiving and other equipment. It is capable of supplying an output from -4 dbm (4 db below a milliwatt into 600 ohms) to +6 dbm (6 db above a milliwatt into 600 ohms) over a frequency range from 30 cycles to 15 kilocycles. One direct reading control dial serves to vary the frequency continuously over the full range, but since for some uses a

greater precision as to frequency is desired in the range below 250 cycles, an expanded scale is provided on the same dial and made effective by the operation of a switch. The oscillator employs five vacuum tubes and has an output impedance of about 600 ohms.

The oscillator per D-175136 is the same as the No. 19C except that the oscillator is modified for mounting on a relay rack framework.

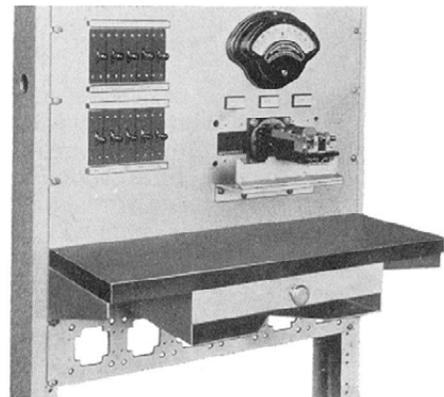
The No. 19C Oscillator is provided in portable form equipped with a power supply cord and removable cover. It is approximately 15 inches long, 9¼ inches wide, and 9½ inches high, weighing about 27 pounds. The unit is of a panel-chassis type construction and is contained in a steel housing. Effect of temperature variations on the output power and the output frequency have been minimized in so far as practicable in the selection and arrangement of the apparatus components of the oscillator.

The power required for operation is 25 watts, 105 to 125 volts, direct current or 50-60 cycles alternating current.

Panels, polar relay test

NO. 111A2 RELAY TEST PANEL (J-66118E)

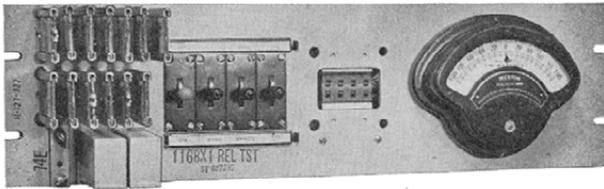
The No. 111A2 Relay Test Panel provides a means for testing and adjusting the 209FA, 209FB, 209FC, 209FG, 209FH, 209FJ, 215A, 215H, 228A or D160118 and 255A Relays. The circuit provides for contact, bias, and sensitivity tests and is de-



**No. 111A2 Relay Test Panel
Front View—Mounted on a Relay Rack Bay with Shelf Assembly,
and Relay Storage Panel**



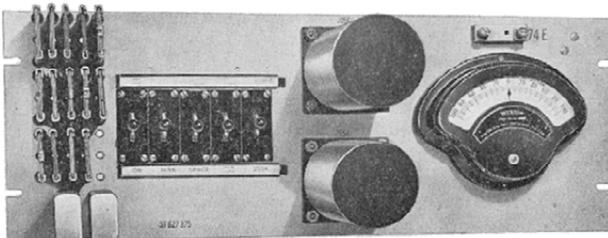
signed to operate from negative 24 volt signal battery, positive or negative 48 volt telegraph battery, positive or negative 130 volt telegraph battery and 20 cycle supply. The equipment is located on a steel panel $12\frac{1}{4}$ " high and arranged to mount on a relay test table or on a 19" mounting plate relay rack bay, taking the space of seven $1\frac{3}{4}$ " mounting plates. A fluorescent lamp arranged to mount on the relay rack above the test panel is available and is recommended for use with relay rack mounted panels.



No. 116BX1 (H-327-327) Relay Test Panel

The Nos. 116BX1 and 116B1 Relay Test Panels provide means for testing and adjusting the No. 255A Relay only. The circuit provides for bias and sensitivity tests and is designed for use in offices having +130 volt battery supply and no 20 cycle supply. The panels are arranged with a vibrating circuit designed to operate a properly adjusted relay at approximately 20 cycles. The equipment is identified as the No. 116BX1 Relay Test Panel for 19" mounting and No. 116B1 Relay Test Panel for 23" mounting. The equipment is mounted on a steel panel $5\frac{1}{4}$ " high and requires the space of three $1\frac{3}{4}$ " mounting plates.

The Nos. 116CX1 and 116C1 Relay Test Panels provide means for testing and adjusting 255A and 209FG Relays. The circuit provides for bias and sensitivity tests and is designed for use in offices having +130 volt battery and 20 cycle supply. The equipment is identified as the No. 116CX1 Relay Test Panel for 19" mounting and No. 116C1 Relay Test Panel for 23" mounting. The equipment is mounted on a steel panel requiring the space for four $1\frac{3}{4}$ " x 19" mounting plates or on a

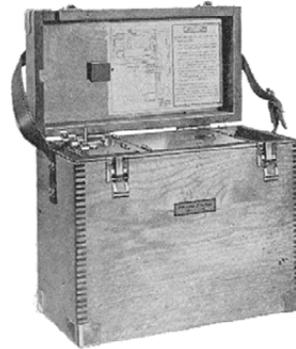


116CX1 Relay Test Panel

steel panel $5\frac{1}{4}$ " high and 23" long when arranged to mount on standard 23" relay racks or in standard steel cabinets arranged for 23" mounting plates.

Sets, test

NO. 20C TEST SET



"1020 Test Set"

The No. 20C Test Set is used as a source of tone, continuous or intermittent, for locating grounds, shorts, crosses, split pairs and wet spots in underground, block, building or aerial cables. An exploring coil, either the No. 19C or 75B Test Set and a No. 716E Receiver and cord are required for use in conjunction with the No. 20C Test Set to pick up the tone generated by the latter. When the No. 19C Test Set is used as an exploring coil, a No. 186 Plug and an R2CD Cord are required for connecting the exploring coil and receiver. When the No. 75B Test Set is used as an exploring coil an R2FA Cord 4 ft. long may be used for this purpose after removing the ends of the spade type cord tips.

The No. 20C Test Set consists of an vibrator-induction coil, a motor driven interrupter, a condenser, resistances and an OFF-ON switch. The apparatus is mounted in a wooden case $12\frac{1}{8}$ " x $6\frac{7}{8}$ " x $10\frac{1}{8}$ " which contains a compartment for four No. 6 dry cells and for the exploring coil cord plug and receiver. The No. 20C Test Set is provided with a carrying strap.

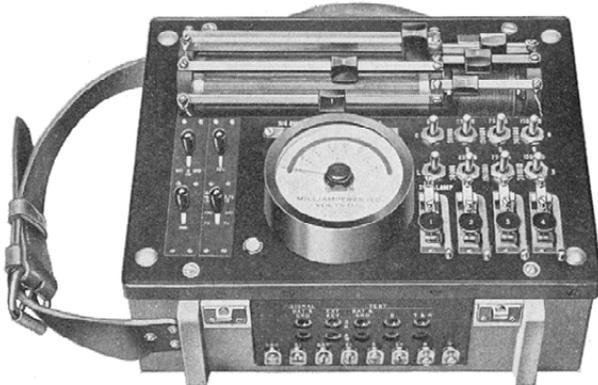
The cable fault is located by moving the exploring coil, No. 19C or No. 75B Test Set along the cable and noting the tone produced in the receiver. While the exploring coil is between the source of the tone and the fault, a tone is produced in the receiver. The tone ceases or decreases in volume depending upon the nature of the fault when the coil passes beyond it.

The exploring coil, No. 19C or No. 75B Test Set, the No. 716E Receiver, Cords, Plug and dry cells must be ordered separately.

Sets, test (continued)

35F TEST SET (J-94714B)

The 35F Test Set is a direct-current regulating and measuring device intended for use in testing and adjusting relays and other apparatus for which current flow and voltage requirements are specified.



35F Test Set

This test set is equipped with a meter, variable resistances and associated control keys by means of which it is possible to set up four different and independent testing conditions at one time for checking current flow or voltage drop requirements specified for relays or other apparatus. The set is wired for central offices having the positive pole of the central office battery grounded.

The current range of the meter provides for full-scale deflections of 3, 15, 75 and 750 milliamperes and the voltage range provides for full-scale deflections of 15, 75 and 300 volts. These ranges are under the control of two non-locking lever type keys.

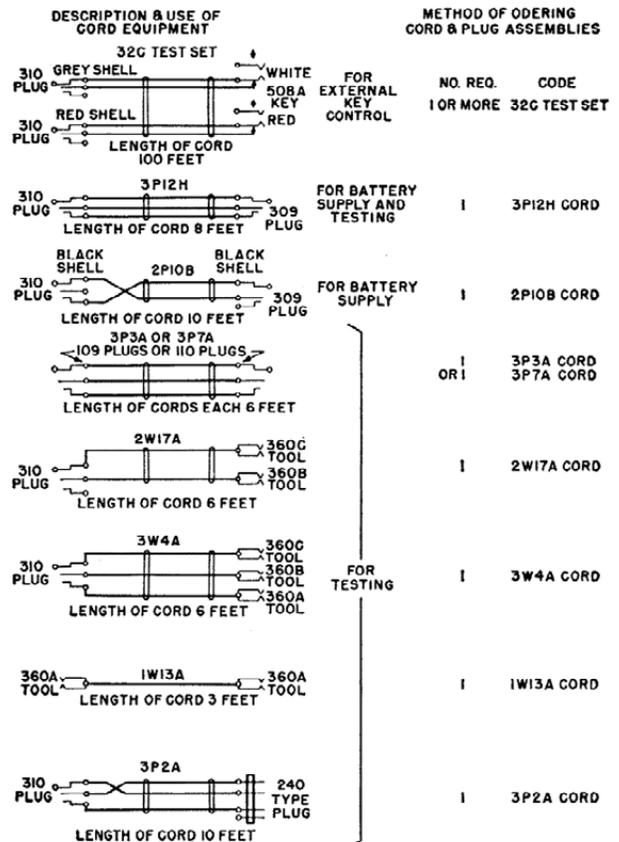
For convenience of the customer a number of patching cords, plugs and tools suitable for use with the 35F Test Set for making connections to different types of switchboard equipment are listed herein. These accessories are not furnished as a part of the test set but may be obtained when specified.

The 360 Type Tool is designed for connecting the cords to various other tools used in making connection with apparatus contacts and terminals, and is provided with a colored shell to indicate the cord conductor with which it is used as indicated in the table below.

Code	Conductor	Color
360A	Sleeve	Red
360B	Ring	Black
360C	Tip	White

The following tools are available and may be obtained for use in connection with the 360 Type Tools as indicated above.

- (a) 357 Tool; used for making connection to sequence switch and other apparatus springs.
- (b) 361B Tool; used for making connection to E or R Type Relay windings from the front of the relay.
- (c) 364 Tool; Spade terminal, for making connection to screw terminal binding posts.
- (d) 365 Tool; Suspender clip type of connector for general use.
- (e) 387A Tool; for use in connection with 111 Type Relays.
- (f) 411A Tool; A test pick connector for general use.
- (g) 419A Tool; A spring clip for use in making connections to various types of apparatus springs and terminals.
- (h) 428A Tool; used for making connection to windings of 89 and various other relays from the front of the relay.
- (i) 509A Tool; used for making connections to the windings of the U and Y Type Relays.



Patching cords, plugs and tools for use with the 35F Test Set for making connections to different types of switchboard equipment



NO. 52A TEST SET

Consists of a metal housing equipped with a No. 5HB-3 Dial having terminals "BB" and "R" strapped, a No. 152A Condenser, which may be short-circuited by means of a turn button switch, one W2AF Cord, three M1W Cords and a leather strap for attaching to a belt.

Intended to operate, together with a No. 55A Test Set, as a dialing and communicating set by installers, repairmen, linemen, cable splicers and central office maintenance men in dial areas.



No. 52A Test Set

NO. 55A TEST SET

The No. 55A Test Set includes a No. 716A Receiver, a No. 646A Transmitter and a No. 15A Headband equipped with a Pad, P-204166, assembled together with a W2AE Cord which connects the instruments in series.

It is intended for use, in conjunction with the No. 52A Test Set, by installers, repair men, linemen, cable splicers, and central office maintenance men in dial areas, and also as a communication set, to be used without the No. 52A Test Set, in connection with the same type of work in manual areas.

NO. 62A TEST SET

The No. 62A Test Set consists of a No. 528 Receiver and No. 646A Transmitter, assembled together with a W2AJ Cord which connects the instruments in series. A No. 161A Condenser is also furnished, mounted on the No. 528 Receiver. The auxiliary cord tip on the conductor connecting the receiver to the line is connected to the No. 161A Condenser.

It is intended for use in connection with splicing work on exchange cables for the double purpose of communicating between splicer and helper, and of detecting the tone placed on a wire by a splicer's test set in connection with the identification of wires in the cable.

NO. 75A TEST SET



No. 75A Test Set

The No. 75A Test Set consists of an exploring coil enclosed in a metal case.

It is intended for use in locating grounds, crosses and split pairs in short non-loaded cables in conjunction with the No. 107A Amplifier.

A 6 ft. or 30 ft. No. W2CG Cord, equipped with a No. 347B Plug, is required for use with this test set, but is not furnished as a part of the test set and must be ordered separately.

This test set utilizes tracing current supplied by a tone source such as the No. 76 Type Test Set.

NO. 75B TEST SET

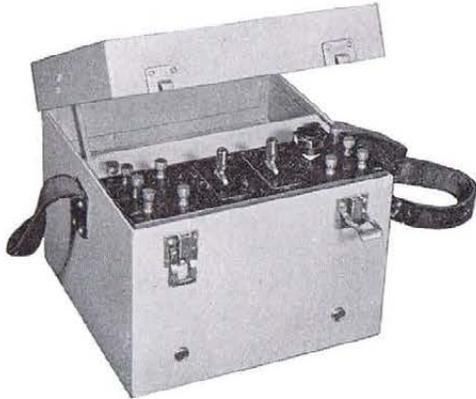
The No. 75B Test Set is intended for use in running down insulation troubles in cables by means of an audio-frequency tracing current. It consists of an exploring coil, tuning capacitor and connecting block mounted in a metal case. Terminals are provided for making external connections. It is the same in size and external appearance as the No. 75A Test Set and is intended to operate into a 200 ohm impedance head receiver either directly or through an amplifier. The sensitivity of the No. 75B Test Set when used with a head receiver is approximately equivalent to that of the 19C Test Set. Over-all dimensions are approximately $1\frac{7}{8}$ " x $1\frac{1}{16}$ " x $2\frac{3}{8}$ " long. The No. 75B Test Set replaces the No. 19C Test Set.

NO. 76C TEST SET

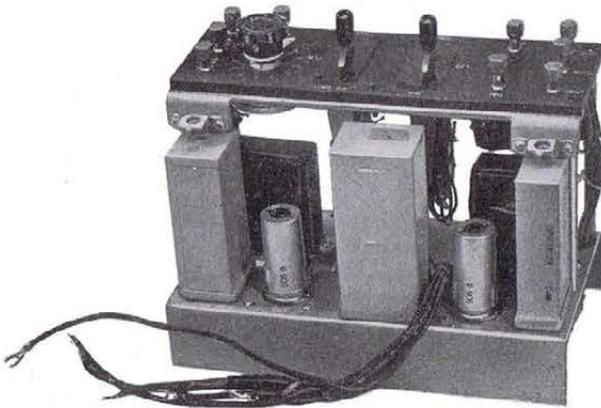
The No. 76C Test Set consists of a vacuum tube oscillator providing a 500-cycle tone warbled at 7-cycle rate. It is intended for use by cable splicers on exchange and toll cable for identification of cable wires and for other tone testing purposes. It includes a d-c relay arrangement for identification of cable wires through wet spots and a calling-in signal arrangement is also provided. The apparatus comprising this test set is contained in a metal box which includes a compartment for a series talking set such as the No. 62A Test Set.

This test set replaces the No. 76B.

Sets, test (continued)



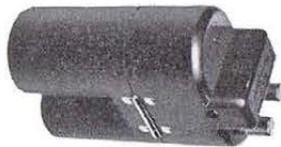
No. 76C Test Set



No. 76C Test Set—Removed from Cabinet

NO. 81AW TEST SET

The No. 81AW Test Set consists of a buzzer, condenser, switch, and a 2-cell battery housed in a moulded case and cover. It is intended for use in making tone and d-c continuity tests in tracing dead drop, block and inside wires. It is equipped with two binding posts to which test leads may be connected and a switch having three positions, the center one being the off position, the one side marked "T" for tone tests and the other side marked "C" for d-c continuity tests. Two Eveready No. 950 dry cells or equivalent are required

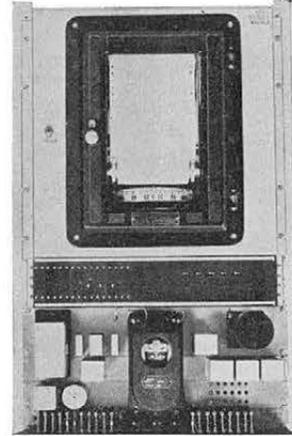


No. 81AW Test Set

for operation. These dry cells are not furnished as a part of the set.

This test set replaces the No. 66AW.

NO. 117B1 TELEGRAPH STABILITY TEST SET (J-70030B)



No. 117B1 Telegraph Stability Test Set (J-70030B)

The No. 117B1 Telegraph Stability Test Set is designed for testing the transmission stability of telegraph circuits and for measuring ground potentials on telegraph circuits. In the design, a recording d-c milliammeter is used to obtain a continuous graphic record of transmission conditions in the circuit under observation. The meter indicates variations in bias and the number and time of occurrence of systematic and fortuitous effects, or variations in ground potentials. A circuit under observation cannot be used for commercial service.

The equipment is arranged in a single circuit for mounting in 17, 1 $\frac{3}{4}$ " mounting plate spaces on a standard 19" relay rack. The unit consists of the recording meter and associated current supply switch which are housed in a metal cabinet, and the control apparatus on a key mounting and mounting plates.

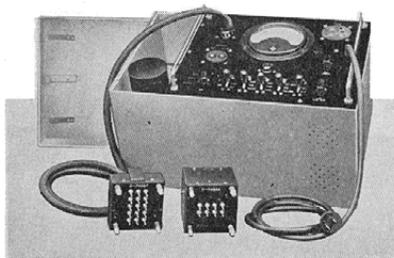
This equipment is adapted for observing test signals at 15, 23 or 33 dots per second on 48 volt, .020 ampere neutral loops; 130 volts, .060 ampere neutral loops; polar loops; or on inverse neutral circuits. It is also adapted for observing variations in ground potential on telegraph line circuits. An adjustable bias alarm feature is incorporated in the test set, which operates an audible alarm signal whenever the circuit under observation becomes unstable beyond a preselected limit.

Any one of four recording meters is provided depending upon the type of drive desired for the meter chart: mechanical spring clock or synchronous motors of 60, 50, or 25 cycle frequency,



115 volt alternating current. Each meter is provided with adjustable chart speeds of $\frac{3}{4}$ ", $1\frac{1}{2}$ ", 3", 6" or 12" per hour or per minute. A lamp is provided in the meter for illuminating the scale and chart. When the meter with spring clock chart drive is provided, the lamp is lighted by 130 volts direct current, under control of a switch. When the meters with synchronous motor drives are provided, the lamp is controlled by the same switch that controls the synchronous motor, and therefore, is lighted continuously while the meter is in service.

NO. 161A1 TELEGRAPH STATION TEST SET (J-70043A)



No. 161A1 Telegraph Station Test Set (J-70043A)

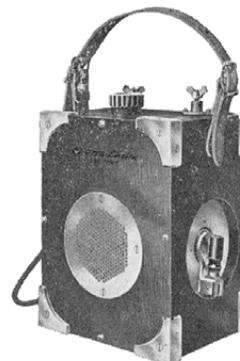
The No. 161A1 Telegraph Station Test Set is a portable box type designed primarily for use at outlying subscriber stations for clearing transmission troubles. It can also be used in main offices for similar tests where more suitable transmission measuring equipment is not available.

The No. 161A1 Telegraph Station Test Set requires an external source of either 115 volts a-c or d-c and has a self-contained a-c power rectifier. The test set is housed in an aluminum box with a removable cover. The set weighs 28 pounds including accessories, and measures approximately 14" x 9" x 9". The accessories consist of the necessary connecting cords, power adapters and receiving relay, with space within the box for these items.

A 15-conductor cord equipped with a plug which can be inserted into a connecting block as a substitute for a polar relay in the teletypewriter, or in the teletypewriter subscriber set, is provided for connecting the testing circuits into the station transmission circuit. The plug substitutes directly for a No. 209FA Relay, and an adapter is provided to adapt the plug so that it can be substituted for a No. 215A or similar type relay where necessary.

The panel unit is equipped with top handles to facilitate moving the set while in use or operation. This panel unit also supports all the test set apparatus and wiring, and is removable for maintenance purposes.

NO. 1017 TYPE PORTABLE TEST SET



No. 1017 Type Test Set

No. 1017C Test Set consists of a wooden box telephone set equipped with a regular battery talking circuit consisting of a standard transmitter, induction coil, receiver and a special three cell dry battery unit. It can be used either on magneto or central battery lines. Will ring through 5,000 ohms. Contains the following items:

Description

- 1 No. 2D Buzzer
- 1 No. 29F Generator
- 3 No. 3C Binding Posts
- 1 No. 716B Receiver (A)
- 1 No. 77C Induction Coil (B)
- 1 No. 649A Transmitter
- 1 No. 703 Eveready Battery
(must be ordered separately)
- 1 Special Switch
- 1 R2CD Cord, 2 ft., equipped with
two No. 77 Cord Tips at
Receiver End

The No. 1017E Test Set is similar to the No. 1017C except it is equipped for use on either composed or straight telephone lines. Contains—

Description

- 1 No. 29F Generator (C)
- 1 No. 2E Buzzer
- 1 No. 716B Receiver (A)
- 1 No. 77C Induction Coil (B)
- 1 No. 649A Transmitter
- 1 No. 6000A Interrupter
- 1 No. 714 Eveready Battery
(must be ordered separately)
- 1 R2CD Cord, 2 ft., equipped with
two No. 77 Cord Tips at
Receiver End

Note (A) When, for maintenance purposes, a receiver is required for a test set originally furnished with a No. 515 Receiver, a No. 528 Receiver less headband should be ordered instead of a No. 716B Receiver.

Sets, test (continued)

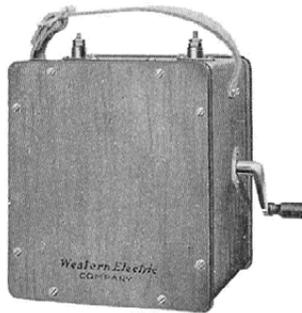
Note (B) A pair of L-shaped brackets are required for mounting 77C Induction Coil in place of the No. 13 Induction Coil in the Nos. 1017C and 1017E Test Sets for maintenance purposes.

Note (C) This generator will operate a No. 56A Drop through 11,500 ohms resistance.

The above sets have a natural birch finish. Size of case, length 6-3/32", width 4-27/32" and height 7-27/32". Weight 7 lbs.

The No. D86418 Test Set is similar to the No. 1017E Test Set except that it includes an exploring coil, special switching device, and a modified circuit for controlling the test tone for the exploring coil; also, the No. 13 Induction Coil is used. This set is intended to fulfill the standard uses for the No. 1017 Type Sets and in addition includes a fault direction locating feature for use in testing open wire lines. The No. 716E Receiver and No. 649A Transmitter are required for operation but must be ordered separately.

NOS. 90510, 90511, 90512 AND 90530 TEST SETS



No. 90530 Test Set

Consist of a generator and ringer, in series for testing through various line resistances.

The case of the set is finished in birch and is designed to withstand rough handling. A leather strap handle is provided.

List No.	Generator	Ringer		Gen. Operates Ringer Through
		Type	Ohms	
90530	22K	19B	2500	10,000 ohms
90510	22K	19H	500	35,000 ohms
90511	22N	19A	1000	50,000 ohms
90512	22N	19B	2500	100,000 ohms

Size of Case in (Inches)
5¾ x 6⅝ x 5¼

D-162269 CURRENT-FLOW TEST SET



No. D-162269 Current Flow Test Set, Cover Removed

The D-162269 Current-Flow Test Set is a current-flow type relay adjusting set. The test set is particularly adapted for use with smaller installations of communication equipments, where simplicity of operation and portability are important considerations. The primary function of the current-flow test set is to measure and control the amount of current flow through the winding of a relay, drop, or similar electro-magnetic apparatus which is being tested or adjusted. This set also may be used as a d-c milliammeter over three scale ranges of 0-15 milliamperes, 0-75 milliamperes, and 0-150 milliamperes.

The test set is assembled in a metal casing equipped with a detachable cover and with a carrying handle attached to one side. All of the apparatus is attached to the top panel of the test set. This panel is removable, for access to wiring and parts.

The milliammeter is equipped with internal shunts which provide three scale ranges, 0-15, 0-75, and 0-150 milliamperes full scale. The pointer has a 160 degree arc of rotation. The selection of the scale ranges is by means of the key designated 75MA-150MA-15MA.

The weight of the test set is approximately 9 pounds. Its dimensions are 8¾ inches by 5¼ inches by 5⅛ inches. The handle extends approximately 1¼ inches outside these dimensions. The feet and cover latches each extend approximately ⅜ inch beyond the dimensions above.



The following cords are used with this test set:

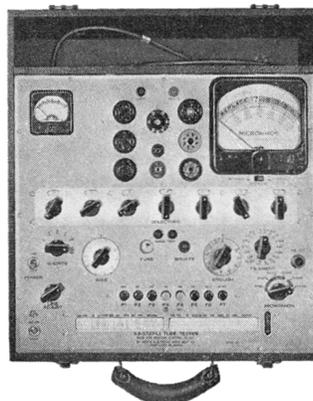
- (1) 2W17A is a 2-conductor cord—6 feet long, terminated on one end with a No. 310 plug, for connection to Jack BG; at the other end each conductor terminates in a socket-type connector (No. 360 Tool). A No. 360B Tool (black) terminates the ring conductor; a No. 360C Tool (white) terminates the tip conductor.
- (2) 1W13B is a single-conductor red cord terminated on each end with a socket-type connector No. 360A Tool (red).

The following tools fit into the No. 360-type socket connectors on the test cords and provide means for making connections to various kinds of apparatus and to test set terminals:

- (1) The No. 364 Tool is a spade terminal, for connecting to binding posts.
- (2) The No. 365 Tool and the KS-6278 Clip are suspender-type clips of different sized jaws, for connecting to winding terminals, protector terminals, and the like.
- (3) The No. 419A Tool is a spring jaw, tweezer-type connector for making contact to narrow terminals such as those at the rear of relays, or to relay springs, and the like, particularly where spacing between adjacent terminals is very small.
- (4) The No. 361B Tool is designed for connecting to the winding terminals of A, E, R, and similar type relays, from the front or adjusting side rather than from the wiring side of the relay.
- (5) The No. 428A Tool is similar to the No. 361B Tool for connecting to the front side of No. 149, 162, 178, and similar type Relays.
- (6) The No. 509A Tool is used for connecting to the windings from the front side of U, UA, and Y type Relays.
- (7) The No. 411A Tool is a test pick with an adjustable length test prod.

A Littelfuse No. 1044, $\frac{1}{8}$ ampere, type 3AG Fuse protects the meter and other test set apparatus.

Tester vacuum tube, KS-5727



KS-5727 Vacuum Tube Tester

The KS-5727 Vacuum Tube Tester is intended primarily for use in telephone central offices, coastal radio telephone service, special radio services, and program service for general testing of a large variety of low-power Western Electric Company electron tubes, as well as low-power commercial electron tubes.

The tester can test for shorts between tube elements, indicated transconductance, filament activity, gas or abnormal grid leakage current, microphonic noise, and plate current in rectifier tubes. The noise test requires the use of auxiliary equipment which is not furnished as a part of this apparatus.

This tube tester is intended for use in a horizontal position on 105 to 125 volts and 50 to 60 cycles. It is self-contained in a portable case whose dimensions are approximately 17 by 18 by 8½ inches. The weight is approximately 30 pounds. The KS-5727, List 1, Vacuum Tube Tester entirely replaces the KS-13588, List 1, and KS-8235 Vacuum Tube Testers.

Test units

NOS. 163A2 (J-70045B) AND 163C1 (J-70045D) TEST UNITS

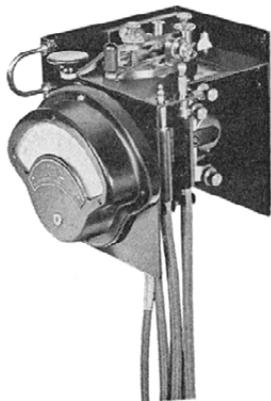
The Nos. 163A2 and 163C1 Test Units are portable units consisting of a model 269 Weston Milliammeter, a telegraph key, and a telegraph sounder, mounted on a steel bracket. This bracket is arranged to mount on extended screws on the relay rack-mounted repeater or carrier terminal units. The meter is terminated on a cord and plug

Units, test (continued)

for insertion into various repeater or carrier terminal jacks for current measurements. The key and sounder may be inserted into jacks in the loop and line circuits of the repeater or the loop of the carrier terminal circuit for communication with distant points when lining up.

The No. 163A2 Test Unit is used for testing d-c telegraph repeaters arranged for balanced loop operation. This set includes a green S2L Cord equipped with a 347B Plug for connecting the key and sounder to the repeater. A red S3J Cord equipped with a 310 Plug is connected to the meter for plugging into the repeater when making current measurements. The meter is a 0-center type, requiring 25 milliamperes for end-scale deflection, on its 100-0-100 scale.

The 163C1 Test Unit is used for testing 40C1 Carrier Telegraph Channel terminals arranged for balanced loop operation. This set includes a green S2M Cord equipped with a 310 Plug for connecting the key and sounder to the carrier telegraph channel terminal loop. A red S3K Cord equipped with a 304A Plug is connected to the meter for plugging into the carrier telegraph channel terminal circuit when making current measurements. The meter has ranges of 10-0-10 and 100-0-100 milliamperes.



No. 163A2 Test Unit

NO. 163E1 ORIENTATION TESTING INDICATOR (J-70045F)

The No. 163E1 Orientation Testing Indicator (J-70045F) may be used for adjusting the 106A2 Regenerative Repeater. It provides means for observing the limits of orientation of the repeater when it is intentionally being operated from distorted signals from a 100 type test distributor so that the regenerative unit may be adjusted for its optimum setting without the use of a teletypewriter. The unit is small and portable and requires no external power supply.

Sets, transmission measuring

NO. 12B TRANSMISSION MEASURING SET



No. 12B Transmission Measuring Set

Consists essentially of a db meter with self-contained copper-oxide rectifier, a condenser, a potentiometer, keys, coils, resistances and jacks mounted on a panel of insulating material and inclosed in a metal box.

Will measure transmission losses from 0 to 20 db below one milliwatt into 600 ohms over the frequency range of 350 to 10,000 cycles. The accuracy at 1000 cycles is in the order of ± 0.2 db for losses of 0 to 15 db and ± 0.5 db for losses of 15 to 20 db.

Will measure transmission gains when external pads are provided.

The meter has both a loss and a gain scale of 10 db. Key controlled pads extend the loss range to 20 db.

The jacks are provided for making connections to external circuits for dialing and measuring.

Intended for use in measuring transmission losses in local and small toll offices.

NO. 13A TRANSMISSION MEASURING SET



13A Transmission Measuring Set



The 13A Transmission Measuring Set is a portable instrument for making transmission measurements at voice frequencies.

This set has an input impedance of approximately 600 ohms and is capable of measuring received power from -45 dbm (45 db below a milliwatt into 600 ohms) to $+10$ dbm (10 db above a milliwatt into 600 ohms) over a frequency range from 30 cycles to 15 kilocycles.

The 13A Transmission Measuring Set is provided in portable form equipped with a power-supply cord and removable cover. It is approximately 11 inches long, $6\frac{1}{2}$ inches wide, and $8\frac{1}{2}$ inches high, weighing about 14 pounds. This apparatus is of a panel-chassis type of construction and is contained in a perforated steel housing. The box is provided with a removable cover to protect the surface apparatus. The perforations in the housing assist in dissipating the heat generated, and the set should be exposed to freely circulating air while in operation. This is an important consideration in the use of the set, due to its compactness and the effects of heat on the life of certain parts, particularly the electrolytic capacitors. The effects of temperature variations on the electrical performance have been minimized by the circuit design.

The power required for operation is a source of 105 to 125 volts which may be obtained from either direct current or 25 to 60-cycle alternating current. The power consumed is about 50 watts.

The meter, binding posts, and adjustable features of the set, consisting of a dial switch, a calibrating rheostat, and a toggle switch in the power-supply circuit are assembled on the panel as shown.

The chassis is fastened to the case by means of four knurled thumb screws, one near each corner of the panel.

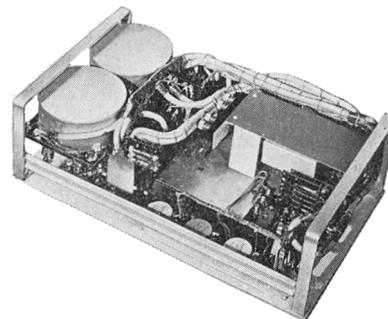
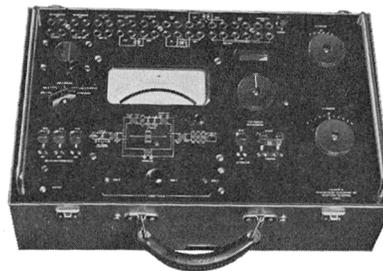
Measurements are indicated on a 5-db range meter scale which is marked in 0.1-db divisions. A dial switch operates a potentiometer circuit in steps of 5 db each with step designations which indicate the amount to be added to the meter scale. This provides an adjustment of the input of the amplifier-rectifier circuit so that any received power in the range of the set can be measured in reference to one milliwatt. With an input of one milliwatt and the dial switch at either zero position, the meter scale deflection will be zero on the meter scale corresponding to the dial switch setting. The dial steps designated in red are associated with the red or upper scale of the meter and indicate received power greater than one milliwatt. On the other steps, designated in white, the received power is less than one milliwatt and the black or lower meter scale is used.

A calibrating rheostat operated by means of a screwdriver is provided for making an adjustment of the amplifier gain.

NO. 30A TRANSMISSION MEASURING SET (J-64030A)

The No. 30A Transmission Measuring Set is intended primarily for use in testing carrier telephone systems. Transmission gains, losses and received power may be measured within close limits at frequencies up to 150 kilocycles. The set is nominally for use with 135 ohm circuits but contains two impedance matching transformers which make it suitable for certain types of measurements on 600 ohm circuits.

The transmission measuring set consists essentially of a thermocouple and micrometer in conjunction with a variable calibrated attenuator and a switching arrangement. The attenuator is made up of a 0-50 db unit variable in steps of 10 db,



No. 30A Transmission Measuring Set

a 0-10 db unit variable in steps of 1 db, and a 30 db pad arranged for key operation. The switching arrangement permits the comparison of unknown received powers, gains or losses with known attenuator values. Jacks are provided at various points in the circuit for the insertion of amplifiers or other external arrangements. A calibration circuit is included for the thermocouple. No source of a-c testing power is provided.

This transmission measuring set has a sensitivity of 1 milliwatt to -10 dbm.

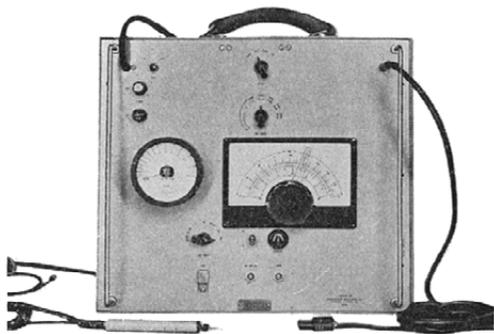
Sets, transmission measuring (continued)

**NO. 31B TRANSMISSION MEASURING SET
(J-64031B)**

The No. 31B Transmission Measuring Set consists essentially of an untuned detector having a substantially uniform response over the range of 1 to 150 kilocycles, a heterodyne selector capable of measuring levels at single frequencies on a selective basis over the range of 10 to 150 kilocycles, and a narrow-band pass filter for use in modulation measurements. A cord is provided for bridging the transmission measuring set onto the circuit to be measured and an input switch is provided for switching this cord to the selector, detector, or filter portion of the set and to the input pad for calibrating the set. Tuning dials for the frequency setting of the selector and sensitivity controls, for the selector and detector are provided. The set operates from 115-volt, 60-cycle a-c power obtained through a cord and plug furnished as a part of the set.

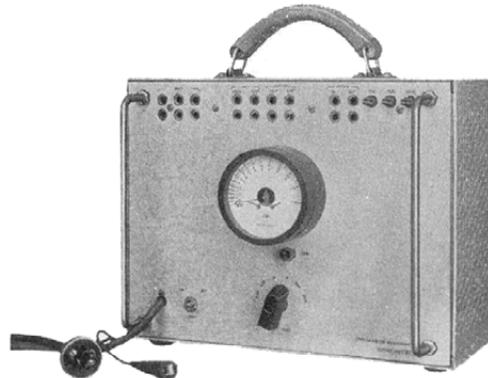
This transmission measuring set has a sensitivity of +35 dbm to -95 dbm on 135 ohm circuits.

This set may be furnished for portable use or for mounting in a fixed location by means of adapter details on a standard framework arranged for 19" mounting plates. For either case, a 3W7A Cord 8 ft. long with a No. 308A Plug is furnished for connecting the set to the circuit to be measured and a power cord 10' 0" long with a plug for connecting to the a-c supply. When used on a portable basis a third conductor with a clip on the end of it is furnished with the power cord for grounding the set.



No. 31B Transmission Measuring Set

**NO. 32A TRANSMISSION MEASURING SET
(J-64032A)**



No. 32A Transmission Measuring Set

The No. 32A Transmission Measuring Set is intended primarily for use in testing "C" Carrier Telephone Systems. It is capable of making transmission level measurements at frequencies between 150 cycles and 150 kilocycles at levels between -35 dbm and +35 dbm. It may be used as a substitute for the No. 30A Transmission Measuring Set for certain types of measurements.

The main part of the equipment consists essentially of the detector portion of the No. 31B Transmission Measuring Set circuit. The set includes patching jacks to permit bridging to a circuit to be tested. For terminating measurements, it includes key controlled pads of 5 db, 10 db and 20 db to extend the range of measurements of the detector, and a 600:135 ohm repeating coil. The repeating coil provides for use on 135 ohm circuits and is also available for changing the output impedance of the No. 51A Oscillator which may be used with this set, from 135 ohms to 600 ohms for testing on type "C" systems. The set is adapted for measuring directly on 600 ohm circuits without the use of the repeating coil or for measuring on a bridging basis.

The set operates from 115 volts 60 cycles a-c power obtained through a cord and plug furnished as part of the set.

This set may be furnished for portable use on a writing shelf or table wagon or for mounting in a fixed location by means of adapter details on a standard framework arranged for 19" mounting plates. When furnished for portable use the power cord is provided with a third conductor for grounding the measuring set framework. When furnished for mounting in a fixed location a two conductor power cord is provided.



NO. 118C2 TELEGRAPH TRANSMISSION MEASURING SET (J-70069K)

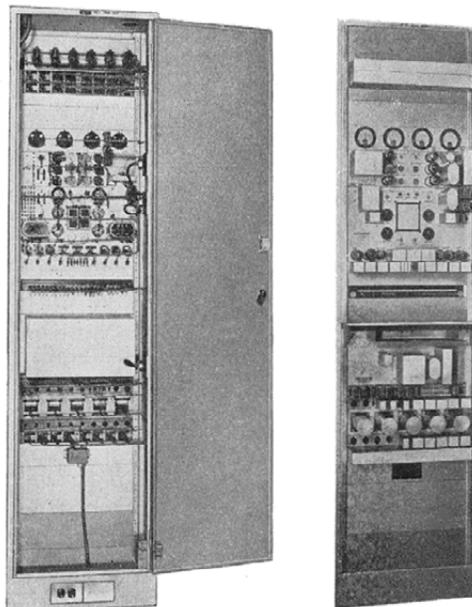
The No. 118C2 Transmission Measuring Set provides a means of receiving ordinary teletypewriter signals from the line under test and indicating their bias and distortion on meters. The measuring method employed depends upon the comparison of the voltage existing on a condenser at the times of transitions in the teletypewriter signals with a reference voltage, the extent of the departure of the condenser voltage from the reference voltage being used as an indication of the amount of distortion. This set is arranged to measure either 5- or 6-unit selecting code teletypewriter signals of 60, 75 or 100 speed, and in 0.020 or 0.060-ampere neutral circuits, in polar circuits, and in inverse neutral circuits. An electronic distributor is used to obtain the timed impulses.

The equipment for the No. 118C2 Transmission Measuring Set is located in a steel cabinet of improved design, 7' 0" high, 1' 9½" wide, and 1' 0" deep. The apparatus panels and mounting plates form the front of the cabinet. The wiring side is accessible by means of a door which closes the back of the cabinet. A door switch operated by the rear door cuts off the power supply to the set when the door is open. A shelf is provided on the front of the cabinet.

The No. 118C2 Set is arranged for a maximum of ten extension circuit appearances at telegraph or at line concentrating units. At other locations, the extension circuit is located in a jack and meter box. This box is made of sheet metal and has a fibre faced front panel, on which the equipment is mounted. The box is arranged to mount on the front of a relay rack upright. The relay equipment for these extension circuits is located in the measuring set bay. The extension circuit appearances are noninterfering with each other. A busy lamp is provided at each appearance. This lamp will flash, at the appearance using the set, if a cord is plugged into the jack at another appearance indicating that the attendant at the latter appearance is waiting to use the set. It will also flash, but at higher speed, if the measuring set has been temporarily adjusted for use with six unit code instead of five and, when the speed key is operated, if the measuring set has been temporarily adjusted for 100 speed when the "normal" speed is 75, or vice versa.

Five No. 255A Relays and the vacuum tubes listed below are required for the No. 118C2 Transmission Measuring Set. These items will be furnished only when specified in the order.

- 1 6H6G Vacuum Tube
- 1 0D3VR-50 Vacuum Tube
- 3 56 Vacuum Tubes
- 1 80 Vacuum Tube
- 2 338A Vacuum Tubes
- 1 6F8G Vacuum Tube
- 1 83V Vacuum Tube
- 1 2A5 Vacuum Tube
- 2 6Y6G Vacuum Tubes
- 3 0C3VR-105 Vacuum Tubes



No. 118C2 Telegraph Transmission Measuring Set—Front View, Rear View with Door Open and Extension Circuit Jack and Meter Box

Western Electric reserves the right, without notice, to make such changes in equipment, design, or components as progress in engineering or manufacturing methods may warrant.

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