

APPARATUS – METHOD OF MAKING TEST CONNECTIONS

1. GENERAL

1.01 This section covers procedures for connecting to relays and other miscellaneous apparatus.

1.02 This section is reissued to include information for making connections to 302-type relays, 334- and 338-type switches, and to add the No. 428B tool. It also covers additional information for making connections in PBX offices. Detailed reasons for reissue will be found at the end of the section.

1.03 *Caution: When connecting to terminals of apparatus, do not apply the No. 419A tool or any other connecting tool over a solderless wrapped connection or in any manner that would disturb such a connection.*

2. PROCEDURES FOR CONNECTING DIRECTLY TO WINDING TERMINALS OF APPARATUS UNDER TEST (See Tables A and B)

2.01 *Connections to Winding Terminals From Wiring Side of Frame (Rear of Frame):*
When connecting to winding terminals from the wiring side, attach the No. 419A test connector or any of the other connector tools listed in Table A to the specified terminal as shown in Fig. 1. Connect stud-ended connecting tools to a

TABLE A – CONNECTIONS TO WINDING TERMINALS FROM WIRING SIDE OF FRAME

APPARATUS	TOOLS FOR CONNECTING
Relays and Other Electromagnetic Apparatus	357
	365
	419A
	KS-6278

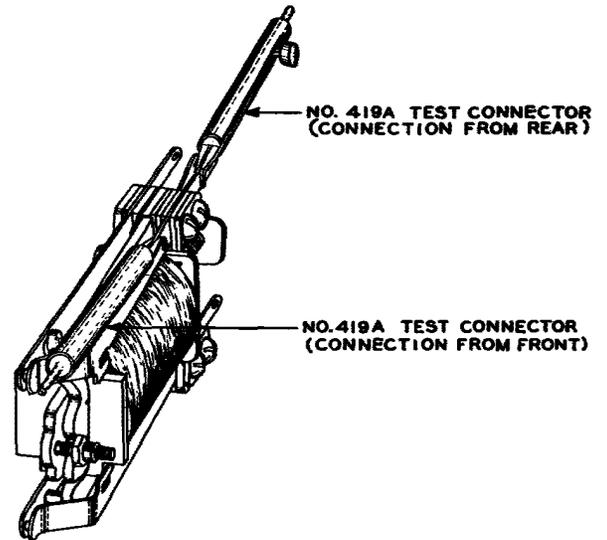


Fig. 1 – Connecting to Winding Terminal and Spring of an R-type Relay

test cord equipped with a 360-type tool. To insulate the jaw of a connecting clip, insert the clip in the No. 108 cord tip. Support or fasten the test cord so that the weight of the cord will not disconnect the connecting tool from the apparatus under test.

2.02 *Relays (Except Wire Spring, Dry Reed, and Polarized), Switches, and Timers:*
Fig. 2 through 9

(a) *Using No. 361B, 428A, 509A, 547A, and 548A Test Connectors:* Place the hooked end of the connector over the winding lug or in the hole of the terminal and draw the handle of the tool forward sufficiently to permit the hook or the pointed end of the handle to engage at the front of the apparatus. (For timers, the hooked end of the handle will engage the bracket at the top of the timer; for 300- or similar-type crossbar switch hold magnets, the spring mounting bracket; and for the 324- or similar-type crossbar switch hold magnets, the

TABLE B — CONNECTIONS TO WINDING TERMINALS FROM APPARATUS SIDE OF FRAME

APPARATUS	TOOLS FOR CONNECTING
<i>Relays</i>	
A, AB, E, EA, F, H, R, and T	361B
U, Y, UA, and UB	607A
AF, AG, AJ, and AK	624A
89, 101, 105, 108, 111, 121, 122, 149, 162, 172, 178, 179, 190, and 196	428A*** or B
245 and 254	547A
263 and 264	509A
266	419A
271	607A
282*	607A
286, 287, and 288	509B
293 and 302	360
<i>Resistors**</i>	
18 and 19	KS-6278
<i>Switches</i>	
300, 301, 302, 303, 304, 305, 306, 307, 308, 314, 315, and 318 (Select Magnets) (Hold Magnets)	547A 548A
324, 325, 328, 334, and 338 (Select Magnets) (Hold Magnets)	547A
<i>Timers</i>	
1 and 2	547A
* Primary and secondary coil winding only.	
** Connect to ferrule except as noted in 207(b).	
*** The No. 428A tool cannot be used on relays manufactured subsequent to 1947.	

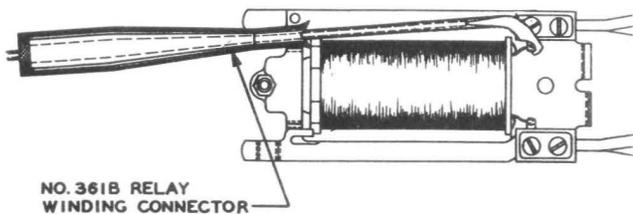


Fig. 2 — Connecting to Winding Terminal of an R-type Relay

switch frame.) When connecting to the terminals of a select magnet of a crossbar switch, hook the end of the tool in the hole or on the notch at the base of the magnet terminal with the tool held at an angle to the magnet. After the end is attached to the terminal, position the tool so that the handle may be fastened to the spoolhead. (Where interference is encountered, as in the case of gauging front contact make of crossbar switch selecting off-normal springs, apply the tool from the far side of one of the adjacent select bars and fasten the handle of the tool to the spoolhead of the select magnet directly below or above the select magnet being energized.)

(b) *Using No. 607A Test Connector:* Press the nail-shaped head of the connector into the hole of the terminal and draw the handle forward so that the head engages the terminal. The connector is held in place by the retaining spring and the weight of the connecting cord. Position it so that it does not interfere with gauging and adjusting operations.

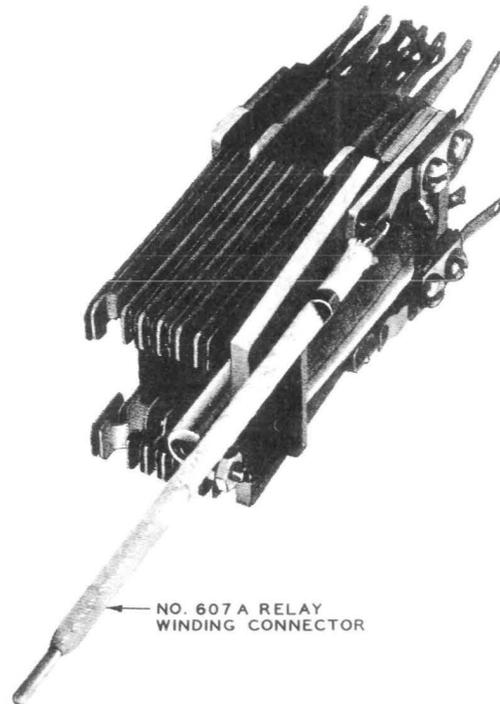


Fig. 3 — Connecting to Winding Terminal of a U-type Relay

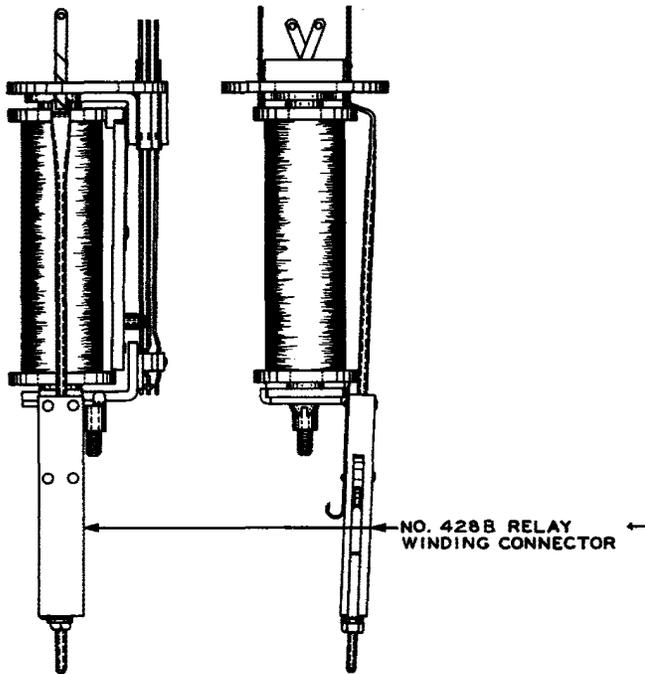


Fig. 4 — Connecting to Winding Terminal of a 149-type Relay

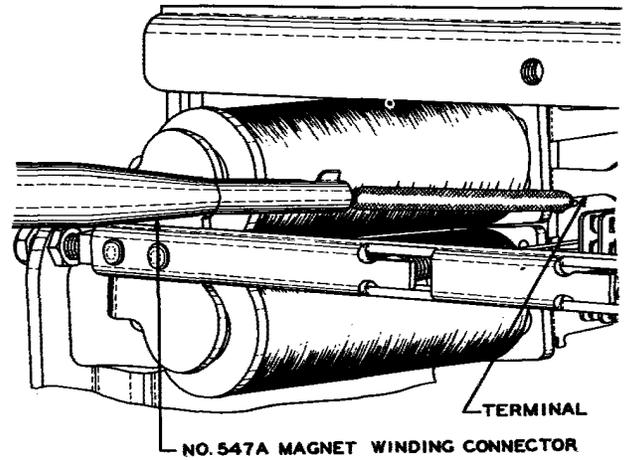


Fig. 6 — Connecting to Winding Terminal of the Select Magnet of a 300- or Similar-type Switch

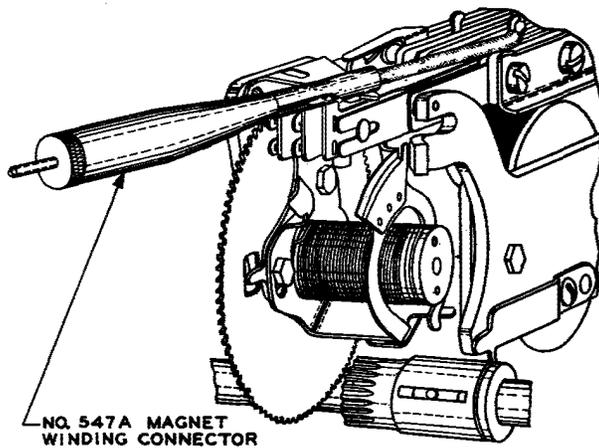


Fig. 5 — Connecting to Winding Terminal of a 1-type Timer

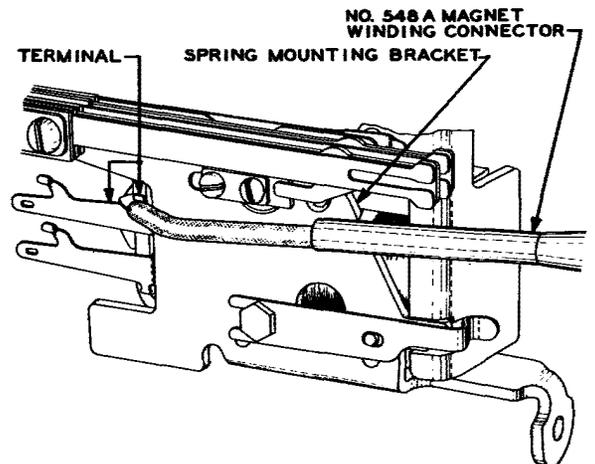


Fig. 7 — Connecting to Winding Terminal of the Hold Magnet of the 300-, 301-, 302-, 303-, 304-, 305-, 306-, 307-, 308-, 314-, 315-, and 318-type Switches

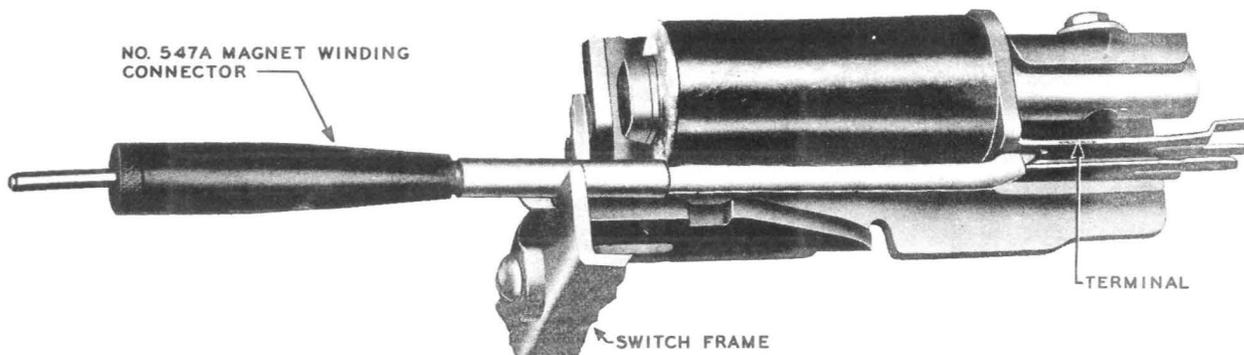


Fig. 8 — Connecting to Winding Terminal of the Hold Magnet of the 324-, 325-, 328-, 334-, and 338-type Switches

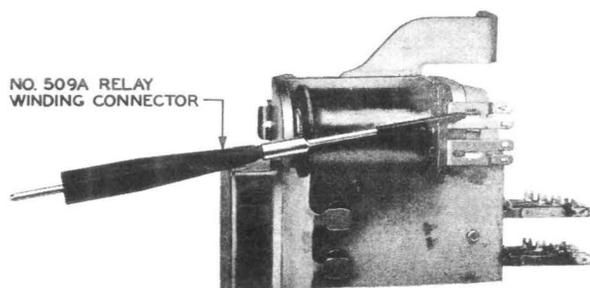


Fig. 9 — Connecting to Winding Terminal of a 263-type Multicontact Relay

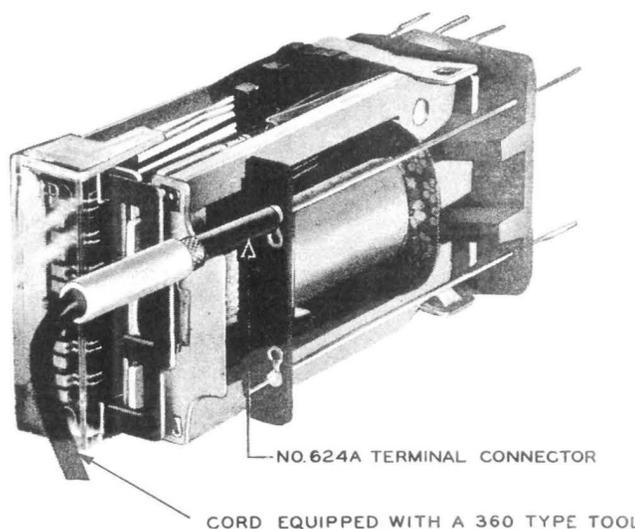


Fig. 10 — Connecting to Winding Terminal of the AF-, AG-, and AJ-type Relays (Wire Spring)

2.03 Connections to Winding Terminals of AF-, AG-, AJ-, and AK-type Relays (Wire Spring) From Apparatus Side of Frame (Front of Frame): Fig. 10 and 11

Caution: Before making a connection, insert the terminal end of the No. 624A terminal connector into the 360-type tool associated with the test cord.

Insert the open end of the No. 624A terminal connector over the winding terminal to which the connection is to be made. Press the connector onto the terminal until it is fully seated.

2.04 Connections to Winding Terminals of 286-, 287-, and 288-type Relays (Multicontact Wire Spring) From Apparatus Side of Frame (Front of Frame): Place the hooked end of the No. 509B relay winding connector in the hole of the winding terminal and draw the handle of the

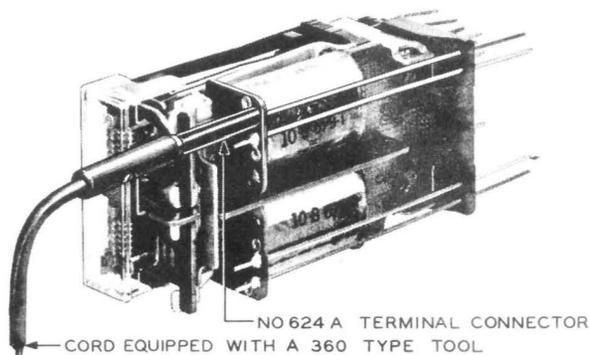


Fig. 11 — Connecting to Winding Terminal of the AK-type Relays (Wire Spring)

tool forward sufficiently to permit the slotted portion of the hook to engage the core plate.

Note: When making a connection, make sure that the connecting tool does not interfere with the operation of the armature.

2.05 Connections to Winding Terminals of 293- and 302-type Relays (Dry Reed) From Apparatus Side of Frame (Front of Frame): Insert the open end of the 360-type tool which is attached to the test cord over the winding terminal to which the connection is to be made. Press the tool onto the terminal until it is fully seated.

Caution: Do not make connections to the 293- and 302-type relays (dry reed) from wiring side of frame.

2.06 Connections to Polarized Relays From Apparatus Side of Frame (Front of Frame): Where a winding of a polarized relay is connected directly to the terminals of a jack, use an appropriate cord and plug inserted into that jack for connecting the relay to a test set.

2.07 Connections to 18- and 19-type Resistors From Apparatus Side of Frame (Front of Frame)

(a) **Resistors Having Metal Ferrules:** Connect the KS-6278 connecting clip, as shown in Fig. 12, to one side of the metal ferrule at the top, bottom, or in case of 19-type resistors, the middle.

(b) **Resistors Having Gray Lacquer Over the Ferrule and Body and Resistors Without Metal Ferrules:** Connections shall only be made from the wiring side of the frame.

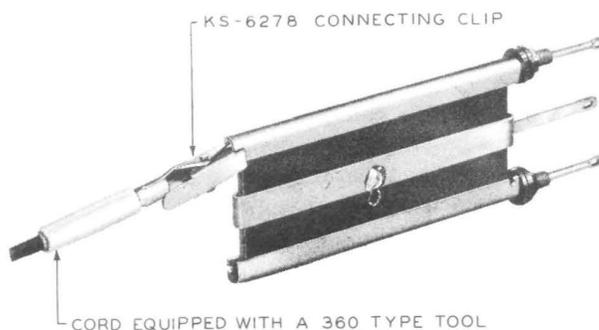


Fig. 12 — Connecting to Ferrule of the 18- and 19-type Resistors

3. PROCEDURES FOR CONNECTING DIRECTLY TO SPRINGS AND TERMINALS OF APPARATUS UNDER TEST (See Table C)

3.01 In general, connections may be made to springs and terminals as covered in 3.02. However, where specific procedures should be followed the information is found in subsequent paragraphs under the proper heading.

3.02 When connecting to springs and terminals of apparatus, use the No. 419A test connector to connect to relay contact springs, contact terminals, or the springs of other apparatus for which this tool is applicable. In some cases, the No. 357 spring contact clip and insulator may be used instead of the No. 419A test connector. Use the No. 364 spade terminal to connect to binding posts of portable test apparatus and the No. 365 and KS-6278 connecting clips for connecting to terminals of miscellaneous apparatus (jacks, repeating coils, etc). Connect stud-ended connecting tools to a test cord equipped with a 360-type tool. To insulate the jaw of a connecting clip, insert the clip in the No. 108 cord tip. Support or fasten the test cord so that the weight of the cord will not disconnect the connecting tool from the apparatus under test. For step-by-step line finder switch banks, use the No. 620A bank contact connector as shown in Fig. 13. Insert the connector in the proper level of the bank, starting the connector over the bank insulator so that the jaws of the connector span the contacts. Rotate the connector until the metal contacts rest on the terminals to be tested.

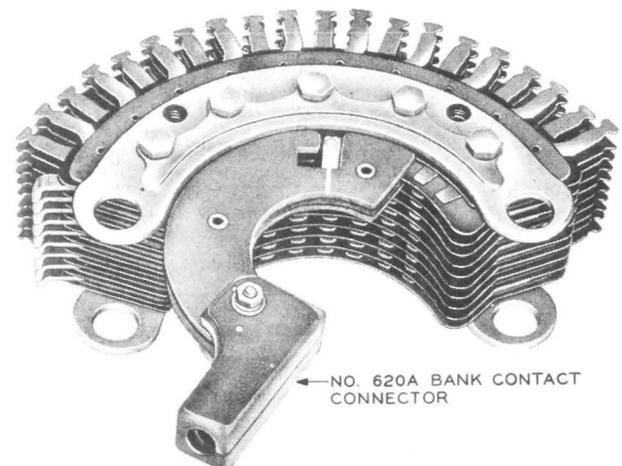


Fig. 13 — Connecting to Terminal of the Step-by-Step Line Finder Switch Bank

**TABLE C — CONNECTIONS TO SPRINGS AND
TERMINALS OF APPARATUS**

APPARATUS	POINT OF CONNECTION	TOOL FOR CONNECTING
Local and Toll Cord Circuits	Tip, Ring, and Sleeve Terminals of Cord Shelves	443A
No. 1 Toll—Cord Circuits	Tip, Ring, and Sleeve Terminals of Cord Shelves	503A
Step-by-Step Relays and Switch Spring Assemblies	Terminals or Springs	419A
Meters Used With Teletypewriter Equipment	A KS-7468 Volt-ohm-milliammeter When Measuring the Voltage Delivered by a KS-5300 Rectifier	471A
Common Systems, Dial Long Line and Tie Trunk Circuits	332A Plug When Inserted in the Resistance Lamp Electron Tube Socket for Testing 239- and 280-type Relays	360
Step-by-Step Line Finder Switch Banks	Terminals	620A
Binding Posts on Test Equipment		364
AF, AG, and AJ Relays	Fixed Contacts	639A, 651A,B,C*, or D
	Contact Terminals	419A
AK Relays	Fixed Contacts	639A 651D
	Contact Terminals	419A

TABLE C (Cont)

APPARATUS	POINT OF CONNECTION	TOOL FOR CONNECTING
111 Relays	Inner Contact Springs	387A
Γ Multicontact Wire-Spring Relays	Contact Terminals	419A
↳ Dry Reed Relays	Terminals (Contacts)	419A 360
Terminal Strips Having Terminals for Solderless Wrapped Connections	Terminals	624B
<i>Miscellaneous</i> Interrupters Jacks Plugs Relays Repeating Coils Sequence Switches Sockets	Terminals, Springs, Cams	357 365 419A KS-6278
* The No. 651C tool is used only for making connections to fixed contacts of the earliest manufactured AF-, AG-, and AJ-type relays (those equipped with plastic covers having metal frames).		

3.03 Connections to Fixed Contacts of AF-, AG-, and AJ-type Relays (Wire Spring) From Apparatus Side of Frame (Front of Frame) Fig. 14

Caution: Before connecting to a wire-spring relay from the apparatus side of frame, insert the terminal end of the No. 639A relay contact connector into the 360-type tool associated with the test cord.

- (a) Remove the contact cover and substitute a 651-type relay contact connector holder. On earliest type 12-contact position relays which use covers having metal frames, use the No. 651C holder; on later type 12-contact position relays which use an all plastic cover (relays equipped with contact cover spring),

use the No. 651A or 651D holder; and on 24-contact position relays, use the No. 651B holder. With the UP position at the top, press the holder firmly into position being careful not to disturb the spring adjustments.

(b) Insert the No. 639A relay contact connector into the proper opening of the 651-type relay contact connector holder to make a connection to the fixed contact. To remove the No. 639A connector, grip it with the forefinger and thumb pressed against the face of the 651-type holder. Remove it by exerting a backward pressure on the No. 639A connector. Remove the 651-type holder and remount the cover, exercising care that the slot in the cover is positioned over the center of the card.

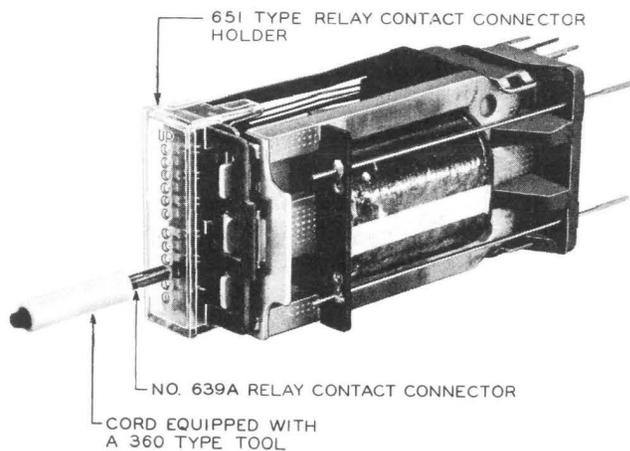


Fig. 14 — Connecting to Fixed Contact of the AF-, AG-, and AJ-type Relays (Wire Spring)

3.04 Connections to Fixed Contacts of AK-type Relays (Wire Spring) From Apparatus Side of Frame (Front of Frame): Fig. 15

Caution: Before connecting to a wire-spring relay from the apparatus side of frame, insert the terminal end of the No. 639A relay contact connector into the 360-type tool associated with the test cord.

(a) Remove the contact cover and substitute the No. 651D relay contact connector holder. With the UP position at the top, press the holder firmly into position being careful not to disturb the spring adjustments.

(b) Insert the No. 639A relay contact connector into the proper opening of the No. 651D relay contact connector holder to make a connection to the fixed contact. To remove the No. 639A connector, grip it with the forefinger and thumb pressed against the face of the No. 651D holder. Remove it by exerting a backward pressure on the No. 639A connector. Remove the No. 651D holder and remount the cover.

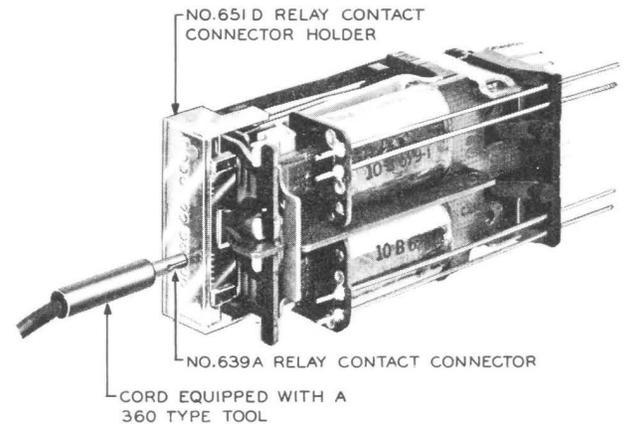


Fig. 15 — Connecting to Fixed Contact of the AK-type Relays (Wire Spring)

3.05 Connections to Movable Contact Terminals of AF-, AG-, AJ-, and AK-type Relays and to Movable and Fixed Contact Terminals of 286-, 287-, and 288-type Relays (Wire Spring) From Wiring Side of Frame (Rear of Frame): To make connections to the contact terminals, use the No. 419A test connector. First insert the stud end of the connector into the 360-type tool and then attach the connector to the desired contact terminal. Position the connector in such a way that it does not make contact with the other contact terminals.

Caution: Connections should not be made on the apparatus side of the frame to movable contacts of AF-, AG-, AJ-, and AK-type relays or to any contact of the 286-, 287-, or 288-type relays.

3.06 Connections to Terminals (Contact) of 289- and 290-type Relays (Dry Reed) From Wiring Side of Frame (Rear of Frame): Attach the No. 419A test connector to the termi-

nal to which the connection is to be made. Where the wiring does not permit the connector to be connected near the end of the terminal, connect it near the base of the terminal.

→ **3.07 Connections to Terminals (Contact) of 290-, 293-, and 302-type Relays (Dry Reed) From Apparatus Side of Frame (Front of Frame)**

(a) *Connecting to 290-type Relays:* Attach the No. 419A test connector to the terminal to which the connection is to be made. Where the wiring does not permit the connector to be connected near the end of the terminal, connect it near the base of the terminal.

→ (b) *Connecting to 293- and 302-type Relays:*
In general, connections may be made to terminals using 360-type tools. However, in some instances, such as making connections to terminals which are adjacent, use a 360-type tool on one terminal and a No. 419A test connector on the other. To connect the 360-type tool, insert the open end of the tool over the terminal to which the connection is to be made. Press the tool onto the terminal until it is fully seated. To connect the No. 419A test connector, first insert the stud end of the connector into the 360-type tool and then attach the connector to the desired terminal. Position the connector in such a way that it does not make contact with the other terminals.

3.08 Procedure for Making Connections to Sequence Switch Springs Using the No. 357 Contact Clip and Insulator: Fig. 16

(a) When making a connection to a sequence switch spring, the spring may or may not be insulated from the cam depending on the position of the No. 357 clip.

(b) To connect the clip, place it on the spring so that the metal jaws span the spring and the notch in the clip is above the brush tips. Press the clip down on the spring until the spring tips enter the notch in the clip shield and the clip engages the spring sufficiently to hold it in place. If it is necessary to insulate the spring from the cam, raise the clip until

the spring tips clear the notch in the clip. Pull the clip forward until the shield is between the spring and the cam.

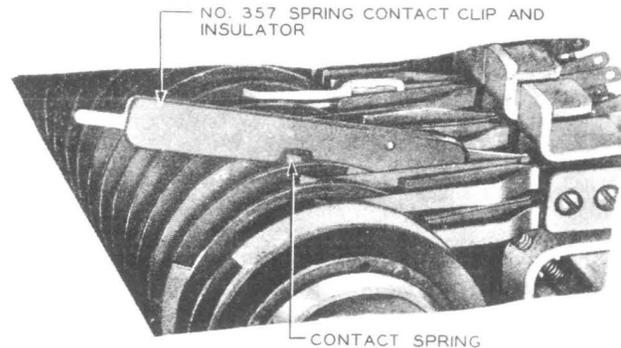


Fig. 16 — Method of Using the No. 357 Contact Clip and Insulator for Sequence Switches

3.09 Connections to Terminal Strips Having Terminals for Solderless Wrapped Connections: Insert the open end of the No. 624B terminal connector over the terminal to which the connection is to be made, provided there is sufficient room to secure the connector. If there is not sufficient room, make connection to some other point.

REASONS FOR REISSUE

1. To add the information for connecting to 271-, 282-, and 302-type relays and to 334- and 338-type switches, and to add the No. 428B tool (Table B).
2. To revise Fig. 4.
3. To revise the title of Fig. 8.
4. To add the information for connecting to 302-type relays (2.05 and 3.07).
5. To add the information for connecting to apparatus in tie trunk circuits and to omit code numbers of multicontact wire-spring and dry reed relays (Table C).