RELAYS

275-, 276-, 292-, 301-, 303-, 316-, 320-, AND 321-TYPES

TESTS USING TEST SETS SD-95439-01 (J94725A)

CONTENTS PAGE

1. GENERAL

1.01 This section covers the method of testing 275-, 276-, 292-, 301-, 303-, 316-, 320-, and 321-type (mercury contact) relays using the J94725A test set (Section 100-139-101) and the 35-type test set (Section 100-101-101).

1.02 This section is reissued to revise Table A, add new Tables B and C, and update to the Standard format. Since this is a general revision, revision arrows have been omitted. The Equipment Test List is not affected.

1.03 Four designs of the J94725A test set covered by SD-95439-01 are in use in the field. Each test set has a nameplate which covers the types of relays that can be tested using the test set.

1.04 Table A augments the nameplate data and covers references to the tests to be made when testing the relays covered in this section, and the test sets and the test set sockets used in making the tests.

1.05 When using a test set, it should be so placed that when the relay to be tested is mounted in the proper test socket, the relay (with the exception of the 316-type) will be in the vertical position. The 316-type relay will be in a horizontal position. Only one socket should be in use at any one time.

1.06 The J94725A test set is used to test the relays in this section. Figures 1 through 9 are in reference to the figure switches found on the J94725A test set. Each figure has the winding and contact arrangements of the various types of relays.

1.07 There are multiple designations on the TEST A and TEST A1 keys of the L3 test set. For convenience in referring to the position of these keys, only one designation for each position will be used.

1.08 Procedures to be followed for relays which do not meet the tests specified in this section are covered in Section 040-263-701.

1.09 ***Caution: Do not disassemble any of these types of relays, since the glass contact switch element mounted within the outside steel shell contains a gas under high pressure. In case the glass envelope of an exposed switch element is broken, pieces of glass may***

TABLE A

RELAY TEST FOR USE ON THE J94725A TEST SET

TEST	RELAY TYPE TO BE TESTED	WHEN CKT SPECIFIED BSP FIG. NO.	LIST NO. OF TEST SET USED	SOCKET OF TEST SET USED
A	275, 276	1, 2, 3, 4, 5,	1 and 2	TEST A (octal)
	275, 276	1, 2, 3, 4, 5, 6, 8,	3 and 4	TEST A (octal)
	275, 276	7	1, 2, 3, 4	TEST B (octal)
B	276	6	1 and 2	TEST B (octal)
C	276	8	1 and 2	TEST B (octal)
D	292	1	2	TEST A (11 prong)
	292	1	3 and 4	TEST A (11 prong)
	292	2, 3	3 and 4	TEST B (11 prong)
E	301	1	2, 3, and 4	TEST A (11 prong)
F	303	1, 2	3	TEST A (octal)
		3, 4	3 and 4*	TEST B (octal)
G	316	1, 2, 3, 4, 5, 6, 7	4	TEST B (9 prong)*
H	320	1	4	TEST B (octal)*
J	321	1	4	TEST B (11 prong)

*Use adapter provided with the test set

be propelled with sufficient force to cause personal injury, particularly to the eyes.

1.10 When checking 321-type relays in the J94725A, L4, test set, remove the adapter from the TEST B socket. The adapter is used only when checking 316- and 320-type relays.

2. APPARATUS

2.01 ***List of Tools, Materials, and Test Equipment***

CODE OR SPEC NO.	DESCRIPTION	MATERIALS	DESCRIPTION
TOOLS			
603A	Extractor		
MATERIALS			
--	Cross-Connecting Wire (or equivalent) for making connections between binding posts of the J94725A test set (as reqd)		
		2P9A	P2J Cord, 9 feet long, equipped with two 310 plugs (required if the J94725A test set is to be connected to a battery supply jack)
		108	Cord Tip (insulating tubing), for use on the 2W6A and 2W12B cords (as reqd)
		2P10A	P2P Cord, 10 feet long, equipped with a 309 plug and a 310 plug
		3P29A	P3F Cord, 8 feet long, equipped with a 309 plug and a 310 plug
		2W6A	W2C Cord, 10 feet long, equipped with a 310 plug and two 59-cord tips (required if the 35-type

MATERIALS	DESCRIPTION
	test set is to be connected to battery supply terminals)
2W12B	W2M Cord, 9 feet long, equipped with a 310 plug and two 59-cord tips (required if the J94725A test set is to be connected to battery supply terminals)
W3BB	Cord, 8 inches long, equipped with a 309 plug and three banana plugs

TEST EQUIPMENT

35 Type	Test Set
J94725A	Test Set

3. EXTRACTING RELAY FROM SOCKET

275-, 276-, 303-, 320-, or 321-Type Relay

3.01 Note that there are four notches 90 degrees apart in the base of the relay.

3.02 Insert the four projections of the 603A extractor under the relay base so that the projections enter between the relay base and the socket. Certain relay sockets are mounted on the upper side of the mounting plate or bracket and are held in position by a clamping ring which is bolted through the plate or bracket.

Caution: Make certain that the extractor is between the relay base and the socket since, where a clamping ring is supplied, it is possible to insert the extractor between the clamping ring and the socket, resulting in damage to the socket.

3.03 Rotate the extractor so the hole in the handle is above and approximately centered between two adjacent notches of the relay base. This positions the tool so the outer projections will provide a reasonably vertical lift, with respect to the socket, on a solid portion of the relay base as the relay is being extracted.

3.04 Pry the relay out of the socket by pressing the tip of the handle of the extractor away from the metal envelope of the relay and use the other hand to guide the relay vertically with respect to the socket.

Caution: Do not allow the relay to tilt during removal, or the aligning plug in the center of the base may be broken off. Do not attempt to remove the relay from the socket by pulling on the metal envelope or the envelope may come loose from the relay base.

292- or 301-Type Relay

3.05 Insert the four projections of the 603A extractor under the relay base so that the projections enter between the relay base and the socket. Certain relay sockets are mounted on the upper side of the mounting plate or bracket and are held in position by a clamping ring which is bolted through the plate or bracket.

Caution: Make certain that the extractor is between the relay base and the socket since, where a clamping ring is supplied, it is possible to insert the extractor between the clamping ring and the socket, resulting in damage to the socket.

3.06 Pry the relay out of the socket by pressing the tip of the handle of the extractor away from the metal envelope of the relay and use the other hand to guide the relay vertically with respect to the socket.

Caution: Do not allow the relay to tilt during removal, or the aligning plug in the center of the base may be broken off. Do not attempt to remove the relay from the socket by pulling on the metal envelope or the envelope may come loose from the relay base.

316-Type Relay

3.07 Grasp the handle on the front of the relay and extract the relay in a horizontal direction.

4. PREPARATION

Tests A, D, E, and F

4.01 Connect battery and ground from the 48-volt battery supply to the BAT and GRD jack of the J94725A test set being used. If a battery supply jack is available, use the P2J cord. If battery supply terminals are provided, use a W2M cord connecting the white (tip) conductor to battery and the red (sleeve) conductor to ground.

> ***Note:*** To avoid possible grounding of the battery supply leads, connect the cord to the test set first and when disconnecting, remove the cord from the test set last.

4.02 Connect the 35-type test set for B/G application by connecting one of the TEST BAT and GRD jacks of the test set to battery supply. Use a P2P cord and connect this jack either to a frame battery supply jack or to the multiple BAT and GRD jack of the relay test set. If it is desired to obtain battery supply from battery supply terminals, use a W2C cord and connect the white (tip) conductor to ground and the blue (ring) conductor to battery. (See paragraph 4.01, note.)

4.03 Make sure that the 35-type test set keys are normal and that the resistance sliders are at the extreme right.

4.04 Use a P3F cord and connect the T and R jack of the 35-type test set to the TEST A jack of the J94725A test set.

4.05 Table B gives the cross-connections on the J94725A, L1, L2, L3, and L4 test sets to be used for testing relays as shown in Fig. 6.

4.06 Table C gives the cross-connections on the J94725A, L3 and L4, test sets to be used for testing relays as shown in Fig. 2 and 3.

Tests B and C

4.07 Connect battery and ground from the 48-volt battery supply to the BAT and GRD jack of the J94725A test set being used. If a battery supply jack is available, use the P2J cord. If battery supply terminals are provided, use a W2M cord connecting the white (tip) conductor to battery and the red (sleeve) conductor to ground.

> ***Note:*** To avoid possible grounding of the battery supply leads, connect the cord to the test set first and when disconnecting, remove the cord from the test set last.

4.08 Connect the 35-type test set for B/G application by connecting one of the TEST BAT and GRD jacks of the test set to battery supply. Use a P2P cord and connect this jack either to a frame battery supply jack or to the multiple BAT and GRD jack of the relay test set. If it is desired to obtain battery supply from battery supply terminals, use a W2C cord and connect the white (tip) conductor to ground and the blue (ring) conductor to battery. (See paragraph 4.07 note.)

4.09 Make sure that the 35-type test set keys are normal and that the resistance sliders are at the extreme right.

4.10 Use a P3F cord and connect the T and R jack of the 35-type test set to the TEST B jack of the J94725A test set.

4.11 Determine to which relay terminals (1 through 11) the winding and contacts of the relay are wired. The wiring arrangements of the relay may be determined either from the circuit schematic which specifies the relay or from Fig. 1 through 9.

4.12 Table D gives the cross-connections on the J94725A, L1 and L2, test sets to be used for testing relays as shown in Fig. 6.

4.13 Table E gives the cross-connections on the J94725A, L1 and L2, test sets to be used for testing relays as shown in Fig. 8.

4.14 Figure 10 shows cross-connections to be used when L1 and L2 test sets are used and the make contacts are brought out to separate terminals and the break contacts are connected internally in the relay and brought out to a single terminal.

4.15 Figure 11 shows cross-connections to be used when L1 and L2 test sets are used and all contacts are brought out to separate terminals and no armature terminal is provided.

Tests G, H, and J

4.16 Connect battery and ground from the 48-volt battery supply to the BAT and GRD jack

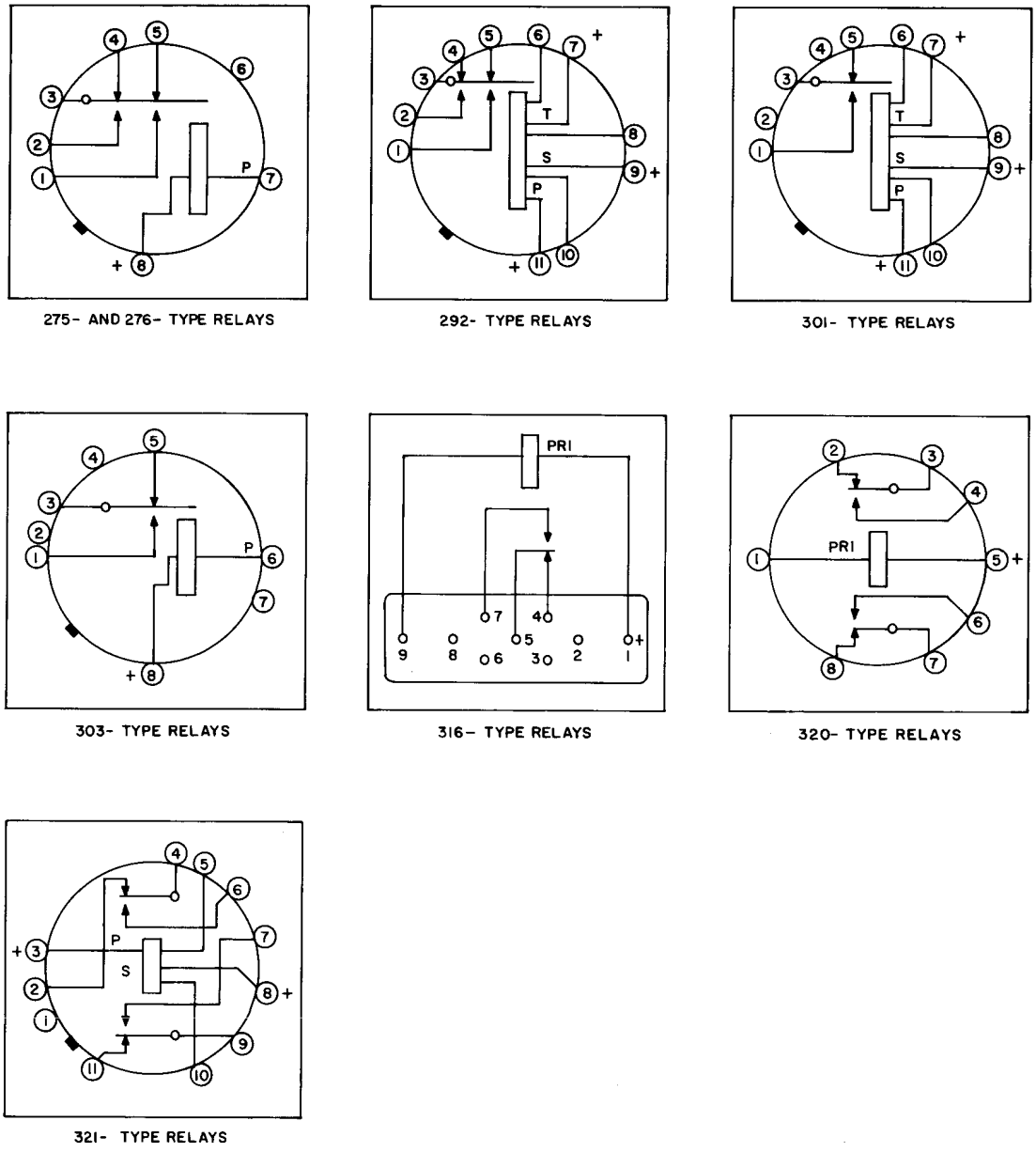

Fig. 1—Winding and Contact Arrangements

of the J94725A test set being used. If a battery supply jack is available, use the P2J cord. If battery supply terminals are provided, use a W2M cord connecting the white (tip) conductor to battery and the red (sleeve) conductor to ground.

Note: To avoid possible grounding of the battery supply leads, connect the cord to the test set first and when disconnecting, remove the cord from the test set last.

4.17 Connect the 35-type test set for B/G application by connecting one of the TEST BAT and GRD jacks of the test set to battery supply. Use a P2P cord and connect this jack either to a frame battery supply jack or to the multiple BAT and

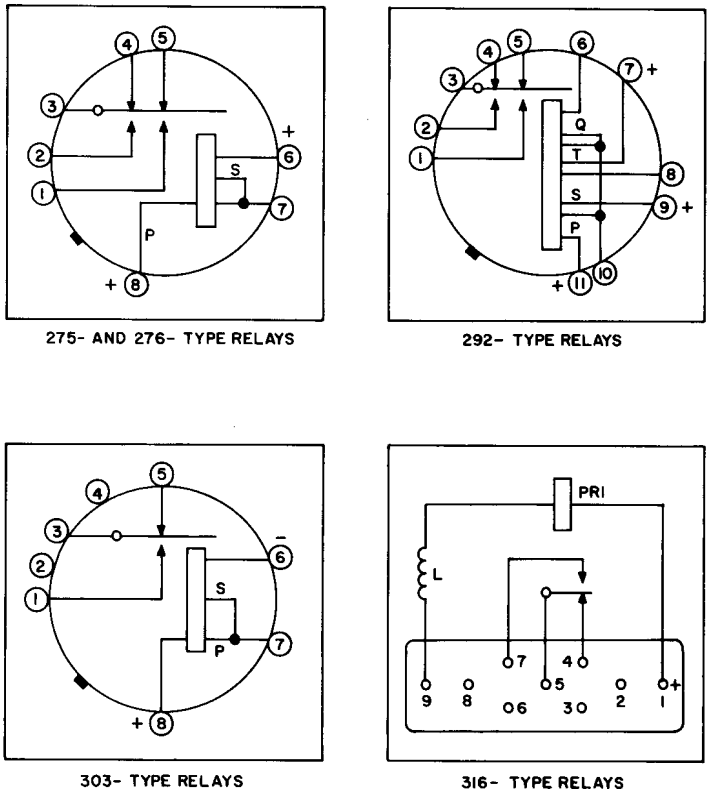

Fig. 2—Winding and Contact Arrangements

GRD jack of the relay test set. If it is desired to obtain battery supply from battery supply terminals, use a W2C cord and connect the white (tip) conductor to ground and the blue (ring) conductor to battery. (See paragraph 4.16, note.)

4.18 Make sure that the 35-type test set keys are normal and that the resistance sliders are at the extreme right.

4.19 Use a P3F cord and connect the T and R jack of the 35-type test set to the TEST B jack of the J94725A test set.

4.20 Use the W3BB cord and connect the TRG jack to cross-connecting binding posts specified in Fig. 12, 13, or 14.

4.21 Determine to which relay terminals the winding and contacts of the relay are wired. The wiring arrangements of the relay may be determined either from the circuit schematic which specifies the relay or from Fig. 1 through 9.

4.22 Table F gives the cross-connections on the J94725A, L4, test set to be used for testing 316-type relays as shown in Fig. 1 through 7.

4.23 Table G gives the cross-connections on the J94725A, L4, test set to be used for testing 320-type relays as shown in Fig. 1.

4.24 Table H gives the cross-connections on the J94725A, L4, test set to be used for testing 321-type relays as shown in Fig. 1.

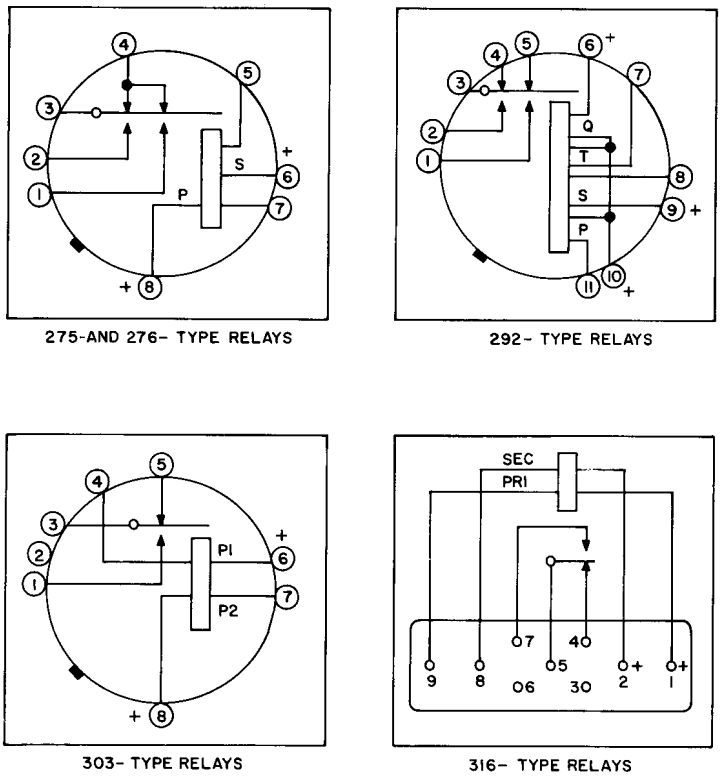

Fig. 3—Winding and Contact Arrangements

4.25 Figure 12, 13, and 14 show cross-connections to be used when the L4 test set is used and all contacts are brought out to separate terminals and no armature terminal is provided.

5. METHOD OF TESTING 275- AND 276-TYPE RELAYS (See Table A)

TEST A

5.01 Turn the BSP FIG. switch to the setting corresponding to the Fig. number shown in the circuit requirements table for the relay to be tested.

Caution: TEST A key and TEST A1 key (when furnished) must be normal whenever the BSP FIG. switch is moved and before inserting a relay into the TEST A socket; and also, the sliders of the 35-type test set must be at the extreme right unless the test set was previously adjusted for the winding condition under test, in order to avoid possible injury to the relay or to the meter of the 35-type test set.

5.02 Insert the relay into the proper TEST A or TEST B sockets.

5.03 When the relay under test is a single-wound relay or when the first adjustment specified in the circuit requirements table for a double-wound

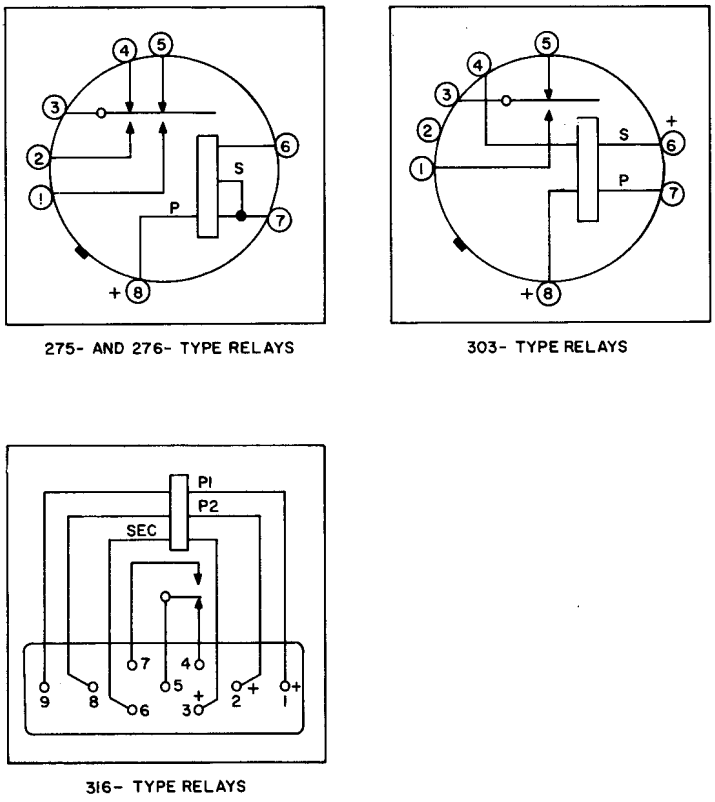

Fig. 4—Winding and Contact Arrangements

relay is for the primary winding, operate the TEST A key to the PRIMARY position. When the first adjustment specified on the circuit requirements table for a double-wound relay is for the secondary winding, operate the TEST A key to the SECONDARY position. Operation of the TEST A key connects the winding under test to the 35-type test set.

5.04 Adjust the 35-type test set, as required, to establish the current flow values for the winding under test, as specified in the circuit requirements table.

5.05 Operate and release the relay three or four times using the soak current, if one is specified, otherwise using the specified operate current, in order to condition the relay by distributing the mercury on the contacts. Disregard all lamp indications at this time.

5.06 Table I indicates which lamps of the J94725A test sets should be lighted and which extinguished, depending upon the Fig. number of the relay under test and the test conditions being applied. This table shall be referred to, as required, when applying the tests covered in paragraphs 5.07 through 5.15.

5.07 With the CROSS TST (cross test) key of the J94725A test set normal, check that the relay meets its specified current flow requirements as indicated by the lighting of the proper test set lamps covered in Table I.

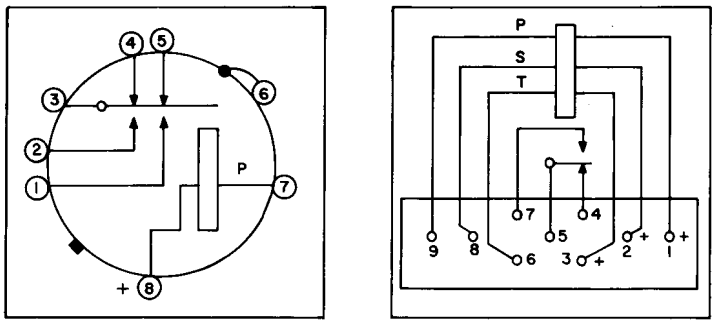

Fig. 5—Winding and Contact Arrangements

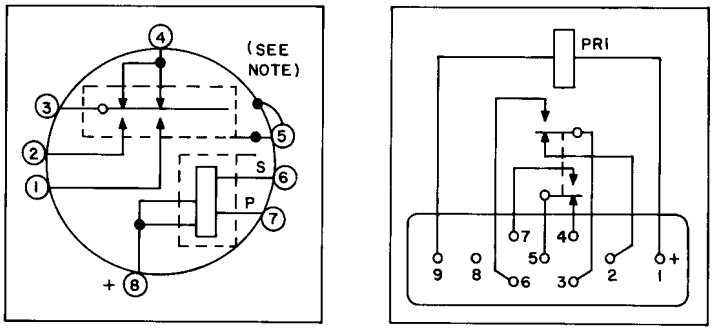

Fig. 6—Winding and Contact Arrangements

Note: Since 276-type relays are magnetically biased, the electrical requirements can only be met when the current is applied in the proper direction. Therefore, if difficulty is encountered in meeting the electrical requirements of 276-type relays, check carefully that all connections were made correctly as specified in Part 4.

5.08 With the relay released, operate and hold the CROSS TST key. Observe that the proper test set lamps, covered for this condition in Table I, are lighted.

5.09 With the CROSS TST key still operated, operate the relay and observe that the proper test set lamps, covered for this condition in Table I, are lighted. Release the CROSS TST key.

5.10 Release the relay. When the relay is a single-wound relay, release the TEST A key and remove the relay from the TEST A socket.

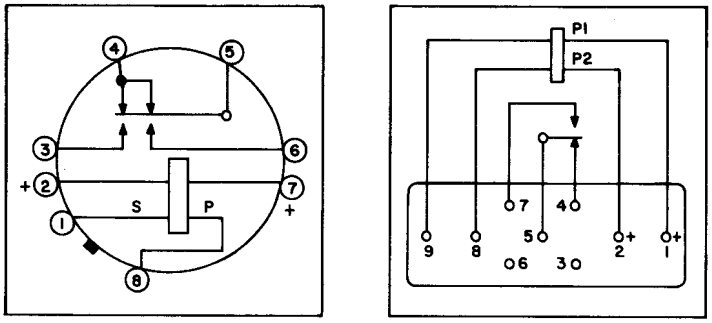

Fig. 7—Winding and Contact Arrangements

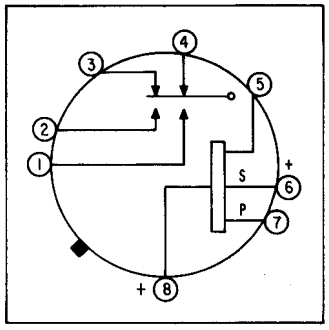

Fig. 8—Winding and Contact Arrangements

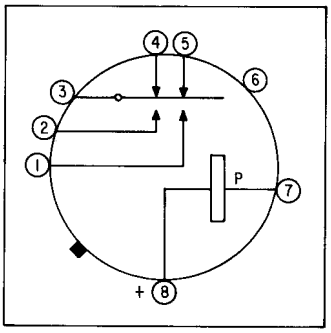

Fig. 9—Winding and Contact Arrangements

When the relay is a double-wound relay, proceed as covered in paragraphs 5.11 through 5.15.

5.11 Move all sliders of the 35-type test set to the extreme right.

5.12 Operate the proper TEST A key to the position corresponding to the winding to be tested.

5.13 Adjust the 35-type test set, as required, to establish the current flow values of the winding under test as specified in the circuit requirements table.

5.14 With the CROSS TST key normal, check that the relay meets its specified current flow requirements as indicated by the lighting of the proper test set lamps covered in Table I.

5.15 Release the TEST A key and remove the relay from the TEST A or TEST B socket.

TABLE B

TEST SET CROSS-CONNECTIONS
FOR 275-TYPE RELAYS, SHOWN IN FIG. 7,
USING TEST SETS L1, L2, L3 AND L4

CONNECT BINDING POST	TO BINDING POST
L1	3
L2	6
L4	4
L5	None
GRD	5
BAT	None
T	8, when testing primary winding 2, when testing secondary winding
R	7

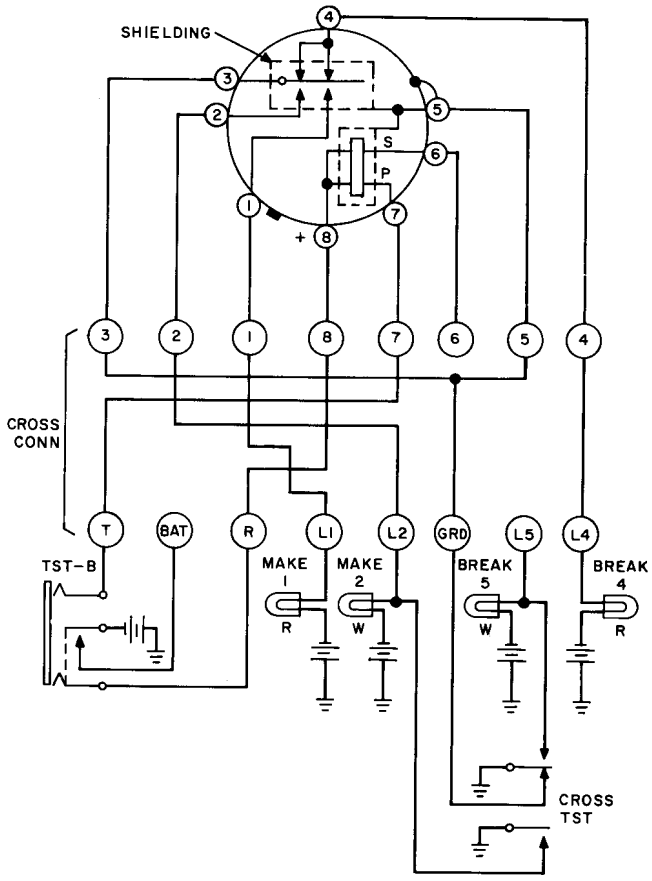

Fig. 10—Cross-Connections When Testing 275- and 276-Type Relays, Shown in Fig. 6, Using Test Set L1 and L2

TEST B

5.16 Insert the relay in the TEST B socket.

Caution: Unless the sliders of the 35-type test set were previously adjusted for the winding condition under test, do not insert the relay in the TEST B socket until all sliders are at the extreme right in order to avoid possible injury to the relay or to the meter of the 35-type test set.

5.17 Adjust the 35-type test set, as required, to establish the current flow values as specified in the circuit requirements table for the winding under test.

5.18 Operate and release the relay three or four times, using the soak requirement, if one is specified, otherwise using the specified operate requirement. Disregard all lamp indications at this time.

5.19 Table H indicates which lamps of the J94725A test sets should be lighted and which extinguished, depending upon the test conditions being applied. This table shall be referred to, as required, when applying the tests covered in paragraphs 5.20 through 5.27.

5.20 With the CROSS TST key of the J94725A test set normal, check that the relay meets its specified current flow requirements, as indicated by the lighting of the proper test set lamps covered in Table J.

Note: Since 276-type relays are magnetically biased, the electrical requirements can only be met when the current is applied in the proper direction. Therefore, if difficulty is encountered in meeting the electrical requirements

TABLE C

TEST SET CROSS-CONNECTION FOR 292-TYPE RELAYS, SHOWN IN FIG. 2 AND 3, USING TEST SETS L3 AND L4

FIG. NO.	CONNECT BINDING POST	TO BINDING POST
2	L1	1
	L2	2
	L4	4
	L5	5
	GRD	3
	BAT	None
		10 Strap to 9
	T	11 Testing P and S
	R	8 Winding
	T	7 T and Q Winding
	R	6
3	L1	1
	L2	2
	L4	4
	L5	5
	GRD	3
	BAT	None
		10 Strap to 9
	T	8 Testing P and S
	R	11 Winding
	T	6 Testing T and Q
	R	7 Winding

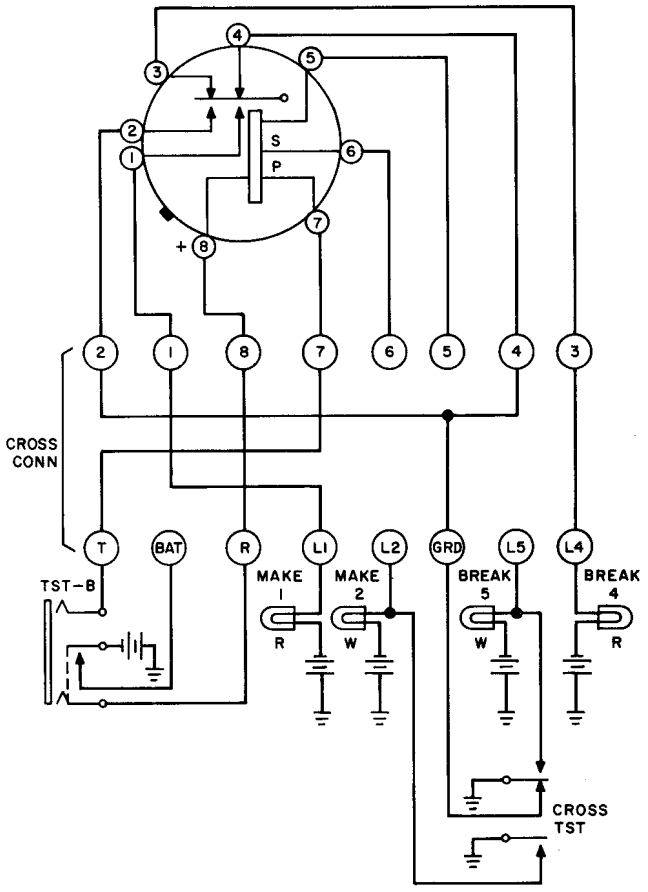

Fig. 11—Cross-Connection When Testing 275- and 276-Type Relays, Shown in Fig. 8, Using Test Sets L1 and L2

of 276-type relays, check carefully that all connections were made correctly as specified in Part 4.

5.21 With the relay released, operate and hold the CROSS TST key. Observe that the proper test set lamps, covered for this condition in Table J, are lighted.

5.22 With the CROSS TST key still operated, operate the relay and observe that the proper test set lamps, covered for this condition in Table J, are lighted. Release the CROSS TST key.

5.23 Release the relay and move all sliders of the 35-type test set to the extreme right.

5.24 Disconnect the leads from the binding posts corresponding to the terminals to which the winding just tested is connected. Reconnect the leads to the binding posts corresponding to the terminals to which the other winding is connected.

5.25 Adjust the 35-type test set, as required, to establish the current flow values as specified in the circuit requirements, Table A, for the winding under test.

5.26 With the CROSS TST key normal, check that the relay meets its specified current flow requirements as indicated by the lighting of the proper test set lamps covered in Table J.

5.27 Remove the relay from the TEST B socket.

TABLE D

TEST SET CROSS-CONNECTIONS FOR 275- AND 276-TYPE RELAYS, SHOWN IN FIG. 6, USING TEST SETS L1 AND L2

CONNECT BINDING POST	TO BINDING POST
L1	1
L2	2
L4	4
L5	None
GRD	3 and 5
BAT	None
T	7, when testing primary winding 6, when testing secondary winding
R	8

TABLE E

TEST SET CROSS-CONNECTIONS FOR 275- AND 276-TYPE RELAYS, SHOWN IN FIG. 8, USING TEST SETS L1 AND L2

CONNECT BINDING POST	TO BINDING POST
L1	1
L2	None
L4	3
L5	None
GRD	2 and 4
BAT	None
T	7, when testing primary winding 5, when testing secondary winding
R	8, when testing primary winding 6, when testing secondary winding

TEST C

5.28 Insert the relay in the TEST B socket.

Caution: Unless the sliders of the 35-type test set were previously adjusted for the winding condition under test, do not insert the relay in the TEST B socket until all sliders are at the extreme right in order to avoid possible injury to the relay or to the meter of the 35-type test set.

5.29 Adjust the 35-type test set, as required, to establish the current flow values as specified in the circuit requirements, Table A, for the winding under test.

5.30 Operate and release the relay three or four times, using the soak requirement, if one is specified, otherwise using the specified operate requirement. Disregard all lamp indications at this time.

5.31 Table K indicates which lamps of the J94725A test sets should be lighted and which extinguished during tests on relays as shown in Fig. 8, depending upon the test conditions being

TABLE F

TEST SET CROSS-CONNECTIONS FOR 316-TYPE RELAYS, SHOWN IN FIG. 1 THROUGH 7, USING TEST SET L4

FIG. NO.	CONNECT		TO BINDING POST
	BINDING POST	BANANA PLUG	
1 And 2	L1		7
	L2		None
	L4		4
	L5		None
		G	5
		T	9
		R	1
3	L1		7
	L2		None
	L4		4
	L5		None
		G	5
		T	9, when testing primary winding
			8, when testing secondary winding
		R	1, when testing primary winding
			2, when testing secondary winding
4	L1		7
	L2		None
	L4		4
	L5		None
		G	5
		T	9, when testing P1 winding
			8, when testing P2 winding
			6, when testing secondary winding
		R	1, when testing P1 winding
			2, when testing P2 winding
			3, when testing secondary winding

TABLE F (Contd)

FIG. NO.	CONNECT		TO BINDING POST
	BINDING POST	BANANA PLUG	
5	L1		7
	L2		None
	L4		4
	L5		None
		G	5
		T	9, when testing primary winding
			8, when testing secondary winding
			6, when testing tertiary winding
		R	1, when testing primary winding
			2, when testing secondary winding
			3, when testing tertiary winding
6	L1		6
	L2		7
	L4		2
	L5		4
		G	5 (strap to 3)
		T	9
		R	1
7	L1		7
	L2		None
	L4		4
	L5		None
		G	5
		T	9, when testing P1 winding
			8, when testing P2 winding
		R	1, when testing P1 winding
			2, when testing P2 winding

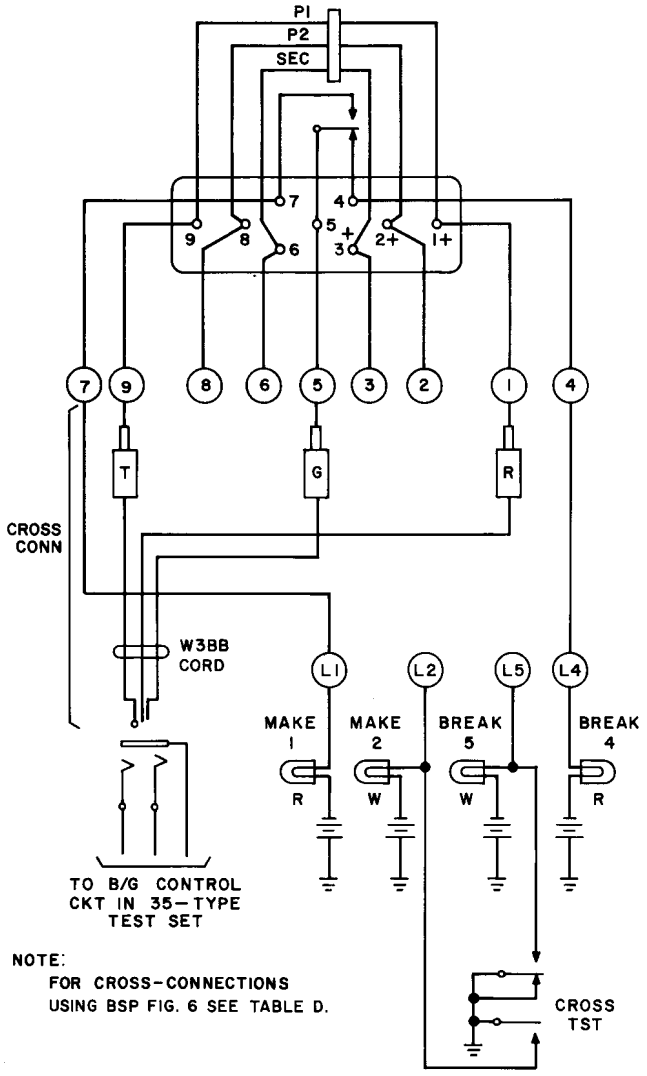

Fig. 12—Cross-Connections When Testing 316-Type Relays, Shown in Fig. 1, 2, 3, 4, 5, or 7, Using Test Set L4

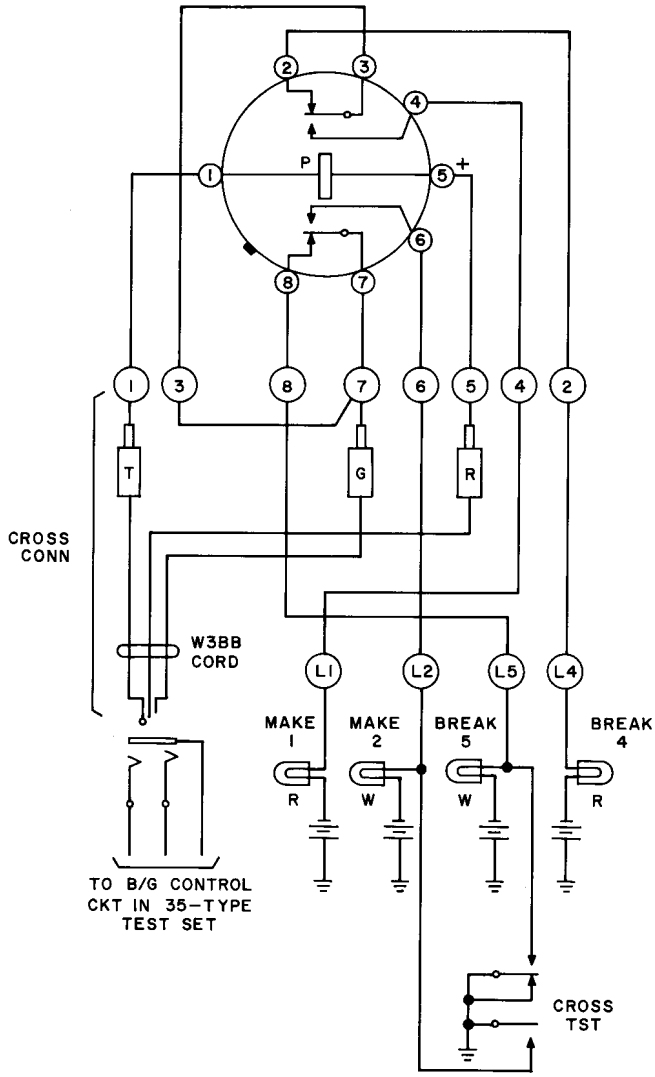

Fig. 13—Cross-Connections Testing 320-Type Relays, Shown in Fig. 1, Using Test Set L4

applied. This table shall be referred to, as required, when applying the tests covered in paragraphs 5.33 through 5.36.

5.32 With the CROSS TST key of the proper J94725A test set normal, check that the relay meets its specified current flow requirements as indicated by the lighting of the proper test set lamps covered in Table K.

Note: Since 276-type relays are magnetically biased, the electrical requirements can only be met when the current is applied in the proper direction. Therefore, if difficulty is encountered in meeting the electrical requirements of 276-type relays, check carefully that all connections were made correctly as specified in Part 4.

5.33 Release the relay and move all sliders of the 35-type test set to the extreme right.

5.34 Disconnect the leads from the binding posts corresponding to the terminals to which the winding just tested is connected. Reconnect the

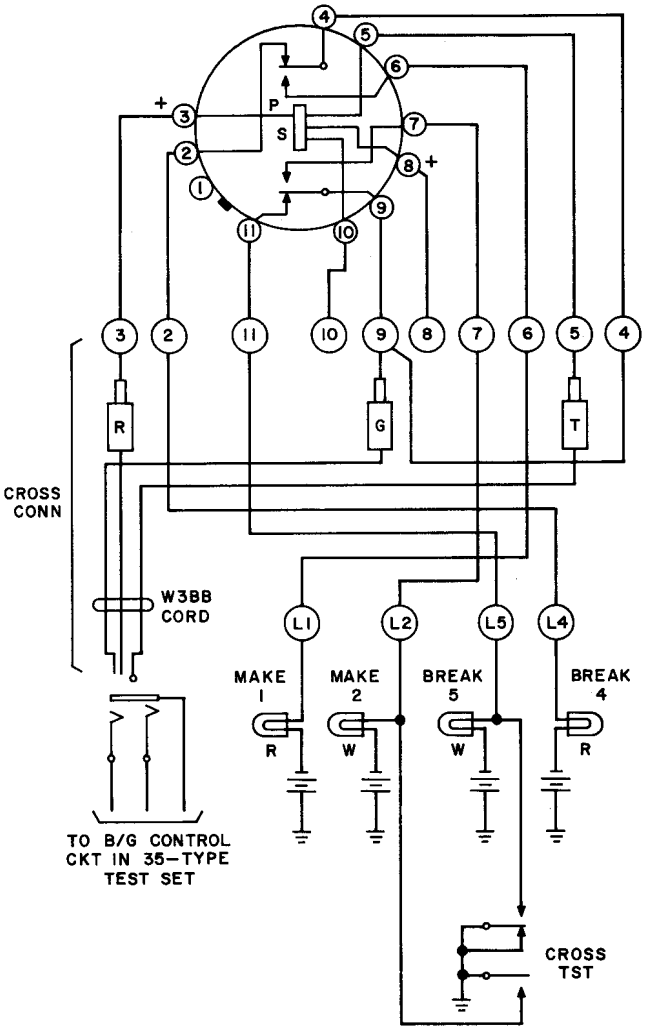

Fig. 14—Cross-Connections When Testing 321-Type Relays, Shown in Fig. 1, Using Test Set L4

leads to the binding posts corresponding to the terminals to which the other winding is connected.

5.35 Adjust the 35-type test set, as required, to establish the current flow values as specified in the circuit requirements, Table A, for the winding under test.

5.36 With the CROSS TST key normal, check that the relay meets its specified current flow requirements as indicated by the lighting of the proper test set lamps covered in Table K.

5.37 Remove the relay from the TEST B socket.

TABLE G

TEST SET CROSS-CONNECTIONS FOR 320-TYPE RELAYS, SHOWN IN FIG. 1 USING TEST SET L4

CONNECT		TO BINDING POST
BINDING POST	BANANA PLUG	
L1		4
L2		6
L4		2
L5		8
	G	7 (strap to 3)
	T	1
	R	5

TABLE H

TEST SET CROSS-CONNECTIONS FOR 321-TYPE RELAYS, SHOWN IN FIG. 1, USING TEST SET L4

CONNECT		TO BINDING POST
BINDING POST	BANANA PLUG	
L1		6
L2		7
L4		2
L5		11
	G	9 (strap to 4)
	T	5, when testing primary winding 10, when testing secondary winding
	R	3, when testing primary winding 8, when testing secondary winding

TABLE I

LAMP INDICATIONS DURING TEST A AND TEST D

TEST CONDITION	CROSS TST KEY POSITION	BSP FIG.	TEST SET LAMPS	
			LIGHTED	EXTINGUISHED
Release or Nonoperate	Normal	1, 2, 4 or 5	BREAK 4 (red) BREAK 5 (white)	MAKE 1 (red) MAKE 2 (white)
		3, 6, or 7	BREAK 4 (red)	BREAK 5 (white) MAKE 1 (red) MAKE 2 (white)
		8	BREAK 4 (red)	BREAK 5 (white) *MAKE 1 (red) MAKE 2 (white)
	Operated	1, 2, 4, or 5	BREAK 4 (red) BREAK 5 (white) MAKE 2 (white)	*MAKE 1 (red)
		3, 6, or 7	BREAK 5 (white) MAKE 2 (white)	BREAK 4 (red) *MAKE 1 (red)
		8	BREAK 5 (white) MAKE 2 (white)	BREAK 4 (red) MAKE 1 (red)
Soak, Operate, or Hold	Normal	1, 2, 3, 4, 5, or 6	MAKE 1 (red) MAKE 2 (white)	††BREAK 4 (red) BREAK 5 (white)
		8	MAKE 1 (red)	MAKE 2 (white) **BREAK 4 (red) BREAK 5 (white)
	Operated	1, 2, 4, or 5	MAKE 1 (red MAKE 2 (white) BREAK 5 (white)	†BREAK 4 (red)
		3, 6, or 7	MAKE 1 (red) MAKE 2 (white) BREAK 5 (white)	BREAK 4 (red)
		8	MAKE 2 (white) BREAK 5 (white)	BREAK 4 (red) MAKE 1 (red)

*MAKE 1 red lamp will light if there is a cross between contacts 1 and 2.

**BREAK 4 red lamp will light if there is a cross between contacts 3 and 4.

†BREAK 4 red lamp will light if there is a cross between contacts 4 and 5.

††BREAK 4 red lamp will light if there is a cross between terminals 4 and 5.

FIG. NO.	WDG	TEST SET LIST 2 KEY	TEST SET LIST 3 KEY	OPERATED TO
1	PRIM	TEST A	TEST A	PRIMARY
	SEC	TEST A	TEST A	SECONDARY
	TERT	TEST A	TEST A1	TERTIARY
2	P/S	—	TEST A	PRIMARY
	T/Q	—	TEST A1	TERTIARY
3	P/S	—	TEST A	PRIMARY
	T/Q	—	TEST A1	TERTIARY

FIG. NO.	WDG	TEST SET LIST 2 KEY	TEST SET LIST 3 KEY	OPERATED TO
1	PRIM	TEST A	TEST A	PRIMARY
	SEC	TEST A	TEST A	SECONDARY
	TERT	TEST A	TEST A1	TERTIARY

6. METHOD OF TESTING 292-TYPE RELAYS (See Table A)

TEST D

6.01 Turn the BSP FIG. switch to the setting corresponding to the Fig. number shown in the circuit requirements table for the relay to be tested.

Caution: TEST A key and TEST A1 key (when furnished) must be normal whenever the BSP FIG. switch is moved and before inserting a relay into the TEST A socket; and also, the sliders of the 35-type test set must be at the extreme right unless the test set was previously adjusted for the winding condition under test, in order to avoid possible injury to the relay or to the meter of the 35-type test set.

6.02 Insert the relay into the proper TEST A or TEST B socket.

6.03 When checking the adjustment as specified in the circuit requirements table, operate TEST A or TEST A1 key as shown in the following for the winding being checked.

TABLE J

LAMP INDICATIONS DURING TEST B

TEST CONDITION	CROSS TST KEY POSITION	TEST SET LAMPS	
		LIGHTED	EXTINGUISHED
Release or Nonoperate	Normal	BREAK 4 (red)	BREAK 5 (white) MAKE 1 (red) MAKE 2 (white)
	Operated	BREAK 5 (white) MAKE 2 (white)	BREAK 4 (red) *MAKE 1 (red)
Soak, Operate, or Hold	Normal	MAKE 1 (red) MAKE 2 (white)	†BREAK 4 (red) BREAK 5 (white)
	Operated	MAKE 2 (white) MAKE 1 (red) BREAK 5 (white)	BREAK 4 (red)

*MAKE 1 red lamp will light if there is a cross between contacts 1 and 2.

†BREAK 4 red lamp will light if there is a cross between terminals 4 and 5.

6.04 Operation of TEST A or TEST A1 key connects the winding under test to the 35-type test set.

6.05 Adjust the 35-type test set, as required, to establish the current flow values for the winding under test, as specified in the circuit requirements Table A.

6.06 Operate and release the relay three or four times using the soak current, if one is specified, otherwise using the specified operate current, in order to condition the relay by distributing the mercury on the contacts. Disregard all lamp indications at this time.

6.07 Table I indicates which lamps of the J94725A test sets should be lighted and which extinguished, depending upon the Fig. number of the relay under test and the test conditions being applied.

6.08 With the CROSS TST key of the J94725A test set normal, check that the relay meets its specified current flow requirements as indicated by the lighting of the proper test set lamps covered in Table I.

Note: Since 292-type relays are magnetically biased, the electrical requirements can only be met when the current is applied in the proper direction. Therefore, if difficulty is encountered in meeting the electrical requirements of 292-type relays, check carefully that all connections were made correctly as specified in Part 4.

6.09 With the relay released, operate and hold the operated CROSS TST key. Observe that the proper test set lamps, covered for this condition in Table I, are lighted.

6.10 With the CROSS TST key still operated, operate the relay and observe that the proper test set lamps, covered for this condition in Table I, are lighted. Release the CROSS TST key.

6.11 After completing the test on one winding, release the TEST A or TEST A1 key and move all sliders of the 35-type test set to the extreme right before checking another winding. Then operate the proper key as covered in paragraph 6.03 and proceed as covered in paragraphs 6.04 through 6.10.

7. METHOD OF TESTING 301-TYPE RELAYS (See Table A)

TEST E

7.01 Turn the BSP FIG. switch to the setting corresponding to the Fig. number shown in the circuit requirements, Table A, for the relay to be tested.

Caution: TEST A key and TEST A1 key (when furnished) must be normal whenever the BSP FIG. switch is moved and before inserting a relay into the TEST A socket; and also, the sliders of the 35-type test set must be at the extreme right unless the test set was previously adjusted for the winding condition under test, in order to avoid possible injury to the relay or to the meter of the 35-type test set.

7.02 Insert the relay into the proper TEST A socket.

7.03 When checking the adjustment as specified in the circuit requirements Table A, operate TEST A or TEST A1 key as shown in the following for the winding being checked.

FIG. NO.	WDG	TEST SET LIST 3 KEY	OPERATED TO
1	PRIM	TEST A	PRIMARY
2	PRIM	TEST A	PRIMARY
	SEC	TEST A	*SECONDARY
3	P1	STRAP-6 to R	P1
		-4 to T	
		-3 to GRD	
		-L1 to Pin 1	
		-L5 to Pin 5	
	P2	STRAP-8 to R	P2
		-7 to T	
		3 to GRD	
		L1 to Pin 1	
		L5 to Pin 5	
**4	SEC	STRAP 6 to R	SEC
		4 to T	
		3 to GRD	
		L1 to Pin 1	
		L5 to Pin 5	
	PRIM	8 to R	PRIM
		7 to T	
		3 to GRD	
		L1 to Pin 1	
		L5 to Pin 5	

*Also operate the 35-type test set REVERSE Key.
**See paragraph 8.01.

7.04 Operation of the TEST A or TEST A1 key connects the winding under test to the 35-type test set.

7.05 Adjust the 35-type test set, as required, to establish the current flow values for the winding under test, as specified in the circuit requirements Table A.

7.06 Operate and release the relay three or four times using the soak current, if one is specified, otherwise using the specified operate current, in order to condition the relay by distributing

the mercury on the contacts. Disregard all lamp indications at this time.

7.07 Table L indicates which lamps of the J94725A test sets should be lighted and which extinguished, depending upon the Fig. number of the relay under test and the test conditions being applied.

7.08 With the CROSS TST key of the J94725A test set normal, check that the relay meets its specified current flow requirements as indicated by the lighting of the proper test set lamps covered in Table J.

Note: Since 301-type relays are magnetically biased, the electrical requirements can only be met when the current is applied in the proper direction. Therefore, if difficulty is encountered in meeting the electrical requirements of 301-type relays, check carefully that all connections were made correctly as specified in Part 4.

7.09 After completing the test on one winding, release the TEST A or TEST A1 key and move all sliders of the 35-type test set to the extreme right before checking another winding. Then, operate the proper key as covered in paragraph 7.03 and proceed as covered in paragraphs 7.04 through 7.08.

8. METHOD OF TESTING 303-TYPE RELAYS (See Table A)

TEST F

8.01 Turn the BSP FIG. switch to the setting corresponding to the Fig. number shown in the circuit requirements, Table A, for the relay to be tested. The 303-type relays, where the circuit requirements table refer to Fig. 4, turn BSP FIG. switch to Fig. 3.

Caution: TEST A key and TEST A1 key (when furnished) must be normal whenever the BSP FIG. switch is moved and before inserting a relay into the TEST A socket; and also, the sliders of the 35-type test set must be at the extreme right unless the test set was previously adjusted for the winding condition under test, in order to avoid possible injury to the relay or to the meter of the 35-type test set.

8.02 Insert the relay into the proper TEST A socket.

TABLE K

LAMP INDICATIONS DURING TEST C

TEST CONDITION	CROSS TST KEY POSITION	TEST SET LAMPS	
		LIGHTED	EXTINGUISHED
Release or Nonoperate	Normal	BREAK 4 (red) (See note)	*MAKE 1 (red) MAKE 2 (white) BREAK 5 (white)
Soak, Operate, or Hold	Normal	MAKE 1 (red)	MAKE 2 (white) †BREAK 4 (red) BREAK 5 (white)

*MAKE 1 red lamp will light if there is a cross between contacts 1 and 2.

†BREAK 4 red lamp will light if there is a cross between contacts 3 and 4.

Note: To check for false ground on armature, remove GRD from binding post 4. If armature is grounded, BREAK 4 red lamp will remain lighted.

8.03 When checking the adjustment as specified in the circuit requirements table, operate the TEST keys as shown in the following for the winding being checked.

TABLE L

LAMP INDICATIONS DURING TEST E AND TEST F

TEST CONDITION	CROSS TST KEY POSITION	BSP FIG.	TEST SET LAMPS	
			LIGHTED	EXTINGUISHED
Release or Nonoperate	Normal	1, 2, 3 or 4	BREAK 5 (white)	MAKE 1 (red) MAKE 2 (white) BREAK 4 (red)
Soak, Operate, or Hold	Normal	1, 2, 3 or 4	MAKE 1 (red)	MAKE 2 (white) BREAK 4 (red) BREAK 5 (white)

8.04 Operation of the TEST A or TEST A1 key connects the winding under test to the 35-type test set.

8.05 Adjust the 35-type test set, as required, to establish the current flow values for the winding under test, as specified in the circuit requirements Table A.

8.06 Operate and release the relay three or four times using the soak current, if one is specified, otherwise using the specified operate current, in order to condition the relay by distributing the mercury on the contacts. Disregard all lamp indications at this time.

8.07 Table L indicates which lamps of the J94725A test sets should be lighted and which extinguished, depending upon the Fig. number of the relay under test and the test conditions being applied.

8.08 With the CROSS TST key of the J94725A test set normal, check that the relay meets its specified current flow requirements as indicated by the lighting of the proper test set lamps covered in Table L.

> ***Note:*** Since 303-type relays are magnetically biased, the electrical requirements can only be met when the current is applied in the proper direction. Therefore, if difficulty is encountered in meeting the electrical requirements of 303-type relays, check carefully that all connections were made correctly as specified in Part 4.

8.09 After completing the test on a relay having a single winding, release the TEST A key and remove the relay from the socket. If the relay is a double-wound relay, release the TEST A or TEST A1 key and move all sliders of the 35-type test set to the extreme right before checking another winding. Then operate the proper key as covered in paragraph 8.03 and proceed as covered in paragraphs 8.04 through 8.08.

9. METHOD OF TESTING 316-TYPE RELAYS (See Table A)

TEST G

9.01 Insert the relay in the 9-prong adapter socket mounted in the TEST B socket.

9.02 Adjust the 35-type test set, as required, to establish the current flow values as specified in the circuit requirements, Table A, for the winding under test.

9.03 Operate and release the relay three or four times, using the soak requirement, if one is specified, otherwise using the specified operate requirement. Disregard all lamp indications at this time.

9.04 Table M indicates which lamps of the J94725A test set should be lighted and which extinguished, depending upon the Fig. number of the relay under test and the test conditions being applied. This table shall be referred to, as required, when applying the tests covered in paragraphs 9.05 through 9.10.

9.05 With the CROSS TST key of the proper J94725A test set normal, check that the relay meets its specified current flow requirements as indicated by the lighting of the proper test set lamps covered in Table M.

Note: Since 316-type relays are magnetically biased, the electrical requirements can only be met when the current is applied in the proper direction. Therefore, if difficulty is encountered in meeting the electrical requirements of 316-type relays, check carefully that all connections were made correctly as specified in Part 4.

9.06 Release the relay and move all sliders of the 35-type test set to the extreme right.

9.07 Disconnect the leads from the binding posts corresponding to the terminals to which the winding just tested is connected. Reconnect the leads to the binding posts corresponding to the terminals to which the other winding is connected.

9.08 Adjust the 35-type test set, as required, to establish the current flow values as specified in the circuit requirements, Table A, for the winding under test.

9.09 With the CROSS TST key normal, check that the relay meets its specified current flow requirements as indicated by the lighting of the proper test set lamps covered in Table M.

TABLE M

LAMP INDICATIONS DURING TEST G

TEST CONDITION	CROSS TEST KEY POSITION	FIG. NO.	TEST SET LAMPS	
			LIGHTED	EXTINGUISHED
Release or Nonoperate	Normal	1, 2, 3, 4, 5 or 7	BREAK 4 (red)	MAKE 1 (red) MAKE 2 (white) BREAK 5 (white)
		6	BREAK 4 (red) BREAK 5 (white)	MAKE 1 (red) MAKE 2 (white)
	Operated	1, 2, 3, 4, 5 or 7	MAKE 2 (white) BREAK 5 (white)	BREAK 4 (red) MAKE 1 (red)
		6	BREAK 4 (red) MAKE 2 (white) BREAK 5 (white)	MAKE 1 (red)
Soak, Operate, or Hold	Normal	1, 2, 3, 4, 5 or 7	MAKE 1 (red)	MAKE 2 (white) BREAK 4 (red) BREAK 5 (white)
		6	MAKE 1 (red) MAKE 2 (white)	BREAK 4 (red) BREAK 5 (white)
	Operated	1, 2, 3, 4, 5 or 7	MAKE 2 (white) BREAK 5 (white)	MAKE 1 (red) BREAK 4 (red)
		6	MAKE 1 (red) MAKE 2 (white) BREAK 5 (white)	BREAK 4 (red)

9.10 Remove the relay from the TEST B adapter socket.

10. METHOD OF TESTING 320-TYPE RELAYS (See Table A)

TEST H

10.01 Insert the relay in the octal socket of the adapter mounted in the TEST B socket.

10.02 Adjust the 35-type test set, as required, to establish the current flow values as specified in the circuit requirements, Table A, for the winding under test.

10.03 Operate and release the relay three or four times, using the soak requirement, if one is specified, otherwise using the specified operate requirement. Disregard all lamp indications at this time.

10.04 Table N indicates which lamps of the J94725A test set should be lighted and which extinguished during tests on relays as shown in Fig. 1, depending upon the test conditions being applied. This table shall be referred to, as required, when applying the tests covered in 10.05 through 10.09.

10.05 With the CROSS TST key of the proper J94725A test set normal, check that the relay meets its specified current flow requirements as indicated by the lighting of the proper test set lamps covered in Table N.

Note: Since 320-type relays are magnetically biased, the electrical requirements can only be met when the current is applied in the proper direction. Therefore, if difficulty is encountered in meeting the electrical requirements of 320-type relays, check carefully that all connections were made correctly as specified in Part 4.

10.06 Release the relay and move all sliders of the 35-type test set to the extreme right.

10.07 Adjust the 35-type test set, as required, to establish the current flow values as specified in the circuit requirements, Table A, for the winding under test.

10.08 With the CROSS TST key normal, check that the relay meets its specified current flow requirements as indicated by the lighting of the proper test set lamps covered in Table N.

10.09 Remove the relay from the TEST B adapter socket.

11. METHOD OF TESTING 321-TYPE RELAYS (See Table A)

TEST J

11.01 Remove the adapter from the TEST B socket. Insert the relay in the TEST B socket.

11.02 Adjust the 35-type test set, as required, to establish the current flow values as

TABLE N

LAMP INDICATIONS DURING TEST H AND TEST J

TEST CONDITION	CROSS TST KEY POSITION	BSP FIG.	TEST SET LAMPS	
			LIGHTED	EXTINGUISHED
Release or Nonoperate	Normal	1	BREAK 4 (red) BREAK 5 (white)	MAKE 1 (red) MAKE 2 (white)
Soak, Operate, or Hold	Normal	1	MAKE 1 (red) MAKE 2 (white)	BREAK 4 (red) BREAK 5 (white)

specified in the circuit requirements, Table A, for the winding under test.

11.03 Operate and release the relay three or four times, using the soak requirement, if one is specified, otherwise using the specified operate requirement. Disregard all lamp indications at this time.

11.04 Table N indicates which lamps of the J94725A test set should be lighted and which extinguished during tests on relays having BPS Fig. 1 depending upon the test conditions being applied. This table shall be referred to, as required, when applying the tests covered in paragraphs 11.05 through 11.09.

11.05 With the CROSS TST key of the proper J94725A test set normal, check that the relay meets its specified current flow requirements as indicated by the lighting of the proper test set lamps covered in Table N.

> ***Note:*** Since 321-type relays are magnetically biased, the electrical requirements can only be met when the current is applied in the proper direction. Therefore, if difficulty is encountered in meeting the electrical requirements of 321-type relays, check carefully that all connections were made correctly as specified in Part 4.

11.06 Release the relay and move all sliders of the 35-type test set to the extreme right. Disconnect the leads from the binding posts corresponding to the terminals to which the winding just tested is connected. Reconnect the leads to the binding posts corresponding to the terminals to which the other winding is connected.

11.07 Adjust the 35-type test set, as required, to establish the current flow values as specified in the circuit requirements, Table A, for the winding under test.

11.08 With the CROSS TST key normal, check that the relay meets its specified current flow requirements as indicated by the lighting of the proper test set lamps covered in Table N.

11.09 Remove the relay from the TEST B socket.