INCOMING TRUNK TEST AND CONNECTOR FRAMES
SD-25161-01
CROSS CONNECTIONS
NO. 1 CROSSBAR OFFICES

1. GENERAL

1.01 This section describes the method of making cross connections on the incoming trunk test frame and incoming trunk test connector frame. Information is also included in this section regarding the functions of the various cross connections.

1.02 This section is reissued to add references to RI1, A, and A1 punchings, and to make minor changes and additions.

1.03 Cross connections are required on two frames; the incoming trunk test connector frame and the incoming trunk test frame. The connector frame cross connections supply information on the type of tests to be made. The test frame cross connections supply the various compensating resistances for testing panel and crossbar incoming trunks and the various signals required for multifrequency and dial pulsing trunks.

Incoming Trunk Test Connector Frames

1.04 Each bay of the incoming trunk test connector frame is arranged to mount five incoming trunk test connector units. Each of these units is made up of a connector (a 200 point crossbar switch), connector cutin relays, and the associated terminal strips. By the operation of a group of cutin relays selected by a group switch (206-type selector), a connector is associated with the test circuit. Each set of crosspoints of the connector switch gives access to a trunk location on the office link frame and has an individual D lead wired to a terminal strip located directly above the connector switch. The D punchings are cross-connected to G, VT, PT, CP, or RI-RI1 punchings so that the test frame can recognize the treatment required by each crosspoint as it is closed. The A, A1 punchings are associated with like numbered RI, RI1 punchings and are cross-connected to G punchings. These cross connections are described in 4.01 through 4.06.

1.05 The terminal strip for the D leads extends across the bay and has three rows of 100 punchings in a row, the terminal numbering appearing at the bottom of the terminal strip (see Fig. 1). The lower two rows, used for the termination of the D lead, are numbered D-0 to D-199 corresponding to the individual trunk terminals of the office link frames. The D leads of the first connector correspond to the jacks in the outgoing trunk test frame for the even trunk levels of the first pair of office frames. The D leads of the second connector correspond to the jacks for the odd trunk levels of the first pair of office frames, etc. The RI RI1, A, and A1 punchings are located on the row above the D punchings.

1.06 The terminal strip to which the G leads are wired is located above the terminal strip to which the D leads are wired and has four rows of punchings vertically and 100 punchings in a row horizontally (see Fig. 1). The punching numbers appear at the bottom of the strip and the rows are designated G, VT, CP, and PT, reading from the bottom up. All the CP, PT, and VT punchings are strapped together to facilitate cross connection by providing a greater number of connecting points. The G punchings may be multipled in pairs for 30 of 50 G leads or left unmultipled for 100 G leads (depending on the number of G relays provided).

1.07 For circuits installed in accordance with ED-26829-01 punchings 0 on blocks (L OPR, P) (L NONOPR RI, TD) (L NONOPR) (A NONOPR, SP) (A OPR, 3D4) (TF-XB, 5D) and (TL) are associated with No. 0 class relay G or DM. Similarly punchings 1 to 99 on the above blocks are associated with class relays 1 to 99 G or DM, respectively. For circuits installed in accord-

ance with ED-25275-01 punchings 0 blocks (L OPR) (L NONOPR RI) (L NONOPR) (A NON-OPR) (A OPR) (XB) (TL) and (TF) are associated with No. 0 class relay G. Similarly punchings 1 to 69 on the above blocks are associated with class relays 1 to 69, respectively.

Incoming Trunk Test Frame

1.08 The class relays (G for revertive pulsing and DM for multifrequency or dial pulsing) are operated over the terminal "D" to terminal "G" cross connection when the connector switch cross-points are closed. An operated G relay cuts in compensating resistances to apply test conditions to the A and L relays as described in 5.08 through 5.16 for revertive pulsing trunks. The value of the compensating resistance required for any trunk is obtained by means of cross connections at the top of the test frame (see Figs. 2 and 3) as determined from the information in Tables 1 through 22. In computing the various conditions, the conductor insulation leakage has been neglected since it is assumed to be zero. An operated DM relay closes the path to various other relays which in turn provide the proper signals required for the multi-frequency or dial pulse trunks.

2. APPARATUS

2.01 Tools and materials as required for connecting and soldering cross connections.

2.02 R-2291 short nose skinning pliers (for type K wire).

2.03 Where solderless terminals are to be connected, see Sections 069-132-811 and 069-133-801.

2.04 The following No. 24 gauge type K cross-connection wire, as required, for terminals *not* arranged for solderless wrapping:

(a) White (P46B086)

(b) Black (P365817)

(c) Red (P46B089)

(d) Brown (P46A328)

(e) Green (P46A327)

2.05 The following No. 24 gauge type BU wire, as required, for terminals arranged for solderless wrapping:

(a) White (P46A565)

(b) Black (P46A567)

(c) Red (P46A566)

(d) Brown (P46A563)

(e) Green (P46A562)

2.06 No. 24 gauge bare strap wire (P46A344), as required.

2.07 No. 22 gauge type J sleeved strap wire (P26991).

3. PREPARATION

3.01 In preparing the cross-connection assignments for the G relays, it is necessary to determine:

(a) The type of incoming trunk test line (synchronizing or nonsynchronizing). Nonsynchronizing test lines are used only in certain panel ground cutoff offices.

(b) The type of incoming trunk (see tables in Part 6).

(c) Conductor loop resistance (except where an E type signaling circuit is employed).

(d) Incoming selector compensating resistance (except where an E type signaling circuit is employed).

3.02 In preparing the cross-connection assignments for the DM relays, it is necessary to determine:

(a) Type of pulsing (MF or DP).

(b) Number of digits required (3, 4, or 5).

(c) Type of start signal (delay pulse, wink, or go).

(d) Test line code (for 3-, 4-, and 5-digit trunks).

(e) Busy line code (for 4- and 5-digit trunks).

(f) 3-digit trunks rering signal (required or not required).

(g) 5-digit trunk office indicating digit (0 to 9).

(h) Stop-go signal (required or not required).

(j) DP trunks type of dialing (LPD, LRD, BGD).

(k) Test line (synchronous or nonsynchronous).

(*l*) Transmission loss (if tested).

3.03 The color code of the wire required for cross connections to the following punching is:

Test Frame Cross Connections Revertive Pulsing

L OPR	Green
L NONOPR RI	Brown
L NONOPR	Black
A OPR	Red
A NONOPR	White
TL	Green
TF-XB	White
CTG RELS	White

Dial Pulsing and MF Pulsing

P	Red
SP	Brown
TD	White
TL	Red
3D4	Black
5D	Brown
S	Black
2W	Red
2WS	Brown
DC0-9 to TU0-9	Black
DC0-9 to TH, H, T, U	Brown
ATY	White
BTY	Black
PEM	Green

Test Connector Frame Cross Connections

G	White
VT	Black
CP	Red
PT	Brown

4. INCOMING TRUNK TEST CONNECTOR FRAME CROSS CONNECTIONS

D Punchings

4.01 All D punchings are cross-connected to a G, VT, PT, CP, RI or RI1 punching.

G Punchings

4.02 The D punchings of revertive pulsing trunks are cross-connected to G punchings of class relays G which introduce the test margins required by the associated trunk. The D punchings of multifrequency or dial pulsing trunks, are cross connected to the G punching of class relays DM which introduce the proper signals required by the trunk. When two or more incoming trunks require identical cross connections, their D leads should be cross-connected to the same G lead, as shown in Fig. 1 for terminal G0.

VT Punching

4.03 Cross-connect the VT punching to the D punching of spare trunks located within a group of working trunks. The sleeve terminals (S1 leads) of these spare trunks are always grounded.

PT Punching

4.04 Cross-connect the PT punching to the D punching of trunks that are vacant and not within a group of working trunks, or straightforward-type trunks that have battery on the ring and ground on the tip when normal.

CP Punching

4.05 Cross-connect the CP punching to the D punching of incoming trunks such as:

(a) Panel and step-by-step call indicator trunks which require the assistance of an operator to complete a test call.

(b) Trunks that require less than three digits (such as 2-wire office and revertive pulsing crossbar tandem trunks).

(c) Those which require more than five digits to complete (such as No. 5 crossbar tandem trunks which complete either locally or to a distant office).

RI, RI1, A, and A1 Punchings

4.06 When RI and A punchings are furnished at the test connector frame, cross-connect the D punching for the crosspoint of the connector switch associated with repeating incoming selectors to an RI-0 to RI-9 or RI1-0 to RI1-9 punching, and cross-connect the corresponding A-0 to A-9 or A1-0 to A1-9 punching to the G punching of the class relay assigned for the repeating incoming trunk group. These cross connections are shown in Fig. 1 for the D22, D23, G2, and G3 punchings.

5. INCOMING TRUNK TEST FRAME CROSS CONNECTIONS FOR REVERTIVE PULSING TRUNKS

TF Punching

5.01 This cross connection is required when the trunk group associated with a particular class relay consists of 24-volt trunks. When 217E and 217H terminal strips are furnished, cross-connect punching TF-XB of the class relay involved to the TF punching, as shown in Fig. 3 for relay G60.

5.02 When 217D and 217F terminal strips are furnished, cross-connect one of the TF punchings located on the top row of terminals, left-hand side facing the front of block designated TF, to the TF punching of the class relay involved. The class relay TF punchings are located in the lower portion of terminal strip TF. This cross connection is shown in Fig. 2 for class relay G61.

TL Punching

5.03 This cross connection is required when the trunk group associated with a particular class relay has access to a nonsynchronous test line. When 217E and 217H terminal strips are furnished, cross-connect the TL punching of the class relay involved to the TL punching located in the same block with the TF, XB, and RI punchings. This cross connection is shown in Fig. 3 for class relay G60.

5.04 When 217D and 217F terminal strips are furnished, cross-connect one of the TL punchings located on the top row of terminals at the right-hand side from the front of the block designated TL, to the TL punching of the class relay involved. The class relay TL punchings are located in the lower portion of terminal strip TL. This cross connection is shown in Fig. 2 for class relay G61.

XB Punchings

5.05 This cross connection is required when the trunk group associated with a particular class relay consists of crossbar trunks or panel trunks working over carrier. When 217E or BB7A and 217H terminal strips are furnished, cross-connect punching TF-XB of the class relay involved to punching XB, as shown in Fig. 3 for class relay G61.

5.06 When 217D and 217F terminal strips are furnished, cross-connect one of the XB punchings located on the top row of terminals at the left-hand side from the front of the block designated XB, to the XB punching of the class relay involved. The class relay XB punchings are located in the lower portion of terminal strip XB. This cross connection is shown in Fig. 2 for class relay G61.

5.07 The TL, TF, and XB punchings are left unused when the conditions specified in 5.01, 5.03 and 5.05 are not present.

L Relay Operate Test (Panel Incoming Selectors and Crossbar Incoming Trunks) L OPR and L OPR COMP RES Punchings

5.08 The test operate current for the L relays of the trunks served by a G relay is obtained by cross-connecting the L OPR punching of the G relay involved to the L OPR COMP RES punching obtained from the proper table. The lead from the contact of the G relay is wired to the terminal

strip designated L OPR located at the top of the incoming trunk test frame. The leads from the resistors are wired to the terminal strip designated L OPR COMP RES located at the top of the frame. By cross-connecting the G relay punching (L OPR) to the punchings of the L OPR COMP RES terminal strip as indicated in the table, the resistance added by the cross connection plus the cable loop resistance will be near to, but not greater than, the maximum external circuit loop for selections shown on the incoming selector drawing. In the case of trunks working over carrier, cross-connect the L OPR punching of the G relay to L OPR COMP RES 0. This is to satisfy the test frame since marginal test currents cannot be passed through carrier systems. A sample cross connection for class relay G61 is shown in Figs. 2 and 3.

5.09 When 217D and 217F terminal strips are furnished, the L OPR terminal strip is numbered from 0 to 49 or 0 to 69. The lead from the contact of the G relay is wired to the punching on this strip having the same designation number as the G relay. The punchings of the L OPR COMP RES terminal strip are numbered from 0 to 8 horizontally. Each row of punchings is multipled vertically in order to provide a greater number of connecting points.

5.10 In the case of crossbar incoming trunks, the lead from the G relay punching (L OPR) is cross-connected to the 0 punching (0 resistance) on the L OPR COMP RES terminal strip where the cable resistance is more than 900 ohms. Where the cable resistance is less than 900 ohms, the resistance added by the test circuit plus the cable resistance should be near to, but not less than 900 ohms.

L Relay Nonoperate Test (Panel Incoming Selectors Only, Carrier Trunks Excluded) L NONOPR and MISC COMP RES Punchings

5.11 The L NONOPR and L NONOPR RI terminal strips are numbered from 0 to 49 or 0 to 69 or 0 to 99. The lead from the contact of the G relay is wired to the punching having the same number as the G relay. These punchings are cross-connected to punchings on the MISC COMP RES terminal strip as shown in Figs. 2 and 3 for class relays G61 and G63. The punchings of the MISC COMP RES terminal strip are numbered from 9 to 27 horizontally. Each vertical row of punchings is permanently strapped in order to provide a greater number of soldering points.

5.12 The test nonoperate current for the L relays of the trunks served by a G relay is obtained by cross-connecting the G relay punching involved (L NONOPR or L NONOPR RI) to the MISC COMP RES punching obtained from the tables in Part 6. For incoming trunks, and repeating incoming trunks which have external shunts around the L relay in the incoming advance position or repeating incoming trunks with 280DG "L" relays, the lead from the contact of the G relay is wired to the terminal strip designated L NONOPR located at the top of the incoming trunk test frame. For other repeating incoming trunks the lead from the contact of the G relay is wired to a terminal strip designated L NONOPR RI at the top of the incoming trunk test frame. The leads from the resistors are wired to the terminal strip designated MISC COMP RES located at the top of the frame. By cross-connecting the G relay punchings (L NONOPR or L NONOPR RI) to the punchings of the MISC COMP RES terminal strip as indicated in the table, the current through the L relay of the incoming will be near to, but not greater than, the test value shown on the incoming circuit drawing when the voltage is 50 volts.

A Relay Nonoperate (Crossbar Incoming Trunks and Panel Incoming Selectors with 24 Volts on A Relay) A NONOPR and MISC RES Punchings

5.13 The test nonoperate current for the A relays of the trunks served by a G relay is obtained by cross-connecting the A NONOPR punching of the G relay involved to the MISC COMP RES punching obtained from the proper table. The lead from the contact of the G relay is wired to the terminal strip designated A NONOPR located at the top of the incoming trunk test frame. By cross-connecting the G relay punching (A NONOPR) to the punchings of the MISC COMP RES terminal strip as indicated in the proper table, the current through the A relay will be near to, but not greater than, the test value shown on the incoming circuit drawing when the voltage is 25 volts for panel trunks and 50 volts for crossbar

trunks. In the case of trunks working over carrier, cross-connect the A NONOPR punching of the G relay to MISC COMP RES 27. This is to satisfy the test frame since marginal test currents cannot be passed through carrier systems. This cross connection is shown in Figs. 2 and 3 for class relay G61.

5.14 The A NONOPR terminal strip is numbered from 0 to 49, 0 to 69, or 0 to 99. The lead from the contact of the G relay is wired to the punching on this strip having the same designation number as the G relay.

A Relay Operate (Panel and Crossbar Incoming Trunks) A OPR and MISC COMP RES Punchings

5.15 The test operate current for the A relays of the group of trunks served by a G relay is obtained by cross-connecting the A OPR punching of the G relay involved to the MISC COMP RES punchings as required. The lead from the G relay is wired to the terminal strip designated A OPR located at the top of the incoming trunk test frame. The resistance added by the test circuit plus the cable resistance will be near to, but not greater than, the maximum external trunk supervisory loop shown on the incoming selector circuit drawing except where the incoming employs a B415 or B144 relay operating with 24 volts, in which case 500 ohms has been substraced from the maximum external trunk supervisory loop. In the cases of Tables 20 and 21, 1000 ohms has been subtracted from the maximum external trunk supervisory loop. In the case of trunks working over carrier, cross-connect the A OPR punching of the G relay to MISC COMP RES 9. This is to satisfy the test frame since marginal test currents cannot be passed through carrier systems. This cross connection is shown in Figs. 2 and 3 for class relay G61.

5.16 The A OPR terminal strip is numbered from 0 to 49, 0 to 69, or 0 to 99. The lead from the contact of the G relay is wired to punchings on this strip having the same designation number as the G relay.

Incoming Brush, Incoming Group, Final Brush, Final Tens, Final Units (Panel and Crossbar Incoming Trunks)

5.17 By means of straps between the BL1 relay and the contacts of the counting relays, and BC1 relay and the contacts of the counting relays, the test circuit is arranged to direct the incoming under test to a test line in the final multiple in panel offices and to a test line in the primary line switch multiple in crossbar offices. If a change in the location of the test line is to be made, it is necessary to make corresponding strapping changes between the BL1 relay and the counting relays or between the BC1 relay and the counting relays. The IB_1, IG_1, FB_1, FT_1, and FU_1 connections between the BL1 relay and the counting relays are used to direct the incoming trunk under test to a line normally made busy, whereas the IB, IG, FB, FT, and FU connections between the BC1 and BL1 relays and the counting relays are used to direct the incoming trunk under test to the test line.

5.18 The IB_1, IG_1, FB_1, FT_1, FU_1, FT, and FU leads extend from the BL1 relay to the punchings 9, 8, 7, 6, 5, 1, and 0, respectively, on the terminal strip designated TL and BL. The IB, IG, and FB leads extend from the BC1 relay to punchings 4, 3, and 2, respectively, of the same terminal strip. The punchings in the TL and BL portion of the block are numbered from 0 to 9 horizontally. The contacts of the counting relays 0 to 9 are wired to punchings 0 to 9, respectively, in the row of terminals designated CR or CTG R located at the top of the frame.

5.19 If a change is to be made in the location of a test line which necessitates a change in the IB, IG, FB, etc, location, change the strap between the IB, IG, FB, etc, leads and the counting relays to introduce the proper counting relay. For example, if a change is made in the number of a test line requiring a change from IB_12, IG_14, FB_10 to IB_11, IG_12, FB_10, change the strap between punchings 9, 8, and 7, respectively, on the TL and BL terminal block and CR punchings 2, 4, and 0, respectively, so that the leads are run from the TL and BL punchings to CR punchings 1, 2, and 0, respectively.

6. TABLES

6.01 Tables 1 through 21 list the compensating resistance punchings required with particular conductor loop resistances for applying test values to the A and L relays which will test the trunks at their maximum range.

TABLE 1

Incoming Selectors Equipped with L Relay E375 or E526

24 Volts on A Relay (Where CRT Specifies N.O. 0.0033 Amperes for A Relay when Functioning on a Supervisory Loop of 1920 Ohms)

	CONDUCTOR *LOOP RES.	L OPR	L NOPR	A NOPR	A OPR
(A)	0-276	4	15	22	11
(B)	277-410	3	15	22	11
(C)	411-485	3	15	21	10
(D)	486-579	3	14	21	10
(E)	580-882	2	14	21	10
(F)	883-915	1	14	21	10
(G)	916-980	1	14	20	9
(H)	981-1185	1	13	20	9
(J)	1186-1300	0	13	20	9

*It will be satisfactory to use the above table based on a pulsing loop of 1488 ohms and a supervisory loop of 1920 ohms for those circuits for which the circuit specifies pulsing and supervisory loops of 1570 ohms and 1875 ohms, respectively.

6.02 Table 22 lists the compensating resistance punchings required with particular conductor loop resistances for applying test values to the A and L relays which, in general, are less severe than those referred to in 6.01, but more severe than the service conditions encountered with the particular trunk loop involved. This table is intended for use where the number of G relays required by the use of Tables 1 through 21 is greater than those available and it has been determined that additional relays are not to be provided.

6.03 A code for each combination of cross connections associated with a G relay entered on the G relay record will assist in determining if a G relay is already wired with the cross connections required for a new assignment. A cross-connection code for each G relay may be obtained by inserting the table number in front of the alphabetical line designation of the punchings cross-connected and adding NS if the test line involved is nonsynchronous.

TABLE 2

Incoming Selectors Equipped with L Relay E375 or E526

24 Volts on A Relay (Where CRT Specifies N.O. 0.0038 Amperes After Soak for A Relay when Functioning on a Supervisory Loop of 2380 Ohms)

	CONDUCTOR LOOP RES.	L OPR	L NOPR	A NOPR	A OPR
(A)	0-276	4	15	20	12
(B)	277-365	3	15	20	12
(C)	366-405	3	15	20	11
(D)	406-485	3	15	19	11
(E)	486-579	3	14	19	11
(F)	580-870	2	14	19	11
(G)	871-900	1	14	19	10
(H)	901-980	1	14	18	10
(J)	981-1185	1	13	18	10
(K)	1186-1300	0	13	18	10

TABLE 3

Incoming Selectors Equipped with L Relay E526

24 Volts on A Relay (Where CRT Specifies N.O. 0.0033 Amperes for A Relay when Functioning on a Supervisory Loop of 2500 Ohms)

	CONDUCTOR LOOP RES.	L OPR	L NOPR	A NOPR	A OPR
(A)	0-276	4	15	22	12
(B)	277-412	3	15	22	12
(C)	413-485	3	15	21	12
(D)	486-579	3	14	21	11
(E)	580-882	2	14	21	11
(F)	883-907	1	14	21	11
(G)	908-980	1	14	20	11
(H)	981-1185	1	13	20	10
(J)	1186-1300	0	13	20	10

TABLE 4

Incoming Selectors Equipped with L Relay E526

24 Volts on A Relay (Where A Relay Functions on a Supervisory Loop of 2850 Ohms)

	CONDUCTOR LOOP RES.	L OPR	L NOPR	A* NOPR	A OPR
(A)	0-276	4	15	27	12
(B)	277-485	3	15	27	11
(C)	486-579	3	14	27	11
(D)	580-791	2	14	27	11
(E)	792-882	2	14	27	10
(F)	883-980	1	14	27	10
(G)	981-1185	1	13	27	10
(H)	1186-1300	0	13	27	10

*There is no A NOPR value requirement for the 124F A relay. Resistance punching 27 is connected only to satisfy the test frame when making the rapid test to busy line as described in Section 216-277-501.

TABLE 5

Incoming Selectors Equipped with L Relay E375 or E526

48 Volts on A Relay (Where A Relay Functions on a Supervisory Loop of 7540 Ohms)

	CONDUCTOR LOOP RES.	L OPR	L NOPR	A OPR
(A)	0-276	4	15	23
(B)	277-470	3	15	23
(C)	471-485	3	15	22
(D)	486-579	3	14	22
(E)	580-882	2	14	22
(F)	883-980	1	14	21
(G)	981-1185	1	13	21
(H)	1186-1300	0	13	21

TABLE 6

Incoming Selectors Equipped with L Relay E375 or E526

48 Volts on A Relay (Where A Relay Functions on a Supervisory Loop of 5340 Ohms or 6350 Ohms)

	CONDUCTOR LOOP RES.	L OPR	L NOPR	A OPR 6350-Ohm LOOP	A OPR 5340-Ohm LOOP
(A)	0-276	4	15	21	19
(B)	277-290	3	15	21	19
(C)	291-485	3	15	20	18
(D)	486-579	3	14	20	18
(E)	580-795	2	14	20	18
(F)	796-882	2	14	19	17
(G)	883-980	1	14	19	17
(H)	981-1185	1	13	19	17
(J)	1186-1300	0	13	19	17

TABLE 7

Incoming Selectors Equipped with L Relay R638

24 Volts on A Relay (Where CRT Specifies N.O. 0.0033 Amperes for A Relay when Functioning on a Supervisory Loop of 1920 Ohms)

	CONDUCTOR LOOP RES.	L OPR	L NOPR	A NOPR	A OPR
(A)	0-35	4	20	22	11
(B)	36-276	4	19	22	11
(C)	277-410	3	19	22	11
(D)	411-530	3	19	21	10
(E)	531-579	3	18	21	10
(F)	580-882	2	18	21	10
(G)	883-915	1	18	21	10
(H)	916-1025	1	18	20	9
(J)	1026-1185	1	17	20	9
(K)	1186-1300	0	17	20	9

TABLE 8

Incoming Selectors Equipped with L Relay R638

24 Volts on A Relay (Where CRT Specifies N.O. 0.0038 Amperes After Soak for A Relay when Functioning on a Supervisory Loop of 2380 Ohms)

	CONDUCTOR LOOP RES.	L OPR	L NOPR	A NOPR	A OPR
(A)	0-35	4	20	20	12
(B)	36-276	4	19	20	12
(C)	277-365	3	19	20	12
(D)	366-405	3	19	20	11
(E)	406-530	3	19	19	11
(F)	531-579	3	18	19	11
(G)	580-870	2	18	19	11
(H)	871-900	1	18	19	10
(J)	901-1025	1	18	18	10
(K)	1026-1185	1	17	18	10
(L)	1186-1300	0	17	18	10

TABLE 9

Incoming Selectors Equipped with L Relay R638

48 Volts on A Relay (Where A Relay Functions on a Supervisory Loop of 7540 Ohms)

	CONDUCTOR LOOP RES.	L OPR	L NOPR	A OPR
(A)	0-35	4	20	23
(B)	36-276	4	19	23
(C)	277-470	3	19	23
(D)	471-530	3	19	22
(E)	531-579	3	18	22
(F)	580-882	2	18	22
(G)	883-975	1	18	22
(H)	976-1025	1	18	21
(J)	1026-1185	1	17	21
(K)	1186-1300	0	17	21

TABLE 10

Incoming Selectors Equipped with L Relay R638

48 Volts on A Relay (Where A Relay Functions on a Supervisory Loop of 5340 Ohms or 6350 Ohms)

	CONDUCTOR LOOP RES.	L OPR	L NOPR	A OPR 6350-Ohm Loop	A OPR 5340-Ohm Loop
(A)	0-35	4	20	21	19
(B)	36-276	4	19	21	19
(C)	277-290	3	19	21	19
(D)	291-530	3	19	20	18
(E)	531-579	3	18	20	18
(F)	580-795	2	18	20	18
(G)	796-882	2	18	19	17
(H)	883-1025	1	18	19	17
(J)	1026-1185	1	17	19	17
(K)	1186-1300	0	17	19	17

TABLE 11

Repeater Incoming Selectors — Without Shunt at Incoming Advance (Where A Relay Functions on a Supervisory Loop of 6080 Ohms)

	CONDUCTOR LOOP RES.	COMP. RES. IN INC. SEL.	L OPR	L NOPR RI	A OPR
(A)	0-20	600	5	12	21
(B)	21-55	600	5	12	20
(C)	56-70	600	4	12	20
(D)	0-20	500	5	13	21
(E)	21-96	500	5	13	20
(B)	97-160	500	5	12	20
(C)	161-375	500	4	12	20
(D)	0-20	300	5	13	21
(E)	21-286	300	5	13	20
(B)	287-370	300	5	12	20
(E)	300-525	0	5	13	20
(F)	526-571	0	5	13	19
(G)	572-685	0	5	12	19
(H)	686-988	0	4	12	19
(J)	989-1030	0	3	12	19
(K)	1031-1066	0	3	12	18
(L)	1067-1291	0	3	11	18
(M)	1292-1535	0	2	11	18
(N)	1536-1561	0	2	11	17
(P)	1562-1594	0	2	10	17
(Q)	1595-1897	0	1	10	17
(R)	1898-2015	0	0	10	17

TABLE 12

Repeater Incoming Selectors — Without Shunt at Incoming Advance (Where A Relay Functions on a Supervisory Loop of 7540 Ohms)

	CONDUCTOR LOOP RES.	COMP. RES. IN INC. SEL.	L OPR	L NOPR RI	A OPR
(A)	0-55	600	5	12	23
(B)	56-70	600	4	12	23
(C)	0-96	500	5	13	23
(A)	97-160	500	5	12	23
(B)	161-375	500	4	12	23
(C)	0-286	300	5	13	23
(A)	287-370	300	5	12	23
(C)	300-470	0	5	13	23
(D)	471-571	0	5	13	22
(E)	572-685	0	5	12	22
(F)	686-975	0	4	12	22
(G)	976-1066	0	3	12	21
(H)	1067-1291	0	3	11	21
(J)	1292-1480	0	2	11	21
(K)	1481-1561	0	2	11	20
(L)	1562-1594	0	2	10	20
(M)	1595-1897	0	1	10	20
(N)	1898-1985	0	0	10	20
(P)	1986-2015	0	0	10	19

TABLE 13

Repeater Incoming Selectors — With Shunt at Incoming Advance or 280DG Relay (Where a Relay Functions on a Supervisory Loop of 6080 Ohms)

	CONDUCTOR LOOP RES.	COMP. RES. IN INC. SEL.	L OPR	L NOPR	A OPR
(A)	0-20	600	5	21	21
(B)	21-55	600	5	21	20
(C)	56-70	600	4	21	20
(A)	0-20	500	5	21	21
(B)	21-160	500	5	21	20
(C)	161-308	500	4	21	20
(A)	0-20	300	5	21	21
(B)	21-370	300	5	21	20
(B)	300-525	0	5	21	20
(D)	526-685	0	5	21	19
(E)	686-783	0	4	21	19
(F)	784-988	0	4	20	19
(G)	989-1030	0	3	20	19
(H)	1031-1278	0	3	20	18
(J)	1279-1535	0	2	19	18
(K)	1536-1594	0	2	19	17
(L)	1595-1773	0	1	19	17
(M)	1774-1897	0	1	18	17
(N)	1898-2015	0	0	18	17

TABLE 14

Repeater Incoming Selectors — With Shunt at Incoming Advance or 280DG Relay (Where a Relay Functions on a Supervisory Loop of 7540 Ohms)

	CONDUCTOR LOOP RES.	COMP. RES. IN INC. SEL.	L OPR	L NOPR	A OPR
(A)	0-55	600	5	21	23
(B)	56-70	600	4	21	23
(A)	0-160	500	5	21	23
(B)	161-308	500	4	21	23
(A)	0-370	300	5	21	23
(A)	300-470	0	5	21	23
(C)	471-685	0	5	21	22
(D)	686-783	0	4	21	22
(E)	784-975	0	4	20	22
(F)	976-1278	0	3	20	21
(G)	1279-1480	0	2	19	21
(H)	1481-1594	0	2	19	20
(J)	1595-1773	0	1	19	20
(K)	1774-1897	0	1	18	20
(L)	1898-1985	0	0	18	20
(M)	1986-2015	0	0	18	19

TABLE 15

Battery Cutoff Incoming Selectors Using R Type L Relay

	CONDUCTOR LOOP RES.	COMP. RES. IN INC. SEL.	L OPR	L NOPR	A OPR
(A)	0-104	900	2	17	21
(B)	105-252	900	1	17	20
(C)	253-415	900	1	16	20
(D)	0-104	600	3	17	21
(E)	105-124	600	3	17	20
(F)	125-252	600	2	17	20
(G)	253-427	600	2	16	20
(C)	428-609	600	1	16	20
(H)	0-104	300	4	17	21
(J)	105-136	300	4	17	20
(E)	137-252	300	3	17	20
(K)	253-439	300	3	16	20
(G)	440-609	300	2	16	20
(L)	610-745	300	2	16	19
(M)	746-1045	300	1	15	19
(N)	300-451	0	4	16	20
(K)	452-609	0	3	16	20
(P)	610-747	0	3	16	19
(Q)	748-1057	0	2	15	19
(M)	1058-1114	0	1	15	19
(R)	1115-1242	0	1	15	18
(S)	1243-1360	0	1	14	18
(T)	1361-1619	0	0	14	18
(U)	1620-1640	0	0	14	17

TABLE 16

Battery Cutoff Incoming Selectors Using N3 L Relay

	CONDUCTOR LOOP RES.	COMP. RES. IN INC. SEL.	L OPR	L NOPR	A OPR
(A)	0-47	900	5	18	21
(B)	48-104	900	5	17	21
(C)	105-266	900	5	17	20
(D)	267-300	900	4	17	20
(E)	0-47	600	6	18	21
(F)	48-104	600	6	17	21
(G)	105-177	600	6	17	20
(C)	178-542	600	5	17	20
(H)	543-581	600	5	16	20
(J)	582-600	600	4	16	20
(K)	0-47	300	7	18	21
(L)	48-104	300	7	17	21
(M)	105-247	300	7	17	20
(G)	248-542	300	6	17	20
(N)	543-629	300	6	16	20
(P)	630-651	300	6	16	19
(Q)	652-900	300	5	16	19
(G)	300-542	0	6	17	20
(N)	543-609	0	6	16	20
(P)	610-799	0	6	16	19
(Q)	800-1037	0	5	16	19
(R)	1038-1114	0	5	15	19
(S)	1115-1203	0	5	15	18
(T)	1204-1506	0	4	15	18
(U)	1507-1532	0	3	15	18
(V)	1533-1619	0	3	14	18
(W)	1620-1809	0	3	14	17
(X)	1810-2027	0	2	14	17
(Y)	2028-2112	0	2	13	17
(Z)	2113-2415	0	1	13	16
(AA)	2416-2522	0	0	13	16
(AB)	2523-2629	0	0	12	16
(AC)	2630-2700	0	0	12	15

TABLE 17

Battery Cutoff Incoming Selectors Using N5 L Relay

	CONDUCTOR LOOP RES.	COMP. RES. IN INC. SEL.	L OPR	L NOPR	A OPR
(A)	0-104	900	6	18	21
(B)	105-300	900	6	18	20
(C)	0-104	600	7	19	21
(D)	105-200	600	7	19	20
(E)	201-255	600	7	19	20
(B)	256-600	600	6	18	20
(F)	0-60	300	8	20	21
(G)	61-104	300	7	19	21
(D)	105-500	300	7	19	20
(E)	501-555	300	7	19	20
(H)	556-629	300	7	18	20
(I)	630-900	300	6	18	19
(J)	300-360	0	8	20	20
(D)	361-609	0	7	19	20
(K)	610-800	0	7	19	19
(K)	801-855	0	7	19	19
(I)	856-1114	0	6	18	19
(L)	1115-1200	0	6	18	18
(L)	1201-1350	0	6	18	18
(M)	1351-1550	0	5	17	18
(M)	1551-1619	0	5	17	18
(N)	1620-1845	0	4	17	17
(O)	1846-2112	0	3	16	17
(P)	2113-2200	0	3	16	16
(P)	2201-2340	0	3	16	16
(Q)	2341-2500	0	2	15	16
(Q)	2501-2629	0	2	15	16
(R)	2630-2700	0	1	15	15
(R)	2701-2800	0	1	15	15
(R)	2801-2835	0	1	15	15
(S)	2836-3200	0	0	14	14

TABLE 18

Crossbar Incoming Trunks Using B Type A Relay

	CONDUCTOR LOOP RES.	L OPR	A NOPR	A OPR
(A)	0-195	3	27	22
(B)	196-305	3	27	21
(C)	306-602	2	27	21
(D)	603-700	1	27	21
(E)	701-899	1	27	20
(F)	900-1205	0	27	20
(G)	1206-1245	0	27	19
(H)	1246-1710	0	26	19
(J)	1711-1740	0	26	18
(K)	1741-2215	0	25	18
(L)	2216-2235	0	25	17
(M)	2236-2610	0	24	17

TABLE 19

Crossbar Incoming Trunks Using S Type A Relay

	CONDUCTOR LOOP RES.	L OPR	A NOPR	A OPR
(A)	0-123	3	21	23
(B)	124-305	3	20	23
(C)	306-430	2	20	23
(D)	431-602	2	20	22
(E)	603-618	1	20	22
(F)	619-899	1	19	22
(G)	900-935	0	19	22
(H)	936-1113	0	19	21
(J)	1114-1440	0	18	21
(K)	1441-1608	0	18	20
(L)	1609-1945	0	17	20
(M)	1946-2103	0	17	19
(N)	2104-2450	0	16	19
(P)	2451-2598	0	16	18
(Q)	2599-2900	0	15	18

TABLE 20

Crossbar Incoming Trunks Using UA Type A Relay

	CONDUCTOR LOOP RES.	L OPR	A NOPR	A OPR
(A)	0-150	3	12	19
(B)	151-305	3	12	18
(C)	306-655	2	11	18
(D)	656-753	1	11	17
(E)	754-899	1	10	17
(F)	900-1160	0	10	17
(G)	1161-1248	0	10	16
(H)	1249-1665	0	9	16
(J)	1666-2170	0	9	15
(K)	2171-2675	0	9	14
(L)	2676-2900	0	9	13

TABLE 21

Crossbar Incoming Trunks Using AJ8 A Relay

	CONDUCTOR LOOP RES.	L OPR	*A NOPR	A OPR
(A)	0-150	3	21	19
(B)	151-305	3	21	18
(C)	306-655	2	21	18
(D)	656-899	1	21	17
(E)	900-1160	0	21	17
(F)	1161-1665	0	21	16
(G)	1666-2170	0	21	15
(H)	2171-2675	0	21	14
(J)	2676-2900	0	21	13

*There is no A NOPR value requirement for the AJ8 A relay. Resistance punching 21 is connected only to satisfy the test frame when making the rapid test to busy line as described in Section 216-277-501.

TABLE 22

Table of Cross Connections (See 6.02) Using Broad Test Requirements

	TYPE OF CIRCUIT	TRUNK RESIST. LOOP & COMP.	L OPR	L NOPR	A NOPR	A OPR
(A)	Panel — 24 Volts	0-579	3	20	22	10
(B)	on A Relay	580-882	2	18	21	10
(C)		883-1185	1	17	21	9
(D)		1186-1300	0	17	20	9
(E)	Panel — 48 Volts	0-579	3	20	—	18
(F)	Nonrepeating	580-882	2	18	—	17
(G)	Ground Cutoff	883-1185	1	18	—	17
(H)		1186-1300	0	17	—	17
(J)	Panel — Repeating —	0-685	5	21	—	19
(K)	With Shunt or	686-1291	3	21	—	18
(L)	280DG Relay	1292-1897	1	19	—	17
(M)		1898-2015	0	18	—	17
(N)	Panel — Repeating —	0-685	5	13*	—	19
(P)	Without Shunt	686-1291	3	12*	—	18
(Q)		1292-1897	1	11*	—	17
(R)		1898-2015	0	10*	—	17
(S)	Panel — Battery	0-618	4	17	—	22
(T)	Cutoff Using	619-921	3	16	—	21
(U)	R Type L Relay	922-1224	2	15	—	20
(V)		1225-1527	1	15	—	20
(W)		1528-1640	0	14	—	20
(S)	Panel — Battery	0-618	4	17	—	22
(T)	Cutoff Using	619-921	3	16	—	21
(U)	N3 L Relay	922-1224	2	15	—	20
(V)		1225-2582	1	15	—	20
(X)		2583-2700	0	12	—	18
(Y	Crossbar Using	0-900	3	—	27	20
(Z)	B Type A Relay	901-2610	0	—	27	17
(AA)	Crossbar Using	0-900	3	—	21	22
(AB)	S Type A Relay	901-2900	0	—	19	18
(AC)	Crossbar Using	0-900	3	—	12	17
(AD)	UA Type A Relay	901-2900	0	—	10	13
(AE)	Crossbar Using	0-900	3	—	21**	17
(AF)	AJ Type A Relay	901-2170	0	—	21**	15
(AG)		2171-2900	0	—	21**	13
(AH)	Panel — Battery	0-609	7	20	—	22
(AJ)	Cutoff Using	610-1350	6	19	—	20
(AK)	N5 L Relay	1351-1845	4	17	—	20
(AL)		1846-2629	2	16	—	18
(AM)		2630-3200	0	15	—	15

*Use L NONOPR RI punchings.

**There is no A NOPR value requirement for the AJ8 A relay. Resistance punching 21 is connected only to satisfy the test circuit when making the rapid test to busy line as described in Section 216-277-501.

Note 1: Cross-connect the TF punching when testing panel incoming selectors with 24 volts on the A relay.

Note 2: Cross-connect the TL punching when testing to a nonsynchronizing test line.

Note 3: Cross-connect the XB punching when testing crossbar incomings.

7. INCOMING TRUNK TEST FRAME CROSS CONNECTIONS DP or MF

P and MF or DP

7.01 This cross connection determines whether DP or MF will be outpulsed. For MF outpulsing, cross-connect the pulsing punching P of the class relay involved to the MF punching as shown in Fig. 3 for class relay DM99. For DP outpulsing, cross-connect the P punching to the DP punching as shown in Fig. 3 for class relay DM98.

TD and LPD or LRD or BGD Punchings

7.02 This cross connection determines whether the dial pulsing on trunks associated with a particular class DM relay will be loop (LPD), loop resistance (LRD) or battery and ground (BGD) dialing. For the various types of dial pulsing, cross-connect the TD punching as indicated in the table below:

TYPE OF DIALING	CROSS-CONNECT TO PUNCHING OF CLASS RELAY INVOLVED TO PUNCHING	CROSS CONNECTION SHOWN IN FIG. 3 FOR CLASS RELAY
Loop	LPD	DM98
Loop Resistance	LRD	DM97
Batt. and Grd.	BGD	DM96

SP and DPL or WK or GO Punchings

7.03 This cross connection determines whether the test circuit will make a delay pulse, wink, or go start signal check on a group of trunks associated with a particular class relay. For the various types of start pulse signal checks, cross-connect the SP punching as indicated in the table below:

START PULSE SIGNAL CHECK	CROSS-CONNECT SP PUNCHING OF CLASS RELAY INVOLVED TO PUNCHING	CROSS CONNECTION SHOWN IN FIG. 3 FOR CLASS RELAY
Delay Pulse	DPL	DM99
Wink	WK	DM98
Go	GO	DM93

Number of Digits Dialed

3-Digit Trunk Group with Rering Signal 3D4 and 3DR Punchings

7.04 This cross connection is required when the trunks associated with a particular class relay require three digits with a rering signal. Cross-connect the 3D4 punching of the class relay involved to the 3DR punching as shown in Fig. 3 for class relay DM99.

3-Digit Test Line Arranged for Rering H, T, and U to DC0-9 Punchings

7.05 Cross-connect the 3DRR H, T, and U punchings to the DC0 to DC9 punchings in accordance with the 3-digit rering test line code. For example, if the test line code is 103, cross-connect H to DC1, T to DC0, and U to DC3 as shown in Fig. 3.

3-Digit Trunk Group without Rering Signal 3D4 and 3DA or 3DB Punchings

7.06 This cross connection is required when the trunks associated with a particular class relay require three digits and are not arranged for a rering signal. Cross-connect the 3D4 punching to the 3DA punching for the first test line code as shown in Fig. 3 for class relay DM98. If another group of 3-digit nonrering trunks associated with another DM relay have access to a test line with a code different from that of the first test line, cross-connect the 3D4 punching of the second DM relay to punching 3DB as shown in Fig. 3 for class relay DM97.

3-Digit Test Lines Not Arranged for a Rering Signal (3 DIG NON RR A and B), H, T, and U to DC0-9 Punchings

7.07 Cross-connect the (3 DIG NON RR A) H, T, and U punchings to the DC0 to DC9 punchings in accordance with the first 3-digit nonrering test line code. For example, if the first test line code is 542, cross-connect punchings H to DC5, T to DC4, and U to DC2 as shown in Fig. 3 for 3 DIG NON RR A. Similarly, cross-connect the (3 DIG NON RR B) H, T, and U punchings to the DC0 to DC9 punchings in accordance with the second 3-digit nonrering test

line code if required. The cross connections for a second test line code 333 are shown in Fig. 3 for 3 DIG NON RR B.

4-Digit Trunk Group 3D4 and 4DA, 4DB or 4DC Punchings

7.08 This cross connection is required when the trunk group associated with a particular class relay is arranged for four digits. Cross-connect the 3D4 punching to the 4DA punching for the first combination of test line and busy line codes as shown in Fig. 3 for class relay DM96. If other groups of 4-digit trunks, each associated with a different DM relay, have access to test lines and busy lines having numbers different from those of the first test line and busy line combination, cross-connect the 3D4 punching of the second DM relay to the 4DB punching as shown in Fig. 3 for class relay DM95. Cross-connect the 3D4 punching of the third DM relay to the 4DC punching as shown in Fig. 3 for class relay DM94.

4-Digit Test Lines and Busy Lines (4-5 DIG TL ABC and BL ABC) TH, H, T, and U to DC0-9 Punchings

7.09 Cross-connect the TH, H, T, and U punchings under 4-5 DIG TL-A to the DC0 to DC9 punchings in accordance with the test line code required. For example, if the first test line code is 9972, cross-connect punchings TH and H to DC9, T to DC7, and U to DC2 as shown in Fig. 3. Also, cross-connect the TH, H, T, and U punchings under 4-5 DIG BL-A to the DC0 to DC9 punchings. For example, if the busy line code is 9970, cross-connect punchings TH and H to DC9, T to DC7, and U to DC0 as shown in Fig. 3.

5-Digit Trunk Group 5D and 5D CONT — Also 3D4 and 4DA, 4DB or 4DC (4-5 DIG TL A, B, C and BL A, B, C) TU, TH, H, T, U, and DC0-9 Punchings

7.10 This cross connection is required when the trunk group associated with a particular class relay is arranged for five digits, four line-number digits (TH, H, T, and U digits) and one office indicating digit (TU, tandem units digit). This test circuit is arranged to provide for 0-9 different TU digits. Cross-connect the 5D punching of the associated class relay to the 5D CONT-0 punching for the first 5-digit trunk group, to the 5D CONT-1 punching for the second, or to 5D CONT-9 for the tenth 5-digit trunk group. Cross-connect punching TU-0 for the first, TU-1 for the second, or TU-9 for the tenth 5-digit trunk group to punching DC0-9, depending on what the TU digit happens to be. The cross connections for class relay DM92 for the first 5-digit trunk group, in which the TU digit is 6, are shown in Fig. 3. In addition to the above cross connections, the 3D4 and 3DA, 3DB or 3DC punchings and the (4-5 DIG TL A, B, C and BL A, B, C) TH, H, T, U and DC0-9 punchings should be cross-connected as described for 4-digit trunk groups.

Test Line and Stop-Go Signal Cross Connections TL, SG, NS, SGNS Punchings

7.11 The cross connections required for various combinations of synchronous and non-synchronous test lines with and without stop-go signals are indicated below:

Feature	Cross-connecct Punchings "TL" of DM Relay of Trunk Group Involved to Punching	Cross Connection Shown in Fig. 3 for Class Relay
Synchronous Test Line with Stop-Go	SG	DM88
Synchronous Test Line without Stop-Go	None	—
Nonsynchronous Test Line with Stop-Go	SGNS	DM87
Nonsynchronous Test Line without Stop-Go	NS	DM89

GN and S or 2W Punchings

7.12 If 2-way trunks appear in the trunk multiple of tandem offices, the above punchings are provided. Cross-connect the GN punching as shown below: (See Fig. 3.)

Type of Trunk	Cross-connect the "GN" Punching of Class Relay Involved to Punching
1-Way Trunk	S
2-Way Trunk Arranged for "MF" Type Pulsing	2W
2-Way Trunk Arranged for "DP" Type Pulsing	2WS

CP1 and PEM Punchings

7.13 Cross-connect the CP1 punching to the PEM punching when trunks using repeated or converted supervision are to be tested for continuity reversal. The CP1 punching number corresponds to the number of the associated G or DM relay. The PEM punchings are common.

TG and ATY or BTY Punchings

7.14 These cross connections are required when trunks are divided into two groups for administrative purposes. Group A may be isolated from group B, for test purposes, by cross-connecting the TG punching of each G or DM relay in the A group to an ATY punching. Similarly the TG punching of each G or DM relay in the B group of trunks should be cross-connected to a BTY punching. Trunks so connected may be tested as a unit or as group A alone or group B alone. (See Fig. 3.)

8. REPORTS

8.01 The required record of the changes in cross connections should be entered on the proper form.