INCOMING REGISTER LINK
NONWIRE-SPRING-RELAY TYPE
CROSS CONNECTIONS
NO. 5 CROSSBAR OFFICES

CONTENTS PAGE

1. GENERAL 1

2. APPARATUS 2

3. WIRING 2

4. CROSS-CONNECTION FACILITIES 3

(A) Terminal Strip C1 3

(B) Terminal Strip F1 3

(C) Terminal Strip J 3

(D) Terminal Strip K 3

(E) Terminal Strip L (Earlier Type Frames) 3

(F) Terminal Strip M (Earlier Type Frames) 3

(G) Terminal Strips REG 0 Through REG 9 3

(H) Terminal Strip TN 4

(I) Terminal Strips on Distributing Frame 4

5. ASSIGNMENTS 4

6. CROSS CONNECTIONS 6

(A) Trunks with or without Line Link Appearances 6

(B) Trunks with Line Link Appearances . 7

(C) Trunks without Line Link Appearances 7

7. REPORTS 7

1. GENERAL

1.01 This section describes the method of assigning cross connections for the incoming register link circuit and is intended for use in connection with the addition of new trunks or changes in existing trunks on the incoming register link frame. Information is also included on the distributing frame terminal strips and punchings, and on the functions of the various cross connections.

1.02 This section is reissued to add information on increased trunk capacity of an incoming register link group, to bring the cross-connection information up to date, and to revise the title. Since this issue is a general revision, arrows ordinarily used to indicate changes have been omitted.

1.03 Cross-connection forms for No. 5 crossbar are presented in Section 218-012-301.

1.04 A number of incoming trunk circuits appearing on an incoming register link are wired directly to the particular equipment on that frame. Where flexibility is desired for the possible reassignment of trunk equipment to different types of incoming registers and therefore different incoming register links, non-bylink type of incoming trunk equipment and portions of the incoming register link equipment are wired to the distributing frame. These incoming trunks are referred to as "flexible" trunks. Changes in the flexible trunk distributing frame cross connections will usually require changes in the cross connections on the incoming register link frame.

1.05 From one to six individual frames may be used together as one incoming register link group to accommodate the number of trunks which may be associated with one group of incoming registers. This group of link frames will provide access to a maximum of 10 incoming registers for varying amounts of trunks depending upon the type of pulsing, in accordance with the tables shown on the SD drawing.

1.06 A basic or auxiliary frame may be equipped with five switches, trunk preference and register control relays, and optional trunk number and auxiliary trunk preference relays. A supplementary or auxiliary supplementary frame may be equipped with five switches, trunk and auxiliary trunk preference relays only. Each

© American Telephone and Telegraph Company, 1955
Printed in U.S.A.

type of frame will accommodate 100 trunks. The basic frame is used as an auxiliary frame without change; however, when auxiliary frames are used, a relay for switching the trouble recorder leads between frames is added to each basic and auxiliary frame for each register. The supplementary frame is not changed when used as an auxiliary supplementary frame.

1.07 The switches on a basic or auxiliary frame provide for the first 20 trunks in a horizontal group and the switches on an associated supplementary frame at corresponding physical levels as the basic switches provide for the second 20 trunks in the same horizontal group. The trunk preference relay leads are extended from the basic or auxiliary frame to its associated supplementary frame so that all 40 trunks in each horizontal group are in one preference chain. A combination of basic and supplementary frames has a capacity for 199 trunks and a test appearance. In some cases to obtain an adequate number of horizontal groups for trunk link frame groups 0 to 9 and 10 to 19, a basic and an auxiliary (instead of supplementary) frame may be used together to provide for 10 horizontal groups with a capacity of 199 trunks. In this case the trunk preference leads are not extended between the two frames.

1.08 The incoming register link frame may be expanded to accommodate 399 or 599 trunks. When it is desired to provide access for more than 199 trunks to the same group of ten incoming registers, an auxiliary frame is furnished for the third 100 trunks and an auxiliary supplementary frame for the fourth 100 trunks. Similarly, second auxiliary and auxiliary supplementary frames are added for the fifth and sixth groups of 100 trunks. The horizontal group control functions of the auxiliary frame are interconnected with the basic frame in such a manner as to increase the number of horizontal groups of the link group from 5 to 10 or to 15.

1.09 Space is provided on the incoming register link frames for auxiliary preference relays, which are required when trunks having line link frame appearances, such as tandem and intertoll, are connected to the incoming register link. Two-way pulse conversion trunks have two link appearances, one for the switchboard and the other for the inward call, but only the appearance for the inward call requires an auxiliary preference relay. Up to 40 such relays may be provided for each horizontal group; 20 being associated with the 20 verticals on a basic link switch and the second 20 with the 20 verticals on a supplementary link switch. Trunks of the above type may be assigned to all types of frames within the limits of the total number of such trunks, as shown on the table in the SD drawings.

2. APPARATUS

2.01 Soldering tools and materials as required.

2.02 The following wire for the incoming register link frame as required:

No. 24 Gauge, Type BG, Insulated Wire (D-175848)

No. 22 Gauge Bare Strap Wire (P-314952)

No. 22 Gauge, Type J, Sleeved Strap Wire (P-26991)

2.03 The following wire for cross connections at the distributing frame as required:

No. 22 Gauge, Type L, 4-conductor (L22F) Distributing Frame Wire (No. 22 Gauge, Type L, 2-conductor (L22P) or KS-14628 Polyvinyl Chloride, 2-conductor Distributing Frame Wire may be used in place of the 4-conductor wire)

No. 22 Gauge, Type L, 3-conductor (L22T) or KS-14628 Polyvinyl Chloride, 3-conductor Distributing Frame Wire

Note: The yellow conductor in the KS-14628 Polyvinyl Chloride Wire is used the same as the white conductor in the Type L Wire.

3. WIRING

3.01 No. 24 gauge, type BG, insulated wire shall be used where any wiring is run between unit terminal strips.

3.02 No. 22 gauge bare strap wire shall be used to connect adjacent punchings in the same vertical row (i.e., a row perpendicular to the fanning strip).

3.03 No. 22 gauge, type J, sleeved strap wire shall be used to connect nonadjacent punchings in the same vertical row and to connect punchings in different vertical rows. When connecting punchings in different vertical rows, the sleeved strap wire shall be run through the fanning strip and approximately one half inch of slack allowed.

3.04 No. 22 gauge, type L, 4- or 2-conductor distributing frame wire shall be used for cross connecting the T, R, F, and D punchings on the distributing frame. No. 22 gauge, type L, 3-conductor distributing frame wire shall be used for cross connecting the CO, BL, and ST punchings on the distributing frame.

4. CROSS-CONNECTION FACILITIES

4.01 The majority of cross connections appear on unit terminal strips located on the wiring side of the link frame. Other cross connections associated with flexible incoming trunks appear on the distributing frame.

(A) Terminal Strip C1

4.02 This terminal strip is supplied for each group of 20 trunk preference (TP-) relays. The B punchings of the TP relays and the C punchings of the CL relays appear on this terminal strip. The B punching of the lowest numbered TP relay appears on punching 1 and the B punching of the highest numbered TP relay appears on punching 20. The C punchings of the CL- relays in the particular horizontal group appear on punchings 21 through 31. The CO punching appears on punching 21 and the C10 punching appears on punching 31. The B and C punchings are used either directly or indirectly to indicate trunk class to the incoming register.

(B) Terminal Strip F1

4.03 This terminal strip is supplied for each group of 20 trunk preference (TP-) relays. The A punchings of the TP relays and the TF relays appear on this terminal strip. The A punching of the lowest numbered TP relay appears on punching 1 and the A punching of the highest numbered TP relay appears on punching 20. The A punchings of the TF- relay in the particular horizontal group appear on punchings 21 through 30. The A0 punching appears on punching 21 and the A9 punching appears on punching 30. The A punchings are used to indicate trunk link frame units to the incoming register

(C) Terminal Strip J

4.04 This terminal strip is supplied for each group of auxiliary preference (AP-) relays associated with a particular horizontal group on a frame. The B punchings of the AP relays appear on this terminal strip. The B punching of the lowest numbered AP relay appears on punching 1 and the B punching of the highest numbered AP relay appears on punching 20. The B punchings are used for associating the AP relays with trunk preference (TP) relays that are connected to trunks that require line link appearances.

(D) Terminal Strip K

4.05 This terminal strip is supplied for each group of auxiliary preference (AP-) relays associated with a particular horizontal group. The C punchings of the AP relays appear on this terminal strip. The C punching of the lowest numbered AP relay appears on punching 1 and the C punching of the highest numbered AP relay appears on punching 20. The C punchings are used for indicating trunk class on trunks that require line link appearances.

(E) Terminal Strip L (Earlier Type Frames)

4.06 This terminal strip is supplied for each group of auxiliary preference (AP-) relays associated with a particular horizontal group prior to Issue 9D of the incoming register link drawing. The LU leads associated with the AP relays appear on the top row of 16 punchings. The LU lead associated with the lowest numbered AP relay appears on punching 1, and the LU lead associated with the highest numbered AP relay appears on punching 15. The LU0 through LU9 leads associated with the trunk number (TN-) relays appear on the bottom ten punchings of the terminal strip. The LU0 lead is located on punching 1 and the LU9 lead is located on punching 10. These punchings are used when AP relays are associated with trunks requiring line link appearances.

(F) Terminal Strip M (Earlier Type Frames)

4.07 This terminal strip is supplied for each group of auxiliary preference (AP-) relays associated with a particular horizontal group prior to Issue 9D of the incoming register link drawing. The LT leads associated with the AP relay appear on the top row of punchings. The LT lead associated with the lowest numbered AP relay appears on punching 1, and the LU lead associated with the highest numbered AP relay appears on punching 15. The LT0 and LTE leads associated with the trunk number (TN-) relays appear on the bottom row of terminals. The LT0 lead is located on punching 1 and LTE is located on punching 15. These punchings are used when AP relays are associated with trunks requiring line link appearances.

(G) Terminal Strips REG 0 Through REG 9

4.08 These terminal strips are located at the top of the basic and auxiliary frames.

4.09 Trunk Link Frame Group (Tens) Punching: The FG0 and FG1 leads from the incoming registers are used to indicate the tens digit of the trunk link frame number for each horizontal group. If auxiliary frames are not provided:

FG0 lead appears on punching 48.

FG1 lead appears on punching 49.

If auxiliary frames are provided:

FG0 lead appears on punching 66.

FG1 lead appears on punching 67.

Note: This change provides for switching trouble recorder leads (see Paragraph 1.06).

Each horizontal group has a TF- relay for each incoming register served by the link. These TF relays function with and are numbered the same as the horizontal group (HG-). On all basic and auxiliary frames the horizontal group trunk link frame tens group indicating punching (9T contact of the TF relay) appears as follows:

Horizontal Group 0 - (TF0 relay) on punching 55.

Horizontal Group 1 - (TF1 relay) on punching 56.

Horizontal Group 2 - (TF2 relay) on punching 57.

Horizontal Group 3 - (TF3 relay) on punching 58.

Horizontal Group 4 - (TF4 relay) on punching 59.

4.10 Direct Pulse and Bylink Punchings - Dial Pulsing Link Groups: The incoming register DPG (F punching) and BLG (E punching) leads appear as follows:

Direct pulse (DPG) appears on punching 43.

Bylink (BLG) appears on punching 44.

Each horizontal group has a CL- relay for each incoming register served by the link. These CL relays function with and are numbered the same as the horizontal group (HG-). On the basic and auxiliary frame the horizontal group type of pulsing D punchings (11T contact of the CL relay) appear as follows:

Horizontal Group 0 - (CL0 relay) on punching 50.

Horizontal Group 1 - (CL1 relay) on punching 51.

Horizontal Group 2 - (CL2 relay) on punching 52.

Horizontal Group 3 - (CL3 relay) on punching 53.

Horizontal Group 4 - (CL4 relay) on punching 54.

(H) Terminal Strip TN

4.11 This terminal strip is supplied for each incoming register serving trunks having line link appearances and therefore requiring number group trunk numbers. The REG lead from 11T contact of the TF relays and the SUP lead from 11T contact of the CL relays appear on this terminal strip. On the later type frames the REG and SUP leads appear on punchings 30 and 29, respectively. The REG and SUP lead punchings will be cross-connected to SUP, REG, SUP1 or REG1 on punchings 25, 26, 27, and 28, respectively, as required to give proper trunk number indications. On earlier type frames the leads are associated directly and therefore no cross connections are required.

(I) Terminal Strips on Distributing Frame

4.12 These terminal strips are supplied when flexible trunk to incoming register link association is required as discussed in Paragraph 1.03. The punchings of the incoming register link are designated by IRL number and switch vertical. The punchings of the trunk equipment are designated by relay rack number and circuit. The T, R, F, D, CO, BL, and ST punchings appear on these terminal strips.

5. ASSIGNMENTS

5.01 The following limitations govern the general assignment of trunks to the incoming register link frame switches:

(a) All trunks in the same horizontal group (20 to 40 trunks) shall be located within the same group of ten trunk link frames, 0 to 9 or 10 to 19. This limitation makes it desirable to give consideration initially to whether or not the ultimate marker group will have trunk link frames 10 to 19. For link groups where the ultimate number of trunks is less than 200 and the number of trunk link frames is greater than 10, horizontal groups shall be reserved for those trunks which will appear on added trunk link frames.

(b) A minimum of two horizontal groups will be furnished in each link group. When the number of trunks initially connected to a link frame is less than 40, they shall be divided between the two link switches so that approximately half of each type of trunk will appear in each of the two horizontal groups. These trunks shall be assigned to routes so that the trunks in any one route will be distributed over the two horizontal groups.

(c) Where a dial pulse incoming register link frame is used for both bylink (repeated pulsing) and direct pulse trunks, two horizontal groups are required for the bylink trunks and two for the direct pulse trunks, since both types can not be assigned in the same horizontal group. Each of these two initial sets of two switches will serve up to 40 trunks.

(d) In general, a basic frame shall be filled before starting a supplementary or auxiliary frame. When a dial pulse basic and supplementary frame arrangement is used with direct pulse and bylink type trunks, space shall be reversed on the basic frame for trunks requiring line link appearances because these can not be assigned to the supplementary frame. In general, the trunks from one trunk link frame associated with a link group shall be assigned in order to the verticals of one or more link switches before proceeding to the assignment of trunks from the next trunk link frame. However, when a large number of trunks are assigned to one location on only a few trunk link frames for an "overflow" appearance, these so-called "bunched" trunks shall be assigned to individual verticals on the incoming register link switches in at least two horizontal groups.

(e) Vertical 00 of horizontal group zero (HG0) on the basic frame of a link group is reserved for register testing. Therefore, no incoming trunk shall be assigned to this vertical.

(f) Two-way intertoll trunks arranged for pulse conversion are assigned two link switch appearances, one associated with the switchboard and one with the inward call. Only that register link appearance associated with the inward call requires an auxiliary preference relay for establishing the trunk number for the line link appearance of these trunks. Where a trunk receives the same kind of pulsing from both the associated switchboard and the connecting office on an inward call, both link appearances will normally be in the same incoming register link group. However, if there are two groups of registers, which incidentally may register different numbers of digits such as seven digits for tandem and four or five digits for local traffic, it may be desirable to assign one of the appearances in each register link group.

(g) Restrictions on assignment of trunks to the various frames are summed up as follows:

Condition	Type of Frame
Dial pulse - bylink trunks	Basic and Auxiliary
Dial pulse - non-bylink trunks	Basic, Auxiliary, and associated Supplementary
Dial pulse - trunks having line link appearances	Basic, Auxiliary, and associated Supplementary without bylink; Basic or Auxiliary with bylink
Multifrequency with or without line link appearances	Basic, Auxiliary, and associated Supplementary
Revertive pulse	Basic, Auxiliary, and associated Supplementary
Tandem revertive pulse	Basic and Supplementary
"B" switchboard	Basic and Supplementary

5.02 The assignment of trunks having line link frame appearance to link switch verticals and the assignment of trunk numbers in the number group frame shall be coordinated within the following limitations.

(a) A tandem or intertoll trunk is identified in the incoming register link (IRL) by a so-called "frame" indication and 2-digit number. The units digit of the number corresponds to the units digit of the switch vertical to which the trunk is connected. The tens digit corresponds to the associated LT lead number. The tens digit leads are connected so that the vertical units of the five switches, with 20 verticals each, can be numbered 00 to 99, the numbers of the ten verticals located on the left half of the five link switches having even tens digits and units digits 0 to 9, and those located on the right half having odd tens digits and repeated units digits 0 to 9.

HOR GRP	Verticals	Lead	LU Lead
0	00-09	LT0	0-9
0	10-19	LT1	0-9
1	20-29	LT2	0-9
1	30-39	LT3	0-9
2	40-49	LT4	0-9
2	50-59	LT5	0-9
3	60-69	LT6	0-9
3	70-79	LT7	0-9
4	80-89	LT8	0-9
4	90-99	LT9	0-9

The "frame" indication is determined by the association of either of two leads (SUP or REG) with one of the four leads designated REG, REG1, SUP, and SUP1.

(b) The REG, REG1, SUP, or SUP1 lead and the tens digits of the IRL identification number are translated together in the incoming register into hundreds and tens digits of a number group trunk number as follows. In the dial pulse registers each combination of REG lead and "LT" digits 0 to 9 can be translated to different number group trunk number hundreds and tens digits. These digits may be any number. Each combination of SUP lead and "LT" digits 0 to 9 can be translated to only one number group trunk number hundreds digit which may be any number but the "LT" digit translation must correspond to the translation for the same "LT" digit associated with the REG lead. In the tandem revertive pulse register and in the multifrequency pulse register each combination of REG and SUP lead, and "LT" digits 0 to 9 can be translated to different number group trunk number hundreds and tens digits. These digits may be any number. In addition, in the MF register each combination of REG1 and "LT" digits 0 to 9 can be translated to only one number group trunk number hundreds digit but any trunk number tens digit. These digits also may be any number. Also in the MF register, each combination of SUP1 and "LT" digits 0 to 9 can be translated to only one number group trunk number hundreds digit which may be any number but the "LT" digit translation must correspond to the translation for the same "LT" digit associated with the REG1 lead.

(c) The number group trunk number units digit corresponds to the IRL identification number units digit, since the indications received on the associated "LU" leads are not translated in the registers.

(d) In a link group a specified REG, REG1, SUP, or SUP1 indication and 2-digit identification number cannot be used for more than one trunk.

(e) Since each half of a link switch represents a particular tens group of a particular hundreds group of trunk numbers, all the trunks assigned to a specific half switch must have the same trunk number tens and hundreds digits. However, all the ten trunks assigned within the same "ten block" of numbers in the number group need not be on the same half of the link switches on a frame or even on the same incoming register link frame, provided that in assigning switch verticals to that group of trunks there is no duplication of the units digits 0 to 9.

6. CROSS CONNECTIONS

6.01 The cross connections required for each trunk and the method of making the cross connections are covered below. Cross connections on the REG-, L, and M terminal strips are made on the front of the frame and on the rear or wiring side of the frame for the remaining terminal strips.

> Caution: When cross connections are to be changed or added, service calls shall be protected by removing the trunks in the particular horizontal group from service or by making the changes as quickly as possible during very light traffic periods. Where cross connections changes affect one particular incoming register at a time, the register shall be removed from service.

(A) Trunks with or without Line Link Appearances

6.02 Trunk Link Frame Group (Tens): In offices where less than 11 trunk link frames are equipped and the incoming register FG0 and FG1 relays are not equipped, this cross connection will not be required. In all other offices the frame group cross connection is required. The terminal strip and punching information is discussed in Paragraph 4.09. On each of the terminal strips the punchings of the horizontal group TF- relays indicating the same trunk link frame tens should be strapped and a single cross connection should be run to the FG0 or FG1 punchings.

6.03 Trunk Link Frame Units: This cross connection is required for all trunks in the link group. The terminal strip and punchings are discussed in Paragraph 4.03. The A punchings of all TP relays within a group of twenty that are located on the same trunk link frame should be strapped and a single cross connection run to the proper trunk link frame units A- punching.

6.04 Dial Pulsing Trunks - Bylink or Direct Pulse Type: This cross connection is required when bylink trunks are used in dial pulsing

link groups. The terminal strip and punchings are discussed in Paragraph 4.10. On each of the terminal strips the D punchings of the horizontal group CL- relays that require the same indication shall be strapped and a single cross connection run to the proper DPG (F) or BLG (E) punching.

6.05 Flexible Trunks (Non-Bylink Only): The terminal strips and punchings are discussed in Paragraph 4.12. The punchings associated with the incoming register link switch and vertical are cross-connected to the punchings associated with the trunk equipment. Whenever changes are made in the flexible trunk distributing frame cross connections, the cross connections on the link frame may change dependent upon nature of the change in regard to type of pulsing, trunk link frame number, class of trunk, and number of group trunk number.

(B) Trunks with Line Link Appearances

6.06 Trunk Class and Auxiliary Preference Relays: The terminal strips and punchings are discussed in Paragraphs 4.02, 4.04, and 4.05. The B punching on the C1 terminal strip for the TP relay should be individually cross-connected to the B punching on J terminal strip associated with a similarly designated AP relay. The C punchings of the AP relays on the K terminal strip that require the same trunk class should be strapped together and a single cross connection run to the proper C punching on C1 terminal strip.

6.07 "Frame" Indication (Later Type Frames): The terminal strips and punchings are discussed in Paragraph 4.11. The punching associated with the REG lead (for basic and auxiliary frame) or SUP lead (for supplementary frames) should be individually cross-connected to the proper SUP, REG, SUP1, or REG1 punching.

6.08 LT EVEN and LT ODD Leads (Earlier Type Frames): The terminal strips and punchings are discussed in Paragraph 4.07. The punchings of the AP relays that require the same indication should be strapped together and single cross connection run to the LTE or LTO punching associated with the horizontal group TN relays.

6.09 LU Leads (Earlier Type Frames): The terminal strip and punchings are discussed in Paragraph 4.06. The punchings of the AP relays that require the same units indication should be strapped together and a single cross connection to the LU- punching associated with the horizontal group TN relays.

(C) Trunks without Line Link Appearances

6.10 Trunk Class: This cross connection is required for all trunks in the link group. The terminal strips and punchings are discussed in Paragraph 4.02. The B punchings of all TP relays within a group of twenty that require the same class should be strapped and a single cross-connection run to the proper class C punching.

7. REPORTS

7.01 Any required record of the cross connections should be entered on the proper form.