SWITCHING SYSTEMS MANAGEMENT
NO. 5 CROSSBAR (2-WIRE)
CROSS-CONNECT ASSIGNMENTS AND
EQUIPMENT BALANCING PROCEDURES

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1. GENERAL

1.01 This Dial Facilities Management Practice (DFMP) describes the completion of forms used to record cross-connection assignments and other pertinent data associated with cross-connections for the No. 5 Crossbar System.

1.02 Whenever this section is reissued, the reason for reissue will be listed in this paragraph.

1.03 The title for each figure includes a number in parentheses which identifies the paragraph in which the figure is referenced.

1.04 The forms included in this section may not be inclusive of all forms used by administrative personnel. They do represent the majority of forms for which the network administrators are responsible. This section does not include an explanation for entries from source drawings, as SDs, CDs, etc. The forms used, with some minor exceptions, are as found in Section 218-012-301—Cross-Connection and Record Forms—No. 5 Crossbar Offices.

1.05 This section addresses the subject of cross-connections. In particular, it provides both general and procedural information as to the development of certain of the cross-connection forms as found in Section 218-012-301 or a variation thereof used by some operating telephone companies (OTC). The user of this section must be proficient in reading and working with the various Western

Electric drawings required in dial assignments (office drawings xx------413, xx------414, etc). The proper administration/assignment via cross-connections is very important in providing quality telephone service at a reasonable cost, and those who make said assignments share an integral role in assuring customer satisfaction and maximum system utilization.

1.06 Cross-connection forms are developed by Western Electric for Bell System use. Listed below are the forms required by network service personnel responsible for preparing either initial or additional trunk assignments.

- Incoming Register Link Cross-Connection
- Outgoing Sender Link Cross-Connections and Assignments
- Trunk Link Cross-Connections A and B Appearances
- Traffic Register and Pin Jack Assignments
- Marker Cross-Connections
- Detailed Trunk Records

1.07 The aim of these assignments is to meet as nearly as possible the following objectives:

(a) Equal distribution of traffic over trunk link frames and switches on these frames so channels between these switches and link frames will carry balanced loads

(b) The reservation of sufficient spare locations for each trunk group so growth can be provided during the installation period without major trunk rearrangements

(c) Balanced loading of outgoing sender groups and incoming register groups when more than one group of a particular type of pulsing is provided.

Office drawings most commonly used in making No. 5 Crossbar cross-connections are:

- T--XX---413—Trunk Link Frame (TLF)
- T--XX---240—Outsender Link Frame (OSL)
- T--XX---414—Outgoing Trunks vs Outsender Groups
- T--XX---420—Incoming Register Link (IRL)
- T--XX---421—Incoming Register Link

  T--XX---422—Incoming Register Link
- T--XX---435—Traffic Usage Recorder (TUR) Assignment
- X--XX---5260—Peg Count (Message Register)

  X--XX---5265—Peg Count (Message Register)

Prior to any assignment (addition or change) it is recommended that the numbering of all pertinent frames be checked with the latest office drawings.

1.08 The following paragraphs present general information for equipment areas affected by cross-connections. This information is not procedural but rather informative background for the procedural process.

2. TRUNKS/TRUNK LINK FRAME

2.01 In the No. 5 Crossbar System, each trunk routing has a TB and TG cross-connection in the marker. The TB marker cross-connection directs one of the TB relays to operate in the trunk link connector circuit.

2.02 Evolutionary developments have resulted in three types of basic trunk link frames; these are related to the regular large crossbar switch, the large switch-modified, and the small or miniswitch. Generally, the basic trunk link frame is thought of as having a capacity of 160 trunks and/or registers. However, those frames which employ the modified switch or the miniswitch can terminate 200 trunks and/or registers. The 160 trunk switch appearances on the basic frame are obtained by utilizing eight of the ten levels on each switch and dividing the levels so there are two trunk appearances on each level. The horizontal level 0 or 1 of each switch, together with a select magnet associated with a level (2 through 9), determines which of the two trunks on that level is to be used. Trunk connections using the number 0 select magnet are called "A" appearance trunks, and those using the number 1 select magnet are called "B" appearance trunks. The miniswitch is a 6-wire,

12-level, 20-vertical trunk switch and the increased capacity of these frames is obtained by having the 12 levels. The 200-size trunk link frame contains 100 FA and 100 FB relays numbered FA(00-99) and FB(00-99) which are hardwired to A and B appearances of trunk switch levels 0 through 9. The appearances are cabled to trunks and originating registers via contacts of FA or FB relays.

2.03 All trunks requiring ringing, that is, incoming, intraoffice, revertive ringing, station ringer test, and intermarker group trunks are associated with a ringing selection switch and are assigned to B appearances.

2.04 Originating registers are associated with A appearances, and outgoing trunks may be associated with either an A or B appearance.

2.05 Intraoffice trunks require both an A and B appearance. The A appearance (calling end) of the trunk is assigned to the same level as the B appearance (called end) but on the next lower numbered switch.

2.06 Operator trunks requiring pulse conversion may be associated with either an A or B appearance.

2.07 The association of trunks or registers with A and B appearances of the trunk switches is shown in table A.

TABLE A

TYPE OF CIRCUIT	APPEARANCE
Intraoffice Trunk — Calling End A / Called End B	A and B appearances on same level but on different trunk switches
All other trunks requiring ringing selection switch	B
All trunks not requiring ringing selection switch	A or B
Originating registers	A

2.08 Intermarker group trunks, used to complete traffic from either a subscriber or incoming trunk in the calling marker group to a subscriber in the called marker group, shall be considered as outgoing trunks in the calling marker group, and as incoming trunks in the called marker group. Where traffic is from a subscriber in the calling marker group to an outgoing trunk in the called marker group, the intermarker group trunk shall be considered as an outgoing trunk in the calling marker group.

2.09 A maximum of 120 routes may be assigned on a trunk link frame.

2.10 Various trunks are available which are used specifically for operation with the No. 5 Crossbar System. These trunks include incoming, outgoing, intraoffice, test, maintenance, and other miscellaneous units required for system operation and are listed in detail in the trunk tables J29261, Section 819-600-150.

2.11 Assignments are prepared to associate a specific trunk equipment with a traffic trunk group and trunk number. Trunk assignments and trunk link frame administration should have the following basic objectives:

(a) Trunks of each group should be spread over all trunk link frames as equally as possible so as to reduce the chance of blockage.

(b) Trunk distribution should result in an equal hundred call seconds (CCS) load on each trunk link frame.

2.12 The cross-connections largely reflect the assignments furnished in the traffic order, but until the advent of the "miniswitch" the network administrator was severely limited in the utilization of trunk equipment because of the fixed TB relay association with trunk switch and level. "Miniswitch" trunk link frames provide complete flexibility of TB relay assignments. The "modified" and "old" trunk link frames have limited flexibility of TB relay assignments which does not permit the network administrator to affect full trunk equipment utilization when required to meet service problems. Certain assignment functions have been imposed on the network services force because of the flexible (nonstandard) trunk block (TB) relay-busy test (BT) lead assignment capabilities. These assignments are required to comply with mechanized

trunk maintenance such as centralized automatic reporting on trunks (CAROT) and automatic transmission measuring system (ATMS).

2.13 There are many types of trunk equipments which can be used only for particular trunk groups and which will not normally be administered on a week-to-week basis. Such types as intraoffice trunks, intermarker group trunks, combination tone trunks, common overflow trunks, are in this category.

TRUNK LINK FRAME LOCATION ASSIGNMENTS

2.14 The introduction of the small switch (SS), or miniswitch trunk link frame has resulted in two general systems of trunk assignment. Trunk and originating register assignments on large switch (LS) frames are governed by a rigid set of rules that conform to the limiting arrangements (TB relays) of trunk selection and ringing functions (except when the option to provide flexibility for TB0-3 to be associated with any level 2 through 5 is applied).

2.15 The network designer assigns trunks and originating registers to LS and large switch-modified (LS-M) trunk link frame locations by including assignment charts similar to Fig. 1 or 2 in the network design order. The assignment procedure and location information for LS and LS-M frames are covered in 2.16 through 2.43. The SS frames are completely flexible in regard to trunk selection and have a more versatile ringing switch arrangement. The Western Electric Company will assign trunks and originating register locations to SS frames as covered in 2.44 through 2.52 unless the network designer requests specific assignments and includes assignment forms similar to Fig. 3 for the new SS frames in the network design order.

A. Location of Trunks and Originating Registers on LS and LS-M Trunk Link Frames

2.16 The following assignment recommendations are specifically for LS trunk link frames and levels 2 through 9 of LS-M trunk link frames. Levels 0 and 1 of LS-M frames can be used for outgoing, incoming, intraoffice (except when ringing selection direction is employed), or 2-way trunks as required. The arrows on the left side of the trunk assignment form (Fig. 2) show the general order of making assignments for LS frames.

2.17 ***Intraoffice Trunks:*** These trunks are a combination of outgoing and incoming trunks. When an outgoing trunk is used, it must be selected by the marker; the outgoing ends of the trunks require a TB relay. Since the incoming end is associated with a ringing selection switch, it must be assigned to a B appearance. Both appearances of a particular trunk are on the same trunk link frame and on the same level, but the A appearance is on the next lower numbered switch from the B appearance. Number 9 is considered as next lower than 0 in making these assignments.

2.18 These trunks are assigned sequentially to level 6, 7, 8, or 9 since these levels do not have a TB relay associated with the B appearances. In addition, intraoffice trunks may not be assigned to levels 0 and 1 when ringing selection direction is employed since intraoffice trunk operation is not possible when both A and B appearances are equipped for ringing.

2.19 ***Reverting Call Trunks:*** Reverting call trunks require both ringing selection switches and TB relays. They are assigned to B appearances on level 2, 3, 4, or 5, usually starting at 5B and continuing downward on the form.

2.20 ***Two-Way Intertoll Trunks:*** Two-way intertoll trunks are considered in two categories. When these trunks are selected by the marker as outgoing trunks, they require TB relays. When selected by the marker as incoming trunks, they require ringing selection switch locations. Therefore, they must be assigned to B appearances on level 2, 3, 4, or 5. They usually start at 5B and continue downward on the form.

2.21 When more than 40 two-way intertoll trunks per trunk link frame are required, the A appearance of level 6, 7, 8, or 9 may be used if no trunks are assigned to the corresponding B appearance. When so assigned, the B as well as the A appearance is required for the particular 2-way intertoll trunk and the trunk capacity of the trunk link frame is reduced correspondingly.

2.22 In some cases, the 2-way intertoll trunks appear on the switches for incoming traffic only with an appearance at a toll board used for all outward traffic. In such cases, the trunks do not require TB relays but require ringing selection switches. Assignments may be made to any B appearance, but because of the possibility of a

future need for selecting the trunks by marker action for outgoing calls, the usual practice is to make assignments as described in 2.21.

2.23 ***Originating Registers:*** Originating registers require TB relays. The circuit operation requires they be assigned to level 2A starting with switch 0 and continuing consecutively to the higher numbered switches.

2.24 ***Outgoing Trunks:*** Outgoing trunks require TB relays but have no need for ringing selection switches. Assignments are made in order to the A appearances of level 2, where the originating registers end, and continue upward to meet the outgoing end of the intraoffice trunks through to level 9. They are then continued to the B appearances of levels 2, 3, 4, and 5.

2.25 Those types of equipments used for only one trunk group must all be assigned to the same TB relay. The exception would be with allotted trunk groups. When trunks of an intraoffice or outgoing trunk group require appearances in two trunk blocks on one trunk link frame or appearances in two outsender groups, or both, a 2-step allotter is provided so the marker can select one of the two trunk blocks for testing.

2.26 Outgoing- and intraoffice-type trunks are tested for an idle condition (20 at a time) by the marker; ie, the 20 BT leads cross-connected to a particular TB relay are cut through to a marker at one time. If there are more than 20 trunks in a trunk group connected to a trunk link frame, the marker provides for allotting calls to trunks associated with two TB relays by means of a 2-step allotter circuit. With this feature, there may be a maximum of 40 trunks in a trunk group associated with a trunk link frame. If there are between 20 and 40 trunks in a group, they should be divided so as to have approximately the same number in each allotted group, so the trunks in the two subgroups will be used equally and marker holding time will not be increased by unnecessary stepping of the allotter circuit. If there are 20 or fewer trunks in a group, all trunks should be associated with the same TB relay so the marker will not have to allot calls on these routes at all. When a trunk group of fewer than 20 trunks is allotted to two sender groups, they should also be associated with two TB relays.

2.27 ***Ringer Test Trunks:*** Ringer test trunks require both a TB relay and ringing selection switches. They are assigned to B appearances on level 2, 3, 4, or 5, usually starting at 5B and continuing downward on the form.

2.28 ***Intermarker Group Trunks*** are trunks used for completing traffic which originates in one marker group (the calling marker group) and completes to equipment in another marker group (the called marker group). Where the traffic is from either a ***customer*** or incoming ***trunk*** in the calling marker group ***to a customer*** in the called group, the intermarker group trunk shall be considered as an outgoing trunk in the calling marker group, and as an incoming trunk in the called marker group. It shall be assigned to the trunk link frames in the respective marker groups as indicated above for outgoing and incoming trunks. Where the traffic is from a ***customer*** in the calling marker group ***to*** an outgoing ***trunk*** in the called marker group, the intermarker group trunk shall be considered as an outgoing trunk in the calling marker group and as an incoming tandem only trunk in the called marker group. For call completion, this type of intermarker group trunk has only a line link frame appearance in the called marker group and the trunk link appearance, for overflow, may be multipled.

2.29 ***Incoming Trunks:*** All types of one-way incoming trunks require a ringing selection switch but do not require a TB relay. These trunks may be incoming interoffice trunks, tandem trunks, one-way intertoll trunks, and various others for which at least some of the calls terminate in the No. 5 office.

2.30 The incoming trunks start at level 9B and continue downward through the B appearances until they meet the terminating appearances of the intraoffice trunks. They skip the terminating appearances of these latter trunks and the appearances of the 2-way intertoll, revertive ringing, and ringer test trunks and then continue downward to level 2B.

2.31 ***Master Test Frame:*** One location on a B appearance on any trunk link frame is required for the master test frame to obtain access to customer lines. This location is assigned as if it were an incoming trunk.

2.32 ***Bunched Trunks:*** Trunks outgoing from the switchboard, which require appearances

on the No. 5 equipment for marker pulse conversion and a few types of trunks which are used entirely for calls to be switched through the No. 5 equipment, require locations on trunk link frames so the marker may obtain access to them for setting up an overflow signal under certain conditions. Several of any one type of these trunks may be multipled at one trunk link frame location since these trunks offer no load to the trunk link frame and are only seized occasionally. The location used may be either an A or B appearance, but the level used must be equipped with a ringing selection switch. In general, an A appearance is preferred in order that the corresponding B appearances may be used for a trunk requiring a ringing selection switch.

2.33 The types of trunks assigned bunched appearances are as follows:

(a) AMA, CAMA, coin, message register, or operator junctors

(b) CAMA incoming tandem without local completion

(c) CAMA intermarker group—customer-to-trunk

(d) Intermarker group—customer-to-trunk

(e) Pulse conversion trunk.

2.34 At least two bunched appearances for each type of trunk are assigned. Where pulse conversion trunks are required, two or more appearances are provided for each type of outpulsing, revertive pulsing (RP) or dial pulsing (DP), depending on the number of trunks. The pulse conversion trunks, like the other bunched trunks listed in 2.33, impose no load on the trunk link frames, but must be seized through their bunched appearance for each call. Therefore, to avoid excessive marker frame delays, it is important these trunks be distributed over several trunk link frames.

2.35 Where CAMA trunks not equipped for local completion are provided, all trunks using a bunched appearance on a trunk link frame must be assigned to the same recorder and have the same type of outgoing supervision.

B. Assignment Procedure for LS and LS-M Trunk Link Frames

2.36 In making the assignments of trunks, proceed in the order in which the trunks are shown in Fig. 4. Under each major category, the types are assigned in descending order by the number of equipments provided. Each type of trunk is assigned on all trunk link frames before proceeding to the next type in order to keep the frames as nearly alike as possible. When possible, each level is completely filled as trunks are assigned to it.

2.37 One ringing selection switch serves the trunk assigned to the ten switches on a particular B appearance and level. To minimize ringing selection switch requirements, confine the trunk equipments requiring such association to as few levels as possible.

2.38 When locations are to be reserved for particular types of trunk equipments for future use, the assignments are made as though the trunks were being provided initially with suitable notations to indicate the reserved status. Except for known requirements, it is usually unnecessary to reserve locations on the trunk link frames for specific purposes. In general, the number of originating registers and trunks per trunk link frame will tend to decrease as additions are made to an office. In an area where the number of offices in service is increasing rapidly, a few locations may be reserved as spare on the TB relay used for outgoing interoffice trunks.

2.39 In order to minimize the loss in call carrying and common control capacity that results from trunk link frame imbalances, relocate trunk terminations on trunk link frames. With careful planning, the network designer can achieve balanced frames by distributing trunks in relation to their anticipated load (table B) rather than trunk quantity.

TABLE B

TRUNK TYPES	LOAD
Originating register	Heavy
Intraoffice (both appearances)	Heavy
Permanent signal hold	Heavy
Outgoing	Medium
Two-Way trunks	Medium
Incoming	Medium
Intermarker group	Medium
Recording and completing	Medium
Information desk	Medium
Combination tone	Medium
Common overflow	Light
Test desk	Light
Repair service	Light
Business office	Light
Miscellaneous trunk types	Light

2.40 On the basis of the typical trunking requirements shown in Fig. 4, the assignment of trunks to trunk link frame 00 is shown in Fig. 1 for a nonmechanized order and in Fig. 2 for a mechanized order. A similar layout is required for each LS and LS-M trunk link frame. These frame layouts become a part of the network design order. The equipment engineer should be consulted to determine if mechanized or nonmechanized forms should be used.

C. Trunk and Originating Register Locations and Assignment Procedures for SS Trunk Link Frames

2.41 When SS trunk link frames are provided, the network designer will include a trunk assignment summary (Fig. 5) in the network design order which specifies the quantities of originating registers and trunks desired on each trunk link frame. The Western Electric Company engineer will then assign the specified quantities of originating registers and trunks to trunk link frame locations in accordance with the guidelines for assignment procedure and location restrictions that follow.

2.42 ***TB Relay Assignments:*** The TB relay association on SS frames is completely flexible in that any trunk link appearance (maximum of 20 appearances per TB relay trunk link frame) can be cross-connected to any TB relay. The TB relay cross-connections are not covered in the network design order. This information should be provided by the network administrator at the time of installation.

2.43 ***Trunk Link Frame Switch Load Balance:*** The Western Electric Company engineer will balance the load within the trunk link frame by spreading the various trunks as evenly as possible over all the switches in the frame. The network designers control frame load balance by the quantity of trunks assigned to each trunk link frame.

2.44 The Western Electric Company engineer uses the following procedure to achieve switch load balance:

(a) The various types of trunks to be assigned in the frame are ranked by the load carried in accordance with table B.

(b) Where 35 or more trunks of a particular trunk type are provided for a single trunk group, these trunks should be considered as being in the "heavy" usage category, that is, AMA junctors, etc.

(c) Trunks requiring "bunched" TLF appearances need not be considered in balancing switch loads.

(d) The trunks are then distributed over the trunk switches by loading category. First, all of the heavy usage trunks are evenly distributed over the switches, then the medium usage trunks, and finally the light usage trunks are assigned.

2.45 ***Ringing Selection:*** All trunks with local completion are connected to a ringing selection switch. These trunks include incoming, intraoffice, revertive ringing, intermarker group, and 2-way intertoll trunks. Each ringing selection switch can be associated with a maximum of ten trunks that require ringing. Ringing switches may be associated with any 10 (A and B) levels (maximum 100 trunks).

2.46 Normally, each ringing selection switch is associated with trunks assigned to one level. Where there are ten or less trunks that require

ringing and are assigned to two or more levels, they may be multipled and connected to one ringing selection switch. Office records should be marked to indicate this arrangement. (This arrangement is not recommended.)

2.47 A feature known as ringing selection direction is provided on all trunk link frames which utilize the SS and as an optional feature on frames which utilize the LS-M. This feature, when properly cross-connected, permits the association of the A appearances of two trunk switch levels (any two levels on SS frames or levels 0 and 1 on LS-M frames) with ringing selection switches. This arrangement permits a maximum of 120 appearances on LS-M and SS frames to be associated with ringing selection switches.

2.48 Originating registers and trunk types will generally be assigned as follows:

(a) ***Originating registers:*** Originating registers must be assigned on level 2A of trunk switches 0 through 9. This restriction is necessary since the dial tone marker is usually only arranged to test circuits assigned to TB relay 0, BT leads 0 through 9. Up to ten originating registers may be assigned to any of the 100 "A" appearances of the new trunk link frame; however, these registers must still be assigned to TB relay 0, BT leads 0 through 9. In offices arranged for local overload announcement features, the dial tone marker circuit is modified to permit testing ten circuits assigned to each of the TB relays 0 through 5. However, the same restriction described above will continue to apply to the assignments for originating registers. In addition, common overflow trunks arranged for local overload announcement features must be assigned to one of the TB relays 1 through 5, BT leads 0 through 9.

(b) ***Intraoffice Trunks:*** See 2.17 for assignment information.

(c) ***Two-Way Trunks:*** There are two types of 2-way trunks: 2-way trunks to CDOs and 2-way intertoll trunks. Both types require a ring switch association although ringing is not required for the 2-way trunks to CDOs. These trunks may be assigned to any location on the trunk link frame.

(d) ***Outgoing Trunks:*** These trunks may be assigned to any location on the trunk link frame. They do not require ring switch association and should be assigned to levels which are not used for ringing puposes.

(e) ***Incoming Trunks:*** These trunks require ring switch association and should be located on any level which is associated with a ringing selection switch.

(f) ***Bunched Trunks:*** Some through-switched trunks require a FA or FB relay appearance, but not the switch crosspoints on the trunk link frame, so an overflow signal may be set in the trunk. Several of any one type of these trunks may be multipled to one trunk link appearance. All types of bunched trunks should be assigned on any level of the least loaded trunk link frame switch. The B appearance should be used as a first choice.

(g) ***Pulse Conversion Trunks:*** These trunks require association with a ringing selection switch but do not require ringing. All trunks are multipled together and assigned to one location which may be either an A or B appearance.

(h) ***Junctors:***

(1) Operator junctors should be assigned in a manner similar to that described for incoming trunks.

(2) Auxiliary junctors have an originating appearance on the trunk link frame and a terminating appearance on a line link frame in the same marker group. The auxiliary junctors require association with a ringing selection switch but do not require ringing. They have overflow appearances which may be multipled together to one location and may be either an A or B appearance.

(i) ***Intermarker Group Trunks:*** These trunks are used for completing traffic which originates in one marker group (***calling*** marker group) and completes in another marker group (***called*** marker group). The telephone company trunk summary chart will indicate which trunks are to be used for ***calling*** and those which are to be used for ***called*** operation on each trunk link frame.

(1) ***IMG—Calling Marker Group:*** Trunks should be considered as outgoing trunks and assigned accordingly.

(2) ***IMG—Called Marker Group:*** Trunks should be considered as incoming trunks and assigned accordingly. All IMG trunks on one trunk link frame, which are used for customer-to-trunk operation (identified as "IMG S to T" in the J section), should be multipled together and assigned to one "bunched" trunk link appearance.

(j) ***Master Test Frame:*** One trunk link frame appearance (normally on the first frame) is required for testing purposes. The master test frame appearance requires a ring switch association and should be located on any level which is assigned to a ringing selection switch. This location is used for line tests of customer lines and for testing line link pulsing (LLP) trunks and senders.

2.49 A new feature called ringing selection direction may be assigned to any two of the ten trunk switch levels. This feature is provided to permit assigning more than ten trunks on a trunk switch level to ringing selection switches. (The capacity of a ringing selection switch is ten trunks.) When associated with a trunk switch level the ringing selection direction feature requires that trunks on "A" appearance of that level be on one ringing selection switch and the "B" appearance trunks of that level be assigned to a second ringing selection switch.

2.50 In the case of trunk switch levels not using the ringing selection direction feature, any ten of the 20 "A" and "B" appearances on each level may be assigned to a single selection switch. Intraoffice trunks cannot be assigned to levels which are arranged for a ringing selection direction feature. When ringing selection is used, the assignment of the cross-connection of the RL-RD leads will be a Network Management function.

2.51 The new trunk link frame may be equipped for a capacity of 160 trunks in place of the 200 trunk arrangement described above. In this case, the 12-level trunk switches will still be provided but control relays for trunks on levels 8 and 9 will be omitted, hence trunks cannot be assigned on these levels.

2.52 ***Modified Trunk Link Frames:*** These trunk link frames are equipped for 200 trunk appearances and are provided with ten TB relays to permit selection of any desired trunk by a marker. The network design order provides trunk assignment charts which associate trunk equipment by type with TLF switch level and appearance. In addition the network design order provides a trunk summary which will show the TB relay assignments for each trunk group along with the quantity of trunks for each group, plus the quantity of trunks for each type TLF.

2.53 There should be proper association of the network design order information with the appropriate crossbar cross-connection forms. Pursuant to this match, additional data will be extracted from office drawings and entered in the proper columns. The incoming trunk number should be coordinated with originating end and care should be taken to spread the trunks by choice over all frames.

2.54 The association of trunk switch level appearance and BT leads on the modified frame is shown in exhibit A; however, with issue 33D of SD26032 the BT leads of TB relays 0 through 3 can be associated with any levels 2 through 5. This feature is provided by YF option of SD26032-01. The BT lead association shown in exhibit A is considered standard and will be used unless flexible BT lead associations are required to overcome trunking service deficiencies or to improve trunk equipment utilization.

EXHIBIT A

TYPICAL EXAMPLE USING FLEXIBLE TB RELAY – BT LEAD ASSIGNMENTS

Assume the following conditions:

TK GP — Out to 241 (3 tks on TLF 03), 12 trunks total

TB relay — TB 2

Trunk TYPE — 1C36M

RR location — 106.03

TLF location	TLF	SW	LEV	APP
TK #1	03	2	4	A
TK #2	03	5	4	A
TK #3	03	8	4	A
Vacant TLF location	03	6	4	A

Assume also that a 1C36M located on RR 106.05 is assigned to TLF 03 SW 9 level 5A and it is spare equipment.

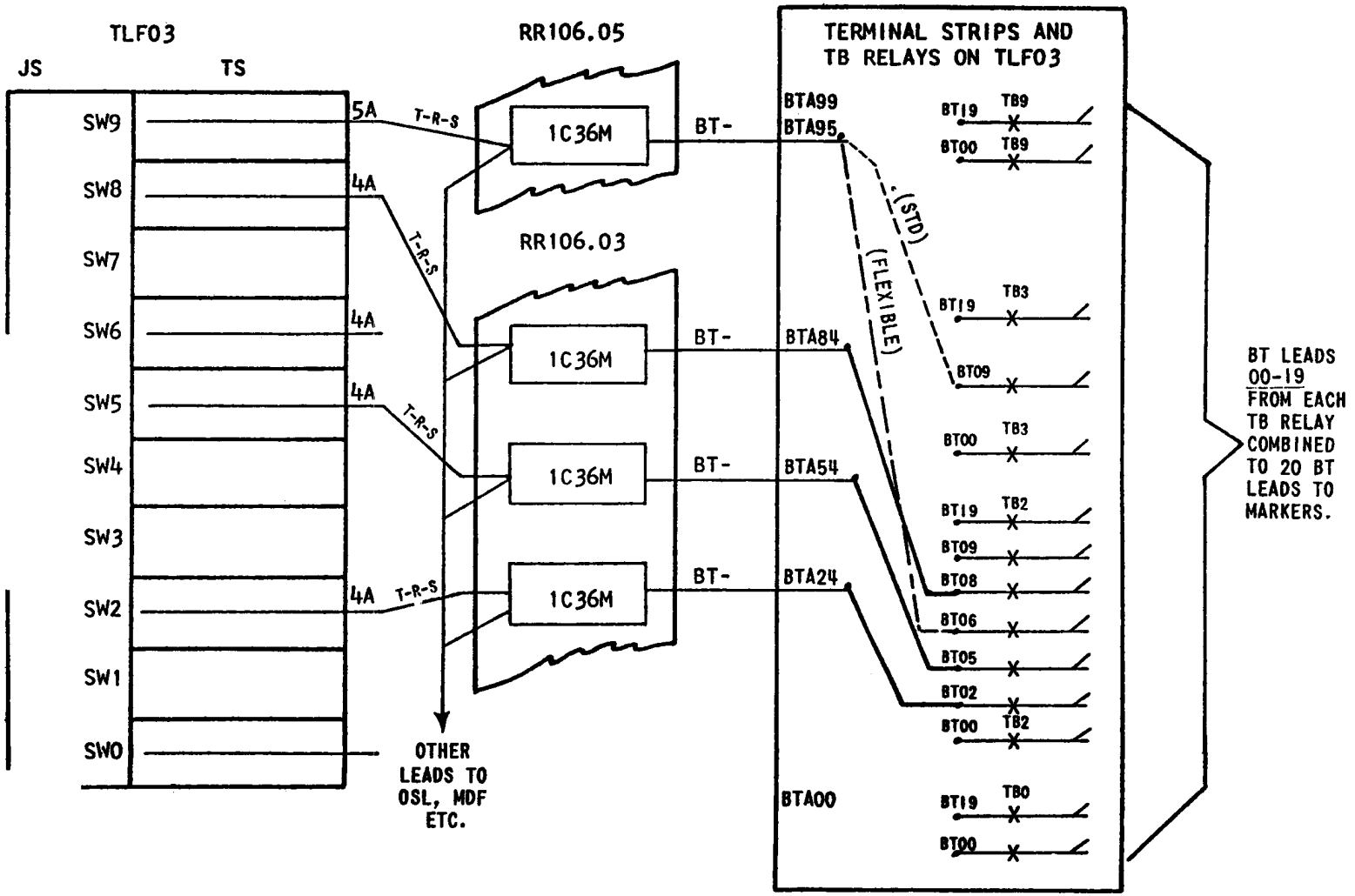
There are no spare 1C36M trunk equipments associated with level 4 (TB2) on this frame so it is desired to utilize the 1C36M located on SW9 level 5A by adding it to trunk Group 241.

Since the marker will be operating TB relay 2 in selecting a trunk to 241 it is necessary to assign at BT lead of TB2 to the 1C36M trunk equipment located on SW9 level 5A (normally TB-3).

The trunk assigner will have to find an unassigned BT lead of TB2 and associate it with the new trunk equipment. In this case switch 6 level 4A is vacant (no TK. EQ. is assigned) and the BT lead for this TLF location is 06. Thus the cross-connection sheets will show for SW9, lev 5 — TB 2, BT, 06.

There are 20 BT leads extended from the marker to each trunk link frame and these are multipled through the contacts of the TB relays on the TLF to provide 200 BT lead terminations on the "new" and "modified" TLF and 120 BT lead terminations on the "old" TLF. Only 20 trunks can be assigned in one TB relay on one trunk link frame; therefore, when network services makes a flexible BT lead association as in the case above it becomes a Network Administrative responsibility to keep track of the BT leads assigned. For example, suppose a 1C36D or other marker selected trunk was later installed on TLF 03 SW6 lev 4 A, then it will be necessary to find a BT lead for that trunk since its "standard" BT lead has been used for the 241 trunk. Of course BT lead 09 in TB 3 is available, but if the 1C36D (or other) trunk is not used in a trunk group assigned to TB 3 then BT09-TB3 could not be used. The result is that once flexible BT lead assignments are made, care must be used in administration of TLF records in order to fully utilize trunk equipment.

Accuracy is a must. Mistakes in this area can cause wiring errors resulting in improper (ATMS/CAROT) trunk testing which in many cases may delay timely turn-up of badly needed trunks.


TLF03
JS
TS
SW9
SW8
SW7
SW6
SW5
SW4
SW3
SW2
SW1
SW0
5A
4A
4A
4A
4A
T-R-S
T-R-S
T-R-S
T-R-S
RR106.05
RR106.03
1C36M
1C36M
1C36M
1C36M
BT-
BT-
BT-
OTHER LEADS TO OSL, MDF ETC.
TERMINAL STRIPS AND TB RELAYS ON TLF03
BTA99
BTA95
BTA84
BTA54
BTA24
BTA00
(STD)
(FLEXIBLE)
BT19
BT00
BT09
BT08
BT06
BT05
BT02
TB9
TB3
TB2
TB0
BT LEADS 00-19 FROM EACH TB RELAY COMBINED TO 20 BT LEADS TO MARKERS.

2.55 The same restrictions outlined under new trunk link frames for assignments or originating registers and local overload announcement trunks to TB relays and BT leads will apply in modified trunk link frames.

2.56 Up to 120 trunks assigned to modified trunk link frames may be associated with ringing selection switches, as in the case of the new trunk link frame. Any ten of the 20 "A" and "B" appearances on each of the trunk switch level 2 through 9 may be associated with a single ringing selection switch. The ringing selection direction feature will also be provided; however, this may be applied to trunk appearances on levels "0" and "1".

> ***Note:*** For old existing TLFs, some frames are equipped for only six TB relays. The network design order shows by trunk link frame assignment charts and the summary of trunks, the type and quantity of trunks for each group and the type and quantity assigned to each trunk link frame with specific switch and level assignments.

2.57 The same limited flexible TB relay-BT lead assignments are permitted on this TLF as on the modified TLF, provided the "YF" option and issue 33D of SD26032-01 are installed. Also, if flexible TB relay-BT lead assignments are utilized, administrative care must be taken as previously discussed. (See Exhibit A.)

2.58 ***Load Balance:*** From a circuit compatibility standpoint, it is possible to install any combination of existing 160 size, modified 200 size, and new design 200 size frames in a given office with certain restrictions. In offices equipped with a mixture of 160 and 200 size frames, the "extra" terminations available in the 200 size should not be used indiscriminately, since this may result in poor matching loss performance due to imbalanced loads.

2.59 In some cases, a moderate imbalance in the number of working terminations in the trunk link frames can be compensated for by concentrating high usage trunks in the frames with the least number of working terminations and low usage trunks in frames equipped with the greatest number of working terminations. The feasibility of balancing frame loads through selective trunk assignments is generally a decision made by Network Administration.

Trunk Numbers

2.60 Each incoming tandem trunk, coin, or other junctor and intermarker group trunk (customer-to-trunk) requires one line link frame appearance; each incoming intertoll trunk requires two line link frame appearances. Each trunk is identified on the incoming register link frame by a 3-digit trunk number corresponding to a number group (NG) frame directory number assignment. This number appears in each of the two NGs selected for trunk assignments. In the case of a tandem trunk, coin junctor, and intermarker group trunk, the cross-connection is the same in both number group frames corresponding to the one line link frame appearance. In the case of an intertoll trunk, one number group has the cross-connection for one line link frame appearance; the other number group, that of the second line link frame appearance.

2.61 Wire spring marker groups can be arranged for up to 4000 trunk numbers, flat spring marker groups up to 2000. Since each trunk number appears on two number group frames, the wire spring number has the ability to access up to eight NGFs containing trunk numbers. The marker determines which pair of NGFs contains the involved trunk from the so-called thousands digit received from the incoming register. The marker's selection of one of the two NGFs of the pair is controlled by the IRMC, ie, on calls handled by even numbered IRMCs the marker will prefer number group A, on calls handled by odd numbered IRMCs the marker will prefer number group B.

2.62 Determination of the thousands digit is by cross-connection in the incoming register. All registers within a particular register group are limited to using the same thousands digit. It should be noted that trunk number thousands digits are independent of regular subscriber directory number group thousands digits.

2.63 The 3-digit number is determined by the incoming register from the location of the trunk on the incoming register link frame. Basically, each half-switch (10 verticals) in the incoming register link frame on which tandem type trunks are connected is assigned arbitrary hundreds and tens digits. The ***units digit*** is derived from the switch vertical to which the trunk is assigned.

2.64 In the case of a CAMA subscriber to trunk intermarker group trunk, the trunk requires a line link frame appearance in the CAMA marker group. Information regarding this location originates in part at an auxiliary sender link vertical associated with the trunk in the originating marker group. Two digits (tens and units) of a 3-digit trunk number are generated in this way and are given to the marker in the CAMA group. The marker connector furnishes the necessary hundreds digit by making it the same as the units digit of the trunk link frame number received from the trunk through the intermarker group sender. Therefore, the trunks appearing on the same CAMA marker group trunk link frame must use a common trunk number hundreds digit, and this digit must agree with the trunk link frame number units digit.

2.65 The ***units digit*** of the trunk number always corresponds to the ***units digit*** of the switch vertical to which the trunk is assigned, (0 through 9).

2.66 The ***tens digit*** is derived from an associated LT relay, (0 through 9). Each half switch of the verticals, called a subgroup, has a LT relay permanently assigned to it. The ***tens digit*** of the trunk directory number is not necessarily the same as the LT relay number associated with the subgroup, but is derived from cross-connections associated with the contacts of the LT relays.

2.67 The ***hundreds digit*** is determined by the association of a horizontal group with terminals designated LH 0 through 3, and the LT relay associated with the subgroup.

2.68 Trunk number limitations as they apply to individual types are as follows.

By-Link Frames

2.69 The ***units digit*** is always the same as the units digit of the switch vertical. Each switch is divided, with units 0 through 9 on the left subgroup and units 0 through 9 on the right subgroup. The ***tens digit*** may be different for each subgroup except in HG5. The tens digit of HG5 must be the same as the tens digit for the subgroup of HB0. The ***hundreds digit*** may be different for each subgroup.

Non-By-Link Frames—Dial Pulse

2.70 The ***units digit*** is derived the same as for by-link frames. The ***tens digit*** must be the same for each subgroup which is associated with the same LT relay. This could apply to a maximum of four subgroups, the corresponding subgroups on basic and supplementary switches of both frames. The ***hundreds digit*** for basic or supplementary switches assigned to LH0 may be different for each subgroup. The hundreds digit for basic or supplementary switches assigned to LH1 must be the same for each subgroup.

Non-By-Link Frames—MF, FSP, and RP Tandem

2.71 The ***units digit*** is derived the same as for the by-link frames. The ***tens digit*** for basic or supplementary switches which are assigned to LH0 or LH1, may have a different tens digit for each subgroup. The tens digit for basic or supplementary switches which are assigned to LH2 or LH3 must be the same tens digit for all subgroups. The ***hundreds digit*** for basic or supplementary switches assigned to LH2 must be the same. The same is true for LH3.

2.72 The hundreds and tens digits are equivalent to the tens block in the two number groups to which the marker looks for the line link frame location. Because two number group appearances are provided for service protection reasons, each ten trunks assigned trunk numbers will use 20 directory numbers. Since these tens blocks can be used only for trunk numbers, it is advisable to concentrate trunk numbers into as few tens blocks as possible to avoid wasting directory number capacity of the office. This is accomplished by concentrating tandem and intertoll trunks on as few half-switches as feasible, and in some cases using the same hundreds and tens digits on more than one-half switch in the same or different link groups. When the latter arrangement is used the detailed assignment of trunks to verticals for these half-switches must be specified in the network design order to avoid number duplication. There is no restriction to filling in the other switch verticals with nontandem type trunks.

2.73 All future tandem and intertoll numbers as well as intermarker group (customer-to-trunk) trunk numbers should be considered when directory numbers are reserved. It may be more economical

to provide spare number group capacity than to change customer numbers at a future date.

2.74 The following is a general approach that may be of value in completing the trunk link frame forms. Upon receipt of an order, all forms including the trunk link frame cross-connect forms are updated with the current order number and date. All change indicators in the change column are erased. Working documents such as "trunking estimates" will be reviewed to determine the actual working trunks versus the estimate. The number of trunks, as listed in the network design order, may not be the actual number of trunks working, but rather the number of available terminations. (The percent fill may not be such that all terminations are full.)

2.75 At this point a check of the network design order should be made to verify both quantity and type of trunks provided. For old and modified frames the network design order "trunk assignment charts" should be checked to verify location of trunks on switch and level. The assignment of trunk equipment or trunk groups is subdivided into two phases:

(a) ***Groups not subject to day-to-day administration:*** Equipment for these trunk groups is generally spread over all the trunk link frames and all equipment of one type may be assigned to a single group. Also, usually all of these trunks are assigned initially and numbered sequentially from TLF 00. An example of these trunks is 1G43-common overflow.

(b) ***Groups subject to day-to-day administration:*** These trunks are interoffice types and trunks to switchboards and desks; one type of equipment may be used for several trunk groups.

ASSIGNMENT CONSIDERATIONS

2.76 ***New Design Trunk Link Frames:*** The "miniswitch" TLF is equipped with ten TB relays, each of which can be associated with up to 20 trunk appearances. Thus, all of the 200 trunk appearances on the new TLF are associated with BT leads; therefore, any of the 200 trunks may be selected by the marker. (Only 120 of the 160 trunks could be selected on the "old" TLF.) The network design order should show equipment quantities by trunk type and trunk group, plus the summary of trunks of each type for each TLF. In adddition, in old and mixed offices, the network design order will contain trunk link frame assignment charts which will associate trunk equipment by type with each TLF appearance. The trunk link frame cross-connect forms should then be arranged/matched with the network design order. A "from and to" working list is made for all trunks which are to be moved. When new trunk data link frames are added, it is a good policy to remove known working trunks and reassign them on the new trunk frame. This assures that "working trunks" will appear on the new TLF.

2.77 The trunk link frame cross-connection form is shown as form 1 at the end of this section, procedural instructions for its completion are included. Form 2 is a variation (used by some operating telephone companies) and may easily adapt the same instructions used for completing form 1.

2.78 Accurate assignment of TB relays and BT leads is generally the responsibility of the network administrator in ***all*** No. 5 Crossbar offices. Other data fields may or may not be this office's responsibility.

3. INCOMING REGISTER LINK FRAMES

3.01 The number of incoming register link frames required is governed by the trunk capacity of the individual frame, register requirements and trunk assignment restrictions. One terminal in each link group is reserved for master test frame access.

BY-LINK FRAMES

3.02 The by-link frame will accommodate a maximum of 119 trunks. Only one frame of this kind may be used in a link group. The by-link frame is designed primarily for use with dial pulse by-link trunks; however, direct pulse trunks may be assigned to a link frame with by-link trunks if it is not economical to provide separate register groups.

3.03 This frame may also be equipped so horizontal groups 0 and 1 serve MF trunks and, up to 3 MF registers, and horizontal groups 2 through 5 serve by-link or direct trunks and up to seven dial pulse registers.

NON-BY-LINK FRAMES

3.04 Non-by-link frames may be MF, RP, or DP. These frames can be equipped with a maximum of eight switches (HG 0 through 3) to accommodate 159 trunks and to provide access to a maximum of ten incoming registers. The eight switches are arranged in four horizontal groups. A horizontal group includes 20 trunks associated with a basic switch and the 20 trunks associated with a supplementary switch. The lower four switches are basic switches and the upper four switches are supplementary switches. Horizontal group 0 includes the first and fifth switch on the frame; horizontal group 1 includes the second and sixth switch, etc. The switches may be equipped in any order except that a basic switch shall be equipped before its associated supplementary switch.

3.05 The incoming registers may be all the same type or may be split with a maximum of seven arranged for DP or RP and three arranged for MF pulsing. If the split is provided, at least two registers of each type must be equipped. One, two or three frames may be used together as one link group. This frame is also arranged for use where, as in centrex, the type of register required by the trunk may vary depending on its use. In this case, a class relay in the trunk will determine which two types of registers will be used.

ASSIGNMENT OF TRUNKS TO INCOMING REGISTER LINK FRAMES

3.06 A minimum of two horizontal groups shall be furnished in each incoming register link group. When the number of trunks initially connected to an incoming link frame is less than 40, the trunks shall be divided between the two link switches so approximately half of each type of trunk or junctor will appear in each of the two horizontal groups. The trunks shall be assigned so the trunks in any one route will not appear in one horizontal group. If two or more register groups are provided for the same type of pulsing, trunks in the same trunk group shall be spread over all the register groups, if feasible.

3.07 When more than 40 trunks are associated with an incoming link group, a link switch shall be provided for each 20 trunks or fraction thereof. In general, the first frame shall be filled before starting a second frame. Sufficient switch verticals shall be available as spares for any incoming trunks for which locations are reserved on trunk link frames for later addition. However, when a large number of trunks are assigned to one location on only a few trunk link frames for an overflow appearance, as with operator junctors, etc, these bunched trunks shall be assigned to individual verticals on the incoming register link switch so they are distributed over at least two horizontal groups.

3.08 All trunks in the same horizontal group (20 or 40) shall be located within the same group of ten trunk link frames, ie, 0 through 9, 10 through 19, or 20 through 29. This limitation makes it desirable to give consideration initially to whether or not the ultimate marker group will have more than ten trunk link frames. For example, if an office initially requires less than ten trunk link frames and only one register link frame of 160 trunk capacity, trunks should be assigned to both basic and supplementary switches. The unused basic switches, and their associated supplementaries can then be assigned to TLFs 10 through 19 when the office grows. If this were not done and all basic switches were associated with trunks from trunk link frames 0 through 9, the supplementary switches would also have to be associated with trunk line frame 0 through 9, since each supplementary switch is in the same horizontal group as its basic switch. In this event major trunk reassociation or the addition of an incoming register link group would be required for the trunks on trunk link frames 10 through 19.

3.09 In general, the trunks from one trunk link frame associated with a link group shall be assigned, in order, to the vertical of one or more link switches before proceeding to the assignment of trunks from the next trunk link frame.

3.10 Where a DP incoming register link frame is used for both by-link and direct pulse trunk, two horizontal groups are required for the by-link trunks and two for the direct pulse trunks, since both types cannot be assigned in the same horizontal group. Each of these two initial sets of two switches will serve up to 40 trunks. For frames using wire spring relays, a maximum of six horizontal groups can be provided for each group of registers serving by-link trunks. Where this frame is used and there will be more than ten trunk frames, it is desirable to coordinate the assignment of trunks to the trunk link and the incoming register link frames so that the incoming

register link switches are used to their greatest capacity. For example, where only a few direct pulse trunks are equipped with a large number of trunk link frames, the direct pulse trunks should not be assigned in both trunk frame groups, thereby requiring very sparsely used incoming register link switches for both trunk link groups.

3.11 Vertical 00 of horizontal group 0 (HG0) on the first frame of an incoming link group is reserved as a test vertical for the master test frame for either the automatic monitor circuit or the register test set circuit. Therefore, no incoming trunk can be assigned to this vertical. When the 120 trunk capacity frame is equipped for both DP and MF, a test vertical in addition to vertical 00 horizontal group 0, which serves MF registers, is required for the DP incoming registers. Vertical 00 of horizontal group two is reserved for this purpose.

3.12 Two-way intertoll trunks arranged for pulse conversion are assigned two appearances on the link switches, one associated with the toll switchboard and one with the inward call. Only that register link appearance associated with the inward call requires consideration for providing a trunk number. 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 may register different numbers of digits such as seven digits for tandem and four digits for local traffic, it may be desirable to assign one appearance in each register link group.

3.13 DP or RP incoming trunks arranged for transfer require the ability to access MF incoming registers in phase I and II centrex offices only. A MF incoming register is used by the console attendant to transfer the call to the desired non-by-link trunks (RP and DP) and have only one appearance in a combined incoming register link group. However, it is possible for these non-by-link trunks to have incoming register link appearances in two separate incoming register link groups. Dial pulse by-link trunks should have appearances in two incoming register link groups (DP and MF) because of the inefficiency of a reduced number of dial pulse incoming registers serving by-link trunks in a combined incoming register link group. MF incoming trunks require an appearance only in the MF incoming register link group. The centrex combined incoming register link frame will serve 159 trunks with line link appearances and may be arranged for a maximum of seven DP or RP incoming registers and three MF incoming registers. Only one combined frame is associated with an incoming register link group.

3.14 All incoming trunks with the transfer feature require incoming register link assignments associated with tandem trunk numbers. In the case of two separate incoming register link group assignments, only the MF appearance requires a tandem type vertical and tandem trunk number. This limits the MF incoming register link group to a maximum of 319 trunks arranged for transfer.

3.15 Where flexibility is desired for the possible reassignment of incoming trunks to different types of incoming registers, the trunks should be cabled via the main distributing frame rather than cabled directly to the incoming register links.

3.16 There are two types of incoming register link frames using wire spring relays. The first type may be equipped with eight switches and a number of relays to accommodate 160 trunks and provide access to a maximum of ten incoming registers. One, two or three frames may be used together as one link group with MF, RP or DP (non-by-link) registers. There is only one design of this frame; no distinction, such as auxiliary or supplementary, is made. However, the first four or lowest four switches on each frame of the eight switch capacity frame are referred to as "basic" switches and the top four as "supplemental" switches. Each frame may have two sets of switches numbered 0 through 3 but distinguished by either being "basic" or "supplemental" switches and assignment records should indicate whether reference is to "basic" or "supplemental" switches. In addition, verticals are numbered 0 through 19 on "basic" switches and 20 through 39 on "supplemental" switches. The other frames may be equipped with six switches and a number of relays to accommodate 120 trunks and to provide access to a maximum of ten incoming DP registers. Only one frame of this type may be used in a link group; it is limited to serving by-link trunks with or without a combination of direct pulse trunks. The six switches on this frame are numbered 0 though 5 and the assignment purposes may all be considered basic. (See Fig. 6 and 7.)

3.17 Since the installer provides permanent cabling between trunk equipments and incoming register link frames, no further assignment is required in the traffic cross-connections. Incoming registers in the No. 5 Crossbar System are cabled to horizontal switches on the incoming register link frames. The usual process followed by the installer is to go through the trunk link frames in consecutive order and cable those trunk equipments to be associated with a particular register link group to switch verticals, using up the capacity of a switch before proceeding to the next switch and using up the capacity of an entire frame before proceeding to the next frame. This method normally equalizes the loading as among link groups having the same type of pulsing.

3.18 Only incoming registers with the same type of pulsing may be served by one incoming register link group. A separate incoming register link group is required for each type of register to be served. When more than ten registers of the same type of pulsing are required, a separate link group is furnished for each ten or less registers. Link group refers to a group of incoming trunks or incoming register link frames being served by one group of ten or less incoming registers.

3.19 In offices provided with only one group of incoming registers of a particular type of pulsing all trunks of that pulsing type will, of course, be assigned to that register group and there is no balancing problem except that trunks of a group should be assigned on at least two switches. Where offices are provided with several groups of incoming registers of the same type of pulsing, the network design order will show the trunk equipments which are associated with each group of incoming registers. After the trunk link frame assignment has been completed, a check should be made of incoming register groups to see that each register group has about the same proportion of high and low usage trunks.

LOAD BALANCE OF THE INCOMING REGISTER LINK FRAME

3.20 For new offices balancing on the incoming register link frames will not usually present any problems as the assignment of the high and low usage trunks equally over the trunk link frames will, due to the direct cabling arrangement mentioned previously, provide a satisfactory spread of high and low usage trunks over the incoming register link frames and switches.

3.21 While the method of assigning trunks on the trunk link frame will usually automatically meet the incoming register link frame loading requirements, checks should be made as follows:

(a) Trunks of a group are spread over at least two switches

(b) High and low usage trunks are equally distributed over the switches

(c) Each register group, if more than one is furnished, is loaded in proportion to its call-carrying capacity. Register groups of the same size should have approximately the same proportion of high and low usage trunks.

3.22 Where it is difficult to obtain a balance on the basis described above, a rough check can be obtained by considering a heavy usage trunk to carry about twice as much traffic as a low usage trunk. With this assumption all trunks can be equated in terms of low usage trunks and a further check made of the balance. If the frames are in reasonable balance on the basis of this later check, no further reassignments need be made.

3.23 If these checks indicate a serious imbalance, it is necessary to adjust the assignments to obtain an approximate balance without disturbing the trunk link frame loading.

3.24 The recommendation that trunk groups be spread over at least two switches not only provides service protection but permits a transition. When incoming registers are to be added, it can be done without taking the full trunk group out of service. With presently working offices, any balance can only be approximate. The actual loading is checked by comparing the readings of the incoming register group busy with Fig. 8. Readings of the incoming register group peg count will provide coordinating information for balancing purposes but are difficult to use because the scorings include cases of false starts by operators and/or subscribers who pulse or dial directly into the register. If imbalance causes overloading of one or more register groups, trunk rearrangement can be made without affecting trunk link frame loading.

3.25 A record of the incoming trunks assigned to the incoming register link frame and the spare trunk available for future assignment is maintained on the "incoming register link cross-connections" form. An example of a completed form with brief instructions is found in form 3. ***Note:*** A designation for the frame involved may be included on this form. A more detailed description of the form and its completion procedure is provided here.

3.26 Spaces are provided at the top of the form for frame, office name, marker group, order number, completion date, sheet number, issue number, issue date, and register link group. The frame space should indicate "by-link" or "non-by-link" 0, 1, 2, etc. The link group should be shown in the space provided if more than one group of incoming registers of the same type are provided.

(a) Refer to Western Electric drawing T-XXXX-421 "assignment of incoming trunks to IRL Fr Sw Verticals and Inc. Trks. to Trk. Numbers," and reading horizontally across the page from left to right on line 114 under IRL-DPO:

HEADING	LINE 114	INTERPRETATION
Hor. Grp.	0	Basic Switch 0
TPU	06	Vertical 06
TFU	0	Trunk Link Frame 00
Trk. No. on NG Fr.	068	Directory Number X068
R. R. Fr. No.	106.09	R. R. Frame No. 106.09
Trk. No.	07	Ckt. or Trk. No. 07
*Trk. Class	B93a	Trk. type B93a

* This heading not included on 421 drawing

3.27 The above could be stated as, dial pulse incoming register link frame 0, switch 0; vertical 06 is assigned to an incoming trunk located on trunk link frame 00. The relay equipment is in bay 106.09 circuit 07. This circuit will have a trunk directory number, the last three digits being "068," the thousands digit being determined by the two number group frames selected for the trunk numbers. The directory numbers reserved for trunks will normally be found in an engineering note on the drawing.

3.28 As stated earlier the completion of the incoming register link cross-connection form is basically a reflection of the 421 office drawing:

Columns 1, 3, and 4—The horizontal group is entered as found in Column A of the 421 drawing with both columns (1 and 4) having identical information.

Column 13—The hundreds (H) and tens (T) digits of the directory number should be entered as taken from Column G, P, etc, of the 421 drawing.

Columns 14 and 15—The relay rack and circuit number are entered as found in columns H and J, Q, and R, etc, of 421 drawing.

Column 16—The trunk name or designation is entered. The trunk link frame cross-connection form can be used as a source of this data, being sure that columns 14 and 15 agree with the data.

Other data fields on this form will be supplied or completed by other telephone company departments.

4. OUTGOING SENDER LINK FRAMES

4.01 The purpose of the outgoing sender link frame (OSL) is to accommodate the crossbar switches through which outgoing, intermarker groups, AMA intraoffice trunks, CAMA junctors and person-to-person trunks or junctors are connected to proper associated senders during the outpulsing period.

4.02 On outgoing calls, a route relay is operated in the marker from the called number information received from the originating or incoming register. Associated cross-connections indicate when a sender is required and what type of pulsing is needed. When requiring the DP-, FSP-, MF-, RP-, or PCI-type outsenders, the marker selects an idle sender of the proper type of pulsing through the outsender connector and also selects an idle trunk. It then connects the trunk to the sender, via the OSL frame, and transfers all the information necessary for the type of sender used.

4.03 Senders are arranged by type in groups on the OSL frame. A maximum of ten outgoing senders of the same type constitute a sender group. The senders of one group are assigned to the horizontals of an OSL switch. Each sender group is made up of two subgroups, A and B. The senders in subgroup A are assigned to the lowest five horizontals of the OSL switch and those in subgroup B are assigned the upper five horizontals.

4.04 Intermarker group trunks handling traffic from subscribers in one marker group to outgoing trunks in another marker group require two appearances on the outsender link frame. Such trunks have a line link frame appearance in the second marker group and must pass an arbitrary trunk number to the marker to assist it in locating the trunk on the line link frame. One appearance of the intermarker group trunk is connected to a switch vertical on the outsender link which has access to the intermarker group sender multiple. The other appearance is connected to an auxiliary vertical which has no association with the sender multiple but is wired to give a trunk number indication. The hundreds digit of the arbitrary trunk number corresponds to the units digit of the trunk link frame to which the intermarker group trunk is assigned in the called marker group.

4.05 On the called end, all of these trunks are assigned to the same trunk link frame, use a common trunk appearance, and thus have the same hundreds digit. This bunched appearance is used to provide reorder when all trunks are busy or a failure to match occurs.

4.06 Intermarker group senders are considered as a separate sender group and are handled the same as other sender groups when considering their assignments to horizontals of outsender link switches. However, since IMG trunks can only operate with IMG senders and have special considerations, they are sometimes assigned to dedicated outgoing sender link frames.

4.07 The quantity of OSL frames required is governed by the physical trunk capacity of the type frame, trunk assignment restrictions,

previous splits of sender frames and sender group CCS requirements.

4.08 An OSL frame has a capacity for mounting ten 200-point switches with a maximum of 20 trunks per switch. This permits 160 or 120 trunks from a 160 type trunk link frame or 200 trunks from 200 type trunk link frames to be terminated on the OSL. The number of OSLs required is determined by the number of outgoing trunks to be terminated.

4.09 ***Trunk Assignments to OSL Frames:*** Trunks assigned to outsender link frames may require one or two appearances depending on the type of trunks and the arrangement used. Regular outgoing trunks are cross-connected from terminals at the top of the frame to verticals on the OSL switches. Terminal strips are also provided at the top of the frame for cross-connection to auxiliary verticals when intermarker group trunks or CAMA junctors requiring a trunk number are assigned to OSL switches.

4.10 Generally, all link switches serving trunks from the same trunk link frame shall be located on the same outgoing sender link frame. This facilitates assignment flexibility, reduces maintenance effort and detail engineering which would otherwise be required. It is therefore desirable either to provide spare switch capacity or to reserve adjacent spaces for added switches for each trunk link frame to serve anticipated trunk growth or additional sender groups.

4.11 The network design order specifies the outgoing sender link switch arrangement for each trunk link frame. It is desirable that each trunk link frame have the same sender link switch arrangement.

4.12 When each trunk link frame does not have the same sender link switch arrangement or when trunks from one trunk link frame appear on more than one sender link frame, an individual assignment for each sender link frame must be included in the network design order.

4.13 In order to determine the sender link frame arrangement, the first step is to obtain the average number of trunks (including spare) per trunk link frame by types of pulsing. Allowance is then made for spare sender link switch verticals for assignment flexibility and for anticipating future changes in pulsing which may occur.

4.14 If trunks of a given type of pulsing are served by more than one sender link switch, they may be served by one or more sender groups. If served by more than one sender group, a sender link frame chart as published in the No. 5 Crossbar, Form E-8000, should be used.

4.15 With respect to OSL balance, there are two possible situations: (a) ***new office,*** and (b) ***working office.***

(a) In a ***new office,*** when only one group of outsenders of a particular type of pulsing is provided, no attention need be paid to the loading as it presents no problems and generally the number of trunk equipments provided will be insufficient to seriously overload the senders as long as they are used approximately as contemplated in the office design. This is true, of course, provided they are equally distributed over all trunk link frames. When an office is provided with several groups of outsenders of a particular type of pulsing, attention must be given to securing and maintaining approximately the same usage on each group or in proportion to each sender group's capacity. For initial assignments the method illustrated in Fig. 9 affords the best possibility of making equitable distribution, and while not entirely accurate, appears adequate for a precutover balance.

(b) In a ***working office*** the outsender group loading may be checked by comparing the scorings of the outsender group busy registers with Fig. 10. Scorings for the outsender group peg count provide coordinate information; however, in offices where the holding time for each use may vary over rather wide limits and equality of uses, a satisfactory balance is not necessarily provided.

OSL FRAME ARRANGEMENT

4.16 In the No. 5 Crossbar System, the outgoing senders are cabled to horizontals of the switches on the outsender link frames while the trunk equipments are cabled to terminal strips at the top of the frames. A cross-connection is made from the terminal strip at the top of the frame to a suitable switch vertical for each trunk. The horizontal strappings on the switches can be split

depending on job requirements so that certain verticals have access to certain sender groups.

4.17 The network design order will generally contain a tabulation showing the number of outsender link frame switches associated with each trunk link frame and the way in which the horizontal strappings are split to provide for the various sender groups. However, it is necessary to consult Western Electric Company wiring lists in order to obtain the frame numbers, the numbers of the switches associated with each trunk link frame, and the numbers of the switch verticals associated with each sender group.

4.18 The outgoing sender group with which each group of outgoing trunks requiring senders is to be associated must be assigned. In general, outsenders are required for all groups of trunks where selections at the terminating end are controlled or determined by information pulsed from the originating end. In addition, outsenders are associated with groups of trunks where no outpulsing is required but where information must be passed to the AMA transverters for charging purposes. The network design order should be followed in determining the type of pulsing to be used with each trunk group even though it is technically possible to pulse on other than the recommended basis in certain cases. Also, where more than one sender group for a given type of pulsing is provided, the network design order should specify the association of trunk groups with each sender group.

4.19 From a traffic assignment standpoint, there are no significant differences between nonwire spring and wire spring type outsender link frames. Therefore, this section applies equally to both types of frames.

ASSIGNMENTS TO OSL FRAMES

4.20 The arrangement of the outsender link frames is made and the quantities of equipment are estimated in accordance with the following limitations which are pertinent to the assignment work.

(a) All trunks on a particular trunk link frame are normally cabled to the same outsender link frame.

(b) A particular switch on the outsender link frame may serve trunks on one trunk link frame only.

(c) All trunks in a particular trunk group (or subgroup, in the case of allotted trunks) must be served by the same outsender group.

(d) Trunks listed in Section 819-600-158, commonly known as table H trunks having bunched trunk link frame appearances for marker pulse conversion only have several trunks cabled to the same trunk link frame location. These trunks are cabled to outsender link frames in accordance with the standard pattern as a function of their trunk link frame locations. They are assigned to outsender groups on a "per group" basis. A maximum of two DP outsender groups and one RP outsender group may be used for marker pulse conversion.

4.21 In offices provided with only one group of outsenders of a particular type of pulsing, all trunks of that pulsing type will, of course, be assigned to that sender group; there is no balancing problem. When an office is provided with several groups of outsenders of a particular type of pulsing, trunk assignments should be made so each sender group is loaded in proportion to its capacity. Association of trunk groups with the sender groups should be made as specified by the network designer in the network design order or from information by the network designer furnished at the time the assignments are made. Attempts to balance sender groups by quantities of trunks will generally prove unsatisfactory. The sender holding time, varying with the number of digits outpulsed, multiplied by the call attempts on the group will give the sender usage in seconds for each trunk group. Since the holding time and call attempts will be more readily available to the network designer, it is recommended that his assignments be used.

4.22 The OSL provides the connection of the outgoing trunk to the appropriate outsender. The purpose of the OSL cross-connect form is to record cross-connections which connect actual switch locations on the OSL frame to terminals appearing at the top of the OSL frame and to identify trunks as assigned. Brief step-by-step instructions for filling out the form and a completed example are included in form 4. Form 5 is a variation of this form (used by some operating telephone companies) and may be preferred because more information

can be compiled in this form. The following explanatory notes provide in-depth instructions for completing the OSL cross-connections form.

Column 1—The switch number may be obtained from the network design order under the heading "outsender link frame assignment chart." The chart will indicate the number of switches per outsender link frame and the number of switch verticals assigned. (The switches on each OSL frame are numbered from the bottom upward with switches 0 through 4 in the most left section of the form, 5 through 9 in the next.) The left and right format of the form indicates which half of the switches are being assigned. Column 2 contains the standard vertical numbering of the OSL frame switch.

Column 3—For clarity, this column has been expanded to include additional information; a modified form is illustrated for consideration. The trunk switch is obtained from the 414 office drawing. The relay rack number and circuit number can be obtained from the TLF record and/or the 413 or 414 office drawing. One should consider that traffic trunk rearrangements may have been found necessary and reflected on the TLF record prior to changing the 413 or 414 drawing.

Column 4 and 5—The trunk group name (or designation) and traffic trunk number should be entered utilizing the network design order outsender link frame assignment chart as well as the TLF record.

Column 6—The trunk link frame number associated with the OSL switches should be entered as indicated in the network design order or the outsender link frame assignment chart.

Column 7—The type sender and group should be obtained from the outsender link frame assignment chart in the network design order and associated with the switches and verticals as outlined. Since the network designer may have "split" the outsender link switches, the type sender and group designation must coincide with this "split." The group assignments should be made in the same order as shown on the outsender link frame assignment chart beginning with the "left switch half" and assigning verticals 0 through 9, then the "right switch half" verticals 0 through 9.

5. TRUNK GROUP (TG) NUMBERS

5.01 In order for a marker to select an idle trunk from an outgoing group, three items of information are provided, one must be different for each trunk group:

trunk link frame number

trunk block (TB) number

trunk group (TG) number

5.02 Each trunk block may have 20 assigned trunks (same or different types). Usually the trunks within a trunk block on a given trunk link frame will be assigned to several trunk groups. Since the trunk link frame and trunk block numbers in this case would be the same, different TG numbers should be assigned to each trunk group.

5.03 The equipment provides for a maximum of 20 TG numbers (00 through 19) associated with each TB relay. Trunk block and trunk group numbers are cross-connectable items on the route relays; one route relay can obtain only one pair of TB and TG numbers.

5.04 The route relay TB and TG record provides a means of assigning TG numbers. In making these assignments certain criteria and/or recommended procedures should be followed. (See Exhibit B.)

EXHIBIT B

EXAMPLE OF ASSIGNMENT OF TG NUMBERS

Trunk Group	No. Ckts.	Type	TB	TG	Trunk Link Frames 00	01	02	03	04	05	06	07
Orig. Registers	44	O.R	0	00	6	6	6	6	5	5	5	5
Inw. Opr. — 121	10	N-18	0	01	2	2	1	1	1	1	1	1
WH Opr. — 1122	5	N-18	0	02	—	—	1	—	1	1	1	1
TX Opr. — 1150	5	N-18	0	03	1	1	1	—	1	1	—	—
TX Opr. — 1126	4	N-18	0	04	1	1	1	1				
TX Opr. — 1127	4	N-18	0	05	—	—	—	—	1	1	1	1
TX Ovfl.	2	N-18	0	06	—	—	—	—	—	—	1	1
Comm. Ovfl.	80	1G43	1	00	10	10	10	10	10	10	10	10
Mt. Holly-EAS 1 Way-Out	18	1C36d	2	00	2	3	3	1	3	2	1	3
Greer-EAS 2 Way-Out	13	1C36d	2	01	2	2	1	2	1	1	2	2
Aiken-EAS 2 Way-Out	13	1C36a	2	02	1	1	1	3	2	2	2	1
Jasper-EAS 2 Way-Out	12	1C36a	2	03	1	1	1	1	2	2	2	2
Hampton-EAS 2 Way-Out	11	1C36a	2	04	1	2	2	1	1	1	1	2
Reverting 2 & 4 Pty.	11	A18	2	05	2	2	2	1	1	1	1	1
Reverting 8 Pty.	11	A20	2	06	1	1	1	1	1	2	2	2
Shelby-EAS 2 Way-Out	10	1C36a	2	07	2	1	1	1	1	1	2	1
Paris-EAS 1 Way-Out	9	1C36v	2	08	2	1	1	1	1	1	1	1
"0" Non-Coin	25	1D24	3	00	3	3	3	3	4	3	3	3
Comb. Tone — Non-Coin	16	1G45	3	01	2	2	2	2	2	2	2	2
"0" Coin	10	1D59	3	02	2	1	2	1	1	1	1	1
Local Information	10	D105	3	03	1	2	1	2	1	1	1	1
Mt. Holly — 2 Way CDO	8	M57	3	04	1	1	1	1	1	1	1	1
Jonesville — 2 Way CDO	4	M55	3	05	—	—	—	—	1	1	1	1
Paris — 2 Way CDO	4	M55	3	06	1	—	1	1	—	—	—	1
Greer — 2 Way CDO	2	M57	3	07	—	1	—	—	—	—	1	—
Hampton — 2 Way CDO	2	M57	3	08	—	—	—	—	—	1	—	1
Jasper — 2 Way CDO	2	M57	3	09	—	—	1	1	—	—	—	—
Shelby — 2 Way CDO	2	M55	3	10	—	—	—	—	—	1	1	—
Aiken - 2 Way CDO	2	M57	3	11	1	—	—	—	1	—	—	—
Intertoll Test — "103"	2	E-37	3	12	1	—	1	—	—	—	—	—
1A0 — Flat Rate	160	1A13	4	00	20	20	20	20	20	20	20	20
1A0 — Flat Rate	84	1A13	5	00	11	11	11	11	10	10	10	10
1A0 — Coin	12	A11	5	01	—	—	2	2	2	2	2	2
Perm. Signal Holding	12	1G51	5	02	1	1	1	2	1	2	2	2
Local Test Desk — "117"	6	E-16	5	03	1	1	1	1	1	1	—	—
I.T. Information — "131"	6	N-22	5	04	—	—	1	1	1	1	1	1
1A0 — Message Rate	6	A-14	5	05	2	2	—	—	2	—	—	—
Comb. Tone — Coin	6	1G44	5	06	1	1	—	1	—	1	1	1
Coin Junctor	5	C166d	5	07	1	1	1	—	—	—	1	1
Etc. —												
Etc. —												

(a) List together all trunk groups assigned to locations served by the same TB relay. Generally, listing in the order of size, starting with the largest group is most satisfactory.

(b) Assign TG numbers to each group in numerical order starting with 00 and proceeding upward to 19 as required. If more than 20 trunk groups are involved, see (e) below.

Note: Originating registers will always be located in trunk block 0. TG-00 has been reserved for assignment to dial pulse originating registers and TG-01 has been reserved for MF originating registers.

If there are more than two groups of originating registers, the additional groups will be numbered from TG-02 to TG-05 before the other trunk groups are assigned. Other than these restrictions, any TG number may be assigned to any group.

(c) All trunks in a particular group must have the same TB and TG number or all TLF numbers, except in the case of allotted trunk groups.

(d) Allotted trunk groups (trunk groups having trunks in two trunk blocks) are reached with the same relay but the allotter circuit causes testing to alternate between two TB relays but not between two TG numbers; hence, the same TG number must be assigned on each of the TB relays of an allotted trunk group. The trunks may be assigned to the same or different sender groups.

Note: In newer type offices (wire spring completing markers) two route relays are employed on an allotted trunk group and different TG numbers may be assigned for each of the two trunk blocks; however, for simplicity in assignments, it is suggested that the same TG number be assigned on each of the TB relays.

(e) Where more than 20 trunk groups appear on one TB relay, it is possible to assign the same TG number to groups which are served by completely different trunk link frames. Such an assignment is possible because, in no instance, do both groups have trunks on the same trunk link frame. This therefore meets the requirement that one of the three items of information must be different for each trunk group.

5.05 TB relay-BT lead assignment procedures should be adhered to as closely as possible for simplicity of administration. Whenever it becomes desirable to deviate from these procedures, care must be used in the administration of TLF records in order to ensure proper wiring and testing and in order to fully utilize trunk equipment.

5.06 With the present trunk link frame arrangement, originating registers must be assigned on level 2A of trunk switches 0 through 9. This restriction is necessary since the dial tone marker is only arranged to test circuits assigned to TB relay 0, BT leads 0 through 9. Up to ten originating registers may be assigned to any of the 200 trunk appearances of the new trunk link frame; however, these registers must still be assigned to TB relay 0, BT leads 0 through 9. In offices arranged for local overload announcement features, the dial tone marker circuit is modified to permit testing ten circuits assigned to each of the TB relays 0 through 5. However, the same restriction described above will continue to apply to the assignments for originating registers. In addition, common overflow trunks arranged for local overload announcement features must be assigned to one of the TB relays 1 through 5, BT lead 0 through 9.

5.07 Up to 120 of the trunk appearances in the new trunk link frame may be associated with ringing. These may be appearance "A" or "B" on each of any eight trunk switch levels, and 20 trunk appearances "A" and "B" on each of the remaining two switch levels.

5.08 The route relay TB and TG record form is illustrated in form 6. Form 7, Trunk Group Assignments, is a variation of this form (used by some operating telephone companies) and may be preferred because more information can be compiled in this form. (Detailed instructions for its completion are included.)

6. LINE LINK FRAME

6.01 The basic function of the line link frame (LLF) is to provide termination for customer lines, test lines, and tandem type trunks and to give these units access to the trunks and originating registers (ORs) located on the TLF. Access paths (called junctors) connecting LLFs with TLFs are arranged for full access; that is, any line on the LLFs can be connected to any trunk appearance on the TLFs. Each basic LLF is equipped with ten 100-point junctor switches. Each switch accommodates ten line links on its horizontals and ten junctors on its verticals.

6.02 The ten verticals (one on each switch) which occupy the same position are called a vertical file (VF). Each group of five adjacent VFs is called a vertical group (VG). VFs are numbered 0 through 4; VGs are numbered 00 through 11. The number of VGs per LLF varies from four (190-size LLF) to 12 (590-size LLF). A line group consists of the five verticals common to one VG and one horizontal group (HG). A customer's line location may be identified by LLF, VG, HG, and VF numbers; for example: 00 01 42.

6.03 ***Class of Service Frame:*** The association of a vertical file with a class of service is accomplished on large switch LLFs via cross-connection field at the top of the frame. When small switch LLFs are used, a line class of service frame is required. This single-bay frame is arranged for ten line link circuits, with up to 12 vertical groups on each LLF, and can accommodate 100 classes of service.

LINE CLASS OF SERVICE

6.04 Class of service is the method by which the completing marker determines the privileges and features available to the customer originating a call. The class of service indication is determined by the VF class of service cross-connection on the LLF. All lines in the same VF have the same class of service unless equipped for class of service on a hold magnet basis (used for line link pulsing or office test frame), in which case three vertical files per frame may be so arranged (ten classes per file).

6.05 A separate class of service and/or rate treatment must be given the originating register for each class of lines which:

(a) Requires a separate routing or tone signal to the special service or toll operator

(b) Requires identification by service class on permanent signal holding trunks

(c) Has a different dialing area than the basic dialing area of the office or is routed over different trunk groups

(d) Has different initial and overtime rates to points within the dialing area from other classes of lines.

A separate class of service and/or rate treatment must be given each PBX in a centrex-central office, each common control switching arrangement customer, and each zone of wide area telephone service. Additionally, certain VFs are equipped to operate with coin lines (VG-01, VF-0 through 4, and VG-02, VF-1 and 2 are standard provision).

6.06 The equal distribution of classes of service across all LLFs is an important tool of the network administrator in maintaining necessary LLF load balance. Although it is not usually possible to achieve exactly equal distribution, the deviation should be kept to a minimum. Load balance is facilitated when all LLFs in an office are of equal size (390, 490, etc).

6.07 An office with large switch LLFs can accommodate a maximum of 60 or 100 classes of services if all completing markers are of the wire spring type. If the completing or combined markers are the U and Y (flat spring) type, the

maximum is either 30 or 60 classes of service. Large switch LLFs shipped after 1960 have 100 classes of service. These frames may be added to existing frames providing either 30 or 60 classes of service on an A&M basis. They may be cross-connected to give the marker a class of service indication that is compatible with existing equipment.

6.08 An office with a small switch line class of service frame can accommodate a maximum of 100 classes of service. The frames may be arranged for either 30 or 60 classes of service on an A&M basis in order to be compatible with existing LLFs.

6.09 The general policy in selecting line switch verticals for assignments is to follow a pattern such that, at all times, no horizontal group or line link frame will be overloaded and, at the time of office line-fill, the percent call-fill will be the same for all horizontal groups and the percent line-fill will be the same for all horizontal groups. In most offices, where all line link frames are the same size, this objective is most easily accomplished by assigning as nearly as possible the same number of lines to each class of service in each horizontal group.

6.10 When dealing with trunks and junctors, the importance of even distribution applies particularly to the horizontal groups. The following items should be considered:

(a) One line switch vertical should be assigned for each incoming or 2-way local tandem trunk. Since the CCS load per vertical for these trunks is usually considerably greater than for any subscriber's line, it is important that particular care be taken to ensure as even a distribution as possible of these assignments over the line link frames and the horizontal groups within the frames; the following procedure is suggested:

(1) If the total number of trunks to be assigned equals or exceeds the number of horizontal groups in the office, one trunk should be assigned in each of the horizontal groups. After making this assignment, if there are any trunks left, a new cycle should be started and the remaining trunks distributed as evenly as possible over the horizontal groups, proceeding as in the first cycle, etc. Where the trunks of this type consist of two or more trunk groups, it is suggested that the respective trunk groups be taken separately, beginning with the largest group, then the next largest group and so on. In assigning a particular trunk group, not more than one trunk should be assigned on any line link frame until a trunk in this group has been assigned on each frame.

(2) If the total number of these trunks to be assigned is less than the number of horizontal groups in the office, one trunk should be assigned on each line link frame. After making this assignment, if there are any trunks left a second trunk should be assigned on each line link frame but in a different horizontal group from the first trunk, and so on until all of the trunks have been assigned. Where the trunks of this type consist of two or more trunk groups, the plan outlined above for taking the respective trunk groups separately is suggested also for the situation contemplated in this paragraph.

(b) Two line switch verticals should be assigned for each incoming or 2-way intertoll trunk, and the two verticals should be on different line link frames. As in the case of the local tandem trunks, it is important to obtain as even a distribution as possible of these intertoll trunk assignments between the line link frames in the office and between the horizontal groups on the frames; the plan suggested in (a) for distributing the local tandem trunks is suggested also for the intertoll trunks with the exception that the two verticals assigned for a given intertoll trunk cannot be on the same frame. In making such a distribution in an office where the number of local tandem trunks is less than the number of horizontal groups, one intertoll trunk assignment should be made first in each horizontal group not having a local tandem trunk, and the remaining intertoll assignments should then be distributed as evenly as possible between all horizontal groups. In any case, the sum of the verticals for the intertoll trunks plus the verticals for the local tandem trunks should be as nearly the same as possible for each of the line link frames and as nearly the same as possible for each of the horizontal groups.

Note: In addition to the plan suggested in (a) and (b) for distributing the trunks by trunk groups beginning with the largest group and so on, it is important to take into account

the relative loads on the different trunks within a particular group. Each trunk within a given trunk group from a crossbar office may be assumed to carry approximately the same load because of the stepping circuit in the marker. In a trunk group from a step-by-step dial office; however, the trunks selected first on outgoing calls will usually carry substantially heavier loads per trunk than those which are later choice on such calls. A similar condition applies in the case of trunks from a CX-type dial office and, to some extent, on trunks from a switchboard. In distributing the trunks on the line link frames of the No. 5 office; therefore, it would be desirable to avoid, as far as practicable, the assigning of two or more of the heavier load trunks on the same frame. In no case should two or more such trunks be assigned in the same horizontal group.

(c) One line switch vertical should be assigned for intercepting trunk (regular intercepting or trouble intercepting or combined regular and trouble intercepting) and for each trunk to a No. 6-A machine from the No. 5 office. One line switch vertical should be assigned also for each operator junctor, for each auxiliary coin-box junctor and for each auxiliary message rate junctor in the office. These circuits should be distributed as evenly as possible between all line link frames in the office and between the horizontal groups on the frames. In an office which has the local tandem or intertoll trunks referred to above, there would seem to be advantages in combining the junctors and intercepting trunks with the other trunks in obtaining the desired distribution.

6.11 A feature of the LLF is that the same frames can serve customers who have various classes of service. Generally, the optional feature of line link pulsing provides an arrangement for direct outpulsing to other switching centers. Each LLF equipped with this feature can serve 30 line circuits assigned to any three vertical files, except file 0 of vertical group 2 (no test). The class of service identification is on a hold magnet basis within a VF. Each hold magnet may be assigned a distinctive class if all lines in the file have the same rate or each may be assigned different class units and different rate units if all lines in the file have the same class tens. The LF leads (provided as part of the line link pulsing feature) may be used on an (A&M) only arrangement for transmission pad control for tie trunks or attendant trunks. Each trunk requiring pad control will reduce frame capacity for line link pulsing line circuits by one.

ASSIGNING CLASS OF SERVICE TO VERTICAL FILES

6.12 In assigning lines and trunks to verticals on the LLFs, preparatory to the cutover of a new central office, the first step is to work out a suitable arrangement of the VFs by classes of service. Similarly, when a working office is getting additional LLFs, it is necessary to set up the class of service arrangement for the VFs on the new frames before these frames can be placed in service. There may also be situations in which some changes will become necessary in the class of service arrangements on existing frames in a working office; as, for example, where it develops that fewer VFs than originally planned are actually required for a certain class of service due to slow growth in that class but some other class of service has grown faster than expected and additional VFs are needed for the latter class.

6.13 After the class of service arrangements have been worked out, the subscribers' lines and coin-box lines should be assigned to line switch verticals which have been arranged to give the proper class indication. Additional instructions on making these assignments are outlined in the following paragraphs. Instructions on assigning verticals for those trunks and miscellaneous circuits which require appearances on the line link frames are also given. Each line and station classified as essential should be so designated in the line equipment record. In posting this record for a completed service order or a completed station transfer order, after the precutover cross-connection lists have been furnished, if a case is found in which more than two stations classed as essential will be working on a given party line, the respective network administrator should call this to the attention of Network Management in order that considerations may be given to moving one or more of the essential stations to another line.

6.14 Each class of service should be distributed equally over all line link frames with percentage of spare verticals allotted each class. Larger classes of service can usually be spread more equally; minor classes of service may appear only on part of the frames. Different classes can be arranged on different frames so as to produce

equalized CCS loads with almost equal line fill on all frames.

DETERMINING CLASS OF SERVICE INDICATIONS REQUIRED

6.15 A separate class of service indication is necessary for each group of subscribers' lines having the same routing and charging on all central office codes, service codes and operator codes which are dialed by customers. In addition, a separate class of service indication is required for PBX lines because of certain test features in the marker. Hence the minimum number of classifications are obtained by selecting from the following list those classes of service which appear on the rate schedule for the office involved. In the case of a new office or addition to an existing office, the classes to be served will also be indicated in the network design order.

Message rate, PBX
Flat rate, PBX-restricted-area calling (note 1)
Flat rate, PBX-extended-area calling
Message rate, individual
Message rate, 2-party
Flat rate, individual and party-restricted-area calling (note 1)
Flat rate, individual and party-extended-area calling
Mixed, 2-party (note 2)
Manual originating, dial incoming
Coin-box

Note 1: Separation of the flat rate lines into separate classifications for restricted area calling and extended area calling will be necessary in all cases where the No. 5 office is arranged for optional extended scope service to another exchange. Provision of a restricted area calling classification on the line link frames may be necessary also in certain special situations involving local tandem trunks, as explained more fully in 6.18.

Note 2: For individual, 4-party, and multiparty lines, all stations on a given line should normally be of the same class of service. In most cases, both mainstations on a 2-party line are of the same class. However, it is possible, by making use of the "party-test" feature in the originating register, to assign one of the 2-party classes as a mixed class in which the parties on the tip side of the line all require one class of service indication and those on the ring side require another; as for example, the tip parties arranged for restricted area calling and the ring parties arranged for extended area calling.

The mixed 2-party message rate 2-party classifications can be used only in offices whose originating registers are arranged for the party test feature. The network design order will specify whether or not an office is to be arranged for this feature, usually in the section of the order which is headed "originating register equipment."

6.16 The following items must be considered in class of service assignments.

(a) Message rate individual lines and message rate 2-party lines may be placed in a single classification at the penalty of a slight increase in originating register holding time and a slight delay in the receipt of dial tone on calls from the individual lines because of the necessity for the originating register to make a party test on each call. If an office serves only a few of these lines, it will usually be desirable to use a single classification; but where the number is relatively large, separate classifications for the individual lines and the 2-party lines will usually be advisable.

(b) In an office where AMA equipment is not provided, it is possible to assign flat rate lines other than PBX lines in the same vertical file with message rate individual and message rate 2-party lines, if separate trunk groups to the special service operator for the flat rate and the message rate services are not required. If this is done, however, a message rate junctor and a message rate intraoffice trunk would be brought in on each call originating from any of the lines (flat rate or message rate) which are assigned in a vertical file containing any message rate lines, even though a junctor is not needed in the circuit on a flat rate call. Because of their cost, only enough junctors are ordinarily provided in an office to handle the traffic originating from message rate lines; and if flat rate lines were placed in the same vertical file with message rate lines, the unnecessary junctor usage on calls from the flat rate lines might overload the junctors to the point where they could not properly handle the message rate calls. As a general practice, therefore, flat rate lines and message rate lines should not be assigned

in the same vertical file. In an office which has AMA equipment, separate vertical files should always be used for flat rate lines and message rate lines, for circuit reasons. Also if a flat rate PBX class customer requires special billing (Q-Z), then a separate vertical file will have to be assigned in order to route these calls to a CAMA operator. This flat rate private branch exchange special billing (F-PBX-O-Z or FR-PBX-Q-Z) class will have to be coordinated with Network Management so proper marker cross-connections can be made; if there are message rate-private branch exchange special billing (MR-PBX-Q-Z) customers, then still another class of service indication will have to be assigned and coordinated.

(c) For the reasons outlined in (b), message rate PBX lines and flat rate PBX lines should not be assigned in the same vertical file. In the offices to which these instructions apply; however, the method of operation of the No. 5 crossbar equipment will be such that a message rate junctor is not brought into the connection on a call handled over an operator junctor, an incoming local tandem trunk, or an incoming or 2-way intertoll trunk which terminates in a vertical file arranged for message rate service; verticals in such vertical files which are not required for message rate subscribers' lines can be used for these trunks and junctors, if desired.

(d) Although a separate class of service indication is required for PBX lines because of certain test features in the marker, individual lines which are arranged for terminal hunting service may be assigned in the same vertical files with lines of the same class which do not require the hunting feature, provided the vertical file is equipped with sleeve lead cabling.

(e) The earlier list of class of service shows only two classes of service indications required for flat rate individual and party lines, one for the lines which are arranged for restricted area calling and the other for the lines which are arranged for extended area calling. However, the procedure to be followed by the party line subscribers in making reverting calls also has a bearing on the number of classifications required, since the class of service indication must cause the central office equipment to select the proper type of revertive ringing trunk on such calls. The two classifications previously mentioned are sufficient for non-AMA offices where the party lines are arranged for 2-party selective ringing service, 4-party semiselective ringing service and multiparty divided code ringing service; but in non-AMA offices which have other arrangements of the party lines, the flat rate lines should be further classified as outlined below.

In an office having 2-party selective ringing service, 4-party ***semiselective*** ringing service and 8-party semiselective ringing service, the flat rate lines (other than PBX lines) should ordinarily be subdivided into the following classes:

Individual, 2-party and 4-party restricted area calling,
Multiparty restricted area calling,
Individual, 2-party and 4-party extended area calling,
Multiparty extended area calling.

In such an office which serves only a small number of multiparty lines, some individual lines having the same calling area may be assigned in the vertical files which are arranged for multiparty service, if desired. However, ***no 2-party*** or ***4-party lines*** should be assigned in such vertical files.

Note: The offices referred to above are so arranged that ***8-party*** subscribers who are making reverting calls will dial the listed number of the called telephone and must also dial a special 1-digit reverting call code; but the classification of lines which is shown contemplates that 2-party and 4-party subscribers will make such calls by dialing merely the listed number of the called station without the special code. If an office is arranged so that the 2-party and 4-party subscribers, as well as the 8-party subscribers, must include the special reverting call code, flat rate individual, 2-party, 4-party and 8-party lines should be grouped into a single class so that separate classifications will be required only for restricted area calling and extended area calling.

In an office having 2-party selective ringing service, ***full selective*** ringing 4-party service and 8-party semiselective ringing service, the flat rate lines (other than PBX lines) should

ordinarily be subdivided into the classes shown below:

Individual and 2-party restricted area calling,
4-party and multiparty restricted area calling,
Individual and 2-party extended area calling,
4-party and multiparty extended area calling.

In such an office, 2-party lines should not be assigned in the vertical files for ***4-party*** and ***8-party*** service; it will usually be undesirable to assign individual lines in such vertical files.

Note 1: The offices referred to above are so arranged that ***4-party and 8-party*** subscribers making reverting calls will dial the listed number of the called telephone and must also dial a special 1-digit reverting call code; but the classification of lines which is shown contemplates that 2-party subscribers will make such calls by dialing merely the listed number of the called station. If an office is arranged so that 2-party subscribers as well as the 4-party and 8-party subscribers must include the 1-digit reverting call code, flat rate individual 2-party, 4-party, and 8-party lines should be grouped into a single class so separate classifications will be required only for restricted area calling and extended area calling.

Note 2: In connection with above paragraphs, the procedure to be followed by party line subscribers when making reverting calls in a particular office will be specified in the network design order.

(f) In an AMA office, it is usually necessary to subdivide the flat rate lines (other than PBX lines) into more classifications than those specified in (e) above. In such offices, the following different classifications for these lines will ordinarily be required:

Individual line restricted area calling,
Individual line extended area calling,
2-party restricted area calling,
2-party extended area calling,
4-party and multiparty restricted area calling,
4-party and multiparty extended area calling.

If the office has the party line ringing arrangement and reverting call procedure contemplated in (e) above, the 4-party and multiparty lines will also require separate classifications. Besides the customers' lines, each auxiliary message rate junctor (in an office which serves dial message rate lines) must be terminated on a vertical on a line link frame. Similarly, in multioffice exchanges, and in single office exchanges having outgoing extended scope service to other exchanges, coin-box junctors are required in the crossbar office and each such junctor requires a vertical on a line link frame. Both types of junctors require verticals equipped with sleeve lead cabling. However, a separate class of service indication is not required for the junctors, and may be mixed with subscribers' lines of any class in a vertical file having the sleeve lead cabling.

6.17 When a No. 5 crossbar office operates as a local tandem office or a toll switching center, the operator junctors, incoming or 2-way local tandem trunks and incoming or 2-way intertoll trunks require terminations on verticals on the line link frames. Verticals equipped with sleeve lead cabling are required. Normally, these trunks and junctors will terminate also on the trunk link frame, and the method of operation of the No. 5 Crossbar System is such that the class of service indication needed on a call received over one of these circuits is obtained by the marker from the trunk equipment via the incoming register. Under the arrangement usually provided, therefore, a separate class of service indication is not necessary for these circuits on the line link frames, and if desired, these circuits may be mixed with subscribers' lines of any class so long as the vertical file is equipped with sleeve lead cabling. The instructions given below, for determining the class of service indications which will be required and the vertical files to have these class indications, contemplete that the normal arrangement for the trunks and operator junctors will be provided. In this connection, however, reference should also be made to the condition described below.

6.18 A variation from the normal arrangement described above may be necessary in the case of some offices. In such offices, the normal arrangement will be provided for the operator junctors and the incoming 2-way intertoll trunks. In the case of the incoming or 2-way local interexchange trunks, however, there may be situations where for special reasons not all of the trunk groups will be terminated on the trunk link frame but instead, the trunks in certain of the groups will be assigned in the manner of subscribers'

lines with terminations on the line link frames and the number group frames only. Under the latter arrangement, one or more vertical files on the line link frames with sleeve lead cabling should be arranged for restricted area calling, and those trunks which do not have trunk link frame terminations should be assigned to verticals in these particular vertical files. In some cases, directory numbers in a theoretical central office will also be required for these trunks. The network design order will indicate an office in which the special arrangement for the local interexchange trunks will be required and will specify the particular trunk groups which should receive the special treatment. Because of the number of optional arrangements which may be used, however, assignment procedures for the trunks requiring the special treatment are not covered in these instructions. Where the special treatment is required, the information needed for making the assignments should be obtained from the network designer.

ASSIGNING CLASS INDICATIONS TO PARTICULAR VERTICAL FILES

6.19 In addition to determining the different class of service indications which will be required on the line link frames in a given office, it is necessary to assign these class indications to particular vertical files in such a way as to produce the distribution of the classes.

6.20 To illustrate assigning class indications to particular vertical files, assume an office with 14 line link frames of the 440 line size serving the lines and trunks listed in (d) below, with the condition existing as expressed in (a) through (c).

(a) The office will be arranged for nonoptional extended scope service with several other exchanges. All customers' lines will have the calling area. The extended scope service trunks and certain intertoll trunks will be of the tandem type requiring terminations on the line link frames of the crossbar office.

(b) AMA equipment will not be provided in the No. 5 office.

(c) The 2-party lines will be arranged for selective ringing, and the 4-party and 8-party lines will be arranged for semiselective ringing. The flat rate party line subscribers will make their reverting calls in the manner contemplated in 6.16 (e). In view of these conditions and the fact that AMA equipment is not provided, the flat rate individual, 2-party and 4-party lines may be assigned in the same vertical files; but separate vertical files with a separate class of service indication will be required for 8-party lines.

(d) Assume the network design order indicates the office has been engineered to serve the subscribers' lines indicated below:

Message Rate PBX	10
Flat Rate PBX (Including Official PBX)	71
Flat Rate Individual (Business & Official)	970
Flat Rate Individual (Residence)	1935
Flat Rate 2-Party	1213
Flat Rate 4-Party	675
Flat Rate 8-Party	131
Coin-Box	135
Total	5140

The network design order indicates verticals on the LLF as follows:

Intertoll trunks	64
Extended-scope-service trunks	96
Intercepting trunks (from Crossbar office)	10
Junctors (Coin-box and message rate)	7
Information trunks (from extended-service exchanges)	5
Repair Service trunks (from extended-service exchanges)	3
Total	185

A class of service indication should be assigned initially for each equipped vertical file on the line link frames except vertical file 0 in vertical group 02. The arrangement which is set up should provide, for each class, the number of vertical files required for the lines estimated to be in service in that class at the end of the engineering period and should also provide approximately the same percentage of spare verticals in each of the classes. For the office illustrated, the 14 line link frames will contain 6160 line switch verticals (440 by 14) arranged in 616 vertical files of ten verticals each. Since this office was engineered to serve only 5140 subscribers' lines plus 185 trunks and junctors requiring line link appearances, the ratio of equipped verticals to estimated lines, trunks and junctors would be 6160 divided by (5140 + 185) or 1.157 for the office as a whole; and in determining the number of vertical files to be arranged for a particular class of service indication initially, the office ratio should be applied to the estimated number of lines requiring that class indication as of the end of the engineering period and the result adjusted to the next multiple of ten. In the case of some of the smaller class groups, this may result in providing spare verticals in excess of the office ratio, necessitating some reduction in the spare verticals allotted to the larger classes. For the office as a whole, however, the ratio mentioned above should apply.

The subscibers' lines (listed earlier) would be rearranged into groups which require separate classes of service along with the number of vertical files for each class previously computed. The office illustrated will have the normal arrangement for trunks and junctors. Since such of these circuits as require line link frame appearances can be terminated in any vertical files having sleeve leads cabled to the MDF without regard to the subscriber line class of service designated for those files, either of two arrangements could be used for these circuits; namely, separate vertical files could be assigned just for them or they could be mixed with subscribers' lines which are assigned in vertical files having this cabling. In the latter case, they should be assigned preferably in vertical files arranged for PBX lines, since these lines usually have the heaviest usage per line of all classes of subscribers' lines. It is desirable that the trunks and junctors appear on each line link frame and that they be distributed as evenly as possible between the frames. It is desirable also that the PBX lines be distributed as evenly as possible between the frames. In the case of an office which has a relatively large number of trunks and junctors and also a relatively large number of PBX lines, there may be advantages in providing separate vertical files just for the trunks and junctors. In the case of the office illustrated, there would appear to be a sufficient number of the trunks and junctors to justify separate vertical files on each line link frame. However, the number of PBX lines is so small that a vertical file could not be set aside for the latter lines on all of the frames without an excessive amount of spare line equipments in these vertical files. The trunks and junctors have been combined with the PBX lines to make feasible a wider distribution of the latter lines and thus result in better opportunity for load balance between the frames and the horizontal groups on the frames.

Type of Line	Lines	Verticals	Vertical-Files	Class Code
Message Rate PBX	10	12)	2	MX
Flat Rate PBX	71	82)	29	FX
Trunks and Junctors	185	214)		
Flat Rate Individual	2905)			
Flat Rate 2-Party	1213) 4793	5544	553	F
Flat Rate 4-Party	675)			
Flat Rate 8-Party	131	152	16	F8
Coin-Box	135	156	16	CN
Total	5325	6160	616	

Having determined the number of vertical files for each group of lines which requires a separate class of service indication, it is necessary to assign these files to the line link frames in a way which will produce as even a distribution as possible of the different class groups over the frames. It is

necessary also to assign the classes of service to particular vertical files on the various frames. An assignment of vertical files to the frames which will produce an approximately even distribution of the class groups between frames is given below. An assignment of classes to particular vertical files based on this numerical distribution between frames is given in Fig. 11.

LINE LINK FRAME	00	01	02	03	04	05	06	07	08	09	10	11	12	13	Total
Class Code															
F	39	39	40	40	40	40	40	40	40	39	39	39	39	39	553
F8	1	1	1	1	1	1	1	1	1	1	1	1	2	2	16
FX	2	2	2	2	2	2	2	2	2	3	2	2	2	2	29
MX											1	1			2
CN	2	2	1	1	1	1	1	1	1	1	1	1	1	1	16
Total	44	44	44	44	44	44	44	44	44	44	44	44	44	44	616

6.21 In making the assignment of class indications to vertical files on Fig. 11, the following features, in addition to those discussed in the preceding paragraphs, were taken into account.

(a) Since vertical file 0 in vertical group 02 on each line link frame is always reserved for gaining access to busy subscribers' lines on a no-test basis, the notation "NO-TEST" is shown for this vertical file instead of a class indication.

(b) Message rate lines, in offices using message registers, must be assigned to vertical files having sleeve leads cabled to the MDF.

(c) PBX lines arranged for terminal hunting operation, and other lines arranged for this feature, must be assigned to vertical files having sleeve leads cabled to the MDF.

(d) Assume the network design order for the office illustrated specifies that the standard arrangement of sleeve lead cabling will be provided, ie, for nine of the vertical files in vertical groups 02 and 03 on each line link frame. This arrangement is indicated on Fig. 11 by the letter "S" in the "S. LDS. -T. TR.-CN" column opposite each of the vertical files so equipped. Also, on Fig. 11, class indications have been assigned to the vertical files in these two vertical groups in a way which will permit the termination of all kinds of lines requiring the sleeve lead cabling in these groups.

(e) Assume the office illustrated has a 10-cent coin-box rate on local calls. The coin-box lines must be assigned to vertical files equipped with universal type line relay equipment which is arranged for ground-start operation. On Fig. 11, the coin-box class indication is assigned to vertical file 1 in vertical group 02 on all line link frames and to vertical file 2 in this vertical group on line link frames 00 and 01. The code "CN" in the column headed "S. LDS. -T. TR. -CN" indicates the arrangement of these vertical files for ground-start operation. On frames 02 through 13, however, the verticals in vertical file 2 of vertical group 02 will have a different class indication and the associated line relay equipment will be rewired to change from ground-start operation to loop-start.

(f) Since subscribers' lines in vertical group 02 receive preferential dial tone service over other lines on the same line link frame, the lines of subscribers whose outgoing service is important from the standpoint of the general public should be assigned in this vertical group; some vertical files of each class indication should be included in this group.

(g) Assume the office illustrated will be equipped for line-load control. Provisions were made in the network design order for the vertical files in vertical groups 02 and 03 on each line link frame to be arranged for no-denial. On Fig. 11, class indications have been assigned in a way which will permit the assigning of essential lines of all classes of service in these vertical groups.

(h) In offices which have AMA equipment, 2-party lines must be assigned to vertical files with

which tip-party translators are associated. Since the office being illustrated is a non-AMA office, this feature is not covered in the examples.

(i) When an office is first cut over, the assignment of class of service indications to vertical files is made on the basis of an estimate of expected working lines as of the end of the engineering period. Frequently, the estimated number of lines of each class materially exceeds the number at the time of the cutover. It is helpful if a few complete vertical files are retained as spares to care for deviations of the actual development from the estimate, as the class indications for these vertical files could be changed as required without rearranging working lines. Such reservations are indicated on Fig. 11 by entries of the letter "V" (vacant). For example, vertical file 2 in vertical 02, which is retained as spare initially on some of the line link frames, could be reclassified as needed and used for growth beyond the estimate in coin-box lines, in lines of other kinds requiring sleeve leads cabled to the MDF or in lines which do not require sleeve lead cabling but which should be rearranged for no-denial under the plan of line load control. In like manner, vertical file 1 in vertical group 03 (which is retained as spare on other frames) could be reclassified as needed and used for growth beyond the estimate in lines other than coin box, etc.

It appears that a plan of withholding complete vertical files from service initially might also be used to advantage by the person responsible for line assignment work in an office as an aid in supervising the office loading; and consideration may be given to the use of such a plan for this purpose. Under the plan referred to here, certain vertical files would be reserved for the purposes mentioned in the preceding paragraph and in addition, several other vertical files, possibly one vertical file in each of several vertical groups on each line link frame, would be held out of service until the unreserved files had been assigned to near their capacity at which time a few of the latter reserved files of the proper class of service indication would be released to the network administrator. The network administrator would notify the person responsible for the office each time it appeared that additional files were needed, and before releasing the additional files, the person responsible for the office could review the existing distribution of the different classes of services as a check on load balance.

6.22 The line link class of service form is shown as form 8. It provides a method for working out in detail the class of service assignment to particular vertical files. In using the form, the various equipped vertical groups on the line link frames are indicated by entries in the column headed "VG" at the left, and the numbers of the five vertical files within each group are printed in the companion column headed "VF". Some variations include a S.LDS T.TR. CN column. Information regarding special equipment associated with a particular vertical file, such as sleeve lead cabling, line relays wired for ground-start coin operation, and tip party translators is shown by an entry opposite that vertical file in the column headed "S.LDS T.TR. CN". The frame number for the installed line link frames are entered above the remaining columns, and the class indication assigned to each vertical file is indicated by entering the class code below the proper frame number in the space opposite the vertical file involved. On this form the association of a GS lead or punching with a particular type or class of service is also shown. When this form is used in conjunction with wire-spring relay type circuits that have been arranged for 60 classes of service, it will be necessary to enter in the vertical group column the class group (A or B) indication. The information in the associated class of service column should also indicate the type or class of service with both class groups. One is reminded that any class of service may be handled on any line link frame. All ten lines assigned in a vertical file must be of the same class of service. Any vertical file may be designated as a particular class of service as governed by the following limitations:

(a) Files equipped with sleeve leads for terminal hunting lines and requiring a line link frame appearance

(b) Files are usually equipped to operate with coin lines.

Form 9 illustrates a minor variation of form 8.

7. TRAFFIC REGISTERS

7.01 Traffic registers are used to record events and conditions (data) as traffic (calls) flows through an office or encounters delays or blockage.

Traffic may be outgoing, incoming, tandem, or interoffice. The network administrator will generally act upon the network design order in developing the cross-connect form; however, there should be prior involvement in the development of the network design order itself.

7.02 A network design order is prepared for all initial installations, additions and rearrangements of central office equipment. The network administrator, network design engineer, and equipment engineer, and at times, a trunk engineer and Network Maintenance representative, should confer on the following:

(a) Traffic register frame configuration

(b) Traffic register layout

(c) Traffic register multipling

(d) TUR frame features

(e) Requirements for administration of the dial machine or other facility

(f) Requirements for network design and trunk engineering through the engineered period

(g) Special register requirements due to transition or equipment rearrangements

(h) Ultimate register requirements

(i) Plans for a computerized data acquisition system

(j) Division of revenue requirements.

7.03 Following the conference, the network design engineer, who should be familiar with the TUR, will prepare the network design order. Quantities, features, and arrangements should be sufficiently detailed to permit the equipment engineer to complete the E-8000 questionnaire. A detailed description of the No. 4A TUR can be found in Section 984-503-100.

7.04 To ensure a complete and accurate TUR installation, a summary of all facilities to be measured should be included with the network design order (Fig. 12). Coupled with the summary should be the scan switch assignments shown on a form similar to Fig. 13. Although both Fig. 12 and 13 are in agreement, they should be considered as illustrations only. The equipment items and quantities selected are not recommendations, as these will depend upon the central office covered by the network design order.

7.05 The assignment of equipment items to the scan switch terminals should be made after considering the initial size of the office, its growth rate, and if possible, its ultimate size. It may be obvious that two TUR frames are required initially or with the first addition to the office. With this knowledge, the scan switch assignments can be made with terminals properly reserved for orderly growth. In the long run, this "orderliness" will reduce unusable data caused by faulty assignments and rearrangements.

7.06 Four basic restrictions apply to the assignment of circuits to the scan and register switches as follows:

(a) All circuits assigned to like-numbered contacts of a switch are associated with the same detector.

(b) Not more than one circuit in a group can be assigned to a crosspoint (consisting of six contacts) when one usage register is furnished for the group.

(c) A circuit group appearing on two or more TUR frames and having a common traffic register must have the switch appearance on these frames located on scanning switches having different numbers; these appearances must be separated by at least 100 crosspoints to prevent overlap scoring of the register by the various frames.

(d) All circuits assigned to like-numbered contacts of a switch associated with the same detector must be either limited scanning circuits or nonlimited scanning circuits.

7.07 The association of traffic registers with circuits or circuit groups is accomplished by means of cross-connections on the TUR register switch terminal strip. The 600 movable crosspoint contacts on each register switch are connected to terminal punching on a pair of terminal strips. Punchings 000 to 299 (representing contacts 0, 1, and 2) appear on terminal strips in bay 0, and punchings 300 to 599 (representing contacts 3, 4,

and 5) appear on the matching terminal strips in bay 1. Each of these terminal strips also contains 100 register punchings to which the traffic register leads are cabled in accordance with local company assignments. All register switch terminal punchings associated with circuits requiring a single traffic register are strapped together and connected to the associated traffic register punching.

7.08 To minimize the number of interterminal strip jumpers, the assignments should be made to the register terminal group appearing on the same terminal strip as the register switch crosspoint contact. In those cases where the traffic register punching appears on a different terminal strip from the switch punchings it is to serve, or where a traffic register punching serves switch punchings on two terminal strips, a limited number of interterminal strip cross-connection facilities are provided.

7.09 For simplicity of administration, traffic registers should be grouped together according to the kind of information being registered. To retain this grouping when the office grows, it is necessary to provide changeable cross-connections between the registers and the scoring leads. The leads come from their associated relay units or directly from the equipment requiring registrations. Because the total number of registers required in different offices varies widely, it is necessary to provide facilities for mounting together either a few registers or a large number of registers, both initially and ultimately.

7.10 The traffic register cabinet satisfies the foregoing requirements. Three-hundred 14-type registers may be provided in groups of ten on coded units. The 14-type registers are 4-digit counters used for scoring counts which do not exceed 10,000 per study period. On each unit mounting plate are ten registers, ten register pin jacks, and one battery supply jack. One end of each register winding is surface wired to its individual pin jack. The other ends of the ten registers are strapped together and connected to the battery supply pin jack on the unit. The register units are mounted on the same cabinet framework that contains a field of 330 ***pulse*** pin jacks to which leads are permanently connected from equipment requiring traffic registrations. By means of No. 26 cords, any traffic register pin jack can be patched to any pulse pin jack. Thus, any register can be connected to any equipment requiring traffic registrations. (See Fig. 14.)

7.11 The battery supply jack of each unit of ten registers may be patched to its related S, S1, or S2 jack in the supply field of 90 jacks. The S jacks (direct battery) are connected directly to fuses. The S1 and S2 jacks (controlled battery) are connected to fuses through relay contacts, the relays being under control of the cutoff switches S1 and S2 mounted at the top of the cabinet. This cutoff arrangement allows heavily used registers to be turned off during periods when readings are not being taken, thus prolonging the life of the registers. The S3 and S4 jacks are not used in No. 5 crossbar offices.

7.12 Where one traffic register cabinet will not accommodate all of the traffic registers associated with a marker group, two or more cabinet frameworks may be provided adjacent to each other. When so provided, it is suggested that at least ten ***pulse field*** pin jacks on each cabinet framework be designated and wired as common jacks. Then, if necessary, a traffic register in one cabinet may be associated with a working pulse field pin jack in another cabinet.

7.13 In place of a unit of ten 14-type registers one or more units of 5-digit magnetic counters (KS-16493) may be mounted. Each unit mounting plate is arranged for six magnetic counters which are preferably mounted in the upper portion of the first traffic register cabinet. These registers are recommended for use in those peg count circuits that may score more than 10,000 counts during a given study period. A 4-digit register that scores more than 10,000 times per period may have its reading misinterpreted. A 5-digit register should be utilized in such cases.

7.14 To eliminate difficulties encountered in taking manual readings from traffic register cabinets equipped with cameras, provision has been made for a multiple appearance of a select group of registers. The multipled registers may be located in a wall-supported traffic register cabinet. In offices equipped with a TUR, these registers may have a multiple appearance on a TUR register bay.

7.15 When a switchboard or an automatic intercept system No. 1 trunk concentrator is located in the same building with a No. 5 crossbar office, the various registers required to engineer and

administer the switchboard or concentrator may be located in the traffic register cabinet provided for the central office equipment.

7.16 Each traffic register cabinet is equipped with a clock pulse register which operates once every six seconds. When read along with other registers, the scorings indicate the elapsed time between successive readings. This register is not required when traffic registers are photographed.

7.17 Traffic registers may be photographed automatically by means of the traffic register camera KS-14776. This provides an accurate and convenient means of obtaining data at precise intervals. It should be noted that computerized methods of collecting traffic data (such as EADAS) are available. Such methods reduce the error rate of the data gathering process considerably by eliminating a series of manual operations.

7.18 Some traffic registers presently installed in an office may no longer be required for traffic engineering or administratiion. This may be due to the addition of a TUR, the development of new registers, improved methods of traffic engineering, etc. Those registers which no longer serve a useful purpose may be reassigned to other functions in lieu of providing additional registers. A detailed description of each traffic register appears in DFMP Division H, Section 5e(2).

7.19 Form 10 of this section illustrates the traffic register form as found in Section 218-012-301; variations of this form are also shown as form 11 and 12. Generally the following data will be provided.

(a) ***Assignment***—enter the function of the register.

(b) ***Register***—enter the register number; consider the following:

(1) All ten registers of a unit must have the same battery supply.

(2) Registers controlled by specific keys as "time registers", "dial tone speed", etc, should always be assigned to constant battery supply.

(3) Registers which indicate overloads of a temporary or permanent nature such as overflow, group busy, etc, will generally be in service at all hours and will usually be assigned to constant battery supply.

(4) If fewer than the frame capacity (300 registers) are provided, the numbering of registers should be determined from the wiring list (526X drawing), as the numbering in these cases will not necessarily start with "00". The general practice is to locate the registers in the center of the space provided and if only 200 are provided they could possibly number 50 to 249 instead of 00 to 199.

(c) ***Type***—Enter PC (peg count), OFL (overflow), GB (group busy) etc.

(d) ***Batt Key***—Enter key number controlling battery supply or nothing if instant battery supply(s) is used.

(e) ***Batt Jack***—Enter S, S1, S2 as determined by requirements constant, or cutoff battery for particular register involved.

(f) ***Pin Jack***—Enter the pin jack number as from office drawing-526X.

(g) ***Under Frame***—Enter the frame on which register is located.

(h) ***Under Cross-Connect***—Using office drawing, enter terminal strip designations. From register to the item being recorded, enter the designation of the termination device terminal strip, circuit, etc.

Note: The assignment of pin jacks is not standard routine in all locations; however, the assignment of pin jacks provides an opportunity to verify the traffic register leads as wired to the pin jacks by Western Electric on the 526X drawing, with the traffic registers as listed in Section D of the network design order. Some consideration should be given to the ***order*** of listing registers. Note that one of the forms is designed such that traffic registers can be listed in order by ***traffic register number*** or in order by ***pin jack number.*** One of the variation forms is to be used as the ***basic*** traffic reference on traffic registers in working with peg counts, TRAP studies, etc, it should always be assigned in traffic register number order with all

registers of similar type grouped together. In many traffic administrative groups another grouping of traffic register (front view sketch of ***entire*** traffic register cabinet, etc), is used as a basic traffic reference and in these offices additions to the traffic registers are made easier on this form if the registers have been listed in pin jack number order, since the Western Electric engineer will normally "pick up" the next successive pin jack numbers on additions rather than rewire the register leads to the pin jacks.

Note: The "traffic register frame wiring list" will usually have a table showing the assignments of the keys in each frame or cabinet. The assignment of the keys may vary in offices but will generally fall into the following or a similar pattern:

Key	Assigned To	Registers Associated with No. 5 Crossbar	Swbd.	Note
0	Time Register			1
—	S 00-29 Supply Jacks	Yes	Yes	2, 3, 4
1	S1 00-29 Supply Jacks	Yes	No	2, 4
2	S2 00-29 Supply Jacks	Yes	No	2, 4
3	S3 00-29 Supply Jacks	No	Yes	3, 4
4	S4 00-29 Supply Jacks	No	Yes	3, 4
5	Dial Tone Speed Registers			1
6-22	Unassigned			
23	Line Ins. Test Ckt.			

Notes

1 — Assign to Constant Battery Supply (S).

2 — Use S, S1 and S2 with registers associated with No. 5 equipment.

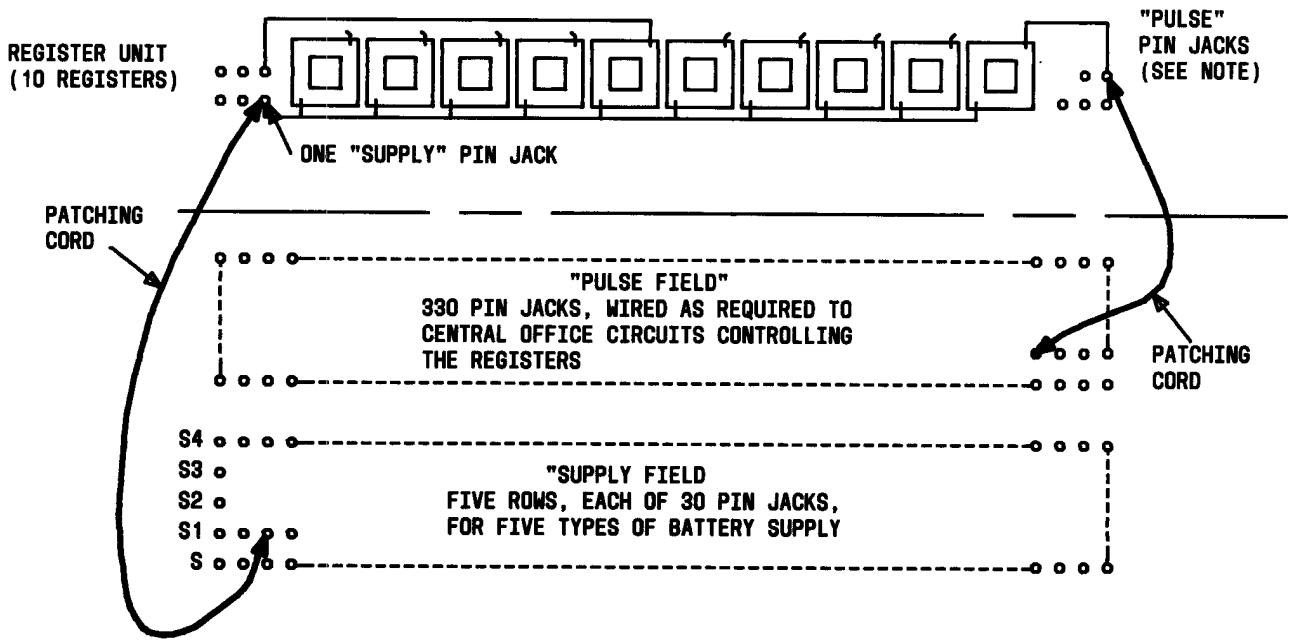
3 — Use S, S3 and S4 with registers associated with switchboard equipment.

4 — The assignment of traffic registers to battery supplies should be made by the traffic operating personnel who will be responsible for the administration of the office. Generally, Group Busy, Matching Loss and Overflow registers should be assigned to constant battery.

7.20 Exhibit C shows one arrangement (30) register unit of ten registers. All registers of this unit are fed from a common battery supply. These should all be the same type register, that is: peg count, overflow, etc.

Exhibit C

SCHEMATIC OF PATCHING ARRANGEMENTS



The patching cord at the left shows that this unit has been patched to the S1 battery supply, which is under the control of a battery cutoff key at the top of the cabinet. The fact that the third jack in the S1 row is used indicates that the third register unit in the cabinet is involved. Any other register unit similarly patched to any other S1 battery supply jack will also be under control of the same battery cutoff key. The patching cord at the right shows that the last register of the unit has been patched to a particular pin jack in the "pulse field," thus scoring on that register whatever central office register circuit has been wired to that pin jack in the pulse field.

> ***Note:*** Each register unit has 11 pin jacks. One, for battery supply, is wired to all ten registers as illustrated. The other ten "pulse" jacks (five at each end) are individually wired to each register, as illustrated for the fifth and last register.

8. MISCELLANEOUS

TENS BLOCK SCREENING

8.01 Tens block screening enables the marker to translate some ringing combinations as terminating marks. This feature requires the use of four tens block screening (TBS) relays per number group (NG) when more than one TBS indication is required. Cross-connections are made in the NG frame so that one out of four TBS relays in the NG frame operate in series with the tens block (TB) relay. This indication is passed to the marker to operate a corresponding TBS relay in the marker. In the marker, ten of the ringing combinations (RCs) are screened through one of the four TBS relays so that the information can have four different meanings for each ringing combination depending on the group of tens blocks in which the line is located. Each RC indication is then extended to two independent terminals. One terminal operates the desired ringing control (RCT) relay, and the other operates the desired terminating treatment relay. Since the ten altered ringing combination indication from the number group are no longer associated with a ringing switch level, they are grouping points with the cross-connections in the marker determining the actual meaning (LLP, LDN, POTS, etc) of the vertical file (F) to ringing combination (RF) cross-connection in the NG frame.

8.02 Among the features requiring tens block screening are:

(a) Link link pulsing

(b) Two-line number

(c) Centrex phase II and III

(d) Do not answer transfer

(e) Busy line transfer

(f) All centrex numbers on temporary intercept routed to an individual announcement.

8.03 The addition of TBS in the number group requires a corresponding provision of TBS relays in the wire spring markers. U and Y markers cannot be arranged for tens block screening.

LINE LINK PULSING

8.04 The No. 5 Crossbar System provides an arrangement for outpulsing over a line circuit connected between the line link frame and a PBX. This arrangement is referred to as line link pulsing (LLP). LLP facilities enable PBXs which are served by a No. 5 crossbar marker group to receive direct-inward-dialed calls to the individual PBX extensions (centrex CU).

8.05 Line link pulsing calls require either one or two number group uses. When the LLP group cannot be identified by marker translation of the office code, thousand and hundred digit, two NG uses are necessary. First, the marker enters the NG containing the called telephone number which, in this case, is a PBX extension. The cross-connection information in the NG provides the marker with the routing by causing the operation of a particular line route (LR) relay and indicates the number of digits to be outpulsed to the PBX. Using information from the LR relay, the marker then enters the NG containing the LLP trunks. Using terminal hunting or PBX allotting, the NG identifies an idle LLP trunk and provides the marker with its LLF location.

8.06 The marker then causes an outgoing LLP (DP and MF) depending on type of PBX, ESS, SXS or Crossbar) sender to be associated with the LLP trunk and directs the sender to outpulse the digits of the PBX extension.

8.07 Where all of the 4-digit numbers in a given thousands series are assigned to the stations of the same PBX, the first number group usage may be omitted and the number group start lead for that thousands series can operate the LR relay directly. This is possible only if the same number of digits is to be outpulsed on all calls and all intercept arrangements are handled at the PBX. If these conditions apply to all the hundreds blocks of a particular thousands series, a hundreds digit translator may be provided in the marker to permit operating the LR relays directly for as many as ten PBXs within a thousands series. When all the numbers in an office code are associated with the same LR relay, the LR relay may be operated directly from a marker code point thereby permitting the use of additional office codes above six. A corresponding saving in NG frames can be realized because this arrangement does not require use of NG frames to identify individual PBX extensions.

8.08 The information regarding the number of digits to be outpulsed is obtained from the LR route relay when the first number group usage is omitted and the LR relay is operated directly from the thousands or hundreds digit, or code point.

8.09 The wire spring markers may be arranged to permit the use of a hundreds digit translator instead of the number group when incoming restricted hundreds blocks of line link pulsing numbers are provided. The hundreds digit translator may also be used when the same number group serves both line link pulsing and noncentrex line.

8.10 Line link pulsing requires the use of the tens block screening feature. The U and Y marker groups cannot be arranged for line link pulsing.

8.11 In the development of cross-connection information one will be concerned with an adequate and accurate spread or equalization of trunks. To aid in this area a ***provisional estimate*** (PE) requirement may be utilized. (This is a working document usually developed by a traffic/network group using trunk use data.) This PE should be reviewed and compared to the extent distribution as well as to that indicated via the network design order. Using these data sources, a decision will be made and the cross-connection assignment of trunks will be indicated on the appropriate form.

8.12 In the completion of any cross-connect form, personnel should update all forms to the current order number and date. Further, all change column indications should be erased so that only the current change is shown. In general, this will be the first procedural step in any cross-connect form completion task.

8.13 Form 13 shows the "detail trunk record" form and is used to summarize trunk data. Information on this form may be found on other cross-connect forms; however, the collection of data as presented will be helpful. Generally, the data for this form will be transcribed from other cross-connect forms/or extracted from common office drawings. However, in some cases this form is completed first and then used as a source; this is particularly true when incorporating small changes. The 413/414 drawing details most of the required data. The traffic trunk number is arbitrarily assigned for record purposes. The directory number is assigned as predicated by internal and/or working lists/documents maintained by the Network Administration office in most cases.

> ***Note:*** The detail trunk record form does not appear in Section 218-012-301; however, this form or a variation thereof has been found useful by various telephone companies and is therefore provided.

8.14 The marker cross-connect code point and route assignment form as it appears in Section 218-012-301 is illustrated in form 14. Form 15 is a modification of this form which most likely will be preferable; form 16 is another variation that is used by one of the operating telephone companies. Instructions are provided with the latter form; however, the responsibility for this form may not generally be held by the network administrator.

9. ABBREVIATIONS AND ACRONYMS

AMA:	automatic message accounting
ATMS:	automatic transmission measuring system
CAMA:	centralized AMA
CAROT:	centralized automatic reporting on trunks

CCS:	hundred call seconds
CDO:	community dial office
DP:	dial pulse/pulsing
FSP:	frequency shift pulsing
IMG:	incoming marker group
IRMC:	incoming register marker connector
LDN:	listed directory number
LLF:	line link frame
LLP:	line link pulse/pulsing
LS-M:	large switch-modified
LT:	line terminal
MF:	multifrequency
NG:	number group
NGF:	number group frame
OR:	originating register
OSL:	outgoing sender link
PCI:	panel call indicator
RC:	ringing combination
RCT:	ringing combination terminal
RP:	revertive pulsing
SS:	small switch
TB:	trunk block
TBS:	tens block screening
TG:	trunk group
TLF:	trunk link frame
TRAP:	traffic register automation program
TUR:	traffic usage recorder

TRUNK ASSIGNMENT
TRUNK LINK FRAME 00
(NONMECHANIZED CHART)

INTRAOFFICE TRK	INC TRK	REGISTER	OUT TRK	APP	TB		SWITCH 0	1	2	3	4	5	6	7	8	9
		→		AO	*8	PRES										
						PROP										
				A1	*9	PRES										
						PROP										
				A2	0	PRES	← OR →						← 1D15b →			
						PROP					← OR-TT →					
				A3	1	PRES	← 1G43 →									
						PROP										
				A4	2	PRES		← 1C146d →					← 1C5m →			
						PROP										
				A5	3	PRES	← 1C46d →									
						PROP										
↓			↓	A6	4	PRES	← 1C46d →									
						PROP										
				A7	4	PRES	← 1C46d →									
						PROP										
				A8	5	PRES		← 1A13 →					1A11			
						PROP										
				A9	5	PRES	← 1A13 →									
						PROP										

* Indicates assignments available on TL FR(J27754A or C) modified for 12-level trunk switch operation.

Fig. 1—Trunk Assignment by Trunk Link Frame—Nonmechanized (Sheet 1 of 2) (2.15) (2.40)

TRUNK ASSIGNMENT
TRUNK LINK FRAME 00
(NONMECHANIZED CHART)

INTRAOFFICE TRK	INC TRK	REGISTER	OUT TRK	APP	TB		SWITCH 0	1	2	3	4	5	6	7	8	9
				B9	*7	PRES	←				1A13					→
						PROP										
				B8	*7	PRES	←				1A13					→
						PROP										
				B7	*6	PRES	←				B90					→
						PROP										
				B6	*6	PRES	←				B90					→
						PROP										
				B5	3	PRES	←				B90					→
						PROP										
				B4	2	PRES	←	B90	→	←	B91				1C5m	→
						PROP										
				B3	1	PRES			←	B112cd	→	C174	←	B80cm	→	← B61m →
						PROP										
				B2	0	PRES	←	1C146m	→	←	1G51	→	← 1G44	→	← D128 →	← 1C161am →
						PROP										
				B1	*9	PRES										
						PROP										
				B0	*8	PRES										
						PROP										

* Indicates assignments available on TL FR(J27754A or C) modified for 12-level trunk switch operation.

Fig. 1—Trunk Assignment by Trunk Link Frame—Nonmechanized (Sheet 2 of 2) (2.15) (2.40)

AREA			OFFICE			CARD TYPE			
1	2	3	4	5	6	7	8	9	10
						M	1	L	4

TRUNK ASSIGNMENT – TRUNK LINK SWITCHES
(MECHANIZED ORDERS ONLY FOR TL FRAMES J27754A OR C)

TLV NO.		LEV		SWITCH 0								SWITCH 1								SWITCH 2								SWITCH 3								SWITCH 4							
11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
0	0	0	A																																								
		1	A																																								
		2	A		0	R							0	R							0	R							0	R							0	R			T	T	
		3	A	1	G		4	3				1	G		4	3				1	G		4	3				1	G		4	3				1	G		4	3			
		4	A	1	C	1	4	6			d	1	C	1	4	6			d	1	C	1	4	6			d	1	C	1	4	6			d	1	C	1	4	6			d
		5	A	1	C	1	4	6			d	1	C	1	4	6			d	1	C	1	4	6			d	1	C	1	4	6			d	1	C	1	4	6			d
		6	A	1	C	1	4	6			d	1	C	1	4	6			d	1	C	1	4	6			d	1	C	1	4	6			d	1	C	1	4	6			d
		7	A	1	C	1	4	6			d	1	C	1	4	6			d	1	C	1	4	6			d	1	C	1	4	6			d	1	C	1	4	6			d
		8	A	1	A		1	3				1	A		1	3				1	A		1	3				1	A		1	3				1	A		1	3			
		9	A	1	A		1	3				1	A		1	3				1	A		1	3				1	A		1	3				1	A		1	3			
		9	B	1	A		1	3				1	A		1	3				1	A		1	3				1	A		1	3				1	A		1	3			
		8	B	1	A		1	3				1	A		1	3				1	A		1	3				1	A		1	3				1	A		1	3			
		7	B		B		9	0					B		9	0					B		9	0					B		9	0					B		9	0			
		6	B		B		9	0					B		9	0					B		9	0					B		9	0					B		9	0			
		5	B		B		9	0					B		9	0					B		9	0					B		9	0					B		9	0			
		4	B		B		9	0					B		9	0					B		9	1					B		9	1					B		9	1			
		3	B																		B	1	1	2		c	d		B	1	1	2		c	d								
		2	B	1	C	1	6	4			m	1	C	1	6	4			m	1	G		5	1				1	G		5	1				1	G		4	4			
		1	B																																								
		0	B																																								

Fig. 2—Trunk Assignment by Trunk Link Frame—Mechanized (Sheet 1 of 2) (2.15) (2.16) (2.40)

AREA		OFFICE				CARD TYPE			
1	2	3	4	5	6	7	8	9	10
						M	1	L	9

TRUNK ASSIGNMENT – TRUNK LINK SWITCHES
(MECHANIZED ORDERS ONLY FOR TL FRAMES J27754A OR C)

TLF NO.		LEV			SWITCH 5							6								7								8								9							
11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
0	0	0	A																																								
		1	A																																								
		2	A		0	R			T	T		1	D		1	5			b	1	D		1	5			b	1	D		1	5			b	1	D		1	5			b
		3	A	1	G		4	3				1	G		4	3				1	G		4	3				1	G		4	3				1	G		4	3			
		4	A	1	C	1	4	6			d	1	C	1	4	6			d	1	C	1	4	6			d	1	C	1	4	6			d	1	C	1	4	6			d
		5	A	1	C	1	4	6			d	1	C	1	4	6			d	1	C	1	4	6			d	1	C	1	4	6			d	1	C	1	4	6			d
		6	A	1	C	1	4	6			d	1	C	1	4	6			d	1	C	1	4	6			d	1	C	1	4	6			d	1	C	1	4	6			d
		7	A	1	C	1	4	6			d	1	C	1	4	6			d	1	C	1	4	6			d	1	C	1	4	6			d	1	C	1	4	6			d
		8	A	1	A		1	3				1	A		1	1																											
		9	A	1	A		1	3				1	A		1	3				1	A		1	3				1	A		1	3				1	A		1	3			
		9	B	1	A		1	3				1	A		1	3				1	A		1	3				1	A		1	3				1	A		1	3			
		8	B	1	A		1	3				1	A		1	3				1	A		1	3				1	A		1	3				1	A		1	3			
		7	B		B		9	0					B		9	0					B		9	0					B		9	0					B		9	0			
		6	B		B		9	0					B		9	0					B		9	0					B		9	0					B		9	0			
		5	B		B		9	0					B		9	0					B		9	0					B		9	0					B		9	0			
		4	B		B		9	1					B		9	1					B		9	1				1	C			5			m	1	C			5			m
		3	B		C	1	7	4					B		8	0		c	m		B		8	0		c	m		B		6	1			m		B		6	1			m
		2	B	1	G		4	4					D	1	2	8					D	1	2	8				1	C	1	6	1		a	m	1	C	1	6	1		a	m
		1	B																																								
		0	B																																								

Fig. 2—Trunk Assignment by Trunk Link Frame—Mechanized (Sheet 2 of 2) (2.15) (2.16) (2.40)

AREA			OFFICE				
1	2	3	4	5	6	7	8
						T	5

TRUNK TYPE								REMOVE FROM					RELOCATE TO					REMOVE FROM					RELOCATE TO					REMOVE FROM					RELOCATE TO					REMOVE FROM					RELOCATE TO				
								TLF		LEV		SW	TLF		LEV		SW	TLF		LEV		SW	TLF		LEV		SW	TLF		LEV		SW	TLF		LEV		SW	TLF		LEV		SW	TLF		LEV		SW
9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
	0	R			T	T		1	6	A	0	4	1	9	A	0	0	1	6	A	0	5	1	9	A	0	1	1	8	A	0	4	1	9	A	0	2	1	8	A	0	5	1	9	A	0	3
	0	R			T	T		1	8	A	0	6	1	9	A	0	4	1	8	A	0	7	1	9	A	0	5																				

Fig. 3—Trunk and Originating Register Relocations and Removal (2.15)

(A)	(B) TYPE NO.	(C) TOTAL TRK RELAYS	(D) TLF LOC REQUIRED	(E) CKTS PER UNIT	(F) TB REL	(G) TRUNK LINK FRAMES 00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19(+)	20(+)	21(+)	22(+)	23(+)	
EQUIPMENT FOR INTRAOFFICE																														
Intraoffice — Flat	1A13	182 (+30)	364	1	4	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	6	6	6	6	6	1A13
Intraoffice — AMA	A37	48 (+10)	96	2	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	A37
Reverting Call	2A18	24 (+5)	24	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2A18
TOTAL INTRAOFFICE		254 (+45)	484			11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	9	9	9	9	9	
TWO-WAY																														
Out MF — In MF, Intertoll	1K1	220 (+49)		1	3	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	10	10	10	10	1K1
Out DP — In MF, Intertoll	1K56	80 (+23)		1	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	5	5	5	5	1K56
Out DP — In MF, Intertoll (MPC)	1K7	80 (+23)		1	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	5	5	5	5	1K7
Out DP — In DP, Intertoll (MPC)	1K3	5 (+5)		1	1																					1	1	1	1	1K3
TOTAL 2-WAY		385 (+100)	385			15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	21	21	21	21	
ORIGINATING REGISTERS		96 (+20)	96	-	0	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
OUTGOING																														
IMG — (Sub-to-Sub) — MG0 — Flat	J30	288 (+60)		2	4	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	J30
Comb. Toll Sw, OG, Tdm Compl — AMA	1L5	240 (+50)		1	5	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	1L5
Comb. Toll Sw, OG, Tdm Compl — AMA	1L5	40 (+40)		1	8																					10	10	10	10	1L5
Full Selector Local AMA — Tdm Compl	2C6m	200 (+48)		2	5	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8(-1)	8(-1)	8(-1)	8(+3)	8	10	10	10	10	2C6m
Common Overflow	G184	172 (+39)		1	0	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	8	8	8	8	G184
RC49 Compl — Noncoin	D139	160 (+46)		2	1	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	10	10	10	10	D139
TX, 121, etc	1N35	136 (+22)		2	2	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	4	4	4	4	1N35
Full Selector — Flat Rate — Tdm Compl	1C36	96 (+20)		2	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1C36
Full Selector — AMA — Tdm Compl	1C24	72 (+15)		1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1C24
IMG (Trk-to-Sub) — To MG0 (Tdm)	1J15	72 (+15)		1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1J15
IMG (Trk-to-Sub) — To MG0 (IT)	1J13	48 (+10)		1	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1J13
Full Selector Local — AMA	1C5	48 (+10)		2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1C5
Comb. Toll Sw, OG, Tdm Compl — AMA	1L52	48 (+10)		1	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1L52
Vacant Code Operator	D140	48 (+10)		2	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	D140
Info — Repair — Installation Desk	2D106	48 (+10)		1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2D106
Comb. Toll Sw, OG, Tdm Compl — Flat	1L29	46 (+8)		1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	1	1L29
Comb. Tone — Noncoin	1G45	38 (+6)		1	1	2	2	2	2	-	2	2	2	2	-	2	2	2	2	-	2	2	2	2	2	1	1	1	1	1G45
Perm. Signal Holding	1G51	33 (+5)		1	3	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	1	1		1	1G51
Toll Info — 131	1N21	16 (+8)		2	1	-	-	-	2	-	-		2				2				2					2	2	2	-	1N21
IMG — (Sub-to-Sub) — To MG0 — AMA	1J1	12 (+2)		2	2	-	-	2	-	-	-	2				2				2				2					2	1J1
To 2-Way RD Trunks (Aux)	1N34	12 (+2)		2	1	-	2	-	-	-	2				2				2				2			2			-	1N34
Bus Office — 811	1D104	12 (+2)		2	1	2	-	-	-	2				2				2				2							-	1D104
Local Test Desk	2E15	9		1	1	1	1	1	1	1	1	1	1	1															-	2E15
Ringer Test	E59c	5 (+2)		1	1	-			1	1	1																	1	1	E59c
Transfer Test	E42	2		1	4	-							1	1															-	E42
Intertoll Trunk Test	1E3	2		2	4	-									2														-	1E3
TOTAL		1903 (+440)	1903			77	77	77	78	76	78	77	78	78	76	77	77	77	77	75	77	77	77	77	74	90	91	90	90	

Fig. 4—Trunk Link Frame Assignment Layout (Sheet 1 of 2) (2.36) (2.40)

(A)	(B) TYPE NO.	(C) TOTAL TRK RELAYS	(D) TLF LOC REQUIRED	(E) CKTS PER UNIT	(F) TB REL	(G) TRUNK LINK FRAMES 00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19(+)	20(+)	21(+)	22(+)	23(+)	
INCOMING																														
IMG — (Sub-to-Sub) — From MG0	J31	284 (+76)		1		10	10	10	10	10	10	10	10	10	10	12	12	12	12	12	12	12	12	12	16	16	16	16	J31
Full Selector — DP — Tdm	B225d	231 (+60)		2		9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	12	12	12	12	B225d
Full Selector — MF — Tdm	B225m	170 (+47)		2		6	6	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7	7	10	10	10	10	B225m
Full Selector — DP — Tdm	1B9d	48 (+10)		2		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1B9d
Toll Sw — Noncoin — Controlled Ring	B61m	30 (+8)		1		2	2		2		2		2		2	2		2		2		2		2	2	2	2	2	B61m
IMG — (Sub-to-Sub) — From MG0 — Coin	1J8	27 (+8)		1		1		2	1	2	1	2		2			2		2		2		2		2	2	2	2	1J8
Intertoll — MF	1K17m	17 (+6)		1			1	2		1	2		2		2				1						2		2	2	1K17m
Full Selector — RP — Nontdm	B226m	12 (+6)		2			2			2											2				2	2		2	B226m
IMG — (Sub-to-Sub) — From MG0 — AMA	1J1	12(+2)		2		2			2				2			2				2							2	-	1J1
Full Selector — MF — Nontdm	B60m	8 (+2)		2								2		2			2									2		-	B60m
Local Test Desk — No Test	E45m	4		1		1	1	1	1																			-	E45m
DSA — No Test	1B34m	4		1						1	1	1	1															-	1B34m
Local Test Desk — Regular	E44m	2		1										1	1													-	E44m
Master Test Frame	MT	1						1																				-	MT
TOTAL LOAD PRODUCING (CCS)		850 (+225)	850			33	33	33	33	33	33	32	34	32	32	34	34	32	33	34	34	32	32	32	30	48	48	48	48	
BUNCHED																														
Opr Junctors	1B42	130 (+30)	1									1																-	1B42
IMG — From MG0 — (Sub-to-Trk) — AMA	1J3	60 (+20)	1																1									-	1J3
TOTAL NO LOAD		190																											
TOTAL — LOAD PROD. — EQUIPMENTS		3458	-			140	140	140	141	139	141	140	142	140	137	141	141	139	140	139	141	139	139	139	141	172	173	172	172	
TOTAL — LOAD PROD. — LOCATIONS		—	3718			150	150	150	151	149	151	150	152	150	147	151	151	149	150	149	151	149	149	149	149	180	181	180	180	
TOTAL — NO LOAD — EQUIPMENTS		190	-									95							95											
TOTAL — NO LOAD — LOCATIONS		—	2									1							1											
GRAND TOTAL — TRUNK EQUIPMENTS		3650				140	140	140	141	139	141	235	142	140	137	141	141	139	235	139	141	139	139	139	141	172	173	172	172	
GRAND TOTAL — LOCATIONS			3720			150	150	150	151	149	151	150	152	150	147	151	151	149	150	149	151	149	149	149	149	180	181	180	180	
TRUNK LINK FRAME TYPE						LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	SS 200	SS 200	SS 200	SS 200	
JUNCTOR PATTERN ARRANGEMENT (TRUNK LINK FRAME TRIPLE NUMBERS)						0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	

(+) Denotes the addition of an entire frame.
(+5) Denotes the addition of five circuits.
(—5) Denotes the removal of five circuits.

Fig. 4—Trunk Link Frame Assignment Layout (Sheet 2 of 2) (2.36) (2.40)

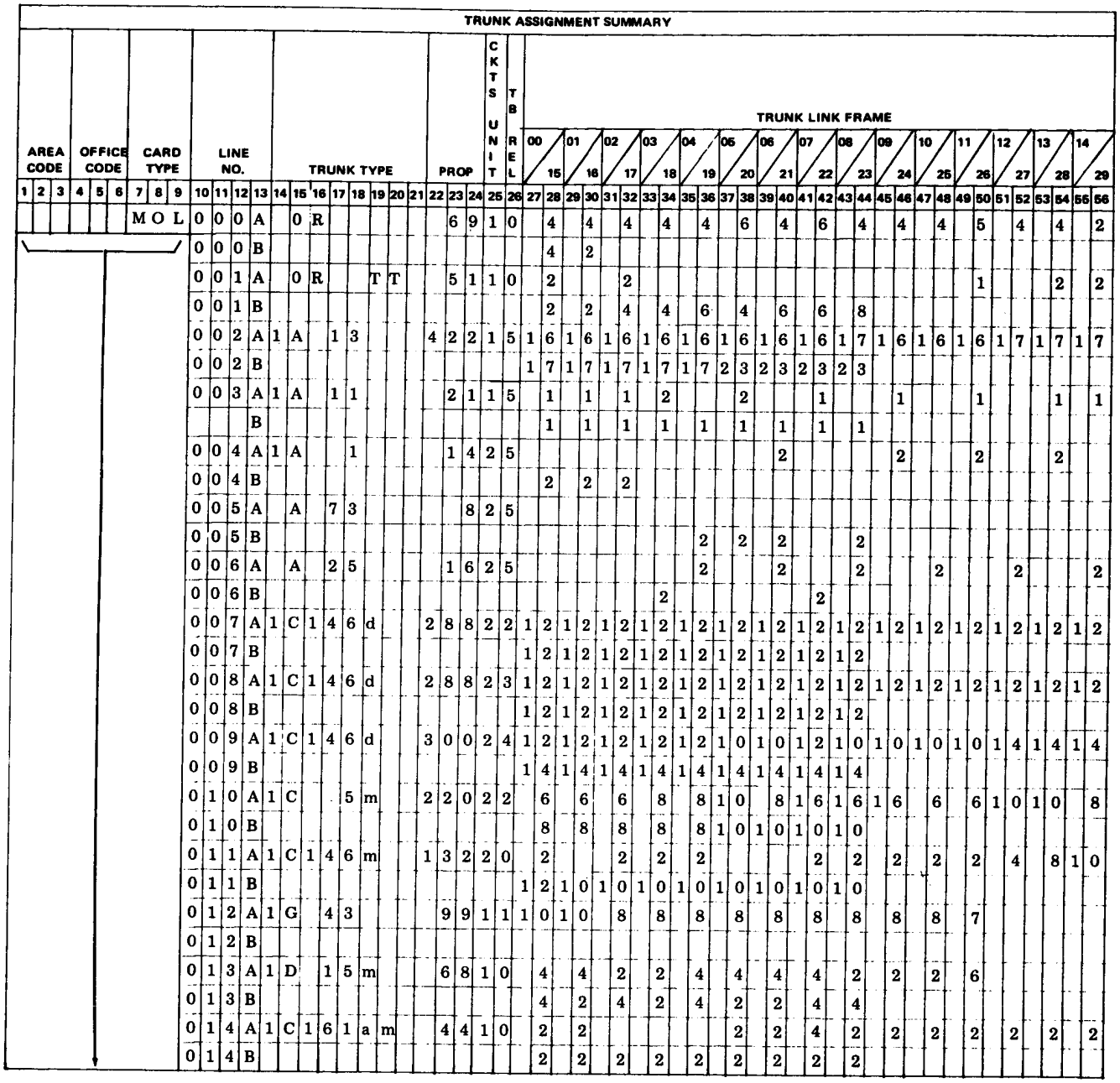
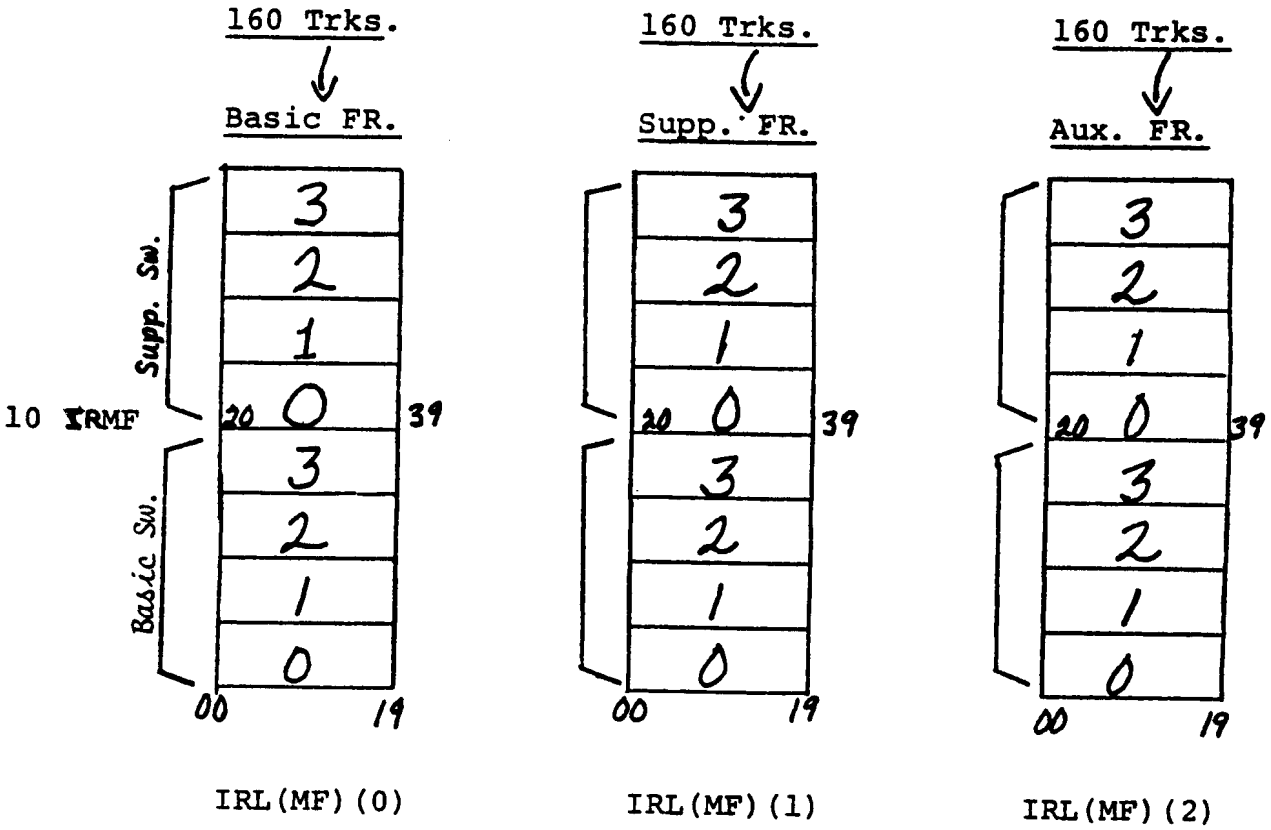


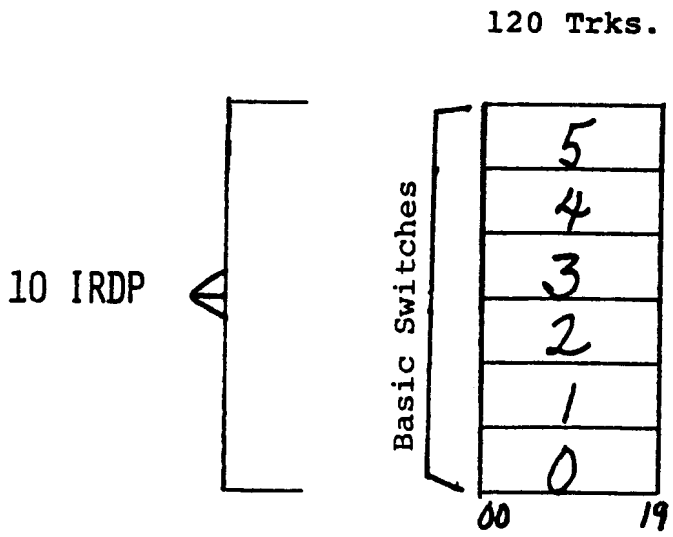
Fig. 5—Trunk Assignment Summary (2.41)



Non By-Link

The non by-link frame may be equipped with eight 200-point, 6-wire crossbar switches. Incoming registers are associated with the horizontals and multipled to the horizontals of all switches. The capacity of the frame is one register group and 160 incoming trunks. Two additional frames may be provided to increase the trunk capacity of the link group to 480.

Fig. 6—Non-By-Link (3.16)



By-Link

The by-link frame may be equipped with six 200-point, 6-wire crossbar switches. The capacity of the frame is one register group and 120 incoming trunks. The capacity of the link group is never increased to more than 120 trunks. This type of frame is required in offices where incoming traffic is received directly from step-by-step offices and it ensures immediate attachment of DP incoming register without waiting for link closure (avoids loss of pulses).

Fig. 7—By-Link (3.16)

INCOMING REGISTER GROUP BUSY REGISTRATIONS

Equipped Incoming REGISTERS OR OUTSENDERS (including one for Maintenance)	Average B.H. Group Busy Registrations with all equipment in service		
	Engineered Load	10% Overload	20% Overload
10	13	22	43
9	12	22	36
8	10	21	32
7	10	18	25
6	9	13	18
5	6	9	13
4	4	6	8
3	2	3	4

Fig. 8—Incoming Register Group Busy Registrations (3.24)

EXAMPLE OF
ASSIGNMENT OF TRUNKS
TO OUT SENDER GROUPS

Trunk Group	No. of Trunks	Estimated Outgoing Trunk CCS	Estimated Trunk Holding Time	Call Attempts Requiring Senders	Sender Holding Time	Sender Usage (Seconds)	Sender Group 0	Sender Group 1
Marker Pulse Conversion - 2-Way Intertoll								
Taunton	20	230	240	96	7.55	725		725
Worcester	9	81	"	34	8.70	296	296	
New Bedford	6	37	"	15	6.40	96	96	
Fall River	5	28	"	12	7.55	91		91
Framingham	3	13	"	5	6.40	32		32
Marker Pulse Conversion - Toll Switch								
Brown 9	11	168	240	70	5.25	368		368
Chapel 8 - Non Coin	5	43	"	18	"	95		95
Chapel 7 - Non Coin	5	39	"	16	"	84	84	
Chapel 8 - Coin	3	12	"	5	"	26	26	
Sherwood 6 - Coin	3	9	"	4	"	21	21	
Sherwood 6 - Non Coin	3	11	"	5	"	26		26
Chapel 7 - Coin	3	14	"	6	"	32		32
Outgoing Full Selector - Toll								
Chapel 8	24	573	240	238	5.25	1250	1250	
Brown 9	15	316	"	132	"	695	695	
Sherwood 6	13	239	"	100	"	525		525
Chapel 7	13	256	"	107	"	562		562
•								
Outgoing Straightforward & Ringdown								
Whitney 4	17	312	240	131	1.00	131		131
Midway 6	15	262	"	108	"	108	108	
Main	14	237	"	99	"	99	99	
Dupont 9	13	216	"	90	"	90		90
Saratoga 9	8	99	"	41	"	41	41	
Normandy 9	6	58	"	24	"	24		24
Hamilton 8	5	43	"	18	"	18		18
Total						5435	2716	2719

Note 1 - In so far as practical each type of use is assigned to both sender groups.

2 - In estimating trunk holding time, proper allowance should be made for call attempts.

3 - Sender groups of equal size.

Fig. 9—Example—Assignment of Trunks to Outsender Groups (4.15)

OUTSENDER GROUP BUSY REGISTRATIONS

Equipped Incoming REGISTERS OR OUTSENDERS (including one for Maintenance)	Average B.H. Group Busy Registrations with all equipment in service		
	Engineered Load	10% Overload	20% Overload
10	13	22	43
9	12	22	36
8	10	21	32
7	10	18	25
6	9	13	18
5	6	9	13
4	4	6	8
3	2	3	4

Fig. 10—Outsender Group Busy Registration (4.15)

EXAMPLE OF

LINE EQUIPMENT CLASS OF SERVICE ARRANGEMENT
NO. 5 CROSSBAR

DATE _____ OFFICE 232

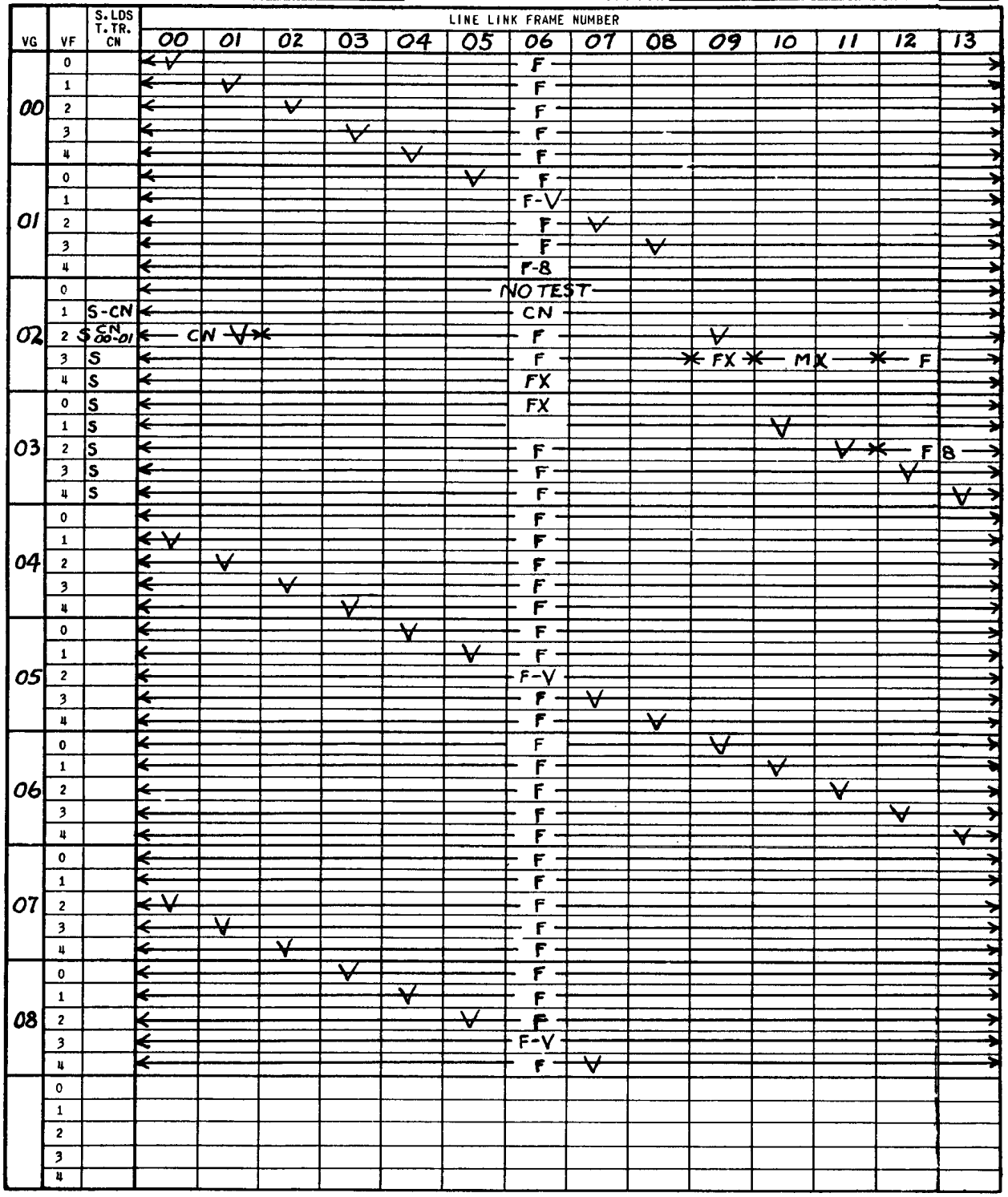


Fig. 11—Example—Line Equipment Class of Service Arrangement (6.20)

	QUANTITY	SCAN SWITCH TERM	USAGE REG
FAST SCAN ITEMS			
Completing Markers — Tot Usage	4	40	4
Dial Tone Markers — Tot Usage	2	20	2
Outsenders, RP — Tot Usage	8 (1 group)	80	1
Outsenders, MF — Tot Usage	4 (1 group)	40	1
Incoming Reg, RP — Tot Usage	9 (1 group)	90	1
Incoming Reg, MF — Tot Usage	6 (1 group)	60	1
Transverters	3	30	3
AMA Recorders	8	80	8
	Total	440	21
SLOW SCAN ITEMS			
Common Control			
Completing Markers — Mtce	4	4	1
Dial Tone Markers — Mtce	2	2	1
Outsenders, RP — Mtce	8 (1 group)	8	1
Outsenders, MF — Mtce	4 (1 group)	4	1
Incoming Reg, RP — Mtce	9 (1 group)	9	1
Incoming Reg, MF — Mtce	6 (1 group)	6	1
Transverters — Mtce	3	3	1
Orig Reg, DP — Tot Usage	64	64	1
Orig Reg, DP — Mtce	64	64	1
	Total	164	9
Line Link Frame — Hor Group	24 frames	480	240
Trunk Link Frame — Hor Group	12 frames	480	120
Subscriber Line Usage (SLU)	100 leads	100	100
Detector Group Usage (DGU)	2 circuits	—	2*
	Total	1060	462
Trunks — Type A	100 (5 groups)	100	5
Trunks — Type C	600 (41 groups)	600	41
Trunks — Type K	40 (2 groups)	40	2
	Total	740	48
	Grand Total	2404	540ϕ

Note: All No. 5 Crossbar circuit items use ground busy detectors except as noted in paragraph 4.12.

* 5-digit registers

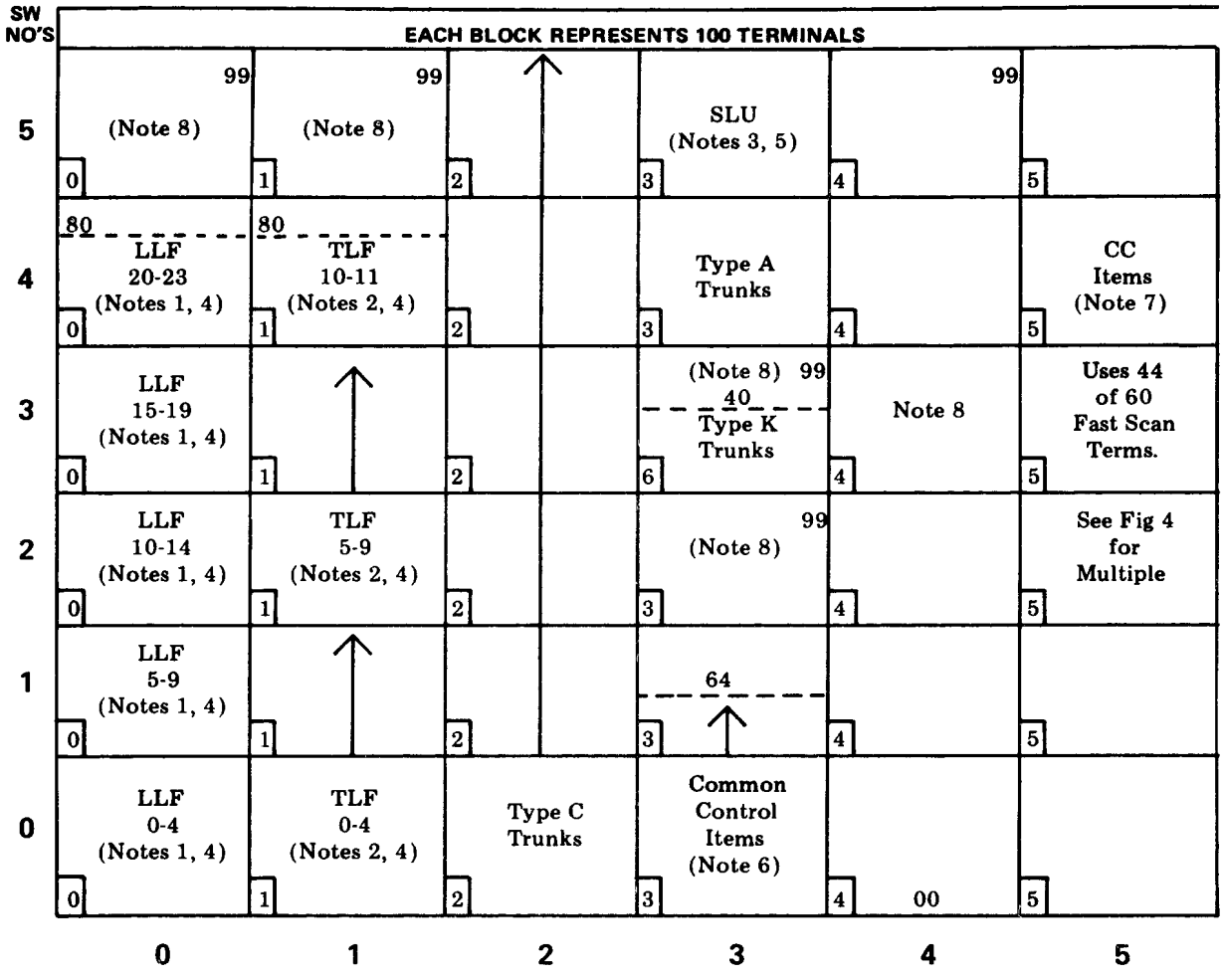
ϕ Provide an additional 5% for administration.

Fig. 12—Summary of Measured Items (7.04)

TRAFFIC USAGE RECORDER
SCAN SWITCH ASSIGNMENTS

BUILDING _____ TEL CO. ORDER _____ TUR NO. _____

OFFICE _____ WE ORDER _____ DATE _____



Note 1: 0 and 5 links of each horizontal group of line link frames.

Note 2: 0 and 5 links left, 0 and 5 links right of each horizontal group of trunk link frames.

Note 3: 2 horizontal groups (maximum of 118 lines; normally 100 terminals provided).

Note 4: Arranged for detector group usage.

Note 5: Arranged for split detector group usage.

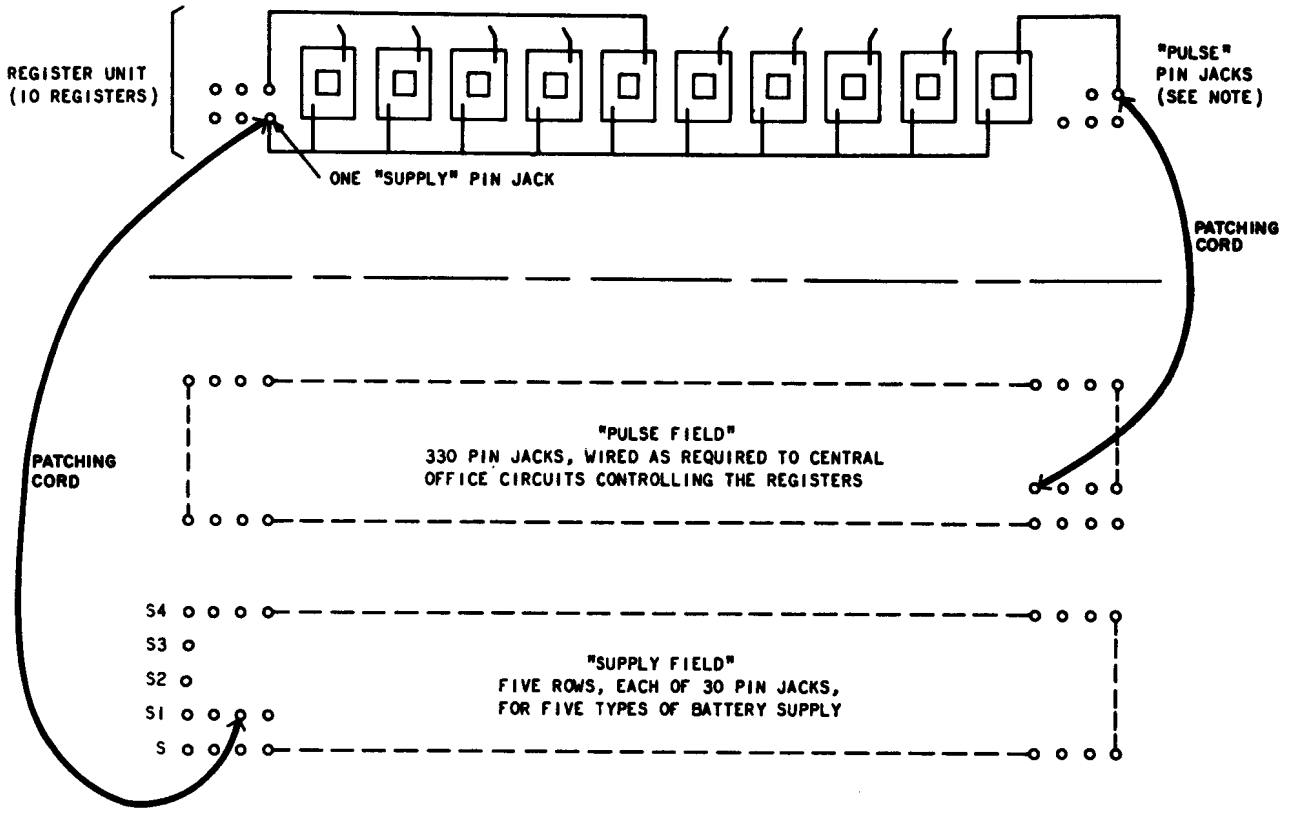
Note 6: Arranged for slow scan.

Note 7: Arranged for fast scan.

Note 8: Unassigned terminals

Note 9: Small block [2] indicates detector number.

Fig. 13—Scan Switch Assignments (7.04)



THE ABOVE ARRANGEMENT SHOWS ONE (OF A POSSIBLE 30) REGISTER UNIT OF 10 REGISTERS. ALL REGISTERS OF THIS UNIT MUST BE FED FROM THE SAME BATTERY SUPPLY, AND PREFERABLY SHOULD BE OF THE SAME TYPE (IE, PEG COUNT, OR OVERFLOW, ETC).

THE PATCHING CORD AT THE LEFT SHOWS THAT THIS UNIT HAS BEEN PATCHED TO THE S1 BATTERY SUPPLY, WHICH IS UNDER THE CONTROL OF A BATTERY CUTOFF KEY AT THE TOP OF THE CABINET. THE FACT THAT THE THIRD JACK IN THE S1 ROW IS USED INDICATES THAT THE THIRD REGISTER UNIT IN THE CABINET IS INVOLVED. ANY OTHER REGISTER UNIT SIMILARLY PATCHED TO ANY OTHER S1 BATTERY SUPPLY JACK WOULD ALSO BE UNDER CONTROL OF THE SAME BATTERY CUTOFF KEY. S3 AND S4 ROWS ARE NOT USED IN NO. 5 CROSSBAR.

THE PATCHING CORD AT THE RIGHT SHOWS THAT THE LAST REGISTER OF THE UNIT HAS BEEN PATCHED TO A PARTICULAR PIN JACK IN THE "PULSE FIELD"; THUS SCORING ON THAT REGISTER WHATEVER CENTRAL OFFICE REGISTER CIRCUIT HAS BEEN WIRED TO THAT PIN JACK IN THE PULSE FIELD.

NOTE: EACH REGISTER UNIT HAS 11 PIN JACKS. ONE, FOR BATTERY SUPPLY, IS WIRED TO ALL 10 REGISTERS AS ILLUSTRATED. THE OTHER 10 "PULSE" JACKS (5 AT EACH END) ARE INDIVIDUALLY WIRED TO EACH REGISTER AS ILLUSTRATED FOR THE 5TH AND LAST REGISTERS.

Fig. 14—Schematic of Patching Arrangements for One Traffic Register Cabinet (7.10)

TRUNK LINK CROSS-CONNECTIONS
TWO-WIRE
A APPEARANCE

NO. 5 CROSSBAR

ISSUE_____ DATE_____
MKR GRP_____ OFFICE_____
FRAME_____ SHEET_____ OF_____

ASSIGNMENT	CROSS CONNECT									ASSIGNMENT	CROSS CONNECT								
	SW & LEV	FA_ TO TG	FTA_ TO FTC	BTA_ TO BT	RCA TO RC	RN_ TO	TKT_ TO	TSC TO	TRN_ TO		SW & LEV	FA_ TO TG	FTA_ TO FTC	BTA_ TO BT	RCA TO RC	RN_ TO	TKT_ TO	TSC TO	TRN_ TO
	00										05								
	10										15								
	20										26								
	30										36								
	40										46								
	50										56								
	60										66								
	70										76								
	80										86								
	90										96								
	01										07								
	11										17								
	21										27								
	04																		
	14										19								
	24										29								
	34										39								
	44										49								
	54										59								
	64										69								
	74										79								
	84										89								
	94										99								

Form 1—Trunk Link Cross-Connections (Sheet 1 of 2)

TRUNK LINK CROSS-CONNECTIONS
TWO-WIRE
B APPEARANCE

NO. 5 CROSSBAR

ISSUE_____ DATE_____
MKR GRP_____ OFFICE_____
FRAME_____ SHEET_____ OF_____

ASSIGNMENT	CROSS CONNECT									ASSIGNMENT	CROSS CONNECT								
	SW & LEV	FB_ TO TG	FTB_ TO FTC	BTB_ TO BT	RCB TO RC	KT_ TO	TKT_ TO	TSC TO	TRN_ TO		SW & LEV	FB_ TO TG	FTB_ TO FTC	BTB_ TO BT	RCB TO RC	KT_ TO	TKT_ TO	TSC TO	TRN_ TO
	00										05								
	10										15								
	20										25								
	30										35								
	40										45								
	50										55								
	60										65								
	70										75								
	80										85								
	90										95								
	01										06								
	11										16								
	21										26								
	31										36								
	14										19								
	24										29								
	34										39								
	44										49								
	54										59								
	64										69								
	74										79								
	84										89								
	94										99								

Form 1—Trunk Link Cross-Connections (Sheet 2 of 2)

BY | DATE | IS.

TRUNK LINK CROSS-CONNECTIONS, B APPEARANCE
TWO-WIRE
NO. 5 CROSSBAR

OFFICE _____ TEL.CO.ORD.NO. _____
MRK.GRP. _____ TRAF.DATE _____
FRAME NO. _____ SHEET _____ OF _____ TRAF.ISSUE _____

ASSIGNMENT						CROSS-CONNECT										
TRK TYPE	TRUNK GROUP	TRAF TK NO.	RELAY RACK BAY	RELAY RACK CKT	SW & LEV	TB REL	BTB TO BT	FB TO TG	FTB TO FTC	RL TO RD	LV TO RS	KT TO CL	TRN	TKT	TSC	* CHANGE
					9	4 2										
					8											
					7											
					6											
					5											
					4											
					3											
					2											
					1											
					0											
					9	3 1										
					8											
					7											
					6											
					5											
					4											
					3											
					2											
					1											
					0											
					9	2 0										
					8											
					7											
					6											
					5											
					4											
					3											
					2											
					1											
					0											
					9	1 9										
					8											
					7											
					6											
					5											
					4											
					3											
					2											
					1											
					0											
					9	0 8										
					8											
					7											
					6											
					5											
					4											
					3											
					2											
					1											
					0											

ASSIGNMENT						CROSS-CONNECT										
TRK TYPE	TRUNK GROUP	TRAF TK NO.	RELAY RACK BAY	RELAY RACK CKT	SW & LEV	TB REL	BTB TO BT	FB TO TG	FTB TO FTC	RL TO RD	LV TO RS	KT TO CL	TRN	TKT	TSC	* CHANGE
					9	9 7										
					8											
					7											
					6											
					5											
					4											
					3											
					2											
					1											
					0											
					9	8 7										
					8											
					7											
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					5											
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					1											
					0											
					9	7 6										
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					0											
					9	5 3										
					8											
					7											
					6											
					5											
					4											
					3											
					2											
					1											
					0											

INSTRUCTIONS FOR PREPARING TRUNK LINK CROSS-CONNECTIONS FORM

OFFICE — Enter the name of the office

MRK. GRP. — Enter the number of the marker group

SHEET OF — Enter appropriate information regarding sheet count

TEL. CO. ORD. NO. — Enter the traffic order/record letter etc, which affected installation, change, or other action

TRAF. DATE — Enter month, day, year

TRAF. ISSUE —

Base Drawing Numbers — List source documents used in creation of form

FRAME NO. — List the frame number as found on the legend/title of the appropriate drawing

Note: Trunks assignment is based on wiring configuration, ie, SW and Lev., TB preprinted entries on form

Column 1 — TRK TYPE: Enter the trunk type as found on the appropriate trunk link frame office drawing

Column 2 — TRUNK GROUP: Enter the name/designation of the trunk group

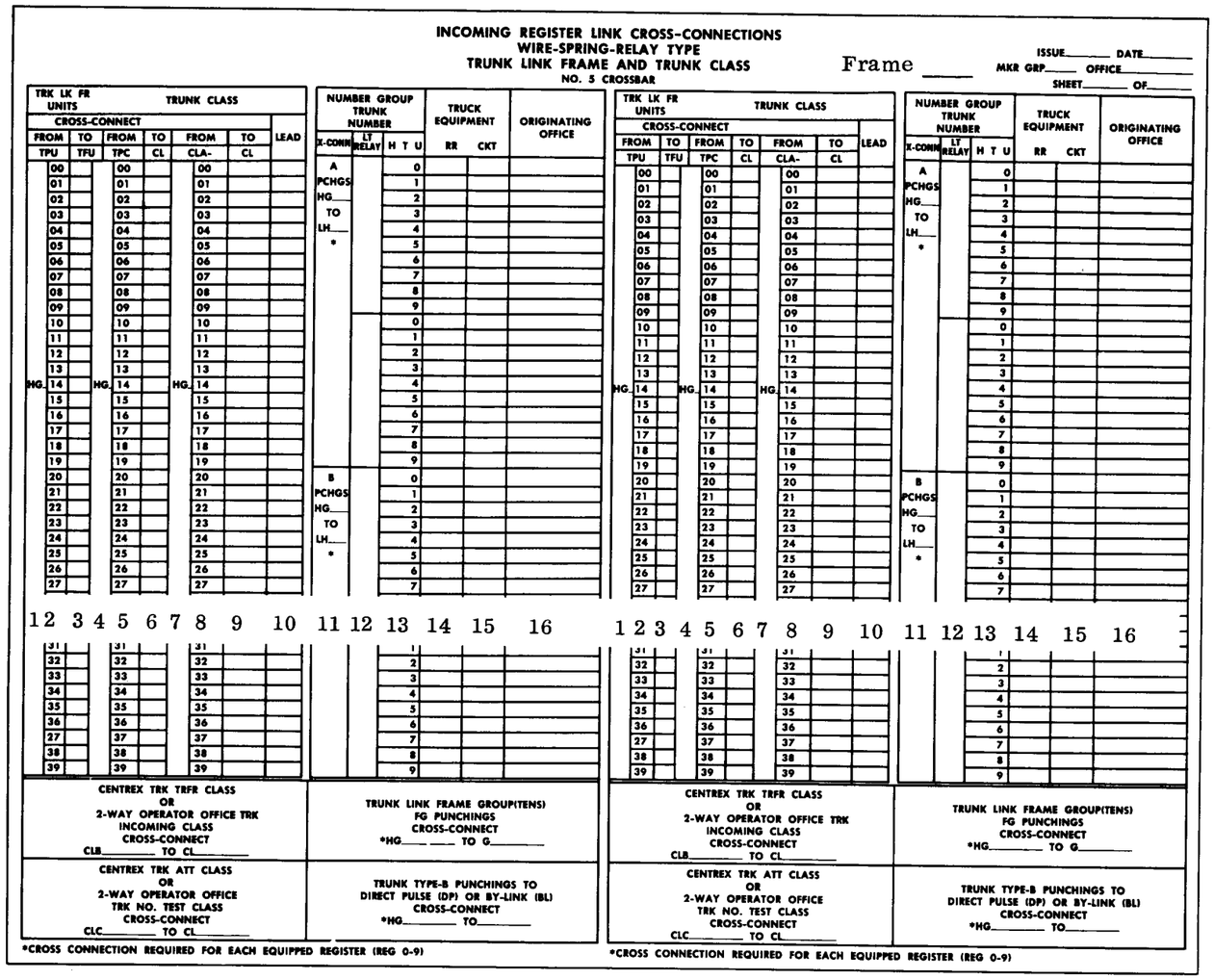
Column 3 — TRAF. TRUNK NO.: Enter the traffic trunk number as assigned on the detail trunk record form

Column 4/5 — RELAY RACK, BAY, CKT: Enter the relay bay, or frame and the associated circuit number as recorded on the detail trunk record form, or as provided on the trunk link frame office drawing

Column 6/7 — SW & LEV, TRUNK BLOCK REL: Information is preprinted

Column 8/16 — CROSS-CONNECT: Information to be supplied

Form 2—Trunk Link Cross-Connections, Variation


INCOMING REGISTER LINK CROSS-CONNECTIONS
WIRE-SPRING-RELAY TYPE
TRUNK LINK FRAME AND TRUNK CLASS
NO. 5 CROSSBAR

Frame ____

ISSUE____ DATE____
MKR GRP____ OFFICE____
SHEET____ OF____

TRK LK FR UNITS — TRUNK CLASS — CROSS-CONNECT
FROM | TO TPU | TO TFU | FROM TPC | TO CL | FROM CLA- | TO CL | LEAD
HG. 00–27 (TPU) | TFU | TPC | CL | CLA- | CL

NUMBER GROUP TRUNK NUMBER
X-CONN | LT RELAY | H T U

TRUCK EQUIPMENT
RR | CKT

ORIGINATING OFFICE

A PCHGS HG____ TO LH____ *
B PCHGS HG____ TO LH____ *

12 3 4 5 6 7 8 9 10 11 12 13 14 15 16
31 32 33 34 35 36 27 38 39

CENTREX TRK TRFR CLASS
OR
2-WAY OPERATOR OFFICE TRK
INCOMING CLASS
CROSS-CONNECT
CLB_____ TO CL_____

TRUNK LINK FRAME GROUP(TENS)
FG PUNCHINGS
CROSS-CONNECT
*HG_____ TO G_____

CENTREX TRK ATT CLASS
OR
2-WAY OPERATOR OFFICE
TRK NO. TEST CLASS
CROSS-CONNECT
CLC_____ TO CL_____

TRUNK TYPE-B PUNCHINGS TO
DIRECT PULSE (DP) OR BY-LINK (BL)
CROSS-CONNECT
*HG_____ TO_____

*CROSS CONNECTION REQUIRED FOR EACH EQUIPPED REGISTER (REG 0-9)

TRK LK FR UNITS — TRUNK CLASS — CROSS-CONNECT
FROM | TO TPU | TO TFU | FROM TPC | TO CL | FROM CLA- | TO CL | LEAD
HG. 00–27 (TPU) | TFU | TPC | CL | CLA- | CL

NUMBER GROUP TRUNK NUMBER
X-CONN | LT RELAY | H T U

TRUCK EQUIPMENT
RR | CKT

ORIGINATING OFFICE

A PCHGS HG____ TO LH____ *
B PCHGS HG____ TO LH____ *

12 3 4 5 6 7 8 9 10 11 12 13 14 15 16
31 32 33 34 35 36 27 38 39

CENTREX TRK TRFR CLASS
OR
2-WAY OPERATOR OFFICE TRK
INCOMING CLASS
CROSS-CONNECT
CLB_____ TO CL_____

TRUNK LINK FRAME GROUP(TENS)
FG PUNCHINGS
CROSS-CONNECT
*HG_____ TO G_____

CENTREX TRK ATT CLASS
OR
2-WAY OPERATOR OFFICE
TRK NO. TEST CLASS
CROSS-CONNECT
CLC_____ TO CL_____

TRUNK TYPE-B PUNCHINGS TO
DIRECT PULSE (DP) OR BY-LINK (BL)
CROSS-CONNECT
*HG_____ TO_____

*CROSS CONNECTION REQUIRED FOR EACH EQUIPPED REGISTER (REG 0-9)

INSTRUCTIONS FOR PREPARING INCOMING REGISTER LINK CROSS-CONNECTIONS RECORD FORM

ISSUE — Enter the numeric designation of this form, issue 1, 2, etc

DATE — Enter the month, day, and year of record

MKR GRP — Enter the designation (name/number) of marker group involved

OFFICE — Enter the name of the office

SHEET OF — Enter the appropriate sheet number and total number of sheets

Column 1 — CROSS-CONNECT — FROM — TPU (HG): Enter the horizontal group number of the crossbar switch. Drawing 421 will be a reference for additional form entries

Column 2 — CROSS-CONNECT — FROM TPU: Preprinted entry representing the 20 verticals on the basic switch as well as the 20 verticals on a supplementary switch

Column 3 — CROSS-CONNECT — TO TFU: The cross-connect to the trunk frame unit (TFU) will generally be supplied. This information may be found on the 421 office drawing and verified, if necessary, via the 413 office drawing by validating that the appropriate relay rack number/circuit number appears on the proper trunk link location

Column 4 — CROSS-CONNECT: Same entry as column 1

Column 5 — CROSS-CONNECT (HG): Same entry as column 2

Column 6 — CROSS-CONNECT TO CL: Information will be supplied

Column 7 — CROSS-CONNECT FROM (HG): Same entry as column 1

Column 8 — CROSS-CONNECT FROM CLA: Same entry as column 2

Column 9 — CROSS-CONNECT TO CL: Information will be supplied

Column 10 — LEAD: Information will be supplied

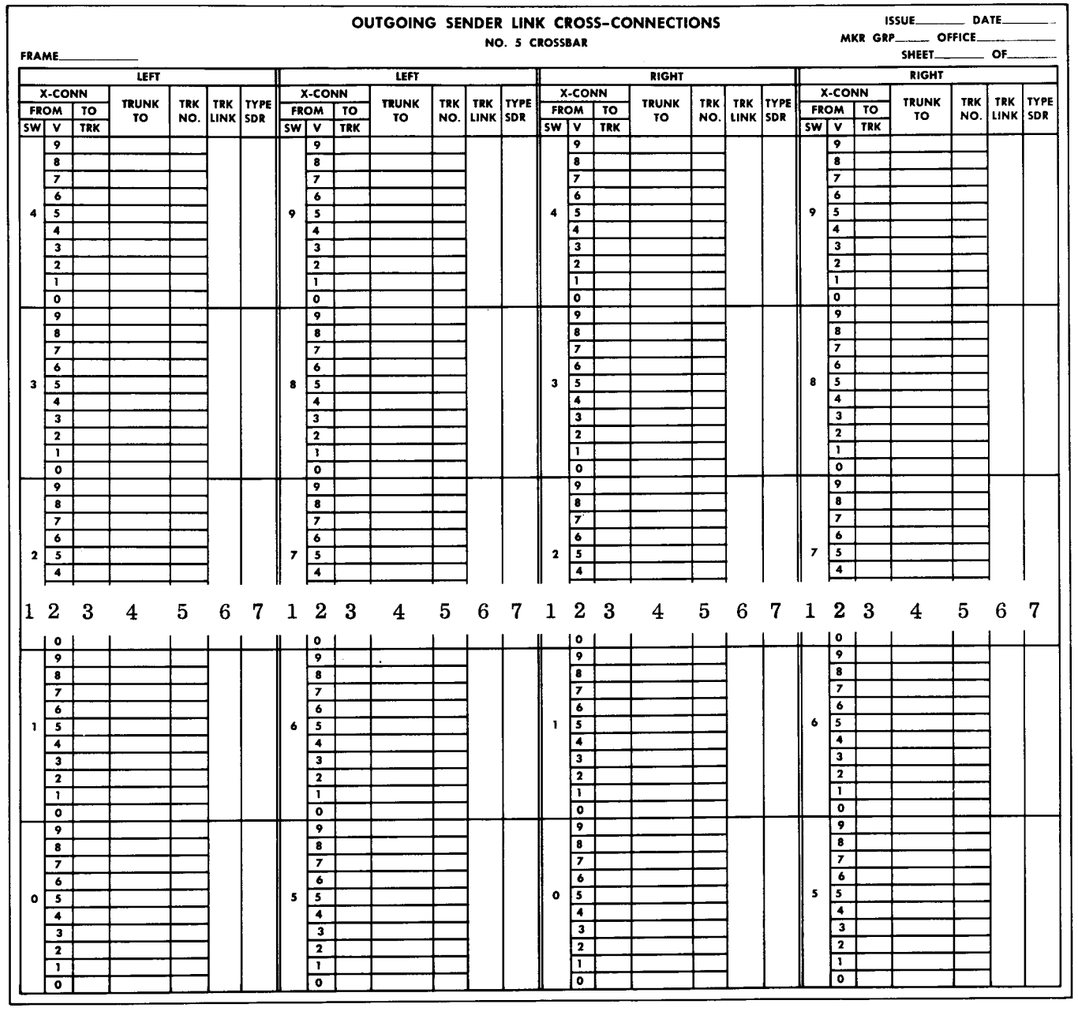
Column 11, 12, 13 — NUMBER GROUP TRUNK NUMBER: This information available on the 420 office drawing

Column 14 — TRUNK EQUIPMENT RR: Enter the relay rack location of the trunk. Office drawing 421 should be used as the source of this information

Column 15 — TRUNK EQUIPMENT CKT: Enter the trunk relay rack circuit number. Office drawing 421 should be used as the source for this information

Column 16 — ORIGINATING OFFICE: Enter the trunk name or designation using the trunk link frame form as the source of information

Form 3—Incoming Register Link Cross-Connections



INSTRUCTIONS FOR PREPARING OUTGOING SENDER LINK CROSS-CONNECTIONS FORM

ISSUE — Enter the numeric designation of this form, issue 1, 2, etc

DATE — Enter the month, day, and year of form

MKR GRP — Enter the designation (usually numeric) of marker group which interfaces with outgoing sender link

OFFICE — Enter the name of office

SHEET OF — Enter the appropriate sheet number as well as total number of sheets involved

FRAME — Enter the identification of outgoing sender link frame

Column 1 — X-CONN-FROM: Preprinted information. This information defines the switch on the outgoing sender link for which further information is provided

Column 3 — X-CONN-TO: Enter the trunk circuit number. This information should be extracted from the appropriate 414 office drawing. (see note)

Note: It will be helpful to include for reference the trunk equipment location, it is suggested that a margin "working column" be made. Enter there the relay rack location of the trunk along with the circuit number. This information is found on both the 413 and 414 drawing. (See Form 5)

Column 4 — TRUNK TO: Enter the name (or designation) for the trunk group from the traffic order. Consider the following:

(a) Each individual switch must be assigned trunk groups which require the same type sender

(b) Each switch will not be totally filled initially

Column 5 — TRK NO: Enter the trunk number as assigned to trunk group. (This number assignment generally comes from a detail worksheet or other working document which enables one to spread trunks and "keep up" with their assignment)

Column 6 — TRK LINK: Enter the trunk link location along with the appearance, switch and level designation. This information is obtained from the 413 office drawing. See below:

(a) Trunk link frame is at the top of 413 drawing on a horizontal with "TL heading"

(b) A/B appearance is obvious on 413 drawing

(c) Switch/level is a vertical under TL heading on 413 drawing

Column 7 — TYPE SDR: Enter the type sender required. Drawing 413 encodes this information within type of trunk

Form 4—Outgoing Sender Link Cross-Connections

OUTGOING SENDER LINK CROSS-CONNECTIONS

NO. 5 CROSSBAR

ISSUE_____ DATE_____

MKR GRP____ OFFICE______

SHEET_____ OF_____

FRAME____ ___

X-CONN FROM SW	V	TRK	TO TS	TO RR	TO CKT	LEFT TRUNK TO	TRK NO.	TRK LINK	TYPE SDR	LEFT X-CONN FROM SW	V	TO TRK	TRUNK TO	TRK NO.	TRK LINK	TYPE SDR	RIGHT X-CONN FROM SW	V	TO TRK	TRUNK TO	TRK NO.	TRK LINK	TYPE SDR	RIGHT X-CONN FROM SW	V	TO TRK	TRUNK TO	TRK NO.	TRK LINK	TYPE SDR
	9										9							9							9					
	8										8							8							8					
	7										7							7							7					
	6										6							6							6					
4	5									9	5						4	5						9	5					
	4										4							4							4					
	3										3							3							3					
	2										2							2							2					
	1										1							1							1					
	0										0							0							0					
	9										9							9							9					
	8										8							8							8					
	7										7							7							7					
	6										6							6							6					
3	5									8	5						3	5						8	5					
	4										4							4							4					
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	6										6							6							6					
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	4										4							4							4					
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	1										1							1							1					
	0										0							0							0					
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	8										8							8							8					
	7										7							7							7					
	6										6							6							6					
1	5									6	5						1	5						6	5					
	4										4							4							4					
	3										3							3							3					
	2										2							2							2					
	1										1							1							1					
	0										0							0							0					
	9										9							9							9					
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	6										6							6							6					
0	5									5	5						0	5						5	5					
	4										4							4							4					
	3										3							3							3					
	2										2							2							2					
	1										1							1							1					
	0										0							0							0					

Form 5—Outgoing Sender Link Cross-Connections, Variation

ROUTE RELAY TB & TG RECORD

NO. 5 CROSSBAR

ISSUE_____ DATE_____

MKR GRP_____ OFFICE_____

SHEET_____ OF_____

TB_____

TG	TRUNK LINE FRAME																											
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
0																														
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19																														

Form 6—Route Relay TB and TG Record

TRUNK GROUP ASSIGNMENTS

NO. 5 CROSSBAR

OFFICE ____________
MRK.GRP. ____________
SHEET_____OF____________

DATE ____________
ISSUE ____________

TRUNK GROUP OR DESTINATION	TRUNK TYPE	NO. OF TRKS.	TB NO.	TG NO.	TRUNKS PER TRUNK LINK FRAME																				*CHANGE
					00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	

INSTRUCTIONS FOR PREPARING TRUNK GROUP ASSIGNMENT FORM

OFFICE — Enter the designation of the office

MRK GRP — Enter the designation of the marker group

SHEET OF — Enter the appropriate sheet number as well as the total number of sheets

DATE — Enter the month, day, and year

ISSUE — Enter the numeric issue of form, Issue 1, 2, etc

TRUNK GROUP — Enter the designation of the trunk group as it appears on the traffic order

TRUNK TYPE — Enter the trunk type as found on the traffic order

NO. OF TRKS — Enter the number of trunks assigned to the trunk group on the traffic order after confirming trunk assignment via office drawing or see the detail trunk record

TB NO. — Enter the designated trunk block number as found on the traffic order

TG NO. — Enter for record purposes an identifying number to the trunk group

TRUNKS PER TRUNK LINK FRAME — Enter the number of trunks assigned to the individual trunk link frames

Form 7—Route Relay TB and TG Record, Variation

LINE LINK CROSS-CONNECTIONS
CLASS OF SERVICE
NO. 5 CROSSBAR

ISSUE_____ DATE_____
MKR GRP_____ OFFICE_____
SHEET_____ OF_____

VERT GRP	VERT FILE OR V PCHG	LINE LINK FRAME — _____ TENS: 0 1 2 3 4 5 6 7 8 9 | _____ TENS: 0 1 2 3 4 5 6 7 8 9 | _____ TENS: 0 1 2 3 4 5 6 7 8 9 | _____ TENS: 0 1 2 3 4 5 6 7 8 9	CS LEAD OR PCHG	ASSOCIATED CLASS OF SERVICE
	0		00	
	1		01	
	2		02	
	3		03	
	4		04	
	0		05	
	1		06	
	2		07	
	3		08	
	4		09	
	0		10	
	1		11	
	2		12	
	3		13	
	4		14	
1	2	3 through 43 ← →	44	45
	3		16	
	4		17	
	0		18	
	1		19	
	2		20	
	3		21	
	4		22	
	0		23	
	1		24	
	2		25	
	3		26	
	4		27	
	0		28	
	1		29	
	2			
	3			
	4			

INSTRUCTIONS FOR PREPARING
LINE LINK CROSS-CONNECTIONS CLASS OF SERVICE FORM

ISSUE — Enter the numeric issue of form, Issue 1, Issue 2, etc

DATE — Enter the month, day, and year

MKR GRP — Enter the designation of the marker group which interfaces with line link frame

SHEET OF — Enter the appropriate sheet number as well as total number of sheets

Column 1 — VERT GRP: Enter the designation: such as 00, 01, 02 for the vertical group

Column 2 — VERT FILE: Preprinted information — There will be five vertical files within each vertical group

Columns 3 — 43 — LINE LINK FRAME

Note: Each major subcolumn represents a line link frame, as LLF 00, 01, 02, etc. Enter the appropriate "tens" digit for each subcolumn

Enter in each space the assigned class of service for that vertical file.

Column 44 — CS LEAD OR PCHG: Preprinted information with appropriate "tens" digit

Column 45 — ASSOCIATED CLASS OF SERVICE: Enter the assigned class of service which permits interpretation of "class of service" code
Ex: 00 = F-1, 10 = MX-TD
16 = Hotel-Motel

Form 8—Line Link Cross-Connections

LINE EQUIPMENT CLASS OF SERVICE ARRANGEMENT
NO. 5 CROSSBAR

OFFICE ____________
MRK. GRP. ____________
SHEET ____ OF ____________
TEL. CO. ORD. NO. ____________
DATE ____________
ISSUE ____________

VG	VF	S. LDS T. TR. CN	LINE LINK FRAME NUMBERS.																														* CHG
	0																																
	1																																
	2																																
	3																																
	4																																
	0																																
	1																																
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Form 9—Line Link Cross-Connections, Variation

TRAFFIC REGISTER CROSS-CONNECTIONS

NO. 5 CROSSBAR

ISSUE_____ DATE_____
MKR GRP_____ OFFICE_____
SHEET_____ OF_____

ASSIGNMENT	REG	FR	CROSS-CONNECT						REMARKS	ASSIGNMENT	REG	FR	CROSS-CONNECT						REMARKS
			FROM		TO								FROM		TO				
			TS	PCHG	TS	RR	CKT	PCHG					TS	PCHG	TS	RR	CKT	PCHG	

Form 10—Traffic Register Cross-Connections

TRAFFIC REGISTER AND PIN JACK ASSIGNMENTS

FRAME OR CABINET NO. _____

Note 1— Assignments furnished are typical and do not constitute a complete record of Register Assignments. (Sheet 2 is omitted)

LINE	PIN JACK	REGISTER	ASSIGNMENT	TYPE	BATT. JK.	BATT. KEY		*CHANGE
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16			See					
17			Note 1					
18								
19								
20								
21								
22								
23								
24								
25								
26								
27	0	216	Elapsed Time Register	Time	S	—		
28	219	217	Dial Tone Speed Test	Load		Start Key 3		
29	220	218	Dial Tone Speed Delay	Load		Start Key 3		
30	218	219	Orig Register Load	Load End		-		
31	202	220	Orig Matching Loss	OF		-		
32	201	221	Inc Matching Loss			-		
33	193	222	Failure To Match TLF 00			-		
34	194	223	01			-		
35	195	224	02			-		
36	196	225	03			-		
37	197	226	04			-		
38	198	227	05			-		
39	199	228	06			-		
40	200	229	Failure To Match TLF 07	OF		-		
41	203	230	Line Link Frame LLF 00	Load End		-		
42								
43								
44								
45								
46								
47								
48								
49								
50								
COL.	A_T	B_T	C_T	D_T	E_T	F_T	G_T	

LINE	PIN JACK	REGISTER	ASSIGNMENT	TYPE	BATT. JK.	BATT. KEY		*CHANGE
51	213	240	Line Link Frame LLF 10	Load End	S	—		
52	214	241	11			-		
53	215	242	12			-		
54	216	243	13			-		
55	217	244	Line Link Frame LLF 14	Load End		-		
56	226	245	Links Busy	LIT		-		
57	227	246				-		
58	228	247				-		
59	229	248				-		
60	230	249				-		
61	231	250				-		
62	232	251				-		
63	233	252				-		
64	234	253				-		
65	235	254	Links Busy			-		
66	129	255	Tot. No. of Cycles Per Run	LIT		-		
67	148	256	Inc Reg Grp DP-0	GBT		-		
68	149	257	DP-1	GBT		-		
69	147	258	Inc Reg Grp MF-0	GBT		-		
70	152	259	Coin Supv	GB		-		
71	150	260	Comb Reg + Tbl Interrupt	GB		-		
72	153	261	Greer-2Wcut EAS	OF		-		
73	154	262	Hampton			-		
74	155	263	Jasper			-		
75	156	264	Shelby			-		
76	157	265	Aiken-2Wcut EAS			-		
77	158	266	Paris-1Wcut EAS			-		
78	159	267	Mt. Holly-1Wcut EAS			-		
79	160	268	Greer-2Wcut EAS			-		
80	161	269	Hampton			-		
81	162	270	Jonesville			-		
82	163	271	Mt. Holly			-		
83	164	272	Jasper			-		
84	165	273	Shelby			-		
85	166	274	Paris			-		
86	167	275	Aiken-2Wcut COO			-		
87	168	276	Toll Inf - "131"			-		
88	169	277	Inw Opr - "121"			-		
89	170	278	TX Opr - "1126"			-		
90	171	279	- "1127"			-		
91	172	280	- "1150"			-		
92								
93								
94								
95								
96								
97								
98								
99								
100								
COL.	H_T	I_T	J_T	K_T	L_T	M_T	N_T	

NOTE: SEE FORM 8230-15 FOR MDF AND TRF CROSS CONNECTIONS.

OFFICE _____
MRK. GRP. _____
SHEET ____ OF ____
TEL. CO. ORD. NO. _____
DATE _____
ISSUE _____

Form 11—Traffic Register Cross-Connections, Variation

OFFICE _____

DRAWING NO. _____

TRAFFIC ORD. NO. _____

TRAFFIC USAGE RECORDER
ASSIGNMENTS AND CROSS CONNECTIONS

DATE _____

ISSUE _____

SHEET __ OF ___

LINE NO.	TRUNK GROUP OR EQUIPMENT ITEM	TRK NO. LF SEL CONN	RG	TRC	REG NO.	PIN JACK	EQ LOCATION RR BAY BAY ROTS GP	EQ LOCATION CKT REP SW TERM	FROM REG TS NO.	FROM REG TS PCHG	TO TUR LOCATION FRAME	TO TUR LOCATION SW	TO TUR LOCATION CONT	TO TUR LOCATION HOR	TO TUR LOCATION VERT	TURDF TS	TURDF LEV	TURDF HOR	TURDF VERT	REMARKS	UC	CHNG
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
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INSTRUCTIONS FOR PREPARING TRAFFIC USAGE RECORDER FORM

OFFICE — Enter the name of the office

DRAWING NO. — List source documents used in creating form (optional)

TRAFFIC ORD. NO. — Enter the traffic order/record, letter, etc, which affected installation, change, or other action

DATE — Enter month, day, and year

ISSUE — Enter numeric issue of form, Issue 1, 2, etc

SHEET OF — Enter appropriate information regarding sheet count

Column 1 — Enter the trunk group for which the record is being made. This should correspond to the trunk groups as shown on Form 11. (Traffic Register and Pin Jack Assignments)

Column 2 — Enter the trunk number as recorded on Detail Trunk Record

Column 3 — Enter the register number as recorded on Detail Trunk Record

Column 4 — Enter the traffic register cabinet for the trunk group from form 11

Column 5 — Enter the register number from form 11

Column 6 — Enter the pin jack designation

Columns 7—19 — To be supplied by applicable department

Form 12—Traffic Register Cross-Connections, Variation

DETAIL TRUNK RECORD

ASSOCIATIONS - FRAMES, DIRECTORY NUMBERS, SWITCHBOARDS, CONNECTING OFFICE ASSIGNMENTS AND MISCELLANEOUS

Drawing No. ___________

OFFICE ___________
MRK.GRP. ___________
SHEET _____ OF _____
TEL.CO.ORD.NO. ___________
DATE ___________
ISSUE ___________

TRAF. TRUNK NO.	NAME OR CLASS OF TRUNK	TRUNK EQUIPMENT			IRL				OSL					TRUNK LINK FRAME APPEARANCE			1ST L.LK.FRAME APP. / 2ND L.LK.FRAME APP.				DIR. NO.							SWBD. TERM.		*CHANGE
		RELAY RACK	CKT. NO.	TYPE	PULSE	FRAME	SW.	VERT.	PULSE	FRAME	SW.	VERT.	GROUP	A / B	FRAME	SW. & LEV.	FRAME	VG	HG	VF	OFF.	DIR. NO.	R.C.					26 PAN.	27 JK.	

INSTRUCTIONS FOR PREPARING
DETAIL TRUNK RECORD FORM

OFFICE — Enter the name of the office

MRK GRP — Enter the number of marker group

SHEET OF — Enter appropriate information regarding sheet count

TEL. CO. ORD NO. — Enter the traffic order/record letter, etc, which affected installation, change, or other action

DATE — Enter month, day, and year

ISSUE — Enter numeric issue of form, Issue 1, Issue 2, etc

DRAWING NOs. — List source documents used in creation of form (optional)

Column 1 — TRAF. TRUNK NO: Enter traffic trunk number as assigned for each trunk

Column 2 — NAME OR CLASS OF TRUNK: Enter the name of the trunk such as "Outgoing 766" as assigned on other cross-connect forms/traffic order

Column 3—5 — TRUNK EQUIPMENT:

Col. 3/5 Enter data from trunk link frame drawing: the trunk relay rack location, ckt. designation, and type trunk

Example:

Relay Rack	123.04
Ckt. No.	06
Type Trunk	B61KM

Column 6—9 — IRL:

Col. 6/9 Enter data from trunk link frame drawing as to type pulse (DP, MF, etc), the frame, switch, and vertical

Example: Pulse MF
(*Note:* This information is encoded within the type trunk code — See Section 819-600-150 through 168

Frame	2
Switch	3
Vertical	36

Column 10—14 — OSL:

Col. 10/14 Enter information from 413 drawing/OSL cross-connect form

Column 15—17 — TRUNK LINK FRAME APPEARANCE:

Col. 15/17 Enter data from the trunk link frame drawing as to whether trunk had A or B appearance. Refer to the legend/title and enter the appropriate FRAME. Record the TRUNK LINK APPEARANCE switch and level designations

Column 18—21 — Use as required by appropriate department

Column 22—24 — DIR. NO.: Enter the 3-digit office code, the 4-digit directory number as assigned by the network administrator. The directory number may be chosen from a worksheet listing of available numbers. Enter the ring code; this code may be obtained from class of service worksheet/summary

Column 25 — This column is provided for comment/remarks/special conditions

Column 26 & 27 — SWBD. TERM.: Use as required by appropriate department

Form 13—Detail Trunk Record

ISSUE_______ DATE_______
MKR GRP_____ OFFICE__________
SHEET_______ OF______

MARKER CROSS-CONNECTIONS
CODE POINT AND ROUTE ASSIGNMENT
NO. 5 CROSSBAR

ASSIGNMENT	CODE POINT	TYPE OF OFFICE	TYPE OF PULSING	RATE AREA	CHARGE CONDITION	DIRECT ROUTE			ALTERNATE ROUTE		LOOP RES	TYPE OF TRUNK			CODE POINT TO	CROSS-CONNECT FROM ROUTE RELAY PUNCHING									
						RELAY	GS	TYPE	RELAY	GS						RC-TO	R-TO	RA-TO	TB-TO TBC	TG-TO TGC	OS-TO OSC	CL-TO CL	CP-TO CP	CR-TO CR	DL-TO DL

Form 14—Marker Cross-Connection

ISSUE_______ DATE_______
MKR GRP_____ OFFICE__________
SHEET_______ OF______

MARKER CROSS-CONNECTIONS
CODE POINT AND ROUTE ASSIGNMENT
NO. 5 CROSSBAR

ASSIGNMENT	CODE POINT	class call	TB relay no.	tri grp no.	senders digits				out pulse	acc to code	rte adv	rmk	CODE POINT TO	CROSS-CONNECT FROM ROUTE RELAY PUNCHING									
					type	reg	delete	add						RC-TO	R-TO	RA-TO	TB-TO TBC	TG-TO TGC	OS-TO OSC	CL-TO CL	CP-TO CP	CR-TO CR	DL-TO DL

Form 15—Marker Cross-Connection, Variation

MARKER CROSS-CONNECTIONS

NO. 5 CROSSBAR

OFFICE _____

MRK. GRP. _____

SHEET ____ OF _____

TEL. CO. ORD. NO. _____

DATE _____

ISSUE _____

S - SUBSCRIBER
O - OPERATOR
B - SUBSCRIBER & OPR.
WT - WATS

LINE	CODE POINT & ROUTE	OFFICE NAME OR TRUNK GROUP	CLASS CALL	TB RELAY NO.	TRK. GRP. NO.	SENDERS					ACCESS TO CODE	ROUTE ADV.	REMARKS	*CHANGE
						TYPE	DIGITS							
							REG.	DELETE	ADD	OUT-PULSE				
1														
2														
3														
4														
5														
6														
7														
8														
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INSTRUCTIONS FOR PREPARING MARKER CROSS-CONNECTIONS

OFFICE — Enter the designation of the office

MRK. GRP. — Enter the designation of the marker group

SHEET OF — Enter the appropriate sheet number as well as the total number of sheets

TEL. CO. ORD. NO. — Enter traffic order/record letter, etc, which affected installation, change, or other action

DATE — Enter the month, day, and year

ISSUE — Enter the numeric issue of form, Issue 1, Issue 2, etc

Column 1 — LINE: Preprinted

Column 2 — CODE POINT & ROUTE: Enter the appropriate NNX code; this assignment may be "original" or come from working documents which contain regional NNX codes

Column 3 — OFFICE NAME OR TRUNK GROUP: Enter the designation (out group, name, code point, etc) of the trunk group

Column 4 — CLASS CALL: Enter local if local trunk

Column 5 — TB RELAY NO.: Enter the trunk block to which trunk is assigned as found on traffic order

Column 6 — TRK GRP NO.: Enter the appropriate designation for trunk group, remembering that the same trunk group will not be assigned to the same trunk block or the same TLF. This information may be verified/obtained from Form 7.

Column 7 — TYPE (SENDERS): Enter the type sender required per traffic order (M section)

Column 8 — 11 — DIGITS (SENDER): Enter the number of digits as required per subcolumn (Reg, Delete, Add, Outpulse) as obtained from the M section of the traffic order. The "Add" information will be determined using internal working forms which document this requirement

Column 12 — ACCESS TO CODE: Enter the NNX of the office to which trunk group goes

Column 13 — ROUTE ADV.: Enter the route advance information as decided upon by traffic/ administration

The number of digits is encoded by Alpha code — A-G meaning 7 digits, A-D 4 digits, etc. Generally there will be within the traffic order (or attached) information which will detail the digits received as well as the digits outpulsed.