

NUMBER GROUP AND BLOCK RELAY FRAME AND LINE DISTRIBUTING FRAME CROSS CONNECTIONS NO. 1 CROSSBAR OFFICES

1. GENERAL

- 1.01 This section describes the number group and block relay frame and line distributing frame cross-connections necessitated by the addition of new lines or by changes in the treatment or routing of calls to existing lines. Information is included in this section regarding the functions of the various connections and the method of determining the proper connection for transmitting to the marker the information required to determine the condition and location of the called line.
- 1.02 The "number group connector circuit" is comprised of block relay frames and a number group connector frame and is arranged to handle calls up to 2500 directory numbers. Each number group connector circuit has its individual cross-connecting equipment.
- 1.03 A "number group" is usually a group of consecutive (with exceptions noted below) numbers which is treated as a circuit unit by the terminating marker and which is associated with a lock-out circuit so that only one marker may work into a block of numbers at one time. The size of a number group depends on the amount of terminating traffic delivered to the numbers, the minimum number being 100 numbers and enlarged in increments of 100, the maximum number being 2500.
- 1.04 Each block relay frame has a capacity of 40 twenty block relays representing a capacity of 800 numbers. If necessary, this equipment may be divided by strapping and cabling arrangements at the block relay frame and at the marker frame so that one, two, three or a maximum of four number groups may appear in the frame with 100, 200, etc. in a group. If the number group contains more than 800 numbers, interframe wiring or cabling extends the number group circuit to as many block relay frames as required. Unless otherwise specified, all punching designations referred to herein are located on the fields at the lower part of the block relay frame.
- 1.05 The subscribers number as translated by the marker determines the number group connector to be used, which hundred block relay and which twenty block relay is to be operated. In addition, the marker determines from the registration the unit in the twenty block to be used. For example, if the number registered is 1134,

except for special arrangements such as for split hundreds, the marker would cause the operation of the (HB3) relay in the second block relay frame and the (TB1) relay associated with the (HB3) relay. On the basis of the last two digits, the marker tests through leads "NC14", "NF14" and "NS14". Dependent upon the number of terminals in any number group, cross-connections in the marker are made to associate the marker with the particular number group connector. The line choice, that is a particular group of 4 line link frames, is determined by the cross-connection of the (NF) terminal to the 0-19 (TF), 0-19 (RF) or 0-19 (HF) or 0-19 (XF) terminal, the numerical part of which designates the line choice to which the number is assigned.

1.06 Following the transfer of digits of the called number from the originating sender to the terminating sender, the terminating marker is seized and the number called registered. A translation of the number directs the marker to the group containing it. Battery is placed on the "ST" lead of the number group connector circuit, and by means of the lock-out circuit and the operation of the number group relays, closes the marker circuit through the block relay frame. One of the contacts of the particular twenty block relay involved connects a lead run through a distributing frame to the sleeve of the selected line for busy test and for operating the line hold magnet. Two other associated contacts connect leads in local cable to the cross-connecting fields in the lower half of the bay. One lead is cross-connected to return to the marker information as to the location of the desired line in the line choices and indicates whether it is individual, party or part of a terminal hunting group. The other gives information to the marker regarding the horizontal group in the line link. With this information the marker can attempt to connect the incoming trunk to the line. The cross-connections and the functions are described below. Those connections which are permanently wired, such as connections to operate the marker connector relays to associate the marker with the number group, are not described herein.

1.07 Each line distributing frame usually is parallel to and faces the same frame aisle as the block relay frame. The groups of 800 circuits terminating on each 4 verticals of line distributing frame are cabled to successive bays of block relay frame. The lowest 200 subscriber numbers are placed on

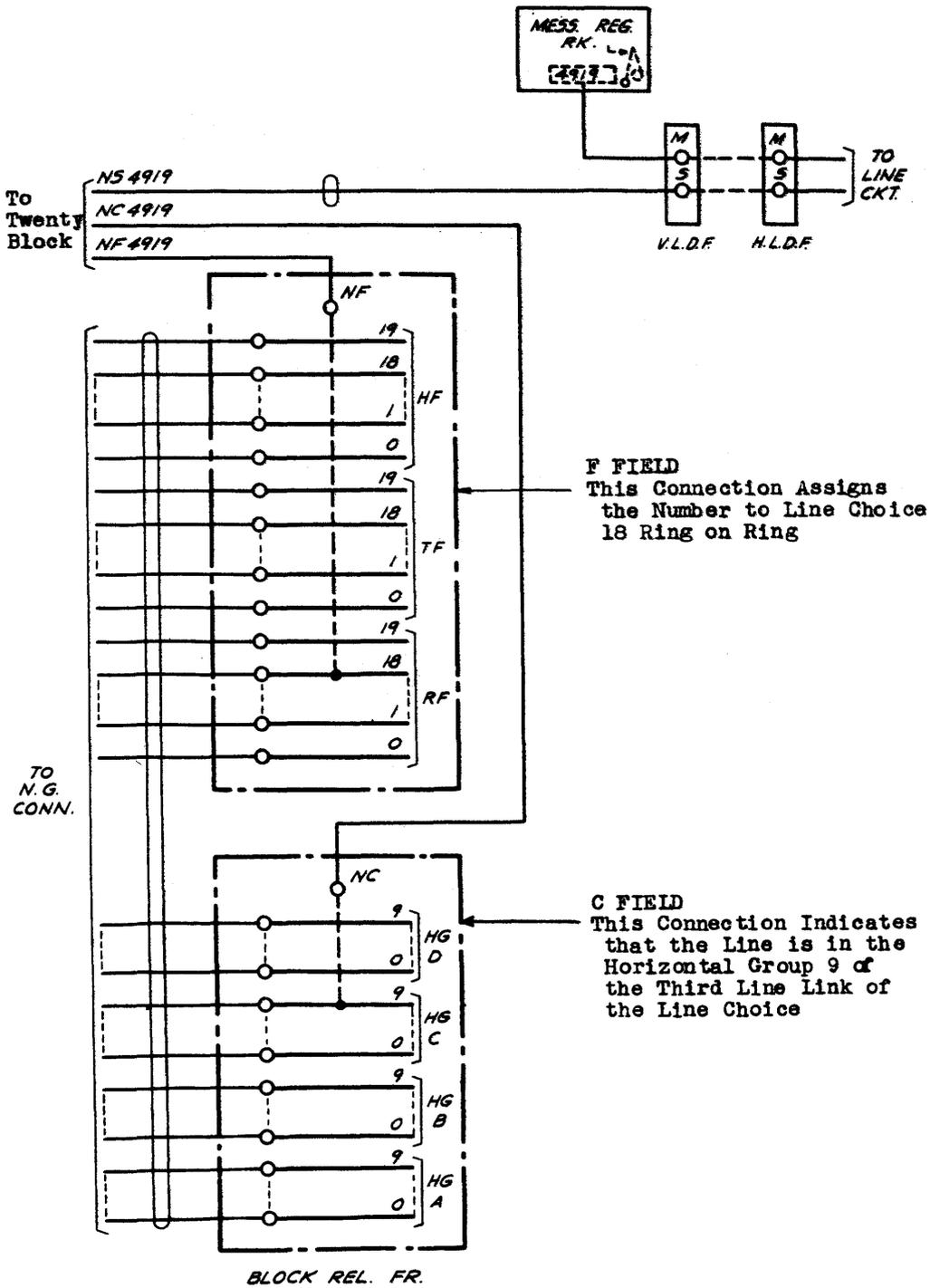


Fig. 1 - Illustrating Subscribers Line Cross-Connections

vertical 1 and consecutive groups of 200 are placed on consecutive verticals, requiring a full length frame initially. The numbering on the vertical terminal strips are from bottom up. On the horizontal portion of the frame, when all lines are individual, the 800 lowest numbered subscriber lines are placed in bays 1 to 4 and consecutive groups of 800 lines in consecutive groups of 4 bays. The numbering on the horizontal terminal strips are from left to right in groups of 100 circuits. Where there are party lines less than 800 lines may be placed in each group of 4 bays.

2. DESCRIPTION

Cross-Connections For Subscribers Lines

2.01 NFO-NF19 to TFO-TF19 or RFO-RF19

The numerical part of the TFO-19 or RFO-19 designation serves to identify the line choice on which the called line is located. The letter part of the TF or RF designation serves to indicate whether the called line is a tip or ring party and also in PBX hunting to indicate the last line of a terminal hunting group. The cross-connection of the NF punching to TFO-19 punching, identifies called lines which are located in line choices 0-19 requiring ringing current connect to the tip. Likewise, by the cross-connection of the NF punching to the RFO-19 punching, identifies called lines which are located in line choices 0-19 requiring ringing current to the ring. (In P.B.X. hunting the NF terminals are connected to the HF terminals to indicate a trunk hunting group, see 2.03).

2.02 NCO-NC19 to HGAO-9, HGBO-9, HGCO-9 and HGDO-9

These cross-connections serve to inform the marker of the location of the called line in the line choice. For example, a cross-connection of the NC14 lead to punching HGB9 serves to inform the marker that the called line is located in horizontal group 9 of line link frame B of the line choice.

P.B.X. Cross-Connections

2.03 When P.B.X. Lines Are Located in 1 Twenty Block Relay

In this case the first and all intermediate NF punchings are cross-connected to the HFO-19 punchings determined by the line choice. This informs the marker that each terminal is in a terminal hunting group as well as the identity of the line choice that it is in. The last NF punching of the P.B.X. group is connected to the RF punching determined by the line choice. The NC punchings are cross-connected to the HGAO, etc. punchings as described in 2.02 for direct subscribers line connections.

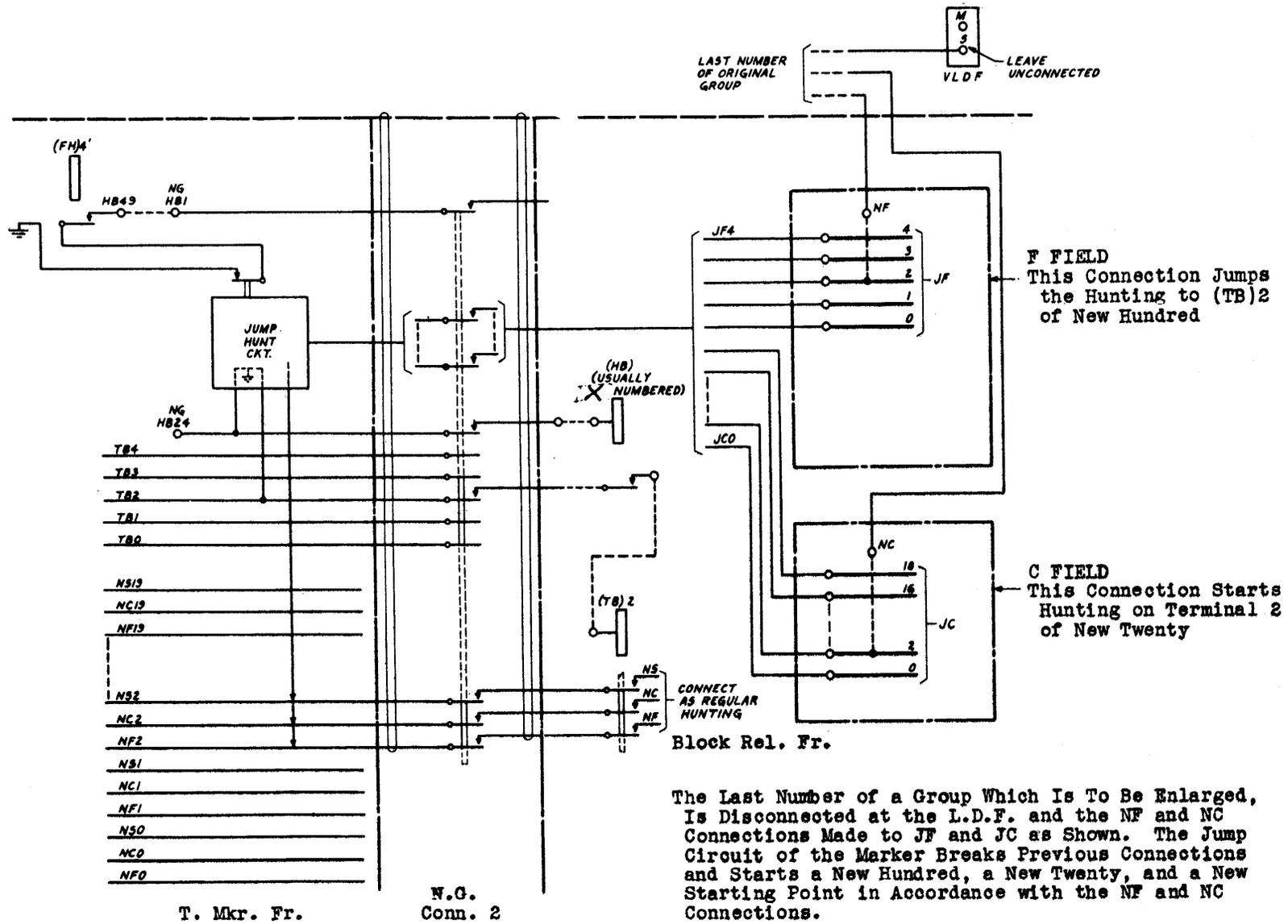
2.04 When P.B.X. Lines Are Located in More Than 1 Twenty Block Relay (Involving Block End Hunting or Allotting)

In these cases the first and intermediate NF punchings of the first twenty block relays are cross-connected to the HFO-19 punching determined by the line choice but the NF-19 punching of the first twenty block is connected to the HF punching of the line choice rather than to the RF punching of the line choice. The last NF punching of the last block is connected to the RF punching determined by the line choice. The NC punchings are connected as described in 2.02 for direct subscribers lines. Block end hunting is limited to hunting to a group of 100 lines. When a P.B.X. is allotted between 2 number groups, the last NF punching of an allotted P.B.X. in each number group is cross-connected to the RF punching determined by the line choice.

2.05 When PBX Lines Are Jump Hunted

If the PBX requires more lines and the numbers are not available in consecutive series due to the next numbers already being assigned or where a group is to be established and there are not enough consecutive regular numbers in the number group, the operation known as "jump hunting" is performed to jump the hunting progress to another relay. In this case the first and intermediate NF punchings are cross-connected to the HF punchings of the line choices except the last NF punching is connected to the punching JFO to JF4 of the same number group which indicates which of the 5 twenty blocks in the one hundred block designated for jumping is to contain the start of the added numbers. In addition the first and intermediate NC punchings of both blocks are cross-connected to the HG punchings as described in 2.02 for direct line connections. The last NC punching is cross-connected to the JCO, JC2-18 to indicate which of the terminals is the first of the added numbers. The last NF punching of the jumped block is cross-connected to the RF punching determined by the line choice. The hundred block assigned for jumping in any group is reached over the HB24 lead on the marker. The sleeve of the last line of the first terminal hunting group is left disconnected at the L.D.F.

2.06 Split Hundreds The first two numerical digits dialed indicate a specific hundred and cross-connections in the marker direct it to the proper number group, where the hundred terminals appear in their regular order. If the twenty block relays are scrambled, (assigned out of regular sequence) the marker is arranged to operate a split hundreds relay which enables the terminals to be placed in number groups of 20's rather than by 100. Ordinarily the twenty blocks run regularly within the number groups, that is, numbers ending in 0-19 are operated by lead TBO, 20 to 39 are operated by TBl, etc. In addition to the cross-connections made in



The Last Number of a Group Which Is To Be Enlarged, Is Disconnected at the L.D.F. and the NF and NC Connections Made to JF and JC as Shown. The Jump Circuit of the Marker Breaks Previous Connections and Starts a New Hundred, a New Twenty, and a New Starting Point in Accordance with the NF and NC Connections.

Fig. 2 - Illustrating Jump Hunting

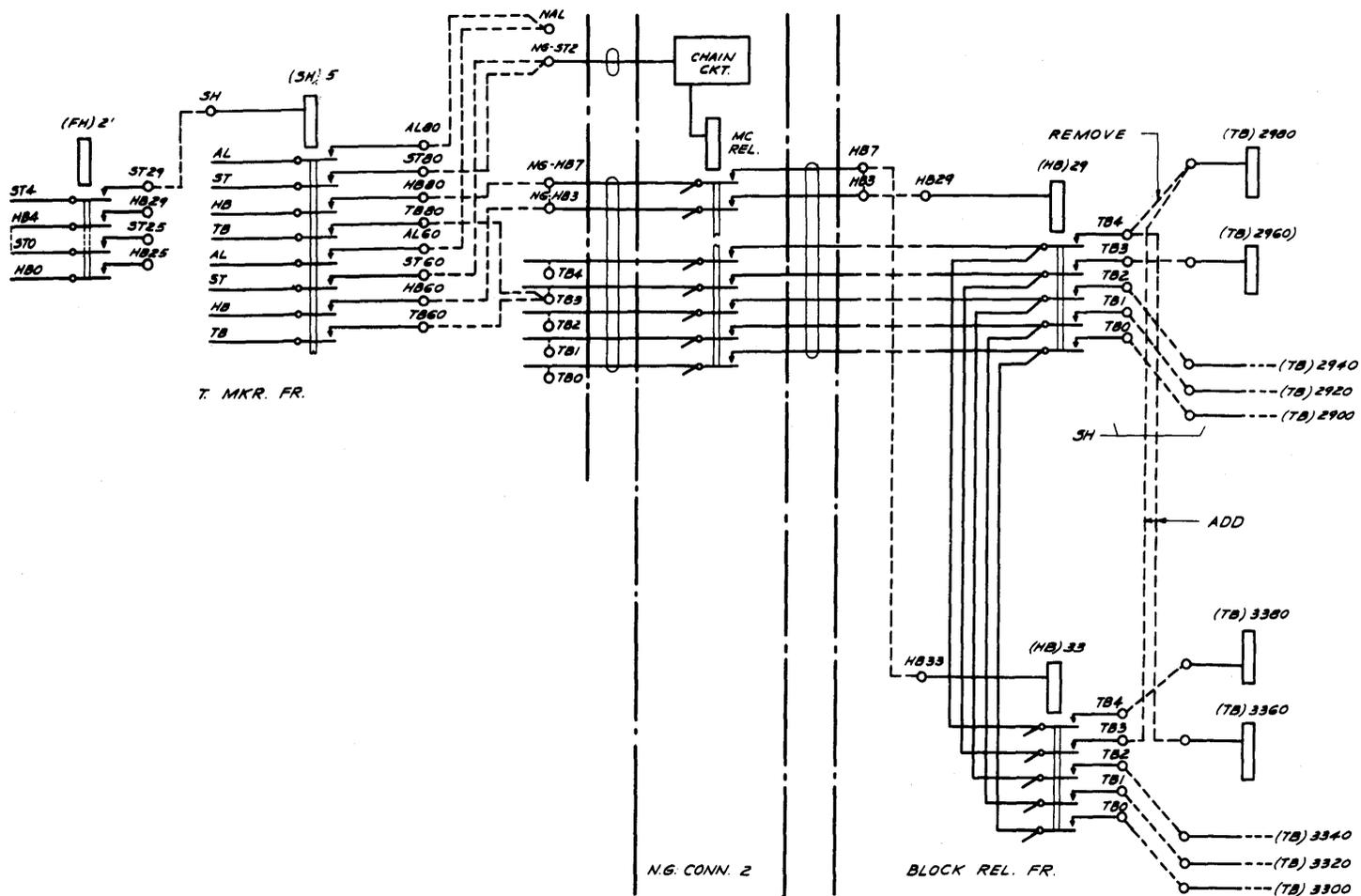


Fig. 3 - Illustrating Split Hundreds for Non-Consecutive End of Block Hunting

the marker the cross-connection at the HS terminal strip at the top of the block relay frame are changed so that the proper twenty block relay in a number group may be operated by the proper lead on the HB relay. For example, if a PBX directory number is 2960 and it is required to grow over 20 lines with number 2980 unavailable, the strap between the TB2980 winding and HB-29 contact is removed and any idle twenty block relay in number group two, for example the TB relay for 3360, is connected in. HB-33 and HB-29 must also be split in the marker. The idle contact on HB-33 may be connected to TB for 2980 and the marker arranged to translate 2980 into 3360.

2.07 X Number Blocks X numbered terminals may be provided for any number group. When provided they are numbered the same as other block relays except the hundreds designation is replaced by the number group circuit number preceded by X such as "X NG2". Where special hunting (Jump hunting or end of block) is required, not in the regular 0000-9999 series, cross-connections are made as outlined in 2.06 except connections are made to the TB relay of the X-numbered group. The terminals at the L.D.F. are bridged to any non-working number. Terminals in the hunting group on an X-numbered relay are connected for hunting and their bridged numbers connected as individual lines.

2.08 Number Checking Where it is desired to extend the terminal hunting for number check calls, the NF punching through which the hunting is to be extended is cross-connected to the XF instead of the RF punching. These added numbers may be above or below or both the numbers in the terminal hunting group. Where the P.B.X. is equipped with an outward group or groups and where the P.B.X. is also equipped with an inward or two way group the NF punching of the last line of the inward or two way group is cross-connected to the XF punching of the line choice in which the line is located. The NS and NC punchings are cross-connected as for any other line. In this manner the last line of the terminal hunting group appears as an RF terminal but on number checking due to the operation of the XG relay, the indication is changed to an HF condition and hunting is continued to check on all lines. The NC punching is cross connected as described in 2.02 for direct subscribers line connections.

2.09 Bridged Cross-Connections For Number Checking Where outward lines are in a different number group than the inward

lines, the outward lines are bridged to terminals in the number group containing the inward lines so that they may be arranged in the same terminal hunting group with inward lines on number checking.

2.10 Overflow To count the attempts to reach a line on PBX group when it is busy a subscribers line overflow circuit is connected. The NF punching of the line is cross-connected to the ANF punching on the AUX terminal strip. The associated ALF punching is cross-connected to the proper RF punching of the line choice. The NS terminal for the line is cross-connected to the ANS terminal and the associated ALS is cross-connected to the LS terminal, to associate this number with the register circuit which records the number of times it is called while busy. When a line overflow register is provided for the last line of an inward or two way group that is associated with lines used for originating traffic only on number checking calls, the last NF punching of the inward or two way group is cross-connected to the ANF punching on the auxiliary terminal strip and the associated ALF punching is cross-connected to the XF punching of the line choice. The NS terminal is cross-connected for the lines as described above.

2.11 Bridged Connections For Night Use When a terminal hunting line is used as an individual line for night use, the NC punching associated with the night numbers is cross-connected to the HF punching associated with terminal hunting line. The NF punching of the night number is cross-connected to the RFO-19 punching determined by the line choice and at the LDF connect the NS terminals of the night number to terminal hunting number.

2.12 Disconnection of a Number An individual number may be disconnected by disconnecting the associated NC and NF jumpers and the M and the S jumper at the LDF frame. The marker will recognize the open leads as a signal to route the call to intercept.

2.13 Number Temporarily Disconnected A number may be temporarily disconnected by removing the S Jumper at the LDF which gives the same information to the marker as covered in 2.12.

2.14 Denied Outward Service (Except Coin and Flat Rate Subscribers That Don't have Grounded M Leads) Outgoing service is denied by disconnecting the M jumper at

the LDF. The originating marker will recognize this open lead as a signal not to allow the call to proceed. If both the M and S jumpers at the LDF are disconnected both outgoing and incoming service are denied. The originating marker will recognize the Open S lead as a signal to route the call to intercept.

2.15 Change in Service - Retaining Same Directory Number Where a change in the class of service is required, and it is

necessary to change the location of the subscribers line in the line choice or even change to a different line choice, the cross-connection at the MDF is made to the proper line link or line choice. Corresponding changes are made at the HGA, HGB, HGC, or HGD punchings at the block relay frame. Also changes are made in the connection at the TF, RF or HF punching where a change has been in the line choice. The S punching at the VLDF is connected to the S punching on the HLDF for the proper hold magnet.

