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COMMON SYSTEMS
LINE VERIFICATION CONNECTOR AND DISPLAY CIRCUIT
AUTOMATIC NUMBER IDENTIFICATION - TYPE B
CROSSBAR NO. 1 AND OR PANEL

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SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 The automatic number identification (ANI) line verification feature, consisting of the line verification connecter and display (LVC and D) circuit, and associated circuits verifies the initial connection (or changed connections)of customers into the (ANI) system, to insure that those customers will be correctly charged for ANI calls.

1.02 The ANI system identifies calling customers and MF outpulses calling customer information to CAMA. Since this information is used to charge calling customers, it is essential that these customers be correctly identified. In addition to existing non-ANI cross-connections required to connect customers for service, each line must be connected into the number network and primary bus circuit. This ANI cross-connection involves interconnecting the customer line sleeve between the LDF (No.1 crossbar) or IDF (panel) and the number network, and two interconnections directly in the primary buses. Interconnection of the LDF or IDF will be made at the time the ANI system is initially installed; however each time a new customer is added, or when changes occur, the primary bus connections must be handled. It is the function of the ANI line verification feature to verify that these connections cause the ANI feature to transmit correct calling customer information.

1.03 The line verification feature provides means for establishing connections from individual crossbar No. 1 and panel

offices into the ANI system such that customer lines being verified are identified by the ANI system, and this information is displayed on indicator tubes, visible at the origination point.

1.04 ANI verifications in crossbar No. 1 involve establishing connections through the terminating end of the office by dialing, MF key pulsing, or with the help of a B-operator. This requires the use of an incoming trunk to which access is gained either at a message register rack (MRR) frame or at a number network (NN) frame through a miscellaneous circuit for the line message register rack.

1.05 The manual connection of a patch cord with a shoe at the line link frame is optional; its use was required (with no option) for non-ANI verifications. The incoming trunk was provided initially for a non-ANI line verification and has been modified to include ANI line verification. This trunk is provided either one per central office or one per two central offices. An ANI line verification in crossbar No. 1 verifies the LDF and block relay frame cross-connections, the customer line sleeve connection between the LDF and the number network, and the connections within the primary buses.

1.06 ANI line verification in panel requires the manual connection of a patch cord with shoe at the IDF. A new ANI line verification trunk circuit is provided, one per MRR display location, regardless of whether the location includes MRR frames serving one or more than one central office (BCO and/or GCO). An ANI line verification in panel verifies only the customer line sleeve connection between the IDF and the number network, and the connections within the primary buses.

1.07 One LVC and D circuit is provided per ANI identifier group, which will function with a maximum of six central offices (crossbar No. 1 and/or panel). The line verification feature is arranged to verify one customer line at a time, using the ANI system in competition with service calls. The LVC and D circuit has direct access to the ANI system by means of a single appearance on the ANI outpulser connector. ANI line verifications in the different central offices are intiated through the trunks mentioned above. The LVC and D circuit connects one of these and then, on receipt of the customer identification from the ANI outpulser, lights indicator tubes only at the MRR or NN frame from which the verification was originated.

1.08 In order to prevent excessive delays when simultaneous verifications are attempted from central offices in the same identifier group, the display automatically releases in 30 seconds (approximately) allowing one of the waiting verifications to be handled. The display can be manually released through the trunk when this occurs in less than 30 seconds.

1.09 As described above, line verifications may be originated at the NN frame as well as at the message register racks (MRR). An optional arrangement provides for access and indicator tubes at the number network frame (the number networks and primary buses are located on the number network frame). For this arrangement interference between verifications from the two locations is minimized by use of additional lamps and a lockout feature.

2. GENERAL DESCRIPTION OF OPERATION

2.01 This circuit (LVC and D) is seized by an associated trunk from a crossbar No. 1 or panel office. A double-ended lockout chain with associated cut-in relays allows only one seizure at a time. (A busy lamp (BYI) is lighted at MRR and/or number network frames at which verification attempts are signaled to wait.) This circuit then seizes an ANI outpulser through the outpulser connector, signaling the connected outpulser that it is being seized for line verification.

2.02 The outpulser then locks in the trunk and seizes an ANI identifier which identifies the customer line being verified and registers this information (customer directory number) in the outpulser. The outpulser registers the customer number in this circuit, which then sends a signal to release the outpulser.

2.03 The customer number is received in this circuit on a one-out-of-seven basis for the office digit, and on a two-out-of-five basis for the thousands, hundreds, tens, and units digits. That is, the outpulser grounds one of seven leads to indicate the office code and two of five leads for each of the numbericals. Grounds on these leads operate register relays in this circuit, which light the corresponding numbers in the display tubes, located either at the MRR or number network frame. One set of indicator tubes is provided at each MRR frame location, which may have message register for more than one central office. When access at the number network frame is provided, a single set of display tubes is provided at each number network frame location regardless of the number of central offices. In any case, indicator tubes are lighted only at the MRR location from which the number is being verified. Verifications originated from the number network (NN) frame light these tubes at the NN frame location, that originated the call.

2.04 Operation of the register relays also energizes a 20.7- to 38.7-second timer (hereafter to be referred to as the 30-second timer). This timer guards against excessive delays for waiting verifications.

If the trunk (associated with the line for which the number is displayed) is not released within 30 seconds, the timer releases the display and frees this circuit to handle other verifications.

2.05 The office code is displayed with a single number. Therefore a translation must be made to enable comparing three-digit offices codes with the display. A second translation must be made for those offices having both physical and theoretical office codes. In both cases the office indication is obtained by the identifier on a single digit basis, and sent to the outpulser on a single digit basis. It is this information also that the outpulser sends to this circuit. Without the physical-theoretical arrangement the assignment of digits in the identifier provides the translation key to the office code; with the physical theoretical arrangement the office code must be obtained from a combination of the single office digit and either the numerical thousands, or from the numerical thousands and hundreds digits.

2.06 If for any reason an outpulser is not connected within a 3-second interval (actually 2 to 3.6 seconds) following seizure of the outpulser connector, this circuit will time out, remove the seizure toward the outpulser connector, light a TO lamp at the MRR or number network frame to indicate the timed out condition, and lock this circuit out of service until manually released through the trunk. The circuit is locked-out on time-out to protect service calls. This is necessary since there will be regular ANI outgoing trunks in the same outpulser connector trunk group and, if the time out is due to trouble in the connector, this could affect the regular trunks, thus affecting service calls.

2.07 If the number being verified is associated with a PBX line arranged for automatic identified outward dialing (AIOD) service, the number identified and displayed will be an arbitrary 4-digit PBX trunk number generated by the AIOD primary and secondary bus system and an office digit assigned as the AIOD class mark. The office digit associated with the AIOD class mark does not require a translation to a 3-digit office code.

2.08 If the number being verified is within a PBX group not arranged for AIOD service, the number identified and displayed will be the group charging number.

2.09 If the number being verified is on a multiparty line (that is, on a line with more than two parties), it will be identified as such by outpulser and identifier. This circuit will be caused by the outpulser to display a multiparty (MP) lamp. Such an indication will be sufficient, since on this type of call the outpulser causes the CAMA office to connect an operator who obtains the calling number verbally from the calling customer.

2.10 Should the outpulser encounter trouble at any time during its attempt to handle a line verification identification, this circuit is given a trouble indication which lights a TBL lamp associated with the trunk circuit. Depending on just when and the conditions under which this occurs, there may or may not be office, thousands, hundreds, tens, and units information also displayed.

2.11 The display tubes and lamp indications described above are located as follows:

(a) No. 1 crossbar message register rack (MRR): One set of five display tubes (Burroughs No. B-5031 Numerical Indicators) is located just above the message registers at a point approximately at the middle of the MRR location. Other lamps (2Y type) are located at the bottom of the MRR and multipled to all even-numbered frames.

(b) Panel message register rack (MRR): One set of five display tubes is located just above the message register at a point approximately at the middle of the MRR location. Other lamps (2Y type), not multipled are located at the bottom of the same frame on which the display tubes are mounted.

(c) Number network frame - crossbar No. 1 and/or panel: One set of display tubes and one set of other lamps are provided per number network frame location for each identifier group. That is, if number network frames for a maximum of six central offices (crossbar No. 1 and/or panel) are located together (adjacent and/or opposite) there will be one set of indications, these being centrally located at the bottom of one of the frames. A display location is not required for use with AIOD number networks since these networks are shop-wired to the ring party bus and do not require any further change.

SECTION II - DETAILED DESCRIPTION

1. TERMINOLOGY

1.01 In this circuit description the following abbreviations will be used for this and connecting circuits.

(a) SD-95828-01 - Common Systems - Line Verification Connector and Display Circuit, use: LVC and D Ckt.

(b) SD-25433-01 - Crossbar No. 1 - Incoming Trunk Circuit From Line Message Register Rack, use: MRR Trunk (No. 1 XB).

(c) SD-25352-01 - Crossbar No. 1 - Miscellaneous Circuit For Line Message Register Rack, use: Misc. Ckt. (No. 1 XB).

(d) SD-21973-01 - Panel - Line Verification Trunk Circuit, use: MRR Trunk (Panel).

(e) SD-95888-01 - Common Systems - Line Verification Circuit For Use At Number Network Frame, use: NNF Verification Ckt.

2. SEIZURE OF LVC AND D CIRCUIT - WHEN ACCESS AT NUMBER NETWORK FRAME IS NOT PROVIDED - Z OPTION - SC1 FOR CROSSBAR NO. 1 - SC2 AND SC1 FOR PANEL

2.01 When a MRR trunk (No. 1XB), or a MRR trunk (Panel) energizes lead ST-, the connected relay VP- operates, operating relays VC-1 and VC-2. The dashes on lead ST-, relays VP-, VC-1 and VC-2 (and dashes shown on leads and relays hereafter) represent a number, 0 to 5, corresponding to the six (maximum) MRR trunks, one of which has seized this circuit.

2.02 Relay VP operated also performs the following functions:

(a) For relay VP0, disconnects operate ground from all other VP- relays.

(b) For relay VP- (except relay VP0), connects its own locking ground and disconnects operate ground from higher numbered VP- relays.

2.03 Relays VC-1 and VC-2 operated perform the following functions:

(a) Energize lead ST to the outpulser connector circuit, under control of the MRR trunk, to seize an outpulser.

(b) Operate relay LP- to control lighting of the proper display and other lamps only at the location from which the seizure originated.

(c) Extinguish lamp BYI. As shown on SC1 and SC2, lamp BYI is energized when a plug is inserted into the MRR or NN frame ANI jack; therefore, this lamp will be energized for a brief interval and may flash.

(d) Operate relay TM to start a 3-second timer (actually 2 to 3.6). As will be described, failure to connect to the outpulser within this time will cause time-out (see 8.01 through 8.03).

(e) Connect grounds over leads TST and PS to the outpulser connector. This will signal the outpulser when connected that is is seized for line verification.

(f) Interconnect leads SP, T, and R between the outpulser connector and the connected MRR trunk, for later use by the outpulser for signals to and from the MRR trunk. Lead SP is a control lead. The MRR trunk connects ground on lead T or R to signal the outpulser, when connected, that the line to be verified is tip or ring party.

(g) Ground leads AN and G1 to the connected MRR trunk to properly control that circuit.

3. SEIZURE OF LVC AND D CIRCUIT - WHEN ACCESS AT NUMBER NETWORK FRAME IS PROVIDED - Y OPTION - SC1 FOR CROSSBAR NO. 1 - SC2 AND SC1 FOR PANEL

3.01 The sequence for Y option is as described in 2. for Z option except as follows:

3.02 Relays VC-1 and VC-2 operated perform the following functions:

(a) Operate relays LP- or NLP. If relay NLP is operated, this circuit has been seized from the number network frame; display tubes and other lamps are thus lighted only at the number network frame locations. Ideally there will be a single NNF location; however where space restrictions require mounting NN frames in more than one location, display tubes and other lamps will be lighted only at the NN frame where the call originated. Information Note 304 shows how these lamps are lighted under control of one NLP- relay. If LP- is operated, the display tubes and other lamps will be lighted only at the message register rack (MRR) associated with the connected MRR trunk.

(b) Lock relay LP- or NLP-. This guards against release of relay LP- or NLP-, should a second MRR trunk in the same identifier group attempt seizing this circuit prior to operation of relay LO (see 5.10 through 5.21).

3.03 The miscellaneous circuit (No. 1 XB) and the MRR trunk (Panel) are arranged to allow the operation of only one relay NLP- of one of the LP- relays. This is done with a lock-out circuit and is described in the descriptions of these circuits.

4. MRR TRUNK CONNECTION AND LOCKOUT - FS1

4.01 This circuit will function with a maximum of six MRR trunks (No. 1 crossbar and/or Panel) in the same identifier group. There is a single appearance in the outpulser connector which provides access to the outpulsers. With this arrangement it is necessary to maintain a busy condition to other MRR trunks once an MRR trunk is connected, and it is also necessary to allow the connection of only one MRR trunk should two or more make simultaneous attempts to seize.

4.02 The VP-, VC-1, and VC-2 relays perform the following functions: one set of these relays is provided for each MRR trunk. Relay VP- is operated with resistance battery from the MRR trunk to ground on the VP- relay winding. However, this ground is directly connected to the winding of VP0 and is fed

through a back contact on relay VPO through similar contacts on each consecutive higher numbered VP- relay. Relays VP1-VP5, once operated, provide their own locking ground (not required on relay VPO). Therefore, relay VPO operated prevents all higher numbered VP- relays from operating. More than one VP- relay can be operated at the same time. However, connection of more than one MRR trunk due to operated VP- relays is prevented by the arrangement used to operate the VC-1 and VC-2 relays. The operate ground is chained consecutively through VP- relay contacts starting at the highest numbered VP- relays; therefore, if more than one VP- relay is operated, associated VC-1 and VC-2 relays are operated only for the highest numbered VP- relay. This arrangement is shown on FS1 of the drawing.

4.03 The VC-1 and VC-2 relays control the connection of the associated MRR trunk to both this circuit and the outpulser connector so that no interference results.

5. OUTPULSER FUNCTIONS - SC1

INITIAL CONNECTION

5.01 When connected, the outpulser verifies lead SP into the MRR trunk (No. 1 XB or Panel), then applies ground to operate relay SP (or relays SP and SP1) in the MRR trunk. This causes the trunk to

(a) Remove resistance battery from lead ST to the outpulser connector, thus enabling that circuit to handle other outpulser seizures.

(b) Release relay TM in this circuit. This de-energizes the 3-second timer. If the outpulser is not connected within 3 seconds after the operation of relays VC-1 and VC-2 (see 2.), time out occurs. (See 8.01 through 8.03.)

5.02 The outpulser then connects resistance battery to lead SP after removing ground from this lead. Battery on lead SP serves to lock the connected MRR trunk under control of the outpulser. This prevents release which could cause a false trouble ticket.

IDENTIFICATION OF CUSTOMER LINE BEING VERIFIED

5.03 After seizing an ANI identifier, the outpulser operates relay ID- in this circuit.

5.04 Relay ID- operated performs the following functions:

(a) Connects ground from the MRR trunk through the ANI oscillator retard coil to the MRR trunk S lead.

(b) Connects control leads from the oscillator to both identifiers.

(c) Connects resistance battery to the MRR trunk. This battery is connected to the outpulser from the MRR trunk over lead R through this circuit.

(d) In No. 1 crossbar only, removes direct ground from the MRR trunk S lead. This is done by opening leads S1 and S2 from the miscellaneous circuit (No. 1 XB).

(e) In No. 1 crossbar only, provides control to eliminate a line link frame patch cord and shoe. This is done by disconnecting lead S3 from the miscellaneous circuit.

5.05 ANI identification requires the connection of a 5800-cycle (ac) signal to the customer sleeve at the crossbar No. 1 line distributing frame (LDF) or the panel intermediate distributing frame (IDF). Relay ID- operated connects this tone since the ANI oscillator retard coil is directly connected across the output of the continuously operating oscillator. As indicated by the dash of relay ID-, one of these relays is provided for each MRR trunk.

5.06 In crossbar No. 1 the 5800-cycle tone is fed through the sleeve of the MRR trunk, the incoming link frame (ILF) and the line link frame (LLF) to the LDF. The connection is normally held with direct groun on the sleeve; in order to both hold the connection and connect the 5800-cycle signal, the retard coil is substituted for the direct ground. The retard coil is very low resistance dc (less than 1 ohm), and its (ac) impedance is such to allow 2.2 volts (approximately), 5800-cycles ac to be imposed. The MRR trunk (No. 1 XB) is arranged so that sleeve lead S is controlled through its associated miscellaneous circuit where the patch cord and shoe are used at the LLF; this requires leads S1 and S2 to be connected in this circuit through a break on relay ID-.

5.07 In panel, the 5800-cycle tone is fed through the sleeve of the MRR trunk to the IDF through a patch cord and shoe connection, which is required for all verification.

5.08 For both panel and No. 1 crossbar the sleeve from the MRR trunk is connected over a shielded cable. This is used to minimize losses and interference due to inductive coupling with adjacent conductors, and thus minimize the possibility of false or incorrect identifications.

5.09 This circuit connects a control lead from the oscillator to both identifiers. The connected outpulser determines which of the two identifiers will be used on a

particular identification. This selection is on a alternate basis for each outpulser. Should a single identifier be provided, then it would be used on all identifications.

REGISTRATION AND DISPLAY OF IDENTIFIED NUMBER

5.10 Connection of 5800-cycle tone to the sleeve lead enables the ANI identifier to determine the customer calling number. The identifier registers this information in the outpulser, which in turn registers it in this circuit. The register relays in this circuit light the display tubes or MP lamp to enable the making of a comparison of the number of ANI feature detected with the actual customer directory number; this is the purpose of the circuit, to verify that proper connections were made so that correct directory number information will be forwarded to CAMA.

5.11 Directory number information is detected by the identifier in the form of a single digit for the central office code and a digit for each of the numericals (thousands, hundreds, tens, and units). The identifier registers this information in the outpulser in this form, and the outpulser in turn registers this information in this circuit in the same form. Regarding the central office code, therefore, a translation must be made. Cross-connections in the identifier will determine which digits are assigned to each central office (six maximum, 0 through 5). Should there be a physical and theoretical code for a central office, the action described above would still occur; that is, this circuit will receive the same office digit whether the number being verified is in the physical or theoretical portion of the office. If required, the physical or theoretical code can be determined from the outpulser cross-connections (the outpulser translates the single office digit into a 3-digit office code with or without the physical-theoretical arrangement).

5.12 If the line being verified is a PBX line arranged for automatic identified outward dialing (AIOD) service the number verified is not the directory number, but is the AIOD office digit (or class mark) and the four digit arbitrary PBX trunk number generated by the AIOD primary and secondary bus system to which the line is connected. The office digit may be any digit 0-5, since the AIOD bus system takes the place of one of the six central office units that an identifier group may serve, or it may be the digit 6 on jobs where an identifier group already serves six central office units and the AIOD unit is added as the seventh office. The office digit used as the AIOD class mark does not require a 3-digit office code translation.

5.13 Registration of the customer directory number in the outpulser and in this circuit is performed as follows: (a) for office, one of seven leads (maximum) is grounded (OFO-6); (b) for each of the numericals, two of five leads are grounded (THO, 1, 2, 4, 7; HO, 1, 2, 4, 7, TO, 1, 2, 4, 7; UO, 1, 2, 4, 7). The outpulser therefore registers the number in the circuit by grounding the appropriate leads described above. There are additional leads between the outpulser and this circuit as follows:

(a) Lead MP - This lead is grounded by the outpulser (instead of the directory number leads) if the customer line is a multiparty line other than two party.

(b) Lead RS - The outpulser grounds this lead to provide this circuit means to time for assuring operation of directory number register relays or MP relay.

(c) Lead RLS - This circuit grounds this lead to signal the outpulser to release.

(d) Lead TBL - The outpulser grounds this lead when trouble is encountered by the outpulser (see8.07 through 8.09).

5.14 When the identification is completed, the outpulser releases relay ID-. Relay ID- released performs the following functions:

(a) Disconnects the oscillator retard coil from the MRR trunk, No. 1 XB or Panel.

(b) Restores direct ground to the MRR trunk (No. 1 XB).

(c) Disconnects control leads affecting the oscillator and identifier.

(d) Removes resistance battery from lead T to the outpulser. This signals the outpulser that relay ID- has released.

5.15 At the same time relay ID- is released, the outpulser registers the identification of the customer line by grounding leads RS and MP, or by grounding leads RS and the directory number leads. Lead TS grounded energizes slow operate relay TS-. Grounding the directory leads operates the following: relay OF-, two of each of relays TH-, H-, T-, and U-; or if lead MP is grounded, this operates relay MP. When relays OF-, TH2/5, H2/5, T2/5, and U2/5 are operated, each performs the following:

(a) Locks operated to the MRR trunk and relay LP- or NLP- operated under control of relay TM1 released.

(b) Partially closes an operate circuit for relay LO.* The slow operate RS- operates LO.

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*This is a multiple arrangement (see FS3) to assure operation of relay LO should trouble prevent the operation of more than one register relay; should relay LO fail to operate, the outpulser would have to time out to release.

(c) Lights display tubes OF-, TH-, T-, and U- under control of the LP- or NLP relay operated.*

(d) Partially closes an operate circuit for relay TM in the timer.

5.15 Relay Mp operated

(a) Locks operated to the MRR trunk and relay LP- or NLP- operated under control of relay TM1 released.

(b) Partially closes an operate circuit for relay LO.

(c) Lights lamp MP under control of the LP- or NLP- relay operated.

(d) Partially closes an operate circuit for relay TM in the timer.

5.16 Relay RS- operated

(a) Operates relay LO through a contact on relays OF-, TH-, H-, T-, and U- or relay MP only operated.

(b) Locks operated under control of the MRR trunk.

(c) Partially closes a control ground to the MRR trunk.

(d) Opens the BY lead to the miscellaneous circuit (No. 1 XB) or the MRR trunk (Panel). This prevents lighting lamp BY1 at the MRR later when relay VC-2 releases.

(e) Disconnects VP- operate battery from the MRR trunk over ST- and connects operate battery from the outpulser over lead SP to the winding of relay VP-. This locks this circuit under control of the outpulser and also prevents relay LO operated from releasing relay VP-.

(f) Partially closes lead RLS to the outpulser.

5.17 Relay LO operated

(a) Locks relay LP- or NLP (Y option) operated.

(b) Opens ST- leads to all MRR trunks, opening operate circuits of all VP- relays. Relay VP- for the connected MRR trunk remains operated over lead SP to the outpulser under control of relay RS- operated; all other VP- relays are prevented from operating, and if previously operated, are released. This assures that all MRR trunks except the connected MRR trunk are locked out.

(c) Operates relay TM through at least one of the register relays operated.

(d) Grounds lead RLS to the outpulser through relay TS- operated. This signals the outpulser to release.

(e) Prepares a locking circuit for possible later use by relay TM1 of the timer.

(f) Opens lead TM.

(g) Connects resistor TM1 into the timer.

(h) Connects an auxiliary ground under control of relay RS- operated to the G1 lead to the connected MRR trunk.

5.18 Relay TM operated

(a) Starts a 30- (actually 20.7 to 38.7) a second timing interval.

(b) Completes a locking circuit for relay TM1 through relay LO operated for possible later use.

5.19 As described above, the display tubes indicating the directory number (or the MP lamp indicating that the customer line being verified is a multiparty line) are lighted by associated register relays. From the time these are lighted, an interval of approximately 30 seconds is allowed for them to be read and compared with actual customer line number. Should release (through the MRR trunk) not occur prior to the end of the 30 seconds, normal time-out will occur (see 6.06); release prior to normal time-out is described in 6.01 through 6.05.

5.20 The timer performs two timing functions: (1) it times for connection to an outpulser (3 seconds) and (2) it times 30 seconds to limit the time a display is available (to minimize the time a particular MRR trunk can lock out other MRR trunks). The timer measures one of these two intervals, depending on the condition of relay LO (when relay TM is operated). With relay LO released, a 3-second interval is measured and lamp TO (at the MRR or NNF) will be lighted should relay TM1 be operated on time-out (see 8.01 through 8.03), with relay LO operated a 30-second interval is measured and lamp TO is prevented from lighting should relay TM1 operate. With relay LO released the resistance component of the timer RC combination is 1.5 megohms; with relay LO operated the resistance is 16.2 megohms.

5.21 As stated above, relay LO operated grounds lead RLS to release the outpulser. On release the outpulser opens all leads to this circuit; battery thus disconnected from lead SP releases relays VP-, VC-1, and VC-2 in this circuit and removes a locking condition to the MRR trunk. Relays VP-, VC-1, and VC-2 released disconnect this circuit and the MRR trunk from the outpulser connector. At this time the display (display tubes for a directory number of the MP lamp for multiparty) is held

*Display tube OF- is lighted by relay OF- operated; display tubes TH-, H-, T-, and U- required two relays each (TH2/5, H2/5, T2/5, and U2/5 operated). These display tubes are located at the message register rack (MRR), Z option, or with Y option at either the MRR or the number network frame (NNF) associated with the connected MRR trunk, depending on which of these locations was used to originate the verification.

under joint control of the MRR trunk and the 30-second timer in this circuit.

6. DISCONNECT - NORMAL - SC4, SC5, AND SC6 PRIOR TO 30-SECOND TIMER TIME-OUT, SC4 AND SC5

6.01 This circuit is released by the MRR trunk by removal of ground from lead G from that circuit (refer to SC4 for No. 1 XB and SC5 for Panel). This releases relay RS- in this circuit.

6.02 Relay RS- released

(a) Releases relay LO.

(b) Releases MRR trunk apparatus by disconnecting ground from lead G1 to that circuit.

(c) Recloses lead BY to the miscellaneous circuit (No. 1 XB) or to the MRR trunk (Panel) in preparation for the next line verification.

6.03 Relay LO released

(a) Releases relay LP- or NLP-.

(b) Recloses ST- leads from all MRR trunks to the VP- relay windings through relays TS- released. This allows waiting MRR trunks (other than the one in the process of disconnecting) to attempt line verifications. The MRR trunk in the process of disconnecting cannot start a second line verification until a positive action is taken (see 7.).

(c) Releases relay TM in preparation for the next seizure of this circuit.

6.04 Relay LP- or NLP- released

(a) Extinguishes the display.

(b) Releases the register relays (1-OF-, 2-TH, 2-H-, 2-T-, and 2-U-, or only MP).

(c) Reconnects operate battery to the VC-1, and VC-2 relays in preparation for the next seizure of this circuit.

6.05 This circuit is available for verification through other MRR trunks, or a repeat verification can be made through the same MRR trunk (see 7.).

AFTER 30-SECOND TIMER TIME-OUT - SC6

6.06 When this circuit is not released by the MRR trunk, the timer will function in approximately 30 seconds to initiate release by operating the TM1 relay. The TM1 releases the register relays (1-OF-, 2-TH-, 2-H-, 2-T-, and 2-U-, or MP). They in turn extinguish the display, release relay LO, and release the timer. The MRR trunks are now unlocked to permit other verification attempts. Release continues as indicated in SC4 and SC5.

7. REPEAT LINE VERIFICATIONS - SC3 AND SC7

7.01 A delay in reading a display or a desire to recheck requires repeating the verification display on the same line. This can be done simply by removing and reinserting the ANI plug, regardless of whether the 30-second timer has released.

7.02 When the repeat attempt is made, the unlocking of the MRR trunk RS- relay chain permits verification attempts by other trunks. Thus, there may be occasions when the repeat will be locked out by a different line verification attempt.

7.03 The repeat line verification starts as shown in SC3 or SC7 and then follows the same procedure as in any normal verification.

8. TROUBLE CONDITIONS

FAILURE TO CONNECT TO AN OUTPULSER - SC8

8.01 Whenever an outpulser is not connected within 2 to 3.6 seconds after the seizure of the outpulser connector, this circuit will time out. It will then remove the outpulser connector seizure, light a TO lamp at the MRR or number network frame to indicate a timeout condition, and lock this circuit out of service until manually released through the trunk.

8.02 Time-out results in a lock-out to protect service calls. This is done because there will be regular ANI outgoing trunks in the same outpulser connector trunk group that serves line verification calls. Thus, if the time-out is caused by trouble in the outpulser connector, this could affect the regular trunks and their service calls.

8.03 The removal of the plugs restores this circuit to normal as shown in SC4 and SC5.

OUTPULSER TROUBLE TIME-OUT PRIOR TO IDENTIFICATION - SC9

8.04 When the outpulser times out, it operates the TBL relay in this circuit which lights the TBL lamp to indicate the outpulser has encountered trouble. The TBL releases the timer and opens the ST lead to the outpulser connector. The timer is reenergized to begin its 20.7- to 38.7-second cycle and a release signal is sent to the outpulser

8.05 If the timer times out, the TBL relay and TBL lamp are released and the MRR trunks are unlocked to permit other verification attempts as indicated in SC6. When

the plugs are removed, release is as shown in SC4 and SC5.

8.06 If the plugs are removed before the timer times out, the LP- or NLP- relay releases the TBL relay as shown in SCR and SC5.

TROUBLE DURING OR AFTER IDENTIFICATION - SC1

8.07 Any trouble during or after identification causes the outpulser to operate the TBL relay in this circuit. The TBL relay lights the TBL lamp to indicate a trouble has been encountered. The timer 20.7- to 38.7-second cycle is energized and all other MRR trunks associated with the same identifier group are locked out.

8.08 If the timer times out, the TBL relay and TBL lamp release and the MRR trunks are unlocked as in SC6. When the plugs are removed, the release is as shown for a normal after-timer release in SC4 and SC5.

8.09 If the plugs are removed before the timer times out, the LP- or NLP- relay releases the TBL relay as shown in SC4 and SC5.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

None.

2. FUNCTIONAL DESIGNATIONS

2.01 Relays

Designation	Meaning	Main Function
HO,1,2,4,7	Hundreds	Registers hundreds digit of directory number on 2/5 basis.
IDO,ID-	Identifier	Connects identification tone.
LO	Lock Out	Locks out other MRR trunks from seizing this circuit. Releases outpulser and starts 30-second timer.
LPO,LP-	Lamp Control	Selects which display will be lighted at MRR frame location.
MP	Multiparty	Lights MP lamp of display.
NLP-	Network Lamp	Lights number network display.
OFO,1,2,3,4,5,6	Office	One operates to indicate office associated with the number being verified.
RSP,RS-	Release Signal	Indicates registration has been completed in this circuit and starts action to release outpulser.
TO,1,2,4,7	Tens	Registers tens digit of directory number on 2/5 basis.
TBL	Trouble	Lights TBL lamp to indicate trouble condition.
THO,12,4,7	Thousands	Registers thousands digit of directory number on 2/5 basis.
TM	Timing	Starts timing for 3- or 30-second timer cycles.
TM1	Timing Auxiliary	Signifies end of timing cycle.
UO,1,2,4,7	Units	Registers units digit of directory number on 2/5 basis.
VC-1,VC-2	Verification Cut-In	Interconnects leads between outpulser and preferred MRR trunk.
VPO,VP-	Verification Preference	In combination with VC-1 and VC-2 relays, selects the preferred MRR trunk.

3. FUNCTIONS

3.01 Connects MRR trunks (No. 1XB and/or Panel - six maximum) to the ANI outpulser connector in order to verify the proper connection of customer lines. A preference-cut-in feature connects one trunk at a time, for verifying customer lines in one identifier group.

3.02 While connected to one MRR trunk, connects busy signals to other trunks.

3.03 Under ANI outpulser control

(a) Is locked to the outpulser, preventing MRR trunk release of this circuit.

(b) Connects identification tone to the customer line.

(c) Registers information with which it lights indicator tubes, a lamp, or a combination of these to display the customer number as identified; a multiparty indication; or a trouble indication. Other than for trouble, the identified information can then be compared with the actual customer line number.

(d) Signals the outpulser to release after registering.

3.04 Provides for timing to intervals as follows:

(a) From 2 to 3.6 seconds for connection to an outpulser. Failure to connect to an outpulser causes this circuit to light a TO lamp, disconnects the outpulser link seizure, and lock this circuit out of service until manually released through the connection MRR trunk.

(b) From 20.7 to 38.7 seconds, during which time a display can be viewed. If at the end of this interval the connected MRR trunk has not released this circuit, automatic release occurs, making it possible for other verifications to be made.

3.05 Provides for seizing the ANI circuits in competition with service calls.

3.06 Provides for repeat verifications. (These are made in competition with other MRR trunks.)

3.07 Provides for disconnection under control of the MRR trunk if such occurs prior to expiration of the 20.7 to 38.7 seconds. Automatic disconnection occurs after 20.7 to 38.7 seconds; in this case the connected MRR trunk must disconnect in order to initiate a second verification.

4. CONNECTING CIRCUITS

4.01 When this circuit is listed on a key-sheet the connecting information shown thereon is to be followed.

(a) Outpulser Circuit - SD-95811-01.

(b) Outpulser Connector Circuit - SD-95890-01.

(c) Identifier Circuit - SD-95810-01.

(d) Oscillator Circuit - SD-95827-01.

(e) Crossbar No. 1 - Incoming Trunk Circuit from Line Message Register Rack arranged for ANI Line Verification - SD-25433-01, SD-25192-01.

(f) Crossbar No. 1 - Miscellaneous Circuit for Line Message Register Rack arranged for ANI Line Verification - SD-25352-01, SD-25065-01.

(g) Panel - Line Verification Trunk Circuit - SD-21973-01.

(h) Common Systems - Line Verification Circuit for Use at Number Network Frame - SD-95888-01.

5. MANUFACTURING TESTING REQUIREMENTS

5.01 This circuit shall perform all service functions specified in this circuit description and shall meet all the standards of the Circuit Requirements table. It also shall be able to function under the test conditions listed below.

5.02 All tests shall be made with the test voltage between -45 to -50 volts.

6. TAKING EQUIPMENT OUT OF SERVICE

6.01 Block the LO relay operated to take this circuit out of service.

SECTION IV - REASONS FOR REISSUE

B. Changes in Apparatus

B.1 ADDED:

App. Fig. 6 consisting of Relay AF51 (OF6).

B.2

SUPERSEDED	SUPERSEDED BY
145C Resistor (TM)	145B or C Resistor (TM)

D. Description of Changes

D.1 FS2, 4, 6, and 8 have been revised to show the addition of App Fig. 6.

D.2 Circuit Note 105 has been added.

D.3 Circuit notes 102 and 104, and CADs 2, 4, and 5 have been revised to reflect the addition of App Fig. 6x and to show the application of this circuit where automatic identified outward dialing (AIOD) service is provided for PBX lines.

D.4 The code of resistor TM has been changed from 145C to 145B or 145C at the request of the Western Electric Company and is made without record by agreement with the Western Electric Company.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2364-MRM-JEM