DETAILED DESCRIPTION
CALL FROM AN OUTWARD SWITCHBOARD TO AN MF NO. 1 CROSSBAR OFFICE VIA TWO NO. 4A TOLL OFFICES AND A NO. 1 CROSSBAR TANDEM OFFICE
NO. 4A TOLL SWITCHING OFFICES

CONTENTS

1. GENERAL

1.01 This is one of a group of sections all having the base number A828.121. These sections describe the detailed circuit operations of the 4A Toll Switching System.

1.02 The call described in this section is originated by an operator at an outward toll switchboard position in St. Louis and is completed to a local subscriber, Humboldt 5-1234, at Newark, New Jersey. The routing of the call is shown diagrammatically on Fig. 1. This description assumes that one of the toll tandem trunks from the outward switchboard to the St. Louis 4A office is available and also that one of the 12 common grade toll trunks from the St. Louis 4A office to the Newark 4A office is available for the call. Therefore, this call does not make use of the alternate route from St. Louis (NC) to New York (RC for region in which Newark is located). At Newark, it is assumed that the eight toll switching trunks to the HU5 No. 1 crossbar office are busy and that the call is alternate routed by the seizure of one of the 20 toll switching trunks to the Jersey crossbar tandem office. The call is then completed to subscriber 1234 over one of the 14 trunks from the tandem office to the HU5 office.

1.03 The outward operator at St. Louis originates the call by selecting a toll tandem trunk to the St. Louis 4A

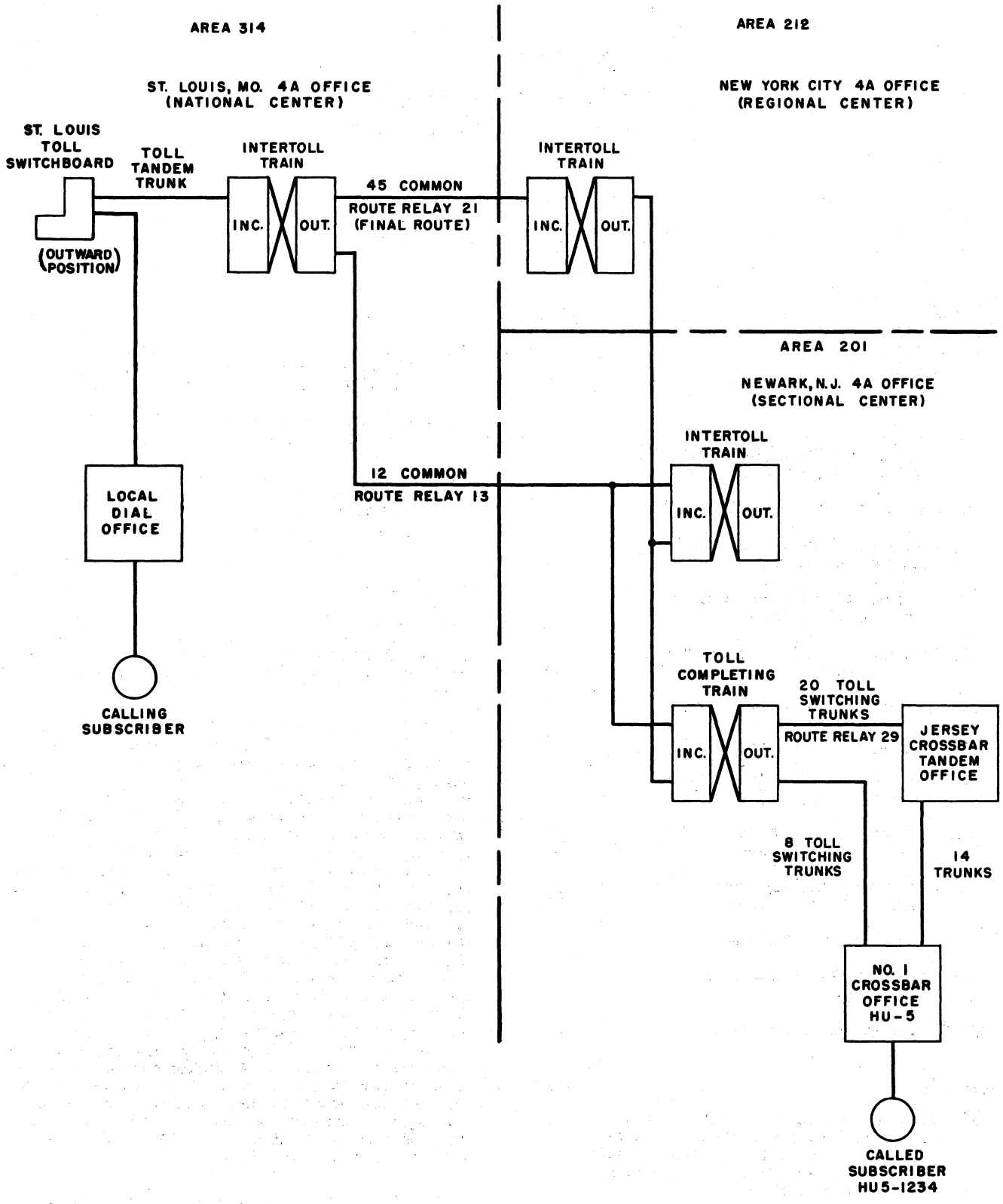


FIG. 1—CALL FROM OUTWARD SWITCHBOARD TO A NO.1 CROSSBAR OFFICE VIA THE ST. LOUIS 4A OFFICE, THE NEWARK 4A OFFICE, AND THE JERSEY CROSSBAR TANDEM OFFICE

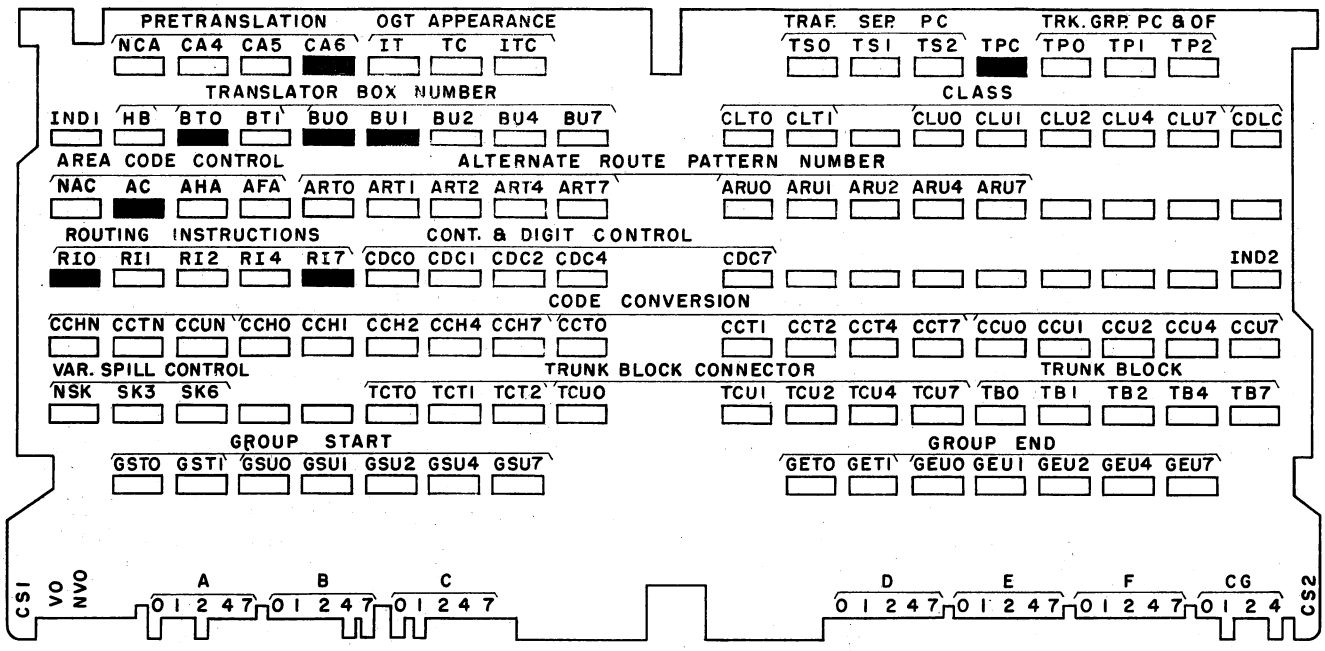
office. The outward positions are equipped with MF keysets; therefore a controller at the St. Louis 4A office connects the toll tandem trunk to an MF incoming sender. When a sender has been seized, the operator receives a start pulsing signal and keys 201 (the New Jersey area code), 485 (the HUmboldt 5 office code), and 1234 (the numericals of the subscriber number) to the incoming sender at the St. Louis 4A office. Receipt of the first three digits results in the seizure of a decoder and the dropping of the 201-3D card in the home translator.

1.04 As shown on Fig. 2, the 201-3D card contains the CA6 (come again 6) instruction indicating that the call requires 6-digit translation. Six-digit translation is necessary for this call from St. Louis because there is more than one entry point to New Jersey from St. Louis. Calls for offices in the southern part of New Jersey from St. Louis are routed through Philadelphia, whereas calls for offices in the northern part are routed through Newark.

1.05 Since 6-digit translation is necessary for selecting the proper route, the decoder uses information from the 201-3D card to seize foreign area translator number 1 and to cause it to drop the 201-485-6D card. The information on this 6D card is shown on Fig. 3.

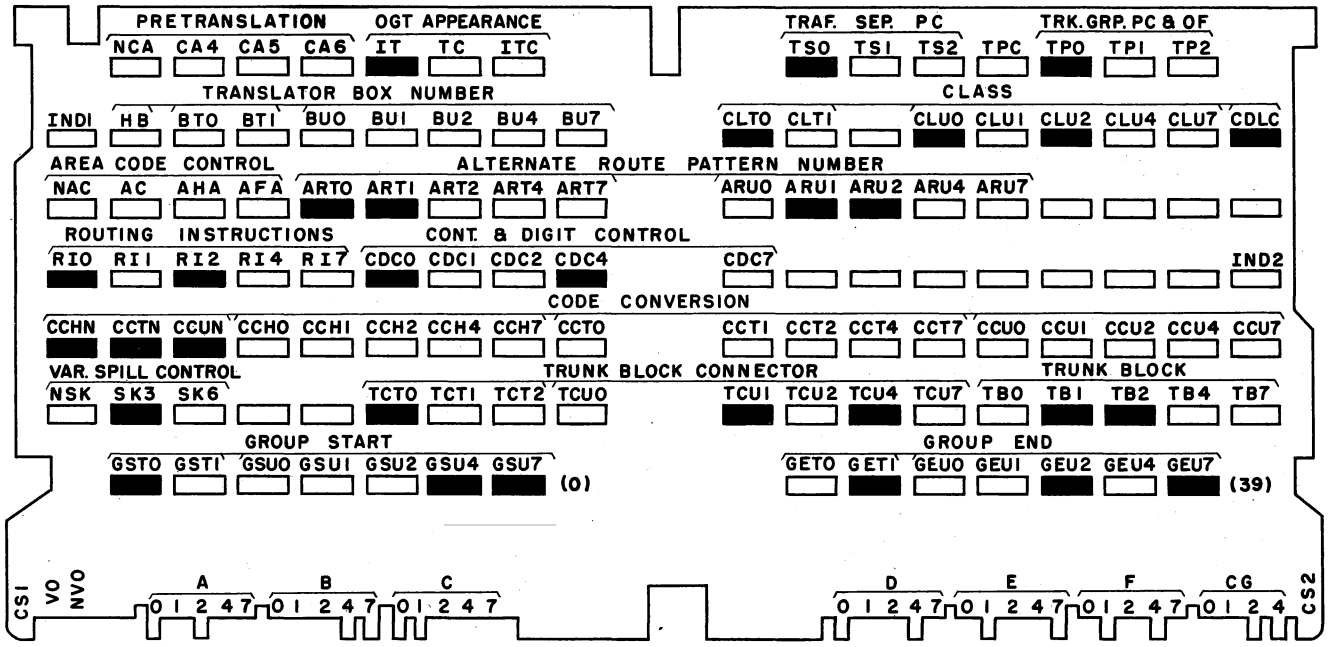
1.06 The 201-485-6D card contains information about the group of 12 intertoll trunks from the St. Louis 4A office to the Newark 4A office. As explained in Section A828.121.3, each common grade intertoll trunk group between 4A offices has a route relay assigned to it at St. Louis. The route relay number assigned to the St. Louis-Newark group is assumed to be 13. This number appears on the 201-485-6D card as the alternate route pattern number (ARTO,1 and ARU1,2). Because a route relay is assigned to the trunk group, the 201-485-6D card contains relay-to-relay routing instruction (RIO and RI2). After reading the RR routing instruction and alternate route pattern number 13, the decoder operates route relay 13. With RR instruction, the marker is prevented from reading the 201-485-6D card unless the decoder determines that at least one of the 12 St. Louis-Newark trunks is idle. The decoder determines the condition of these trunks when operated route relay 13 closes through leads from the group busy chain relay circuit.

1.07 Suppose that the decoder receives an indication that the St. Louis-Newark trunks are busy. This trunk group from St. Louis to Newark, a sectional center, is a high usage group. As shown on Fig. 1, one alternate route is available via trunks from St. Louis to New York, the regional center on which Newark homes.



NOTES:
1. VIEWED FROM LIGHT SOURCE
2. ENLARGED PUNCHES SHOWN IN BLACK

FIG. 2 – 201-3D CARD AT ST. LOUIS



NOTES:
1. VIEWED FROM LIGHT SOURCE
2. ENLARGED PUNCHES SHOWN IN BLACK

FIG. 3 – 201-485-6D CARD AT ST. LOUIS (TRUNKS BETWEEN ST. LOUIS AND NEWARK)

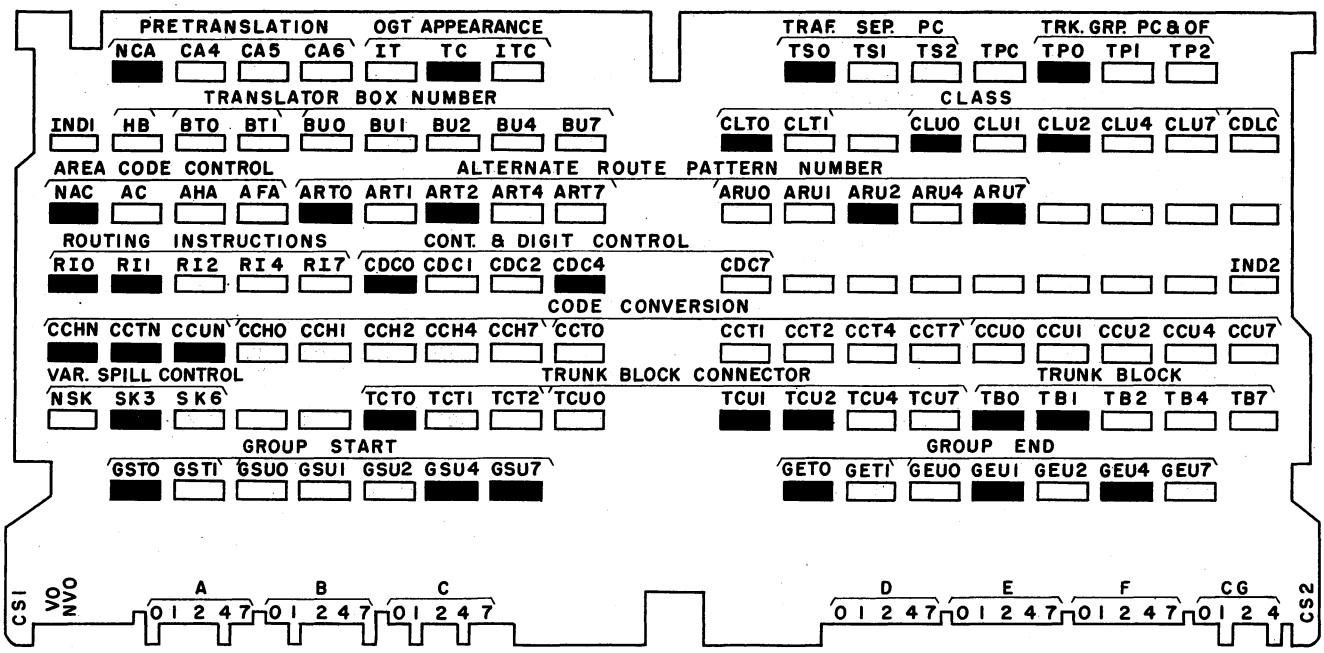
Assume that route relay 21 is assigned to the St. Louis-New York group. Route relay 13 is cross-connected to route relay 21 at the alternate route traffic control frame. Thus when the St. Louis-Newark group appears busy to the decoder, route relay 21 can be operated and the idle condition of the subgroups in the St. Louis-New York group can be determined. The decoder selects the lowest-numbered idle subgroup, and after restoring the 201-485-6D card, causes the home translator to drop the AR (alternate route) card for the selected subgroup. The marker is allowed to read information from this card and to select one of the St. Louis-New York trunks. If all the St. Louis-New York trunks test busy to the decoder, the marker is allowed to test the trunks represented by the last (2nd) AR card. This card also carries an FOF routing instruction and thus the marker routes the call to an overflow trunk.

1.08 As pointed out in Par. 1.02, this call assumes that at least one of the 12 St. Louis-Newark trunks is idle. When the leads from the group busy chain relay circuit indicate that one or more of the trunks are idle, the decoder passes information to the marker and allows it to read the 201-485-6D card. The marker checks the information it receives from the decoder and the card to determine that it is complete. If the check is satisfactory, the marker signals the decoder to release.

1.09 The marker selects an idle outgoing trunk and sets up a channel between the incoming and outgoing trunks. The marker signals the sender to outpulse on an MF basis and to skip the area code (201). The marker is released after setting up the connection.

1.10 When the connection to the outgoing trunk is established at St. Louis, an MF sender at the Newark 4A office becomes attached to it. The sender at St. Louis outpulses 485-1234.

1.11 When the first three digits (485) have been registered in the Newark incoming sender, an idle decoder is seized at Newark. This decoder causes the associated home translator to drop the 485-3D card which contains information about the group of eight toll switching trunks between the Newark 4A office and the HU5 No. 1 crossbar office. As shown on Fig. 4, the 485-3D card contains card-to-relay routing instruction (RIO and RI1). No route relay is assigned to this group of eight trunks but the card-to-relay instruction indicates that there is available at least one alternate route group to which a route relay is assigned. As shown on Fig. 1, the alternate route available for this call is the group of



NOTES:

1. VIEWED FROM LIGHT SOURCE
2. ENLARGED PUNCHES SHOWN IN BLACK

FIG. 4 – 485 (HU 5)–3D CARD AT NEWARK (TRUNKS BETWEEN NEWARK AND HU5 OFFICE)

20 trunks to the Jersey crossbar tandem office. At the Newark 4A office, route relay 29 is assigned to this group. This number is contained on the 485-3D card in the space for the alternate route pattern number (ARTO,2 and ARU2,7).

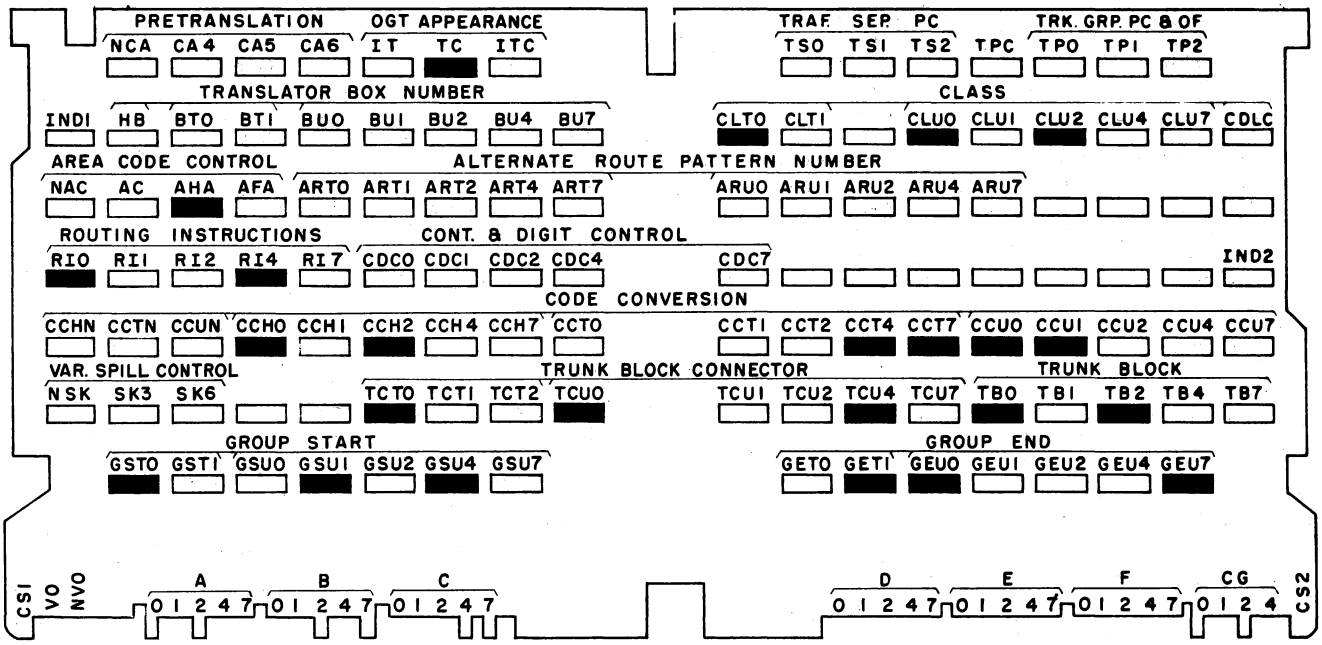
1.12 After the decoder reads the 485-3D card, it seizes a toll completing marker and then allows the marker to read information from the 485-3D card. The marker tests the trunks to the HU5 office and attempts to select one which is idle. The card-to-relay instruction indicates that an alternate route is available; therefore the marker is signaled to "hold" the decoder.

1.13 Using the CR instruction and the alternate route pattern number on the 485-3D card, the decoder operates route relay 29 which closes through the leads which indicate the condition of the 20 trunks in the alternate route group.

1.14 While the marker is testing the eight trunks to the HU5 office, the 485-3D card is restored so that both the decoder and home translator will be prepared to receive from the marker either a TKS (trunk selected) or an ATB (all trunks busy) signal. On this call it has been assumed that the marker finds the eight trunks to the HU5 office busy, and also that the leads closed by route relay 29 from the group busy chain relay circuit indicate that one or more of the trunks to the Jersey tandem office are idle.

1.15 When the decoder receives the all-trunks-busy signal and when the 485-3D card has been restored, the decoder causes the home translator to drop the AR card for the 20 trunks in the alternate route group. As shown on Fig. 5, the card has tabs CG0 and CG2 indicating AR and tabs corresponding to the route relay number 29 (A and B digits), and the subgroup number 0 (C digit).

1.16 The 290-AR card contains follow-with-reorder routing instruction (RI0 and RI4). This is used because the card represents the last subgroup of the group and because no additional alternate routes are available. When the decoder reads the routing instruction, it allows the marker to read information from the card. When the marker has determined that the information received is complete, a signal is sent to the decoder to release. The marker selects an idle trunk, sets up a connection between the incoming and



NOTES:

1. VIEWED FROM LIGHT SOURCE
2. ENLARGED PUNCHES SHOWN IN BLACK

FIG. 5 – 290 – AR CARD AT NEWARK
(TRUNKS BETWEEN NEWARK
AND JERSEY CROSSBAR TANDEM)

outgoing trunks, signals the sender to outpulse on an MF basis with no skip*, and then releases.

*On AR cards the variable spill information is not punched on the card. It is determined by code matching which is described in detail in Section A828.121.3.

1.17 When connection to the trunk to the Jersey crossbar tandem office is established at the Newark 4A office an MF sender becomes attached to the trunk at the crossbar tandem office. The sender at the Newark 4A office pulses forward 485-1234, and releases. The crossbar tandem sender calls in a marker when the first three digits are registered. The tandem marker selects a trunk to HU5, connects the incoming and outgoing trunks, signals the tandem sender to outpulse on an MF basis, and releases.

1.18 When connection to the outgoing trunk to the local office is established at the tandem office, an MF terminating sender at the local central office becomes attached to the trunk. The tandem sender pulses forward 1234 and releases. The terminating marker at HU5 completes the connection to the called subscriber line, sets the incoming trunk to apply the correct ringing current to the line, and then releases.

1.19 When the called subscriber answers, an off-hook signal is returned to the operator's cord circuit at St. Louis indicating to the outward operator that the connection has been established.

2. DECODER AND MARKER OPERATIONS

(A) General

2.01 At St. Louis, the decoder operations on this call are similar to the call described in Section A828.121.4. The following detailed description of decoder and marker operations assumes that the call has progressed to the point where the 485-3D card has dropped in the home translator at the Newark 4A office. The progress of the call from this point may be followed by referring to SC 121-1.

(B) Recording HU5(485)-3D Card Information in the Decoder

2.02 When the HU5-3D card (see Fig. 4) is dropped, as indicated by the operated decoder COP1 and COP2 relays (OS 163-1), the decoder proceeds to read

it by operating the CCM, FAT, MKR, CA, and RI battery supply relays. These operations, together with subsequent cold-cathode tube and relay operations necessary for recording the card information, are shown at the top of SC 121-1. The following information is accordingly registered in the decoder by the operation of the relays shown in parenthesis:

(a) No Code Conversion (CCHN, CCTN, and CCUN relays) - Indicates that no code conversion will be necessary if one of the trunks to the HU5 office is selected.

(b) Not an Area Code (NAC relay) - Indicates that 485 (HU5) is not an area code.

(c) Traffic Separation Peg Count (TSO relay) - This information is used in conjunction with registrations from the sender to operate one of 28 traffic registers (OS 180-1).

(d) Trunk Block (TBO and TB1 relays) - Indicates trunk block No. 1.

(e) Trunk Block Connector (TCTO, TCU1, and TCU2 relays) - Indicates trunk block connector No. 3.

(f) Trunks to the HU5 Office Appear on Toll Completing Train (TC relay) - Indicates that a TC marker is required.

(g) No Come Again (NCA relay) - Indicates 3-digit translation. The NCA relay operates the RCC battery supply relay enabling the decoder to read alternate route and continuity and digit control information (OS 163-1).

(h) Alternate Route Pattern (ART0, ART2, ARU2 and ARU7 relays) - Indicates alternate route pattern No. 29.

(i) Continuity and Digit Control (CDC0 and CDC4 relays) - This indicates four numerical digits will be received following the code digits and that loop continuity test is to be cancelled.

(j) Card-to-Relay Routing Instruction (RIO and RI1 relays) - The RIO and RI1 relays in conjunction with the operated NCA and RIH relays operate the CR relay (OS 171-1). The CR relay operates the CRA and CRP relays.

(C) Operation of Route Relay 29

2.03 As pointed out in the general discussion, the alternate route pattern number 29, on the HU5-3D card, represents the route relay number assigned to the group of 20 trunks between the Newark 4A office and the Jersey crossbar tandem office. The CR instruction on the HU5 card indicates to the decoder that this group is available as an alternate route if the trunks to the HU5 office are busy. The operation of route relay 29 is described in the following paragraphs.

2.04 Soon after decoder seizure, the CK3 relay operates all CI- (route relay ground supply cut-in) relays (OS 171-1). Later when the HU5-3D card is dropped, the COP1 relay operates the ARST (alternate route start) relay through the make contacts of all CI- relays. On this call, the RIO and RI1 relays operate the CRP relay. Through make contacts of the ARST relay and the ART- and ARU- relays, the CRP relay operates the CR2 relay. Ground through the operated ARU2, ARU7, and the CR2 relays, and through the normal RT29 relay in the alternate route traffic control circuit, operates route relay 29. In this description it is assumed that the path of operation for route relay 29 has not been blocked by the operation of route transfer key 29 in the traffic operating room.

2.05 As shown on OS 173-1, the operated route relay 29 closes through leads from the group busy chain relay circuit for the trunk group to the Jersey crossbar tandem office. This group contains only one subgroup of 20 trunks. Ground on any one of the 20 GB leads from the trunk circuits operates the GBO relay in the group busy chain relay circuit. The operated GBO relay places ground on the GB lead to operate the GO relay in the decoder. However, the decoder does not use the information that there are idle trunks in the alternate route group at this time. While the route relay is being operated the decoder seizes a marker. This marker then proceeds to determine if an idle trunk is available to the HU5 office.

(D) Connecting to an Idle Toll Completing Marker

2.06 When decoder seizure takes place at Newark, ground on the SMC and SMI leads operates the SMC, SMC1, SMI and SMI1 relays in the decoder (SC 113-1 and OS 168-1), indicating that the incoming intertoll trunks from St. Louis terminate on both trains at Newark. These relays operate the SMI2 and SMC2 relays. Also, the NRO (not a reorder routing) relay operates since this call is not to be routed to reorder (OS 132-1).

2.07 The dropped HU5 card indicates that the outgoing trunks are on the toll completing train. The TC1 relay operates through the operated SMC2, TC and COP2 relays (SC 121-1 and OS 168-1). The TC1 relay causes the operation of the SMC0 and TC2 relays. The TC2 relay operates an

MP (marker preference) relay in the marker connector circuit (OS 168-1) which connects the decoder to the marker in a manner described in Section A828.121.2.

(E) Transmitting Decoder Information to the Marker

2.08 When the marker is connected to the decoder, the following information is passed from the decoder to the marker (SC 121-1):

(a) Trunk Block Connector No. 3 - The decoder TCTO, TCU1, and TCU2 relays operate the TC3 relay in the marker (OS 169-1).

(b) Read Card Control - The marker RCD relay operates in series with the marker TC3 relay and indicates that the decoder is ready for the marker to read the HU5-3D card (OS 169-1).

(c) Connector Odd or Even Preference - The decoder PF and normal TR2A relays operate either the marker CNO or CNE relay (OS 190-1).

(d) First Trial - The normal decoder TR2A relay operates the marker TR1 relay (OS 190-1).

2.09 When the marker RCD relay operates the following additional information is passed from the decoder to the marker:

(a) Trunk Block Number - The decoder TBO and TB1 relays operate the TBO and TB1 marker relays (OS 192-1).

(b) Hold Routing Control Information - The decoder CR relay operates the marker HLD relay (OS 191-1).

(c) Code Conversion Information - The decoder CCHN, CCTN and CCUN relays operate the marker CCHN, CCTN and CCUN relays (OS 195-1).

(d) Continuity and Digit Control - The decoder CDCO and CDC4 relays operate the CLCT (cancel loop continuity) and 4DG relays in the marker (OS 176-1). The CLCT and MLCT (make loop continuity) relays in the marker are used only for calls requiring loop dialing. Since this call is to be outpulsed on an MF basis, the only function of the CLCT relay on this call is to satisfy the RCK check circuit (OS 197-1).

2.10 Dial pulse senders require digit control information supplied via the operated ODG, 4DG or 5DG relay in the marker. Since this description assumes that an MF incoming sender is being used on the call, the only function of the operated 4DG relay is to satisfy the marker continuity test of the 4DG lead (OS 194-1 and 217-1).

(F) Recording Card Information in the Marker

2.11 The marker RCD relay operates the RCD1 and RCD2 (read card auxiliaries) relays (OS 169-1). The RCD, RCD1 and RCD2 relays supply battery to permit the marker to read and register the following information from the HU5-3D card. The relays which operate to record this information are shown in parenthesis:

(a) Trunk Group Starting Point 0 (GSTO, GSU4, and GSU7 relays) - These relays operate the GS0 relay indicating that the trunk group starts at terminal 0 (OS 192-1).

(b) Trunk Group Ending Point 11 (GETO, GEU1, and GEU4 relays) - These relays operate the GE11 relay, indicating that the group ends at terminal 11. As shown on Fig. 1, eight trunks are assigned in the HU5 group. Group start 0 and group end 11 provides 12 terminals. The unused terminals in the group are made busy. With this arrangement, four more trunks may be added in the future without changing the cards in the translators.

(c) Class 2 Information (CLTO, CLUO, and CLU2 relays) - These relays operate the CL2 relay to indicate MF outpulsing (OS 193-1).

(d) Skip 3 Variable Spill Control (SK3) - This indicates that the A, B and C codes as received by the incoming sender should not be pulsed forward (OS 176-1). The toll switching trunks represented by the card are direct to the HU5 central office. Consequently only the numericals of the called number (1234) should be outpulsed by the Newark incoming sender.

(e) Trunk Group Peg Count and Overflow (TPO) - The TPO relay operates indicating the register to be operated on this call (OS 196-1).

2.12 When the marker has received all the necessary information from the decoder and from the HU5-3D card, the RCK (route register check) relay operates in the marker (OS 197-1). The RCK relay operates the RCA relay in the decoder (SC 121-1 and OS 172-1). The RCA relay indicates that the decoder should restore the HU5-3D card.

2.13 When the marker registers the information listed above, it seizes the trunk block connector and trunk block and

attempts to seize one of the eight trunks to the HU5 office. Since hold routing control instruction has been signaled to the marker, the decoder is not permitted to release at this time but waits for a trunk selected signal or an all-trunks-busy signal from the marker. In the meantime the decoder and card translator restores the HU5-3D card.

(G) Restoring the HU5-3D Card

2.14 The operated RCA (restore card and advance to next route) relay operates the RCA1 relay (OS 172-1) and releases the OC (output control) relay which releases the OC1-10 relays (OS 163-1). The RCA1 relay causes the release of the CC1, 2, and 5 relays to cut off the input information to the translator from the sender. The RCA relay also operates the ARC (automatic restore card) relay in the home translator.

2.15 As shown on SC 121-1, the operated ARC relay causes the HU5-3D card to be restored and also operates the HBI (home box indicated) decoder relay. On this call the HBI relay causes the release of the RA relay and the operation of the DCB relay (OS 172-1), thus opening the leads to those card grouping bars which indicate 3D and 6D (OS 162-1).

2.16 Satisfactory restoration of the HU5-3D card is indicated when the CBK and ARC home translator relays release (OS 162-1 and 166-1). It should be noted that at this time the latches, the pull-up magnets, and the card support lift magnets are energized (SC 121-1). As shown on OS 161-1, these magnets are held energized over two holding paths; one through the operated SR translator relay and another through the operated HTR decoder relay. The operating path for the SR (slow release) relay is opened when the ARC relay releases indicating that all code bar slave relays have restored (OS 166-1). The SR relay will release after approximately 350 milliseconds have elapsed, however, the HTR remains operated throughout decoder seizure in this example (OS 161-1). Thus, the latches, pull-up magnets, and card support lift magnets remain energized, keeping the home translator prepared to receive information for operating the code bars in order to drop an alternate route card.

2.17 As shown on SC 121-1, the operation of the DCB2 relay and the release of the COP1 and COP2 relays cause the CCM, MKR and RI battery supply relays to release (OS 163-1). This causes the decoder to discard some of the information from the HU5-3D card by releasing the CCHN, CCTN, CCUN, TBO, TB1, TCTO, TCU1, TCU2, TC, RIO and RI1 relays (OS 164-1). Because the FAT, RCC, and CA battery supply relays remain locked (OS 163-1), the following relays, NAC, TSO, NCA, CDCO, CDC4, ARTO, ART2, ARU2 and ARU7, do not release and thus hold information from the HU5-3D card registered in the decoder.

2.18 While the decoder is restoring the HU5-3D card, the marker is examining the trunk group to the HU5 office. This example assumes that these trunks are busy, therefore the marker operates its ATB relay (OS 201-1). It is necessary for the marker to obtain the alternate route information. However, before receiving new information the HU5-3D card information must be removed. The ATB relay in the marker operates its TB (trunks busy) relay (OS 202-1). The TB relay causes:

(a) All of the marker register relays to release by the release of the RCD, RCD1, and RCD2 relays (OS 191-1).

(b) The release of the trunk block connector by release of the TC- relay.

(c) The operation of the ATB relay in the decoder.

(H) Dropping the 290-AR Card

2.19 The operation of the decoder ATB relay indicates to the decoder that the marker has been unsuccessful in seizing an idle trunk. The operated ATB relay allows the decoder to start operations which will bring about the dropping of an AR card. The ATB relay allows the RCA1 relay to release, since the RCA and CR relays have released and the DCB2 relay has operated (OS 171-1 and 172-1). Also the ATB relay closes a circuit to operate the GPL (subgroup lock) relay (OS 173-1).

2.20 As pointed out in Par. 2.05, the operated route relay 29 allows the decoder to register that the subgroup of 20 trunks to the Jersey crossbar office has idle trunks by the operation of the GO relay. During the time the marker tests the trunks to the HU5 office, the GO relay is not locked and can release if the alternate route trunks become busy. However, as soon as the ATB relay causes the GPL relay to operate, a locking path is provided for the GO relay, and the CO (trunk subgroup cut-off) relay operates, stabilizing the group selection (OS 173-1). The release of the RCA1 relay, together with the operation of the CO and GO relays, permits the ARS (alternate route selected) relay to operate. With the ARS relay operated and the ARC home translator relay released, indicating that the home translator has satisfactorily restored the HU5-3D card, the decoder CCA (code cut-in for alternate route) relay operates (OS 161-1).

2.21 The operated CCA relay operates the A0, A2, B2, and B7 code bars through the make contacts of route relay 29

(OS 162-1). The CCA relay also operates the C4 and C7 code bars through the make contacts of the GO relay and the 0 and 2 code grouping bars. The code bar slave relays for these code bars operate and the action is checked by the operation of the CBK relay. After the operation of the CBK relay, the latches, the pull-up magnets, and the card support lift magnets are released, and the card support magnets are energized causing the 290-AR card to drop.

(I) Reading the Decoder Information from the 290-AR Card

2.22 When the 290-AR card drops, as indicated by the operation of the COP1 and COP2 relays, the decoder operates the MKR and RI battery supply relays and the OC relay (OS 163-1). The OC relay operates the OC1-10 output control relays. The FAT battery supply relay is already locked operated through the FATH relay. Note on OS 163-1 that the CCM battery supply relay cannot operate when the 290-AR card drops because both the ARB and NAC relays are operated.

2.23 The operated MKR, RI, and FAT relays allow the decoder to register the following information from the 290-AR card (see Fig. 5) by operating the relays shown in parenthesis:

(a) Trunks to Jersey Tandem Office Appear on the Toll Completing Train (TC relay) - The TC relay operates but performs no useful function on this call because the toll completing marker is still connected to the decoder (OS 164-1).

(b) Area Code Control (AHA relay) - The AHA relay operates indicating that the trunks to Jersey tandem office terminate in the home area of the Newark 4A office.

(c) Follow-with-Reorder Routing Instruction (RIO and RI4 relays) - These relays operate the FRO relay (OS 167-1) indicating that this is the only alternate route. If the alternate route trunks test busy, the call is to be terminated on a reorder trunk.

(d) Trunk Block Connector (TCTO, TCUO and TCU4 relays) - These relays indicate that the 20 Jersey tandem trunks appear on trunk block connector No. 4 (OS 164-1).

(e) Trunk Block (TBO and TB2 relays) - These relays indicate that the trunks are on trunk block No. 2.

(J) Transmitting Decoder Information to the Marker

2.24 When the marker has released the trunk block connector and certain other relays shown on SC 121-1, it signals the decoder that it is ready to receive new information by removing ground from the ATB lead, thus releasing the decoder ATB relay (OS 172-1). As soon as the decoder RI4 relay and the TCTO, TCUO, and TCU4 relays operate, a path is closed through the normal ATB relay to transmit the following information to the marker:

(a) Trunk Block Connector No. 4 - The Decoder TCTO, TCUO, and TCU4 relays operate the TC4 marker relay (OS 169-1).

(b) Read Card Control - The marker RCD relay operates in series with the TC4 relay (OS 191-1).

2.25 When the RCD relay operates, the following information is passed from the decoder to the marker:

(a) Trunk Block No. 2 - The decoder TBO and TB2 relays operate the TBO and TB2 relays in the marker (OS 192-1).

(b) No Code Conversion - The operated decoder AHA and ARB relays operate the CCHN, CCTN, and CCUN relays in the marker (OS 195-1).

(c) Continuity and Digit Control - The decoder CDCO and CDC4 which were locked operated when the HU5-3D was read now reoperate the 4DG and CLCT relays in the marker (OS 176-1).

(d) Follow-with-Reorder Routing Instruction - The decoder FRO relay operates the marker FRO relay (OS 191-1).

2.26 The marker RCD relay operates the RCD1 and RCD2 relays. The operated RCD1 relay registers no-skip variable spill information by operating the marker NSK relay through the operated NSK decoder relay. As shown on OS 176-1, the decoder NSK relay is operated in this example through the operated AHA and NAC relays.

(K) Recording 290-AR Card Information in the Marker

2.27 The RCD, RCD1, and RCD2 relays supply battery to permit the marker to read and register the following information from the 290-AR card by operating the relays shown in parenthesis:

(a) Trunk Group Start (GSTO, GSU4 and GSU1 relays) - These relays operate the GS10 relay indicating that the group starts on terminal 10 (OS 192-1).

(b) Trunk Group End (GET1, GEU0 and GEU7 relays) - These relays operate

the GE35 relay indicating that the group ends on terminal 35 (OS 192-1). The trunk group from the Newark 4A office to the Jersey crossbar tandem office contains 20 trunks. Terminals 30 to 35 are spare and are made to appear busy to the marker by grounding the associated MS leads at the assignment distributing frame.

(c) MF Class Information (CLTO, CLUO, CLU2 relays) - These relays operate the CL2 relay indicating that MF outpulsing is required (OS 193-1).

2.28 When the marker registers all the information received from the decoder and the AR card, the RCK relay operates (OS 197-1).

(L) Releasing the Decoder

2.29 The RCK relay operates the RCD relay (restore card and disconnect) in the decoder through the operated FRO relay (OS 167-1). The RCD relay releases the OC relay which releases the OC1 to OC10 relays (OS 163-1), and operates the ARC relay (OS 172-1). The latter relay restores the 290-AR card in the regular manner and operates the decoder RLT relay (OS 177-1). The RLT relay in the decoder causes the decoder connector RLT relay (OS 177-1) to operate and release the DC1 relay (OS 155-1). This removes the shunting ground from the CHK relay allowing it to operate in series with the MC relay (OS 177-1). The CHK relay operates the RLT1 relay which opens the start lead to the decoder connector (OS 155-1) releasing the decoder. The marker is left attached to the sender only through the decoder connector MC relay which, as stated above, is locked operated in series with the CHK relay. The operation of the CHK relay and the release of the decoder causes the marker connector to be released as shown on OS 168-1. The decoder is now available to serve other calls.

(M) Transmitting Information to the Sender

2.30 When the decoder transmits trunk block information to the marker, the marker seizes the trunk block connector and then seizes an idle trunk to the Jersey tandem crossbar office. The marker connects to the outgoing and incoming frames and selects a channel to connect the incoming and outgoing trunks together. After the channel is selected, the marker transmits the following information to the sender:

(a) MF Class - The marker CL2 relay operates the MF relay in the sender (OS 193-1), indicating MF outpulsing.

(b) No Skip Variable Spill Information - The NSK relay in the marker operates the NSK relay in the sender (OS 194-1), indicating that the sender shall outpulse all digits (485-1234). The digit control information in the marker (4DG) is not registered in an MF sender, however the sender returns 48-volt battery over the 4DG lead to operate the DGA (digit control lead check) relay in the marker.

(N) Release of the Marker

2.31 The marker operates the hold magnets, makes a continuity test through the crosspoints, transfers the control of the hold magnets to the sender, and signals the sender to release the marker connector. The decoder connector releases the marker, leaving the sender connected through the crosspoints to the Jersey crossbar tandem office.

2.32 When the trunk to the tandem office is seized, an MF sender becomes attached at the tandem office. The Newark 4A sender pulses forward the digits (485-1234) to the distant sender, transfers control of the hold magnets to the incoming trunk circuit, and releases. The marker at the crossbar tandem office sets up a connection between the incoming trunk (from the 4A system) and an outgoing trunk (to HU5). When the HU5 trunk is seized, an MF terminating sender becomes attached at the HU5 office. The crossbar tandem sender pulses the numerical digits (1234) forward to the HU5 sender, transfers control of the hold magnets to the incoming trunk, and releases.

2.33 If the crossbar tandem senders are not equipped to outpulse on an MF basis, the pulsing between the tandem office and the No. 1 crossbar office takes place on a revertive basis.

2.34 When the No. 1 crossbar sender has registered the digits (1234) it seizes a terminating marker. This marker:

(a) Closes the crosspoints which connect the incoming trunk to the called line.

(b) Starts the ringing circuit in the incoming trunk.

(c) Transfers control of the hold magnets to the incoming trunk.

(d) Signals the sender to release.

The sender releases the marker.

2.35 When the called subscriber answers, the ringing trips, and an off-hook signal is sent back to the cord circuit at the outward switchboard in St.Louis. The associated supervisory lamp is extinguished indicating that the called subscriber has answered.