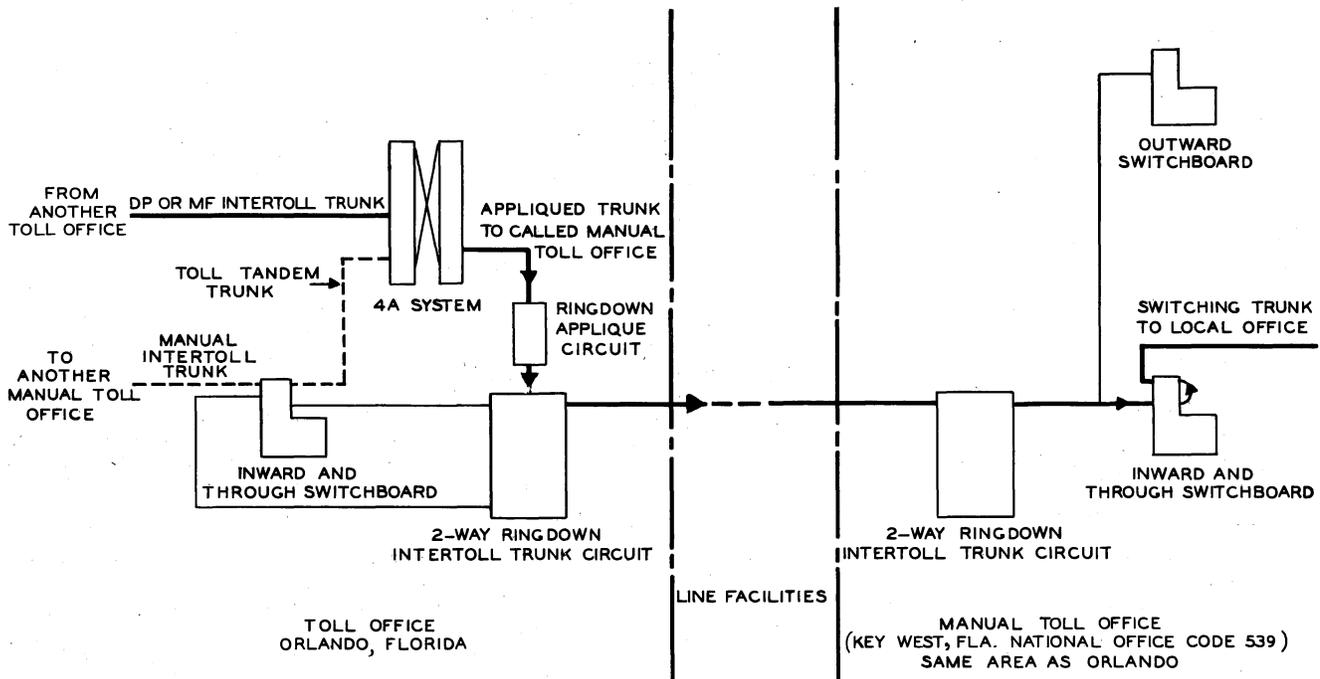


DETAILED DESCRIPTION
 CALL FROM AN OUTWARD OPERATOR
 TO A MANUAL TOLL OFFICE -
 3-DIGIT TRANSLATION
 NO. 4A TOLL SWITCHING OFFICES

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2 - 539-3D Card at Orlando 12 Common Grade Trunks	3	1.05 The applique circuit, in addition to furnishing a means of bridging the

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NOTE:

THE HEAVY LINES SHOW THE ROUTE OF A CALL TERMINATING AT A MANUAL TOLL OFFICE, USING AN "APPLIQUED" RINGDOWN INTERTOLL TRUNK BETWEEN A 4A OFFICE AND A MANUAL TOLL OFFICE. THE LIGHT SOLID LINES INDICATE THE PATHS USED (ON THIS TYPE CALL) TO LIGHT BUSY LAMPS. OTHER TRUNKS ARE SHOWN WITH DOTTED LINES.

FIG. 1- CALL TO MANUAL TOLL OFFICE

ringdown trunk to the 4A office, automatically causes a two second application of ringing current to be applied to the trunk when it is seized, causing the incoming lamp signal to light at the distant toll office. The applique circuit, when seized, also causes the associated ringdown trunk to appear busy at the inward and through switchboards at the 4A office.

1.06 Outgoing traffic from the distant manual toll office to dial or MF toll offices reached through the 4A office, is switched by the inward and through operator at the 4A office. This operator receives, orally, the required information from the calling operator and then key pulses (or dials) the proper code over a toll tandem trunk. In this case the applique circuit performs no function other than that of making itself appear busy to the markers in the 4A office.

1.07 For the call here described, 3-digit translation is used since the called office is in the same area with the 4A office. The principal relay operations for this call are shown on SC 128-1.

1.08 As previously described in Section A828.121.2, when the 3 digits, 539, have been registered in the incoming sender, operation of relay MS2 (marker start auxiliary) signals the decoder connector to seize an idle decoder (SC 113-1).

2. DECODER OPERATIONS

(A) General

2.01 The decoder upon seizure, and as described in Section A828.121.2, makes an integrity check of certain input leads (SC 113-1 and OS 160-1). Satisfactory completion of this integrity check is followed by the operation of relays CKG, CKG1, CKG2 (OS 155-1) and then the HTR relay (OS 160-1). The operation of the HTR relay causes the decoder to seize the home translator.

2.02 As previously stated the national office code for the distant manual toll office, which is the termination of the call being described, is assumed to be 539. The sender therefore grounds leads A1, A4, B1, B2, C2 and C7 (OS 162-1). Leads CG1, CG4 and VO are also grounded by the decoder since the call requires a 3D

card, and because the wiring option on the KT1 lead of the incoming intertoll trunk causes the decoder VO relay to operate (OS 121-1). Ground on the above leads operates the corresponding code bars and the 539-3D card (see Fig. 2) is caused to drop.*

*The VO code bar operates but performs no useful function on this call since the outgoing (539) trunk group is made up of common grade trunks only, and thus both the VO and NVO tabs have been removed from the card.

(B) Reading the Card

2.03 The decoder now reads the following information from the card (OS 164-1 and RM 3-5):

- (a) NCA (no come again). This is a 3-digit translation call.
- (b) IT (intertoll marker required). Outgoing trunks are on intertoll train.
- (c) NAC (no area code). Call terminates in same area as the Orlando 4A office.
- (d) RI1 and RI2 (routing instruction). This indicates follow-with-overflow routing instruction.

(e) CDC4 and CDC7 (continuity and digit control). A variable number of digits should be expected by the sender and a loop continuity test should be cancelled by the marker.

(f) CCHN, CCTN and CCUN (code conversion). No code conversion is required in hundreds, tens or units digits.

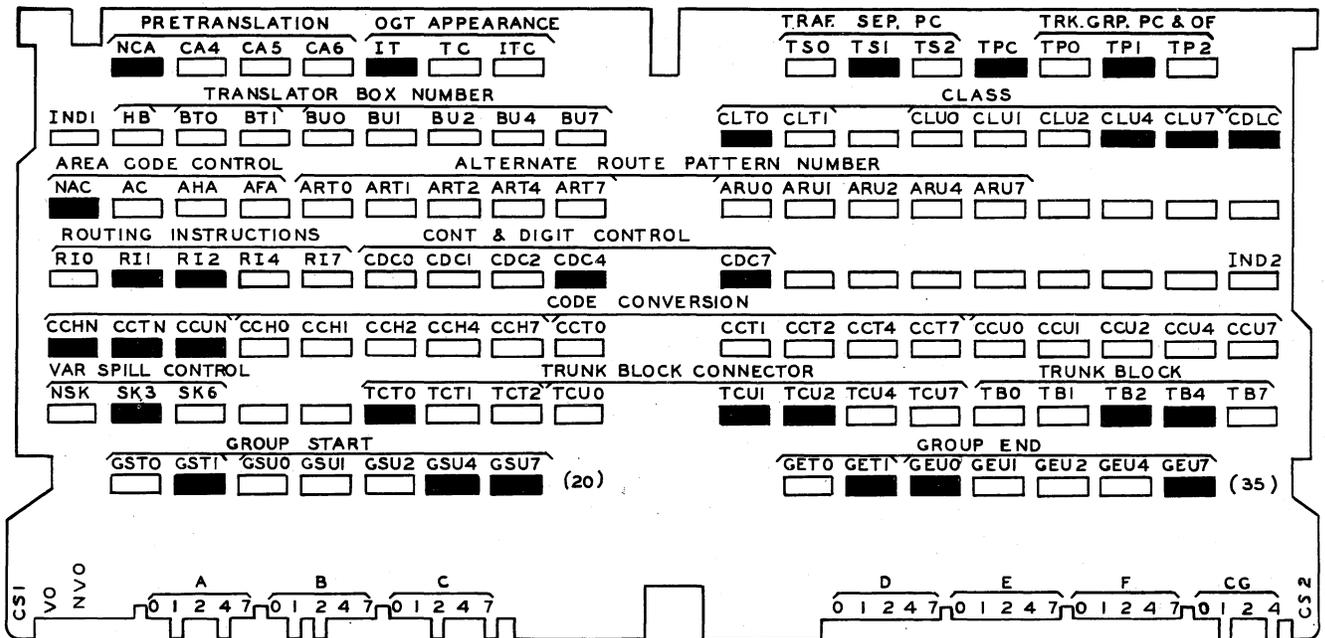
(g) TCTO (trunk block connector tens) TCU1 and TCU2 (trunk block connector units). The outgoing trunks can be tested through operation of trunk block relays via trunk block connector O3.

(h) TB2 and TB4 (trunk block relay). The outgoing trunks can be tested through the operation of trunk block relay O3.

The remaining card information is read later by the marker.

(C) Marker Selection and Seizure

2.04 The decoder, as directed by the card, selects and seizes an idle intertoll marker. The various leads between the decoder and marker and between the incoming sender and the marker are then cut through as explained in Section A828.121.2.



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

FIG. 2- 539-3D CARD AT ORLANDO
 12 COMMON GRADE TRUNKS, FOF

3. MARKER OPERATIONS(A) Registering Card Information

3.01 When the marker connector relays have closed through the leads between the decoder and marker, the marker proceeds to register the information necessary to complete the call. This includes operation of the TR1 or TR2 relay to indicate a first or second trial call, the CNE (connector even) or CNO (connector odd) to indicate connector preference, and the registration of the additional information

from the decoder or card as shown in the table below.

(B) Releasing the Decoder

3.02 The marker seizes the trunk block connector as soon as item (a) in the table below has been read, and then proceeds to register the remaining items in the table. When all the items (excluding item (K) have been correctly registered the RCK (receiving lead check) relay operates (OS 197-1) and signals the decoder to release so that it can be used on other calls.

<u>Information</u>	<u>Registered on Relays</u>	<u>Shown on OS</u>	<u>Marker Information Received From</u>
(a) Trunk block connector number	TC3 (RCD relay operates in series with TC3, enabling following items to be read).	191-1	Decoder
(b) Trunk block relay number	TB2, TB4	192-1	Decoder
(c) Routing instructions	FOF* (follow-with-overflow)	191-1	Decoder
(d) Group start (tens and units)	GST1 and GSU4, 7 (group start 20)	192-1	Card
(e) Group end (tens and units)	GET1 and GEUO, 7 (group end 35)	192-1	Card
(f) Class (tens and units)	CLTO and CLU4, CLU7 (class 0 indicating manual class)	193-1	Card
(g) Variable spill	SK3 (skip 3)	176-1	Card
(h) Continuity and digit control	CDC7, CDC4 (variable number of digits expected; cancel loop continuity test)	176-1	Decoder
(i) Cancel delayed loop closure	CDLC	193-1	Card
(j) Code conversion (units, tens, and hundreds)	CCUN, CCTN, CCHN (no code conversion)	195-1	Decoder
(k) Trunk group peg count	TP- (as assigned)	196-1	Decoder

*It is assumed that the Orlando-Key West trunk group is not an alternate route for any other point. The group contains less than 40 trunks, including allowances for growth and overflow trunks, and thus can be handled on a single 3D card with FOF routing instruction. (See Figs. 1 and 2.)

(C) Other Marker Operations

3.03 With all the necessary information registered, the marker selects an idle trunk in the Key West (539) group, finds an idle channel and closes the crosspoints to connect the incoming and outgoing trunks together. These operations are described in detail in Section A828.121.2.

3.04 When the K- relay operates, indicating that a specific trunk has been selected, a ground is placed on the MS lead of the trunk causing the OS (outgoing seizure) relay in the ringdown applique circuit to operate, in the same manner as shown on OS 203-1. Operation of the OS relay sends a seizure signal forward on the trunk, makes the trunk busy to other markers and prepares a circuit for lighting associated busy lamps on the manual switchboard. This is covered in more detail in later paragraphs.

3.05 As the call progresses, the marker passes the class and variable spill information to the sender resulting in the operation of relays M (manual class) and SK3 (skip 3) in the sender (OS 193-1 and 194-1).

3.06 Digit control information is not sent to the sender by the marker since, on manual class calls, this function is taken care of by the operated M relay (OS 127-1) which causes the sender to complete the SL check and release immediately after completion of RTT (round trip transit timing)*, as covered under Sender Release later in this section.

*The enlarged CDLC punch on the card operated the CDLC relay in the marker which opens the DLC lead (OS 193-1) to prevent operation of the DLC relay in the sender. (See RM 3-5.)

3.07 Also, on manual class the marker cancels loop continuity test by operating its CLCT relay from the operated CDC4 and CDC7 relays in the decoder (OS 176-1).

3.08 Following the operation of the K- relay in the marker, relay TKE releases (OS 201-1) which now causes the TKS (trunk selected) relay in the marker to operate (OS 202-1). Operation of the TKS relay in the marker causes relay TKS in the sender and TSA in the marker to operate in series (OS 125-1 and 202-1).

(D) Marker Release

3.09 With the above operations completed, the marker completes its continuity test of the OT and OR and the OT1 and OR1 leads after which the marker proceeds to release. Before releasing, relay SRL

(send release) in the marker operates sending a marker release signal to the sender over the MRL lead operating the MRL relay (OS 217-1). The operating path of the SRL relay is through a checking path which is closed only when complete and correct information has been closed through to the sender (OS 216-1 and 217-1).

(E) Sender Release

3.10 Operation of the TKS relay in the incoming sender, with the M relay operated, causes the sender to recognize this as a manual call and thus complete its SL check and prepare to release. The TKS relay operating is followed by the operation of the TCA (RTT timing completed) relay (OS 125-1), SL (sleeve out) relay (OS 127-1)* and the SL1 (sleeve out auxiliary) relay (OS 128-1).

*OS 127-1 shows the operation, using a dial pulse outgoing trunk, but the circuit operation is essentially the same when an applique circuit is used.

3.11 Operation of the SL1 relay in the sender permits the operation of the marginal SL (sleeve) relay in the trunk (applique) circuit. This opens the circuit to the SL relay in the sender releasing it. Relays AV (advance to release) and AV1 (AV auxiliary) in the sender operate, then the sender releases (OS 126-1).

3.12 The operated AV1 relay releases the SP (splitting) relay in the incoming sender which in turn releases the SP relay in the tandem trunk circuit. The splitting relays cause the holding ground for the channel crosspoints to be transferred from the sender to the trunk circuit (OS 222-1). The SP relay in the tandem trunk also transfers the IT, IR, IT1, and IR1 leads from the sender input and output leads back to the trunk equipment.

4. RINGDOWN APPLIQUE OPERATIONS (SC 128-1)(A) General

4.01 By referring to Fig. 1 and OS 222-1 it may be seen that the ringdown trunk is 2-way between the 4A office and the manual toll office and is bridged to the intertoll outgoing frame of the 4A office by means of the ringdown applique circuit. This enables the 4A system to switch calls to the ringdown intertoll trunks for completion at the distant manual toll office.

(B) Making the Trunk Busy

4.02 It is necessary to insure that the trunk seized by the marker be made to test busy to the operators at the inward and through switchboards associated

with the 4A system, and also to insure that the trunk tests busy to other markers in the 4A system.

4.03 Operation of the OS relay in the applique circuit (OS 222-1) connects battery to the TS lead to the ringdown trunk circuit operating the S (sleeve) relay. This action is followed by the operation of relays SC (signal cut-off) and BS (busy signal). The operated BS relay lights the busy lamps at all switchboard positions (at 4A office) informing the operators that the trunk is in use.

4.04 After the trunk is seized but before the MS lead is grounded by closure of the outgoing frame crosspoints, the K-relay in the marker grounds the MS lead to prevent trunk seizure by another marker.

4.05 After the closure of the crosspoints but prior to completion of the SL check the trunk is made busy to other markers by bridging the grounded OS lead to the MS lead at the normal contacts of the SL relay. Following the SL check the MS lead is grounded at the make contacts of the SL relay.

4.06 The trunk is not made busy to the operators at the distant manual office until the seizure signal (ring) is received, operating certain relays at that office. To reduce the possibility of simultaneous seizure of this trunk at opposite ends, the trunks are arranged so that they are selected in reverse order at the two ends.

(C) Connect Signal Sent Forward

4.07 At the same time the selected trunk is made busy to all operators at the 4A end, the distant inward operator must be called in by sending forward a connect signal. For this purpose a 1000-cycle signaling circuit is used to transmit a ringing signal to the distant office.

4.08 The tip and ring of the ringdown applique circuit are cut through to the ringdown trunk circuit upon operation of the OS relay (OS 222-1). The OS relay also causes the R (ringing) relay to operate, over its tertiary winding, and lock-up under control of the T (timing) and SL relays. The R relay connects 48-volt battery to the tip conductor operating the R (ringing) relay in the ringdown trunk circuit which in turn places 24-volt battery on the SG lead to operate the R (ringing) relay in the 1000-cycle cut-off circuit. This relay connects 1000-cycle ringing current to the line facilities for transmission to the distant toll office.

4.09 The 1000-cycle current is maintained for two seconds and is cut off following the operation of the T (timing)

relay in the ringdown applique circuit. The T relay operates after a period of approximately two seconds under control of a timing circuit consisting of the cold cathode tube V and associated capacitors and resistors.

4.10 During this interval the marker has completed its functions and has released along with the marker connector and trunk block connector. The sender in the meantime has completed the SL check, as previously described, operating the SL relay in the applique circuit. With the SL and T relays both operated the chain of R-relays is released cutting off the ringing current.

(D) Off-Hook Signal to Originating Operator

4.11 The originating operator of a call completed through a manual office does not receive direct switchhook supervision from the called subscriber. Therefore the ringdown applique circuit is arranged to transmit an "off-hook" signal to the originating operators cord circuit immediately after completion of the SL check by the sender.

4.12 When the SL relay in the applique circuit is operated, a 500-ohm ground is connected to the simplex OT and OR leads (OS 222-1) to operate the SVP (supervisory) relay in the incoming trunk circuit. Operation of the SVP relay places battery on the M lead so that an off-hook signal will be indicated by extinguishing the cord supervisory lamp at the originating operators switchboard.

5. DISTANT MANUAL OFFICE OPERATIONS

5.01 The 1000-cycle ringing current sent out over the line facilities by the ringer at the 4A office is received at the manual toll office end by a 1000-cycle receiver circuit (OS 222-1). This 1000-cycle current is converted to a DC signal to operate the DC (direct current) relay in the receiver circuit. Operation of the DC relay places 24-volt battery on the SG lead to operate the LU (lock-up) relay in the ringdown trunk followed by operation of the LI (incoming lamp) and BS (busy signal) relays. The LI relay operating causes the incoming line signal lamp to light and the BS relay operating causes the trunk busy lamp to light at all switchboards.

5.02 The inward operator at the manual toll office inserts her answering cord and answers the call by giving the name of the city or town in which she is located. The battery on her answering cord sleeve operates the S relay which in turn operates the SC relay to release the LU and LI relays, extinguishing the line lamp. The operated SC relay locks the BS

relay to keep the busy lamp lighted for the duration of the call.

6. RINGING FEATURES (SC 128-1 AND OS 222-1)

(A) General

6.01 The call described here is one which requires the services of an inward operator. The fact that the inward operator's cord circuit at the manual toll office appears in the connection prevents called subscriber supervision to the originating operator. Ringing signals must, therefore, be used by the two operators to signal each other. These signals may originate at the outward position in which case they are known as ring forward signals, or they may be originated by the inward operator at the called end and are then referred to as ring back signals. These signals are employed only as recall signals by either operator because each receives switchhook supervision from her respective subscriber.

(B) Ringback Signal (OS 222-1)

6.02 When the inward operator at the called manual office desires to ring back the outward operator she operates the ringing key of her answering (toll) cord. Battery is connected over the tip lead from her cord circuit to operate the R (ring) relay in the trunk circuit which in turn operates the R relay in the 1000-cycle cut-off circuit connecting 1000-cycle tone on the toll trunk toward the 4A office.

6.03 The DC relay in the 1000-cycle receiver circuit responds to the rectified 1000-cycle tone placing 24-volt battery on the SG lead to operate relay LU in the ringdown trunk circuit at the distant end. The operation of the LU relay connects the winding of the SF (signal flash) relay in parallel with the S relay winding to ground, thus reducing the sleeve resistance to ground on lead TS from 1800 ohms to

80 ohms. The marginal SM (sleeve marginal) relay in the applique circuit operates under this condition, but the SF relay in the ringdown trunk does not operate.

6.04 Operation of the SM relay in the applique circuit removes ground from the simplexed OT and OR leads (OS 222-1) releasing the SVP relay in the intertoll trunk circuit which will in turn cause the cord lamp to light at the DSA switchboard. This is not a flashing type recall. The cord lamp will light with each operation of the ringing key at the called end.

(C) Ringing Forward

6.05 When the originating operator rings forward, the ringing signal is translated into a momentary on-hook signal over the composite or single frequency signaling circuit. This momentarily opens the E lead and releases the LC relay (OS 222-1, sheet 2). The normal LC operates the IR relay which places ground and battery on the OT1 and OR1 leads causing relay R in the applique circuit to operate and lock under control of the T relay. Relay R remains operated for approximately two seconds during which time it applies 48-volt resistance battery to the T lead as a ring forward signal.

6.06 The transmission of the ringing signal from this point is the same as described above for the original seizure except that, in this case, when the LU relay at the distant office operates it causes relay SF to operate from battery on the sleeve of the plug circuit, and lock to its own contacts. Relay SF connects 120 ipm ground impulses to cause relay I (interrupter) to flash, changing the sleeve ground resistance intermittently from 1800 ohms to 85 ohms. By this means the cord supervisory lamp is flashed at 120 ipm indicating that the originating operator has rung on the circuit. This is known as a flashing recall signal to the inward operator at the manual toll office.

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