CROSSBAR SYSTEMS
NO. 5
MASTER TEST FRAME CONNECTOR CKT

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SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 This circuit connects markers, pretranslators, transverters, AMA recorders, recorder and recorder control, trunk control, master timing circuit, route translators, the automatic monitor circuit, the automatic range extension test circuit, the billing data transmitter, and the line insulation test control circuit to the trouble recorder for trouble records. It also connects the master test control circuit to markers, pretranslators, program controlled transverter, and transverters for test calls; the automatic progression trunk test circuit, the remote office test line circuit or remote office test line register circuit to markers for test calls, the automatic range extension test circuit to markers for test calls, and the line verification circuit to markers and transverters for line verification test, the line insulation test control circuit to transverters for directory number printout test, and associates the trouble recorder if a trouble is encountered on such calls, or if a record of a properly completed marker or transverter or line insulation test directory number printout (TTY features not provided) test call is to be made. In addition, connections between the automatic monitor circuit and the combined or completing markers for monitor and test calls are made through this circuit.

2. GENERAL DESCRIPTION OF OPERATION

2.01 This circuit is arranged to recognize start signals as follows:

(a) from combined, completing, or dial-tone markers for trouble records or from combined or completing markers for incoming trunk test calls - no pulsing class (battery TRST lead),

(b) from the master test control circuit for marker, originating register and sender test calls, intraoffice and outgoing trunk test calls, and incoming trunk test calls - pulsing class (battery MTP lead),

(c) from the automatic monitor circuit for monitor or test calls on registers or senders or for trouble records (battery TRST lead).

(d) from pretranslators for trouble records (battery TRST lead),

(e) from the master test control circuit for pretranslator test calls (battery PTP lead),

(f) from transverters for trouble records, sender test calls, program controlled transverter test calls or line verification calls (battery TRST lead),

(g) from the master test control circuit for transverter, program controlled transverter, test calls (battery TTP lead),

(h) from the AMA recorders for trouble records (battery TRST lead),

(i) from the even or odd parts of the master timing circuit for trouble records (battery TRST lead),

(j) from the common part of the master timing circuit for AMA recorder test and special pattern calls (battery PCN lead),

(k) from the line insulation test control circuit for trouble records or properly completed directory number printout test where TTY features are not provided (battery TRST lead),

(l) from the automatic progression trunk test circuit for trunk tests (battery ATP lead,

(m) from the line verification circuit for line verification tests (battery LVP lead) for marker line verification; and (battery LTP lead for transverter line verification),

(n) from the line concentrator 2A control circuit for trouble records (ground OP or OP1 lead),

(o) from the trunk test register circuit (battery TTRP lead),

(p) from the route translator circuit for trouble records (battery TRST lead),

(q) from the automatic range extension test circuit for range extender tests (battery REP lead), and for trouble records (battery TRST lead),

(r) from the remote office test line circuit or remote office test line register circuit for trunk tests (battery RTP lead),

(s) from the trunk control circuits for trouble records (battery TRST lead),

(t) from the recorder and recorder control circuit for buffer trouble records (battery TRST1 lead),

(u) from the recorder and recorder control circuit for system control trouble records (battery TRST lead), and

(v) from the master timing circuit for trouble records (battery TRST lead).

2.02 The sequence of preference relays is as follows: Fig. 2 (44, 46, 183, 181, if provided) 3, and 5 (3-134, 40, 159, 13-18, 49, 19-21, if provided).

2.03 The preference relays are arranged so that only one call may enter the connector at a time in case of simultaneous or overlapping attempts by two or more circuits, except for AMA recorder test and special pattern calls (2.01 (j) above). Such calls require a connection between the master timing circuit and an AMA recorder which is closed in the recorder and recorder connector circuit. They do not require the use of the internal multiple in the master test frame connector circuit between the various connectors and the scanning relays, the master test control circuit, and the automatic monitor circuit. Therefore, a call of this type may be allowed to proceed concurrently with a marker or pretranslator trouble record call, a test call involving a marker or pretranslator, or a monitor call, but must not be allowed to proceed concurrently with any other call involving AMA circuits as interference might result in the AMA recorder and recorder connector circuits.

2.04 In order to meet the above conditions the preference relays except PCN (for AMA recorder test and special pattern calls) are arranged so that any relay may operate if all succeeding relays are normal or if a preceding relay is operated. Two or more relays may operate simultaneously. The preference is accorded the relay nearest the end of the chain shown in Fig. 2. The PCN relay may operate if all other relays of Fig. 13 through 21 are normal, and if it operates, the call it represents will proceed regardless of the relays of preceding figures. The PCN relay locks out all simultaneous or subsequent AMA calls. Preference relays operated for trouble record calls which are locked out are released after the call which obtains preference has started. Preference relays operated for test calls will remain operated until the calls are served.

2.05 The master timing circuit maintains a standing test on the AMA recorder perforator leads. On any AMA call involving the master test frame connector circuit, it is necessary that this standing test be removed before allowing the call to proceed. Therefore, all relays of Fig. 13 through 18, 49 (if provided), and 19 through 21 are arranged to connect ground to the CO lead to the master timing circuit when in the preferred position. This ground causes the timing circuit to remove the standing test and to return ground on the CI lead when the test has been removed. Ground on the CI lead permits the preferred call to proceed.

2.06 If AMA is not provided, Fig. 13 through 21 are omitted and the relays of Fig. 2 (44, 46, 183, 181, if provided) 3, and 5 (31 through 34, 40, 159, if provided) constitute a conventional preference chain.

SECTION II - DETAILED DESCRIPTION

1. DESCRIPTION OF FRAMES

FOR OFFICES USING SINGLE-SIDED TR CARDS

1.01 Four types of frames are provided (in offices using single-sided TR cards) for mounting the equipment of the master test frame connector circuit as follows:

(a) Master Test Connector Frame for Combined or Completing Markers - This frame is required in all installations in offices which use the single-sided TR card. It consists of 2 bays and has a capacity of 6 markers, 16 multicontact connector relays, and the associated preference and controller relays provided per marker. The common connector controller and scanning connector, the repeating relays for marker leads, and certain other miscellaneous equipment are also mounted on this frame.

(b) Supplementary Master Test Connector Frame for Combined or Completing Markers - This is a 1-bay frame having a capacity of 3 markers, 16 multicontact capacitor relays, and the associated preference and controller relays provided per marker as in (a) above. This frame is required when the number of combined or completing markers exceeds the capacity of the basic frame (a). Two of these frames may be provided, if required, for a total of 12 markers.

(c) Master Test Connector Frame for Dial-Tone Markers - This is a 1-bay frame having a capacity of 6 dial-tone markers, 8 multicontact connector relays, and the associated preference and controller relays provided per marker. Dial-tone markers require approximately half as many connecting leads as do combined or completing markers. These leads, which appear at 11 of the 16 connector relays per marker of frames (a) and (b) have been relocated to appear on the 8 relays per marker of this frame. One frame of this type is provided in offices having dial-tone markers, except as described in 1.02.

(d) Auxiliary Master Test Connector Frame - One frame of this type is provided in offices having AMA. It is arranged to mount the preference, controller, and connector relays for a maximum of 6 transverters, 11 AMA recorder and recorder connector circuits, and 1 master timing circuit.

1.02 Combined or completing markers may be associated only with frames (a) and (b) above. Dial-tone markers are ordinarily associated with frame (c). However, dial-tone markers, together with completing markers, may be assigned to frames (a) and (b) if this should be cheaper than the provisions of frame (c). In such a case, no provision is made for omitting the connector relays which are not required.

1.03 Frames (b), (c), and (d), when provided are interconnected with frame (a) to provide continuity of the preference chain and access to the common equipment.

1.04 The pretranslator preference, controller, and connector relays are located on the pretranslator frame and cabled to frame (a).

1.05 One Fig. 6 marker connector controller, and 16 Fig. 8, marker connector relays, are provided per marker on frames (a) and (b). They are used for combined or completing markers, and for dial-tone markers, when associated with these frames. One Fig. 41 dial-tone marker connector controller, and eight Fig. 9 dial-tone marker connector relays, are provided per marker on frame (c). They are used for dial-tone markers when assigned to this frame.

1.06 Table 1 is a lead index for all leads from external circuits connecting to the master test frame which uses the single-sided TR card. This table also shows, schematically, the connections between the connector relays and the scanning relays, and all trouble recorder punch indications. All leads and trouble recorder punches are listed alphabetically.

1.07 Other tables for use with single-sided TR cards are 2, 3, 4, 5, and 6.

FOR OFFICES USING DOUBLE-SIDED TR CARDS - NEW FRAME

1.08 Three frames are required for mounting the equipment for the new standard master test frame connector.

(a) Master Test Connector Frame for Completing Markers - This frame is provided in all installations of the new standard master test frame connector. It is a 1-bay frame and has a capacity of 8 markers, 34 multicontact connector relays, and the associated preference and controller relays provided per marker. The common connector controller and scanning connector,

the repeating relays for marker leads, and certain other miscellaneous equipment are mounted on this frame. A cross-connecting field is provided between the connector and scanning relays to facilitate wiring changes when changes or additions are to be made on the double-sided trouble recorder card.

(b) Master Test Connector Frame for Dial-Tone Markers - This is a 1-bay frame having a capacity of 4 dial-tone markers, 17 multicontact connector relays, and the associated preference and controller relays provided per marker.

(c) Auxiliary Master Test Connector Frame - One frame of this type is provided in offices having AMA. It is arranged to mount the preference, controller, and connector relays for a maximum of 10 transverters, 20 AMA recorders plus 1 emergency recorder and recorder connector circuits and 1 master timing circuit.

1.09 Frames (b) and (c) when provided are interconnected with frame (a) to provide continuity of the preference chain and access to common equipment. The new frame (a) will be equipped with the preference relays for automatic progression trunk testing, line verification, and line insulation testing in addition to the main preference relays. These preference relays will be provided at all times on the new frame with or without the features for these preference relays arranged for in the office. This method of providing additional equipment was adopted to simplify the additions of features in the offices. When AMA is provided, the AMA preference relays for line verification (Fig. 49) and the AMA auxiliary preference relays (Fig. 48) are provided on the AMTC.

1.10 The pretranslator preference, controller, and connector relays are located on the pretranslator frame as in offices which use the single-sided TR card and cabled to frame (a). The pretranslator auxiliary preference relay (Fig. 47) is located on frame (a).

1.11 One Fig. 6 marker connector controller and one Fig. 150 marker connector relay are provided per marker on frame (a). They are used for completing markers. One Fig. 41 dial-tone connector controller, and one Fig. 151 dial-tone marker connector relay, are provided per marker on frame (b).

1.12 Table 1A and 1E are a lead index for all leads from external circuits connecting to the new standard master test frame. It also shows the cross-connecting field, and trouble recorder card punches on both sides of the card. All leads and punch designations are listed alphabetically.

1.13 Other tables for use with the new frame are 2A, 3A, 4A, 4B, 4C, 4D, 4H, 4I, 4J, 4K, 4L, 5A, 5B, 5C, and 6A.

1.14 Table 4D shows miscellaneous punchings which, together with those specified in the instructions under the title of Table 4A, should not be cross-connected for an office which does not have or will not ultimately have AMA.

FOR OFFICES CONVERTING FOR USE WITH DOUBLE-SIDED TR CARDS

1.15 For an office converting for use with the double-sided trouble recorder card, the following changes and additions are made to existing equipment in the office using the single-sided card.

(a) Master Test Connector Frame for Combined or Completing Markers - The scanning relays are removed from this frame. An additional marker connector relay per marker (B5, 287A relay) is added and mounted in the space formerly occupied by the scanning relays. The auxiliary preference relay for pretranslators (Fig. 47) and preference relays for line verification, automatic progression, and line insulation testing will also be located on this frame.

(b) Supplementary Master Test Connector Frame for Combined or Completing Markers - Added B5 relays for combined or completing markers will be provided as required [see 1.01(b)].

(c) Master Test Connector Frame for Dial-Tone Markers - An added connector relay (B6, 287A relay) will be added per marker on this frame [see 1.01 (c)].

(d) Auxiliary Master Test Connector Frame - An additional connector relay V4, 286B-type, Fig. 158 will be added per transverter (0 through 5) to this frame for additional leads required for more than 10 recorders plus 1 emergency recorder.

(e) Supplementary Auxiliary Master Test Connector Frame - This frame is added to all offices which convert for use with the double-sided trouble recorder card.

(1) In offices in which AMA was installed prior to Issue 20D, the following equipment is provided on the frame: scanning relays, nine Fig. 152; repeating relay for second extension trunk link frames, SEF relay of Fig. 11; connector relay for trunk class expansion, one Fig. 157.

(2) If an office which has 6 transverters, increases the number of transverters to a maximum of 10, the following additional equipment is provided for local transverters 6 through 9. One Fig. 153 and one Fig. 154 per transverter. For CAMA transverters in the 6 through 9 group, one Fig. 153 and one Fig. 155 per CAMA transverter are provided; transverter preference relay Fig. 20 or 21; one each RT2 and RT3 relays of Fig. 22 for additional TRB leads for added transverters. One Fig. 25 for each added transverter.

(3) If an office also increases the number of recorders from 10 plus one EMG recorder to a maximum of 20 plus 1 EMG recorder, the following equipment is provided in addition to that required above. Recorder preference relay Fig. 16 and 17; 1 each RR2 and RR3 relay, Fig. 22; 1 each STC2 and STC3 relay, Fig. 29.

(4) In offices using single-sided TR card and in which AMA is installed subsequent to Issue 20D, the new AMTC frame is used [see 1.08 (c)]. The SAMTC in this case will be equipped only with the following; scanning relays, nine Fig. 152, and cross-connecting field, and one U-type relay Fig. 157.

1.16 The following table shows circuit figures which may be provided in offices using:

(a) Single-sided TR card.

(b) Double-sided TR card, new standard frame, and converted frame.

(c) Two-out-of-five double-sided TR card, and new standard frame.

(d) Two-out-of-five double-sided TR card, for offices converting from single-sided or converted double-sided TR card.

TABLE A			
OFFICE			CIRCUIT FIGURES
Using Single-Sided TR Card		1---49 159-162,168	 For ANI Transverters
Using Double-Sided TR Card	New MTF Conn (Double-Sided) TR Card	1-7, 11-25, 150-152, 159-162,163,168 153, 154 28-49, 153, 155, 156, 157 181, 182 182, 183, 184	 For ANI Transverters For Local Transverters For CAMA Transverter For Route Translators For Automatic Range Extension Test Circuit
	New MTF Conn (2/5 Double-Sided) TR Card	1-7, 11-25, 150-152,163 159-162,168 153,154 28-49 153,155, 156,157 169-177,178,179 181, 182 182,183,184	 For ANI Transverters For Local Transverters For CAMA Transverters For Route Translators For Automatic Range Extension Test Circuit
For Offices Converted to Double-Sided TR Card	AMA Provided Prior to Issue 20D	1-9 11-25 26, 27, 152, 153, 154, 153, 155, 157	 For Local Transverters 0-5 For Local Transverters 6-9 For CAMA Transverters
	AMA Provided Subsequent to Issue 20D	1-9 11-25, 28-49 158 153, 154 153, 155 156 157 181, 182 182,183,184	 For Local Transverters For CAMA Transverters For Route Translators For Automatic Range Extension Test Circuit
For Offices Converted to 2/5 Double-Sided TR Card	AMA Provided Prior to Issue 20D	1-9,11-25, 28-49,156-158,163,169-177,179 26 27 152 153,154 153,155 159-162,168 181,182 182,183,184	 For Local Transverters 0-5 For Local Transverters 6-9 For CAMA Transverters For ANI Transverters For Route Translators For Automatic Range Extension Test Circuit
	AMA Provided Subsequent to Issue 20D	1-9,11-25,28-49, 152,156-158,163 169-177,179 153,154 153,155 159-162,168 181,182 182,183 184	 For Local Transverters For CAMA Transverters For ANI Transverters For Route Translators For Automatic Range Extension Test Circuit

2. DOUBLE-SIDED TR CARDS

GENERAL DESCRIPTION

2.01 Since the addition of the many new punch designations required by CAMA, etc, added to the existing single-sided trouble recorder card, would result in an excessive number of card locations having multiple designations, a trouble recorder card with designations printed on both sides has been designed for use with master test frames having all connector and scanning relays of the 286B-type (new frame), or for offices which at present use the single-sided card and convert for use with the double-sided card, because of the addition of CAMA, etc.

2.02 All AMA and CAMA designations are located on the reverse side of the card. CAMA designations for trouble indications from the marker are printed on the front of the card. The new master test frame connector, and converted frames, are equipped with a cross-connecting field between the connector and scanning relays for flexibility in the reassignment or addition of leads for trouble recording.

2.03 The new master test frame connector is wired through the connector and scanning relays according to Table 1A for the 1/X TR card and through the connector and scanning relays according to Table 1E for the 2-out-of-5 TR card, and an existing office which converts for use with the double-sided card is wired through the connector and scanning relays according to Table 1B. Table 1 shows the wiring through connector and scanning relays for offices using single-sided trouble recorder card.

2.04 Tables 4A, 4B, and 4D are cross-connecting tables for use with any office using the double-sided TR card. Table 4A is arranged in the pattern of the new card and shows the punch designations for the front and back of the card. Table 4A also shows the cross-connecting punchings from the scanning relay to all leads over which trouble indications are recorded.

2.05 Table 4C is a table of additional cross-connecting information for converted offices.

2.06 Table 4D shows miscellaneous punchings which together with those specified in the instructions under the title of Table 4A should not be cross-connected for an office which does not have or will not ultimately have AMA.

3. TROUBLE RECORDS - COMBINED OR COMPLETING MARKERS

SEIZURE OF MASTER TEST FRAME CONNECTOR CIRCUIT

3.01 When a marker encounters a cross or times out due to trouble, it connects battery to the TRST lead to this circuit. This causes the corresponding MPR relay to operate and lock and to connect ground to the CI lead to the marker if the preference conditions outlined in SECTION I, 2. GENERAL DESCRIPTION OF OPERATION are met. Ground on the CI lead is returned on the MKA and MKB leads, operating the MKA, MKA1, MKB, and and MKB1 relays of the corresponding Fig. 6. This figure is furnished on a per marker basis.

3.02 The MKA relay connects resistance battery to the TRA lead to the trunk link and connector circuit, or trunk link connector circuit. This lead is used to operate a trouble relay in the trunk link and connector circuit or trunk link connector circuit, which may be associated with the calling marker, in order that it may close switch and level recording leads. With wiring option RN the MKA relay also operates the associated MKA1 and A- relays of Fig. 8 or Fig. 150 and the CIC relay (option E) or the MTR relay (option B), which in turn operates CIC. The MTR relay connects the SL repeating relay to the common SL lead from the marker connector relays and, in offices using the new MTF or the converted frame, the MTR relay also operates the TCA relay with option VA. The operating ground for the CIC relay is extended to the MKR lead to the scanning relays.

3.03 The MKA1 relay connects ground to the RCCK lead to the marker, to prevent operation of its display lost relay. It also connects ground to the NG and NG1 leads to the number group and connector circuit, or number group connector circuit, and to the direct access pretranslator connector circuit. With wiring option RN the MKA1 relay also connects ground to the FRG, CNG, and SG leads to the outgoing sender connector circuit or outgoing sender connector circuit MKR part; the FRG, CNG, and RGG leads to the originating and incoming register marker connector circuits, and the FRG and CNG leads to the line link marker connector circuit. These grounds are returned on frame and circuit recording leads for identifying number group and connector circuits, senders, registers, and line link frames which may be connected to the calling marker.

3.04 The CIC relay operates the ON relay which locks, connects ground to the TRB leads to the monitor circuit and through MTE and MTC normal to the even and odd parts of the master timing circuit, and operates relays RM1, RP1, RT1, RR1, and RT3, RR3, and RM1S (if provided). The RM1 operates RMA. The ON relay also grounds the PERF0, "1" or "2" lead (if provided). The RM1 and RMA relays connect ground to the TRB leads to all markers except the one involved in the call, this path having previously been opened in the marker connector controller, and connects ground to the MTR1 lead to the monitor circuit. This closure is incidental as the MTR1 lead is required only on monitor calls. The RP1 relay connects ground to the TRB leads to all pretranslators via normal contacts of the respective controller relays. The RT1 and RT3 (if provided) and RR1 and RR3 (if provided) perform similar functions for the transverters and the emergency AMA recorder, and for the regular AMA recorders, respectively. The RM1S relay connects ground to the TRB1 leads to all route translators and the automatic range extension test circuit. Connection of ground to the TRB and TRB1 leads causes waiting trouble record calls from markers, pretranslators, transverters, AMA recorders, route translators, the automatic range extension test circuit, and from the even and odd parts of the master timing circuit to release or recycle as required, in turn, releasing their preference relays, if operated. Subsequent calls of these types are released or recycled without closing the TRST leads as long as ground remains connected to the TRB leads. The CIC relay also operates the RON relay which connects ground to the RON lead to each marker in order that the frame delay timing may be extended. This is done because the marker in trouble may be holding other frames out of service while the record is being taken and, consequently, may unduly delay other markers which may be waiting for these frames. The CIC relay also connects ground to the RTG lead to the jack, lamp, and key circuit, this ground being returned on route transfer recording leads if this feature is in effect. The RON relay is also operated from ground over the RON lead from the line insulation test control circuit when line tests are being made, because the holding time of the line link frame in this case may be greater than the marker short frame delay time interval.

3.05 The MKB relay (3.01) operates the B- relays (Fig. 8 or Fig. 150) and the D- relays (Fig. 163) for the calling marker and, with wiring option RO, operates relay MKA1 which in turn operates the A- relays of Fig. 150. Also with MKB1 and CIC both operated, the C- relays (Fig. 8 or Fig. 150) are operated. The marker connector relays are provided per marker and, with the A- relays, the B- relays and the C- relays (Fig. 8 or 150 and Fig. 163) operated, the recording leads from the calling marker and the RP0-4 lead, option ZM, the RPB and RPBA leads, option Q, and the RPSA lead, option ZQ, from the incoming register marker connector circuit or the trouble recorder connector circuit (WS version of incoming register marker connector) are closed to a common multiple. The leads thereby closed, which are required for a marker trouble record call, are those from the marker through the above connector relays to the R and S scanning relays (Fig. 10 for single-sided TR card), or R-, RA-, S-, SA- (Fig. 152 for double-sided card); the optional leads listed above; the HN, T, U, and JC 0-9 leads and the RF, EF and SEF leads, (if provided) which connect to repeating relays of Fig. 11; the CH0-9 leads which connect to repeating relays of Fig. 12; the EXG and EXB leads which connect to the repeating relay of Fig. 45, and the SL lead which connects directly to the scanning connector or through MTR operated ot the SL repeating relay, Fig. 42. The MTR relay with option VA also operates the TCA relay, provided in converted offices and in offices using new standard frame, for closing through the PCD, PCD1, PCR, and INC leads, when the TCA relay is not provided in the marker. The repeating relays of Fig. 11 are provided in order to convert battery signals received from the marker into ground signals for use with the trouble recorder; those of Fig. 12 and 42 are provided to repeat low-voltage ground signals as direct ground signals for the same purpose, and the repeating relays of Fig. 45 is provided to convert battery signals from the marker into direct ground signals or (normal) to transmit ground signals over the EXG-EX lead to the trouble recorder. Upon operation of the A- relays (Fig. 8 or 150), the relays of Fig. 11, corresponding to leads closed to battery in the marker, operate and those of Fig. 12 corresponding to leads closed to ground in the marker operate. The SL relay, if provided, operates when its connector relay operates, if ground is connected to the SL lead and the EXB relay operates when its connector relay operates if battery is connected to the EXB lead in the marker. These relays, in turn, connect ground to corresponding leads, and in the case of the EXB relay, to the EX lead to the scanning connector. The MKB relay also connects ground to a DR lead, and to a DRT lead, if used, to the scanning relays.

3.06 With the relays CIC, MKA, MKA1, MKB, and MKB1 operated, ground is closed through normal contacts of TRC, TRC2, TS, and MON (option YG) or direct (option YH) to the STR lead to the trouble recorder control circuit or to the trouble recorder control and test circuit to start the trouble record. The time required for the operations which take place in the trouble recorder and associated circuits, to prepare for perforating the first line of the card, is greater than the maximum operate time of the connector relays. These relays, therefore, will be operated before the first operation of the scanning connector. Leads associated with repeating relays are not involved in the first scanning operation. This compensates for the additional operate time of these relays.

A. Operation of Scanning Connector

3.07 In response to the start signal, the trouble recorder and associated circuits advance causing ground to be connected momentarily in succession to leads SO through S8, (Fig. 10 or 152). Closure of ground to the SO lead operates the RO and SO relays in parallel (Fig. 10) or the RO RAO, SO, SAO relays (Fig. 152). These relays in turn close the recording leads connected to their make-contacts (in Fig. 10, or the movable spring contacts of Fig. 152) to leads BW0 through BW119 to the trouble recorder. Recording leads connected to ground operate the corresponding interposer magnets in the trouble recorder, these being connected to the BW leads. After the operated interposer magnets are latched in, ground is removed from the SO lead, releasing the RO and SO relays (Fig. 10) or RO, RAO and SO, SAO relays (Fig. 152) thereby disconnecting the first step recording leads. The second step recording leads are then closed in a similar manner by connection of ground to the SI lead which operates relays R1 and S1 (Fig. 10) or R1, RA1 and S1, SA1 relays (Fig. 152). The interposer magnets having meanwhile controlled the perforator operation and, having been released, are reoperated in the required pattern. This process continues for 9 steps of 120 leads maximum each. For each step, the position of the card is advanced so that the interposer magnets will cause the proper lines to be perforated.

3.08 Relay RO (Fig. 10) or RO, RAO (Fig. 152) controls the bottom line of the card, R1 (Fig. 10) or R1 RA1 (Fig. 152) the second line from the bottom, etc, up to R8 (Fig. 10) or R8 RA8 (Fig. 152) which controls the ninth line from the bottom. These relays connect to the BW0 through BW59 leads. The SO through S8 (Fig. 10) or SO, SA0 through S8, SA8 (Fig. 152) relays similarly control the tenth to eighteenth lines, counting from the bottom and connect to the BW60 through BW119 leads. The relay contact numbers 0 through 59 for single-sided card or 00-54 (these run 00-04, 10-14, 20-24, 30-34, 40-44, 50-54) for double-sided card for each line correspond to the card designations read left to right through both halves of the card. Corresponding lines in the lower and upper halves of the card are perforated simultaneously, starting at the bottom in each half.

3.09 A number of the spaces on the single-sided card are used both for calls from marker groups and from AMA or pretranslator circuits. The leads and punch designations are shown alphabetically in Table 1 and all circuits from which the punch originates are grouped at the single S or R location. (See CN-RG-RST under CN in Table 1.)

3.10 On the double-sided trouble recorder card, all AMA punch designations have been located on the reverse side of the card, and additional locations have been used for CAMA punch designations. The front of the card is used for marker, pretranslator automatic monitor, and line INS test trouble records and records on test calls for markers or pretranslators. Some locations on the double-sided card are still dual designated. In some instances one punch designation is used for wire spring markers and the other for U-type markers. In other instances the second designation applies to CAMA.

3.11 The leads required for a marker trouble record are as follows:

(a) Recording leads closed through the marker connector relays A-, B-, and C-, (Fig. 8 or 150) and the D- relays (Fig. 163) to the scanning connector, (Fig. 10 or 152).

(b) Recording leads closed directly to the scanning connector from connecting circuits. These include frame and circuit recording leads FR-, CN-, and RG- from marker connectors, FR-, CN-, and S- from sender and transverter connectors; OA, OB, and NGC0-9 from number group connectors, or number group and connectors. (When an office is arranged for more than 20 number groups the NGCT0-3 leads replace the OA and OB leads); switch and level recording leads LC- and LV- from the trunk link and connector circuit or trunk link circuit; route transfer recording leads RT0-4 from the jack, lamp, and key circuit; RP0-4 leads (option ZN), RPB and RPAB leads (option ZP) and RPSA lead (option ZR) from

incoming register marker connector circuit or trouble recorder connector (WS version of incoming register marker connector).

(c) Day and time leads DT, DU, HT, HU, MT, and MU "0", "1", "2", "4", and "7" closed directly to the scanning connector from the master timing circuit or time of day circuit.

(d) The MKR lead, Fig. 1, indicating that the call is from a marker; the TI lead, Fig. 1, meaning trouble record; the DR- leads for the calling marker, Fig. 6, used to identify it, and the PERF0, 1 or 2 (if provided). This punch designation appears only on double-sided TR card, and indicates the number of the trouble recorder producing the trouble record. The DRT leads (tens digit of marker number) are used only in offices having more than 10 markers.

(e) Leads from the repeating relays, Fig. 11, 12, 42, and 45, to the scanning connector. Operated repeating relays connect ground to the corresponding leads. Relay EXB of Fig. 45 normal may also pass a ground signal over the EXG-EX lead.

(f) The PCR, PCD, PCD1, and ECN leads for an office using the double-sided TR card are now routed through the TCA relay, which is operated locally or from the marker.

B. Trouble Record Complete

3.12 After the scanning operation has been completed, the trouble recorder circuit or the trouble recorder control and test circuit connects ground to the TRC lead operating the TRC relay through TRC2 normal. The TRC relay removes ground from the start lead to the trouble recorder control circuit or to the trouble recorder control and test circuit and locks locally to the start lead ground. This locking path is provided so that the trouble recorder will not be continuously restarted if the relays, which control the start lead ground, should fail to release due to trouble. This feature is effective on all trouble record calls.

3.13 The TRC relay also operates the TRC1 relay which holds the ON relay, operates RM, RP, RT, RR, and RT2, and RMS, (if provided) and connects ground to the TRC lead to the monitor circuit. The RM relay connects ground to the TRB lead to the calling marker so that it may release or recycle as required. Connection of ground to the TRB leads to the other markers and to the pretranslators, route translators, the automatic range extension test circuit, and AMA circuits by the RM, RP, RT, RR, and RT2, RR2, and RMS (if provided) relays has no effect as ground has already been connected to these leads. The TRC1 relay also operates the TRC2 relay which further opens the start lead, opens the operating path for the TRC relay, and locks to ground on the TRC lead.

C. Return to Normal

3.14 When the marker recognizes ground on the TRB lead it removes battery from the TRST lead, releasing the MPR- relay, and it opens the MKA lead, releasing the MKA relay. Release of the MKA relay release the MKA1, (with wiring option RN), MTR, CIC, A- (Fig. 8 or 150) and TRC relays. The CIC relay releases the RON relay. Release of the A- and MTR relays causes operated repeating relays to release. The MKB, MKB1 relays and, with wiring option RQ, the MAK1 relay releases when the MPR- relay removes ground from the CI and MKB leads. This causes the B- and C- relays to release. Release of its C- relay causes repeating relay of Fig. 45, if operated, to release. Release of TRC causes TRC1, RM, RP, RT, RR, and RT2, RR2, and RMS (if provided) on RM1 RMA, RT1, RP1, RR1 and RT3, RR3, and RM1S (if provided) to release. When the trouble recorder reaches its normal position, it removes ground from the TRC lead, releasing the TRC2 relay thereby restoring the circuit to normal. The ON relay will remain operated and maintain ground on the TRB leads if any of the connector controller relays should fail to release due to trouble.

3.15 In restoring to normal, ground is removed from the TRC lead to the monitor circuit before it is removed from the TRB lead to the monitor. This is necessary on all trouble record calls except those from the monitor circuit itself as otherwise a waiting call in that circuit might be falsely released.

3.16 Another call may enter the connector when the preference relay releaeses and when ground is removed from the TRB leads. Such a call, however, cannot close the troubel recorder start lead until the trouble recorder has ejected the perforator card and has restored to normal as indicated by release of the TRC2 relay due to removal of ground from the TRC lead.

4. MONITOR TROUBLE RECORDS

4.01 If the monitor circuit detects unsatisfactory operation of a register or sender it releases the connection through this circuit to the marker, if this connection has not already been released, and connects battery to the TRST lead. This causes the MON relay to operate and to function as in 13.01. Ground connected to the ON lead by the monitor circuit causes the ON, RM1, RP1, RMA, RT1, RR1 and RT3, RR3, and RM1S (if provided) relays to operate and to connect ground to the TRB leads to the MTR1 lead.

4.02 In this case the MKB lead is not closed, as no connector relays are required to be operated in this circuit. The monitor circuit, however, connects ground to the STR lead which is closed through TRC, TRC2, and TS normal and MON operated to the STRA lead to the trouble recorder control circuit, or the trouble recorder control and test circuit. This closure causes an entry to be made on the trouble recorder card as described in 3.07.

4.03 The leads required for a monitor trouble record are as follows:

(a) Recording leads closed from the monitor circuit to the scanning connector by way of a multiple shown at the B- relays (Fig. 8 or 150). These leads are designated MON-CM (monitor-combined or completing marker) in Table 1 for single-sided TR card; Table 1A for double-sided card, and new standard MTF; and Table 1B for converted office. These leads also show connection to the R and S relays (Fig. 10) or R, RA, S, SA (Fig. 152). These leads are used, in general, by the monitor circuit to receive information while it is connected to the marker and to return the same information to the scanning relays for the trouble record.

(b) Recording leads closed from the monitor circuit to the scanning connector by way of a multiple shown at the A5 relay (Fig. 8) or A10 relay (Fig. 150). These leads are designated MON-CM in Table 1 for offices using single-sided TR card; Table 1A for offices having new standard MTF, and Table 1B for offices converted to double-sided TR card, and also show a connection to the R and S relays (Fig. 10,) or R, RA, S, SA relays, (Fig. 152). They are not used by the monitor circuit to receive information, as the A5 or A10 relay is not operated on such calls, and are required for trouble record only.

(c) Recording leads DR0-9, and DRT0,1, if used, closed from the monitor circuit to the scanning connector by way of a multiple shown at the various Fig. 6. These leads are used to record the identity of the marker to which the monitor was connected at the time the trouble was encountered.

(d) Recording leads closed directly from the monitor circuit to the scanning connector. These include switch and level leads LC and LV, and leads MOR, MIR, and MOS used for indicating, respectively, a monitor call on an originating register, an incoming register, or an outgoing sender.

(e) Frame and circuit recording leads FR-, CN-, and RG- from registers and FR-, CN-, and S- from senders. These leads are used to record the identity of the register or sender to which the monitor is connected in terms of marker connector or sender connector locations. The ground supply for these leads is furnished by the monitor circuit to the register or sender.

(f) The T1 lead, Fig. 1, means trouble record.

(g) The PERF0,1, or 2 closed by the ON relay to indicate the MTF associated with a particular office in a building having more than one MTF. (This lead is provided only for double-sided TR card).

(h) Day and time leads DT, DU, HT, HU, MT, and MU "0", "1", "2", "4", and "7" closed directly to the scanning connector from the master timing circuit or time of day circuit.

4.04 After the scanning operation has been completed, the TRC relay operates from ground on the TRC lead from the trouble recorder circuit or trouble recorder control and test circuit. This relay locks to the start lead ground furnished by the monitor circuit to prevent continuous restarting of the trouble recorder, if this ground should not be removed due to trouble, and opens the STRA lead. It also operates the TRC1 relay which holds the ON relay, connects ground to the TRC lead to the monitor circuit, and operates RM, RP, RT, RR and RT2, RR2, and RMS (if provided) and TRC2. The TRC2 relay further opens the start lead and locks to ground on the TRC lead.

4.05 Connection of ground to the TRC lead to the monitor circuit causes it to restore to normal, removing battery from the TRST lead and removing ground from the ON

and STR leads. Removal of battery from the TRST lead causes the MON relay to release. Removal of ground from the STR lead releases the TRC relay which releases TRC1 and, in turn, RM, RP, RT, RR and RT2, RR2, and RMS (if provided) with ground removed from the ON lead and with TRC1 normal, on releases, releasing RM1, RP1, RMA, RT1, RR1 and RT3, RR3, and RM1S (if provided). When the trouble recorder returns to normal, ground is removed from the TRC lead releasing TRC2, thereby restoring the circuit to normal. Another call may enter the connector when the MON relay releases and when ground has been removed from the TRB leads. The trouble recorder start lead, however, cannot be reclosed until the TRC2 relay releases.

5. PRETRANSLATOR TROUBLE RECORDS

SEIZURE OF MASTER TEST FRAME CONNECTOR CIRCUIT

5.01 When a pretranslator encounters a cross or times out due to trouble it connects battery to the TRST lead to this circuit. This causes the corresponding PPR- relay to operate and lock and to operate the associated PRA and PRB relays, in parallel, if the preference conditions outlined in SECTION I, 2. GENERAL DESCRIPTION OF OPERATION are met.

5.02 The PRA relay connects ground to the RCCK lead to the pretranslator, to prevent operation of its display lost relay. It also connects ground to the FRG, CNG, and RGG leads to the pretranslator connector circuit. These grounds are returned on FR-, CN-, and RG- recording connector, register subgroup, and register involved in the call.

5.03 The PRA relay also connects ground to the PRT lead to the scanning connector and to the DR lead which corresponds to the calling circuit, and it operates relays RGC0, RGC1, and RGC2 (if provided). These relays connect the RG leads from the pretranslator connector circuit to the scanning connectors for recording register positions in the subgroups and they remove ground on the G lead, to the jack, lamp, and key circuit, and from the RGG1 leads to the pretranslator connectors. The RGG1 leads control the register position in use lamps. It is necessary to open these leads and to cut in the RG leads to prevent interference from pretranslator connectors other than the one involved in the trouble record. The ground for the RGG1 leads, is furnished from the jack, lamp, and key circuit so that the in use lamps may be made inoperative when desired.

5.04 The PRA relay also operates the ON relay which in turn causes RM1, RP1, RT1, RR1 and RT3, RR3 and RM1S (if provided) to operate. The RM1S relay grounds the TRB1 leads to route translators and the automatic range extension test circuit. The RM1, etc, relay operations cause ground to be connected to the TRB leads to the monitor circuit, the even and odd parts of the master timing circuit, and to each marker, pretranslator, transverter, and AMA recorder except for the pretranslator involved in the call, this path having previously been opened in the connector controller. The ON relay grounds the PERF0,1,2 leads (if provided) for recording the particular MTF used when there are more than one in a building. (This lead is provided in offices using double-sided TR card.)

5.05 The PRB relay operated closes a locking path for the ON relay and operates connector relays PC0, 1, and 2 for the calling pretranslator. These relays close recording leads from the pretranslator to the scanning connector.

A. Operation of the Scanning Connector

5.06 With relays PRA and PRB operated, ground is closed through normal contacts of TRC, TRC2, TS, and MON (option YG) or directly (option YH) to the STR lead to the trouble recorder control circuit or to the trouble recorder control and test circuit to start the trouble record. The operations described in 3.07 then take place.

5.07 The leads required for a pretranslator trouble record are as follows:

(a) Recording leads closed through the pretranslator connector relays PC0, 1, and 2 to the scanning connector. Some of these leads are shown schematically as connecting to the scanning connector by way of a multiple at the marker connector relays.

(b) Recording leads FR- and CN- closed directly to the scanning connector from the pretranslator connector circuit.

(c) Recording leads RG- cut in by the RGC relays.

(d) The PRT lead, Fig. 36, indicating that the call is from a pretranslator; the DR lead for the calling pretranslator, Fig. 36, used to identify it; and the T1 lead, Fig. 1, meaning trouble record.

(e) Day and time leads DT, DU, HT, HJ, MT, and MU "0", "1", "2", "4", and "7", closed directly to the scanning connector from the master timing circuit or time of day circuit.

B. Trouble Record Complete

5.08 After the scanning operation has been completed, the trouble recorder circuit

or the trouble recorder control and test circuit connects ground to the TRC lead, operating the TRC relay through TRC2 normal. The TRC relay removes ground from the trouble recorder start lead and locks locally to the start lead ground. This locking path is provided so that the trouble recorder will not be continuously restarted if the relays which control the start lead ground should fail to release due to trouble. The TRC relay also operates the TRC1 relay which holds the ON relay, connects ground to the TRC lead to the monitor circuit, and operates TRC2, RM, RP, RT, RR, and RT2, RR2 and RMS (if provided). The TRC2 relay further opens the operating path for the TRC relay and locks to ground on the TRC lead. The RP relay connects ground to the TRB lead to the calling pretranslator.

C. Return to Normal

5.09 When the pretranslator recognizes ground on the TRB lead, it removes battery from the TRST lead, releasing the PPR- relay. This releases PRA and PRB, which release RGC0, 1 and 2 (if provided) and PC0, 1, 2, respectively. Release of PRA or PRB releases TRC and TRC1. Release of TRC1 releases ON, RM, RP, RT, RR, and RT2, RR2, RMS (if provided). Release of ON causes RM1, RP1, RMA, RT1, RR1 and RT3, RR3, and RM1S (if provided) to release. When the trouble recorder reaches its normal position, it removes ground from the TRC lead releasing the TRC2 relay, thereby restoring the circuit to normal. The ON relay will remain operated and maintain ground on the TRB leads if either of relays PRA or PRB should fail to release due to trouble.

5.10 Another call may enter the connector when the preference relay releases and when ground is removed from the TRB leads. Such a call, however, cannot close the trouble recorder start lead until the trouble recorder has ejected the perforated card and has restored to normal, as indicated by release of the TRC2 relay due to removal of ground from the TRC lead.

6. TRANSVERTER TROUBLE RECORDS

SEIZURE OF MASTER TEST FRAME CONNECTOR CIRCUIT - LOCAL OR CAMA TRANSVERTERS

6.01 When a transverter encounters a cross or time-out due to trouble it connects battery to the TRST lead to this circuit. This causes the corresponding TVP- relay to operate and lock and to connect ground to the C0 lead to the master timing circuit subject to the preference conditions described in SECTION I, 2. GENERAL DESCRIPTION OF OPERATION. This closure causes the master timing circuit to remove a standing test from the AMA recorder perforator leads and to return ground on the CI lead after this test has been removed. This ground is forwarded to the CI lead to the transverter if the call secures preference. It is returned on the TVA and TVB and TVB leads, operating the TVA and TVB relays of the corresponding Fig. 25. This figure is furnished per transverter.

6.02 The TVA relay connects ground to the TV lead to the scanning connector, connects ground to the RC1 lead to the transverter, and operates the associated TVA1 relay and the ON relay. The TVA1 relay closes the TM and TVT leads from the transverter to the scanning connector; it connects ground to the DR lead to the scanning connector; and it connects ground to the RCCK lead to the transverter to prevent operation of its display lost relay. It also connects ground to the FRG, CNG, and SG leads to transverter connector circuits, and to the TRG and GG leads to the transverter circuit. These grounds are returned on recording leads used for identifying senders, translators, and translator groups which may be involved in the call.

6.03 The ON relay connects ground to the TRB leads to the monitor circuit and to the even and odd parts of the master timing circuit and operates RM1, RP1, RT1, RR1 and RT3, RR3, and RM1S (if provided). The ON relay also grounds the PERF0, 1 or 2 lead (if provided). The RM1S relay grounds the TRB1 leads to the route translators and the automatic range extension test circuit. The RM1, etc, relays connect ground to the TRB leads to all markers, pretranslators, transverters, and AMA recorders except the calling transverter and an associated recorder if one is attached. If a recorder is attached to the transverter, the RC relay for the recorder will have been operated as described below and the TRB lead for that circuit will therefore have been opened. The RM1 relay also connects ground to the MTR1 lead to the monitor circuit.

6.04 The TVB relay operated, operates the V- Fig. 26 or Fig. 153 and 154, for local transverters, or Fig. 153 and 155 for CAMA transverters, thereby closing the associated recording leads to the scanning connector.

6.05 A transverter may call for a trouble record before or after it has established a connection to an AMA recorder. After such a connection has been made, the occurrence of trouble in either circuit causes the transverter, rather than the recorder, to call for the trouble record. An AMA recorder can call for such a record only when it is not attached to a transverter.

On a call from a transverter it is necessary to determine either that a recorder is not attached to the transverter or that a particular recorder is so attached, in order that the required leads, which differ in these cases, may be closed. This is accomplished by closure of ground to the RC1 lead to the transverter (6.02) which is returned on the RNA lead (Fig. 22) if a recorder is not attached, or through the operated recorder connector relay to the RC lead to this circuit (Fig. 24) corresponding to a recorder which is attached.

6.06 If a recorder is not attached, the RNA relay operates from ground on the RNA lead as above. It closes a locking path for the ON relay and operates the W- relay (Fig. 26 or 153) for the transverter through contacts of TVA operated. The W- relay closes the associated recording leads to the scanning connector.

6.07 If a recorder is attached the corresponding RC relay of Fig. 24 operates from ground on the RC lead. This figure is furnished per recorder. The RC relay connects ground to the corresponding TRCA, TRCB, and TRCC leads to the recorder and recorder connector circuit for operating connector relays in that circuit. These relays connect the recorder to the associated even or odd recorder multiple and connects ground to the ONL lead to this circuit (Fig. 22), thereby providing a locking path for the ON relay. The RC relay also connects ground through RCR normal to the DRA- lead to the scanning connector and to the DRT0, 1 lead, if provided to scanning connector, it holds the ON relay, and operates RTE (Fig. 27) and RTE1 (Fig. 28) or RTE RTEA (Fig. 156) and RTE1 (Fig. 28) if an even recorder is involved, or RT0 (Fig. 27) and RT01 (Fig. 28), or RT0 RT0A (Fig. 156) and RT01 (Fig. 28) for an odd recorder. These relays connect the even and odd recorder multiple, respectively, to the scanning connector. The DRT0,1 leads are used for both DRT- and DRAT- punch designations. With DRA0-9, a perforation in card location S7, 32 (double-sided TR card) would be read as DRAT0.

A. Trouble Record

6.08 With RNA or an RC relay operated, ground is closed through TVA and TVB operated and TRC, TRC2, TS, and MON normal (option YG) or direct (option YH) to the STR lead to the trouble recorder control circuit. This causes a trouble record to be made as previously described. Refer to 3.07 to 3.09.

6.09 The leads required for a transverter trouble record in offices using single-sided TR cards are as follows:

Note: V- and W- relays are those in Fig. 26; RTE and RTO, Fig. 27; scanning connector, Fig. 10. (Offices having single-sided TR cards will have local transverters only).

(a) Recording leads closed from the transverter through the connector V- relays (Fig. 26) to the scanning connector (Fig. 10) as indicated by connecting circuit designations TR - TV (trouble recorder-transverter) in Table 1. These include the RST0-9 leads which are connected to the scanning relays by way of Fig. 29. These leads, in general, represent transverter receiving or input leads. The SW "0", "1", "2", "4", and "7" leads and the VF0-4 leads from the transverter connector circuit are also closed by the V- relays.

(b) If a recorder is not connected, leads closed from the transverter through the W- relay to the scanning connector by way of a multiple at the RTE and RTO relays are required. These are transverter output leads and in this case are connected directly from the transverter to this circuit.

(c) If a recorder is attached, leads closed from the transverter and from the recorder to the recorder multiple, and through the RTE and RTE1 or RTO and RTO1 relays to the scanning connector are required. These include the transverter output leads which in this case are connected indirectly from the transverter to this circuit.

(d) Recording leads closed directly to the scanning connector from the connecting circuits. These include sender identifying leads FR-, CN-, and S- from the transverter connector circuits, (see Table 1); translator leads TLR0-29 and translator group leads G0-19; and GA and GB leads from the translator circuits.

(e) The TM and TVT leads closed from the transverter to the scanning connector by the TVA1 relay.

(f) The TV lead (Fig. 25) indicating that the call is from a transverter, the DR lead for the calling transverter, (Fig. 25) used to identify it, and the DRA lead for the recorder (from Fig. 24) if a recorder is attached. The TI lead (Fig. 1) is also required. Ground is connected locally to these leads.

(g) Day and time leads DT, DU, HT, HU, MT, and MU "0", "1", "2", "4", and "7" closed directly to the scanning connector from the master timing circuit.

(h) The EXG and EXB leads from the transverter to Fig. 45. Signals on these leads are repeated over the EX lead to a scanning relay contact.

(i) If a recorder is attached and has received a trouble indicator attached indication, TIA relay operated, the billing data transmitter circuit closes the EA0, 1, 2, EB0, 1, 2, 4, 7, EC0, 1, 2, 4, 7, ED0, 1, 2, 4, 7, EE0, 1, 2, 4, 7, EF0, 1, 2, 4, 7, ENC0, ENC1, and CLF leads directly to the scanning relays for the trouble recorder.

6.10 The leads required for a local transverter trouble record in offices having new MTF connector and double-sided TR card are as follows:

Note: V- and W- relays are Fig. 153 and 154; RTE, RTEA, RTO, RTOA, Fig. 156; scanning connector, Fig. 152.

(a) Recording leads closed from the transverter through the connector V- relays to the scanning connector as indicated by connecting circuit designations TR - TV (trouble recorder-transverter) in Table 1A. These include the RST0-9 and RST10-19 (if provided) leads which are connected to the scanning relays by way of Fig. 29. These leads, in general, represent transverter receiving or input leads. The SW "0", "1", "2", "4", "7" leads and the VF0-4 leads from the transverter connector circuit are also closed by the V- relays.

(b) If a recorder is not attached, leads closed from the transverter through the W- relays to the scanning connector by way of a multiple at the RTE, RTEA, and RTO, RTOA relays are required. These are transverter output leads and in this case are connected directly from the transverter to this circuit.

(c) If a recorder is attached, leads closed from the transverter and from the recorder to the recorder multiple, and through the RTE, RTEA, and RTE1, or RTO, RTOA, and RTO1 relays to the scanning connector are required. These include the transverter output leads which in this case are connected indirectly from the transverter to this circuit.

(d) Recording leads closed directly to the scanning connector from the connecting circuits. These include sender identifying leads FR-, CN-, and S- from the transverter connector circuit, (see Table 1A); translator leads TLR0-29, translator group leads G0-19, and GA and GB leads from the translator circuits.

(e) The TM and TVT leads closed from the transverter to the scanning connector by the TVA1 relay.

(f) The TV lead (Fig. 25) indicating that the call is from a transverter, the DR lead for the calling transverter, (Fig. 25) used to identify it, the DRA leads for the recorder, if one is attached, and the DRT0 or "1" lead for tens digit recorder number (Fig. 24) if one is attached (TR punch DRAT0, or 1). The TI lead (Fig. 1) is also required. Ground is connected locally to these leads.

(g) Day and time leads DT, DU, HT, HU, MT, and MJ "0", "1", "2", "4", and "7" closed directly to the scanning connector from the master timing circuit.

(h) The EXG and EXB leads from the transverter to Fig. 45. Signals on these leads are repeated over the EX lead to a scanning relay contact.

(i) If a recorder is attached and has received a trouble indicator attached indication, TIA relay operated, the billing data transmitter circuit closes the EA0, 1, 2, EB0, 1, 2, 4, 7, EC0, 1, 2, 4, 7, ED0, 1, 2, 4, 7, EE0, 1, 2, 4, 7, EF0, 1, 2, 4, 7, ENC0, ENC1, and CLF leads directly to the scanning relays for the trouble recorder.

6.11 The leads required for a local transverter trouble record for an office converting for use with double-sided TR card are as follows:

Note: Offices converting for more than 6 transverters will have Fig. 26 for transverters 0 through 5, and Fig. 153 and 154 for transverters 6 through 9 for AMA installed prior to Issue 20D. For AMA installed subsequent to Issue 20D, Fig. 153 and 154 are used for all local transverters.

(a) Recording leads closed from the transverter through the transverter connector relays V- (Fig. 26 or Fig. 153 and 154),

to the scanning connector (Fig. 152) as indicated by connecting circuit designations TR - TV (trouble recorder-transverter) in Table 1B. These include the RST0-9 leads which are connected to the scanning relays by way of Fig. 29. When an office has increased the number of recorders to exceed 10 plus one EMG recorder (maximum 20 regular plus one EMG recorder) RST10-19 and RNT0 and "1" leads through the V- relay of Fig. 158 (added for this type of conversion in offices having AMA prior to Issue 20D), or Fig. 154 (in offices having AMA installed subsequent to Issue 20D) are included. These leads, in general, represent transverter receiving or input leads. The SW "0", "1", "2", "4", and "7" leads and the VF0-4 leads from the transverter connector circuit are also closed by the V- relays (Fig. 26 or Fig. 154).

(b) If a recorder is not connected, leads closed from the transverter through the W- relay (Fig. 26 or Fig. 153) to the scanning connector by way of a multiple at the RTE or RT0, relays (Fig. 27) or RTE, RTEA or RTO, RTOA (Fig. 156) are required. These are transverter output leads and in this case are connected directly from the transverter to this circuit.

(c) If a recorder is attached, leads closed from the transverter and from the recorder to the recorder multiple, and through the RTE (Fig. 27) and RTE1, or RTE, RTEA (Fig. 156) and RTE1, or RTO (Fig. 27) and RTO1, or RTO RTOA (Fig. 156) and RTO1 relays to the scanning connector are required. These include the transverter output leads which in this case are connected indirectly from the transverter to this circuit.

(d) Recording leads closed directly to the scanning connector from the connecting circuits. These include sender identifying leads FB-, CN-, and S-, from the transverter connector circuits and translator leads TLR0-29, translation group leads G0-19, GA, and GB from the translator circuits.

(e) The TM and TVT leads closed from the transverter to the scanning connector by the TVA1 relay.

(f) The TV lead (Fig. 25) indicating that the call is from a transverter, the DR lead for the calling transverter (Fig. 25) used to identify it, and the DRA leads for the recorder, (if one is attached) and the DRT0 or 1 leads for the tens digit of recorder number (Fig. 24) if a recorder is attached (the TR punch is DRAT0 or 1). The TI lead (Fig. 1) is also required. Ground is connected locally to these leads.

(g) Day and time leads DT, DU, HT, HU, MT, and MU0, "1", "2", "4", and "7" closed directly to the scanning connector from the master timing circuit.

(h) The EXG and EXB leads from the transverter to Fig. 45. Signals on these leads are repeated over the EX lead to a scanning relay contact.

6.12 The leads required for a CAMA transverter trouble record are as follows (CAMA punches only on double-sided TR cards):

(a) Recording leads closed from the CAMA transverter through the connector V-relays (Fig. 153) and 155) to the scanning connector (Fig. 152) as indicated by connecting circuit designations TR - CTV (trouble recorder-CAMA transverter) in Table 1A (for new MTF) or 1B for offices converted for use with double-sided TR card. These include the RST0-9 leads which are connected to the scanning relays by way of Fig. 29. These leads, in general, represent transverter receiving or input leads.

(b) If a recorder is not connected, leads closed from the CAMA transverter through the W- relays (Fig. 153) to the scanning connector (Fig. 152) by way of a multiple at the RTE, RTEA, and RTO, RTOA (Fig. 156). Figure 156 is provided on new MTF or in offices in which AMA is provided subsequent to Issue 20D. The multiple may also be at the RTE, RTO (Fig. 27) in converted offices which have had AMA prior to Issue 20D. These are transverter output leads and in this case are connected directly from the CAMA transverter to this circuit.

(c) If a recorder is attached, leads closed from the CAMA transverter and from the recorder to the recorder multiple, and through the RTE, RTEA (Fig. 156) and RTE1, or RTE (Fig. 27) and RTE1, or RTO, RTOA (Fig. 156) and RTO1, or RTE, RTO (Fig. 27) and RTO1 relays to the scanning connector are required. These include the transverter output leads which in this case are connected indirectly from the transverter to this circuit.

(d) Recording leads closed directly to the scanning connector from the connecting circuits. These include sender identifying leads FR-, CN-, and S- from the CAMA transverter connector circuits.

(e) Recording leads closed directly from the CAMA transverter to the scanning connector. These leads are common leads with leads from the billing indexer. If

the billing indexer is attached, ground indications would be over the billing indexer leads; additional billing indexer leads also connect directly to the scanning relays. These latter leads are for billing indexer indications only and do not multiple to common CAMA transverter leads. These leads are shown in Table 1A and 1B. (Connector circuit designations TR-CTV and TR-BI).

(f) The TM and TVT leads closed from the CAMA transverter to the scanning connector by the TVA1 relay.

(g) The TV lead (Fig. 25) indicating that the call is from a transverter, the DR lead for the calling transverter, (Fig. 25) used to identify it, and the DRA lead if a recorder is attached. The TI lead (Fig. 1) is also required. Ground is connected locally to these leads.

(h) Day and time leads DT, DU, HT, HU, MT, and MU "0", "1", "2", "4", and "7" closed directly to the scanning connector from the master timing circuit.

(i) The EXG and EXB leads from the CAMA transverter to Fig. 45. Signals on these leads are repeated over the EX lead to a scanning relay contact.

6.13 After the scanning operation has been completed, the trouble recorder circuit or the trouble recorder control and test circuit connects ground to the TRC lead, operating the TRC relay through TRC2 normal. The TRC relay removes ground from the trouble recorder start lead and locks locally to the start lead ground. This locking path is provided so that the trouble recorder will not be continuously restarted if the relays which control the start lead ground should fail to release due to trouble. This feature is effective on all trouble record calls. The TRC relay also operates the TRC1 relay which holds the ON relay, connects ground to the TRC lead to the monitor circuit, and operates TRC2, RM, RP, RT, RR, and RT2, RR2, and RMS (if provided). The TRC2 relay further opens the start lead, opens the operating path for the TRC relay, and locks to ground on the TRC lead.

6.14 The RT relay, and RT2 (if provided), operates to connect ground to the TRB lead to the calling transverter. If a recorder is attached, ground is connected to its TRB lead by the RR and RR2 (if provided), or by the RT relay for the emergency recorder. This closure performs no useful function.

6.15 When the transverter recognizes ground on the TRB lead it removes battery from the TRST lead releasing the TVP- relay, and it opens the TVA lead releasing the TVA relay. Release of TVA releases TRC, TVA1, and RNA or RC. Release of TRC releases TRC1 and in turn RM, RP, RT, RR and RT2, RR2, and RMS (if provided). Release of RNA or RC releases the W- relay (Fig. 153) or the operated RTE, RTO, (Fig. 27) or RTEA RTOA (Fig. 156). Release of TVP- removes ground from the CO lead to the master timing circuit. This causes the standing test on the perforator leads to be restored and ground to be removed from the CI lead. Release of the TVP- relay also removes ground from the CI lead to the transverter and therefore from the TVB lead, releasing the TVB relay. This releases the V-relays (Fig. 153 and 155). The ON relay releases, releasing the RM1, RP1, RMA, RT1, RR1 and RT3, RR3, and RM1S (if provided) relays, when TVA, TVA1, TVB, and RNA or RC have released. The ON relay released also opens the PERF0, 1, 2 leads (if provided). If an AMA recorder was attached to the transverter, ground must also be removed from the ONL lead in order for ON to release. This prevents the start of another trouble record call until the operated connector relays have released. When the trouble recorder restores to its normal position, ground is removed from the TRC lead releasing the TRC2 relay.

6.16 Another call may enter the connector when the preference relay releases and when ground is removed from the TRB leads. Such a call, however, cannot close the start lead to the trouble recorder control circuit until the TRC2 relay releases.

SEIZURE OF MASTER TEST FRAME CONNECTOR CIRCUIT - ANI TRANSVERTER

6.17 When a transverter encounters a cross or times out due to trouble it connects battery to the TRST lead to this circuit (Fig. 159). This causes the corresponding TVP- relay to operate and lock and to connect ground to the CI lead to the transverter if the call secures preference. It is returned on the TVA and TVB leads, operating the TVA and TVB relays of the corresponding Fig. 160. This figure is furnished per transverter.

6.18 The TVA relay connects ground to the TV lead to the scanning connector, and operates the associated TVA1 relay and the ON relay. The TVA1 relay closes the TM and TVT leads from the transverter to the scanning connector, it connects ground to the DR lead to the scanning connector, and connects ground to the RCCK lead to the transverter to prevent operation of its display

lost relay. It also connects ground to the FRG, CNG, and SG leads to transverter connector circuits, and to the TRG and GG leads to the translator circuit. These grounds are returned on recording leads used for identifying senders, translators, and translator groups which may be involved in the call.

6.19 Ground on the ON lead operates the ON relay which functions as for other types of trouble record calls.

6.20 The TVB relay operated, operates the V- relays (Fig. 161) for ANI transverters, thereby closing the associated recording leads to the scanning connector.

A. Trouble Record

6.21 Ground is closed through relays TVA and RVB operated and TRC, TRC2, and TS normal to the STR lead to the trouble recorder control circuit. This causes a trouble record to be made as previously described. Refer to 3.07 through 3.09.)

6.22 The leads required for an ANI transverter trouble record are as follows:

(a) Recording leads closed from the transverter through the connector V- relays (Fig. 161) to the scanning connector (Fig. 10 or 152) as indicated by connecting circuit designations TR-ATV (trouble recorder-ANI transverter) in Table 1, 1A, and 1B.

(b) Recording leads closed directly to the scanning connector from the connecting circuits. These include sender identifying leads FR-, CN-, and S- from the transverter connector circuits, translator leads TLR0-29 and translator group leads G0-19; and GA and GB leads from the translator circuits.

(c) The TM and TVT leads closed from the transverter to the scanning connector by the TV1 relay.

(d) The TV lead (Fig. 160) indicating that the call is from a transverter, and the DR lead for the calling transverter (Fig. 160) used to identify it. The TI lead (Fig. 1) is also required. Ground is connected locally to these leads.

6.23 After the scanning operation has been completed, the trouble recorder circuit or the trouble recorder control and test circuit connects ground to the TRC lead, operating the TRC relay through TRC2 normal. The TRC relay removes ground from the trouble recorder start lead and locks locally to the start lead ground. This locking path is provided so that the trouble recorder will not be continuously restarted if the relays, which control the start lead ground, should fail to release due to trouble. This feature is effective on all trouble record calls. The TRC relay also operates the TRC1 relay which holds the ON relay, and operates TRC2, RM, and RT. The TRC2 relay further opens the start lead, opens the operating path for the TRC relay, and locks to ground on the TRC lead.

6.24 The RT relay operates to connect ground to the TRB lead to the calling transverter.

6.25 When the transverter recognizes ground on the TRB lead it removes battery from the TRST lead releasing the TVP- relay, and it opens the TVA lead, releasing the TVA relay. Release of TVA releases TRC and TVA1. Release of TRC releases TRC and TVA1. Release of TRC releases TRC1 and in turn RT (Fig. 162). Release of the TVP- relay also removes ground from the CI lead to the transverter and therefore from the TVB lead, releasing the TVB relay. This releases the V- relays (Fig. 161). The ON relay releases, releasing the RM1, RMA, and RT1. When the trouble recorder restores to its normal position, ground is removed from the TRC lead releasing the TRC2 relay.

6.26 Another call may enter the connector when the preference relay releases and when ground is removed from the TRB leads. Such a call, however, cannot close the start lead to the trouble recorder control circuit until the TRC2 relay releases.

7. AMA RECORDER TROUBLE RECORDS

7.01 When an AMA recorder, which is not attached to a transverter, encounters trouble, it connects battery to the TRST lead to this circuit. This causes the corresponding RPR- relay to operate and lock and to connect ground to the CO lead to the master timing circuit subject to the preference conditions described in SECTION I, 2. GENERAL DESCRIPTION OF OPERATION. This closure causes the master timing circuit to remove its standing test and to return ground on the CI lead, operating the RCR relay for the recorder.

7.02 The RCR relay connects ground to the RCCK lead to the recorder and recorder connector circuit to prevent operation of its display lost relay, and it operates the STC1 relay and SCT3 relay (if provided) if the call is from the emergency recorder. It also operates the RC relay which connects ground through RCR operated to the REC and DR leads

to the scanning connector and connects ground to the TRCA, TRCB, and TRCC leads to the recorder and recorder connector circuit for operating connector relays in that circuit. The RC relay operated also places ground on the DRT0 or DRT1 lead to indicate the tens digit of the recorder number. The connector relays in the recorder connect the recorder to the associated even or odd recorder multiple and close ground to the ONL lead back to this circuit. The RC relay also operates the RTE (Fig. 27) and RTE1 relays, or the RTE RTEA (Fig. 156) and RTE1 relays, or the RTO (Fig. 27) and RTO1, or the RTO, RTOA (Fig. 156) and RTO1 relays, which connect the even or odd multiple, as required, to the scanning connector, and it operates the ON relay.

7.03 The ON relay locks through normal contacts on ON1 to ground on the ONL lead, it connects ground to the TRB leads to the monitor circuit and to the even or odd parts of the master timing circuit, and it operates RM1, RP1, RT1, RR1, and RT3, RR3, and RM1S (if provided). The ON also grounds the PERF0, 1, or 2 leads (if provided). These relays connect ground to the TRB leads to all markers, pretranslators, transverters and recorders except the calling recorder. The RM1S relay grounds the TRB1 leads to route translators and the automatic range extension test circuit. The RM1 relay also connects ground to the MTR1 lead to the monitor circuit.

7.04 With RC and RCR operated, ground is closed through TRC, TRC2, TS, and MON normal (option YG) or direct (option YH) to the STR lead to the trouble recorder control circuit or to the trouble recorder control and test circuit. This causes a trouble record to be made as previously described. Refer to 3.07 through 3.09.

7.05 The leads required for an AMA recorder trouble record are as follows:

(a) Recording leads closed from the even or odd AMA recorder mutliple through the RTE (Fig. 27) or RTE RTEA (Fig. 156) or RTO (Fig. 27) or RTO RTOA (Fig. 156) relay to the scanning connector (Fig. 10, single-sided card, Table 1) or to scanning connector (Fig. 152, double-sided TR card. Table 1A or 1B). In the AMA recorder and recorder connector circuit, the relay which controls the XTL lead removes ground from it when trouble is encountered. It is therefore necessary to reverse this signal, which is done by the XTL relay (Fig. 30). It is further necessary to close ground to the XTL lead to the scanning connector only when the XTC lead is grounded to prevent a false cross indication on a call from the master timing circuit. The XTL relay is not operated on such calls.

(b) Recording leads closed from the even or odd AMA recorder multiple through the RTE1 or RTO1 relay to the scanning connector.

(c) If the emergency recorder is calling, leads RST, closed through the STC1 relay and STC3 (if provided) are required. These leads indicate the recorder which is replaced by the emergency circuit.

(d) The REC lead (Fig. 24) indicating that the call is from an AMA recorder; the DR lead for the calling recorder, (Fig. 24) used to identify the recorder, and the DRT0 or "1" lead for the tens number of the recorder; the TI lead (Fig. 1) meaning service trouble record. Ground is connected locally to these leads.

(e) Day and time leads DT, DU, HT, HU, MT, and MU "0", "1", "2", "4", and "7" closed directly to the scanning connector from the master timing circuit.

(f) After the recorder has operated its trouble indicator attached relay TIA the billing data transmitter circuit closes the EA0, 1, 2, EB0, 1, 2, 4, 7, EC0, 1, 2, 4, 7, ED0, 1, 2, 4, 7, EE0, 1, 2, 4, 7, EF0, 1, 2, 4, 7, ENC0, ENC1, and CLF leads are closed directly to the scanning relays for the trouble recorder.

7.06 After the scanning operation has been completed, the TRC relay operates and functions as in 6.13. Ground is connected to the TRB lead to the calling recorder by operation of RR and RR2 (if provided) or RT and RT2 (if provided). The recorder then removes battery from the TRST lead, releasing the RPR relay. This causes ground to be removed from the CO lead to the master timing circuit, which in turn removes ground from the CI lead. Release of RPR also releases RCR which releases STC1 and STC3 (if provided) and RC and TRC. This causes RTE (Fig. 27) and RTE1, or RTE RTEA (Fig. 156) and RTE1, or RTO (Fig. 27) and RT01, or RTO RTOA (Fig. 156) and RTO1, TRC1, RM, RP, RT, RR, and RT2, RR2, and RMS (if provided), ON, RM1, RP1, RMA, RT1, RR1, and RT3, RR3, and RM1S (if provided) to release. Release of ON is also dependent upon the release of the recorder connector controller relays. When the trouble recorder reaches its normal position ground is removed from the TRC lead, releasing the TRC2 relay.

7.07 Another call may enter the connector when the preference relay releases and when ground is removed from the TRB leads. Such a call, however, cannot close the start lead to the trouble recorder control circuit until the TRC2 relay releases.

8. MASTER TIMING CIRCUIT TROUBLE RECORDS

8.01 When the even or odd part of the master timing circuit encounters trouble it connects battery to the corresponding TRST lead to this circuit. If an AMA recorder is attached for a test or special pattern call, the timing circuit rather than the recorder calls for the trouble record regardless of the location of the trouble. Connection of battery to the TRST lead causes the TPE relay for the even circuit or the TPO relay for the odd circuit to operate and lock and to connect ground to the CO lead to the master timing circuit subject to the preference conditions described in SECTION I, 2. GENERAL DESCRIPTION OF OPERATION. This causes the master timing circuit to remove its standing test and to return ground on the CI lead, operating the MTE or MTO relay.

8.02 The MTE or MTO relay connects ground to the associated DR lead to the scanning connector and connects ground to the RT1E lead to the master timing circuit if the even circuit is calling, or to the RT10 lead for the odd circuit. The master timing circuit returns ground on the RT3E or RT30 lead if a recorder is attached or under certain trouble conditions with a recorder not attached, as in these cases it is necessary to scan the AMA recorder multiple. The RT3 lead closed corresponds to the multiple which is connected and not necessarily to the even or odd part of the timing circuit. Either part of this circuit may be used with either multiple. If ground is returned on one of the RT3 leads, the corresponding RTE (Fig. 27) and RTE1, or RTE RTEA (Fig. 156) and RTE1, or RTO (Fig. 27) and RTO1, or RTO RTOA (Fig. 156) and RTO1, relays operate, thereby connecting the associated multiple to the scanning connector.

8.03 The MTE or MTO relay also connects ground to the corresponding RCCK lead to the master timing circuit to prevent operation of the display lost relay, it operates the STC relay and STC2 (if provided) and connects ground to the TMG lead to the scanning connector in parallel; it operates TXE and TXE1 if the even circuit is calling or TXO and TXO1 for the odd circuit and it operates the ON relay. The STC relay and STC2 (if provided) close recording leads which are required on calls from either the even or odd part of the timing circuit. The TX- relays close leads which are individual to the even or odd part of the circuit.

8.04 The ONL lead will be grounded if an AMA recorder is attached to the timing circuit, this ground being closed by the recorder connector relays operated for such a connection. The ON relay locks through normal contacts of ON1 to this ground if present, it connects ground to the TRB leads to the monitor circuit and to the even or odd part of the master timing circuit which is not involved in the call and it operates RM1, RP1, RT1, RR1 and RT3, RR3, and RM1S (if provided). These relays connect ground to the TRB leads to all markers, pretranslators, transverters, and AMA recorders; and the TRB1 leads to all route translators and the automatic range extension test circuit. The RM1 relay connects ground to the MTR1 lead to the monitor circuit.

8.05 The MTE and MTO relay also connects ground through TRC, TRC2, TS, and MON normal (option YG) or directly (option YH) to the STR lead to the trouble recorder control circuit or to the trouble recorder control and test circuit. This causes a trouble record to be made as previously described. Refer to 3.07 through 3.09.

8.06 The leads required for a timing circuit trouble record are as follows:

(a) Recording leads closed from the even or odd part of the master timing circuit through the TXE and TXE1 or TXO and TXO1 relays to the scanning connector.

(b) Recording leads closed from the common part of the master timing circuit through the STC relay and STC2 (if provided) to the scanning connector. The RT lead from the recorder and recorder connector circuits is also closed through the STC relay.

(c) If the recorder multiple is involved as indicated by ground on one of the RT3 leads, recording leads corresponding to the multiple, and closed by the RTE (Fig. 27) and RTE1, or RTE RTEA (Fig. 156) and RTE1, or RTO (Fig. 27) and RTO1, or RTO RTOA (Fig. 156) and RTO1 relays to the scanning connector are also required.

(d) The TMG lead (Fig. 23) indicating that the call is from the timing circuit and the DR lead (Fig. 23) used to identify the even or odd part of the circuit. The DRO lead corresponds to the even part and the DR1 lead to the odd part. The TI lead (Fig. 1) is also required. Ground is connected locally to these leads.

(e) Day and time leads DT, DU, HT, HU, MT, and MU "0", "1", "2", "4", and "7" closed directly to the scanning connector from the master timing circuit.

8.07 After the scanning operation has been completed, the TRC relay operates from ground on the TRC lead from the trouble recorder circuit or the trouble recorder control and test circuit. This causes the functions described in 6.13 to take place. Ground is connected to the TRB lead to the even or odd part of the master timing circuit, whichever is calling, by the RT relay. Battery

is then removed from the TRST lead, releasing the TPE or TOP relay. This causes ground to be removed from the CO lead to the master timing circuit, which in turn removes ground from the CI lead. Release of TPE or TPO also releases MTE or MTO which in turn releases the RT relays if operated, STC and STC2 (if provided), the operated TX relays and TRC. Release of TRC causes TRC1, RM, RP, RT, RR, and RT2, RR2, and RMS (if provided) to release. The ON relay releases, releasing RM1, RP1, RMA, RT1, and RT3, RR3, and RM1S (if provided) when the MTE or MTO relay releases and when ground is removed from the ONL lead by release of the recorder connector relays, if such ground was connected. When the trouble recorder reaches its normal position, ground is removed from the TRC lead, releasing the TRC2 relay.

8.08 Another call may enter the connector when the preference relay releases and when ground is removed from the TRB leads. Such a call, however, cannot close the start lead to the trouble recorder control circuit until the TRC2 relay releases.

9. LINE INSULATION TEST FRAME TROUBLE RECORDS

9.01 The line insulation test frame normally tests 5 lines per line link frame and then proceeds to the next frame. If a line insulation resistance trouble is encountered, the line link frame is released, a record of the trouble is taken, and the same frame is then reseized so that the remaining lines in the group of 5 may then be tested. The operations as described in 19.05 through 19.08 in connection with each such line link frame seizure then take place.

9.02 Line insulation failures may be recorded by the trouble recorder or may be teletyped to a distant test center. In the former case Fig. 40 is provided in the master test frame connector circuit. On the new master test frame connector (Issue 20D) and on installations using automatic progression trunk testing, line verification, or line insulation testing, beginning with Issue 20D, Fig. 40 will always be provided. Where the trouble recorder is not used, the LIT relay (Fig. 40) will be inoperative. The LIT relay of this figure is operated from battery on the TRST lead when a line insulation trouble record is to be made, provided that all succeeding preference relays are normal. The LIT relay operated locks and connects ground on the CIA lead from preceding figures to the LA lead to Fig. 1 if the call obtains preference.

9.03 Ground on the LA lead is closed through normal contacts of TRC2 to the LA lead to the line insulation test control circuit where it operates a connector controller relay. This relay locks over the LAL lead to Fig. 40, under control of the LIT relay. The line insulation test control circuit then connects ground to the ON, STR, DR, and LIT leads to this circuit and operates connector relays which cut in the required recording leads.

9.04 Ground on the ON lead operates the ON relay which functions as for other types of trouble record calls. Ground on the STR lead is closed through TRC, TRC2, ROS, and TS normal to the STR2 lead to the line insulation test control circuit and returned on the STRA lead which connects to the STRA lead to the trouble recorder control circuit or the trouble recorder control and test circuit. This starts the trouble recorder. The LA lead is wired through normal contacts of TRC2 to prevent false locking of the TRC relay if it should still be operated from the previous call at the time the STR lead is closed.

9.05 The recording leads used for a line insulation test trouble record are as follows:

(a) The LIT lead, which indicates that the record is originated by the line insulation test frame.

(b) Leads DR0-9, one of which is closed to indicate the marker group with which the line insulation test frame is associated. The trouble records for several marker groups may be processed at a common test center. Arbitrary numbers are assigned to these groups and recorded as above so that the records may readily be identified.

(c) Leads S1-9, one of which is closed to indicate the type of test and the range used.

(d) Leads FS0-2, one of which is closed to indicate the resistance band in which a failure occurred on an initial test of a line.

(e) Leads TS0-3, one of which is closed to indicate the results of a retest, if required. Leads TS0-2 represent the resistance bands for failures on retest, and TS3 indicates that the retest did not disclose trouble.

(f) Leads FTT0-3, FUT0-9, VGT0-11, HGT0-9, and VFT0-4. One lead in each of these groups is closed to identify the line in trouble in terms of its line link frame location.

9.06 The terminations and locations of TR punches for leads LIT, DR0-9, and S1-9, and those for other leads listed above are shown in SECTION III, 2. FUNCTIONAL DESIGNATIONS.

9.07 Upon completion of the trouble record, relays TRC, TRC1, and TRC2 operate as for other trouble record calls. Relay TRC1 operated, connects ground to the TRC lead to the line insulation test control circuit, causing that circuit to open the TRST lead thereby releasing the LIT relay. The LIT relay released opens the LAL lead to the line insulation test control circuit which in turn removes ground from ON, STR, DR, and LIT leads and releases the connector relays which control the recording leads. Removal of ground from the ON and STR leads causes the master test frame connector to restore to normal in the usual manner.

9.08 Except during the progress of a line insulation test trouble record, the STR2 lead to the line insulation test control circuit is connected to the STR1 lead, in order to complete the STR lead path for other types of trouble records.

9.09 For operation of the line insulation test control circuit with directory number printout features see 35. SEIZURE OF MASTER TEST FRAME CONNECTOR CIRCUIT - LIT - PRINTOUT OF DIRECTORY NUMBER.

10. LINE CONCENTRATOR 2A CONTROL CIRCUIT TROUBLE RECORDS

SEIZURE OF MASTER TEST FRAME CONNECTOR CIRCUIT

10.01 The preference, connector controller, connector and trouble recorder busy relays used for line concentrator trouble records are located on the line concentrator frame.

10.02 When a concentrator encounters trouble, it operates a preference relay subject to the preference conditions described in SECTION I, 2. GENERAL DESCRIPTION OF OPERATION. If the call secures preference, a connector controller relay is operated which operates connector relays to cut through the recording leads to the scanning connector in this circuit and it also connects ground to the ON and STR leads to this circuit to operate the ON relay and to start the trouble recorder.

10.03 The ON relay operated, functions as for other types of calls to make the master test frame connector circuit appear busy to other circuits if they try to gain access. Ground from the ON relay over the TRB1 lead to the line concentrator operates the TRB1 relay in that circuit to make the master test frame connector busy to all other line concentrator control units except the one that has its connector controller relay operated.

A. Trouble Record

10.04 Ground on the STR lead is closed through the TRC, TRC2, TS, and MON normal (option YG) or direct (option YH) to the STR lead to the trouble recorder control circuit. This causes a trouble record to be made as previously described. Refer to 3.07 through 3.09.

10.05 The leads required for a line concentrator trouble record are closed by the concentrator connector relays to the scanning connector (Fig. 10 or 152) are indicated by connecting circuit designations TR-WC (trouble recorder-WADS concentrator) in Table 1, 1A, and 1B.

10.06 The same set of coordinates on both the single-sided and double-sided trouble recorder card are used to identify the trouble information. This information is not printed on the cards. To determine the concentrator that failed and the nature of the failure, the trouble recorder card is inserted into a mask imprinted with the required trouble designations.

10.07 The WC (WADS concentrator) trouble record punch is printed on both the single- and double-sided trouble recorder cards. It indicates that the record is originated by a line concentrator 2A control circuit and that a mask is required to read the indication.

B. Trouble Record Complete

10.08 After the scanning operation has been completed, the trouble recorder control circuit or the trouble recorder control and test circuit connects ground to the TRC lead operating the TRC relay through TRC2 normal. The TRC relay removes ground from the start lead to the trouble recorder control circuit or to the trouble recorder control and test circuit and locks locally to the start lead ground. This locking path is provided so that the trouble recorder will not be continuously restarted if the relays which control the start lead ground should fail to release due to trouble. This feature is effective on all trouble record calls.

10.09 The TRC relay also operates the TRC1 relay which holds the ON relay, operates RM, RP, RT, RR and RT2, RR2, RMS (if provided) and the TRB in the line concentrator control circuit. It also connects ground to the TRC lead to the monitor circuit. The TRB relay connects ground to the calling line concentrator so that it may release. Connection of ground to the TRB leads to the other circuits by the RM, RP, RT, RR, and RT2, RR2, RMS (if provided) and the TRB in the line concentrator has no affect as ground has already been connected to these leads. The TRC1 relay also operates the TRC2 relay which

further opens the start lead, opens the operating path for the TRC relay, and locks to ground on the TRC lead.

C. Return to Normal

10.10 When the line concentrator recognizes ground from its TRB relay, it removes battery from the preference relay, releasing it. The preference relay releases the connector controller relay. With the connector controller and the connector relays released, relay ON releases and causes the release of the TRB1 in the line concentrator. Release of the connector controller relay also releases the TRC which releases the TRC1. The TRC1 released, removes ground on the TRB leads to the various connecting circuits. When the trouble recorder restores to its normal position, ground is removed from the TRC lead releasing the TRC2 relay.

10.11 Another call may enter the connector when the preference relay releases and when ground is removed from the TRB leads. Such a call, however, cannot close the start lead to the trouble recorder control circuit until the TRC2 relay releases.

11. MARKER, ORIGINATING REGISTER TEST CALLS AND SENDER TEST CALLS, INTRAOFFICE AND OUTGOING TRUNK TEST CALLS, AND INCOMING TRUNK TEST CALLS - PULSING CLASS (COMBINED OR COMPLETING MARKERS)

SELECTION OF MARKER

11.01 On these classes of test calls a particular marker is selected under control of a key in the master test control circuit, which obtains entry to this circuit for selection of the marker by means of the MTP preference relay. When the test call is started, the master test control circuit connects battery to the MTP lead, operating the MPT relay subject to the conditions outlined in SECTION I, 2. GENERAL DESCRIPTION OF OPERATION. The MTP relay locks. If the MON relay is normal, the MTP relay connects ground (option ZH) from the MON relay through contacts of all of the MKT relays in series to the MKS lead to the master test control circuit. With option ZI or whenever Fig. 43 is provided this ground is from the MTL relay operated. This ground is then closed through the key for the desired marker and is returned on the corresponding MKT0-11 lead, operating the MKT relay for the marker to be connected. This path includes normal contacts of all of the MKT relays so that the call will block if any of them should be operated falsely. The MKT relay locks through normal contacts of preceding relays to ground at the MON relay normal (option ZH) or MTL relay (option ZI) and opens its operating path by disconnecting ground from the MKS lead. The MKT relay also connects ground to the MB lead to the marker to make it busy to subsequent service calls and it operates the CIC and CIT relays. The CIC relay functions as in 3.04. Closures to the RTG and MKR leads are effective only in case a record should be taken. The CIT relay closes another path for operating the ON relay. The MTR relay does not operate unless a trouble record is called for as described later. This relay is provided to connect the SL relay to the SL lead for trouble records only, to prevent interference with test calls.

11.02 At this point in the call it is necessary to determine whether or not the marker is engaged on a service call and, if it is so engaged, to delay the test call connections until the marker has been released. A test of the MIT lead is made for this purpose, as described below; ground on this lead indicating that the marker is busy. Since the marker may be selected on a service call just as this circuit connects ground to the MB lead, it is further necessary to delay the test of the MIT lead until sufficient time has elapsed to insure that ground has been connected to it under these conditions. This delay is provided by the slow-operate TM2 relay and the slow-release TM1 relay. When the CIT relay operates, it connects the marker MIT lead through MKT operated and TS normal to the winding of the TM relay. This relay operates if ground is present on the MIT lead, or if ground is connected thereto during the aforementioned time interval. The CIT relay also operates the TM1 relay through normal contacts of TM2 to ground at TS normal. The TM1 relay operates the TM2 relay which locks and releases the TM1 relay. When the TM1 relay releases, the TM relay, if operated, will delay the test call and, if normal, will allow it to proceed as in the following.

A. Trouble Record on the Service Call

11.03 This circuit is arranged to make the marker preference relay effective even though the MTF relay is operated if the marker should be engaged on a service call when the TM1 relay releases. The TM relay operated under these conditions closes ground from operated contacts of the CIT relay, through contacts of TM1 normal and TM2, TM, and CIC operated to the previously connected service call should require this procedure. No other circuits can call for a record as their TRB leads have already been closed.

11.04 If a trouble record is called for under these conditions, the marker preference relay (MPR-) operates from battery on the TRST lead and connects ground to the CI lead. This ground is returned as before on the MKA and MKB leads, operating the MKA, MKA1, MKB, and MKB1 relays. The operations as described in 3.02 through 3.14 take place, except that the CIC relay and the relays which it controls have already been operated, and remain

operated after the trouble record call disconnects. This leaves the circuit in the same condition as just prior to the start of the service call trouble record.

B. Connections for Test Call

11.05 If the TM relay is normal when the TM1 relay releases, or when it subsequently releases whether or not a trouble record on the service call has been made, the marker preference relay is made ineffective and the test call is allowed to proceed by operation of the TS relay. This relay operates from battery through its winding, contacts of TM normal, TM2 operated, TM1 normal and CIT operated to ground. The TS relay locks to the CIT relay operated, removes ground from the TI recording lead, releases the TM2 relay and connects ground to the TS lead to the master test control circuit as a signal to that circuit that the test may be started. It also disconnects the marker MIT lead from the TM relay, closes ground through the MKT relay operated to the MT lead to the marker so that it may arrange certain internal connections as required for test calls, and it closes ground on the CIB lead from the master test control circuit through MKT operated to operate MKB, MKB1, and (with wiring option RO) MKA1.

11.06 The MKB relay operates the B- relays Fig. 8 or Fig. 150 for the marker, and MKB1 operates C- and T-, Fig. 8 or Fig. 150 from grounds at CIC and TS. With wiring option RO and MKA1 operates the A- relays Fig. 150 for the marker. The leads required for the test call are now closed. These leads include the following:

(a) Leads closed from the marker to the master test control circuit by the B-, C-, and T- relays of Fig. 8 or Fig. 150. These leads are designated with connecting circuit designations MTC-CM - (master test control-combined or completing marker) in Table 1 (single-sided TR card), Table 1B (converted office), and Table 1A (new standard frame).

(b) The AMA and ROT leads closed from the marker to the trunk test circuit by their B- relays. These leads have connecting circuit designations TT-CM (trunk test-combined or completing marker).

(c) The TSK lead closed from the trunk link and connector circuit or trunk link connector circuit to the master test control circuit by its T- relay, of Fig. 8 or Fig. 150.

(d) The STR lead closed from the outgoing sender connector circuit to lead STR1 to the master test control circuit by its T- relay of Fig. 8 or Fig. 150.

(e) The TST lead closed from the trunk link and connector circuit or trunk link connector circuit to the master test control circuit by the MKB1 relay.

(f) With wiring option RO leads are closed from the marker to the marker test control circuit by the A- relays of Fig. 150. These leads appear in Table 1A.

11.07 Upon closure of these leads the test call is allowed to proceed under control of the master test control circuit, which primes the marker and checks the results by means of the leads closed as above. A trouble record is made on a test call if trouble is encountered. A record of a properly completed test call may be made if desired, this feature being controlled by a key in the master test control circuit.

C. Record Not Required for Test Call

11.08 If a record is not required, the master test control circuit removes battery from the MTP lead, releasing the MTP relay, and removes ground from the CIB lead releasing the MKB, MKB1, and (with wiring option RO) MKA1 relays when the test is completed. Release of MKB and MKB1 causes B-, C-, and T- relays, Fig. 8 or Fig. 150, to release. Release of MKA1 causes A- relays, Fig. 150, to release. Release of MTP releases MKT, option ZH, or MTP releases MTP1 and MTL which releases MKT, in turn, causing the release of CIC, RON, CIT, TS, ON, RM1, RP1, RMA, RT1, RR1 and RT3, RR3, RM1S (if provided) thereby restoring the circuit to normal.

D. Record Required for Test Call

11.09 If a record is required due to trouble or at the completion of the test, the operating ground for the MKA1 (with wiring option RO), MKB and MKB1 relays, which is also connected to the MKB lead to the marker, is connected in the marker to the MKA lead back to this circuit operating the MKA relay. The marker preference relay MPR- also operates but without effect. The MKA relay operated causes the functions described in 3.02 and 3.03 to take place, except that the CIC relay is already operated. The repeating relays operate as in 3.05. With relays CIC, MKA, MKA1, MKB, and MKB1 operated, ground is closed through TRC and TRC2 normal and TS operated to the STRA lead to the trouble recorder control circuit or to the trouble recorder control and test circuit. The STRA lead is used for test call and monitor trouble records whereas the STR lead is used for service trouble records. Either lead causes the trouble recorder to start. Two leads are provided in order that the trouble recorder circuits may count the number of service trouble records called for within a time interval and may refuse to accept any more such records during the remainder of the interval

if this number is excessive. It is not desired to include test call and monitor trouble records in this count.

11.10 Closure of ground to the STRA lead causes the functions described in 3.07 through 3.13 to take place. Ground is closed to the TI lead by the marker test control circuit if the record is due to trouble. Otherwise this lead is not grounded due to the TS relay being operated. Additional recording leads such as MTPT, STR, etc, closed directly from the master test control circuit to the scanning connector, are used to indicate the type of test call being made. Also, since the master test control circuit has set up the marker, the grounds on the priming leads used for recording are those furnished by the test circuit. On a service trouble record these grounds are furnished by service circuits which connect to the marker, and are closed through the marker connector relays.

11.11 The circuit restores to normal as in 11.08, except that with wiring option RN the MKA relay releases when the marker removes ground from the MKA lead, in turn, causing the MKA1, A-, and repeating relays to release, and the TRC relay releases as in 3.14, in turn, releasing the relays which it controls. Removal of ground from the TRB leads permits another call to enter the connector. The STR or STRA lead, however, cannot be reclosed until ground is removed from the TRC lead, releasing the TRC2 relay.

12. INCOMING TRUNK TEST CALLS - NO PULSING CLASS (COMBINED OR COMPLETING MARKERS

SEIZURE OF MASTER TEST FRAME CONNECTOR CIRCUIT

12.01 On this class of test a marker is selected by an incoming register circuit which is connected to the trunk to be tested. Any marker may be used. Access to this circuit is obtained by the marker, by means of its preference relay, and the MTP relay is not used. The marker connects battery to the TRST lead causing the corresponding MPR- relay to operate and lock and to connect ground to the CI lead to the marker if the call obtains preference as described in SECTION I, 2. GENERAL DESCRIPTION OF OPERATION. This ground is returned on the MKT lead in this case, operating the MKT relay for the marker. The MKT relay locks through normal contacts of preceding relays to ground on the MTL lead, option ZH. When Fig. 43 is provided, ground over the MTL lead is supplied through the SKT relay operated to the master test control circuit. The SKT relay also closes the TTG lead to the TTM lead. The MKT relay also connects ground to the MB lead to the marker and it operates the CIC and CIT relays. The CIC relay functions as in 3.04. The CIT relay closes another path for operating the ON relay.

12.02 On test calls involving direct seizure of a marker, as described in 11., it was necessary to delay the test call connections if the desired marker should be found busy, as indicated by ground on the MIT lead, the busy condition in this case being caused by the presence of a service call. In the present instance, the marker is busy on the test which is to be connected. Therefore, the test of the MIT lead is not required, and the call must be allowed to proceed regardless of the busy condition of the marker. For these reasons the TS relay is operated when the CIT relay operates from ground on the SKT lead, option ZH. With Fig. 43 provided this ground is supplied from the SKT relay which is operated from battery in the master test control circuit. The TS relay locks, removes ground from the TI recording lead, releases the TM and TM1 relays, if operated due to operation of CIT, and connects ground to the TS lead to the master test control circuit. This ground is direct to the master test control circuit, option ZH, or through SKT operated when Fig. 43 is provided. The TS relay also closes ground through the MKT relay operated to the MT lead to the marker, and closes ground on the CIB lead from the master test control circuit through MKT operated to operate MKB and MKB1. The operations described in 11.06 then take place.

A. Record Not Required for Test Call

12.03 If a record is not required, the master test control circuit removes ground from the MTL and CIB leads, and the marker removes battery from the TRST lead at the conclusion of the test. Removal of ground from the CIB lead releases MKB and MKB1, in turn, releasing the B-, C-, and T- relays of Fig. 8 or Fig. 150. Removal of battery from the TRST lead releases MPR- which removes ground from the CI lead and thereby from the MKT- lead from the marker. With this lead opened and ground removed from the MTL lead the MKT relay releases, in turn releasing CIC, RON, CIT, TS, ON, RM1, RP1, RMA, RT1, RR1 and RT3, RR3, and RM1S (if provided), thereby restoring the circuit to normal.

B. Record Required for Test Call

12.04 If a record is required due to trouble or at the completion of the test, the operating ground for the MKB and MKB1 relays, which is also connected to the MKB lead to the marker, is connected in the marker to the MKA lead, operating the MKA relay. The marker removes ground from the MKT- lead at this time, but the MKT relay does not release as it is locked to ground on the MTL lead from the master test control circuit. This ground is direct from the master test control circuit option ZH, or through SKT operated and MTL normal when Fig. 43 is provided. The MKA relay operated causes the functions described in 3.02 and 3.03 to take place, except that the CIC relay is already operated.

The repeating relays operate as in 3.05. With relays CIC, MKA, MKB, and MKB1 operated, ground is closed through TRC and TRC2 normal and TS operated to the STRA lead to the trouble recorder control circuit. This closure causes the record to be taken as in 11.10.

12.05 The circuit restores to normal as in 12.03, except that the MKA relay releases when the marker removes ground from the MKA lead, in turn, causing the MKA1 A-relay of Fig. 8 or Fig. 150 and repeating relays to release. Release of MKA also releases TRC which causes TRC1, RM, RP, RT, RR, and RT2, and RMS (if provided) to release. The TRC2 relay releases when the trouble recorder circuit or the trouble recorder control and test circuit removes ground from the TRC lead. Another call may enter the connector when the MPR- relay releases and when ground has been removed from the TRB leads. The STR or STRA lead, however, cannot be released until the TRC2 relay releases.

13. MONITOR AND TEST CALLS - AUTOMATIC MONITOR CIRCUIT (COMBINED OR COMPLETING MARKERS)

13.01 On monitor or test calls on registers or senders, it is necessary for the automatic monitor circuit to connect to the receiving leads of the marker involved in the call. This is done on register calls to enable the monitor circuit to match the information received by the register against the information which it sends to the marker. On sender calls, the marker input is matched against the information which the sender pulses out. On a call of this type, the monitor circuit connects battery to the TRST lead, operating the MON relay if all other preference relays (except PCN) are normal. The MON relay locks and connects ground to the CI lead to the monitor circuit. This closure causes the monitor circuit to connect ground to the ON lead to this circuit, operating the ON relay. The ON relay connects ground to the TRB leads to the monitor circuit and to the even and odd pairs of the master timing circuit, and it operates RM1, RP1, RT1, RR1 and RT3, RR3, and RMIS (if provided), and RM1 operates RMA. These relays connect ground to the TRB leads to all markers, pretranslators, transverters and AMA recorders and the TRB1 leads to all route translators and the automatic range extension test circuit. The RM1 relay connects ground to the MTR1 lead to the monitor circuit. Ground connected to the TRB and TRB1 leads causes waiting or subsequent trouble record calls to release or recycle, except for the marker involved in the call as hereinafter described.

13.02 The monitor circuit also causes the marker which is involved in the call to connect ground to the MKB lead to this circuit, operating the corresponding MKB and and MKB1 relays. The MKB relay connects ground to a DR lead, to a DRT lead if used, and to the monitor circuit. This enables the monitor circuit to record the identity of the marker for use if a trouble record should be called for. The MKB relay also connects the TRA lead from the monitor circuit to the TRA lead to the trunk link and connector circuit or trunk link connector circuit. This lead is used to operate a relay in the trunk link and connector circuit or trunk link connector circuit, which closes switch and level recording leads LC- and LV- to the monitor circuit. These leads are required for marker trouble record calls as previously described and are also required for monitor trouble records as described later. The connections for these leads between the trunk link and connector circuit or trunk link connector circuit and the monitor circuit required in the present case are made by way of a multiple to these two circuits at the scanning connector as shown in SECTION III, 2. FUNCTIONAL DESIGNATIONS.

13.03 The MKB relay also operates the B- relays of Fig. 8 or Fig. 150, which close leads designated MON-CM (monitor-combined or completing marker) in Table 1, 1A, or 1B. The B1 relay of Fig. 8 or the B2 relay of Fig. 150 operated also connects ground to the SCT lead to the monitor circuit. This closure is necessary because the bottom half of the B1 relay of Fig. 8 or the B2 relay of Fig. 150 must be checked operated before certain operations in the monitor circuit may be allowed to proceed. The MKB1 relay performs no useful function on this type of call.

13.04 After the monitor has recorded the information which it required, it removes battery from the TRST lead releasing the MON relay, and it removes ground from the ON lead, releasing the ON relay and, in turn, the RM1, RP1, RMA, RT1, RR1 and RT3, RR3, and RMIS (if provided). It also causes disconnection of ground from the MKB lead releasing the MKB and MKB1 relays. This releases the B- relays of Fig. 8 or Fig. 150 thereby restoring the circuit to normal.

13.05 If a marker, to which the monitor is connected as described above, should encounter trouble, it signals the monitor to disconnect and to release the connection through this circuit. The marker then calls for a trouble record. In order to prevent false release of the marker under this condition, which would otherwise occur because of ground on its TRB lead, this lead is opened

in the marker while the monitor is connected and is held open under control of the monitor circuit until ground is removed from the MTR1 lead to that circuit. Ground is removed from the MTR1 lead by the release of RM1 or RMA simultaneously with the removal of ground from the TRB leads to the markers.

14. PRETRANSLATOR TEST CALL

SELECTION OF PRETRANSLATOR

14.01 A pretranslator to be tested is selected under control of a key in the master test control circuit, which obtains entry to this circuit for selection of the pretranslator by means of the PTP preference relay. When the test call is started, the master test control circuit connects battery to the PTP lead, operating the PTP relay subject to the conditions outlined in SECTION I, 2. GENERAL DESCRIPTION OF OPERATION. The PTP relay locks and, if the call obtains preference, it connects ground through normal contacts of all the PTT relays in series to the PTS lead to the master test control circuit. When Fig. 47 is provided the PTP relay operates the PTP1 relay, and ground through the normal contacts of the PTT relays is over the PTL lead from Fig. 47. The PTP1 relay locks through operated PTP relay. The ground on the PTS lead through PTP operated, or direct to master test control circuit is then closed through the key for the desired pretranslator and is returned on the corresponding PTT0, 1, 2 lead, operating the PTT relay for the pretranslator to be connected. This path includes normal contacts of all the PTT relays so that the call will block if any of them should be operated falsely.

14.02 The PTT relay locks through normal contacts of preceding relays to ground on the CIA lead to Fig. 2 (for offices not equipped with Fig. 43, 44, and 46) or to ground on the CIA lead from the ATP1 relay, option XF, (for offices using single-sided TR cards which were equipped with automatic progression trunk testing prior to Issue 22D and to which line verification has not been added), or to PTL lead, Fig. 47, and opens its operating path by disconnecting ground from the PTS lead. It also connects ground to the MB lead to the pretranslator to make it busy to subsequent service calls, it disconnects the LK lead to the jack, lamp, and key circuit from the LK lead to the pretranslator to cancel the trouble recorder request alarm on test call trouble records, and it operates CIT (directly from ground on PTT, option ZH, or when Fig. 43 was provided prior to Issue 22D in offices using single-sided TR card, the PTT relay operates the CITA relay. Beginning with Issue 22D the CITA relay will not be provided for use with AMA and/or pretranslators. In all cases the CIT relay will be operated directly from the PTT relay with option WH (Fig. 1). Relay CIT operates ON which functions as in 5.04. The PTT relay also removes ground from the PRG lead to the pretranslator circuit to prevent operation of the pretranslator trouble registers on test calls.

14.03 At this point a test of the pretranslator TM lead is made in order that the test call may be delayed if the pretranslator is busy on a service call. This follows operation of the PTT relay and is as described for marker test calls in 11.02, except that the TM lead is tested instead of the MIT lead. If the TM relay is operated when the TM1 relay releases, ground is closed from operated contacts of the CIT relay, through contacts of TM1 normal, TM2, and TM operated, PR lead to Fig. 36, and through contacts of the operated PTT relay to contacts of the PPR relay for the pretranslator which has been selected. This permits the pretranslator to call for a trouble record if the previously connected service call should require this procedure.

A. Trouble Record on the Service Call

14.04 If a trouble record is called for under these conditions, the pretranslator preference relay PPR- operates from battery on the TRST lead, in turn operating PRA and PRB. The operations described in 5.02 through 5.10 take place, except that the ON relay and the relays which it controls have already been operated and remain operated after the trouble record call disconnects. This leaves the circuit in the same condition as just prior to the start of the service call trouble record. The trouble recorder request alarm is not actuated due to the PTT relay operated.

14.05 If the TM relay is normal when the TM1 relay releases, or when it subsequently releases whether or not a trouble record on the service call has been made, the pretranslator preference relay is made ineffective and the test call is allowed to proceed by operation of the TS relay. This relay operates from battery through its winding, contacts of TM normal, TM2 operated, TM1 normal, and CIT operated to ground. The TS relay looks, removes ground from the TI recording lead, releases the TM2 relay, and connects ground to the TS lead to the master test control circuit as a signal that the test may be started. The ground on the TS lead is direct to the master test control circuit from the TS relay operated (option ZH), or through the CITA relay operated when Fig. 43 is provided, (offices using single-sided TR card in which Fig. 43 was provided prior to Issue 22D and to which line verification has not been added). Beginning with Issue 22D, when Fig. 43 is provided, Fig. 47 will also be provided (the CITA relay being no longer required) and the PTP1 relay operating will close the TS lead to master test control

circuit. The TS relay also disconnects the pretranslator TM lead from the TM relay and closes it to the master test control circuit for subsequent connection to ground in that circuit so that the pretranslator work timer may be restarted without overlap.

14.06 The TS relay also closes ground on the CIB lead from the master test control circuit through PTT operated to operate PRB. Relay PRB operated, operates the associated PC0, 1, 2 relays which close the leads required for the test from the pretranslator to the master test control circuit. Some of these leads are shown schematically as connecting to the master test control circuit by way of a multiple at the marker connector relays. These leads are shown in Tables 1, 1A, and 1B.

14.07 Upon closure of the above leads the test call is allowed to proceed under control of the master test control circuit which primes the pretranslator and checks the results of the call. A trouble record is made on a test call if trouble is encountered. A record of a properly completed pretranslator test call cannot be made. The results of such calls are indicated by lamps in the master test control circuit.

B. Test Call Properly Completed

14.08 For offices using single-sided TR cards and in which Fig. 43 was provided prior to Issue 22D and no line verification added, if no trouble is encountered, the master test control circuit removes ground from the CIB lead, releasing the PRB relay, and removes battery from the PTP lead, releasing the PTP relay, when the test is completed. Release of PRB releases the associated PC0, 1, 2 relays. Release of PTP causes PTT to release; PTT releases CITA. The release of CITA causes CIT, TS, ON, RM1, RP1, RMA, RT1, and RR1 to release, thereby restoring the circuit to normal.

14.09 For offices using single-sided TR card or converted offices and Fig. 43 provided beginning with Issue 22D, or for offices with the new frame (double-sided TR card Issue 20D). If no trouble is encountered, the master test control circuit removes ground from the CIB lead, releasing the PRB relay and removes battery from the PTP lead, releasing the PTP relay when the test is completed. Release of PRB releases the associated PC0, 1, 2 relays. Releasing PTP causes PTP1 and PTT to release, releasing CIT (option WH). The release of CIT, causes TS, ON, RM1, RP1, RMA, RT1, RR1, and RT3, RR3, and RMIS (if provided) to release, thereby restoring the circuit to normal.

C. Trouble on the Test Call

14.10 If the test call encounters trouble, the pretranslator preference relay PPR- operates from battery on the TRST lead, in turn, operating the PRB relay from ground on the CIB lead from the master test control circuit. The PRA relay operated causes the functions described in 5.02 and 5.03 to take place. With relays PRA and PRB operated ground is closed through normal contacts of TRC and TRC2 and operated contacts of TS to the STRA lead to the trouble recorder control circuit or to the trouble recorder control and test circuit. The operations described in 3.07 and 3.08 then take place.

14.11 When the pretranslator recognizes ground on the TRB lead, it removes battery from the TRST lead, releasing the PPR- relay. This causes PRA, RGC0, RGC1, and RGC2 (if provided), TRC, TRC1, RM, RP, RT, RR, and RT2, RR2, and RMS (if provided) to release. The master test control circuit removes ground from the CIB lead which releases the PRB relay, and it removes battery from the PTP lead. Release of the PTP relay, however, is slightly delayed in this case as it is held by battery from the pretranslator on the PTP lead closed through operated contacts of the PTT relay. This battery is removed, causing the PTP relay to release, when the operating paths for the pretranslator trouble registers are opened in the pretranslator circuit. Release of PRB releases PC0, 1 and 2. Release of PTP causes PTT, (option XJ) to release or PTP1 (if provided). PTT releases, CIT, (option ZH or WH) or CITA (option ZF) which releases CIT. CIT releases TS, ON, RM1, RP1, RMA, RT1, RR1, and RT3, RR3, and RMIS (if provided). When ground is removed from the TRC lead, the TRC2 relay releases, thereby restoring the circuit to normal. The release of PTP, PTP1, and, consequently, PTT is delayed as above to delay the connection of ground to the PRG lead until after the operating paths of the trouble registers have been opened in the pretranslator to prevent false scoring.

15. TRANSVERTER TEST CALLS - (LOCAL CAMA)

SELECTION OF TRANSVERTER

15.01 On this class of test call a particular transverter is selected under control

of a key in the master test control circuit, which obtains entry to this circuit for selection of the transverter by means of the TTP preference relay. When the test call is started, the master test control circuit connects battery to the TTP lead to this circuit. This causes the TTP relay to operate and lock. If operating in the paper AMA mode, the TTP operated connects ground to the CO lead to the master timing circuit subject to the preference conditions outlined in SECTION I, 2. GENERAL DESCRIPTION OF OPERATION. The master timing circuit then removes the standing test and returns ground on the CI lead. This ground operates the TTP1 relay. If operating in the magnetic AMA mode, the ground is closed through the TTP relay operated, through normal contacts of all of the TVT relays in series, and again through TTP operated to the TVS lead to the master test control circuit (option XK). When Fig. 48 is provided the TTP1 relay operates from TTP and TTL operates from TTP1. The ground through the TVT relays in this case is from the TTL relay over the TTL lead and then over the TVS lead of Fig. 48 to the master test control circuit. It is then closed through the key for the desired transverter and is returned on the corresponding TVT0-9 lead, operating the TVT relay for the transverter to be connected. This path includes normal contacts of all of the TVT relays so that the call will block if any of them should be operated falsely. The TVT relay locks through normal contacts of preceding relays to ground furnished by the master timing circuit on the CI lead (option XK) or when Fig. 48 is provided the locking ground is from the TTL relay operated. The TVT opens its operating path by disconnecting ground from the TVS lead. The TVT relay also connects ground to the MB lead to the transverter to make it busy to subsequent service calls and it operates the CIT relay, option ZH or option WH, or it operates the CITA relay (if provided) which operates CIT relay. For offices adding Fig. 43 after Issue 22D or on the new standard frame the CITA relay will not be provided. The CIT relay operates the ON relay which functions as in 6.03, except that ground is connected to the TRB leads to all of the AMA recorders or trunk controls.

15.02 At this point a test of the transverter TM lead is made in order that the test call may be delayed if the transverter is busy on a service call. This follows operation of the TVT relay and is as described for marker test calls in 11.02 except that the TM lead is tested instead of the MIT lead. If the TM relay is operated when the TM1 relay releases, ground is closed from operated contacts of the CIT relay, through contacts of TM1 normal, TM2, and TM operated and CIC normal to the PR1 lead to Fig. 19. This permits the transverter to call for a trouble record if the previously connected service call should require this procedure.

A. Trouble Record on the Service Call

15.03 If a trouble record is called for under these conditions, the transverter preference relay TVP- operates from battery on the TRST lead and closes ground to the CI lead to the transverter. This ground is returned as before on the TVA and TVB leads, operating the TVA and TVB relays. The operations described in 6.02 and 6.04 through 6.12 take place, except that the ON relay and the relays which it controls have already been operated after the trouble record call disconnects. Furthermore, ground is not removed from the CO lead to the master timing circuit as the TTP relay remains operated. This leaves the circuit in the same condition as just prior to the start of the service call trouble record.

B. Connections for Test Call

15.04 If the TM relay is normal when the TM1 relay releases, or when it subsequently releases whether or not a trouble record on the service call has been made, the transverter preference relay is made ineffective and the test call is allowed to proceed by operation of the TS relay. This relay operates from battery through its winding, contacts of TM normal, TM2 operated, TM1 normal, and CIT operated to ground. The TS relay locks, removes ground from the TI recording lead, releases the TM2 relay and connects ground to the TS lead to the master test control circuit as a signal that the test may be started. The ground from the relay is direct to the master test control circuit (option ZH), or through the CITA relay operated (for those offices using single-sided TR card in which Fig. 43 was provided prior to Issue 22D). Beginning with Issue 20D, (new MT frame) and with 22D for offices using single-sided TR card, or converted offices, when Fig. 43 is provided CITA relay will not be provided. It also disconnects the transverter TM lead from the TM relay and closes it to the master test control circuit for subsequent connection to ground in that circuit so that the transverter short timing may be restarted without overlap. The TS relay also closes ground through the TVT relay

operated to the TVT lead to the transverter, that it may arrange certain internal connections as required for test calls, and it closes ground on the CIB lead from the master test control circuit through TVT operated to operate TVB.

Note: Figures listed below are for the following offices:

Fig. 26 (offices having single-sided TR Card)

Fig. 26 (TV0-5) and Fig. 153 and 154 (TV6-9) [offices which had AMA prior to Issue 20D and to to which local transverters have been added, exceeding 6 (maximum 10)]

Fig. 153 and 154 (offices which have local AMA added subsequent to Issue 20D)

Fig. 153 and 155 (CAMA transverter connector relays).

15.05 The TVB relay operates the V- relays of Fig. 26, or 153 and 154, for local transverters or of Fig. 153 and 155 for CAMA transverters. If the test call does not require that an AMA recorder or trunk control be connected to the transverter, the latter returns ground on the TVT3 leads which is closed through the operated TVT relay and operates the TVT3 relay. This relay closes a locking path for the ON relay and operates the W- relays of Fig. 26 or 153 for the transverter through TVB operated. The leads required for the test call are now closed. These include the following:

(a) Leads closed from the transverter directly to the master test control circuit by the V- relays of Fig. 26 or Fig. 153 and 154 or Fig. 153 and 155. These leads are designated MTC-TV (master test control-transverter) in Tables 1, 1A, and 1B, or MTC-CTV (master test control-CAMA transverter), in Tables 1A and 1B.

(b) Leads closed from the transverter to the master test control circuit by the V- relays of Fig. 26 or Fig. 153 and 154, or Fig. 153 and 155 by way of multiples shown in Tables 1, 1A, and 1B. These leads are also designated MTC-TV (in Tables 1, 1A, and 1B), or MTC-CTV (in Tables 1A and 1B).

(c) If an AMA recorder or trunk control is not to be attached to the transverter, leads closed from the transverter directly to the master test control circuit by the W- relays (Fig. 26 or 153) are also required. These leads are designated with connecting circuit designations MTC-TV in Tables 1, 1A, and 1B, or MTC-CTV, in Tables 1A and 1B.

15.06 Upon closure of these leads the test call is allowed to proceed under control of the master test control circuit. A trouble record is made on a test call if a trouble is encountered. A record of a properly completed test call may be made if desired, this feature being controlled by a key in the master test control circuit.

C. Record Not Required for Test Call

15.07 If a record is not required, the master test control circuit removes battery from the TTP lead, releasing the TTP relay, and removes ground from the CIB lead, releasing the TVB relay, when the test is completed. The TTP relay releases the TTP1 (if provided). Release of TVB releases V-, Fig. 26, or Fig. 153 and 154 or Fig. 153 and 155, and W-, Fig. 26 or Fig. 153, if operated. Release of TTP removes ground from the CO lead to the master timing circuit which, in turn, removes ground from the CI lead and it releases the operated TVT relay. When Fig. 48 is provided the TTL relay releases the TVT relay. This in turn causes TVT3, if operated, and CIT to release. The CIT releases TS, ON, RM1, RP1, RMA, RT1, RR1, and RT3, RR3, and RMIS (if provided), thereby restoring the circuit to normal.

D. Record Required for Test Call

15.08 If a record is required, the operating ground for the TVB relay, which is also connected to the TVB lead to the transverter, is connected in the transverter to the TVA lead back to this circuit, operating the TVA relay. The transverter preference relay TVP- also operates but without effect. The TVA relay operated causes the functions described in 6.02 to take place except that the ON relay is already operated. The operations described in 6.06 or 6.07 also take place except that if a recorder is not attached the W- relays, (Fig. 26 or Fig. 153), will already have been operated. With relays RNA or RC, TVA and TVB operated, ground is

closed through TRC and TRC2 normal and TS operated to the STRA lead. This causes a trouble record to be made as previously described. Refer to 3.07 through 3.09. The recording leads required are as in 6.09 (for local TVTR in offices using single-sided TR card), 6.10 (for offices having new MTF and double-sided TR card); 6.11 (for local TVTR in offices converted for double-sided card); and 6.12 (for CAMA transverter TR). There is the following exception in the above paragraphs that, due to the TS- relay being operated, ground is not connected directly to the T1 recording lead. The master test control circuit, however, connects ground to this lead if the record is due to trouble. Additional recording leads closed directly from the master test control circuit to the scanning connector are used to indicate the type of test call being made. Also, since the master test control circuit has set up the transverter, the grounds on the priming leads used for recording are those furnished by the test circuit.

15.09 After the scanning operation has been completed, the operations described in 6.13 and 6.14 take place. The circuit restores to normal as in 15.07, the additional relays operated for the trouble record being released as in 6.15. If an AMA recorder was attached, ground must be removed from the ONL lead in order for ON to release. Removal of ground from the TRB leads permits another call to enter the connector. The STR or STRA lead, however, cannot be reclosed until the TRC2 relay releases.

SELECTION OF TRANSVERTER (ANI)

15.10 On this class of test call a particular transverter or program controlled transverter is selected under control of a key in the master test control circuit, which obtains entry to this circuit for selection of the transverter or program controlled transverter by means of the TTP preference relay. When the test call is started, the master test control circuit connects battery to the TTP lead to this circuit. This causes the TTP relay to operate and lock. The TTP1 relay operates from TTP and TTL operates from TTP1. Ground from the TTL relay is closed over the TTL lead through all the TVT relays in series and through the TTP1 operated to the TVS lead to the master test control circuit. It is then closed through the key for the desired transverter or program controlled transverter and is returned on the corresponding TVT0-1 lead, operating the TVT relay for the transverter or program controlled transverter to be connected. This path includes normal contacts of both of the TVT relays so that the call will block if one of them should be operated falsely. The TVT relay locks through normal contacts of the preceding relay to ground from the TT1 relay operated. The TVT opens its operating path by disconnecting ground from the TVS lead. The TVT relay also connects ground to the MB lead to the transverter or program controlled transverter to make it busy to subsequent service calls and it operates the CIT relay, or it operates the CITA relay (if provided) which operates CIT relay. The CIT relay operates the ON relay which functions as for other types of trouble record calls.

15.11 At this point a test of the transverter or program controlled transverter TM lead is made in order that the test call may be delayed if the transverter or program controlled transverter is busy on a service call. This follows operation of the TVT relay and is as described for marker test calls in 11.02 except that the TM lead is tested instead of the MIT lead. If the TM relay is operated when the TM1 relay release, ground is closed from operated contacts of the CIT relay, through contacts of TM1 normal. The TM2 and TM operated, and CIC normal to the PR1 lead to Fig. 149. This permits the transverter to call for a trouble record if the previously connected service call should require this procedure.

A. Trouble Record on the Service Call

15.12 If a trouble record is called for under these conditions, the transverter preference relay (TVP-) operates from battery on the TRST lead and closes ground to the CI lead to the transverter. This ground is returned as before on the TVA and TVB leads, operating the TVA and TVB relays. The operations described in 6.18 and 6.20 through 6.22 take place.

15.13 Connections for test calls are made as described in 15.04 except that ANI connector relays, Fig. 161, are used.

15.14 The TVB relay operates the V- relays of Fig. 161. The leads required for the test call are now closed. These include the following: leads closed from the ANI transverter directly to the master test control circuit by the V- relays of Fig. 161, or by way of multiples shown in Table 1, 1A, and 1B. These leads are designated MTC-ATV (master test control-ANI transverter). Upon closure of these leads the test call is allowed to proceed under control of the master test control circuit. A trouble record is made on a test call if a trouble is encountered. A record of a properly completed test

call may be made if desired, this feature being controlled by a key in the master test control circuit.

B. Record Not Required for Test Call

15.15 If a record is not required, the master test control circuit removes battery from the TTP lead, releasing the TTP relay, and removes ground from the CIB lead, releasing the TVB relay, when the test is completed. The TTP relay releases the TTP1. Release of TVB releases V- relays (Fig. 161). Release of TTP1 releases the TTL which releases the TVT relay. This in turn causes the CIT to release. The CIT releases TS, ON, RM1, RMA, and RT1, thereby restoring the circuit to normal.

C. Record Required for Test Call

15.16 If a record is required, the operating ground for the TVB relay, which is also connected to the TVB lead to the transverter, is connected in the transverter to the TVA lead back to this circuit, operating the TVA relay. The transverter preference relay TVP- also operates but without effect. The TVA relay operated causes the functions described in 6.18 to take place except that the ON relay is already operated. With relays TVA and TVB operated, ground is closed through TRC and TRC2 normal and TS operated to the STRA lead. This causes a trouble record to be made as previously described. Refer to 3.07 through 3.09. The recording leads required are as in 6.22. The following exception appears in the above paragraphs, that due to the TS- relay being operated, ground is not connected directly to the TI recording lead. The master test control circuit, however, connects ground to this lead if the record is due to trouble. Additional recording leads closed directly from the master test control circuit to the scanning connector are used to indicate the type of test call being made. Also, since the master test control circuit has set up the transverter, the grounds on the priming leads used for recording are those furnished by the test circuit.

15.17 After the scanning operation has been completed, the operations described in 6.23 and 6.24 take place. The circuit restores to normal as in 15.15, the additional relays operated for the trouble record being released as in 6.25. Removal of ground from the TRB leads permit another call to enter the connector. The STR or STRA lead, however, cannot be reclosed until the TRC2 relay releases.

16. SENDER TEST CALLS AND LINE VERIFICATION-AMA (USING MASTER TEST FRAME)

SEIZURE OF MASTER TEST FRAME CONNECTOR CIRCUIT

16.01 On these types of test calls a transverter or program controlled transverter is selected by means of a marker and a sender. Any transverter or program controlled transverter may be used. Access to this circuit is obtained by the transverter or program controlled transverter, by means of its preference relay, and the TTP relay is not used. The transverter or program controlled transverter connects battery to its TRST lead causing the corresponding TVP- relay to operate and lock and to connect ground to the CO lead to the master timing circuit subject to the preference condition described in SECTION I, 2. GENERAL DESCRIPTION OF OPERATION. This closure causes the master timing circuit to remove the standing test and to return ground on the CI lead. This ground is forwarded to the CI lead to the transverter or program controlled transverter if the call obtains preference. It is returned in this case on the TVTA lead, operating the TVT relay for the transverter or program controlled transverter. The TVT relay locks through normal contacts of preceding relays to ground on the TTL lead furnished by the master control circuit on this type of call. Ground is direct from the master test control circuit, (options ZH and XK in Fig. 18) or through SKT relay operated and over the TTL lead (option XK Fig. 18) for those offices using single-sided TR cards in which Fig. 43 was provided prior to Issue 22D. Prior to Issue 22D when automatic progression trunk testing was not provided option ZH was provided in Fig. 18. Beginning with Issue 22D, option XK, in addition to option ZH, is removed when preference relays for any of the following features are added. These features are automatic progression trunk testing, line verification, or line insulation testing. The TVT relay also connects ground to the MB lead to the transverter and it operates the CIT relay, option ZH or WH, or the CITA relay, option ZF, which operates the CIT relay when Fig. 43 is provided. (The CITA relay was provided with automatic progression trunk testing with AMA and/or pretranslators prior to Issue 22D in offices having single-sided TR card). On new master test frames (Issue 20D), and beginning with Issue 22D, for single-sided TR card or offices converted for double-sided TR card, whenever Fig. 43 is provided, Fig. 47 will be provided instead of the CITA relay for pretranslators and Fig. 48 will be provided instead of CITA relay for AMA. The

CIT relay operates the ON relay which functions as in 6.03 except that ground is connected to the TRB leads to all of the AMA recorders.

16.02 On test calls involving direct seizure of a transverter or program controlled transverter as described in 15., it was necessary to delay the test call connections if the desired transverter or program controlled transverter should be found busy, as indicated by ground on the TM lead, the busy condition in this case being caused by the presence of a service call. In the present case, the transverter or program controlled transverter is busy on the test call which is to be connected. Therefore the test of the TM lead is not required, and the call must be allowed to proceed regardless of the busy condition of the transverter. For these reasons the TS relay is operated from ground on the SKT lead when the CIT relay is operated. This ground is direct from the master test control circuit with option ZH or from the SKT relay operated from battery in the master test control circuit when Fig. 43 is provided. The TS relay locks, removes ground from the TI recording lead, releases the TM and TM1 relays if operated due to operation of CIT, and connects ground to the TS lead to the master test control circuit. This ground is direct with option ZH or, when Fig. 43 is provided, through SKT operated. It also connects the TM lead to the master test control circuit, closes ground through the TVT relay operated on the TVT lead to the transverter or program controlled transverter, and closes ground on the CIB lead from the master test control circuit through TVT operated to operate TVB.

16.03 The TVB relay operates the V- relays of Fig. 26 or Fig. 153 and 154 for local transverters, or of Fig. 153 and 155 for CAMA transverters, or Fig. 161 for ANI transverters or program controlled transverters. Test calls of this type do not require that an AMA recorder be attached to the transverter or program controlled transverter, but only that the transverter closes ground to the TVT3 lead, operating the TVT3 relay through TVT operated. The program controlled transverter does not require the operation of the W relay, Fig. 26, or W- relays, Fig. 153 and therefore does not provide the TVT3 lead. The TVT3 relay closes a locking path for the ON relay and operates the W relay, Fig. 26, or W- relays, Fig. 153, for the transverter. The leads required for the test call, which are as described in 15.05(a), (b), and (c) are now closed.

A. Record Not Required for Test Call

16.04 If a record is not required, the master test control circuit removes ground from the TTL and CIB leads and the transverter or program controlled transverter removes battery from the TRST lead at the conclusion of the test. Removal of ground from the CIB lead releases TVB, in turn releasing V- and W- of Fig. 26 or V-, W- of Fig. 153 and 154 (for local transverters) or V- and W- of Fig. 153 and 155 (for CAMA transverters) or V- of Fig. 161 (for ANI or program controlled transverter). Removal of battery from the TRST lead releases TVP- which removes ground from the CO lead to the master timing circuit. This circuit, in turn, removes ground from the CI lead. Release of TVP also removes ground from the CI lead to the transverter or program controlled transverter and thereby from the TVTA lead. With this lead opened and ground removed from the TTL lead, the TVT relay releases, in turn, releasing TVT3, CIT (options ZH or WH) or CITA (option ZF) which releases CIT when CITA is provided with Fig. 43. The CIT relay releases TS, ON, RM1, RP1, RMA, RT1, RR1, and RT3, RR3, and RMIS (if provided) thereby restoring the circuit to normal.

B. Record Required for Test Call

16.05 If a record is required due to trouble, or at the completion of the test, the operating ground for the TVB relay, which is also connected to the TVB lead to the transverter, is connected in the transverter to the TVA lead operating the TVA relay. The transverter removes ground from the TVTA lead at this time, but the TVT relay does not release as it is locked to ground over the TTL lead from the master test control circuit option ZH. With Fig. 43 provided prior to Issue 22D in offices using single-sided TR card, this ground is through the SKT relay operated and over the TTL lead of Fig. 18. Beginning with Issue 22D for offices using single-sided card and converted offices and beginning with Issue 20D (new MTF) when Fig. 43 is provided in offices having AMA, Fig. 48 will be provided and the TVT relay will lock over the TTL lead through the TTL relay of Fig. 48. The TVA relay causes the functions described in 6.02 to take place except that the ON relay is already operated. The RNA relay operates from ground on the RNA lead. With relays RNA, TVA, and TVB operated, ground is closed through TRC and TRC2 normal and TS operated to the STRA lead. This causes a trouble record to be made as previously described. Refer to 3.07 through 3.09.

16.06 The recording leads required are as described in 6.09, 6.10, and 6.11. Additional recording leads closed directly from the master test control circuit to the scanning connector are used to indicate the type of test call being made. After the scanning operation is completed, the functions described in 6.13 and 6.14 take place.

16.07 The circuit restores to normal as described in 16.04, the additional relays operated for the trouble record being released as in 6.15. Removal of ground from the TRB leads permits another call to enter the connector. The STR or STRA lead, however, cannot be reclosed until the TRC2 relay releases.

16.08 The program controlled transverter will not provide a trouble record on this type of call. If the REC key in the master test control circuit is operated a ground is applied to the TRP lead to the distributor and scanner circuit requesting a trouble record printout on the teletypewriter.

17. AMA RECORDER TEST AND SPECIAL PATTERN CALLS

17.01 The master timing circuit is arranged for connection to the AMA recorders for test calls and for putting special patterns on the AMA tape. These connections are made in the recorder and recorder connector circuit and require the use of the recorder multiple in that circuit. Since this multiple may also be required for AMA trouble records, a mutual lockout between these two types of calls is necessary. This feature is provided by the PCN preference relay which is included in the chain with the other AMA preference relays.

17.02 When an AMA recorder test or special pattern call is to be started, the master timing circuit connects battery to the PCN lead, causing the PCN relay to operate and lock subject to the preference conditions described in SECTION I, 2. GENERAL DESCRIPTION OF OPERATION, and to connect ground to the CO lead to the master timing circuit. This causes the master timing circuit to remove its standing test and to return ground on the CI lead. This ground is forwarded to the TPR lead to the master timing circuit, thereby permitting that circuit to close the connections which it requires.

17.03 The PCN relay also operates the ON1 relay which locks to ground on the ONL lead closed by operation of the recorder connector relays required for the call. The ON1 relay also operates the RT1 and RT3 (if provided), and RR1 and RR3 (if provided) relays which connect ground to the TRB leads to all of the transverters and AMA recorders. Ground is not connected to the TRB leads to the even and odd parts of the master timing circuit to prevent the loss of a trouble record if one should be called for due to trouble on the call in progress. In such a case the master timing circuit closes the required TRST lead and simultaneously releases the PCN relay. A marker or pretranslator trouble record call, a test call involving a marker or pretranslator, or a monitor call may proceed concurrently with an AMA recorder test or special pattern call as previously described.

17.04 When the call is completed, the master timing circuit removes battery from the PCN lead, releasing the PCN relay. This removes ground from the CO lead to the master timing circuit which in turn removes ground from the CI lead, and it disconnects the CI lead from the TPR lead. The ON1 relay releases, releasing the RT1 and RT3 (if provided), and RR1 and RR3 (if provided) relays, when the PCN relay releases and when ground has been removed from the ONL lead by release of the recorder connector relays.

18. AUTOMATIC PROGRESSION TRUNK TEST

SELECTION OF MARKER

18.01 When the automatic progression trunk test circuit is used, a particular marker is selected under control of a key in the automatic progression trunk test circuit, which obtains entry to this circuit for selection of the marker by means of the ATP preference relay. When the test call is started, the automatic progression trunk test circuit connects battery to the ATP lead, operating the ATP relay subject to the conditions outlined in SECTION I, 2. GENERAL DESCRIPTION OF OPERATION. The ATP relay locks and operates the ATP1 relay over the CIA lead through normal contacts of the MTP, MON, and MTP1 relays from ground on the ATP1 relay normal (option XF). When automatic progression trunk testing is provided beginning with Issue 22D, additional preference relays for line verification (Fig. 46), auxiliary preference pretranslator (Fig. 47) will be provided and line verification for AMA (Fig. 48 and 49) will also be provided if the office has AMA. On the new standard master test frame, preference relays for line verification and line insulation testing will always be provided in additon to the preference relays for automatic progression trunk testing. In this case, the ground over the CIA lead

will originate from Fig. 47 or 49. The ATP1 relay locks to its own contact (option XF) or from ground on Fig. 47 (option XI) or from Fig. 49 through the ATP relay operated. Upon operation of the ATP1 relay, the MTL relay operates over the MTL lead from ground on the TS relay (Fig. 1) normal, through the CIT relay normal. The MTL relay locks to its own contacts through ATP1 operated. The ATP1 relay in operating, also closes the TTG lead to the TTA lead. Operation of the ATP1 relay closes the path over which the TS relay, upon later operation, will signal the automatic progression trunk test circuit to proceed with the test call. The MTL relay operated connects ground over the MTL lead through normal contacts of all the MKT relays in series to the AMKS lead to the automatic progression trunk test circuit. This ground is then closed through a key in the automatic progression trunk test circuit for the desired marker and is returned on the corresponding MKT0-11 lead, operating the MKT relay for the marker to be connected. This path includes normal contacts of all of the MKT relays. The MKT relay locks through normal contacts of preceding relays to ground at the MTL relay operated, and opens its operating path by opening the AMKS lead. The MKT relay also connects ground to the MB lead to the marker to make it busy to subsequent service calls and it operates the CIC and CIT relays. The CIC relay functions as in 3.04. Closures to the RTG and MKR leads are effective only in case a record should be taken. The CIT relay closes another path for operating the ON relay.

18.02 At this point in the call it is necessary to determine whether or not the marker is engaged on a service call and, if it is so engaged, to delay the test call connections until the marker has been released. A test of the MIT lead is made for this purpose, as described below, ground on this lead indicating that the marker is busy. Since this marker may be selected on a service call just as this circuit connects ground to the MB lead, it is further necessary to delay the test of the MIT lead until sufficient time has elapsed to insure that ground has been connected to it under these conditions. This delay is provided by the slow operate TM2 relay and the slow release TM1 relay. When the CIT relay operates it connects the marker MIT lead through MKT operated and TS normal to the winding of the TM relay. This relay operates if ground is present on the MIT lead, or if ground is connected thereto during the aforementioned interval. If the TM relay operates, there is a possibility that this marker has been seized by a register being tested by the automatic monitor register and sender test circuit, in which case a connection to the monitor must be established before the marker can be freed for use by the automatic progression trunk test circuit.

18.03 Therefore, during the interval that the TM relay is operated, if any marker grounds the RTST lead indicating a register test call, the RTST relay operates and opens the ATP start lead to release the ATP relay for the automatic progression trunk test circuit. This, in turn, releases the ATP1, MTL, MKT, and CIT relays. Upon release of the MTL relay, the monitor may operate its preference relay and proceed with the register test call. Upon completion of the register test call, the RTST relay is released and the automatic progression trunk test call may proceed as before.

18.04 The CIT relay operates the TM1 relay through normal contacts of TM2 to ground at TS normal. The TM1 relay operates the TM2 relay which locks and releases the TM1 relay. When the TM1 relay releases, the TM relay if operated will delay the test call, as in 18.07.

TROUBLE RECORD ON THE SERVICE CALL

18.05 This circuit is arranged to make the marker preference relay effective even though the ATP relay is operated. If, under the above conditions, the service call should develop a trouble and require a record, the TM relay operated closes ground from operated contacts of the CIT relay through contacts of TM1 normal and TM2, TM, and CIC operated to the PR lead to Fig. 3. This permits the marker to call for a trouble record if the previously connected service call should require this procedure. No other circuits can call for a record as their TRB leads have already been closed.

18.06 If a trouble record is called for, the marker preference relay MPT- operates from battery on the TRST lead and connects ground tothe CI lead. This ground is returned as before on the MKA and MKB leads, operating the MKA, MKB, and MKB1 relays. The operations described in 3.02 through 3.13 take place, except that the CIC relay and the relays which it controls have already been operated, and remain operated after the trouble record call disconnects. This leaves the circuit in the same condition as just prior to the start of the service call trouble record.

CONNECTIONS FOR TEST CALL

18.07 If the TM relay is normal when the TM1 relay releases, or when it subsequently releases whether or not a trouble record on

the service call has been made, the marker preference relay is made ineffective and the test call is allowed to proceed by operation of the TS relay. This relay operates from battery through its winding, contacts of TM normal, TM2 operated, TM1 normal, and CIT operated to ground. The TS relay locks to the CIT relay operated, removes ground from the TI recording lead, to the TS lead to the automatic progression trunk test circuit as a signal to that circuit that the test may be started. It also disconnects the marker MIT lead from the TM relay, closes ground through the MKT relay operated to the MT lead to the marker so that it may arrange certain internal connections as required for test call, and it closes ground on the CIB lead from the automatic progression trunk test circuit through MKT operated to operate MKB and MKB1.

18.08 The MKB relay operates the B- (Fig. 8 or 150) relays for the marker, and MKB1 operates C- and T- (Fig. 8 or 150), from grounds at CIC and TS. The MKB1 relay also closes the TTG lead from the marker to the TTA lead to the trunk link and connector circuit or trunk link connector circuit. With ground on the TTG lead from the marker now closed by the operation of the MKB1 relay to the TTA lead, the TTA relay of the trunk and connector circuit will be operated. The leads required for the test call are now closed. These include the following:

(a) Leads closed from the marker to the automatic progression trunk test circuit by the B-, C-, and T- relays (Fig. 8 or 150). These leads have connecting circuit designations APTT-CM (automatic progression trunk test combined or completing marker) in Tables 1, 1B, 1A, and 1E.

(b) The TST lead closed from the trunk link and connector circuit or trunk link connector circuit to the automatic progression trunk test circuit.

18.09 Upon closure of these leads the test call is allowed to proceed under control of the automatic progression trunk test circuit, which primes the marker and checks the results by means of the leads closed as above. A trouble record is made on a test call if trouble is encountered.

18.10 If trouble is not encountered, the automatic progression trunk test circuit removes battery from the ATP lead releasing the ATP relay, and removes ground from the CIB lead releasing the MKB and MKB1 relays when the test is completed. Release of MKB and MKB1 causes B-, C-, and T- relays of Fig. 8 or 150 to release. Release of ATP releases ATP1, which releases MTL. The release of MTL releases the MKT relay, in turn, causing the release of CIC, RON, CIT, TS, ON, RM1, RP1, RMA, RT1, RR1 and RT3, RR3, and RMIS (if provided) thereby restoring the circuit to normal.

RECORD REQUIRED DUE TO TROUBLE

18.11 If a record is required due to trouble, the operating ground for the MKB and MKB1 relays, which is also connected to the MKB lead to the marker, is connected in the marker to the MKA lead back to this circuit operating the MKA relay. The marker preference relay MPR- also operates but without effect. The MKA relay operated, causes the functions described in 3.02 and 3.03 to take place, except that CIC relay is already operated. The repeating relays operate as in 3.05. With relays CIC, MKA, MKB, and MKB1 operated, ground is closed through TRC and TRC2 normal and TS operated to the STRA lead to the trouble recorder control circuit or to the trouble recorder control and test circuit. The STRA lead is used for test call and monitor trouble records whereas the STR lead is used for service trouble records. Either lead causes the trouble recorder to start. Two leads are provided in order that the trouble recorder circuit may count the number of service trouble records called for within a time interval and may refuse to accept any further such records during the remainder of the interval if this number is excessive. It is not desired to include test call and monitor trouble records in this count.

18.12 Closure of ground to the STRA lead causes the functions described in 3.07 through 3.12 to take place. Ground is closed to the TI lead by the automatic progression trunk test circuit in this case to indicate that this record is due to a trouble. An additional recording ATKT is closed directly from the automatic progression trunk test circuit, to the scanning connector to indicate the type of test call being made. Also, since the automatic progression trunk test circuit has set up the marker, the grounds on the priming leads used for recording are those furnished by the test circuit. On a service trouble record these grounds are furnished by service circuits which connect to the marker and are closed through the marker connector relays.

18.13 The circuit restores to normal as in 18.10, except that the MKA relay releases when the marker removes ground from then MKA lead, in turn, causing the MKA1, A- relays (Fig. 8 or 150) and repeating relays to release, and the TRC relay releases as in 3.13, in turn, releasing the relays which it controls. Removal of ground from the TRB leads permits another call to enter the connector. The STR or STRA lead, however, cannot be reclosed until ground is removed from the TRC lead, releasing the TRC2 relay.

19. LINE VERIFICATION (USING LINE VERIFICATION CIRCUIT)

MARKER LINE VERIFICATION

19.01 For marker line verification, a marker is selected under control of a key in the line verification circuit, which obtains entry to this circuit for selection of the marker by means of the LVP preference relay. When the test call is started, the line verification circuit connects battery to the LVP lead, operating the LVP relay subject to the conditions outlined in SECTION I, 2. GENERAL DESCRIPTION OF OPERATION. The LVP relay locks and operates the LVP1 relay over the CIA lead through normal contact of the ATP, MTP, MON, and MTP1 relays from ground on the PTP1 relay normal, (option XI) or from the LTP1 relay when AMA is provided. The LVP1 relay locks to ground on the PTP1 relay or LTP1 relay through the LVP relay operated. Upon operation of the LVP1 relay the MTL relay operates over the MTL lead from ground on the TS relay (Fig. 1) normal, through the CIT relay normal. The MTL relay locks to ground over the MTL lead through LVP1 operated. Operation of the LVP1 relay prepares the TS lead for later closure to the line verification circuit as a signal to proceed with the test call. The MTL relay operated connects ground over the MTL lead through normal contacts of all the MKT relays in series to the MKS lead to the line verification circuit. This ground is then closed through a key in the line verification circuit for the desired marker and is returned on the corresponding MKT0, 1 lead, operating the MKT relay for the marker to be connected. This path includes normal contacts of all of the MKT relays. The MKT relay locks through normal contacts of preceding relays to ground at the MTL relay operated, and opens its operating path by opening the MKS lead. The MKT relay also connects ground to the MB lead to the marker to make it busy to subsequent service calls and it operates the CIC and CIT relays. The CIC relay functions as in 18.06. Closures to the RTG and MKR leads are effective only in case a record should be taken. The CIT relay closes another path for operating the ON relay.

19.02 At this point in the call it is necessary to determine whether or not the marker is engaged on a service call and, if it is so engaged, to delay the test call connections until the marker has been released. A test of the MIT lead is made for this purpose, as described below, ground on this lead indicating that the marker is busy. Since this marker may be selected on a service call just as this circuit connects ground to the MB lead, it is further necessary to delay the test of the MIT lead until sufficient time has elapsed to insure that ground has been connected to it under these conditions. This delay is provided by the slow operate TM2 relay and the slow release TM1 relay. When the CIT relay operated it connected the marker MIT lead through MKT operated and TS normal to the winding of the TM relay. This relay operates if ground is present on the MIT lead or if ground is connected thereto during the aforementioned interval. If the TM relay operates, there is a possibility that this marker has been seized by a register being tested by the automatic monitor, register and sender test circuit, in which case a connection through the master test frame connector to the monitor must be established before the marker can be freed for use by the line verification circuit.

19.03 Therefore, during the interval that the TM relay is operated, if any marker grounds the RTST lead indicating a register test call, the RTST relay operates and opens the LVP start lead to release the LVP relay for the line verification circuit. This, in turn, releases the LVP1, MTL, MKT, and CIT relays. Upon release of the MTL relay, the monitor may operate its preference relay and proceed with the register test call. Upon completion of the register test call, the RTST relay is released and the line verification call may proceed as before.

19.04 The CIT relay operates the TM1 relay through normal contacts of TM2 to ground at TS normal. The TM1 relay operates the TM2 relay which locks and releases the TM1 relay. When the TM1 relay releases, the TM relay, if operated, will delay the test call and, if normal, will allow it to proceed as in 18.07.

TROUBLE RECORD ON THE SERVICE CALL

19.05 This circuit is arranged to make the marker preference relay effective even though the LVP relay is operated. If, under the above conditions, the service call should develop a trouble and require a record the TM relay operated closes ground from operated contacts of the CIT relay, through contacts of TM1 normal and TM2, TM, and CIC operated to the PR lead to Fig. 3. This permits the marker to call for a trouble record if the previously connected service call should require this procedure. No other circuits can call for a record as their TRB leads have already been closed.

19.06 If a trouble record is called for the marker preference relay (MPR-) operates from battery on the TRST lead and connects ground to the CI lead. This ground is returned as before on the MKA and MKB leads, operating the MKA, MKB, and MKB1 relays. The operations described in 3.02 through 3.13 take place, except that the CIC relay and the relays which it controls have already been operated, and remain operated after the trouble record call disconnects. This leaves the circuit in the same condition as just prior to the start of the service call trouble record.

CONNECTIONS FOR TEST CALL

19.07 If the TM relay is normal when the TM1 relay releases, or when it subsequently releases whether or not a trouble record on the service call has been made the marker preference relay is made ineffective and the test call is allowed to proceed by operation of the TS relay. This relay operates from battery through its winding, contacts of TM normal, TM2 operated, TM1 normal, and CIT operated to ground. The TS relay locks to the CIT relay operated, removes ground from the TI recording lead, releases the TM2 relay and connects ground to the TS lead to the line verification circuit as a signal to that circuit that the test may be started. It also disconnects the marker MIT lead from the TM relay, closes ground through the MKT relay operated to the MT lead to the marker so that it may arrange certain internal connections as required for test call, and it closes ground on the CIB lead from the line verification circuit through MKT operated to operate MKB and MKB1.

19.08 The MKB relay operates the B- relays (Fig. 8 or 150) for the marker, and MKB1 operates C- and T-, (Fig. 8 or 150,) from grounds at CIC and TS. The leads required for the test call are now closed. These leads are the following:

(a) Leads closed from the marker to the line verification circuit by the B-, C-, and T- relays (Fig. 8 or 150.) These leads have connecting circuit designations LV-CM (line verification-combined or completing marker) in Tables 1, 1A, or 1B.

19.09 Upon closure of these leads the call is allowed to proceed under control of the line verification circuit, which primes the marker and checks the results by means of the leads closed as above. A trouble record is made on a test call if trouble is encountered. A record of a properly completed test call may be made if desired, this feature being controlled by a key in the line verification circuit.

19.10 If a record is not required, the line verification circuit removes battery from the LVP lead releasing the LVP relay and removes ground from the CIB lead releasing the MKB and MKB1 relays when the call is completed. Release of MKB and MKB1 causes B-, C-, and T- relays (Fig. 8 or 150) to release. Release of LVP releases LVP1, which releases MTL. The release of MTL releases the MKT relay, in turn, causing the release of CIC, RON, CIT, TS, ON, RM1, RMA, RT1, RR1 and RT3, RR3, and RMIS (if provided), thereby restoring the circuit to normal.

RECORD REQUIRED DUE TO TROUBLE

19.11 If a record is required due to trouble the operating ground for the MKB and MKB1 relays, which is also connected to the MKB lead to the marker, is connected in the marker to the MKA lead back to this circuit operating the MKA relay. The marker preference relay MPR- also operates but without effect. The MKA relay operated causes the functions described in 3.02 and 3.03 to take place, except that CIC relay is already operated. The repeating relays operate as in 3.05. With relays CIC, MKA, MKB, and MKB1 operated, ground is closed through TRC and TRC2 normal and TS operated to the STRA lead to the trouble recorder control circuit or to the trouble recorder control and test circuit. The STRA lead is used for test call and monitor trouble records whereas the STR lead is used for service trouble records. Either lead causes the trouble recorder to start. Two leads are provided in order that the trouble recorder circuit may count the number of service trouble records called for within a time interval and may refuse to accept further such records during the remainder of the interval if this number is excessive. It is not desired to include test call and monitor trouble records in this count.

19.12 Closure of ground to the STRA lead causes the functions described in 3.07 through 3.12 to take place, except that there is no TI perforation to indicate that this record is due to a trouble. An additional recording lead MLV is closed directly from the line verification circuit to the scanning connector to indicate the type of test call being made. Also, since the line verification circuit has set up the marker, the grounds on the priming leads used for recording are those furnished by the test circuit. On a service trouble, record these grounds are furnished by service circuits which connects to the marker, and are closed through the marker connector relays.

19.13 The circuit restores to normal as in 19.10, except that the MKA relay releases when the marker removes ground from the MKA lead, in turn, causing the MKA1 A-relays (Fig. 8 or 150) and repeating relays to release, and the TRC relay releases as in 3.13, in turn, releasing the relays which it controls. Removal of ground from the TRB leads permit another call to enter the connector. The STR or STRA lead, however, cannot be reclosed until ground is removed from the TRC lead, releasing the TRC2 relay.

TRANSVERTER LINE VERIFICATION

19.14 For transverter line verification a particular transverter is selected under control of a key in the line verification circuit which obtains entry to this circuit for selection of the transverter by means of the LTP preference relay. When the test call is started, the line verification circuit connects battery to the LTP lead to this circuit. This causes the LTP relay to operate and lock and to connect ground to the CO lead to the master timing circuit subject to the preference conditions outlined in SECTION I, 2. GENERAL DESCRIPTION OF OPERATION. The master timing circuit then removes the standing test and returns ground on the CI lead. This ground is closed through the LTP relay operated, and operates the LTP1 relay. The TTL relay operates from ground over the MTL lead on the TS relay normal through the LTP1 operated. The TTL relay locks to ground on its own contacts through LTP1 operated. The TTL relay closes ground over the TTL lead through normal contacts of all the TVT relays in series, and through LTP1 operated to the TVS lead to the line verification circuit. It is then closed through the key for the desired transverter and is returned on the corresponding TVT0, 1 lead, operating the TVT relay for the transverter to be connected. This path includes normal contacts of all the TVT relays so that the call will block if any of them should be operated falsely. The TVT relay locks through normal contacts of preceding relays to ground from the TTL relay and opens its operating path by disconnecting ground from the TVS lead. The TVT relay also connects ground to the MB lead to the transverter to make it busy to subsequent service calls and it operates the CIT relay. The CIT relay operates the ON relay which functions as in 6.03, except that ground is connected to the TRB leads to all of the AMA recorders.

19.15 At this point a test of the transverter TM lead is made in order that the test call may be delayed if the transverter is busy on a service call. This follows operation of the TVT relay and is described for marker test calls in 11.02 except that the TM lead is tested instead of the MIT lead. If the TM relay is operated when the TM1 relay releases, ground is closed from operated contacts if the CIT relay, through contacts of TM1 normal, TM2, and TM operated and CIC normal to the PR1 lead to Fig. 19. This permits the transverter to call for a trouble record if the previously connected service call should require this procedure.

TROUBLE RECORD ON THE SERVICE CALL

19.16 If a trouble record is called for under these conditions, the transverter preference relay TVP- operates from battery on the TRST lead and closes ground to the CI lead to the transverter. This ground is returned as before on the TVA and TVB leads, operating the TVA and TVB relays. The operations described in 6.02 and 6.04 through 6.12 take place, except that the ON relay and the relays which it controls have already been operated and remain operated after the trouble record call disconnects. Furthermore, ground is not removed from the CO lead to the master timing circuit as the LTP relay remains operated. This leaves the circuit in the same condition as just prior to the start of the service call trouble record.

CONNECTIONS FOR TEST CALL

19.17 If the TM relay is normal when the TM1 relay releases, or when it subsequently releases whether or not a trouble record on the service call has been made, the transverter preference relay is made ineffective

and the test call is allowed to proceed by operation of the TS relay. This relay operates from battery through its winding, contacts of TM normal, TM2 operated, TM1 normal, and CIT operated to ground. The TS relay locks, removes ground from the TI recording lead, releases the TM2 relay and connects ground to the TS lead to the line verification circuit as a signal that the test may be started. The ground from the TS relay is over the LTP1 relay operated to the line verification circuit. The TS relay also disconnects the transverter TM lead from the TM relay and closes it to the line verification circuit for subsequent connection to ground in that circuit so that the transverter short timing may be restarted without overlap. The TS relay also closes ground through the TVT relay operated to the TVT lead to the transverter, so that it may arrange certain internal connections as required for test calls, and it closes ground on the CIB lead from the line verification circuit through TVT operated to operate TVB.

19.18 The TVB relay operates the V- relays, (Fig. 26 or Fig. 153 and 154) for the transverter.

Note: V- and W- relays mentioned below are associated with Fig. 26 (offices using single-sided TR cards) or Fig. 153 and 154 (converted offices-local transverters).

The transverter line verification call does not require that an AMA recorder be connected to the transverter, therefore, the transverter closes ground to the TVT3 lead which is closed through the operated TVT relay and operates the TVT3 relay. This relay closes a locking path for the ON relay and operates the W- relay (Fig. 26 or 153) for the transverter through TVB operated. Line verification leads are not located on the W- relays but if a record is taken, TR indications may be recorded over these leads. The leads required for the test call are now closed. These leads are the leads closed from the transverter directly to the line verification circuit by the V- relays (Fig. 26 or Fig. 153 and 154). These leads are designated LV-TV (line verification-transverter) in Tables 1, 1A, and 1B.

19.19 Upon closure of these leads the test call is allowed to proceed under control of the line verification circuit. A trouble record is made on a test call if trouble is encountered. A record of a properly completed test call may be made if desired, this feature being controlled by a key in the line verification circuit.

RECORD NOT REQUIRED FOR TEST CALL

19.20 If a record is not required, the line verification circuit removes battery from the LTP lead, releasing the LTP relay, and removes ground from the CIB lead, releasing the TVB relay, when the test is completed. Release of TVB releases V- and W- (Fig. 26 or Fig. 153 and 154). Release of LTP removes ground from the CO lead to the master timing circuit which, in turn, removes ground from the CI lead and it releases the operated LTP1 relay. The LTP1 released, releases TTL which releases the operated TVT relay. This, in turn, causes TVT3 (if operated) CIT, TS, ON, RM1, RP1, RMA, RTI, RR1 and RT3, RR3, and RMIS (if provided) to release, thereby restoring the circuit to normal.

RECORD REQUIRED FOR TEST CALL

19.21 If a record is required, the operating ground for the TVB relay, which is also connected to the TVB lead to the transverter, is connected in the transverter to the TVA lead back to this circuit, operating the TVA relay. The transverter preference relay (TVP-) also operates but without effect. The TVA relay operated causes the functions described in 6.02 to take place except that the ON relay is already operated. The operations described in 6.06 also take place except that the W- relay (Fig. 26 or 153) will already have been operated. With relays RNA or RC-, TVA and TVB operated, ground is closed through TRC and TRC2 normal and TS operated to the STRA lead. This causes a trouble record to be made as previously described. Refer to 3.07 through 3.09. The recording leads required are as in 6.09 through 6.11 except that a TI indication is not received. Additional recording leads closed directly from the line verification circuit to the scanning connector are used to indicate the type of test call being made. Also, since the line verification circuit has set up the transverter, the grounds on the priming leads used for recording are those furnished by the test circuit.

19.22 After the scanning operation has been completed, the operations described in 6.13 and 6.14 take place. The circuit restores to normal as in 19.20, the additional relays operated for the trouble record being released as in 6.15. Removal of ground from the TRB leads permits another call to enter the connector. The STR or STRA lead however, cannot be reclosed until the TRC2 relay releases.

20. TRUNK TEST REGISTER CALLS

SELECTION OF MARKER

20.01 Two markers are assigned for use with the trunk test register circuit. One of these markers is selected under control of a relay in the trunk test register circuit which obtains entry to this circuit for selection of the marker by means of the TTR preference relay. Then the test call is started, the trunk test register circuit connects battery to the TTRP lead, operating the TTR relay subject to the conditions outlined in SECTION I, 2. GENERAL DESCRIPTION OF OPERATION. The TTR relay locks and operates the TTR1 relay over the CIA lead through normal contacts of the ATP, MTP, MON, MTP1, ATP1, TTR1, and LVP1 from ground at the PTP1 normal or from the last provided auxiliary preference relay. The TTR1 locks over its own contact to ground from the last provided auxiliary preference relay.

20.02 Upon operation of the TTR1 relay, the MTL relay operates over the MTL lead from ground on the TS relay normal (Fig. 1) through the CIT relay normal. The MTL relay locks to its own contacts through TTR1 operated. Operation of the TTR1 relay closes the path over which the TS relay upon later operation will signal the trunk test register circuit to proceed with the test call. The MTL relay operated connects ground over the MTL lead through normal contacts of all the MKT relays in series to the MKS lead to the trunk test register circuit. This ground is then closed through a relay in the trunk test register circuit for the desired marker and is returned on the corresponding MKT0, 1 lead, operating the MKT relay for the marker to be connected. This path includes normal contacts of all of the MKT relays. The MKT relay locks through normal contacts of preceding relays to ground at the MTL relay operated, and opens its operating path by opening the MKS lead. The MKT relay also connects ground to the MB lead to the marker to make it busy to subsequent service calls and it operates the CIC and CIT relays. The CIC relay functions as in 18.06. Closures to the RTG and MKR leads are effective only in case a record should be taken. The CIT relay closes another path for operating the ON relay.

20.03 At this point in the call it is necessary to determine whether or not the marker is engaged on a service call and, if it is so engaged, to delay the test call connections until the marker has been released. A test of the MIT lead is made for this purpose, as described below, ground on this lead indicating that the marker is busy. Since this marker may be selected on a service call just as this circuit connects ground to the MB lead, it is further necessary to delay the test of the MIT lead until sufficient time has elapsed to insure that ground has been connected to it under these conditions. This delay is provided by the slow operate TM2 relay and the slow release TM1 relay. When the CIT relay operates it connects the marker MIT lead through MKT operated and TS normal to the winding of the TM relay. This relay operates if ground is present on the MIT lead or, if ground is connected thereto, during the aforementioned interval. If the TM relay operates, there is a possibility that this marker has been seized by a register being tested by the automatic monitor, register, and sender test circuit, in which case a connection to the monitor must be established before the marker can be freed for use by the automatic progression trunk test circuit.

20.04 Therefore, during the interval that the TM relay is operated if any marker grounds the RTST lead indicating a register test call, the RTST relay operates and opens the TTRP start lead to release the TTR relay for the trunk test register circuit. This in turn releases the TTR1, MTL, MKT, and CIT relays. Upon release of the MTL relay, the monitor may operate its preference relay and proceed with the register test call. Upon completion of the register test call, the RTST relay is released and the trunk test register test call may proceed as before.

20.05 The CIT relay operates the TM1 relay through normal contacts of TM2 to ground at TS normal. The TM1 relay operates the TM2 relay which locks and releases the TM1 relay. When the TM1 relay releases, the TM relay, if operated, will delay the test call and, if normal, will allow it to proceed as in 18.07.

TROUBLE RECORD ON THE SERVICE CALL

20.06 This circuit is arranged to make the marker preference relay effective even though the TTR relay is operated. If, under the above conditions, the service call should develop a trouble and require a record the TM relay operated closes ground from operated contacts of the CIT relay, through contacts of TM1 normal and TM2, TM and CIC operated to the PR lead to Fig. 3. This permits the marker to call for a trouble record if the previously connected service call should require this procedure. No other circuits can call for a record as their TRB leads have already been closed.

20.07 If a trouble record is called for the marker preference relay (MPR-) operates from battery on the TRST lead and connects ground to the CI lead. This ground is returned as before on the MKA and MKB leads, operating the MKA, MKB, and MKB1 relays. The operations described in 3.02 through 3.13 take place, except that the CIC relay and the relays which it controls have already been operated and remain operated after the trouble record call disconnects. This leaves the circuit in the same condition as just prior to the start of the service call trouble record.

CONNECTIONS FOR TEST CALL

20.08 If the TM relay is normal when the TM1 relay releases or when it subsequently releases, whether or not a trouble record on the service call has been made, the marker preference relay is made ineffective and the test call is allowed to proceed by operation of the TS relay. This relay operates from battery through its winding, contacts of TM normal, TM2 operated, TM1 normal, and CIT operated to ground. The TS relay locks to the CIT relay operated, removes ground from the TI recording lead, releases the TM2 relay and connects ground to the TS lead to the trunk test register circuit as a signal to that circuit that the test may be started. It also disconnects the marker MIT lead from the TM relay, closes ground through the MKT relay operated to the MT lead to the marker so that it may arrange certain internal connections as required for test call, and it closes ground on the CIB lead from the trunk test register circuit through MKT operated to operate MKB and MKB1.

20.09 The MKB relay operates the B- (Fig. 8 or 150) relays for the marker, and MKB1 operates C- and T- (Fig. 8 or 150), from grounds at CIC and TS. The leads required for the test call are now closed. These include the following:

(a) Leads closed from the marker to the trunk test register circuit by the B-, C-, and T- relays (Fig. 8 or 150). These leads have connecting circuit designations TTR-CM (trunk test register-combined or completing marker) in Tables 1, 1A, and 1B.

(b) The TST lead closed from the trunk link and connector circuit or trunk link connector circuit to the trunk test register circuit.

20.10 Upon closure of these leads the test call is allowed to proceed under control of the trunk test register circuit, which primes the marker and checks the results of means of the leads closed as above. A trouble record is made on a test call if a trouble is encountered.

20.11 If trouble is not encountered, the trunk test register circuit removes battery from the TTRP lead releasing the TTR relay and removing ground from the CIB lead releasing the MKB and MKB1 relays when the test is completed. Release of MKB and MKB1 causes B-, C-, and T- relays of Fig. 8 or 150 to release. Release of TTR releases TTR1, which releases MTL. The release of MTL releases the MKT relay, in turn causing the release of CIC, RON, CIT, TS, ON, RM1, RP1, RMA, RT1, RR1 and RT3, RR3, and RMIS (if provided), thereby restoring the circuit to normal.

RECORD REQUIRED DUE TO TROUBLE

20.12 If a record is required due to trouble, the operating ground for the MKB and MKB1 relays, which is also connected to the MKB lead to the marker, is connected in the marker to the MKA lead back to this circuit operating the MKA relay. The marker preference relay (MPR-) also operates but without effect. The MKA relay operated, causes the functions described in 3.02 and 3.03 to take place except that CIC relay is already operated. The repeating relays operate as in 3.05. With relays CIC, MKA, MKB, and MKB1 operated, ground is closed through TRC and TRC2 normal and TS operated to the STRA lead to the trouble recorder control circuit or to the trouble recorder control and test circuit.

20.13 Closure of ground to the STRA lead causes the functions described in 3.07 through 3.12 to take place. Ground is closed to the TI lead by the trunk test register circuit, in this case, to indicate that this record is due to a trouble. An additional recording lead TTR is closed directly from the trunk test register circuit, to the scanning connector to indicate the type of test call being made. Also, since the trunk test register circuit has set up the marker, the grounds on the priming leads used for recording are those furnished by the test circuit. On a service trouble record these grounds are furnished by service circuits which connect to the marker and are closed through the marker connector relays.

20.14 The circuit restores to normal as in 18.10, except that the MKA relay releases when the marker removes ground from the MKA lead, in turn, causing the MKA1, A- relays (Fig. 8 or 150) and repeating relays to release. The TRC relay releases as in 3.13, in turn, releasing the relays which it controls. Removal of ground from the TRB leads permits another call to enter the connector. The STR or STRA lead, however, cannot be reclosed until ground is removed from the TRC lead, releasing the TRC2 relay.

21. SENDER TEST CIRCUIT TROUBLE RECORDS ON FREQUENCY SHIFT PULSING TESTS

21.01 If a trouble record of the information outpulsed by a sender is to be made on a sender frequency shift pulsing test, the sender test circuit connects battery to the TRST lead. This causes the FSP relay to operate provided that all succeeding preference relays (except PCN) are normal. The FSP locks and connects ground on the CIA lead from preceding preference figures to the CI lead to the sender test circuit if the call obtains preference. The ground on the CI lead causes the sender test circuit to connect ground to the ON, STR, and SRT leads to this circuit and to operate connector relays which cut in the required recording leads.

21.02 Ground on the ON lead operates the ON relay which functions as for other types of trouble record calls. Ground on the STR lead is closed through TRC, TRC2, and ROS normal to the STR2 lead to the sender test circuit and returned on the STRA lead which connects to the STRA lead to the trouble recorder control circuit or the trouble recorder control and test circuit. This closure causes an entry to be made on the trouble recorder card as described in 3.07.

21.03 The recording leads used for a sender test circuit frequency shift pulsing test trouble record are as follows:

(a) The SRT lead which indicates that the record is originated by the sender test circuit. This TR punch is also used for other types of sender-register calls. An FSP call will be distinguished from other types by observing on the perforated card that the only other locations perforated, in addition to the SRT punch and the day and time information, will be the called number information located on the left-side center or both TR cards and designated as in (b) below.

(b) Leads A-, B-, C-, D-, E-, F-, G-, H-, J-, K-0, "1", "2", "4", "7", and M7 which indicate the FSP digits outpulsed by the sender.

21.04 The terminations and locations of the above leads are shown in Tables 1, 1A, and 1B and are indicated by the connecting circuit designations TR-STR (trouble recorder-sender test circuit).

21.05 Upon completion of the trouble record, relays TRC, TRC1, and TRC2 operate as for other trouble record calls. Relay TRC operated connects ground to the TRC lead to the sender test circuit, causing that circuit to open the TRST lead to release the FSP relay. The FSP relay released opens the CI lead to the sender test circuit which in turn removes ground from ON, STR, and SRT leads and releases the connector relays which control the recording leads. Removal of ground on the ON and STR leads causes the master test frame connector to restore to normal in the usual manner.

22. MISCELLANEOUS

NO-TEST CONNECTOR PREFERENCE

22.01 The SP relays of Fig. 7, 39, and 184 are provided to allow only one call for the no test connector circuit to proceed in case of simultaneous or overlapping attempts by two or more circuits. These relays are associated with two special markers; with the master test control circuit; with the line insulation test control circuit; and with the automatic range extension test circuit. They are wired in a conventional preference chain, the lowest numbered relay being in the preferred position to operate from battery on the corresponding SP lead and the highest numbered relay being in the preferred position for returning ground on its SPC lead.

22.02 Figure 39 is required in all installations where the line insulation test control circuit is furnished. On master test frame, Issue 20D (double-sided TR card), Fig. 39 will always be provided and, in offices using single-sided TR cards, beginning with Issue 22D, in converted offices, Fig. 39 will also be provided when automatic progression trunk testing or line verification are provided. The line insulation test control circuit connects to subscriber lines through the no-test connector and it must, therefore, have an appearance in the no test connector preference chain.

22.03 When the line insulation test control circuit requires the use of the no test connector circuit, it connects battery to lead SP, causing relay SP3 to operate and lock if the SP relays of Fig. 7 are normal. The SP3 relay opens the operating path for the SP4 relay and the operating and locking paths for the SP2 relay, it removes ground from the SPC lead to Fig. 7 so that the SP relays for the special markers will not be effective if they should operate, and it connects ground to the G and SPC leads to the line insulation test control circuit. Ground on the SPC lead causes that circuit to connect to a line link frame for testing five lines.

22.04 After a channel is set up through a no-test junctor and a line link in preparation for testing the lines, the no-test connector select magnets, which were operated for this purpose, are released. At this point it is permissible for the special markers to use the no-test connector for setting up calls involving other no-test junctors. The line insulation test control circuit connects ground on the G lead from Fig. 39 to the G1 lead to Fig. 7, thereby allowing the SP0 and SP1 relays to be effective if they should operate.

22.05 The master test control circuit, however, must remain locked out while the line tests are being made, as the line insulation test control circuit uses the same level on the no-test connector switches that is used by master test control circuit. Relay SP3 accomplishes this purpose by preventing the operation of relay SP2 as described above. The automatic range extension test circuit also remains locked out due to SP3 and SP4 relay.

22.06 Upon completion of the test of the last line, relay SP3 is released due to removal of battery from the associated SP lead. This allows the SP2 or SP4 relay to operate if the master test control circuit or automatic range extension test circuit requires the no-test connector. The make-before-break springs 1, 2, and 3, top of the SP3 relay, prevent interruption of the SPC lead ground for marker calls if this relay should release with such a call in progress after the G and G1 leads have been connected.

LOCKOUT BETWEEN LINE INSULATION TEST FRAME AND ASSOCIATED MARKER

22.07 One of the nonspecial markers is associated with the line insulation test control circuit so that the latter can use its multiple to reach the line link and trunk link frames. While the line insulation test control circuit is in operation, this marker is made busy at the marker connectors.

22.08 The TSG lead (option YE or VC) supplies ground from the line insulation test control circuit for the operation of the TS relay. This ground is always present on the TSG lead for test calls for markers other than the marker associated with the line insulation test control circuit and, consequently, these test calls proceed in the usual manner without delay. However, when the line insulation test control circuit is making tests, this ground will be removed from the TSG lead if the marker associated with the line insulation test control should be seized for a direct test call. In this case, the operating ground from the master test control circuit for the MKT or MKT1 relay in the master test frame connector circuit is extended over the MKT lead to the line insulation test control circuit, operating a relay in that circuit.

22.09 The operation of this relay removes the ground from the TSG lead and causes the line insulation test control circuit to stop testing at a convenient point.

22.10 With ground removed from the TSG lead, the TS relay of the master test connector circuit cannot operate and the test call is momentarily delayed. After the line insulation test control circuit has stopped testing and has released the marker, ground is replaced on the TSG lead, operating the TS relay, and allowing the test call to proceed.

A. Excessive Number of Service Trouble Records

22.11 As previously described, the trouble recorder control circuit counts the number of service trouble records received within a time interval. If this number is excessive, it connects ground to the RTOS lead, operating the RTOS relay. This relay connects ground to the TRB lead to the even or odd parts of the master timing circuit and operates RM1, RP1, RT1, RR1 and RT3, RR3, and RMIS (if provided). These operations connect ground to the TRB leads to all markers, pretranslators, transverters and AMA recorders and the TRB1 leads to all route translators and the automatic range extension test circuit. This prevents the acceptance of further service trouble records. Monitor and test call records, however, may be made as ground is not connected to the TRB lead to the monitor circuit and the TRB lead to a marker, pretranslator, or transverter involved in a test call is opened by the MKT, PTT, or TVT relay at the start of such a call. The RTOS relay also bridges the MJ and MN leads to the jack, lamp, and key circuit so that a minor trouble recorder request alarm will be charged to a major alarm and

it prevents the connection of ground to the MTR1 lead to the monitor circuit so that a marker, to which the monitor is connected, will not time out falsely if it should encounter trouble. At the expiration of the time interval measured by the trouble recorder control circuit, ground is removed from the RTOS lead releasing the RTOS relay and, in turn, RM1, RP1, RT1, RR1 and RT3, RR3, and RMIS (if provided).

B. Trouble Recorder Out of Service

22.12 If the trouble recorder circuit or the trouble recorder control and test circuit recognizes an inoperative condition of the trouble recorder, or if it is made busy, ground is connected to the ROS lead operating the RCS relay. This relay connects ground to the TRB1 lead to the monitor circuit to prevent it from calling for trouble records and it operates RM, RP, RT, RR and RT2, RR2, and RMS (if provided). These relays connect ground to the TRB leads to all markers, pretranslators, transverters, route translators, the automatic range extension test circuit, and AMA recorders and to the even and odd parts of the master timing circuit, thereby preventing the start of trouble record calls from these circuits. Test calls may be made under these conditions but no records can be made for them as the grounds on the TRB leads, in this case, are connected directly and not through the MKT, PTT, or TVT relays. The ROS relay also bridges the MJ and MN leads for the purpose described in 10.08, and it connects ground to the MB lead to the trouble recorder control and test circuit as an indication that the inoperative condition has been recognized. When ground is removed from the ROS lead the ROS relay releases, in turn releasing RM, RP, RT, RR and RT2, RR2, and RMS (if provided).

C. Make Busy

22.13 This circuit may be made busy to all trouble record calls by means of the MB jack in the trouble recorder circuit. This connects ground to the ROS lead which causes the functions described in 10.09 to take place. It may be made busy to an individual circuit by means of a jack in the jack, lamp, and key circuit. One of these jacks is provided for each marker, pretranslator, transverter, and AMA recorder, for the even and odd parts of the master timing circuit and for the monitor circuit. Insertion of a plug in one of these jacks causes ground to be connected to the corresponding TRB1 lead to this circuit. These leads appear at Fig. 6 and 41 for the markers; Fig. 36 for the pretranslators; Fig. 25 for the transverters; Fig. 24 for the recorders; Fig. 23 for the timing circuit and Fig. 1 for the monitor. Ground on the TRB1 lead is forwarded to the associated circuit except that for markers, pretranslators, transverters, recorders, and the timing circuit this closure is delayed by the associated MKA, PRA, TVA, RC, or MT- relay operated if a call is in progress until the call is completed.

D. Trouble Recorder Off-Normal

22.14 If a trouble recorder is moved off-normal ground is connected to the ON lead. If this circuit is normal, this ground operates the ON relay through normal contacts of TRC. The ON relay connects ground to the TRB leads to the monitor circuit and to the even and odd parts of the master timing circuit and operates RM1, RP1, RT1, RR1 and RT3, RR3, RMIS (if provided). These relays close ground to the TRB leads to all markers, pretranslators, transverters, and AMA recorders and the TRB1 leads to all route translators and the automatic range extension test circuit.

23. DIAL-TONE MARKERS

23.01 Dial-tone markers are ordinarily associated with the master test connector frame for dial-tone markers, but may be assigned to the basic supplementary master test connector frames under certain conditions. Refer to 1.01 through 1.17.

23.02 When these markers are associated with the basic or supplementary frames, one Fig. 6 marker connector controller, and 16 Fig. 8 marker connector relays, are provided per marker, as for combined or completing markers. The operation of the circuit under such conditions is as described in 3. for a marker trouble record and in 11. for a marker test call, with the following exceptions:

(a) Dial-tone markers use approximately half as many leads as are required for combined markers. The leads which are used may be identified as those which show a connection in Table 1 or 1B, to the A-, B-, C-, and T- relays of Fig. 9.

(b) Leads FRG, CNG, and RGG to the originating and incoming register marker connector circuits, leads FRG, CNG, and SG to the outgoing sender connector circuit, leads NG and NG1 to the number group and connector circuit, and lead MKT to the marker (Fig. 6) are not connected as dial-tone markers do not require them.

(c) Marker connector relays A4, A5, B1, B2, and C3 (Fig. 8) do not operate as battery is not connected to their windings.

See Note 205. None of the leads on these relays is required for dial-tone marker calls.

23.03 When dial-tone markers are associated with the master test connector frame for dial-tone markers, Fig. 41 is used for the marker connector controller and eight Fig. 9 are used for the marker connector relays [see 1.01(c)]. This is for offices having a single-sided TR card. When such an office converts for CAMA and/or operation with second extension trunk link frames, a B6 relay is added (option VL). On the MTF connector using all 286B connector relays (new frame) one Fig. 41 and one Fig. 151 per dial-tone marker are used for marker connector relays. Figure 41 is similar to Fig. 6, except that the leads referred to in 20.06 and 20.07, and leads TRA, DTT-, and DR to the automatic monitor circuit are omitted. The required functions of the MKA and MKA1 relays (Fig. 6) have been combined on the MKA2 relay (Fig. 41) and those of the MKB and MKB1 relays have been combined on the MKB2 relay. The MKA2 and MKB2 relays are arranged to control the multicontact connector relays A-, B-, C-, T- of Fig. 9, for offices using single-sided TR card, and when such an office converts for CAMA and/or operation with second extension trunk link frames, (double-sided TR card) the MKB2 controls, in addition, the B6 relay (option VL) for a converted office. On new frames (double-sided TR card) the MKB2 controls for the A-, B-, C-, and T- relays of Fig. 151. The relays of Fig. 9 replace the corresponding A-, B-, C-, and T- relays of Fig. 8 with respect to the leads required for dial tone markers. The MKT1 relay of Fig. 41 performs the same functions as the MKT relay of Fig. 6. The circuit operation using Fig. 41 and 9 is as described in 3. for a marker trouble recorder and in 11. for a marker test call except for minor differences introduced by the circuit, changes herein described. The relays of Fig. 9 (single-sided TR card or converted offices) are connected to the scanning connector and other points by means of a multiple shown in Tables 1 and 1B. The relays of Fig. 151 (double-sided TR card and new frame) are connected to the scanning connector (Fig. 152) and other points by means of a multiple shown in Table 1A.

23.04 Dial-tone markers are not used for orginating register and sender test calls, intraoffice and outgoing trunk test calls, or incoming trunk test calls - pulsing class, described in 11. for combined and completing markers, for incoming trunk test calls - no pulsing class 12, for monitor and test calls, automatic monitor circuit, class 13.

24. ROUTE TRANSLATOR TROUBLE RECORDS SEIZURE OF MASTER TEST FRAME CONNECTOR CIRCUIT

24.01 When a route translator encounters a cross or times out due to trouble it connects battery to the TRST lead to this circuit. This causes the corresponding RTP relay to operate and lock and to connect ground to the CI lead to the route translator if the preference conditions outlined in SECTION I, 2. GENERAL DESCRIPTION OF OPERATION are met.

24.02 In this case no connector relays are required to be operated in this circuit. This route translator circuit connects ground to the STR and ON leads. Ground connected to the ON lead causes the ON relay to operate which, in turn, operates RM1, RP1, RT1, RR1, RMIS, and RT3, RR3 (if provided). These operations cause ground to be connected to the TRB leads to the monitor circuit, the even and odd parts of the master timing circuit, to each marker, pretranslator, transverter, and AMA recorder and the TRB1 leads to the automatic range extension test circuit and all route translators except the one involved in the call, this path having been opened in the route translator circuit under control of the CI lead. The STR lead is closed through TRC, TRC2, TS, and MON normal to the STR1 lead to the trouble recorder control circuit or to the trouble recorder control and test circuit. This closure causes an entry to be made on the trouble recorder card as described in 3.07.

24.03 The leads required for a route translator trouble record are as follows:

(a) Recording leads closed directly from the route translator to the scanning connector.

(b) Day and time leads DT, DU, HT, HU, MT, and MU "0", "1", "2", "4" and "7" closed directly to the scanning connector from the master timing circuit.

TROUBLE RECORD COMPLETE

24.04 After the scanning operation has been completed, the trouble recorder circuit

or the trouble recorder control and test circuit connects ground to the TRC lead, operating the TRC relay through TRC2 normal. The TRC relay removes ground from the trouble recorder start lead and locks locally to the start lead ground. This locking path is provided so that the trouble recorder will not be continuously restarted if the relays which control the start lead ground should fail to release due to trouble. The TRC relay also operates the TRC1 relay which holds the ON relay, connects ground to the TRC lead to the monitor circuit, and operates TRC2, RM, RP, RT, RR, RMS, and RT2, RR3 (if provided). The TRC2 relay further opens the operating path for the TRC relay, and locks to ground on the TRC lead. The RMS relay connects ground to the TRB lead to the calling route translator circuit.

RETURN TO NORMAL

24.05 When the route translator recognizes ground on the TRB lead it removes battery from the TRST lead, releasing the RTP-relay. This removes ground from the CI lead which, in turn, causes the route translator to remove ground from the ON and STR leads. Ground removed from the STR lead releases TRC and TRC1. Release of TRC1 releases ON, RM, RP, RT, RR, RMS and RT2, RR2 (if provided). Release of ON causes RM1, RP1, RT1, RR1, RMIS and RT3 and RR3 (if provided) to release. When the trouble recorder reaches its normal position, it removes ground from the TRC lead releasing the TRC2 relay, thereby restoring the circuit to normal.

24.06 Another call may enter the connector when the preference relay releases and when ground is removed from the TRB leads. Such a call, however, cannot close the trouble recorder start lead until the trouble recorder has ejected the perforated card and has restored to normal, as indicated by release of the TRC2 relay due to removal of ground from the TRC lead.

25. AUTOMATIC RANGE EXTENSION TEST CIRCUIT TROUBLE RECORDS

SEIZURE OF MASTER TEST FRAME CONNECTOR

25.01 When the automatic range extension test circuit detects unsatisfactory operation of a range extender it connects battery to the TRST lead to this circuit. This causes the REP2 relay to operate and lock and to connect ground to the CI lead to the automatic range extension test circuit if the preference conditions outlined in SECTION I, 2. GENERAL DESCRIPTION OF OPERATION are met.

25.02 In this case no connector relays are required to be operated in this circuit. The automatic range extension test circuit connects ground to the STR and ON leads. Ground connected to the ON lead causes the ON relay to operate which, in turn, operates RM1, RP1, RT1, RR1, RMIS and RT3 and RR3 (if provided). These operations cause ground to be connected to the TRB leads to the monitor circuit, the even and odd parts of the master timing circuit, to each marker, pretranslator, transverter, and AMA recorder and the TRB1 leads to each route translator and the automatic range extension test circuit. The TRB1 lead to the automatic range extension test circuit is opened in that circuit under control of the CI lead. The STR lead is closed through TRC, TRC2, TS, and MON normal to the STR2 lead to the automatic range extension test circuit and returned on the STRA lead which connects to the STRA lead to the trouble recorder control circuit, or to the trouble recorder control and test circuit. This closure causes an entry to be made on the trouble recorder card as described in 3.07.

25.03 The leads required for the automatic range extension test circuit trouble record are as follows:

(a) Recording leads closed directly from the automatic range extension test circuit to the scanning relays.

(b) Day and time leads DT, DU, HT, HU, MT, and MU "0", "1", "2", "4", and "7" closed directly to the scanning connector from the master timing circuit.

A. Trouble Record Complete

25.04 After the scanning operation has been completed, the trouble recorder circuit or the trouble recorder control and test circuit connects ground to the TRC lead, operating the TRC relay through TRC2 normal. The TRC relay removes ground from the trouble recorder start lead and locks locally to the start lead ground. This locking path is provided so that the trouble recorder will not be continuously restarted if the relays which control the start lead ground should fail to release due to trouble. The TRC relay also operates the TRC1 relay which holds the ON relay, connects ground to the TRC lead to the monitor circuit, and operates TRC2, RM, RP, RT, RR, RMS, and RT2 and RR2 (if provided). The TRC2 relay further opens the operating path for the TRC relay, and locks to ground on the TRC lead. The RMS relay connects ground to the TRB lead to the automatic range extension test circuit.

B. Return to Normal

25.05 When the automatic range extension test circuit recognizes ground on the TRB lead it removes battery from the TRST lead, releasing the REP2 relay. This removes ground from the CI lead which, in turn, causes the automatic range extension test circuit to remove ground from the ON and STR leads. Ground removed from the STR lead releases TRC and TRC1. Release of TRC1 releases ON, RM, RP, RT, RR, RMS, and RT2 and RR2 (if provided). Release of ON causes RM1, RP1, RT1, RR1, RMIS, and RT3 and RR3 (if provided) to release. When the trouble recorder reaches its normal position, it removes ground from the TRC lead releasing the TRC2 relay, thereby restoring the circuit to normal.

25.06 Another call may enter the connector when the preference relay releases and when ground is removed from the TRB leads. Such a call, however, cannot close the trouble recorder start lead until the trouble recorder has ejected the perforated card and has restored to normal, as indicated by release of the TRC2 relay due to removal of ground from the TRC lead.

26. AUTOMATIC RANGE EXTENSION TEST

SELECTION OF MARKER

26.01 When the automatic range extension test circuit is used, a particular marker is selected under control of a key in the automatic range extension test circuit, which obtains entry to this circuit for selection of the marker by means of the REP preference relay. When the test call is started, the automatic range extension test circuit connects battery to the REP lead, operating the REP and REP1 relays if the conditions outlined in SECTION I, 2. GENERAL DESCRIPTION OF OPERATION are met. The REP1 relay operates the MTL relay and closes the path over which the TS relay will signal the automatic range extension test circuit to proceed with the test call. The MTL relay operated connects ground over the MT lead through normal contacts of all the MKT relays in series to the MKS lead to the automatic range extension test circuit. This ground is then closed through a key in the automatic range extension test circuit for the desired marker and is returned on the corresponding MKT0-11 leads, operating the MKT relay for the marker to be connected. This path includes normal contacts of all of the MKT relays. The MKT relay locks through normal contacts of preceding relays to ground at the MTL relay operated, and opens its operating path by opening the MKS lead. The MKT relay also connects ground to the MB lead to the marker to make it busy to subsequent service calls and it operates the CIC and CIT relays. The CIC relay functions as in 3.04. Closures to the RTG and MKR leads are effective only in case a record should be taken. The CIT relay closes another path for operating the ON relay.

26.02 At this point in the call it is necessary to determine whether or not the marker is engaged in a service call and, if it is so engaged, to delay the test call connections until the marker has been released. A test of the MIT lead is made for this purpose, as described below, ground on this lead indicating that the marker is busy. Since this marker may be selected on a service call just as this circuit connects ground to the MB lead, it is further necessary to delay the test of the MIT lead until sufficient time has elapsed to insure that ground has been connected to it under these conditions. This delay is provided by the slow operate TM2 relay and the slow release TM1 relay. When the CIT relay operates it connects the marker MIT lead through MKT operated and TS normal to the winding of the TM relay. This relay operates if ground is present on the MIT lead or if ground is connected thereto during the aforementioned interval. If the TM relay operates, there is a possibility that this marker has been seized by a register being tested by the automatic monitor register and sender test circuit, in which case, a connection to the monitor must be established before the marker can be freed for use by the automatic range extension test circuit. Therefore, during the interval that the TM relay is operated, if any marker grounds the RTST lead indicating a register test call, the RTST relay operates and opens the REP start lead to release the REP relay for the automatic range extension test circuit. This in turn releases the REP1, MTL, MKT, and CIT relays. Upon release of the MTL relay, the monitor may operate its preference relay and proceed with a register test call. Upon completion of the register test call, the RTST relay is released and the automatic range extension test call may proceed as before. The CIT relay operates the TM1 relay through normal contacts of TM2 to ground at TS normal. The TM1 relay operates the TM2 relay which locks and releases the TM1 relay. When the TM1 relay release, the TM relay, if operated, will delay the test call as in 26.05.

A. Trouble Record on the Service Call

26.03 This circuit is arranged to make the marker preference relay effective even though the REP relay is operated. If, under the above conditions, the service call should

develop a trouble and require a record the TM relay operated closes ground from operated contacts of the CIT relay, through contacts of TM1 normal and TM2, TM, and CIC operated to the PR lead to Fig. 3. This permits the marker to call for a trouble record if the previously connected service call should require this procedure. No other circuits can call for a record as their TRB leads have already been closed.

26.04 If a trouble record is called for, the marker preference relay MPT- operates from battery on the TRST lead and connects ground to the CI lead. This ground is returned as before on the MKA and MKB leads, operating the MKA, MKB, and MKB1 relays. The operations described in 3.02 through 3.13 take place, except that the CIC relay and the relays which it controls have already been operated and remain operated after the trouble record call disconnects. This leaves the circuit in the same condition as just prior to the start of the service call trouble record.

B. Connection for Test Call

26.05 If the TM relay is normal when the TM1 relay releases, or when it subsequently releases whether or not a trouble record on the service call has been made, the marker preference relay is made ineffective and the test call is allowed to proceed by operation of the TS relay. This relay operates from battery through its winding, contacts of TM normal, TM2 operated, TM1 normal, and CIT operated to ground. The TS relay locks to the CIT relay operated, removes ground from the TI recording lead, releases the TM2 relay and connects ground to the TS lead to the automatic range extension test circuit as a signal to that circuit that the test may be started. It also disconnects the marker MIT lead from the TM relay, closes ground through the MKT relay operated to the MT lead to the marker so that it may arrange certain internal connections as required for test call, and it closes ground on the CIB lead from the automatic range extension test circuit through MKT operated to operate MKB and MKB1.

26.06 The MKB relay operates the B- (Fig. 8 or 150) relays for the marker, and MKB1 operates C- and T- (Fig. 8 or 150), from grounds at CIC and TS. The MKB1 relay also closes the TTG lead from the marker to the TTA lead to the trunk link and connector circuit or trunk link connector circuit. With ground on the TTG lead from the marker now closed, by the operation of the MKB1 relay to the TTA lead, the TTA relay of the trunk and connector circuit will be operated. The leads required for the test call are now closed. These include the following:

(a) Leads closed from the marker to the automatic range extension test circuit by the B-, C-, and T- relays (Fig. 8 or 150). These leads have connecting circuit designations ARET-CM (automatic range extension test-combined or completing marker) in Tables 1B, 1A, and 1E.

(b) Day and time leads DT, DU, HT, HU, MT, and MU "0", "1", "2", "4", and "7" closed directly to the scanning connector from the master timing circuit or time of day circuit.

26.07 Upon closure of these leads the test call is allowed to proceed under control of the automatic range extension test circuit, which primes the marker and checks the results by means of the leads closed as above. A trouble record is made on a test call if a trouble is encountered.

26.08 If trouble is not encountered, the automatic range extension test circuit removes battery from the REP lead, releasing the REP relay, and removes ground from the CIB lead releasing the MKB and MKB1 relays when the test is completed. Release of MKB and MKB1 causes B-, C-, and T- relays of Fig. 8 or 150 to release. Release of REP releases REP1 which releases MTL. The release of MTL releases the MKT relay, in turn, causing the release of CIC, RON, CIT, TS, ON, RM1, RP1, RMA, RT1, RR1, RMIS and RT3 and RR3 (if provided), thereby restoring the circuit to normal.

C. Record Required Due to Trouble

26.09 If a record is required, due to trouble, the operating ground for the MKB and MKB1 relays, which is also connected to the MKB lead to the marker, is connected in the marker to the MKA lead back to this circuit operating the MKA relay. The marker preference relay (MPR-) also operates but without effect. The MKA relay operated, causes the functions described in 3.02 and 3.03 to take place, except that CIC relay is already operated. The repeating relays operate as in 3.05. With relays CIC, MKA, MKB, and MKB1 operated, ground is closed through TRC and TRC2 normal and TS operated to the STRA lead to the trouble recorder control circuit or to the trouble recorder control and test circuit. The STRA lead is used for test call and monitor trouble records whereas the STR lead is used for service trouble records. Either lead causes the trouble recorder to start. Two leads are provided in order that the trouble recorder circuit may count the number of service trouble records called for within a time interval and may refuse to accept further such records during

the remainder of the interval if this number is excessive. It is not desired to include test call and monitor trouble records in this count.

26.10 Closure of ground to the STRA lead causes the functions described in 3.07 through 3.13 to take place. Ground is closed to the TI lead by the automatic range extension test circuit, in this case, to indicate that this record is due to a trouble. Also, since the automatic range extension test circuit has set up the marker, the grounds on the priming leads used for recording are those furnished by the test circuit. On a service trouble record these grounds are furnished by service circuits which connect to the marker and are closed through the marker connector relays.

26.11 The circuit restores to normal as in 18.10 except that the MKA relay releases when the marker removes ground from the MKA lead, in turn, causing the MKA1, A-relays (Fig. 8 or 150) and repeating relays to release, and the TRC relay releases in 3.13, in turn, releasing the relays which it controls. Removal of ground from the TRB leads permits another call to enter the connector. The STR or STRA lead, however, cannot be reclosed until ground is removed from the TRC lead, releasing the TRC2 relay.

27. REMOTE OFFICE TEST LINE OR REMOTE OFFICE TEST LINE REGISTER TESTS

SELECTION OF MARKER

27.01 Two special markers are assigned for use with the remote office test line circuit or remote office test line register circuit. One of these markers is selected under control of a relay in the remote office test line circuit or remote office test line register circuit which obtains entry to this circuit for selection of the marker by means of the RTP preference relay. When the test call is started, the remote office test line circuit or remote office test line register circuit connects battery to the RTP lead, operating the RTP relay subject to the conditions outlined in SECTION I, 2. GENERAL DESCRIPTION OF OPERATION. The RTP relay locks and operates the RTP2 relay over the CIA lead through normal contacts of the ACD, MTP, MON, MTL, MTP1, ACD1, RTP2, ATP1, TTR3, TTR1, LVP1, and REP1 from ground at the PTP1 normal or from the last provided auxiliary preference relay. The RTP2 relay locks over its own contact to ground from the last provided auxiliary preference relay.

27.02 Upon operation of the RTP2 relay, the MTL relay operates from ground on the TS relay normal (App Fig. 1) through the CIT relay normal. The MTL relay locks to its own contacts through RTP2 operated. Operation of the RTP2 relay closes the path over which the TS relay, upon later operation, will signal the remote office test line circuit or remote office test line register circuit to proceed with the test call. The MTL relay operated connects ground through normal contacts of all the MKT relays in series to the AMKS lead to the remote office test line circuit or remote office test line register circuit. This ground is then closed through a relay in the remote office test line circuit or remote office test line register circuit for the desired marker and is returned on the corresponding MKT0 or MKT1 lead, operating the MKT relay for the marker to be connected. This path includes normal contacts of all of the MKT relays. The MKT relay locks through normal contacts of preceding relays to ground at the MTL relay operated, and opens its operating path by opening the AMKS lead. The MKT relay also connects ground to the MB lead to the marker to make it busy to subsequent service calls and it operates the CIC and CIT relays. The CIC relay functions as in 3.04. Closures to the RTG and MKR leads are effective only in case a record should be taken. The CIT relay closes another path for operating the ON relay.

27.03 At this point in the call it is necessary to determine whether or not the marker is engaged on a service call and, if it is so engaged, to delay the test call connections until the marker has been released. A test of the MIT lead is made for this purpose, as described below, ground on this lead indicating that the marker is busy. Since this marker may be selected on a service call just as this circuit connects ground to the MB lead, it is further necessary to delay the test of the MIT lead until sufficient time has elapsed to insure that ground has been connected to it under these conditions. This delay is provided by the slow-operate TM2 relay and the slow-release TM1 relay. When the CIT relay operates it connects the marker MIT lead through MKT operated and TS normal to the winding of the TM relay. This relay operates if ground is present on the MIT lead, or if ground is connected thereto during the aforementioned interval. If the TM relay operates, there is a possibility that this marker has been seized by a register being tested by the automatic monitor register and sender test circuit, in which case a connection to the monitor must be established before the marker can be freed for use by the remote office test line circuit or the remote office test line register circuit.

27.04 Therefore, during the interval that the TM relay is operated, if any marker grounds the RTST lead indicating a register test call, the RTST relay operates, operating RTSB relay, which opens the RTP start lead to release the RTP relay for the remote office test line circuit or remote office test line register circuit. This, in turn, releases the RTP2, MTL, MKT, and CIT relays. Upon release of the MTL relay, the monitor may operate its preference relay and proceed with the register test call. Upon completion of the register test call, the RTST relay is released, releasing RTSB relay, and remote office trunk test or remote office trunk test register call may proceed as before.

27.05 The CIT relay operates the TM1 relay through normal contacts of TM2 to ground at TS normal. The TM1 relay operates the TM2 relay which locks and releases the TM1 relay. When the TM1 relay releases, the TM relay if operated will delay the test call, as in 27.08.

TROUBLE RECORD ON THE SERVICE CALL

27.06 This circuit is arranged to make the marker preference relay effective even though the RTP relay is operated. If, under the above conditions, the service call should develop a trouble and require a record, the TM relay operated closes ground from operated contacts of the CIT relay through contacts of TM1 normal and TM2, TM, and CIC operated to the PR lead to App Fig. 3. This permits the marker to call for a trouble record if the previously connected service call should require this procedure. No other circuits can call for a record as their TRB leads have already been closed.

27.07 If a trouble record is called for, the marker preference relay MPR- operates from battery on the TRST lead and connects ground to the CI lead. This ground is returned as before on the MKA and MKB leads, operating the MKA, MKB, and MKB1 relays. The operations described in 3.02 through 3.13 take place, except that the CIC relay and the relays which it controls have already been operated, and remain operated after the trouble record call disconnects. This leaves the circuit in the same condition as just prior to the start of the service call trouble record.

CONNECTIONS FOR TEST CALL

27.08 If the TM relay is normal when the TM1 relay releases, or when it subsequently releases whether or not a trouble record on the service call has been made, the marker preference relay is made ineffective and the test call is allowed to proceed by operation of the TS relay. This relay operates from battery through its winding, contacts of TM normal, TM2 operated, TM1 normal, and CIT operated to ground. The TS relay locks to the CIT relay operated, removes ground from the T1 recording lead, to the TS lead to the remote office test line circuit or remote office test line register circuit as a signal to that circuit that the test may be started. It also disconnects the marker MIT lead from the TM relay, closes ground through the MKT relay operated to the MT lead to the marker so that it may arrange certain internal connections as required for test call, and it closes ground on the CIB lead from the remote office test line circuit or remote office test line register circuit through MKT operated to operate MKB and MKB1.

27.09 The MKB relay operates the B- (App Fig. 8 or 150) relays for the marker, and MKB1 operates C- and T- (App Fig. 8 or 150), from grounds at CIC and TS. The MKB relay also closes the TTG lead from the marker to the TTA lead to the trunk link and connector circuit or trunk link connector circuit. With ground on the TTG lead from the marker now closed by the operation of the MKB relay to the TTA lead, the TTA relay of the trunk and connector circuit will be operated. The leads required for the test call are now closed. These include the following:

(a) Leads closed from the marker to the remote office test line circuit or remote office test line register circuit by the B-, C-, and T- relays (App Fig. 8 or 150). These leads have connecting circuit designations ROTL-CM or ROTR-CM (remote office test line or remote office test line register-combined or completing marker) in Tables 1, 1A, 1B, 1E, and 1F.

(b) The TST lead closed from the trunk link and connector circuit or trunk link connector circuit to the remote office test line circuit or remote office test line register circuit.

27.10 Upon closure of these leads the test call is allowed to proceed under control of the remote office test line circuit or remote office test line register circuit, which primes the marker and checks the results by means of the leads closed as above. A trouble record is made on a test call if a trouble is encountered.

27.11 If trouble is not encountered, the remote office test line circuit or remote office test line register circuit removes battery from the RTP lead releasing the RTP relay, and removes ground from the CIB lead releasing the MKB and MKB1 relays when the test is completed. Release of MKB and MKB1 causes B-, C-, and T- relays App Fig. 8 or 150 to release. Release of RTP releases RTP2, which releases MTL. The release of MTL releases the MKT relay, in turn, causing the release of CIC, RON, CIT, TS, ON, RM1, RP1, RMA, RT1, RR1, and RT3, RR3, and RMIS (if provided), thereby restoring the circuit to normal.

RECORD REQUIRED DUE TO TROUBLE

27.12 If a record is required due to trouble, the operating ground for the MKB and MKB1 relays, which is also connected to the MKB lead to the marker, is connected in the marker to the MKA lead back to this circuit operating the MKA relay. The marker preference relay MPR- also operates but without effect. The MKA relay operated, causes the functions described in 3.02 and 3.03 to take place, except that CIC relay is already operated. The repeating relays operate as in 3.05. With relays CIC, MKA, MKB, and MKB1 operated, ground is closed through TRC and TRC2 normal and TS operated to the STRA lead to the trouble recorder control circuit or to the trouble recorder control and test circuit. The STRA lead is used for test call and monitor trouble records whereas the STR lead is used for service trouble records. Either lead causes the trouble recorder to start. Two leads are provided in order that the trouble recorder circuit may count the number of service trouble records called for within a time interval and may refuse to accept any further such records during the remainder of the interval if this number is excessive. It is not desired to include test call and monitor trouble records in this count.

27.13 Closure of ground to the STRA lead causes the functions described in 3.07 through 3.12 to take place. Ground is closed to the TI lead by the remote office test line circuit or the remote test line register circuit in this case to indicate that this record is due to a trouble. An additional recording ATKT and ROTL leads are closed directly from the remote office test line circuit or the remote office test line register circuit, to the scanning connector to indicate the type of test call being made. Also, since the remote office test line circuit or the remote office test line register circuit has set up the marker, the grounds on the priming leads used for recording are those furnished by the test circuit. On a service trouble record these grounds are furnished by service circuits which connect to the marker and are closed through the marker connector relays.

27.14 The circuit restores to normal as in 27.11, except that the MKA relay releases when the marker removes ground from the MKA lead, in turn, causing the MKA1, A-relays (App Fig. 8 or 150) and repeating relays to release, and the TRC relay releases as in 3.13, in turn, releasing the relays which it controls. Removal of ground from the TRB leads permits another call to enter the connector. The STR or STRA lead, however, cannot be reclosed until ground is removed from the TRC lead, releasing the TRC2 relay.

28. ACD TROUBLE INDICATOR TROUBLE RECORDS

28.01 If a trouble record of the ACD trouble indicator display is to be made, the test connector circuit for ACD connects battery to the TRST lead. This causes the ACD preference relay to operate, provided that the conditions outlined in SECTION I, 2. GENERAL DESCRIPTION OF OPERATION are met. The ACD relay locks and operates the ACD1 relay over the CIA lead through normal contacts of the preceding preference relays from ground at the PTP1 normal or from the last provided auxiliary preference relay. The ACD1 locks over its own contact to ground from the last provided auxiliary preference relay.

28.02 Operation of ACD1 relay, grounds the TRS1 lead to the ACD test connector circuit. Ground on the TRS1 lead causes the ACD test connector circuit to connect ground to the ON and STR or STRA leads to this circuit and to operate ACD test connector transfer relays required to complete a connection of recording leads from the ACD trouble indicator to the scanning relay contacts of this circuit.

28.03 Ground on the ON lead operates the ON relay which performs functions as described in 3.04. Ground on either STR or STRA lead to the trouble recorder control circuit or trouble recorder control and test circuit causes the functions described in 3.07 and 3.08 to take place. The STR lead is used for service trouble records whereas the STRA lead, which is closed by operation of TS relay, is used for test call trouble records.

28.04 All leads going to the trouble recorder for punch indication purposes must have a ground signal attached. If a lead has a battery signal, it goes through a repeating relay where the signal is converted to a ground signal, then proceeds to the scanning relays. When using a 2/5 trouble record card, certain groups of leads which provide a one-out-of-X indication are connected to a set of conversion relays. These relays convert to leads to a 2-out-of-5 indication scheme. The leads are then connected directly to the scanning relays.

28.05 A trouble record of ACD trouble indicator information can be recorded on either single-sided or double-sided trouble record cards, although all the ACD trouble indicator information will be punched on the front side of the card. The trouble record cards with ACD office trouble information can be identified from the rest of the No. 5 crossbar trouble record cards by a perforated ACD0 punch on the top left hand side of the card. Some locations on the trouble record cards are dual designated. Reference can be made to SECTION III of this CD (list of Functional Meanings of Punches) to determine which designation of a dual designated punch applies to ACD office.

28.06 The leads associated with the ACD office are shown in Tables 1, 1A, 1B, 1E, and 1F of this circuit. These leads have TCC listed in the connecting circuit column.

28.07 Upon completion of the trouble record, relays TRC, TRC1, and TRC2 operate as for other trouble record calls. Relay TRC1 operated, connects ground to the TIR lead to the ACD test connector circuit. Ground on TIR lead causes that circuit to open the TRST lead to release the ACD preference relay, remove ground from ON, STR, or STRA leads, and release the ACD test connector transfer relays which control the recording leads. Removal of ground on the ON and STR or STRA leads causes the master test frame connector to restore to normal in the usual manner.

29. SEIZURE OF MASTER TEST FRAME CONNECTOR CIRCUIT - LAMA TRANSVERTER (MAGNETIC AMA)

29.01 When a transverter encounters a cross or times out due to trouble it connects battery to the TRST lead to this circuit. This causes the corresponding TVP- relay to operate and lock and ground is forwarded to the CI lead to the transverter if the call secures preference. It is returned on the TVA and TVB leads, operating the TVA and TVB relays of the corresponding transverter FS1. These relays are furnished per transverter.

29.02 The TVA relay connects ground to the TV lead to the scanning connector, connects ground to the RC1 and FRG lead to the transverter, and operates the ON and TVA1 relays. The TVA1 relay closes the TM and TVT leads from the transverter to the scanning connector, it connects ground to the DR lead to the scanning connector, and connects ground to the RCCK lead to the transverter to prevent operation of its "display lost" relay. The TVA1 relay also connects ground to the CNG and SG leads to transverter connector circuits, and to the TRG and GG leads to the translator circuit. These grounds are returned on recording leads used for identifying senders, translators, and translator groups which may be involved in the call.

29.03 The ON relay connects ground to the TRB leads to the monitor circuit and operates RM1, RT1, and RR1. The ON relay also grounds the PERF0, 1, or 2 lead (if provided). The RM1, etc, relays connect ground to the TRB leads to all markers, pretranslators, transverters, and trunk controls except the calling transverter and an associated trunk control if one is attached. If a trunk control is attached to the transverter, the RC relay for the trunk control will have been operated as described below and the TRB lead for that circuit will therefore have been opened. The RM1 relay also connects ground to the MTR1 lead to the monitor circuit.

29.04 The TVB relay operated operates the V- relays FS20 thereby closing the associated recording leads to the scanning connector.

29.05 A transverter may call for a trouble record before or after it has established a connection to a trunk control. After such a connection has been made, the occurrence of trouble in either circuit causes the transverter, rather than the trunk control, to call for the trouble record. A trunk control can call for such a record only when it is not attached to a transverter. On a call from a transverter it is necessary to determine either that a trunk control is not attached to the transverter or that a particular trunk control is so attached, in order that the required leads, which differ in these cases, may be closed. This is accomplished by a closure of ground to the RC1 lead to the transverter, 29.02 which is returned on the RNA lead FS24 if a trunk control is not attached, or through the operated trunk control connector relay to the RC lead to this circuit FS24 corresponding to a trunk control which is attached.

29.06 If a trunk control is not attached, the RNA relay operates from ground on the RNA lead as above. It closes a locking path for the ON relay and operates the W- relay FS20 for the transverter through contacts of TVB operated. The W- relay closes the associated recording leads to the scanning connector.

29.07 If a trunk control is attached the corresponding RC relay FS24 operates from ground on the RC lead. This relay is furnished per trunk control. The RC relay connects ground to the corresponding TRCA lead to the trunk control circuit for operating connector relays in that circuit. These relays connect the trunk control to the associated even or odd trunk control multiple and connect ground to the ONL lead to this circuit thereby providing a locking path for the ON relay. The RC relay also connects ground through RCR normal to the DRA- lead to the scanning connector and to the DRT0 or 1 lead, if provided to scanning connector, it holds the ON relay, and operates RTE and RTEA if an even trunk control is involved, or RT0 and RT0A for an odd trunk control. These relays connect the even and odd trunk control multiple, respectively, to the scanning connector. The DRT0, 1 leads are used for both DRT- and DRAT- punch designations. With DRA0-9, a perforation in card location S7, 42 (2/5 double-sided card) or S7, 32 (1/X double-sided card) would be read as DRAT0.

TROUBLE RECORD

29.08 With RNA or an RC relay operated, ground is closed through TVA and TVB operated and TRC, TRC2, TS, and MON normal to the STR lead to the trouble recorder control and test circuit. This causes a trouble record to be made as previously described. Refer to 3.07 through 3.10.

29.09 The leads required for local transverter trouble records are described in 6.10 and 6.11.

29.10 After the scanning operation has been completed, the trouble recorder circuit or the trouble recorder control and test circuit connects ground to the TRC lead, operating the TRC relay through TRC2 normal. The TRC relay removes ground from the trouble recorder start lead and locks locally to the start lead ground. This locking path is provided so that the trouble recorder will not be continuously restarted if the relays, which control the start lead ground, should fail to release due to trouble. This feature is effective on all trouble record calls. The TRC relay also operates the TRC1 relay which holds the ON relay, and operates TRC2, RM, RT, and RR. The TRC2 relay further opens the start lead, opens the operating path for the TRC relay, and locks to ground on the TRC lead.

29.11 The RT and RT2 relays operate to connect ground to the TRB lead to the calling transverter. If a trunk control is attached, ground is connected to its TRB lead by the RR and RR2 or by the RT relay for the emergency trunk control. This closure performs no useful function.

29.12 When the transverter recognizes ground on the TRB lead it removes battery from the TRST lead releasing the TVP- relay, and it opens the TVA lead releasing the TVA relay. Release of TVA releases TRC, TVA1, and RNA or RC. Release of TRC releases TRC1 and in turn releasing RM, RT, and RR. Release of RNA or RC releases the W- relay or the operated RTE and RTEA or RT0 and RT0A. Release of the TVP- relay removes ground from the CI lead to the transverter and therefore from the TVB lead, releasing the TVB relay. This releases the V- relays. The ON relay releases, releasing the RM1, RT1, and RR1 relays, when TVA, TVB, and RNA or RC have released. The ON relay releases also opens the PERF0, 1 or 2 leads (if provided). If a trunk control was attached to the transverter, ground must also be removed from the ONL lead in order for ON to release. This prevents the start of another trouble record call until the operated connector relays have released. When the trouble recorder restores to its normal position, ground is removed from the TRC lead releasing the TRC2 relay.

29.13 Another call may enter the connector when the preference relay releases and when ground is removed from the TRB and TRB1 leads. Such a call, however, cannot close the start lead to the trouble recorder control and test circuit until the TRC2 relay releases.

30. TRANSVERTER TEST CALLS (MAGNETIC AMA)

30.01 Refer to 15.01 through 15.09, LAMA portion using double-sided trouble record card.

31. TRUNK CONTROL TROUBLE RECORDS

31.01 When a trunk control which is not attached to a transverter encounters a trouble, it connects battery to the TRST lead to this circuit. This causes the corresponding RPR- relay to operate and lock, and, if the preference conditions are met, the RCR- relay for that trunk control circuit is operated.

31.02 The RCR relay connects ground to the RCCK lead to the trunk control circuit to prevent operation of its "display lost" relay, and it operates the STC1 relay, if the call is from the emergency trunk control. The RCR relay also operates the RC relay. The RC relay connects ground through RCR operated to the REC and DR leads to the scanning connector and connects ground to the TRCA lead to the trunk control circuit to operate its connector relays, TI0 and TI1. The connector relays in the trunk control connect the trunk control to the associated even or odd trunk control multiple and close ground on the ONL lead back to this circuit. The RC relay also places ground on the DRT0 or DRT1 lead to indicate the tens digit of the trunk control number, and operates the RTE and RTEA or RTO and RTOA relays FS22, which connect the even or odd multiple, as required, to the scanning connector.

31.03 The RC relay also operates the ON relay which locks to ground on the ONL lead. The ON relay then grounds the TRB lead to the monitor circuit and the PERF0, 1, or 2 leads, if provided. The ON relay also operates the RM1, RT1, and RR1 relays which connect ground to the TRB leads to all markers, pretranslators, transverters, and trunk controls, except the calling trunk control, the TRB1 and TRB lead to the recorder and recorder control, and the MTR1 lead to the monitor circuit.

31.04 With RC and RCR operated, ground is closed through TRC, TRC2, TS, and MON normal to the STR lead to the trouble recorder control and test circuit. This causes a trouble record to be taken as described in 3.07 through 3.10.

31.05 The leads required for a trunk control trouble record are shown in Table 1A, 1B, 1E, and 1F of this circuit. These leads have TC listed in the connecting circuit column. If the emergency trunk control is calling, leads TCN- closed through the STC1 and STC3 relays, are required. These leads indicate the trunk control replaced by the emergency circuit.

31.06 After the scanning operation has been completed, the TRC relay operates and functions as in 6.13. Ground is connected to the TRB lead to the calling trunk control by operation of RR. The trunk control then removes battery from the TRST lead, releasing the RPR relay. Release of RPR releases RCR which releases STC1, RC, and TRC. The RC releases RCE and RCEA or RTO and RTOA, and TI0 and TI1 in the trunk control circuit. The TI0 and TI1 release the ON relay, which releases RR1, RM1, and RT1. When the trouble recorder reaches its normal position, ground is removed from the TRC lead, releasing the TRC2 relay, which releases RR, RM, and RT.

31.07 Another call may enter the connector when the preference relay releases and when ground is removed from the TRB leads. Such a call, however, cannot close the start lead to the trouble recorder control and test circuit until the TRC1 relay releases.

32. TRUNK CONTROL TEST CALL

32.01 If, on a trunk control test call, a trouble record is requested, resistance battery is placed on the TRST lead to this circuit. This causes the corresponding RPR- relay to operate and lock, and, if the preference conditions are met, the RCR- relay for that trunk control is operated.

32.02 At this point the test call proceeds as described in 31.02 and 31.03, except that the operation of the TI0 and TI1 relays in the trunk control circuit also send a ground to the recorder and recorder control circuit to operate the TMCB relay in that circuit and a ground to the master test control circuit on the TS lead and back to this circuit on the TS0 lead to operate the TS relay.

32.03 With the RC2 and RCR relays operated, ground is closed through TRC and TRC1 normal and TS operated to the STRA lead to the trouble recorder control and test circuit. This causes a trouble record to be taken as described in 3.07 through 3.10. The recording leads required for a trouble record shown in Tables 1A, 1B, 1E, and 1F have TC listed in the connecting circuit column. If the emergency trunk control is calling, leads TCN- closed through the STC1 and STC3 relays, are required. These leads indicate the trunk control replaced by the emergency circuit.

32.04 After the scanning operation has been completed, the operations described in 31.06 takes place, except that the release of the RECE relay in the master test control circuit releases the TS relay in this circuit, and the release of TI0 and TI1 in the trunk control circuit releases the TMCB relay in the recorder and recorder control circuit. Removal of ground from the TRB leads permits another call to enter the connector. However, the STR or STRA leads cannot be reclosed until the TRC1 relay releases.

33. RECORDER AND RECORDER CONTROL TROUBLE RECORD

TROUBLE BUFFER TROUBLE RECORD

33.01 When the trouble buffer portion of the recorder and recorder control circuit initiates a trouble record, battery is connected to the TRST1 lead to this circuit. This causes the MPB relay to operate and lock, and, if the preference conditions are met, the BC relay is operated. This causes the ON relay to operate.

33.02 The ON relay operated grounds the PER 0, 1, or 2 lead (if provided), and the TRB lead to the monitor circuit. The ON relay also operates RM1, RT1, and RR1. The RM1, RT1, and RR1 relays connect ground to the TRB leads to all markers, pretranslators, transverters, trunk controls, and the recorder and recorder control circuit, except the associated transverter, trunk control, or recorder and recorder control circuit (system control portion) if attached. The RM1 relay also connects ground to the MTR1 lead to the monitor circuit.

33.03 The BC relay operated grounds the CIS and CISC leads to the recorder and recorder control circuit, the TC1 lead to the transverter, and the TC1 lead to the trunk control.

33.04 If a trunk control is attached to the trouble buffer, the ground on the TC1 lead will be passed through the trunk control circuit and back to this circuit on the RC lead to operate the RC relay associated with the attached trunk control. The RC relay connects ground to the TRCA lead to the trunk control circuit for operating the connector relays in that circuit. These relays connect the trunk control multiple and connect ground to the ON lead to this circuit, providing a locking path for the ON relay. The RC1 relay also connects ground through RCR normal to the DRA- leads to the scanning connector and to the DRT0 or 1 lead, if provided, to the scanning connector. The RC relay also operates RTE and RTEA if an even trunk control is involved, or RT0 and RT0A for an odd trunk control. These relays connect the even and odd trunk control multiple, respectively, to the scanning connector.

33.05 If a transverter with a trunk control is attached to the trouble buffer, the ground on the TC1 lead to the trunk control causes the trunk control connections to be made as described in 33.04. The ground on the TC1 lead to the transverter is passed back to this circuit on the TVA and TVB leads to operate the TVA and TVB relays associated with the transverter attached to the trouble buffer. The TVA relay operates the TVA1 relay. The TVA1 relay connects ground to the DR- leads to the scanning connector and operates the V- relays, FS29, thereby closing the associated recording leads to the scanning connector.

33.06 If the system control circuit is attached to the trouble buffer, the ground on the CISC lead will operate the TRC1 relay in the recorder and recorder control circuit, and TRC1 will operate TRC2. These relays connect the system control recording leads to the scanning connector.

33.07 The ground on the CIS lead to the recorder and recorder control will operate the SCI0 and SCI1 relays. These relays connect the trouble buffer recording leads to the scanning connector.

33.08 The SCI0, 1 relays also close ground on the STR lead to this circuit through the TRC, TRC2, TS, and MON normal to the STR lead to the trouble recorder control and test circuit. This causes a trouble record to be made as described in 3.07 to 3.10.

33.09 The leads required for the trouble buffer trouble record are shown in Tables 1A, 1B, 1E, and 1F of this circuit. These leads have RRC listed in the connecting circuit column.

33.10 After the scanning operation has been completed, the TRC relay operates and functions as in 6.13. Ground is connected to the TRB1 lead to the recorder and recorder control by operation of the RT relay. The recorder and recorder control then removes battery from the TRST1 lead, releasing the MPB relay. Release of MPB releases BC which releases the SCI0 and SCI1 relays in the recorder and recorder control circuit.

33.11 If the system control is attached, the BC relay releases the TRC1 relay, which releases TRC2 relay in the RRC. If the trunk control is attached, the BC relay releases the RC relay. The RC relay then releases RTE and RTEA or RT0 and RT0A and the connector relays in the trunk control circuit. If a transverter is attached with a trunk control, BC also releases TVA and TVB. The TVB relay then releases the V- relays.

33.12 The release of the SCI0 and SCI1 relays releases the TRC relay. When the trouble recorder reaches its normal position, ground is removed from the TRC lead, releasing the TRC1 relay.

33.13 Another call may enter the connector when the preference relay releases and when ground is removed from the TRB and TRB1 leads. Such a call, however, cannot close the start lead to the trouble recorder control and test circuit until the TRC1 relay releases.

SYSTEM CONTROL TROUBLE RECORD

33.14 When the system control portion of the recorder and recorder control circuit requests a trouble record, battery is connected to the TRST lead to this circuit. This causes the MPS relay to operate and lock, and, if the preference conditions as described in 2. GENERAL DESCRIPTION OF OPERATION are met, the SC relay is operated.

33.15 The SC relay operates the ON relay which grounds the PERF0, 1, or 2 lead (if provided) and the TRB lead to the monitor circuit. The ON relay also operates the RM1, RT1, and RR1 relays. The RM1, RT1, and RR1 then connect ground to the TRB leads to all markers, pretranslators, transverters, trunk controls, and the TRB1 lead to the recorder and recorder control circuit. The SC relay also connects ground to the CISC lead to the recorder and recorder control to operate the TRC1 relay which operates the TRC2 relay, resulting in the closure of the associated recording leads to the scanning connector.

33.16 The TRC1 relay also closes ground to the STR lead to this circuit through the TRC, TRC1, TS, and MON normal to the STR lead to the trouble recorder control and test circuit. This causes a trouble record to be made as previously described. Refer to 3.07 through 3.10.

33.17 The leads required for system control trouble records are shown in Table 1 of this circuit. These leads have RRC listed in the connecting circuit column.

33.18 After the scanning operation has been completed, the TRC relay operates and functions as in 6.13. Ground is connected to the TRB lead to the recorder and recorder control circuit by operation of RR. The recorder and recorder control then removes battery from the TRST lead, releasing the MPS relay. Release of MPS releases SC which releases the TRC1 relay in the recorder and recorder control. The TRC1 relay releases the TRC2 relay in that circuit and the TRC relay in this circuit. When the trouble recorder reaches its normal position, ground is removed from the TRC lead, releasing the TRC2 relay.

33.19 Another call may enter the connector when the preference relay releases and when ground is removed from the TRB and TRB1 leads. Such a call, however, cannot close the start lead to the trouble recorder control and test circuit until the TRC2 relay releases.

34. MASTER TIMING CIRCUIT TROUBLE RECORDS (MAGNETIC TAPE)

34.01 When master timing circuit encounters trouble with the recorder and recorder control attached and trouble buffer is out of service, the master timing circuit connects battery to the TRST lead to this circuit. This causes the MAGT relay to operate and lock, and if the preference conditions are met, the MMT relay is operated. This causes the ON relay to operate.

34.02 The ON relay operated grounds the PERF0, 1, or 2 lead (if provided), and the TRB lead to the monitor circuit. The ON relay also operates RM1, RT1, and RR1. The RM1, RT1, and RR1 relays connect ground to the TRB lead to all markers, pretranslators, transverters, trunk controls, recorder and recorder control, except the master timing circuit. The RM1 relay also connects ground to the MTR1 lead to the monitor circuit.

34.03 The MMT relay operated grounds the CI lead to the master timing circuit to operate the cut-in relays, TRCI. The master timing circuit in turn sends a ground on STR lead through TRC, TRC2, TS, and MON normal to the STR lead to the trouble recorder control and test circuit. This causes a trouble record to be taken as described in 3.07 through 3.10.

34.04 If the master timing circuit encounters a trouble with recorder and recorder control attached and trouble buffer is available, the trouble buffer stops the progress of the master timing circuit and initiates the trouble record request as described in TROUBLE BUFFER TROUBLE RECORD. With trouble buffer attached a signal is sent to both recorder and recorder control and master timing circuit to operate TRCI cut-in relays.

34.05 The leads required for master timing circuit trouble record are shown in Tables 1A, 1B, 1E, and 1F of this circuit. These leads have MT listed in the connecting circuit column.

34.06 After the scanning operation has been completed, the TRC relay operates and functions as in 6.13. Ground is connected

to the TRB lead to the master timing circuit by operation of the RT relay. The master timing circuit removes battery from the TRST lead, releasing the MAGT relay. Release of MAGT releases MMT which releases the TRCI cut-in relays in the master timing circuit.

(a) If the trouble buffer is attached the TRB signal is returned to both recorder and recorder control and master timing circuit. The master timing circuit releases as described in 34.06 and recorder and recorder control releases as described in 33.10.

34.07 Another call may enter the connector when the preference relay releases and when ground is removed from the TRB and TRB1 leads. Such a call, however, cannot close the start lead to the trouble recorder control and test circuit until the TRC2 relay releases.

35. SEIZURE OF MASTER TEST FRAME CONNECTOR CIRCUIT - LIT - PRINTOUT OF DIRECTORY NUMBER

35.01 The line insulation test control circuit applies battery on the IT lead to place a bid in the preference chain of this circuit for connection to a transverter. If there are no other circuits with a higher priority (lower in the preference chain) than the line insulation test control circuit, referred to from here on in 35. as the LIT circuit, the LIT circuit gains preference and operates the LITV relay. The LITV in operating prepares an operating path for the LIT and LITV1 relays. If ground is extended to the LIT circuit over the CI lead indicating to the LIT circuit that the master test frame connector is ready to serve the LIT circuit the LITV1 relay operates and locks.

35.02 The LITV1 relay in operating prepares an operate path for the test start (TS) relay FS5, applies ground on the TVS lead to the LIT circuit to allow the LIT circuit to select the desired transverter FS8 and prepares an operate path for the DPS relay in the LIT circuit over the TS lead FS6. The LIT circuit selects the desired transverter and connects the TVS lead of FS8 back to the master test frame connector over lead TVT0, 1 lead of FS8 thus operating the proper TVT0, 1 relay of FS8 indicating the desired transverter was idle.

35.03 The TVT0, 1 relay in operating operates the CIT relay FS2, prepares an operate path for the TVB(-) relay FS1 and cuts the TM lead through to the TM relay of FS6 from the transverter. If the transverter and its associated transverter connector are idle the TM relay in the master test frame connector will not operate. The TVT0, 1 also applies ground to the transverter on the MB lead.

35.04 The CIT relay in operating prepares an operate path for the TS relay of FS5 and operates the TM1 relay in FS4. The TM1 (slow-release) and TM2 (slow-operate) compose a timer to allow the master test frame connector to both provide an interval of time to allow this circuit and the connecting circuit to complete proper operation prior to starting the test and at the same time provide a means of releasing and taking a trouble record if the proper operation both in this circuit and the connecting circuits are not completed in time. The time provided from when the TM1 relay operates to the time the TM1 relay releases with the TM2 relay still operated is a minimum of 135 milliseconds to a maximum of 340 milliseconds.

35.05 With the LITV1, CIT, and TM2 relays operated and the TM1 relay released the TS relay of FS5 will operate. The TS relay in operating operates the TVB(-) and applies ground on the TS lead to the line insulation test control circuit and the TVT lead to the transverter FS13.

35.06 The TVB(-) relay in operating operates the V- relays of FS20 or FS21 which are the cut-through relays between the transverter and the line insulation test control circuit.

TEST RECORD

35.07 If the line insulation test control circuit is equipped for TTY operation and not trouble recorder operation for printout of the directory number, the test call is allowed to complete and release normally with the TTY providing the printout of the directory number.

35.08 If the line insulation test control circuit is equipped for trouble recorder printout of the directory number and not TTY operation battery is held on the IT lead to the master test frame connector by the DPS relay in the line insulation test control circuit. As soon as the DNK relay in the LIT circuit operates this same battery is placed on the TRST lead to the master test frame connector maintaining the LIT circuits bid into the master test frame connector and lockout of other circuits.

35.09 The LIT relay operates and locks under control of the line insulation test control circuit. The LIT relay releases the LITV relay which in turn releases the LITV1

relay. The LITV1 relay releases and closes the ground on the CI lead of FS1 to the LIT circuit over the LAL lead. As soon as the LITV relay released the master test frame restored to normal releasing the relays used by the LIT circuit on the test call. As soon as the LIT circuit has a release from the transverter and the LA relay operated from the master test frame connector the LIT circuit will proceed as if taking a trouble record but will actually printout the directory number information.

TROUBLE RECORD

35.10 If trouble is encountered in the normal sequence of operation by the line insulation test control circuit an overall timer is provided in the LIT circuit which will allow the master test frame connector in conjunction with the LIT circuit to force a trouble record as explained in 9. LINE INSULATION TEST FRAME TROUBLE RECORDS.

36. SEIZURE OF MASTER TEST FRAME CONNECTOR CIRCUIT BY INTF - INTERFACE CIRCUIT FOR PROGRAM CONTROLLED DATA ACQUISITION

36.01 The minicomputer via the interface circuit checks for ground on the ON1 lead. If ground is present this circuit appears busy and the minicomputer releases. If the ON1 lead is not grounded then this circuit provides an idle indication to the minicomputer via the interface circuit.

36.02 If this circuit had been idle the ON1 lead is monitored for 80 milliseconds to seconds if this circuit remains idle. If this circuit had remained idle then the interface circuit removes the preference chain ground by opening the OP lead to this circuit.

36.03 The BID relay in the interface circuit monitors the preference chain for any service or test circuits which bid for the use of this circuit while the interface circuit is in operation. The BID relay in the interface circuit is arranged for marginal operation to permit it to operate on a small amount of current through the preference relay of any other circuit that may be bidding for this circuit. This current is not enough to allow the preference relay in this circuit to operate.

36.04 The RCG, the HF1-HF2 loop, and the JCG leads to this circuit are opened. The operate path for the ON and MTR relays of this circuit as well as the trouble recorder start leads STR and STRA are also opened. This is to prevent false relay operation in the service circuit being observed as the trouble recorder punch leads are being scanned.

36.05 The minicomputer may select the desired service circuit via the interface circuit in the following manner. The CM0-11 distribute points in the interface circuit will select one of the completing markers over one of the MKA(-) and MKB(-) leads in this circuit, the DTM0-5 distribute points select one of the dial tone markers over MKA2(-) and MKB2(-) leads of this circuit, the PT(0-7) distribute points select one of the pretranslators over the PRA(0-7) and PRB(0-7) leads of this circuit and the TV(0-9) distribute points select one of the transverters over the TVA(0,1) and TVB(0,1) leads of this circuit for ANI transverters or the TVA(0-9) and TVB(0-9) leads of this circuit for non-ANI transverters.

36.06 Operation of the MKA(-) and MKB(-) relays will operate the associated multicontact cut-through relays for the required completing marker, operation of the MKA2(-) and MKB2(-) relays will operate the required cut-through relays for the dial tone marker requested, operation of the PRA(0-7) and PRB(0-7) relays will operate the cut-through relays for the required pretranslator, operation of the TVA(-) and TVB(-) relays for ANI transverters will operate the required cut-through relays for the requested ANI transverter and operation of the TVA(-) and TVB(-) relays for non-ANI transverters will operate the cut-through relays for the requested non-ANI transverter.

36.07 The minicomputer now gathers information from the selected service circuit by operation of the S0D-S8D distribute points which will operate corresponding scan relays in this circuit over the S0-8 leads.

36.08 If another circuit bids for preference in this circuit while this circuit is connected to the interface circuit the BID relay in the interface circuit will operate. The minicomputer and the interface circuit function together and then the interface circuit releases its bid to this circuit thus allowing the new service request to be served.

36.09 This process of gathering information will continue until the minicomputer decides either by manual indication or through software to stop gathering information. This process is interrupted each time this circuit receives a request for service from either a service circuit or test circuit but will automatically continue when the new request is served and no other bids from either service or test circuits are received by this circuit.

36.10 Scanning trouble information in the automatic trouble analysis (ATA) mode will cancel card operation. This mode of operation is initiated as described in 36.01. Now the interface circuit opens the STR, STRA leads which are the trouble recorder start leads. The interface circuit places the BIDA relay on these leads to monitor for trouble recorder starts. The ROS, ON, and TRC relays in this circuit have their operate paths opened by the interface circuit.

36.11 When a circuit bids for a trouble record the minicomputer via the interface circuit will see the ground on the STR or STRA scan points over the STR or STRA lead from this circuit but will not operate STR1 or STR2 relays. The minicomputer now operates the scan relay in this circuit as described in 36.07.

36.12 After processing the card information the minicomputer decides either to allow the card to be dropped in the office or to cancel the drop of this card. If the card is to be dropped, then the minicomputer releases all the distribute points thus releasing relays in the interface circuit which will allow the STR1 or STR2 relay in the trouble recorder to operate over the STR or STRA lead of this circuit to permit the card to be punched.

36.13 If the card is to be canceled the TRC relay in this circuit is operated by the interface circuit which will cause the service circuit to back out as if the card had been punched without actually punching it.

37. SEIZURE OF THE MASTER TEST FRAME CONNECTOR CIRCUIT BY ETSPD - ETS POWER AND DATA INTERFACE CIRCUIT

37.01 The ETS- power and data interface circuit is connected to this circuit to provide a connection between the central office equipment and the data base generation test box for ETS data base generation only.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 None.

2. FUNCTIONAL DESIGNATIONS

TROUBLE RECORDER CARD DATA

Note: SS - Single-Sided Trouble Recorder Card.

DSF - Double-Sided Front Trouble Recorder Card.

DSR - Double-Sided Rear Trouble Recorder Card

A. Single-Sided Trouble Recorder Card (SS)

Note: In addition to the functional meaning and indication of punch designations shown below, reference may be made to Schematic Table 1, under column headed "Connecting Circuits" (right-hand column) for the circuits from which trouble indications originate. All punch designations are listed alphabetically and are shown with the trouble recorder punch symbol in left-hand column, under "Lead Designation and Trouble Recorder Punch." The designation of the lead over which the trouble indication is transmitted is not always the same as the punch designation. Legend for Table 1 shows the title of connecting circuits that are abbreviated in Table 1.

2.01 "S" Relays:

Card Coordinates	Punch Designation	Functional Meaning and Indication
S8 0	TI	Trouble Indication Trouble encountered on a service, monitored, or test call.
S8 1	MTPT	Marker Transverter Pretranslator Subscriber Line Test Trouble card perforated on: (a) Marker test call. (b) Transverter test call. (c) Pretranslator test call. (d) Customer line test call.
	ROTL	Remote Office Test Line Trouble record perforated on: (a) Remote office test line call or (b) Remote office test line register call.
S8 2	ATKT	Automatic Trunk Test Trouble card perforated on an automatic trunk test call.
S8 3	SRT	Sender-Register Test Trouble card perforated on: (a) Outgoing sender test call. (b) Intermarker group sender test call. (c) Originating register test call. (d) Incoming register test call.
S8 3	DRT	Digit Register Test Indicates a digit register test call (ACD office).
S8 4	TKT	Trunk Test Trouble card perforated on a trunk test call.
S8 5	MLV	Marker - Line Verification Line verification test in the marker stage. The number group cross-connections and the customer class of service on the line link frame are checked.
	ACDO	Automatic Call Distribution Office Trouble card perforated on an ACD trouble indicator trouble record request.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
S8 6	TLV	Transverter - Line Verification Line verification test in the transverter stage. The translator cross-connections are checked.
S8 7	LVF	Line Verification Failure Line verification test failure (unsatisfactory test).
S8 8	LVM	Line Verification Match Line verification test match (satisfactory test).
S8 9	MOR	Monitored Originating Register Automatic monitor was connected to an originating register.
S8 10	MIR	Monitored Incoming Register Automatic monitor was connected to an incoming register.
S8 11	MOS	Monitored Incoming Register Automatic monitor was connected to an incoming sender.
	SSTI	Stuck Sender Trunk Identifier The trouble record was made by the stuck sender trunk identifier circuit.
S8 12	TRS	Transfer Start Marker start lead in a marker connector, a pretranslator start lead in a pretranslator connector, or a transverter start lead in a transverter connector was transferred. This punch does not indicate a service call failure, but with the information given elsewhere on the trouble recorder card it indicates a connector trouble in the normal access paths.
S8 13	GT5	Ground Test Ground test failure on a customer line when such a test is made on a service call.
S8 14	PRT	Pretranslator A pretranslator engaged the trouble recorder.
S8 15	MKR	Marker A marker engaged the trouble recorder.
S8 16	TV	Transverter A transverter engaged the trouble recorder.
S8 17	REC	Recorder An AMA recorder engaged the trouble recorder.
S8 18	TMG	Timing The master timing circuit engaged the trouble recorder.
S8 19-28	DR0-9	Display Registered (a) Number of the pretranslator, transverter, AMA recorder, or master timing circuit or the units digit of the number of the marker connected to the trouble recorder.

Card Coordinates (Cont)		Punch Designation	Functional Meaning and Indication
S8	19-28	DR0-9	(b) On line insulation tests, the number of the marker group with which the line insulation test circuit is associated. The trouble recorder cards for several marker groups may be processed at a common test center. Arbitrary numbers are assigned to these groups for identification purposes.
S8	19-24	DR0-5	Display Registered (c) On ACD office trouble records, the number of the ACD marker circuit connected to the ACD trouble indicator (DR0-5).
S8	29	DR-EMG	Display Registered - Emergency The emergency AMA reorder was connected to the trouble recorder.
S8	30	TM	Timing Closure (a) Timing (TM) lead grounded by a marker connector to which the marker is connected. (b) The TM lead grounded by released MSK, MCK, MAK relays in the marker, indicating a marker connector is attempting to seize this marker or the preference chain through the MSK, MCK, MAK relays is open.
S8	31	CKG	Check Ground Closure Connector Check Ground (CKG2) relay in the marker has operated. Check ground is closed from marker connector relays to provide off-normal grounds and remove certain standing tests.
S8	32	DCK	Double-Connection Check The incoming register Double-Connection Check (DCK) relay operated. Absence of this perforation indicates incoming register DCK relay encountered a double connection in the incoming register link and thus failed to operate.
		CWF	Call-Waiting Feature/Failure The completing marker recognizes that the called customer has call-waiting service. On a dial tone marker operation a call-waiting failure has occurred.
S8	33	GTL	Ground Transmitting Leads Ground Transmitting Lead (GTL) relay in the marker functions to apply ground on transmitting leads to registers or senders.
S8	34	TC1	Traffic Control 1 Marker assumed control of line link marker connector.
S8	35	CHE	Channel End - Junctor Crosspoints Check Channel selection not completed. (CHE)
		JXP1	Junctor Crosspoints Closed. (JXP1)
S8	36	LXP1	Line Crosspoint 1 The LXP relay in the marker did not operate to indicate continuity of the line sleeve to battery through the line hold magnet.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
S8 37	NE	Number End One of the N1A, N2A, N3A, N4A (number translator cut-in auxiliary) relays in the marker operated on an incoming or intraoffice trunk connection. These relays are operated for number group translation of the called number.
S8 38	TRN	Trunk Number Identification The Trunk Number (TRN) relay in the marker operated to pass the trunk number (numerical digits) into the number group for a tandem or toll trunk connection.
S8 39	FCK	Frame Connector Check The cut-in relay of a selected route operated, thus closing the test leads to the trunk link connector frame serving this route.
S8 40	FTCK	Frame Test Check Trunk link frame have been tested for presence of an idle trunk or originating register and at least one frame has an idle trunk or register of the desired route.
S8 41	CK	Check Marker Preference (MP or E) relay on the selected trunk link frame operated.
S8 42	FML	Frame Memory Lock Frame memory lock for trunk link connection (FML) relay in the marker operated to insure a different order of trunk link frame preference for succeeding marker usage.
S8 43	MAK1	Marker Connector Cut-in Both halves of the Marker Cut-in (MCA) relay in the selected trunk link connector operated.
S8 44	TBK	Trunk Block Check A Trunk Block (TB-) relay of the selected trunk link connector operated.
S8 45	TSE	Trunk Selection End None of the marker Trunk Selection (TS0-19) relays operated to indicate that a trunk was selected.
S8 46	LCK	Link Connector Check Link Cut-in (LC-) relay in the selected trunk link connector operated.
S8 47	JCK	Junctor Connector Check Operation of a Junctor Cut-in (JC-) relay in the selected trunk link connector has operated the JCK0 and JCK1 relays in the marker. If CH0 or CH1 operates, JCK0 and JCK1 will release.
S8 48	TCHK	Test Channel Check Marker Test Channel (TCH0-9) relay operated to indicate channel numbers in the selected junctor subgroup associated with the trunk link frame.
S8 49	LK	Left-side Check Left-half Frame Check (LK) relay in the marker operated from an operated Left (L) relay on the selected trunk link frame. This causes the marker to test junctors serving the left half of the trunk link frame.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
S8 50	RK	Right-side Check Right-half Frame Check (RK) relay in the marker operated from an operated Right (R) relay on the selected trunk link frame. This causes the marker to test junctors serving the right half of the trunk link frame.
S8 51	TK	Test Check Necessary functions in the marker have been completed to select a channel. The test check for channels (TK) relay in operating initiates marker functions for channel test.
S8 52	FM	Failure to Match Functional failure of the marker to find an idle channel in available subgroups after permissible retesting.
S8 53	RCY	Recycle Functional failure of the marker during an attempt to recycle because of: (a) Customer line, other than PBX, being connected to a plugging up circuit. (b) Made busy line link frame on toll trunk connection. (c) Failure to match.
S8 54	RA	Route Advance Marker prepared for route advancing.
S8 55	DTK	Dial Tone Check Dial Tone (DT) relay in the line link connector operated.
S8 56	ORK	Registers Check Registers called number checked (ORK).
	RK1	Registration Check 1 No false ground on calling line identification integrity path (RK1).
S8 57	RK2	Registration Check 2 No false battery on calling line identification integrity path. The operation of RK1 and RK2 relays in the marker is a check that all the information that is to be forwarded to the originating register has been transmitted.
S8 58	RK3	Registration Check 3 The RK3 relay in the marker has operated to show that all necessary information has been forwarded and is locked into the originating register. With the RK1 and RK2 indication punched, an absence of the RK3 indicates that the check of locking path in register is incomplete.
S8 59	SNK	Selection Normal Check If not perforated, the marker released the selections made before a recycle took place.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
S7 0	MLF	Mixed Line Frame Line link frame originating this connection serves both dial pulse and multifrequency pulse customers. The MLF perforation will be accompanied by either The D or MF perforation.
S7 1	D	Dial Pulse Frame (a) Line link frame originating this connection serves only telephone sets equipped with dials. First Originating Register Group (b) Indicates the first group of originating registers to the dial tone marker.
S7 2	MF	Multifrequency Pulse Frame (a) Line link frame originating this connection serves only telephone sets equipped for multifrequency key pulsing. Second Originating Register Group (b) Indicates the second group of originating register to the dial tone marker.
S7 3	LIT	Line Insulation Test Trouble recorder card perforated on a line insulation test.
S7 4	2DT	Two-digit Translator On incoming calls, the office code transmitted to the marker is the last two digits of a 3-digit code where the first digit of the 3-digit code has been absorbed by the originating office.
S7 5	ITR	Intraoffice (a) Marker establishing an intraoffice trunk connection. Immediate Trouble Record (b) Trouble record request by operation (ACD Office).
S7 6	RV	Revertive Marker establishing a reverting trunk connection.
S7 7	SOG	Subscriber Outgoing Marker establishing an outgoing trunk connection.
S7 8	TOG	Toll-Tandem Outgoing Marker establishing a toll or a tandem trunk connection.
S7 9	TER	Terminating Marker establishing an incoming trunk connection.
S7 10	ROA	Reorder Marker received reorder indication.
S7 11	SON	Sender Outgoing Outgoing trunk connection requiring a sender or an intraoffice trunk connection with AMA requiring a sender.
S7 12	NSO	No Sender Outgoing Outgoing trunk connection not requiring a sender.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
S7 13	NSI	No Sender Intraoffice Intraoffice trunk connection not requiring a sender.
S7 14	FLG	First Linkage Ground Marker is ready to set up the terminating stage of an intraoffice trunk connection or is ready to set up the linkage on an incoming trunk connection, thus in both cases it is ready to seize the number group. Also operated on a tandem or toll trunk connection.
	PRR	Primary Route Connection Indicates a connection to a primary route (ACD office).
S7 15	SCB	Start Call Back (a) Marker is establishing the originating stage of an intraoffice trunk connection. (b) Marker is establihsing a call back connection to a supplementary route (ACD office).
S7 16	RPB	Register Preference Basic Incoming trunk appears on the basic or the associated supplementary incoming register link frame.
	DRC	Digit Register Connection Increase a connection to a digit register (ACD office).
S7 17	RPAB	Register Preference Auxiliary Basic Incoming trunk appears on the first auxiliary basic or the associated supplementary incoming register link frame.
	LLCK	Line Link Check Ground is closed from line link marker connector relays to the marker (ACD office).
S7 18	RPSA	Register-Preference Second Auxiliary Incoming trunk appears on the second auxiliary basic or the associated supplementary incoming register link frame.
	TTT	Transverter Translator Trap The number setting on the AMA line verification test circuit (transverter) matches a number in the translator.
S7 19,20	DRT0-1	Display Registered Tens - (DRT0, 1) The tens digit of the number of the marker circuit connected to the trouble recorder (DRT0,1).
	DRA0-1	Display Registered Auxiliary DRA0-1 The AMA recorder associated with the transverter when a transverter failure was recorded (DRA0,1). The transverters number is recorded by the DR0-9 punches.
S7 21-28	DRA2-9	Display Registered Auxiliary The AMA recorder associated with the transverter when a transverter failure was recorded. The transverters number is recorded by the DR0-9 punches.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
S7 29	DRA-EMG	Display Registered Auxiliary - Emergency Emergency AMA recorder was attached to the transverter.
S7 30	CGT	Cancel Ground Test Marker canceled ground test as is required on certain types of connections, such as all originating and certain types of terminating calls, or if one of the cancel ground test keys is operated at the master test frame.
S7 31	VTKI	Vertical Group Test Check Only one VGT0-11 relay is locked operated in the marker for vertical group selection.
S7 32	HTK1	Horizontal Group Test Check Only one marker HGT0-9 relay is locked operated for horizontal group slection.
S7 33	FTK1	Vertical File Test Check Only one marker VFT0-4 relay is locked operated for vertical file selection.
S7 34	NR	Number Release Marker Release Number Group (RNG), Trouble Intercept (TBI), Regular Intercept (RI), Blank Number (BN), or Plugged Up Line (PUL) relay operated to release the number group.
S7 35	LFK	Line Link Frame Check Associated Marker Cut-In (MCA) relay operated on the selected line link frame.
S7 36	HGK	Horizontal Group Check One of the HG0-9 relays on associated line link frame operated.
S7 37	LB	Line Busy Called line found busy for an intraoffice or incoming trunk connection.
S7 38	RL	Release Marker grounded the RL lead to the originating register marker connector.
S7 39	HMS1	Hold Magnet Start 1 Marker initiated the operation of selected channel hold magnets.
S7 40	SL	Sleeve (Trunk Link Frame) Closure of trunk link frame trunk switch crosspoints.
S7 41	LXPA	Line Hold Magnet Operation of line hold magnet (LXPA).
	LTR	Light Traffic Light-traffic condition - the marker was idle more than one second from previous seizure (LTR).
S7 42	HTR	Heavy Traffic Heavy traffic condition - the marker was idle less than one second from previous seizure or the marker is establishing the call-back stage of a PBX call.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
S7 43	GLH	Ground Line Hold Magnet Marker started to operate the selected line hold magnet.
S7 44	CON	Continuity Completion of line continuity test.
S7 45	GT2	Ground Text Auxiliary Checks the operation of CON1, CON2, SL, and LLC1 and the nonoperation of LXP1, LXP, and SP relays.
S7 46	DCT	Double-Connection Text Double connection did not exist on the selected channel.
S7 47	DCT1	Double-Connection Test 1 Locks in the indication of a successful double connection test on terminating (call-forward) stage of an intraoffice trunk connection. Also successful similar test on a dial tone connection, an outgoing, or an incoming trunk connection.
S7 48	LK1	Linkage Check 1 Successful completion of linkage between: (a) Calling line and originating register on a dial tone connection. (b) Called line and incoming trunk on an incoming trunk connection. (c) Called line and intraoffice trunk on an intraoffice trunk connection. (d) Calling line and outgoing trunk on an outgoing trunk connection.
S7 49	JXPA	Junctor Crosspoints Check Auxiliary Junctor sleeve continuity to line link frame checked.
S7 50	DCT2	Double-Connection Test 2 Successful completion of a double-connection test on originating (call-back stage of an intraoffice trunk connection).
S7 51	DCT3	Double Connection Test 3 Successful completion of a double-connection test on a tandem or toll trunk connection and the check that the tandem or toll completing path to the outgoing trunk is set up.
S7 52	TRL	(a) Trouble Release Ground placed on TRL lead to marker connector by the marker after a trouble record is taken or an attempt to seize the trouble recorder on first trial failures. This causes the connector to reseize a marker on a second-trial basis. (b) Transverter Release Failure to match trunk number to station number.
S7 53	BT	Busy Tone The marker, by ground BT lead to marker connector, requested: (a) Originating register to return busy tone to calling customer or to release because of a second-trial failure. (b) Incoming register to release because of a second-trial failure.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
S7 53 (Cont)	BT	(c) Line link to release because of a second trial failure.
S7 54	DIS1	Disconnect Marker completed all its functions and is ready to request the associated marker connector to make a normal disconnect.
S7 55	MRL	Marker Release Marker signaled the marker connector over MRL lead to release the associated incoming or originating register.
S7 56	WC	WADS Line Concentrator 2A Trouble record on a line concentrator 2A call. A trouble recorder card mask is required to identify the trouble.
S7 57	WT	Work Timer The marker timed out while trying to complete a function or a group of functions.
S7 58	SDT	Short Delay Timer Marker time-out while trying to seize a line link, trunk link, sender group, or number group.
S7 59	LDT	Long Delay Timer Marker time-out while trying to seize a line link, trunk link, sender group, or number group.
S6 0-1	FR0-1	Connector Frame (a) The incoming register marker connector frame number. (b) The originating register marker connector frame number. (c) The line link marker connector frame number. (d) The pretranslator connector.
S6 2	FR2	Connector Frame (a) The originating register marker connector frame number. (b) The line link marker connector frame number. (c) The pretranslator connector.
S6 3	FR3	Connector Frame (a) The originating register marker connector frame number. (b) Line link marker connector frame number.
S6 4-9	FR4-9	Connector Frame Line link marker connector frame number.
S6 10-12	CN0-2	Connector Number (a) Connector number of following frames: line link marker connector, originating register marker connector, incoming register marker connector. (b) The originating register subgroup on a pretranslator trouble record.
S6 13	CN3	Connector Number Connector number of the following frames: line link marker connector, originating register marker connector, incoming register marker connector.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
S6 14,15	RP	Register Preference Trunk preference for incoming register in a selected horizontal link group. (RP0,1)
	RNT'0,1	Recorder Number Tens Tens number of AMA recorder. (RNT'0,1)
S6 16-18	RP2-4	Register Preference Same as RP0,1.
S6 19-28	CN0-9	Connector - Register-Recorder Start (a) LLMC number. (CN0-9)
	RG0-9	(b) The position of the register (incoming or originating) in a particular connector (RG0-9). (c) The originating register position in the subgroup on a pretranslator trouble record (RG0-9).
	RST0-9	(d) The AMA recorder start lead closed to the master timer when the master timer requested the trouble recorder (RST0-9). (e) The AMA recorder start lead closed to the transverter when the transverter requested the trouble recorder (RST0-9). (f) The regular AMA recorder which has been transferred to the emergency recorder prior to the time the regular AMA recorder called for the trouble recorder. If no AMA recorder transfer takes effect during this call, an operated RST- position will be matched by a correspondingly numbered perforation in the DR- group. If there is a transfer of an AMA recorder to the emergency recorder while handling this call, the RST- perforation will indicate the AMA recorder transferred and the DR-EMG will be perforated to indicate that the emergency recorder is associated and involved in the trouble record (RST0-9).
S6 29	RST-EMG	Recorder Start - Emergency The emergency recorder was associated with the master timer when the master timer called for a trouble record.
S6 30	XCL	Cross Class More than one CL- (OP/5P, OS/5S) lead in the marker is grounded.
S6 31	SCR	Cross-Code Route More than one CR- (OP/4P, OS/4S) lead in the marker is grounded.
S6 32	XDL	Cross Deletion More than one DL- (OP/6P, OS/6S) lead in the marker is grounded.
S6 33	XMB	Cross-Message Billing More than one message billing index is recorded in the marker.
S6 34	XCP	Cross-Code Pattern More than one CP- (OP/4P, OS/4S) lead in the marker is grounded.
S6 35	XOB	Cross-Service Observation Both the NOB and OBS (observation) relays in the marker operated.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
S6 36	XTV	Cross-Transverter - Service Class Both the Transverter Test (TVA) and Service Class (SCC) relays in the marker operated.
	XI	Cross on ITR Lead False ground on the Immediate Trouble Record (ITR) lead to digit register (ACD office).
S6 37	XT5	Cross-Transmission False grounds on unused transmission leads to outgoing sender connector.
S6 38	XTB	Cross-Trunk Block More than one Trunk Block (TB-) relay in the marker operated.
S6 39	XTG	Cross-Trunk Group More than one Trunk Group (TG-) relay in the marker operated.
S6 40	XTB1	Cross-Trunk Block Leads Cross TB- leads to trunk link frame. (Checks for flase battery.)
S6 41	XTG1	Cross-Trunk Group Leads Crossed TG- leads to trunk link frame. (Checks for false grounds.)
S6 42	XJC	Cross-Junctor Connector Leads Crossed Junctor Connector (JC-) leads to trunk link frame.
S6 43	XJG	Cross-Junctor Group Leads Crossed Junctor Group (JG-) leads to trunk link frame.
S6 44	XJS	Cross-Junctor Select Magnets Crossed Junctor Switch Select Magnet (JS-) leads to trunk link frame.
S6 45	XLR	Cross Left- and Right-Sides Crossed Left (L) and Right (R) leads to their respective relays on the trunk link frame.
S6 46	XTS	Cross-Trunk Switch Select Magnets A false cross to battery on ASM, BSM, or TSX (select magnet battery) leads to trunk link frame.
S6 47	XLC	Cross-Link Connector Crossed Link Connector (LC-) leads to trunk link frame.
S6 48	XLV	Cross-Level Leads Crossed Level (LV-) leads to trunk link frame.
S6 49	XAB	Cross-A and -B Side Simultaneous operation of FAK and FBK relays in marker.
S6 50	XF	Cross-Frame Crossed Regular Frame (RF) and Extension Frame (EF) leads to trunk link frame.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
S6 51	XSL	Cross-Sleeve Trunk False ground on AST or BST leads to trunk link frame.
S6 52	XTS1	Cross-Trunk Selection False ground on TSX- (trunk select magnet) lead to trunk link frame during trunk selection.
S6 53	XPT	Cross-Incoming Trunk Class Crossed or falsely grounded incoming trunk class and AMA recorder number leads to trunk link frame.
S6 54	XRS	Cross Ringing Select Magnet Leads Cross Ringing Selection Magnet (RS-) leads to trunk link frame.
S6 55	XRS1	Cross Ringing Select Magnet Selections Both RS0 and RS1 and/or more than one RS2-9 relays in the marker operated.
S6 56	XFT	Cross FTC Leads An unused FTC lead in the selected trunk link frame is falsely grounded or that the marker was directed to a trunk link frame that does not include any trunks for the route.
S6 57	XCH	Cross-Channel Test False ground on any J0-9 and/or LH0-9 leads to trunk link frame and/or LL0-9 lead to line link frame.
S6 58	XVGA	Cross Vertical Group A Crossed Vertical Group Relay for Originating Call (VGA-) leads to line link marker connector.
S6 59	XVGB	Cross Vertical Group B Crossed Vertical Group Relay for Class of Service (VGB-) leads to line link marker connector. (XVGB)
	XCW	Cross Call-Waiting A cross exists in the call-waiting link circuit. (XCW)
S5 0-9	CN10-19	Connector - Register - Recorder Start (a) LLMC member. (CN10-19)
	RG10-19	(b) Number of incoming register within the marker connector. (RG10-19) (c) On a pretranslator trouble record the originating register position in the groups. (RG10-19)
	RST10-19	(d) The AMA recorder start lead closed to the transverter when the transverter requested the trouble recorder. (RST 10-19) (e) The regular AMA recorder which has been transferred to the emergency recorder prior to the time the regular AMA recorder called for the trouble recorder. If no AMA recorder transfer takes effect during this call, an operated RST-position will be matched by a correspondingly numbered perforation in the DR- group. If there is a transfer of an AMA recorder to the emergency recorder while handling this call, the RST-perforation will indicate the AMA recorder transferred and the DR-EMC will be perforated to indicate that the emergency recorder is associated and involved in the trouble record. (RST10-19)

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
S5 10	RG20 PCR	Register-Pulse Conversion, Revertive (a) On a pretranslator trouble record the originating register position in the groups. (RG20) (b) Incoming register has signaled the marker that it is serving a PCR class of trunk which requires revertive outpulsing with the aid of a revertive pulse outgoing sender. (PCR)
S5 11	RG21 PCD	Register-Pulse Conversion, Dial (a) On a pretranslator trouble record the originating register position in the groups. (RG21) (b) Incoming register has signaled the marker that it is serving a PCD class of trunk which requires dial outpulsing with the aid of a dial pulse outgoing sender in one group. (PCD)
S5 12	RG22 PCD1	Register-Pulse Conversion, Dial (a) On a pretranslator trouble record the originating register position in the groups. (RG22) (b) Incoming register has signaled the marker that it is serving a PCD class of trunk which requires dial outpulsing with the aid of a dial pulse outgoing sender in a second group. (PCD1)
S5 13	RG23 ECN	Register-Even Connector (a) On a pretranslator trouble record the originating register position in the groups. (RG23) (b) Even-numbered marker connector is associated with the incoming register. This steers the marker to a preferred number group to obtain the equipment location of a tandem or toll incoming trunk. (ECN)
S5 14	OCN	Odd Connector Odd-numbered marker connector is associated with the incoming register. This steers the marker to a preferred number group to obtain the equipment location of a tandem or toll incoming trunk.
S5 15-19	HT0,1,2,4,7	Trunk Hundreds (a) Hundreds Trunk (HT-) lead grounded by the incoming register to aid the marker in locating the line appearance of this tandem or toll trunk for the completion of the call. (b) The HT- lead (of subscriber-to-trunk intermarker group trunk) grounded by intermarker group sender.
S5 20-24	TT-T0,1,2,4,7	Trunk Tens (a) The tens trunk (TT-) lead grounded by the incoming register to aid the marker in locating the line link appearance of this tandem or toll trunk for the completion of the call. (b) The Tens (T-) lead grounded by call identity indexer via the AMA recorder for identifying the trunk attached to the AMA recorder. (c) The TT- lead of subscriber-to-trunk (intermarker group trunk) grounded by outsender link in calling marker group.
S5 25-29	UT-U0,1,2,4,7	Trunk Units (a) The Units Trunk (UT-) lead grounded by the incoming register to aid the marker in locating the line link appearance of this tandem or toll trunk for the completion of the call.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
S5 25-29 (Cont)	U0,1,2,4,7	(b) The Units (U-) lead grounded by call identity indexer via AMA recorder for identifying the trunk attached to the AMA recorder.
	UT0,1,2,4,7	(c) The UT- lead of subscriber-to-trunk (intermarker group trunk) grounded by outsender link in calling marker group.
S5 30	XHG	Cross-Horizontal Group More than one Horizontal Group (HG-) relay operated in line link connector.
S5 31	XLG	Cross-Line Group More than one Line Group Connector (LG-) relay operated in line link connector.
S5 32	XCS	Cross Class of Service More than one Class of Service (CS-) relay in the marker operated due to crossed CS- leads in line link frame. Cross Class Information False ground or a cross on a class-of-service leads to digit register (ACD office).
S5 33	XLS	Cross Line Select Magnets Crossed Select Magnet (SM-) leads to line link frame.
S5 34	XLH	Cross Line Hold Magnets Crossed Line Hold (LH-) leads to line link frame on dial tone connection under light traffic condition (provisional).
S5 35	XLO	Cross Lockout False ground on LO, LOB, LOK, G leads to LO (Lockout for dial tone connections) relay in line link frame.
S5 36	XFTT	Discontinued
S5 37	XFUT	Cross-Frame Units and Tens Test More than one Frame Units Test (FUT-) or Frame Tens Test (FTT-) relay in the marker operated.
S5 38	XRCT	Discontinued
S5 39	XSS	Cross Sender Select Magnets Crossed Sender Select Magnet (SS-) leads to sender link via trunk link frame. (XSS)
	SXT	Standing Cross Test There is a false ground on the CWK lead between the marker and the call-waiting circuit. (SXT)
S5 40	XS	Cross-Sender Connector More than one Sender (S-) relay in an outgoing sender connector operated. (XS)
S5 41	XSA	Cross Sender Connector Relay (a) More than one AMA relay in an outgoing sender connector operated. (b) More than one Pulse Conversion Control (PC) relay in an outgoing sender connector operated. (XSA)
	XHM	Cross Hold Magnet More than one CWH hold magnet in the call-waiting link are crossed - the magnets are not operated. (XHM)

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
S5 42	XN	Cross-Number Control Mismatch due to more than one called-number control relay (TBIA, RIA, TNRI, NE, OAN, OBN) being operated in the marker.
S5 43	XFG	Cross-Frame Group Simultaneous operation of FG0 and FG1 (trunk frame group) relays in the marker.
S5 44	XPG	Cross-Pattern Group Operation of more than one pattern (PA, PB, PC, PNR) relay in the marker.
S5 45	XPTN	Cross-Pattern Relays Operation of more than one Pattern (P-) relay in the marker.
S5 46	XT	Cross-Translation Control Operation of more than one translation control (THC, PHC, OA, OB, X11, 11X, TC5, TC6, TC7) relay in the marker.
S5 47	XCLC	Cross-Class Control Operation of more than one class control (OR, TNA, TOL, INC, RO) relay in the marker.
S5 48	XCKR	Cross or Ground on Class Check Circuit False ground on class check circuit during a dial tone connection. Ground is on the class check circuit during intraoffice and outgoing trunk connections.
S5 49	XTC	Cross-Traffic Control False ground on Traffic Control (TC) lead to line link marker connector.
S5 50	XTC1	Cross Traffic Control Auxiliary False ground on Traffic Control (TC1) lead to line link marker connector.
S5 51	XTRK	Cross First-Trial Check Lead False ground on First-Trial Check (TRK) lead to marker connectors when marker is functioning on a second trial.
S5 52	XTRL	Cross-Trouble Release False ground on Trouble Release (TRL) lead to marker connectors.
S5 53	XBT	Cross-Busy Tone False ground on Busy Tone (BT) lead to marker connector.
S5 54	XRL	Cross-Release False ground on Release (RL) lead to originating register marker connector.
S5 55	XMRL	Cross-Marker Release False ground on Marker Release (MRL) lead to marker connector.
S5 56	XAN	Crossed Allotter Number (a) Failure to match between marker and number group indication on allotted PBX numbers. (b) Two or more allotted number relays operated.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
S5 57	FCG	False Cross and Ground Marker FCG relay had operated due to trouble on tip or ring of selected channel prior to line hold magnet operation.
S5 58	SQA	Sequence Advance Marker Sequence Advance (SQA) relay remained operated long enough for SQA1 relay to release (an abnormal length of time), thus indicating a failure in the sequence advance circuit.
S5 59	LR	Link Release Incoming register link has encountered a trouble condition and the incoming register, after a timing period, has sent a trouble indication to the marker.
S4 0	LT	Local Translator (a) A register has directed the marker to employ its local translator for this connection. (b) The pretranslator signals the register that the translation is for a home area code. (c) The LT is always perforated on pretranslator trouble records if LT and 11X relays are not equipped in the pretranslator.
	SDG	Single Digit Indicates a single digit call (ACD office). (SDG)
S4 1	TT	Toll Translator A register has directed the marker to employ its toll translator for this connection.
S4 2	FVD	Five-digit Translator A register has directed the marker to employ its 5-digit translator for this connection.
S4 3	X11	Service Code Translator A register has directed the marker to employ its service code translator for this connection.
S4 4	11	11 Translator (a) A register has directed the marker to employ its 11 translator for this connection. (b) A pretranslator signals the register that the translation is for a directing code.
S4 5	OA	Office A On an incoming trunk connection, the office unit to which a marker is to complete the connection.
S4 6	OB	Office B On an incoming trunk connection, the office unit to which a marker is to complete the connection.
S4 7	PHC	Physical Office The incoming register directed the marker to complete the connection to the physical subdivision of the directory number series for an office unit.
S4 8	THC	Theoretical Office The incoming register directed the marker to complete the connection to the theoretical subdivision of the directory number series for an office unit.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
S4 9	OR	Originating The originating marker connector notified the marker that this is an originating connection.
S4 10	TAN	Tandem The incoming register notified the marker that this connection is from a tandem trunk.
S4 11	TOL	Toll The incoming register notified the marker that this connection is from a toll trunk.
S4 12	INC	Local Incoming Incoming register notified the marker that this connection is from an incoming trunk.
S4 13	RO	Reorder Incoming register signaled the marker for a reorder (overflow) signal.
*S4 14	TRK	First-Trial Check - Direct Distance Dialing Check (a) Marker connector signals the marker that this is a first trial. (TRK) (b) Pretranslator indicates that this is a first trial. (TRK)
	FAC	(c) Originating register informed the marker that it is handling a direct distance dialing call. (FAC)
*S4 15	TR2	Second Trial (a) Marker connector signals the marker that this is a second trial. (TR2) (b) Pretranslator indicates that this is a second trial. (TR2)
	LT1	Local Translation Access 1 Digit 1 Access Code. (LT1)
S4 16	TOBS	Trunk Observed - Service Observation 1 Call may be trunk observed (for WS markers) (TOBS).
	OBS1	Service Observation 1 Marker received a service observation indication from the service observing circuit on a dial tone connection. (OBS1)
S4 17	TOB	Trunk Observed - Service Observation 2 Call is being trunk observed (for WS markers) (TOB).
	OBS2	Service Observation 2 Marker passed the service observation indication on to the originating register. (OBS2)
S4 18-19	FG0-1	Trunk Link Frame - Tens Ground on a Trunk Frame Group (FG-) lead from the incoming register provides the trunk link frame tens identification. (Equipped when there are more than ten trunk link frames.)

*The TRK and TR2 punch indications also appear at R2 33 and R2 34, respectively. The appearance of these designations at R2 33 and R2 34 show the STD arrangement while the appearance at S4 14 and S4 15 show the MD arrangement.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
S4 20-24	TF0,1,2,4,7	Trunk Link Frame - Units Ground on Trunk Frame Units (TF-) leads from the incoming register provides the trunk link frame units identification.
	CD0,1,2,4,7	Control Digit A control digit registered within the marker by a digit register (ACD office).
S4 25-29	LL0,1,2,4,7	Line Linkage The line link used on a dial tone connection. This information, which was stored in the register while the call was being set up, is passed back to the marker after dialing, to indicate that this part of the channel is to be considered idle when making channel test for the originating (call-back) stage of an intraoffice trunk connection or a subscriber outgoing trunk connection. (LL-)
	TH0,1,2,3	Trunk Thousands Thousands digit of the trunk number. (TH-)
S4 30-33	FTT0-3	Frame Tens Test (a) The FTT- relay operated in the marker to aid in closing through the Start (ST-) lead to the line link connector. One FTT- and one FUT- perforation identifies the line link frame. (b) Locates the line in trouble in terms of the tens digit of the line link frame on line insulation tests.
	RTE0,1,2,4	Class Transmission Method (c) The method by which the class information is transmitted (ACD office).
S4 34-43	FUT0-9	Frame Units Test (a) The FUT- relay operated in the marker to aid in closing through the ST- lead to the line link connector. One FTT- and one FUT- perforation identifies the line link frame. (b) Locates the line in trouble in terms of the units digit of the line link frame on line insulation tests.
S4 34-38	FUT0,1,2,4,7	Frame Units Test (c) The frame units of the line link frame associated with the calling line as registered in the marker (ACD office). (on 2/5 basis)
S4 44	TPT	Tip Party Translator Transverter is signaled that this is a tip party call. (TPT)
	PS1	Permanent Signal Auxiliary Passed first permanent signal ground test. (PS1)
S4 45-59	RCT1-15	Ringing Control Ringing Control (RCT-) relay operated in the marker, from the number group, for proper ringing control.
S3 0	PS	Permanent Signal Originating register signals the marker to select a permanent signal route due to failure to start dialing in the allotted time.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
S3 1	PD	Partial Dial Originating register signals the marker to select a partial dial route due to failure to complete dialing in the allotted time.
S3 2	PK	Partial Dial Permanent Signal Check Originating register signals the marker that the dialing functions were completed in the allotted time.
S3 3	CR	Coin Returned Originating register signals the marker that the coin was satisfactorily returned.
S3 4	SCN	Stuck Coin Originating register signals the marker that there is a coin return failure.
S3 5	SCK	Stuck Coin Check Originating register signals the marker that there is no stuck coin or coin return failure.
S3 6	MAN	Manual Marker has received the class-of-service group of a calling line and proceeds to signal the originating register, on a dial tone connection, that this is a manual class of call. This causes the register to cancel dial tone and immediately reseize a marker and request an operator trunk.
	NSP	Nonsample Peg Count Call was not sampled for traffic purposes.
S3 7	2P	Two-Party Marker has received the class-of-service group of a calling line and proceeds to signal the originating register, on dial tone connection, that this is a 2-party class call and thus the register is to make the party identification test.
	SPC	Sample Peg Count WADS call was sampled for traffic purposes.
S3 8	OBS	Observed (a) Originating register signals the marker that this call is up on service observation. (b) Outgoing sender signals the transverter that this call is up on service observation. (AMA, ANI)
S3 9	NOB	Nonobserved (a) Originating register signals the marker that this call is not up on service observation. (b) Outgoing sender signals the transverter that this call is not up on service observation. (AMA, ANI)
S3 10	CNR	Coin Return Marker signals the originating register to return the coin.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
S3 11	CM3	Call Marker After Three Digits If perforated alone, the pretranslator signaled the register to call the marker after three digits and not to return the coin on coin lines. If accompanied by the SD perforation, the register is to call the marker after three digits, but before doing so, to return the coin on coin lines.
S3 12 S3 13 S3 14	CMA CMB CMC	Call Marker Start - Indexes A, B, and C The pretranslator signals the originating register when to call the marker. This may represent any number of digits, as determined by the originating register cross-connections.
S3 15	SD	Stations Delay (a) Pretranslator set the originating register for stations delay when CMA, CMB, or CMC is perforated. (b) Pretranslator signals the originating register to return the coin on coin lines when CM3 is perforated.
S3 16	PCK	Pretranslator Connector Check Pretranslator connector was attached.
S3 17	PRL	Pretranslator Release Pretranslator signaled the originating register to release.
S3 18	RLK	Release Check (Pretranslator Function) Release relay in the originating register operated; also used for a trouble release.
S3 19	PTR	Pretranslator Connector Second Trial Pretranslator signaled pretranslator connector to make a second trial.
S3 20	XX	Cross-Detection Operation of a cross-detecting relay within the pretranslator circuit.
S3 21	TST	Test Call Incoming register signals the marker that this is a test connection.
S3 22	M	Monitored The connection is being monitored.
S3 23	SPL	Special Incoming register signals that this is a no-test or no-hunt call requiring a special marker.
	NID	Not Automatically Identified Outward Dialing Calling party is not associated with 101 ESS group control.
S3 24	NC	Discontinued (NC)
	CSW	Cancel Ringing Switch (CSW) Ringing selection switch not required on this call.
S3 25	NT	No Test Incoming trunk signals the marker that this call is to be a no-test connection.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
S3 26	NTT	No-test Train Marker uses a no-test linkage to complete this connection.
S3 27	MPT	Message Potential Test Message Potential Test (MPT) relay in the marker operated due to a message registration taking place while the marker was making a line sleeve potential check prior to establinsing a no-test connection.
	AIS	Automatic Intercept Call routed to automatic intercept sender.
S3 28	NH	No Hunt The incoming trunk signals the marker that there is to be no PBX hunting on this call.
	AID	Automatic Identified Outward Dialing Calling party is automatically identified for charging purposes by 101 ESS group control.
S3 29	NN	Non-No Test Incoming trunk signals the marker that there is a regular test incoming trunk arranged for PBX hunting.
S3 30-41	VGT0-11	Vertical Group Test (a) The marker Vertical Group Identification Test (VGT-) relay operated from the number group to identify the vertical group of the called line. (b) The marker VGT- relay operated on the originating (call-back) stage of a reverting, intraoffice, or subscriber outgoing trunk connection from the calling line location registered in the marker. (c) The marker VGT- relay operated on a dial tone connection from the line, line link, and connector. (d) Identifies the line in trouble in terms of its vertical group location on line insulation tests.
S3 42	CGA	Class Group A In conjunction with the CS-, or CT-, and CU- punches, identifies the class of service as being within the first 30 classes of service. (CGA)
	VGT12	See Vertical Group Test (VGT12).
S3 43	CGB	Class Group B In conjunction with the CS-, or CT- and CU- punches, identifies the class of service as being within the second 30 classes of services. (CGB)
	VGT13	See Vertical Group Test (VGT13).
S3 44	RPT	Ring Party Translator Transverter was signaled that this is a ring party call. (AMA,ANI)
S3 45-54	HGT0-9	Horizontal Group Test (a) The marker Horizontal Group Identification Test (HGT-) relay operated from the number group to identify the horizontal group of the called line. (b) The marker HGT- relay operated on the originating (call-back) stage of a reverting, intraoffice, or subscriber outgoing trunk connection from the calling line location registered in the marker.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
S3 45-54 (Cont)	HGT0-9	(c) The marker HGT- relay operated on a dial tone connection from the line, line link, and connector. (d) Identifies the line in trouble in terms of its horizontal group location on line insulation tests.
S3 55-59	VFT0-4	Vertical File Test (a) The marker Vertical File Identification Test (VFT-) relay operated from the number group to identify the vertical file of the called line. (b) The marker VFT- relay operated on the originating (call-back) stage of a reverting, intraoffice, or subscriber outgoing trunk connection from the calling line location registered in the marker. (c) The marker VGT- relay operated on a dial tone connection from the line, line link, and connector. (d) Identifies the line in trouble in terms of its vertical file location on line insulation tests.
S2 0-2	FR0-2	Sender or Transverter Connector Frame (a) The number of the ourgoing sender connector frame. (b) The number of the transverter connector frame.
S2 3	FR3-CN3	Transverter Connector Frame (FR) Connector Number (CN) (a) The number of the outgoing sender connector frame. (b) The number of the transverter connector frame. (c) Connector number in outgoing sender connector (Wire spring).
S2 4-5	CN0-1	Connector Number (a) Particular connector number (letter) in the outgoing sender connector frame. (0 corresponds to A; 1 corresponds to B). (b) Particular connector number in the outgoing sender connector frame (For wire spring connectors). (c) Particular connector number in the transverter connector frame.
S2 6	CN2	Connector Number (a) Particular connector number in the transverter connector frame. (b) Particular connector number in outgoing sender connector frame (For wire spring connectors).
S2 7	S0	Sender Position of the particular sender in the outgoing sender connector or transverter connector.
S2 8-16	S1-9	Sender (a) Position of the particular sender in the outgoing sender connector or transverter connector. (b) Indicates the type of test and the range used on line insulation tests.
S2 17-19	S10-12	Sender Position of the particular sender in the outgoing sender connector or transverter connector.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
S2 20	LST	Lettered Stations (a) Operation of the Four Digits Plus Lettered Stations (LST) relay in the outgoing sender for AMA functions. (A&M Only) (b) Information code 411 call.
S2 21	L5D	Lettered Stations or Five Digits Operation of the Lettered Stations or Five Digits (L5D) relay in the outgoing sender for AMA functions. (A&M Only)
S2 22	4DG	(a) Four Digits Maximum (A&M Only) Operation of the Four Digits Maximum (4DG) relay in the outgoing sender for AMA functions. (b) Local AMA Call
S2 23	5DG	(a) Five Digits Only (A&M Only) Operation of the Five Digits, No Letters (5DG) relay in the outgoing sender for AMA functions. (b) Tandem AMA Call
S2 24	SC	Service Call Operation of the Service Call (SC) relay in the outgoing sender for AMA or ANI functions.
S2 25	TVT	Transverter Test Operation of the Transverter Test (TVT) relay in the outgoing sender for AMA or ANI functions.
S2 26	OBS'	Observation Operation of the Observation (OBS) relay in the outgoing sender for AMA functions (forces a 4-line entry).
S2 27	NOB'	No Observation Operation of the No Observation (NOB) relay in the outgoing sender for AMA functions.
S2 28	AMA	Automatic Message Accounting Operation of the AMA relay in the outgoing sender for AMA functions.
S2 29	RO'	Reorder Operation of the Reorder (RO) relay in the outgoing sender to the outgoing trunk for reorder.
S2 30-59	CS0-29	Class of Service (CS) - Translator (TLR) (a) Class of service of the calling line on a dial tone connection, as signaled by the line link connector to the marker. (b) Class of service of a called ground start coin line on the terminating (call-forward) stage of an intraoffice or an incoming trunk connection.
	TRL0-29	(c) On a line verification test, marker stage, the class of service of the line being verified. (d) Number of the translator associated with a transverter on an AMA call.
S1 0-5	OSG0-5	Outgoing Sender Group Outgoing sender group selected by the marker.
S1 6	SSA	Sender Subgroup A Outgoing sender subgroup A was seized by the marker.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
S1 7	SSB	Sender Subgroup B Outgoing sender subgroup B was seized by the marker.
S1 8-12	OS0-4	Outgoing Sender Selection (a) Idle sender within the selected subgroup.
	RA0-4	Route Available (b) Indicates routes available for intraflow (ACD office). (RA0-4)
S1 13	OSE	Outgoing Sender End Operation of marker Outgoing Sender End (OSE) relay to end outgoing sender selection.
S1 14	OSK	Outgoing Sender Check Operation of marker Outgoing Sender Check (OSK) relay showing that selection of the sender is completed.
S1 15	TSR	Timing Sender Registration All sender connector relays operated and the marker is to start timing for the operation of the sender memory relays. (TSR)
	TA	Trunks Available There was at least one idle trunk available on an idle trunk link frame (ACD office). (TA)
S1 16	OST2	Outgoing Sender Timing 2 Sender registration timing is completed and the sender memory relays are being checked for holding before releasing the sender connector.
S1 17	RSC	Release Sender Connector Sender registration was satisfactory and the marker is to release the sender connector.
S1 18	RNT2	Recorder Number Timing (a) Timing interval for operation of AMA recorder number relays in the sender is completed and a check is being made of their holding ability. (b) Timing interval for operation of pulse conversion class relays in sender is completed.
S1 19	RNK	Recorder Number Check (a) Marker has satisfactorily completed the check of the AMA recorder number relay operation in the sender. (b) Marker has satisfactorily completed the condition of pulsing check.
S1 20	SLK1	Sender Link Check 1 Lead from the sender link hold magnet is continuous.
S1 21	SLK2	Sender Link Check 2 Sender link hold magnet operated and closed the crosspoints.
S1 22	AVK1	Sender Advance Check Marker has checked that the sender AV relay locked operated.
S1 23	TTR	Trunk Test Register Indicates a trunk test register call.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
S1 24-27	OSG6-9	Outgoing Sender Group Outgoing sender group selected by the marker.
S1 28-29	S13,14	Sender Position of the particular sender in the outgoing sender connector of transverter connector.
S1 30-32	FS0-2 G0-2	Frame Selection - Group (a) Trunk link frame selected. (b) On AMA calls, the G- (vertical group of 50 lines for line identification) relay operated in the selected translator. (c) On line insulation tests, the resistance band in which a failure occurred on an initial test of a line.
S1 33-49	FS3-19 G3-19	Frame Selection - Group (a) Trunk link frame selected. (b) On AMA calls, the G- relay operated in the selected translator.
S1 50,51	GA,GB TB0,1	Translator Group A, B - Trunk Block 0, 1 (a) Translator group A or B in 2000 line translator office. (b) Trunk Block (TB0,1) relay in marker operated to cause the operation of corresponding relay in trunk link frame.
S1 52-55	TB2-5	Trunk Block Which TB- relay in the marker operated to cause the operation of corresponding relay in trunk link frame.
S1 56	SF	Single Frame The trunk link frame signals the marker to function for single frame operation.
S1 57	PR	Paired Frame The trunk link frame signals the marker to function for paired frame operation.
S1 58	RF	Regular Frame Marker functioned to operate the RF relay on the trunk link frame.
S1 59	EF	Extension Frame Marker functions to operate the EF relay on the trunk link frame.
S0 0-4	A0,1,2,4,7	A Digit (a) The A code digit registered within the marker by a register. (b) The A code digit transmitted from marker to monitor. (c) The A code digit transmitted to transverter by outsender via transverter connector. (AMA,ANI) (d) The A code digit registered within the pre-translator. (e) The A code digit to sender from monitor on test calls and on trouble records made by monitor.
S0 5-9	B0,1,2,4,7	B Digit Same as for A digit.

Card Coordinates (Cont)		Punch Designation	Functional Meaning and Indication
S0	10-14	C0,1,2,4,7	C Digit Same as for A digit. The C digit appears on trouble recorder cards in 2-digit offices, although not recorder by the pretranslator.
S0	15-17	D0,1,2,4,7	D Digit Same as for A digit, excluding(d).
S0	20-24	E0,1,2,4,7	E Digit Same as for A digit, excluding(d).
S0	25-29	F0,1,2,4,7	F Digit Same as for A digit, excluding(d).
S0	30-33	TS0-3 OFF0-3	Trunk Selected - Office Group (a) The Trunk or Originating Register Selected (TS0-3) relay operated in the marker. (b) On line insulation tests, the results of a retest. The TS0-2 represent the resistance bands for failures on retest and TS3 indicates that the retest did no disclose trouble. (c) On AMA calls, the Office Number (OFF0-3) relay operated in the transverter by the attached translator to indicate the originating office group of a line location.
S0	34-39	TS4-9 OFF4-9	Trunk Selected - Office Group (a) The TS4-9 relay operated in the marker. (b) On AMA calls, the OFF4-9 relay operated in the transverter by the attached translator to indicate the originating office group of a line location.
S0	40-49	TS10-19	Trunk Selected (a) The TS10-19 relay operated in the marker.
S0	50-59	LC0-9	Link Connector The Link Cut-In (LC-) relay operated on the trunk link frame for link selection. This also indicates the trunk switch on the trunk link frame on which the selected trunk is located. Also indicates the vertical unit on the junctor switch of the trunk link frame.
2.02	"R" Relays		
R8	0-4	A'0,1,2,4,7	A' Digit (a) The A code digit passed by the marker to an outgoing sender. (b) The A lead grounded between the transverter and an AMA recorder which may or may not be attached. (c) The A code digit registered in the monitor by monitoring on pulsing leads of either originating or incoming register or outgoing sender. (d) Lead grounded by master timer, if attached to recorder.
R8	5-9	B'0,1,2,4,7	B' Digit Same as for A' digit.
R8	10-14	C'0,1,2,4,7	C' Digit Same as for A' digit.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
R8 15-19	D'0,1,2,4,7	D' Digit Same as for A' digit.
R8 20-24	E'0,1,2,4,7	E' Digit Same as for A' digit.
R8 25-29	F'0,1,2,4,7	F' Digit Same as for A' digit.
R8 30-49	TG0-19	Trunk Group Trunk Group (TG-) relay operated in the marker by the Route (R-) relay.
R8 50	FAK	Frame A Appearance Check A Appearance (FA-) relay in the trunk link frame operated showing the selected trunk has an A appearance location in the selected trunk link frame.
R8 51	FBK	Frame B Appearance Check B Appearance (FB-) relay in the trunk link frame operated showing the selected trunk has a B appearance location in the selected trunk link frame.
R8 52-59	LV2-9	Level Level (LV-) relay operated on the trunk link frame to show the horizontal level of the trunk switch on which the selected trunk appears.
R7 0-4	G0,1,2,4,7	G Digit (a) The G digit transmitted to the transverter from the sender via the transverter connector. A single perforation of a 7 indicates that the last completed digit was registered in the sender digit group immediately preceding the digit group in which this 7 is perforated. (b) The G code digit registered in the marker by a register. (c) The G code digit transmitted to the monitor by the marker. (d) The G code digit to sender from monitor on test calls and on trouble records made by monitor.
R7 5-9	H0,1,2,4,7	H Digit Same as for G digit.
R7 10-14	J0,1,2,4,7	J Digit Same as for G digit.
R7 15-19	K0,1,2,4,7	K Digit Same as for G digit.
R7 20-24	L0,1,2,4,7	L Digit Same as for G digit.
R7 25-29	CR0,1,2,4,7	Compensating Resistance - Arbitrary Digit (a) Marker transmits to the outgoing sender (RP and PCI) the compensating resistance required for outgoing trunks. (b) Marker transmits to the outgoing sender (DP and MF) an arbitrary digit for outpulsing. (c) Marker transmits to the monitor the arbitrary digit and compensating resistance information. (d) Number pulsed by sender for arbitrary C digit on monitored or test calls and a failure to check occurred.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
R7 30-39	RS0-9	Ringing Selection The marker Ringing Selection (RS-) relays operated to select the ringing switch select magnets on the ringing control switch associated with the selected trunk. Either RS0-1 or RS2-9 are required.
R7 30-34	TP0-4	Trunk Preference The trunk preference used by the marker for routing selection (the TPA0-4 relay operated in the marker, ACD office).
R7 40	RN0	Recorder Number - Sender Pulsing Case - Incoming Class (a) AMA recorder (0) associated with intraoffice or outgoing trunk.
	SPC0	(b) Sender pulsing class (pulse conversion calls): (1) DP to tandem or nonlink-type SXS over any one-way trunk except intertoll. (2) RP to No. 1 crossbar or panel battery cut-off, repeated incoming ground cutoff over any one way trunk.
	ITC0	(c) Incoming trunk class (NN) - no numbers in this marker group.
	TTG0	Transmission Test Guard Transmission test tone detected. The marker started to recycle when setting up to a test trunk but did not complete recycling (ACD office).
R7 41	RN-SPC-ITC 1	Recorder Number - Sender Pulsing Class - Incoming Class (a) AMA recorder (1) associated with intraoffice or outgoing trunk. (b) Incoming trunk class (SE - supervision, RN number). (c) Incoming trunk class (TB - toll, physical and theoretical).
R7 42	RN-SPC-ITC 2	Recorder Number - Sender Pulsing Class - Incoming Class (a) AMA recorder (2) associated with intraoffice or outgoing trunk. (b) Sender pulsing class (pulse conversion calls): (1) DP to nonlink-type SXS local or tandem, sender-type or link-type CDOs over any one-way IT or 2-way trunk. (c) Incoming trunk class (SA - supervision, non-discriminating numbers). (d) Incoming trunk class (MB - manual, pnysical and theoretical).
R7 43	RN-SPC-ITC 3	Recorder Number - Sender Pulsing Class - Incoming Class (a) AMA recorder (3) associated with intraoffice or outgoing trunk. (b) Sender pulsing class (pulse conversion calls): (1) DP to sender-type local or tandem over any one-way trunk except IT. (2) RP to panel ground incoming without repeating incoming over any one-way trunk. (c) Incoming trunk class (NA - no supervision, non-discriminating numbers). (d) Incoming trunk class (FB - full selector, physical and theoretical).

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
R7 44	RN-SPC-ITC 4	Recorder Number - Sender Pulsing Class - Incoming Class (a) AMA recorder (4) associated with intraoffice or outgoing trunk. (b) Incoming trunk class (NE - no supervision, EN number). (c) Incoming trunk class (TT - toll, theoretical).
R7 45	RN-SPC-ITC 5	Recorder Number - Sender Pulsing Class - Incoming Class (a) AMA recorder (5) associated with intraoffice or outgoing trunk. (b) DP sender pulsing class (pulse conversion calls). Battery-ground pulsing nonlink-type SXS (local or tandem) over any one-way trunk except IT. (c) Incoming trunk class (ST - supervision, TN number). (d) Incoming trunk class (MT - manual, theoretical).
R7 46	RN-SPC-ITC 6	Recorder Number - Sender Pulsing Class - Incoming Class (a) AMA recorder (6) associated with intraoffice or outgoing trunk. (b) Incoming trunk class (NT - no supervision, TN numbers). (c) Incoming trunk class (FT - full selector, theoretical).
R7 47	RN-SPC-ITC 7	Recorder Number - Sender Pulsing Class - Incoming Class (a) AMA recorder (7) associated with intraoffice or outgoing trunk. (b) Incoming trunk class (TP - toll, physical).
R7 48	RN-SPC-ITC 8	Recorder Number - Sender Pulsing Class - Incoming Class (a) AMA recorder (8) associated with intraoffice or outgoing trunk. (b) Incoming trunk class (SP - supervision, PN number). (c) Incoming trunk class (MP - manual, physical).
R7 49	RN-SPC-ITC 9	Recorder Number - Sender Pulsing Class - Incoming Class (a) AMA recorder (9) associated with intraoffice or outgoing trunks. (b) Incoming trunk class (NP - no supervision, PN number). (c) Incoming trunk class (FP - full selector, physical).
R7 50-59	CH0-9	Channel Selected channel. The channel number corresponds to the number of the select magnet operated on the line link frame line switch. The channel number corresponds to the junctor switch number on both the line link and trunk link frame. The channel number corresponds to the vertical unit on the trunk link frame trunk switch.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
R6 0-4	G'0,1,2,4,7	G' Digit (a) The G code digit transmitted to the outgoing sender by the marker. (b) The G code digit registered on the monitor by monitoring on the pulsing leads of either an outgoing sender, originating or incoming register.
R6 5-9	H'0,1,2,4,7	H' Digit Same as for G' digit.
R6 10-14	J'0,1,2,4,7	J' Digit Same as for G' digit.
R6 15-19	K'0,1,2,4,7	K' Digit Same as for G' digit.
R6 20-24	L'0,1,2,4,7	L' Digit Same as for G' digit.
R6 25-29	BR0,1,2,4,7	Arbitrary Digit (a) Marker transmitted to the outgoing sender an arbitrary digit for outpulsing. (b) Marker transmitted arbitrary digit information to the monitor for DP senders only. (c) Number outpulsed by sender for arbitrary B digit on monitored or test calls and a failure to check occurred.
R6 30-39	JC0-9	Junctor Cut-in The Junctor Cut-In (JC-) relay to be operated on the trunk link frame. The JC- relay operation closes the J0-9 leads, on the trunk link frame, to the marker for idle junctor selection. Also closes the operate paths to the junctor switch select magnets on the trunk link frame. The horizontal (operated select magnet) on the trunk link frame junctor switch is always the same as the JC- relay operated.
R6 40-44	JG0-4	Junctor Group The Junctor Group (JG-) relay operated in the marker, thus showing the junctor subgroup used for the call.
R6 45	RV1	Reverse Toll diversion signal from completing marker to the originating register.
R6 46	PNR	Pattern Normal The marker Pattern Normal (PNR) relay operates signifying the selected junctor subgroup consisted of a full group of ten junctors.
R6 47	PA	Pattern A The marker PA relay operated to signify the selected junctors subgroup consisted of less than ten junctors.
R6 48	PB	Pattern B The marker PB relay operated to signify the selected junctor subgroup consisted of less than ten junctors.
R6 49	PC	Pattern C The marker PC relay operated to signify the slected junctor subgroup consisted of less than ten junctors.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
R6 50-59	P0-9	Pattern Number The Pattern (P-) relay operated in the marker to identify the junctor subgroup pattern and to identify the junctors which are available within the junctor subgroup. The PA, PB, or PC punch together with a P0-9 determine the available junctors according to the pattern.
R5 0-4	CP0,1,2,4,7	Code Pattern The called party area as transmitted from marker to sender and from sender to transverter for AMA functions. The above information notifies the transverter as to the number of digits in the called office code (0 to 3) and the area, extended, local, or foreign.
R5 5-9	MB0,1,2,4,7	Message Billing Index The message billing index as transmitted from marker to sender and from sender to transverter for AMA functions.
R5 10-14	RNG,1,2,4,7	Recorder Number The number of the AMA recorder associated with a selected trunk, as transmitted from marker to sender and from sender to transverter.
R5 15-20	DL1-6	Deletion (a) The Delete (DL-) relay operated in the sender by the marker to inform the sender what digital information is to be deleted from outpulsing. The number of digits to be deleted corresponds to the DL- relay operated, starting with the A digit. (b) The DL- relay operated in the monitor by the marker for checking sender performance when deletion is required.
	CK1-5	Class Check 1-5 Class (type of traffic) information transmitted from the marker to the data link (ACD office).
R5 21	M11	Monitor 11 Prefix The monitor had a 11 prefix registered from either a monitored sender or register. This is to be matched in the monitor with the 11 prefix signal from the marker when a register is monitored or the CL1 signal when a sender is monitored.
R5 22	CL1	Class 1 The marker indicates: (a) To DP and MF senders, that a 11 prefix is to be outpulsed. (b) To RP senders, that the call is to a No. 1 crossbar office. (c) To monitor, the information is either line a or b, above.
R5 23	CL2	Class 2 The marker indicates: (a) To DP sender, that the call is to a community dial office or is a toll call or over a 2-way trunk. (b) To RP sender, that the call is to a 2-digit office in a 2- and 3-digit area.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
R5 23 (Cont)	CL2	Class 2 (c) To PCI sender, that the call is to an office with no numbers above 9999. (d) To MF sender, that this is a local call with a 2-way trunk or toll call; thus the sender gives immediate trunk closure. (e) To monitor, the information in one of the lines a through d, above.
R5 24	CL3	Class 3 The marker indicates: (a) To DP sender, to delay dialing until a start signal is received from the distant office. (b) To RP sender, that the call is to a nonrepeating incoming panel ground cutoff office and thus a marginal trunk test is required. (c) To PCI senders, that the call is to an office with numbers above 9999. (d) To monitor, the information in one of the lines a through c, above.
R5 25	CL4	Class 4 The marker indicates: (a) To DP sender, that 22 pps dialing is to be used. No Indication means 10 pps is to be used. (b) To RP sender, that a five (5) should be added to incoming group selection. (c) To monitor, the information in either line a or b above.
R5 26	CL5	Class 5 The marker signals: (a) The DP sender, that battery-ground pulsing is required. No indication means dialing on a loop basis. (b) The automatic monitor, the above information.
R5 27	CL6	Class 6 The marker signals: (a) Subscriber access to CX intertoll or CX 2-way trunks. (b) The automatic monitor, the above information.
R5 28	M7	Maximum Digits The last digit of a maximum of eleven digits was registered in the incoming or originating register.
	ANC	Announcement Check Announcement AN relay has operated in the service assistant trunk (ACD office).
R5 29	M'7	Maximum Digits The marker signaled the completion of called number registration, which consisted of eleven digits from a register to the sender.
	SQ1	Sequence One Trunk sequence recycle position, ACD office.
R5 30	STP1	Junctor Step 1 The marker had made a first test of the junctor subgroups, as is normally done.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
R5 31	STP2	Junctor Step 2 The marker recycled to make a second test of the junctor subgroups when a channel retest was necessary, due to an all busy condition encountered.
R5 32-36	GS1-5	Ground Supply The ground supply progress position of the marker at time of trouble indication.
	TSQ0,1,2,4,7	Trunk Sequence Indicates a position of a trunk sequence walking circuit (ACD office).
R5 37	AL	Allotment The operation of one of the Allotted Groups (AL0-3) relays in the marker showing use of an allotted trunk or sender group.
R5 38	GPA	Group Preference A The marker selected the subgroup A trunks or senders in an allotted group.
	AVG	Advance Gate No available preferred trunks. Marker advances to the nonpreferred trunks and sends a gate signal to the gate control circuit (ACD office).
R5 39	GPB	Group Preference B The marker selected the subgroup B trunks or senders in an allotted group.
R5 40	DR	Denied Route A Denied Route (DR0-2) relay was operated in the marker for denied service reroute.
R5 41	TWT	Two-Way Trunk Route A 2-Way Trunk (TWT0-2) relay was operated in the marker for 2-way trunk operation.
	CWK	Call-Waiting Check On a marker operation the call-waiting checks were properly completed.
R5 42	OPR	Operator Route The marker routed the call to an operator.
R5 43	CNS	Coin Service The call is a coin class.
R5 44-46	CRR0-2	Coin Zone Reroute A marker Coin Zone Reroute (CR-) relay was operated for rerouting a coin class call to an operator.
R5 47	EX	Extra Presence of battery or ground at particular circuit points. Temporary wiring connected to terminals EXB and EXG on terminal strips, to assist in the analysis of any particular trouble.
R5 48-52	RT0-4	Route Transfer A Route Transfer (RT-) relay is operated at the master test frame in order to transfer a regular route to an alternate route.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
R5 53	FAA	Foreign Area A Foreign area translator A was associated with marker when trouble record was taken.
R5 54	FAB	Foreign Area B Foreign area translator B was associated with marker when trouble record was taken.
R5 55	NOC	No Class No trunk class conditions are required for this call.
R5 56	CLG	Class Grounds The marker Class Ground (CLG) relay is functioning to apply ground to operate the class relays in the outgoing trunk or to transmit party class to outsender.
R5 57	CLT1	Class Timing 1 The marker is timing for the operation of trunk class relays.
R5 58	CLT2	Class Timing 2 The marker completed timing for operation of trunk class relays or outsender relays and is now timing for their locking-in feature.
R5 59	CLK	Class Check The marker satisfactorily checked the locking in of the trunk class or outsender party class relays.
R4 0-2	NGCU0-2	Number Group Connector Units - Thousands Digit (a) The NGCU- punch indicates the units digit of the number group connector.
	TH0-2	(b) The Thousands (TH-) relay operated in the transverter by the translator on an AMA or ANI call. (c) Number of direct access pretranslator connector circuit 0-2.
R4 3-9	NGCU3-9	Number Group Connector Units - Thousands Digit (a) The NGCU- punch indicates the units digit of the number group connector.
	TH3-9	(b) The TH- relay operated in the transverter by the translator on an AMA or ANI call.
R4 10-19	HN0-9	Hundreds Digit (a) That the marker had applied battery to the HB- relay in the number group. (b) The Hundreds (HN-) relay operated in the transverter by the translator on an AMA or ANI call.
R4 20	OA	Office A (a) The number group MCC relay for office A operated. (b) The A portion of direct access pretranslator connector circuit.
R4 21	OB	Office B (a) The number group MCC relay for office B operated. (b) The B portion of direct access pretranslator connector circuit.
R4 22	SNG	Seizure Number Group The marker is preparing to seize the number group.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
R4 23	NGK	Number Group Check The marker had seized the number group and operated its MCA relay.
R4 24	UK	Units Check The U- relay in the number group operated.
R4 25	HTUK	Hundreds, Tens, Units Check The satisfactory operation of the number group hundreds, tens, and units relays and that the marker has started a timing interval for registration of number group information in the marker.
R4 26	TNK	(a) Tens Number Check On a toll or tandem trunk connection, that a trunk number is involved. (b) Trunk Number Check AIOD translator has derived a trunk number from equipment location information.
R4 27	PTK	Physical-Theoretical Check The connection has satisfactorily completed the physical and theoretical office check.
R4 28	NGK1	Number Group Check Auxiliary The number Number Group Check Auxiliary (NGK1) relay operated to supply battery to F, L, and G, leads to number group.
R4 29	PBX1	Private Branch Exchange The call is to a PBX subscriber or to other lines having PBX hunting. (PBX1)
	SNR	Select New Route Marker is ready to select new route (ACD office).
R4 30	TC	Talking Charge The marker operated its TC relay and grounded the TC or RC lead to the selected trunk.
R4 31	CN	Coin Call The marker recognizes this as a coin call and proceeds to operate the CN relay in the selected trunk.
R4 32	TP	Tip Party The originating register signaled the marker that this is a tip party call.
R4 33	TP'	Tip Party Prime - Incoming Trunk Ringing Switch Hold Magnet (a) The marker operated the proper class relay in the selected trunk. (b) The marker operates TP relay in register-sender for AMA information on tip party calls. (c) The marker operates the ringing switch hold magnet associated with the incoming trunk.
R4 34	RP	Ring Party The originating register signaled the marker that this is a ring party call.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
R4 35	RPK	Ring Party Check (a) Checks RP lead from marker to outsender on AMA calls. (Mfr Disc.) (b) Indicates a one up check of TP and RP leads from marker to outsender on AMA calls. (Standard)
R4 36	ND1	No Digits The marker prepares to send a "no digit to be pulsed" signal to the sender.
R4 37	NDK	No Digits Check The marker had sent the "no digit to be pulsed" signal to the sender which was received and locked-in by the sender.
	TSA	Trunk Sequence A Multiplier trunk sequence relays (TSQ) (ACD office).
R4 38	OTT	Operate Trunk Test Relay The marker functioned to operate the Trunk Test (TT) relay in the selected trunk for test connection functions.
R4 39	TTK	Trunk Test Relay Check The TT relay in the selected trunk operated and established a locking circuit.
R4 40	CL7	Class 7 The marker indicates to a 2-wire MF sender that an ANI dial "0" call is to be outpulsed.
R4 41	CL8	Class 8 Prefix "0" ANI coin special toll call.
R4 42	LT2	Local Translator Two Person-to-person prefix "0" was dialed.
R4 43		Unassigned
R4 44-46	OFT0,1,2	Office Tens (ANI)
R4 47	TV	Transverter Connected to AMA Recorder (a) The Transverter Connector (TC) relay operated in the recorder connector showing connection to a transverter. (b) On recorder test connections, the master timer grounded TV lead to simulate a transverter by operating the AMA recorder TVM relay.
R4 48	IPA	Identifier Preference The call identity indexer preference relay operated in the AMA recorder.
R4 49	OTO	OTO Relay Operated The operation of the OTO relay in the AMA recorder.
R4 50	HR1	Hour Entry Preference The operation of Hour Preference (HP) relay in the AMA recorder.
R4 51		Unassigned

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
R4 52	MT-A NGCT0	Master Timing Circuit Block A - Number Group Connector Tens Digit "0" (a) The master timer blocked when a plug was inserted into the transfer jack of an AMA recorder. (b) Identifies the number group connector tens digit as 0.
R4 53	MT-B NGCT1	Master Timing Circuit Block B - Number Group Connector Tens Digit "1" (a) The master timer blocked when a plug was removed from the transfer jack of an AMA recorder. (b) Identifies the number group connector tens digit as 1.
R4 54	MT-D NGCT2	Master Timing Circuit Block D - Number Group Connector Tens Digit "2" (a) The master timer blocked when a plug was inserted into the make-busy jack of an AMA recorder. (b) Identifies the number group connector tens digit as 2.
R4 55	MT-3 NGCT3	Master Timing Circuit Block E - Number Group Connector Tens Digit "3" (a) The master timer blocked when a plug was removed from the make-busy jack of an AMA recorder. (b) Identifies the number group connector tens digit as 3.
R4 56	MT-SP	Splice The master timer blocked during a splice operation.
R4 57	MT-RT	Recorder Master Timing The AMA recorder was attached to the master timer for an end-of-tape function.
R4 58	MT-TEN	Test Entry The master timer is being used for test purposes.
R4 59	MT-ET	End of Tape The master timer was engaged in the end-of-tape operation for tape cutting pattern (3:00 a.m.).
R3 0-9	T0-9	Tens Digit (a) That the marker had applied battery to the Tens Block (TB-) lead to operate the corresponding TB- relay in the number group. (b) The Tens (T-) relay operated in the transverter by the translator on an AMA or ANI call.
R3 10-19	U0-9	Units Digit (a) That the marker had applied battery to the Units (U-) lead to operate the corresponding U- relay in the number group. (b) The U- relay operated in the translator on an AMA or ANI call.
R3 20	SLCK	Sleeve Check The Sleeve Connector (SC) relay in the number group had operated and locked, in series with the Sleeve Connector Check (SLCK) relay in the marker.
R3 21	CK0	Check Operation The marker has begun a recycle of called line identification on a PBX, RI, TBI, or BN class.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
R3 22	CKR	Check Released The marker has completed the called line identification recycle described in line above (R3 21).
R3 23	A	Advance of Marker The marker functioned to make a number group advance from one tens block relay to the next, in the event that no idle line is found in the first tens block or to prepare the marker to set up busy-back if all PBX lines are busy.
R3 24	AK	Advance Check The number group completed the advance from one tens block to another.
R3 25	SAE	Sleeve Auxiliary End There is at least one idle PBX line available within a tens block.
R3 26	EG	End Group The number group signals the marker that the end of a PBX group (tens block) has been reached without finding an idle line and no further TB- relay operation is to be made.
R3 27	RNG	Release Number Group The called line identification has been successfully recorded and the number group is to be released by the marker.
R3 28	AN	Allotter Number Marker worked with an allotted PBX number.
R3 29	PRCY	Marker Recycle on PBX Connection The marker RCY2 relay has operated indicating a marker recycle on a PBX connection.
	RR	Release Route Marker starts route advance by releasing original route relay (ACD office).
R3 30	TM	Transverter Timing The transverter connector, upon seizing a transverter, had grounded the TM lead to the transverter to supplement the ground supplied by the transverter for actuating the transverter alarm. (AMA, ANI)
R3 31	CKG	Check Ground The transverter connector closed the CKG lead to the transverter to provide off-normal ground and remove standing cross tests.
R3 32	CK7	Check 7 The transverter functioned to operate its CK7 (check) relay.
R3 33,34	CK1,2	Check 1 and 2 The operation of CK1 and CK2 relays in the transverter checks that the proper number of relays operated to register the information received from the sender.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
R3 33,34(Cont)	DAC	Direct Access The completing marker DAC relay operated indicates direct inward dialing to No. 101 ESS on a multilead basis.
	TLT	Translation Trouble The direct access pretranslator control TLT relay operated indicates pretranslator translation trouble on a direct inward dialing call to No. 101 ESS.
R3 35	CK4	Check 4 The operating paths for the transverter Recorder Start (RST-) relays have been opened and only one RST- relay is operated and held on its locking path, thereby insuring that only the selecting AMA recorder will be served.
	LOLD	Long Loop Line The completing markers LOLD relay was operated, indicating a unigauge call of one of the following types: (a) No test call (b) Ringer test call (c) Test trunk call to or from local test deck (d) Reverting call (e) OLI call
R3 36	DNK	Directory Number Check The proper quota of directory number relays operated from the translator functions.
	LOLL	Long Loop Line (Unigauge) A completing or dial tone marker trouble record occurred while connecting a long loop line.
R3 37	RK	Recorder Check The AMA recorder is attached to the transverter.
R3 38	IC	Identifier Check The continuity of the ICK lead through the AMA recorder, call identity indexer and trunk is satisfactory.
R3 39	TOK	Trunk Okay The transverter Trunk Okay (TOK) relay operated showing the ICK lead checks clear of false battery and ground.
R3 40	CI4	Cut-in Fourth Line Perforation The transverter Cut-in Perforator (C14) lead has been grounded, showing process of, or completion of, perforations for the first line of a 4-line entry.
R3 41	CI3	Cut-in Third Line Perforation The transverter C13 lead has been grounded, showing process of, or completion of, perforations for the second line of a 4-line entry.
R3 42	CI2	Cut-in Second Line Perforation The transverter C12 lead has been grounded showing process of, or completion of, perforations for the third line of a 4-line entry or the first line of a 2-line entry.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
R3 43	IRY	Identifier Ready The operation of transverter Identifier Ready (IR) relay indicates that the trunk number has been checked by the AMA recorder. The transverter should now proceed to send its last line of information to the AMA recorder.
R3 44	CI1	Cut-in First Line Perforation The transverter CI1 lead has been grounded showing process of, or completion of, perforations for the last line of an entry.
R3 45	P5	Progress Fifth Line The transverter Progress Fifth Line (P5) relay had operated, indicating that the last line of entry had been sent from transverter to AMA recorder.
R3 46	RLR	Release Transverter The transverter grounded the RL lead to the transverter connector as a signal to release.
R3 47	RL	RL Relay Operation The transverter Release (RL) relay operated. (AMA, ANI)
R3 48	TR	Trouble Release The transverter grounded the Trouble Release (TR) lead to the transverter connector. (AMA, ANI)
R3 49	TM1	Time-out 1 A time-out function of transverter TM1 tube timer which covers the following intervals: (a) From seizure of transverter to seizure of translator. (b) From seizure of AMA recorder until perforating functions are complete.
R3 50	TM2	Time-out 2 A time-out function of transverter TM2 tube timer which covers the following intervals: (a) From seizure of translator to seizure of AMA recorder. (b) From operation of RL relay to restoration of the transverter to normal. (TM2)
	TB6	Trunk Block Which TB- relay in the marker operated to cause the operation of corresponding relay in trunk link frame.
R3 51	CIFA	Cut-in 5-line Entry All codes were recorded on tape as dialed when foreign area codes, X0X and X1X, were used. (CIFA)
	TB7	Trunk Block Which TB- relay in the marker operated to cause the operation of corresponding relay in trunk link frame. (TB7)
R3 52	FABC	Foreign Area Digit Check The transverter register relays operated in proper combination in restoring the X0X and X1X codes. (FABC)
	TB8	Trunk Block Which TB- relay in the marker operated to cause the operation of corresponding relay in trunk link frame.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
R3 53	FACK	Foreign Area Code Check Cut-in relays released and code translation (X0X and X1X) was completed. (FACK)
	TB9	Trunk Block Which TB- relay in the marker operated to cause the operation of corresponding relay in trunk link frame.
R3 54	XSC	Crossed SC Relay Two Sleeve Connector (SC) relay have been operated in the number group.
R3 55	OF-TRIT	Overflow The AMA translator cross-connection for the calling line transmits an overflow signal to the sender.
R3 56	TBY	Trouble Release (a) Trouble release signal sent from transverter to sender. No second trial initiated by transverter connector. (ANI) Translator Busy (b) The requested AMA translator is plugged busy.
R3 57	EXT	Extend Timing The AMA recorder signaled for extended timing in the transverter if the AMA recorder was engaged in an end-of-tape or splice pattern function.
R3 58	RB	Recorder Busy The requested AMA recorder is plugged busy.
R3 59	BY	Service Busy of Recorder The requested AMA recorder is busy on a service or test call.
R2 0	PN	Physical Number The Hundreds Block (HB-) relay operated in a number group serving a physical office.
R2 1	TN	Theoretical Number The HB- relay operated in a number group serving a theoretical office.
R2 2	PTN	Physical-Theoretical Number The HB- relay operated in a number group serving a nondiscrimminating office.
R2 3	PBN	Permanently Busy Number The operation of marker Permanently Busy Number (PBN) relay when the called number is a permanently busy line.
R2 4	FNA	Free Number - Group A The operated Free Number (FN-) relay in the number group is cross-connected to operate the marker FNA relay when 4-wire ringing selection switches are installed.
R2 5	FNB	Free Number - Group B The operated FN- relay in the number group is cross-connected to operate the marker FNB relay when 6-wire or a combination of 4- and 6-wire ringing selection switches are installed.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
R2 6	OV	Overflow The marker is to set the incoming trunk for overflow (recorder) signal.
R2 7	BY	Busy Called line is busy; thus the marker is to set the incoming trunk for busy signal.
R2 8	OFH	Overflow Hold Magnet The marker functioned to operate its OFH (overflow hold magnet, operate ringing switch) relay to reset the trunk ringing switch for busy or overflow conditions.
R2 9	PUL	Plugged-up Line The called line was plugged for reroute to intercept of special operator.
	LH	Left Hand Left hand side of outsender link switch.
R2 10	LCH	Local Charge The marker functioned to operate its Local Charge (LCH) relay for setting up local charge supervision in an incoming, intraoffice, or reverting trunk.
	RH	Right Hand Right hand side of outsender link switch.
R2 11	TCH	Toll Charge The marker functioned to operate its Toll Charge (TCH) relay for setting toll charge supervision in an incoming trunk.
R2 12	LIN	Local Incoming The marker has prepared to serve an intercept condition on a connection served by an intraoffice, reverting, or local incoming trunk.
R2 13	TIN	Toll Incoming The marker has prepared to serve an intercept condition on a connection served by a toll incoming trunk.
R2 14	BN	Blank Number The marker recognized that this connection was to a blank (unassigned or unequipped) number and functioned to route this connection to a tone trunk or intercept operator.
R2 15	RI	Regular Intercept The marker functions to route this connection to regular intercept trunk.
R2 16	TBI	Trouble Intercept The marker functions to route this connection to a trouble intercept trunk.
R2 17	TBH	Trouble Intercept Hold Magnet The marker functioned to operate its Trouble Intercept, Hold Magnet, Operate Ringing Switch (TBH) relay to reset the trunk ringing switch for ringing into a trouble intercept trunk.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
R2 18	RSK	Ringing Switch Select Magnet Check A ringing switch select magnet had operated.
R2 19	LI	Line Idle Indicates to the marker that the called line is idle and there is an idle channel available for connection to this idle line.
R2 20	TCK1	Talking Charge Check The operation of the marker Talking Charge Check (TCK) relay indicates continuity of the TC lead from marker to associated trunk.
R2 21	EN	Extra-Theoretical Number The HB- relay operated in a number group serving an extra-theoretical office.
R2 22	SRK	Start Ringing Check The marker had checked the operation of the ringing switch select magnet and also found clear and continuous the RC lead to Ringing Congrol (RC) relay in the associated trunk. The operation of the RC relay in the trunk caused the operation of the ringing switch hold magnet associated with this trunk.
R2 23	RCK2	Ringing Switch Crosspoint Check The operation of the marker RCK1 relay indicates crosspoint closure of the ringing selection switch. This also checks the holding ground for the trunk RC relay.
R2 24	RCK3	Ringing and Charging Function The marker functions to operate its RCK3 relay to show a satisfactory check of the charge and ringing conditions.
R2 25-29	AR0,1,2,4,7	Arbitrary Digit (a) Marker transmitted to the outgoing sender (DP) an arbitrary digit for outpulsing. (b) Marker transmitted arbitrary digit information to the monitor and master test control. This is for DP senders only. (c) Number outpulsed by sender for A arbitrary digit on monitored or test calls and a failure to check occurred.
R2 30	TEA	Trouble Entry - Transverter The operation of the transverter Trouble Entry Cut-In (TEA) relay for closing a trouble line entry to an associated AMA recorder.
	CRG	Circuit Reserve The call-waiting customer line at the time the completing marker enters the CW link circuit is either connected to level zero or to a CW circuit - the CW link appearance is busy.
R2 31	TGR	Test Group Relay The UG relay (in the transverter), which verifies the path of the cross-detection feature XG relay (in the transverter), failed to operate. (AMA, ANI)

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
R2 31 (Cont)	HMS	Hold Manget Start The call-waiting customers line is either being connected to level zero on the CW link (dial tone marker in the CW link) or is being connected to a selected CW circuit (completing marker in the CW line).
R2 32	OP1	Open P1 Lead This lead is used only on transverter test connections. The master test control circuit operates the transverter Opens P1 Lead (OP1) relay to stop progress of the transverter on a selected line of entry so that a trouble record may be taken of the transverter output for this line of entry.
R2 33	1TR	First Trial of Transverter (1TR) First Trial Check (TRK) (a) The transverter connector functioned to operate the transverter First Trial (1TR) relay for a first trial indication. (AMA, ANI)
	TRK	(b) Marker connector signals the marker that this is a first trial. (TRK) (c) Pretranslator indicates that this is a first trial. (TRK)
R2 34	2TR	Second Trial of Transverter (2TR). Second Trial (TR2) (a) The transverter connector functioned to operate the transverter Section Trial (2TR) relay for a second trial indication. (2TR) (AMA, ANI)
	TR2*	(b) Marker connector signals the marker that this is a second trial. (TR2) (c) Pretranslator indicates that this is a second trial. (TR2)
R2 35	AC8	Access Eight Out of a PBX the subscriber has dialed the private line network access digit eight.
R2 36	4L	4-Line A 4-line entry is desired for the AMA tape.
R2 37	2L	2-Line A 2-line entry is desired for the AMA tape.
R2 38	P	Perforate (a) False ground on Perforator (P) lead in transverter while transverter is normal (standing test). (b) The AMA recorder grounds the P lead to transverter as a signal that it is ready to perforate. (c) The AMA recorder grounds the P lead to master timer as a signal that it is ready to perforate.
R2 39	DTK	Trunk Check The operation of the AMA recorder DTK relay over DTK lead from transverter. This signals that the trunk involved had been identified and the AMA recorder is prepared for perforation of the last line of an entry.

*The TRK and TR2 punch indications also appear at S4 14 and S4 15. The appearance of these designations at S4 14 and S4 15 show the MD arrangement while the appearance at R2 33 and R2 34 show the STD arrangement.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
R2 40	TP1	Perforation Timing 1 (a) False ground on Perforator Timing (PT1) lead in transverter while normal (standing test). (b) Transverter grounds PT1 lead to AMA recorder to operate PTC relay in the AMA recorder when perforating the last line of an entry. (c) Master timer grounds PT1 lead in AMA recorder to control timing for perforating the recorder number entry.
R2 41	DTN	Trunk Number (a) A false ground on Trunk Number (DTN) lead in transverter when normal (standing test). (b) Transverter grounds DTN lead to AMA recorder to operate the AMA recorder DTN relay, when ready to perforate the last line, thus showing satisfactory trunk identification. (c) Master timer grounds DTN lead to AMA recorder.
R2 42	PT	Perforator Timing (a) False ground on PT lead in transverter while normal (standing test). (b) Transverter grounds PT lead to AMA recorder to operate the AMA recorder PTC relay when perforating any but the last line entry. (c) Master timer grounds PT lead to AMA recorder.
R2 43	PAK	Paper Advance Check Operation of the perforation paper-advance magnet.
R2 44	CK	Check (a) False ground on Check (CK) lead in transverter, when normal. (b) Transverter grounds CK lead to advance the AMA recorder from the trouble condition which caused it to block. (c) Master timer grounds CK lead to AMA recorder.
R2 45	P1	Perforator Control 1 (a) False ground on Perforator Release (P1) lead when transverter is normal. (b) AMA recorder grounds PL lead to transverter when transverter is to release its perforator magnet cut-in relay for that particular entry. (c) AMA recorder grounds P1 lead to master timer when master timer is to release its perforator magnet cut-in relay for that particular entry.
R2 46	LC	Line Complete The AMA recorder has completed a single-line timing entry, with associated checks, and has started to release.
R2 47	DS	Disconnect Start (a) False ground on Disconnect Start (DS) lead when transverter is normal. (b) Transverter grounds DS lead to AMA recorder as a disconnect signal after the AMA recorder signals that the last line is perforated. (c) Master timer grounds DS lead to AMA recorder as a disconnect signal after the AMA recorder signals that the last line is perforated.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
R2 48	RD	Release Call Identity Indexer The operation of the AMA recorder RD relay indicates the talking charge relay had functioned in the trunk and the AMA recorder is now to release the call identity indexer. Also operated on initial entries upon seizure of the AMA recorder by transverter. This releases any previously operated tens and units relays in the call identity indexer.
R2 49	TBL	Trouble Encountered The AMA recorder functioned to notify the transverter or master timer that a trouble had been encountered and that the trouble recorder should be seized and an appropriate trouble entry should be perforated.
R2 50	PTS	Perforator Trouble Start (a) False operation of a perforator magnet when AMA recorder is normal. (b) The AMA recorder functions to begin a trouble entry on a trouble encountered by the AMA recorder on answer-disconnect entries.
R2 51		Unassigned
R2 52		Unassigned
R2 53	BSP	Before Splice Pattern The master timer timed out before completion of the splice pattern while perforating an end-of-tape pattern.
R2 54	ASP	After Splice Pattern The master timer timed out after completion of the splice pattern while perforating an end-of-tape pattern.
R2 55	DA	Day Record The master timer timed out while perforating the day record on an end-of-tape pattern.
R2 56	HR	Hour Record The master timer timed out while perforating the hour record on an end-of-tape pattern.
R2 57	SC	Straddle Call The master timer timed out while perforating a straddle call entry on a transferred end-of-tape pattern.
R2 58	SY	Synchronized The master timer and the AMA recorder were in synchronism at time of perforating an end-of-tape pattern.
R2 59	NS	Not Synchronized The master timer and the AMA recorder were not in synchronism at the time of perforating an end-of-tape pattern.
R1 0-3	FT0,1,2,3	Frame Tens (a) The Frame Tens (FT-) of the line link frame associated with the calling line as registered in the marker, AMA or ANI transverter, or monitor. (b) The FT- of the outsender link frame associated with the stuck sender and trunk identification.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
R1 4-8	FU0,1,2,4,7	Frame Units (a) The Frame Units (FU-) of the line link frame associated with the calling line as registered in the marker, AMA or ANI transverter, or monitor. (b) The FU- of the outsender link frame associated with the stuck sender and trunk identification.
R1 9-14	VG0,1,2,4,7,10	Vertical Group (a) The Veritcal Group (VG-) of the calling line as registered in the marker, AMA or ANI transverter, or monitor.
	VU0,1,2,4,7	(b) Vertical unit number of outsender link switch identified by stuck sender trunk identifier circuit.
R1 15-19	HG0,1,2,4,7	Horizontal Group Switch (a) The Horizontal Group (HG-) of the calling line as registered in the marker or monitor.
	SW0,1,2,4,7	(b) The Switch or Horizontal Group (SW-) of the calling line as registered in the translator and outgoing sender on an AMA call.
R1 20-24	VR0-4	Vertical File The Vertical File (VF-) of the calling line as registered in the marker, translator, and outgoing sender on an AMA call or monitor.
R1 25-27	CT0-2	Class Tens The Class Tens (CT-) of the calling line class of service as registered in the marker.
R1 28	TGT	Trunk Guard Test The outgoing sender failed to complete trunk test in the allotted time.
R1 29	PSR	Permanent Signal Record A permanent signal caused the trouble record to be taken after the marker has made linkage check.
R1 30	RN	Recorder Number Entry The master timer timed out while perforating the recorder number entry on an end-of-tape pattern.
R1 31	MO	Month Entry The master timer timed out while perforating the month entry on an end-of-tape pattern.
R1 32	MG	Marker Group Entry The master timer timed out while perforating the marker group entry on an end-of-tape pattern.
R1 33	SPA	Splice Pattern Applied Entry The master timer timed out while perforating the splice pattern on an end-of-tape pattern.
R1 34	SKP	Skip Splice Entry The master timer timed out while perforating the skip splice entry on an end-of-tape pattern.
R1 35	CLF	Control Lead Failure Billing data transmitter encountered a control lead failure.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
R1 36	ENC0	Encoder 0 Encoder 0 was the primary encoder in the billing data transmitter when record was taken.
R1 37	ENC1	Encoder 1 Encoder 1 was the primary encoder in the billing data transmitter when the record was taken.
R1 38	XPL	Crossed Perforator Leads The master timer, while normal, detected a false battery or ground on the perforator leads toward an AMA recorder or had detected false ground on perforator leads within the master timer. (A false ground on the perforator leads toward an AMA recorder will register A' to F' indications, but a false battery on the perforator leads toward an AMA recorder or a false ground on the perforator within the master timer is not registered on the A' to F' indications.)
R1 39	X	Cross-detected A transverter cross-detecting relay operated, in turn operating the X relay of the transverter as a trouble signal. (AMA, ANI)
R1 40	XRST	Crossed Recorder Start Lead The transverter detected a falsely grounded AMA recorder start lead.
R1 41	XRL	Crossed Release Lead A transverter detected: (a) A falsely grounded RL lead. (b) A premature operation of the RL relay. (c) A falsely grounded TR lead. (d) A premature operation of the P5 relay. (e) Contacts crossed on the RTR, TAL, TM3, SDT2, RL, TRBA, TBY, or TEC relays.
R1 42	XIC	Cross Identifier Control Leads A transverter detected: (a) A falsely grounded Trunk Identification Control (TIC) lead toward the trunk. (b) A premature operation of transverter TOK relay or RK relay. (c) A false battery or ground on Identification Control (XICA) lead within the transverter.
R1 43	XICK	Crossed Identifier Control Check The transverter detected a premature operation of either its IC, ICK, or DCB relays.
R1 44	XNL	Crossed Number Leads The transverter, while normal, detected a false ground on one or more of the following leads to the transverter connector: A0-A7, B0-B7, C0-C7, D0-D7, E0-E7, F0-F7, G0-G7, H0-H7, J0-J7, and M'7.
R1 45	XP	Crossed Perforator Leads The transverter, while normal, detected a false battery or ground on one or more of the following perforating and signaling leads from the transverter to the AMA recorder: A'0, A'2, B'0-B'7, C'0-C'7, D'0-D'7, E'0-E'7, F'0-F'7, P, P1, PA, PT, PT1, TCT,

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
R1 45 (Cont)	XP	DS, and DTN. If the P, P1, DS, DTN, PT, or PT1 indications are perforated on the trouble record card, it indicates that these leads are grounded, otherwise they had false battery on them to cause a trouble reaction.
R1 46	XRB	Crossed Recorder Busy Leads The transverter had detected a falsely grounded Recorder Busy (RB) lead to an AMA recorder.
R1 47	XTL	Crossed Tens Leads The AMA recorder detected a cross between two TC lead contacts on the same TL- relay in the call identity indexer. The XTL is always accompanied by XTC, but an XTC is not always accompanied by the XTL.
R1 48	XTC	Crossed Trunk Control The AMA recorder detected: (a) False ground on XTC or XTC1 leads to the call identity indexer. An XTC indication without an XTL shows that two or more TL- relays in the call identity indexer had operated. (b) False ground on XTC or TC1 leads on a transverter type of call.
R1 49	XU	Crossed Units Leads The transverter detected: (a) False battery on XT lead to the AMA recorder. (b) False ground on UK lead to the AMA recorder. (c) More than one units relay in the call identity indexer had operated.
R1 50	XTKK	Crossed Trunk Check The transverter detected a false ground on DTK or DTKA leads to the recorder.
R1 51	XP1	Crossed Preference Chain The AMA recorder detected a cross on the contacts of its perference chain relays IP, HP, TP-, and MTP.
R1 52	XT1	Crossed Tens The AMA recorder detected: (a) Crossed top 1 and 2 contacts of a T- relay in the call identity indexer when that particular T- relay is operated. (b) Open bottom 1 and 2 contacts of AT- relay in the call identity indexer.
R1 53	XU1	Crossed Units The AMA recorder detected an open or a cross at the top 1 and 3 and bottom 2 and 3 contacts of a U- relay in the call identity indexer.
R1 54	XCK	Crossed CK Lead The transverter detected a falsely grounded CK lead to an AMA recorder.
R1 55	XOF	Crossed Overflow Lead The transverter detected a falsely grounded OF lead to a transverter connector.
R1 56	X2P	Crossed Perforator Check The transverter detected operation of more than one Perforator Check (P1K-P4K) relay for the same line of entry.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
R1 57	XVF	Crossed Vertical File The transverter detected the operation of more than one VF- relay in the translator. (AMA, ANI)
R1 58	XET	Crossed Equipment Terminals The transverter detected a false ground on or cross between two or more equipment terminals in the translator. (AMA, ANI)
R1 59	XVG	Crossed Vertical Group The transverter detected the operation of more than one Group (G-) relay in the translator. (AMA, ANI)
R0 0-3	FT'0-3	Frame Tens Prime The FT- of the line link frame associated with the calling line, as transmitted by the marker to originating register or AMA sender.
R0 0-2	EA0-2	Encoder A-digit A-digit as registered in the billing data transmitter.
R0 4-8	FU'0,1,2,4,7	Frame Units Prime The FU- of the line link frame associated with the calling line, as transmitted by the marker to originating register or AMA sender.
R0 4-8	EB0,1,2,4,7	Encoder B-digit B-digit as registered in the billing data transmitter on a 2-out-of-5.
R0 9-14	VG'0,1,2,4,7,10	Vertical Group Primg The VG- of the calling line, as transmitted by the marker to originating register or AMA sender.
R0 9-13	EC0,1,2,4,7	Encoder C-digit See Encoder B-digit.
R0 15-19	HG'0,1,2,4,7	Horizontal Group Prime The HG- of the calling line, as transmitted by the marker to originating register or AMA sender.
R0 15-19	ED0,1,2,4,7	Encoder D-digit See Encoder B-digit.
R0 20-24	VF'0-4	Vertical File Prime The VF- of the calling line, as transmitted by the marker to originating register or AMA sender.
R0 20-24	EE0,1,2,4,7	Encoder E-digit See Encoder B-digit.
R0 25-29	CU0,1,2,4,7	Class Units The Class Units (CU-) of the calling subscriber's class of service, as registered in the marker.
R0 25-29	EF0,1,2,4,7	Encoder F-digit See Encoder B-digit.
R0 30-34	DT0,1,2,4,7	Day Tens The day in tens, as received from the master timer or the time-of-day circuit.

Card Coordinates (Cont)	Punch Designation	Functional Meaning and Indication
R0 35-39	DU0,1,2,4,7	Day Units The day in units, as received from the master timer or the time-of-day circuit.
R0 40-44	HT0,1,2,4,7	Hour Tens The hour in tens, as received from the master timer or the time-of-day circuit.
R0 45-49	HU0,1,2,4,7	Hour Units The hour in units, as received from the master timer or the time-of-day circuit.
R0 50-54	MT0,1,2,4,7	Minutes Tens The minutes in tens, as received from the master timer or the time-of-day circuit.
R0 55-59	MU0,1,2,4,7	Minutes Units The minutes in units, as received from the master timer or the time-of-day circuit.

B. Double-Sided Trouble Recorder Cards

2.03 Card Coordinates vs Punch Designation for Double-Sided Trouble Recorder Cards; Tables 1A, 1B, 1E, and 1F

Punch Designation

Card Coordinates		Front		Rear	
		Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
S8	00	TI	TI	TI	TI
S8	01	TST	TST		
S8	02	ROTL/MTPT	ROTL/MTPT	MTPT	MTPT
S8	03	ATKT	ATKT	ATKT	ATKT
S8	04	DRT/SRT	DRT/SRT	ARET	ARET
S8	10	TKT	TKT	TKT	TKT
S8	11	M	M		
S8	12	ACDO/MLV	ACDO/MLV	TLV	TLV
S8	13	LVF	LVF	LVF	LVF
S8	14	LVM	LVM	LVM	LVM
S8	20	MOR	MOR	TURN-OVER	PRT
S8	21	MIR	MIR	TURN-OVER	TV
S8	22	MOS	SS17 MOS	TURN-OVER	REC
S8	23	LIT	LIT	TURN-OVER	TMG
S8	24	ARET/PRT	ARET	TURN-OVER	MTR
S8	30	MKR	MKR CM	TURN-OVER	MTRS
S8	31	TURN-OVER	MKR DTM	MTRS/TV	
S8	32	TURN-OVER		ARET/REC	
S8	33	TURN-OVER		MTR/TMG	
S8	34	DR0		DR0	
S8	40	1		1	
S8	41	2		2	
S8	42	3	TURN-OVER	3	READ
S8	43	4	READ	4	TURN-OVER
S8	44	5	DR0	5	DR0
S8	50	6	1	6	1
S8	51	7	2	7	2
S8	52	8	4	8	4
S8	53	9	7	9	7
S8	54	DRT0	DRT0	DR-EMG	DR-EMG
S8	A	2W	DRT1		

Punch Designation (Cont)

Card Coordinates	Front		Rear	
	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
S7 00	1TR	1TR	1TR	1TR
S7 01	2TR	2TR	2TR	2TR
S7 02	WT	WT	TM1/TM2T	TM1/TM2T
S7 03	SDT	SDT	TM2/TM3T	TM2/TM3T
S7 04	LDT	LDT	NMF	NMF
S7 10	TRS	TRS	TRS	TRS
S7 11	IRT/TGT	IRT/TGT	TR	TR
S7 12	FCG	FCG	TR1T	TR1T
S7 13	LR	LR	RL	RL
S7 14	CWF/DCK	LRI	RL1	RL1
S7 20	GT5	CWF/DCK		
S7 21	SQA	GT5		
S7 22	PSR	SQA		
S7 23	MLF	PSI	L01	L01
S7 24	D		NL01	NL01
S7 30	MF		RE1	RE1
S7 31	ITR	ITR	NMB1/DRT2	NMB1
S7 32	SOG	SOG	DRT0/DRAT0	
S7 33	TER	TER	DRT1/DRAT1	
S7 34	TOG	TOG	DRA0	
S7 40	RV	RV	1	
S7 41	CAMA	CAMA	2	
S7 42	DTF	RSW	3	DRT0/DRAT2
S7 43	ROA	ROA	4	DRT1/DRAT2
S7 44	PRR/FLG	PRR/FLG	5	DRA0
S7 50	SCB	SCB	6	DRA1
S7 51	NSO	NSO	7	DRA2
S7 52	NSI	NSI	8	DRA4
S7 53	SON	SON	9	DRA7
S7 54	DRT1	LIO	DRA-EMG	DRA-EMG
S7 A	4W	LT1		

Punch Designation (Cont)

Card Coordinates	Front		Rear	
	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
S6 00	RPB	RPB	2W	2W
S6 01	RPAB	RPAB	4W	4W
S6 02	RPSA	RPSA	TTT	TTT
S6 03	RP0/RA0	RP0/RA0	T1A0	T1A0
S6 04	RP1/RA1	RP1/RA1	1	1
S6 10	RP2/RA2	RP2/RA2	2	2
S6 11	RP3/RA3	RP3/RA3	3	3
S6 12	RP4/RA4	RP4/RA4		
S6 13	LB	LB		
S6 14	FM	FM		
S6 20	RCY	RCY		
S6 21	RA	RA		
S6 22	RR/PRCY	RR/PRCY		
S6 23	SNR/ALN	SNR/ALN	L00	L00
S6 24	IFK/LRA	IFK/RWL	NL00	NL00
S6 30	SQ1/TRF	SQ1/LWL	RE0	RE0
S6 31	ATT	TRF	DRC/NMB0	NMB0
S6 32	AMA	ATT	LLCK/BBFC	DRC/BBFC
S6 33	TH'0	DTF	TS	TS
S6 34	TH'1	DT1	BI0	BI0
S6 40	CM3	DAT1	BI1	BI1
S6 41	CMA	AOT		
S6 42	CMB	PBX		
S6 43	CMC			
S6 44	TAN0/SD	WDTF		
S6 50	TAN1/PCK	WDTI		
S6 51	TAN2/PRL	WAT		
S6 52	TAN3/RLK			
S6 53	TAN4/PTR	MLF		
S6 54	TAN5/XX	D		
S6 A	CD0	MF		

Punch Designation (Cont)

Card Coordinates	Front		Rear	
	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
S5 00	FR0	FR0	RST-EMG	FR0
S5 01	1	1		1
S5 02	2	2		FR2
S5 03	3	FR3		
S5 04	4			
S5 10	5	CN0		CN0
S5 11	6	1		1
S5 12	7	2		CN2
S5 13	8	CN3		
S5 14	FR9			
S5 20	CN0	HT0	CN0	HT0
S5 21	1	1	1	1
S5 22	CN2	HT2	CN2	HT2
S5 23	CN3	4		4
S5 24	TOK/CMK	HT7		HT7
S5 30	HT0	TT0	MBI0	MBI0
S5 31	1	1	1	1
S5 32	2	2	2	2
S5 33	4	4	4	4
S5 34	HT7	TT7	MBI7	MBI7
S5 40	TT0	UT0	T0	T0
S5 41	1	1	1	1
S5 42	2	2	2	2
S5 43	4	4	4	4
S5 44	TT7	UT7	T7	T7
S5 50	UT0	FG0	U0	U0
S5 51	1	1	1	1
S5 52	2	2	2	2
S5 53	4	ECN	4	4
S5 54	UT7	OCN	U7	U7
S5 A	CD1			

Punch Designation (Cont)

Card Coordinates	Front		Rear	
	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
S4 00	CN-RG0	CN-RG/T0	RST0	RST/T0
S4 01	1	1	1	RST/T1
S4 02	2	CN-RG/T2	2	RST/T2
S4 03	3	CN-RG/U0	3	RST/U0
S4 04	4	1	4	1
S4 10	5	2	5	2
S4 11	6	4	6	4
S4 12	7	CN-RG/U7	7	RST/U7
S4 13	8	PS	8	RST-EMG
S4 14	9	PD	9	TOK/CMK
S4 20	10	PK	10	
S4 21	11	CR	11	
S4 22	12	SCN	12	
S4 23	13	SCK	13	
S4 24	14	CNR	14	
S4 30	15	TCA/MAN	15	
S4 31	16	TCB/2P	16	
S4 32	17	AC8	17	
S4 33	18	RV1	18	
S4 34	CN-RG19	TAN0	RST19	
S4 40	RG20	1	TRT0	TRT0
S4 41	21	2	1	1
S4 42	22	4	2	2
S4 43	RG23	7	4	4
S4 44	SPC	TAN5	TRT7	TRT7
S4 50	FG0	2W	TRU0	TRU0
S4 51	1	TF0	1	1
S4 52	FG2	1	2	2
S4 53	ECN	2	4	4
S4 54	OCN	4	TRU7	TRU7
S4 A	CD2	TF7		

Punch Designation (Cont)

Card Coordinates	Front		Rear	
	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
S3 00	SDG/LT	SDG/LT	RST20	LT
S3 01	TT	TT	21	TT
S3 02	2DT	2DT	22	2DT
S3 03	FVD	FVD	23	FVD
S3 04	X11	X11	24	X11
S3 10	11	11	25	11
S3 11	OA	OA	26	OA
S3 12	OB	OB	27	OB
S3 13	PHC	PHC	28	PHC
S3 14	THC	THC	RST29	THC
S3 20	OR	OR	NTB	
S3 21	FAC	FAC	CIK	
S3 22	INC	INC	RK	
S3 23	TAN	TAN	ASK	
S3 24	TOL	TOL	TRMF	
S3 30	PCR	PCR	RG0	RG0
S3 31	PCD	PCD	1	1
S3 32	PCD1	PCD1	2	2
S3 33	CAMF	CAMF	4	4
S3 34	CAMS	CAMS	RG7	RG7
S3 40	LT1	LT1	AT0	AT0
S3 41	LT2	LT2	1	1
S3 42	LT3	LT3	AT2	AT2
S3 43	NSP	PK1		
S3 44	R0	R0		
S3 50	TF0	4W	EC0	EC0
S3 51	1		1	1
S3 52	2		EC2	EC2
S3 53	4			
S3 54	TF7			
S3 A	CD4			

Punch Designation (Cont)

Card Coordinates	Front		Rear	
	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
S2 00	RNT20/PS	CD0	RNT2	CM3
S2 01	PD	1		CMA
S2 02	PK	2		CMB
S2 03	CR	4		CMC
S2 04	SCN	7		SD
S2 10	SCK	10		PCK
S2 11	CNR	CD 15		PRL
S2 12	TCA/MAN	CD'CT'0		RLK
S2 13	TCB/2P	1		PTR
S2 14	TOBS/OBS1	2	NSP	XX
S2 20	TOB/OBS2	4	SPC	NTB
S2 21	OBS	7	OBS	CIK
S2 22	NOB	CD'CT'10	NOB	RK
S2 23	WC	CD'CT'15	WC	ASK
S2 24	CDN			TRMF
S2 30	AR-HT'0	AR-HT'0	ORT0	ORT0
S2 31	1	1	ORT1	ORT1
S2 32	2	2		ORU0
S2 33	4	4		ORU1
S2 34	AR-HT'7	AR-HT'7		ORU2
S2 40	BR-TT'0	BR-TT'0	ORU0	ORU4
S2 41	1	1	1	ORU7
S2 42	2	2	2	O1T0
S2 43	4	4	4	O1T1
S2 44	BR-TT'7	BR-TT'7	7	O1T2
S2 50	CR-UT'0	CR-UT'0	O1N0	O1N0
S2 51	1	1	1	1
S2 52	2	2	2	2
S2 53	4	4	4	4
S2 54	CR-UT'7	CR-UT'7	7	7
S2 A	CD7			

Punch Designation (Cont)

Card Coordinates	Front		Rear	
	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
S1 00	A0	A0	A0	A0
S1 01	1	1	1	1
S1 02	2	2	2	2
S1 03	4	4	4	4
S1 04	A7	A7	7	7
S1 10	B0	B0	B0	B0
S1 11	1	1	1	1
S1 12	2	2	2	2
S1 13	4	4	4	4
S1 14	B7	B7	7	7
S1 20	C0	C0	C0	C0
S1 21	1	1	1	1
S1 22	2	2	2	2
S1 23	4	4	4	4
S1 24	C7	C7	7	7
S1 30	D0	D0	D0	D0
S1 31	1	1	1	1
S1 32	2	2	2	2
S1 33	4	4	4	4
S1 34	D7	D7	7	7
S1 40	E0	E0	E0	E0
S1 41	1	1	1	1
S1 42	2	2	2	2
S1 43	4	4	4	4
S1 44	E7	E7	7	7
S1 50	F0	F0	F0	F0
S1 51	1	1	1	1
SL 52	2	2	2	2
S1 53	4	4	4	4
S1 54	F7	F7	7	7
S1 A				

Punch Designation (Cont)

Card Coordinates	Front		Rear	
	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
S0 00	A'0	A'0	A'0	A'0
S0 01	1	1	1	1
S0 02	2	2	2	2
S0 03	4	4		
S0 04	A'7	A'7		
S0 10	B'0	B'0	B'0	B'0
S0 11	1	1	1	1
S0 12	2	2	2	2
S0 13	4	4	4	4
S0 14	B'7	B'7	7	7
S0 20	C'0	C'0	C'0	C'0
S0 21	1	1	1	1
S0 22	2	2	2	2
S0 23	4	4	4	4
S0 24	C'7	C'7	7	7
S0 30	D'0	D'0	D'0	D'0
S0 31	1	1	1	1
S0 32	2	2	2	2
S0 33	4	4	4	4
S0 34	D'7	D'7	7	7
S0 40	E'0	E'0	E'0	E'0
S0 41	1	1	1	1
S0 42	2	2	2	2
S0 43	4	4	4	4
S0 44	E'7	E'7	7	7
S0 50	F'0	F'0	F'0	F'0
S0 51	1	1	1	1
S0 52	2	2	2	2
S0 53	4	4	4	4
S0 54	F'7	F'7	7	7
S0 A		N7		

Punch Designation (Cont)

Card Coordinates	Front		Rear	
	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
R8 00	G0	G0	G0	G0
R8 01	1	1	1	1
R8 02	2	2	2	2
R8 03	4	4	4	4
R8 04	G7	G7	G7	G7
R8 10	H0	H0	H0	H0
R8 11	1	1	1	1
R8 12	2	2	2	2
R8 13	4	4	4	4
R8 14	H7	H7	H7	H7
R8 20	J0	J0	J0	J0
R8 21	1	1	1	1
R8 22	2	2	2	2
R8 23	4	4	4	4
R8 24	J7	J7	J7	J7
R8 30	K0	K0	K0	K0
R8 31	1	1	1	1
R8 32	2	2	2	2
R8 33	4	4	4	4
R8 34	K7	K7	K7	K7
R8 40	L0	L0	L0	L0
R8 41	1	1	1	1
R8 42	2	2	2	2
R8 43	4	4	4	4
R8 44	L7	L7	L7	L7
R8 50	N7/M7	M0	M7	
R8 51	CRU0	1	M0	
R8 52	1	2	1	
R8 53	2	4	2	
R8 54	CRU4	M7	M4	M7
R8 A	LOLD	N'7		

Punch Designation (Cont)

Card Coordinates	Front		Rear	
	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
R7 00	G'0	G'0	AT-/OA0	AT/OA0
R7 01	1	1	1	1
R7 02	2	2	2	2
R7 03	4	4	4	4
R7 04	G'7	G'7	AT-/OA7	AT/OA7
R7 10	H'0	H'0	BT-/OB0	BT/OB0
R7 11	1	1	1	1
R7 12	2	2	2	2
R7 13	4	4	4	4
R7 14	H'7	H'7	BT-/OB7	BT/OB7
R7 20	J'0	J'0	CT/OC0	CT/OC0
R7 21	1	1	1	1
R7 22	2	2	2	2
R7 23	4	4	4	4
R7 24	J'7	J'7	CT/OC7	CT/OC7
R7 30	K'0	K'0	OD0	OD0
R7 31	1	1	1	1
R7 32	2	2	2	2
R7 33	4	4	4	4
R7 34	K'7	K'7	OD7	OD7
R7 40	L'0	L'0	OE0	OE0
R7 41	1	1	1	1
R7 42	2	2	2	2
R7 43	4	4	4	4
R7 44	L'7	L'7	OE7	OE7
R7 50	N'7/M'7	M'0	OF0	OF0
R7 51	M11	1	1	1
R7 52	CL7	2	2	2
R7 53	CL8	4	4	4
R7 54	CRU7	M'7	OF7	OF7
R7 A	LOLL	M11		

Punch Designation (Cont)

Card Coordinates	Front		Rear	
	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
R6 00	GS1	GS1	OG0	OG0
R6 01	2	2	1	1
R6 02	3	3	2	2
R6 03	4	4	4	4
R6 04	GS5	GS5	7	7
R6 10	FAA	FAA	ALS	ALS
R6 11	FAB	FAB	AL0	AL0
R6 12	AL	AL	1	1
R6 13	AVG/GPA	AVG/GPA	2	2
R6 14	GPB	GPB	4	4
R6 20	CWK/TWT	CWK/TWT	AL7	AL7
R6 21	OPR	OPR	ARS	ARS
R6 22	CNS	CNS	AR0	AR0
R6 23	DR	DR	1	1
R6 24	CRR0	NW	2	2
R6 30	1	NWT	4	4
R6 31	CRR2		AR7	AR7
R6 32	TTR	TTR	TTR	TTR
R6 33	RT0	RT0		
R6 34	1	1		
R6 40	2	2		
R6 41	3	3		
R6 42	RT4	RT4		
R6 43	CTUK	TH'0		
R6 44	TC	TH'1		
R6 50	CN	TOBS/OBS1		NSP
R6 51	TP	TOB/OBS2		SPC
R6 52	TP'	OBS		OBS
R6 53	RP	NOB		NCB
R6 54	RPK	WC		WC
R6 A	CE'			

Punch Designation (Cont)

Card Coordinates	Front		Rear	
	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
R5 00	FR0	FR0	FR0	FR0
R5 01	1	1	1	1
R5 02	2	2	2	2
R5 03	3	3	3	3
R5 04	FR4	FR4	FR4	4
R5 10	CN0	CN0	CN0	CN0
R5 11	1	1	1	1
R5 12	2	2	2	2
R5 13	CN3	CN3	CN3	CN3
R5 14	S0	S/T0	S0	S/T-0
R5 20	S1	S/T1	1	1
R5 21	2	S/U0	2	S/U-0
R5 22	3	1	3	1
R5 23	4	2	4	2
R5 24	5	4	5	4
R5 30	6	S/U7	6	S/U-7
R5 31	7		7	
R5 32	8		8	
R5 33	9		9	
R5 34	10		10	
R5 40	11		11	
R5 41	12		12	
R5 42	13	SR1	13	
R5 43	S14	TH'2/2	S14	
R5 44	2LN	TH'3/SR3		
R5 50	NT-ORC0	AG1	ORC0	
R5 51	NN-ORC1	2	1	
R5 52	HF-ORC2	3	ORC2	
R5 53	NH	4		
R5 54	SPL	CRS/5	SPL	TC
R5 A	BRL	HMS/AG6		

Punch Designation (Cont)

Card Coordinates	Front		Rear	
	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
R4 00	OSG0	OSG/T0	CLF	CLF
R4 01	1	OSG/T1	ENC0	ENC0
R4 02	2	OSG/U0	ENC1	ENC1
R4 03	3	1		POTS
R4 04	4	2		DTW
R4 10	5	4		W
R4 11	6	OSG/U7		SCH
R4 12	7	SSA		SNC
R4 13	8	SSB		AC
R4 14	9	R0'		NAC
R4 20	10	LH/LST		LST
R4 21	11	RH/L5D		L5D
R4 22	SSA	4DG		4DG
R4 23	SSB	5DG	POTS	5DG
R4 24	OS0	SC		SC
R4 30	OS1	NC/TVT	W	TVT
R4 31	OS2	OBS'	SCH	
R4 32	3	NOB'	SNC	
R4 33	OS4	AMA	AC	
R4 34	CGC	LOLL	NAC	
R4 40	R0'	LOLD		SK1
R4 41	AC8	VTC		VTC
R4 42	DAC	DNC		DNC
R4 43	TLT	RC		FC
R4 44	RV1	WKC		WKC
R4 50	RNT'2/ORC'0	AID/NH	SK0	
R4 51	1	NID/SPL	1	SPL
R4 52	ORC'2	NT/ORC0		ORC0
R4 53	NTT	NN/ORC1		1
R4 54	AIS/MPT	HF/ORC2	TC	2
R4 A	ESCK			

Punch Designation (Cont)

Card Coordinates	Front		Rear	
	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
R3 00	RN-SPC-ITC0	RN-SPC-ITC0		
R3 01	1	1		
R3 02	2	2		
R3 03	3	4		
R3 04	4	RN-SPC-ITC7		
R3 10	5	OS 0		
R3 11	6	1		
R3 12	7	2		
R3 13	8	3		
R3 14	RN-SPC-ITC9	OS 4		
R3 20	OD-RNT0	OD-RNT0	OD/RNT0	OD/RNT0
R3 21	AD-RNT1	AD-RNT1	AD/RNT1	AD/RNT1
R3 22	OD'-RNT'0	OD'-RNT'0		
R3 23	AD-'RNT'1	AD-'RNT'1		
R3 24	LH/LST	RNT20	LST	RNT2
R3 30	RH/L5D		L5D	
R3 31	4DG		4DG	
R3 32	5DG		5DG	
R3 33	SC		SC	
R3 34	TVT/NC		TVT	
R3 40	OBS'			
R3 41	NOB'			SK0
R3 42	LCD0	LCD0	LCD0	LCD0
R3 43	1	1	1	1
R3 44	LCD2	LCD2	2	2
R3 50	ACD	ACD	ACD	ACD
R3 51	VTC	NTT	VTC	
R3 52	DNC	MPT	DNC	
R3 53	FC	RNT'2/ORC'0	FC	
R3 54	WKC	ORC'1	WKC	
R3 A	PS1	ORC'2		

Punch Designation (Cont)

Card Coordinates	Front		Rear	
	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
R2 00	CP0	CP0	CP0	CP0
R2 01	1	1	1	1
R2 02	2	2	2	2
R2 03	4	4	4	4
R2 04	CP7	CP7	CP7	CP7
R2 10	MB-CU'-0	MB-0	MB0	MB0
R2 11	1	1	1	1
R2 12	2	2	2	2
R2 13	4	4	4	4
R2 14	MB-CU'-7	MB-7	MB7	MB7
R2 20	VU/RN0	VU/RN0	RN0	RN0
R2 21	1	1	1	1
R2 22	2	2	2	2
R2 23	4	4	4	4
R2 24	VU/RN7	VU/RN7	RN7	RN7
R2 30	CK/DL1	CK/DL1	OAR0	
R2 31	2	2	1	
R2 32	3	3	OAR2	
R2 33	4	4		
R2 34	CK/DL5	CK/DL5		
R2 40	DL6	DL6		
R2 41	CL1	CL1		
R2 42	2	2		OAR0
R2 43	3	3		1
R2 44	4	4		OAR2
R2 50	5	5	TAR0	TAR0
R2 51	CL6	6	1	1
R2 52	CT4	7	2	2
R2 53	CT7	CL8	TAR3	TAR3
R2 54	AND/PBX	ANC/SPC		
R2 A	SR1	NSP		

Punch Designation (Cont)

Card Coordinates	Front		Rear	
	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
R1 00	FT0	FT0	FT0	FT0
R1 01	1	1	1	1
R1 02	2	2	2	2
R1 03	FT3	FT3	FT3	3
R1 04	FU0	FU0	FU-TH'-0	FU-TH'-0
R1 10	1	1	1	1
R1 11	2	2	2	2
R1 12	4	4	4	4
R1 13	FU7	FU7	FU-TH'-7	7
R1 14	VG0	VG0	VG-H'- 0	VG-H'- 0
R1 20	1	1	1	1
R1 21	2	2	2	2
R1 22	4	4	4	4
R1 23	7	7	7	7
R1 24	VG10	VG10	VG-H'-10	VG-H'-10
R1 30	HG0	HG0	SW-T'- 0	SW-T'- 0
R1 31	1	1	1	1
R1 32	2	2	2	2
R1 33	4	4	4	4
R1 34	HG7	HG7	SW-T'- 7	SW-T'- 7
R1 40	VF0	VF0	U'-VF0	U'0 VF0
R1 41	1	1	1	1 1
R1 42	2	2	2	2 2
R1 43	3	3	4/3	4 3
R1 44	VF4	VF4	U'-7/4	7 4
R1 50	CT0	CDA0	OFF'-CD-0	OFF'-CD-0
R1 51	1	1	1	1
R1 52	CT2	2	2	2
R1 53	CGA	4	4	4
R1 54	CGB	CDA7	OFF'-CD-7	OFF'-CD-7
R1 A	TH'2/SR2			

Punch Designation (Cont)

Card Coordinates	Front		Rear	
	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
R0 00	SWT/FT'-FG'0	SWT/FT'-0	EA0/NID	EA0/NID
R0 01	SWT1	SWT1	EA1/IOD	EA1/IOD
R0 02	2	2	EA2/AOS	EA2/AOS
R0 03	FT'-FG'3	FT'-3		
R0 04	SW/FU'-TF'0	SW/FU'0		
R0 10	1	1	EB0	EB0
R0 11	2	2	1	1
R0 12	4	4	2	2
R0 13	SW/FU'-TF'7	SW/FU'7	4	4
R0 14	VG'0	VG'0	EB7	EB7
R0 20	1	1	EC0	EC0
R0 21	2	2	1	1
R0 22	4	4	2	2
R0 23	7	7	4	4
R0 24	VG'10	VG'10	EC7	EC7
R0 30	HG'0	HG'0	ED0	ED0
R0 31	1	1	1	1
R0 32	2	2	2	2
R0 33	4	4	4	4
R0 34	HG'7	HG'7	ED7	ED7
R0 40	VF'0	VF'0	EE0	EE0
R0 41	1	1	1	1
R0 42	2	2	2	2
R0 43	3	3	4	4
R0 44	VF'4	VF'4	EE7	EE7
R0 50	CU 0		EF0	EF0
R0 51	1		1	1
R0 52	2		2	2
R0 53	4		4	4
R0 54	CU 7		EF7	EF7
R0 A	TH'3/SR3			

Punch Designation (Cont)

	Front		Rear	
Card Coordinates	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
SA8 B	LVR			
SA8 00	TM			
SA8 01	CKG			
SA8 02	TC1			
SA8 03	NE			
SA8 04	TRN	TM		
SA8 10	GTL	CKG		
SA8 11	TSE	TC1		
SA8 12	FCK	NE		
SA8 13	FTCK	TRN		
SA8 14	SNK	GTL		
SA8 20	CK	TSE		
SA8 21	FML	FCK		
SA8 22	MAK1	FTCK		
SA8 23	TBK	SNK		
SA8 24	RK1/ORK	CK		
SA8 30	RK2	FML		
SA8 31	VTK1	MAK1	XRL1	
SA8 32	HTK1	TBK	XOST	
SA8 33	FTK1	RK1/ORK	XTOK	
SA8 34	LFK	RK2	XRTL	
SA8 40	DTK	VTK1	XIN1	
SA8 41	FAK	HTK1	XIN2	
SA8 42	FBK	FTK1	XIN3	
SA8 43	LCK	LFK	XRA	
SA8 44	RK3	FK	XS	
SA8 50	HGK	LFK1	XRN	
SA8 51	RK	DTK	XRE	
SA8 52	LK	FAK		
SA8 53	JCK	FBK		
SA8 54	TCHK	LCK		

Punch Designation (Cont)

Card Coordinates	Front		Rear	
	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
SA7 B	LVS	RK3		
SA7 00	TK	HGK	RN	
SA7 01	RL	RK	MO	
SA7 02	HTR	LK	MG	
SA7 03	HMS1	JCK	SPA	
SA7 04	LTR/LXPA	TCHK	SKP	
SA7 10	JXPA	TK		
SA7 11	SL	RL		
SA7 12	CHE/JXP1	HTR	SP	
SA7 13	LXP1	HMS1	X	
SA7 14	GLH	LTR/LXPA	XST/XPL	
SA7 20	CON	JXPA	XRST	
SA7 21	GT2	SL	XRL	
SA7 22	DCT	CHE/JXP1	XTS/XIC	
SA7 23	RSC	LXP1	X1CK	
SA7 24	AVK1	GLH	XNL	
SA7 30	DCT1	CON	XDS/XP	
SA7 31	DCT3	GT2	XRB	XRL1
SA7 32	LK1	DCT	XTL	XOST
SA7 33	DCT2	RSC	XTC	XTOK
SA7 34	DIS1	AVK1	XU	XRTL
SA7 40	OSE	DCT1	XTKK	XIN1
SA7 41	OSK	DCT3	XTP/XP1	XIN2
SA7 42	TA/TSR	LK1	XT1	XIN3
SA7 43	OST2	DCT2	XU1	XRA
SA7 44	RNT2	DIS1	XCK	XS
SA7 50	RNK	OSE	XOF	XRN
SA7 51	SLK1	OSK	XRD/X2P	XRE
SA7 52	SLK2	TA/TSR	XVF	
SA7 53	TIR	OST2	XET	
SA7 54	CGT	RNT2	XVG	

Punch Designation (Cont)

Card Coordinates	Front		Rear	
	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
SA6 B	CD'/CT'0	RNK		
SA6 00	XCL	SLK1	TEA	RN
SA6 01	XCR	SLK2	TGR	MO
SA6 02	XDL	RIK	OP1	MG
SA6 03	XHG1/XMB	CE'		SPA
SA6 04	XCP	TTG0/MMK		SKP
SA6 10	XOB/XL	TTG1/WCV		
SA6 11	XTV/XI	WFCK	PRE	
SA6 12	XT5	WLFK	BA	SP
SA6 13	XTB/RIK	WHSI	P	X
SA6 14	XTG/AOT	LXWA	DTK	XST/XPL
SA6 20	XTB1	JXWA	PT1	XRST
SA6 21	XTG1	LXWI	DTN	XRL
SA6 22	XJC	JXWI	PT	XTS/X1C
SA6 23	XJG	WCK	PAK	X1CK
SA6 24	XJS	WCN	CK	XNL
SA6 30	XLR	CWCN	P1	XDS/XP
SA6 31	XTS	RSMR	LC	XRB
SA6 32	XLC	RUKI	DS	XTL
SA6 33	XLV	TSK	RD	XTC
SA6 34	XAB/MXT	WDCI	TNR/TBL	XU
SA6 40	XF	WTK	PTS	XTKK
SA6 41	XSL	WTPK	EQL/TRL	XTP/XP1
SA6 42	XTS1	WSL	OOL/TNK	XT1
SA6 43	XPT	RDCK	HDK/BSP	XU1
SA6 44	XRS	TIR	RL/ASP	XCK
SA6 50	XRS1	TRL	RL1/DA	XOF
SA6 51	XFT	BT	RL2/HR	XRD/X2P
SA6 52	TRL	BRL	TRL/SC	XVF
SA6 53	BT	MRL	MET/SY	XET
SA6 54	MRL	CGT	DCT/NS	XVG

Punch Designation (Cont)

	Front		Rear	
Card Coordinates	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
SA5 B	CD'/CT'1	MXT		
SA5 00	XHG	XPG/XCL	TM	TEA
SA5 01	NMRS/XLG	XCR	CKG/GC	TGR
SA5 02	NMSC/XCS	XJC/XDL	CK7	OP1
SA5 03	XLS	XMB	CK1	
SA5 04	XLH	XCP	CK2	
SA5 10	XL0	XBT/XTV	CK4	
SA5 11	LRI	XT5	FABC	PRE
SA5 12	XFUT	XTB1	FACK	BA
SA5 13	RYK	XTG1	DNK	P
SA5 14	SXT/XSS	XJG	RK	DTK
SA5 20	XS	XJS	IC	PT1
SA5 21	XHM/XSA	XCLC/XLR	TOK	DTN
SA5 22	XN	XTS	MRST/CI4	PT
SA5 23	DTI/XFG	XLC	LCP/CI3	PAK
SA5 24	XPG	XLV	MRRL/C1FA	CK
SA5 30	XPTN/DAT1	XF	TTKL/CI2	P1
SA5 31	XT	XSL	IRY	LC
SA5 32	XCLC	XTS1	CI1	DS
SA5 33	XCKR	XRL/XPT	P5	RD
SA5 34	LIO/XTC	XRS	RLR	TNR/TBL
SA5 40	XTC1/CI1	XRS1		PTS
SA5 41	XTRK	XFT		EOL/TRL
SA5 42	XTRL	XHG		OOL/TNK
SA5 43	XBT	XLG		HDK/BSP
SA5 44	XRL	XCS	ITTR	RL/ASP
SA5 50	XMRL	XLS	OF	RL1/DA
SA5 51	XAN	XLH	TBY	RL2/HR
SA5 52	XCH	XLO	EXT	TRL/SC
SA5 53	XVGA/XHGA	XFUT	RB	MET/SY
SA5 54	XCW/XVGB	SXT/XSS	BY	OCT/NS

Punch Designation (Cont)

Card Coordinates	Front		Rear	
	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
SA4 B	CD'/CT'2	XS		
SA4 00	RTE/FTT0	XHM/XSA	CC0	TM
SA4 01	1	XN	1	CKG/GC
SA4 02	2	XTC	2	CK7
SA4 03	RTE/FTT3	XTC1	3	CK1
SA4 04	4	XCKR/XTRK	4	CK2
SA4 10	FTT5	XT/XTRL	5	CK4
SA4 11	FUT0	XMRL/XAN	6	FABC
SA4 12	1	XCH	7	FACK
SA4 13	2	XVGA	8	DNK
SA4 14	3/4	RCW/XVGB	CC9	RK
SA4 20	4/7	XLF		IC
SA4 21	5	XSC		TOK
SA4 22	6	XCE		MRST/CI4
SA4 23	7	XBRL		LCP/CI3
SA4 24	8	XI	4WT/TPT	MRRL/CIFA
SA4 30	FUT9	XL	4WL/RPT	TTKL/CI2
SA4 31	VGT0	XHG1		IRY
SA4 32	1	XHGA	TV	CI1
SA4 33	2	XST	IPA	P5
SA4 34	3	XAB	OT0	RLR
SA4 40	4	XWB	HR1	
SA4 41	5	BCN		
SA4 42	6	LSK	ME/A	
SA4 43	7		MTTR/B	
SA4 44	8		TST/D	ITTR
SA4 50	9		RTRS/E	OF
SA4 51	10		3ANT/SP	TBY
SA4 52	VGT11		3AM/RT	EXT
SA4 53	XLF		RTST/TEN	RB
SA4 54	XSC	WMXT	MTFT/ET	BY

Punch Designation (Cont)

	Front		Rear	
Card Coordinates	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
SA3 B	CD'/CT'4	FTT0		
SA3 00	HGT0	1	AC	
SA3 01	1	2	7DG	
SA3 02	2	3	RGK	
SA3 03	3	4	G	
SA3 04	4	FTT5	T5L	
SA3 10	5	FUT0	T4L	
SA3 11	6	1	OIK	
SA3 12	7	2	NMK	
SA3 13	8	4	PRLK	
SA3 14	HGT9	FUT7	P2L	
SA3 20	VFT0	VGT/T0	P4L	
SA3 21	1	VGT/T1	P5L	
SA3 22	2	VGT/U0	B1RA	
SA3 23	3	1	1E	
SA3 24	VFT4	2	ROP	4WT/TPT
SA3 30	RCT1	4	PRL	4WL/RPT
SA3 31	2	VGT/U7	2L	
SA3 32	3	HGT0	4L	TV
SA3 33	4	1	CK	1PA
SA3 34	5	2	ABX	OT0
SA3 40	6	4	VTC	HR1
SA3 41	7	HGT7	TC	
SA3 42	8	VFT0	ROP1	ME/A
SA3 43	9	1	RSG1	MTTR/B
SA3 44	10	2	RSG2	TST/D
SA3 50	11	3	RSG3	RTRS/E
SA3 51	12	VFT4	OTK	3ANT/SP
SA3 52	13	RS0	TTK	3AM
SA3 53	14	RS1	MBK	RTST/TEN
SA3 54	RCT15	RS2		MTFT/ET

Punch Designation (Cont)

Card Coordinates	Front: Tables 1A and 1B 1/X Card	Front: Tables 1E and 1F 2/5 Card	Rear: Tables 1A and 1B 1/X Card	Rear: Tables 1E and 1F 2/5 Card
SA2 B	CD'/CT'7	CS/T0		
SA2 00	CS0	1	TLR0	AC
SA2 01	1	2	1	7DG
SA2 02	2	4	2	RGK
SA2 03	3	CS/T7	3	G
SA2 04	4	CS/U0	4	T5L
SA2 10	5	1	5	T4L
SA2 11	6	2	6	O1K
SA2 12	7	4	7	NMK
SA2 13	8	CS/U7	8	PRLK
SA2 14	9	RTF0	9	P2L
SA2 20	10	1	10	P4L
SA2 21	CS11	RTE2	TLR111	P5L
SA2 22	CS12	RTE4	TLR12	B1RA
SA2 23	13	RTE7	13	1E
SA2 24	14	CGA	14	ROP
SA2 30	15	CGB	15	PRL
SA2 31	16	CGC	16	2L
SA2 32	17	TCGA	17	4L
SA2 33	18	TCGB	18	CK
SA2 34	19	WB0	19	ABX
SA2 40	20	WB1	20	VTC
SA2 41	21	WB2	21	TC
SA2 42	22	WBT0	22	ROP1
SA2 43	23	WBT1	23	RSG1
SA2 44	24	WBT2	24	RSG2
SA2 50	25	WMM	25	RSG3
SA2 51	26	JSSF	26	OTK
SA2 52	27	TBL	27	TTK
SA2 53	28	WGA	28	MBK
SA2 54	CS29	WGB	TLR29	

Punch Designation (Cont)

	Front		Rear	
Card Coordinates	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
SA1 B	TB6	CT0		
SA1 00	TB0	1	AIODT0	RA1
SA1 01	1	2	1	RB1
SA1 02	2	4	AIODT2	RC1
SA1 03	3	CT7		RD1
SA1 04	4	CU0		RA2
SA1 10	TB5	1		RB2
SA1 11	TG0	2		RC2
SA1 12	1	4		RD2
SA1 13	2	CU7		RA3
SA1 14	3	CRU0		RB3
SA1 20	4	1		RC3
SA1 21	5	2		RD3
SA1 22	TG6	CRU4		RA4
SA1 23	7	CRU7		RB4
SA1 24	8	WHC0		RC4
SA1 30	9	WHC1		RD4
SA1 31	10	WHC2		RA5
SA1 32	11	WHC4		
SA1 33	12	WHC7		
SA1 34	13	WL-TSQ0		
SA1 40	14	WL-TSQ1		DL0
SA1 41	15	2		1
SA1 42	16	4		2
SA1 43	17	WL-TSQ7		4
SA1 44	18	LLCK		DL7
SA1 50	TG19	LLC0		DR0
SA1 51	TTG-TBS0	1		1
SA1 52	TTG- 1	2		2
SA1 53	2	LLC3	TLR30	4
SA1 54	TBS3	TSA/SWAT	TLR31	DR7

Punch Designation (Cont)

Card Coordinates	Front		Rear	
	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
SA0 B	TB7	TE0		
SA0 00	FS0	1	G-0	TRE
SA0 01	1	2	1	TRSA
SA0 02	2	4	2	TRSB
SA0 03	3	TB7	3	TRA
SA0 04	4	TG/T0	4	TRA2
SA0 10	5	TG/T1	5	HDA
SA0 11	6	TG/U0	6	PKA
SA0 12	7	1	7	HDB
SA0 13	8	2	8	PKB
SA0 14	FS9	TG/U4	9	ON
SA0 20	FS10	TG/U7	10	SW
SA0 21	11	FS/T0	11	SW1
SA0 22	FS12	FS/T1	G-12	RLK
SA0 23	13	FS/T2	13	RL1
SA0 24	14	FS/U0	14	RL2
SA0 30	15	1	15	
SA0 31	16	2	16	CRT
SA0 32	17	4	17	ETM
SA0 33	18	FS/U7	18	SP
SA0 34	19	TS/T0	G-19	WTL
SA0 40	20	TS/T1	GA	CL0
SA0 41	21	TS/U0	GB	1
SA0 42	22	1		2
SA0 43	23	2		4
SA0 44	24	4		CL7
SA0 50	25	TS/U7		CR0
SA0 51	26	TS0		1
SA0 52	27	1		2
SA0 53	28	2		4
SA0 54	FS29	TS3		CR7

Punch Designation (Cont)

	Front		Rear	
Card Coordinates	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
RA8 B	TB8	LV0		
RA8 00	TS0	1	OFF-0	DC
RA8 01	1	2	1	DCC
RA8 02	2	4	2	TSTI
RA8 03	3	LV7	3	ACTA
RA8 04	4	LVR	4	ACTB
RA8 10	5	LVS	5	GO
RA8 11	6	LC0	6	SM
RA8 12	7	1	7	WSM
RA8 13	8	2	8	WCK
RA8 14	9	4	OFF-9	RS1
RA8 20	10	LC7	OFT0	RS2
RA8 21	11	SF	OFT1	EOR
RA8 22	TS12	PR	OFT2	
RA8 23	13	TTF	OIT0	PSR
RA8 24	14	RF	O1T1	DCKF
RA8 30	15	EF	O1T2	WSF
RA8 31	16	SEF		CTBL
RA8 32	17	JC0		LCPT
RA8 33	18	1		ECT
RA8 34	TS19	2		
RA8 40	LV2	3		BL0
RA8 41	3	4		1
RA8 42	4	5		2
RA8 43	5	6		4
RA8 44	6	7		BL7
RA8 50	7	8		BR0
RA8 51	8	JC9		1
RA8 52	LV9	STP1		2
RA8 53	LV0	STP2		4
RA8 54	LV1			BR7

Punch Designation (Cont)

	Front		Rear	
Card Coordinates	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
RA7 B	TB9	P0		
RA7 00	LC0	1	RA1	TLR30
RA7 01	1	2	RB1	31
RA7 02	2	3	RC1	CH0
RA7 03	3	4	RD1	1
RA7 04	4	5	RA2	2
RA7 10	5	6	RB2	
RA7 11	6	7	RC2	
RA7 12	7	8	RD2	MTRA
RA7 13	8	P9	RA3	MTRB
RA7 14	LC9	LL-TH0	RB3	SA/LL0
RA7 20	FK	LL-TH1	RC3	SB/1
RA7 21	LFK1	LL2	RD3	SC/2
RA7 22	SF	LL4	RA4	SD/4
RA7 23	PR	LL7	RB4	7
RA7 24	TTF	CH0	RC4	CPT0
RA7 30	RF	1	RD4	ETM0
RA7 31	EF	2	RA5	EPT0
RA7 32	SEF	4		BAR
RA7 33	AGCK	CH7		CKLS
RA7 34	4B	PNR		CKRS
RA7 40	5I	PA	DL0	CKL0
RA7 41	NOC	PB	1	1
RA7 42	CLG	PC	2	2
RA7 43	CLT1	PE	4	4
RA7 44	CLT2	JG0	DL7	CKL7
RA7 50	TCK/CLK	1	DR0	CKR0
RA7 51	OTT	2	1	1
RA7 52	TKK	3	2	2
RA7 53	ND1	JG4	4	4
RA7 54	NDK		DR7	CKR7

Punch Designation (Cont)

Card Coordinates	Front		Rear	
	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
RA6 B	XCE	TC		
RA6 00	JC0	CN	TRE	TLR0
RA6 01	1	TP	TRSA	1
RA6 02	2	TP'	TRSB	2
RA6 03	3	RP	TRA	3
RA6 04	4	RPK	TRA2	4
RA6 10	5	DLT	HOA	5
RA6 11	6	CDN	PKA	6
RA6 12	7	4B	HOB	7
RA6 13	8	5I	PKB	8
RA6 14	JC9		ON	9
RA6 20	JG0		SW	10
RA6 21	1		SW1	11
RS6 22	JG2		RLK	TLR12
RA6 23	3	AGCK	RL1	13
RA6 24	JG4	PCK	RL2	14
RA6 30	PNR	ESCK		15
RA6 31	PA	MCS	CRT	16
RA6 32	PB	CM	ETM	17
RA6 33	PC	NMR	SP	18
RA6 34	PE	RDR	WTL	19
RA6 40	P0	RDS	CL0	20
RA6 41	P1	CTUK	1	21
RA6 42	2	RYK	2	22
RA6 43	3	AIS	4	23
RA6 44	4	CLG	CL7	24
RA6 50	5	TCK/CLK	CR0	25
RA6 51	6	OTT	1	26
RA6 52	7	TTK	2	27
RA6 53	8	ND1	4	28
RA6 54	P9	NDK	CR7	TLR29

Punch Designation (Cont)

Card Coordinates	Front		Rear	
	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
RA5 B	XBRL	NGCT0		
RA5 00	TH-LL0	1	DC/LL0	OFT0
RA5 01	TH-LL1	2	DCC/ 1	1
RA5 02	TH/LL2	GCT3	TST1/ 2	2
RA5 03	TH3/ 4	HGCU-RT	ACTA/ 4	OFF-0
RA5 04	LL7	RT1	ACTB/LL7	1
RA5 10	CH0	2	G0	2
RA5 11	1	4	SM	4
RA5 12	2	NGCU7	WSM	7
RA5 13	3	HN0	WCK	TH0
RA5 14	4	1	RS1	1
RA5 20	5	2	RS2	2
RA5 21	6	4	EOR	4
RA5 22	CH7	HN7		TH7
RA5 23	8	T0	PSR	HN0
RA5 24	CH9	1	DCKF	1
RA5 30	TP-/RS0	2	WSF	2
RA5 31	1	4	CTBL	4
RA5 32	2	T7	LCPT	7
RA5 33	3	U0	ECT	T0
RA5 34	TP-/ 4	1		1
RA5 40	5	2	BL0	2
RA5 41	6	4	1	4
RA5 42	7	U7	2	7
RA5 43	8	TBS0	4	U0
RA5 44	RS9	1	BL7	1
RA5 50	MCS	2	BR0	2
RA5 51	CM	TBS3	1	4
RA5 52	NMR	TPMK	2	7
RA5 53	STP1	LPMK	4	
RA5 54	STP2	STMM	BR7	

Punch Designation (Cont)

	Front		Rear	
Card Coordinates	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
RA4 B	7T/TSQ7	LPI		
RA4 00	TSQ/NGCT0	LLP	TST	AIODT0
RA4 01	1	LDN	EX1	1
RA4 02	2	POTS	EX2	AIODT2
RA4 03	TSQ4/NGCT3	MRI/CTI	CH0	
RA4 04	TSA/LPI	PAN	CH1	
RA4 10	LLP	RIP	CH2	
RA4 11	LDN	2LN		
RA4 12	POTS	BLT	MTRA	
RA4 13	MRI/CTI	BLDA	MTRB	
RA4 14	PAN	DAT	SA	
RA4 20	RIP	KM	SB	
RA4 21	BLT	DAC	SC	
RA4 22	DAT	TLT	SD	
RA4 23	BLDA	TP/RS0		
RA4 24	KM	1	CPT0	
RA4 30	RDR	2	ETM0	
RA4 31	RDS	3	ERT0	
RA4 32	DLT	TP/RS4	BAR	
RA4 33	TCGA	RS5	CKLS	TST
RA4 34	TCGB	6	CKRS	EX1
RA4 40	M/CDA0	7	CKL0	EX2
RA4 41	1	8	1	GA
RA4 42	2	RS9	2	GB
RA4 43	4	RCT/T0	4	G/T0
RA4 44	M/CDA7	RCT/T1	CKL7	G/T1
RA4 50	M'/CDA'0	RCT/U0	CKR0	G/U0
RA4 51	1	1	1	G/U1
RA4 52	2	2	2	G/U2
RA4 53	4	4	4	G/U4
RA4 54	M'/CDA'7	RCT/U7	CKR7	G/U7

Punch Designation (Cont)

	Front		Rear	
Card Coordinates	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
RA3 B				
RA3 00	NGCU-RT		TH0	
RA3 01	NGCU/RT1	AN	1	
RA3 02	2	GLA/SNG	2	
RA3 03	3	NGK	3	
RA3 04	4	GLB/NGK1	4	
RA3 10	5	UK	5	
RA3 11	6	HTUK	6	
RA3 12	7	TNK	7	
RA3 13	8	PTK	8	
RA3 14	NGCU9	PBX1	9	
RA3 20	HN0	SLCK	HN0	
RA3 21	1	CK0	1	
RA3 22	HN2	CKR	HN2	
RA3 23	3	LPA	3	
RA3 24	4	A	4	
RA3 30	5	AK	5	
RA3 31	6	SAE	6	
RA3 32	7	EG	7	
RA3 33	8	RNG	8	
RA3 34	HN9	NR	HN9	
RA3 40	T0		T0	
RA3 41	1		1	
RA3 42	2	LCH	2	
RA3 43	3	TCH	3	
RA3 44	4	RSK	4	
RA3 50	5	LI	5	
RA3 51	6	TCK1	6	
RA3 52	7	SRK	7	
RA3 53	8	RCK2	8	
RA3 54	T9	RCK3	T9	

Punch Designation (Cont)

	Front		Rear	
Card Coordinates	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
RA2 B		PTN		
RA2 00	U0	PN	U0	
RA2 01	1	TN	1	
RA2 02	2	EN	2	
RA2 03	3	PBN	3	
RA2 04	4	FNA	4	
RA2 10	5	FNB	5	
RA2 11	6	LIN	6	
RA2 12	7	TIN	7	
RA2 13	8	BN	8	
RA2 14	U9	RI	9	
RA2 20	OA	TBI		
RA2 21	OB	TBH		
RA2 22	AN	OV		
RA2 23	GLA/SNG	BY		
RA2 24	NGK	OFH		
RA2 30	GLB/NCK1	PUL		
RA2 31	UK	2LV/CSW		
RA2 32	HTUK	OHS		
RA2 33	TNK	DN		
RA2 34	PTK	PLR		
RA2 40	PBX1	LNPR		
RA2 41	SLCK	LNP		
RA2 42	CK0	PML		
RA2 43	CKR	NPM		
RA2 44	A	NPC		
RA2 50	AK			
RA2 51	SAE	TOK		
RA2 52	EG	TA		
RA2 53	RNG	LRL		
RA2 54	NR			

Punch Designation (Cont)

	Front		Rear	
Card Coordinates	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
RA1 B	CRS/AG1	R01		
RA1 00	PTN	02		
RA1 01	PN	R03		
RA1 02	TN	ROT		
RA1 03	EN	FGA		
RA1 04	PBN	SGA		
RA1 10	FNA	TGA		
RA1 11	FNB	CDP0		
RA1 12	LIN	1		
RA1 13	TIN	2		
RA1 14	BN	4		
RA1 20	RI	7		
RA1 21	TBI	10		
RA1 22	TBH	CDP15		
RA1 23	OV	CDP'0		
RA1 24	BY	1		
RA1 30	OFH	2		
RA1 31	PUL	4		
RA1 32	LCH	7		
RA1 33	TCH	10		
RA1 34	RSK	CDP'15		
RA1 40	LI	STL0		
RA1 41	TCK1	STL1		
RA1 42	SRK	2		
RA1 43	RCK2	3		
RA1 44	RCK3	4		
RA1 50	CSW	STL5		
RA1 51	EX	EX	EX	EX
RA1 52	PERF0	PERF0	PERFORATOR 0	PERFORATOR 0
RA1 53	1	1	1	1
RA1 54	PERF2	PERF2	2	2

Punch Designation (Cont)

Card Coordinates	Front		Rear	
	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card	Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
RA0 B	HMS/AG2			
RA0 00	DT0	DT0	DT0	DT0
RA0 01	1	1	1	1
RA0 02	2	2	2	2
RA0 03	4	4	4	4
RA0 04	DT7	DT7	DT7	DT7
RA0 10	DU0	DU0	DU0	DU0
RA0 11	1	1	1	1
RA0 12	2	2	2	2
RA0 13	4	4	4	4
RA0 14	DU7	DU7	DU7	DU7
RA0 20	HT0	HT0	HT0	HT0
RA0 21	HT1	HT1	HT1	HT1
RA0 22	HT2	HT2	HT2	HT2
RA0 23	4	4	4	4
RA0 24	HT7	HT7	HT7	HT7
RA0 30	HU0	HU0	HU0	HU0
RA0 31	1	1	1	1
RA0 32	2	2	2	2
RA0 33	4	4	4	4
RA0 34	HU7	HU7	HU7	HU7
RA0 40	MT0	MT0	MT0	MT0
RA0 41	1	1	1	1
RA0 42	2	2	2	2
RA0 43	4	4	4	4
RA0 44	MT7	MT7	MT7	MT7
RA0 50	MU0	MU0	MU0	MU0
RA0 51	1	1	1	1
RA0 52	2	2	2	2
RA0 53	4	4	4	4
RA0 54	MU7	MU7	MU7	MU7

2.04 The following trouble record punch designations do not appear on the trouble record card, however, they are still shown in Schematic Tables 1A, 1B, 1E, and 1F of this SD as Mfr Disc. trouble record punchings.

Back of the Card Punch Designation

Card Coordinates		Tables 1A and 1B 1/X Card	Tables 1E and 1F 2/5 Card
S8	11	RT	
	12	FWR	FWR
	14	WR	WR
	31	RTA	
	32		RT
S5	01	TCA	
	02	TCB	
	30-34	OA0,1,2,4,7	OA0,1,2,4,7
	40-44	OB0,1,2,4,7	OB0,1,2,4,7
	50-54	OC0,1,2,4,7	OC0,1,2,4,7
S4	00-02	TSC0,1,2	
	03	TSC3	TSC/U0
S4	04	TSC4	TSC/U1
S4	10	TSC5	TSC/U2
	11	TSC6	TSC/U4
	12	TSC7	TSC/U7
	13	TSC8	
	14	TSC9	
	40-44	CST0,1,2,4,7	CST0,1,2,4,7
	50-54	CSU0,1,2,4,7	CSU0,1,2,4,7
S2	01		TCA
	02		TCB
R6	00-04	N0,1,2,4,7	N0,1,2,4,7
SA1	00-04,10-12		CP0-7
	40-44		TC0,1,2,4,7
	50-54		ID0,1,2,4,7
SA0	00		CKF
	01		OT
	02		BE
	40-44		TA0,1,2,4,7
	50-54		TB0,1,2,4,7
RA7	00,01	TC0,1	
	02	TC2	CF0
	03	TC4	CF1
	04	TC7	CF2
	10	ID0	CF3
	11	ID1	CF4
	12-14	ID2,4,7	
	20	CKF	
	21	OT	
	22	BE	
	23	DAC	
RA6	00-04	TA0,1,2,4,7	
	10-14	TB0,1,2,4,7	
RA5	03,04,10-12		S0-4
RA2	20-24	S0-4	

2.05 Punch Designation vs 2/X and 1/X Card Coordinates for Double-Sided Trouble Recorder Cards*

Note: In addition to the functional meaning and indication of punch designation shown in the following, reference may be made to Schematic Table 1A (for offices having new standard master test frame), Table 1B (for offices which convert for use with double-sided trouble record card) or Table 1E and 1F (for offices which convert for use with the 2-out-of-5 double-sided trouble record card). In these tables in the right-hand column under "Connecting Circuits" all circuits from which trouble indications originate are shown. All punch indications are shown in the left-hand column under "Lead Designation and Trouble Recorder Punch." These punches are shown with the trouble record symbol. In some cases the punch designation does not agree with lead designation. Connecting circuits are shown abbreviated, and titles of circuits are shown in legends for Tables 1A, 1B, 1E, and 1F.

Punch Designation	Card Coordinates	Functional Meaning and Indication
1TR	S7 00 S7 00	First Trial of Transverter The transverter connector functioned to operate the transverter 1TR (first trial) relay for a first trial indication (AMA, CAMA, ANI). Intraoffice Marker establishing an intraoffice trunk connection. First Trial Check (a) Marker connector signals the marker that this is a first trial. (b) Pretranslator indicates that this is a first trial. (c) Route distributor indicates to route translator that this is a first trial.
2DT	S3 02 S3 02	Two-digit Translator On incoming calls, the office code transmitted to the marker is the last two digits of a 3-digit code where the first digit of the 3-digit code has been absorbed by the originating office.
2L	SA2 31 SA3 31	2 Line A 2 line entry is desired for the AMA tape. (CAMA)
2LN	RA4 11 R5 44	Two Line Number Selection of alternate line on line busy conditions.
2LV	RA2 50 ———	Two Level Trunk Indicates that trunk has a single memory relay for priority of any level.
2P	S4 31 S2 13	Two-party Marker has received the class-of-service group of a calling line and proceeds to signal the originating register, on dial tone connection, that this is a 2-party class call and thus the register is to make the party identification test.
2TR	S7 01 S7 01	Second Trial (a) Marker connector signals the marker that this is a second trial. (b) Pretranslator indicates that this is a second trial. (c) Route distributor indicates to route translator that this is a second trial.

*For each punch designation the top card coordinate is for the 2/5 card and the bottom card coordinate is for the 1/X card.

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
2TR	S7 S7	01 01	Second Trial of Transverter The transverter connector functioned to operate the transverter 2TR (second trial) relay for a second trial indication (AMA, CAMA, ANI).
2W	S4 S8	50 A	Two-Wire Two-wire network operation.
2W	S6 S6	00 00	Two-Wire Two-wire network operation.
3AM	SA3 SA4	52 52	3 A.M. Transfer Entry Magnetic tape is switched at 3 a.m. (AMA)
3ANT	SA3 SA4	51 51	3 A.M. No Transfer Magnetic tape is not switched at 3 a.m. (AMA)
4B	RA6 RA7	12 34	Four Busy Four-digit dialing signal to transfer register or line busy indication to transfer trunk.
4DG	R4 R3	22 31	Four Digits Maximum (a) Operation of the 4DG (four digits maximum) relay in the outgoing sender for AMA functions. (A&M Only) (b) For a dial tone call indicates a 4-digit intra-PBX call. (c) Local AMA call.
4L	SA2 SA3	32 32	4-Line A 4-line entry is desired for the AMA tape. (CAMA)
4W	S3 S7	50 A	Four-Wire Four-wire network operation.
4W	S6 S6	01 01	Four-Wire Four-wire network operation.
4WL	SA3 SA4	30 30	Four-Wire Four-wire local call (A&M Only).
5DG	R4 R3	23 32	Five Digits Only (a) Operation of the 5DG (five digits, no letters) relay in the outgoing sender for AMA functions. (A&M Only) (b) For a dial-tone call indicates a 4-digit intra-PBX call. (c) Tandem AMA call.
5I	RA6 RA7	13 40	Five Idle Five-digit dialing signal to transfer register or line idle indication to transfer trunk.
7DG	SA2 SA3	01 01	Seven Digit The transverter has determined that a 7-digit call was initiated. (CAMA)
7T	RA6 RA6	B 14	Seven Transfer

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
11	S3 S3	10 10	11 Translator (a) A register has directed marker to employ its 11 translator for this connection. (b) A pretranslator signals the register that the translation is for a directing code.
A	RA3 RA2	24 44	Advance of Marker The marker functioned to make a number group advance from one tens block relay to the next, in the event that no idle line is found in the first tens block or to prepare the marker to set up busy-back if all PBX lines are busy.
A-	SA3	42	Master Timing Circuit Block A The master timer blocked when a plug was inserted into the transfer jack of an AMA recorder.
A0,1,2,4,7	S1 S1	00-04 00-04	A Digit (a) The A code digit transmitted to transverter by outsender via transverter connector (AMA, CAMA, ANI). (b) The A code digit transmitted from the marker to the route translator. (c) On a translation administration test call, the first five bits of a word in translator memory unit as transferred to TAT circuit. The B digit indicates second five digits, C digit third five, etc.
A0,1,2,4,7	S1 S1	00-04 00-04	A Digit (a) The A code digit registered within the marker by a register. (b) The A code digit transmitted from marker to monitor. (c) The A code digit registered within the pretranslator.
A'0,1,2,4,7	S0 S0	00-04 00-04	A' Digit (a) The A code digit passed by the marker to an outgoing sender. (b) The A code digit registered in the monitor by monitoring on pulsing leads of either originating or incoming register or outgoing sender.
A'0,1,2	S0	00-02	A' Digit (a) The A lead grounded between the transverter and an AMA recorder which may or may not be attached. (b) Lead grounded by master timer, if attached to recorder A'0, A'1 (AMA or CAMA transverter trouble records with or without recorder attached. A'1 (AMA or CAMA trouble records with recorder attached.)
ABX	SA2 SA3	34 34	ABX Code Relay ABX has operated in the billing indexer circuit. This indicates that the digits received are in the series used for central office designations. (CAMA)
AC	SA2 SA3	00 00	Area Code The transverter has determined from the B digit of the called number that an area code was registered in the transverter. (CAMA)

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
AC	R4 R4	13 33	Area Code The transverter has determined that a 10-digit call was initiated. (AMA)
AC8	S4 R4	32 41	Access Eight Out of a PBX the subscriber has dialed the private line network access digit eight.
ACD	R3 R4	50 50	Area Code Dialed Call being served has ten digits. Area Code Dialed The CAMA transverter has grounded ACD lead to the CAMA transverter connector.
ACD0	S8 S8	12 12	Automatic Call Distribution Office Trouble card perforated on an ACD trouble indicator trouble record request.
ACTA	RA8 RA5	03 03	Active A The A recorder is in use. (AMA)
ACTB	RA8 RA5	04 04	Active B The B recorder is in use. (AMA)
AD RNT1	R3 R3	21 21	Automatically Identified Call (AD) - Recorder Number Tens (RNT1) The CAMA equipment has identified the calling number automatically. (AD) Tens number of the recorder as registered in the transverter. (RNT1) (AMA)
AD-RNT	R3	21	Automatic Identification (AD) Recorder Number Tens (RNT1) Indication from trunk link frame that calling customer can be automatically identified. Recorder Number Tens (RNT1) Tens number of recorder. Recorder tens number in offices having more than 10 recorders. Transmitted over AD lead.
AD'-RNT'1	R3 R3	23 23	Automatic Identification (AD') Recorder Number Tens (RNT'1) Indication to sender that calling customer can be automatically identified. Recorder Number Tens (RNT'1) The number of recorder. Indication to sender of recorder tens number. Punch indication transmitted over AD lead from marker.
AG1	R5 RA1	50 B	Advance Group Marker Advance group marker is advancing out of routing group 1.
AG2	R5 RA0	51 B	Advance Group Marker Advance group marker is advancing out of routing group 2.
AG3,4,5,6	R5	52-54,A	Advance Group Marker is advancing out of routing group 3, 4, 5, or 6.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
AGCK	RA6,23 RA7,33	Access Group Controller Check Indicates a trouble condition in the access group controller circuit.
AID	R4 50	Automatic Identified Outward Dialing Calling party is automatically identified for charging purposes by 101 ESS group control.
AIODT0,1,2	RA4 00-02 SA1 00-02	Automatically Identified Outward Dialing Translator The number (0,1 or 2) of the Automatically Identified Outward Dialing Translator (AIODT) associated with the call in progress.
AIS	RA6,43 R4,54	Automatic Intercept Call routed to automatic intercept sender.
AK	RA3 30 RA2 50	Advance Check The number group completed the advance from one tens block to another.
AL	R6 12 R6 12	Allotment The operation of one of the AL0-3 (allotted groups) relay in the marker showing use of an allotted trunk or sender group.
AL0,1,2,4,7	R6 11-14,20 R6 11-14,20	A Left Character Pair Data passed to the recorder from the trunk control containing the trunk number thousands and hundreds information. (AMA)
ALN	S6 23 S6 23	Activate Listed Number Marker is ready to generate listed number.
ALS	R6 10 R6 10	A Left Character Pair (Special) Same as for AL0,1,2,4,7. (AMA)
AMA	R4 33 S6 32	Automatic Message Accounting Operation of the AMA relay in the outgoing sender for AMA functions.
AN	RA3 01 RA2 22	Allotted Number Marker worked with an allotted PBX number.
ANC	R2 54 R2 54	Announcement Check Announcement AN relay has operated in the service assistant trunk. (ACD)
AOS	R0 02 R0 02	All Other Sender Identifies non person to person calls.
AOT	S6 41 S6 14	All Other Transfer
AR0,1,2,4,7 HT'0,1,2,4,7	S2 30-34 S2 30-34	Arbitrary Digit (AR0, 1, 2, 4, 7) - Hundreds Trunk (HT'0, 1, 2, 4, 7) (a) Marker transmitted to the outgoing sender (DP) an arbitrary digit for outpulsing. (b) Marker transmitted arbitrary digit information to the monitor and master test control. This is for DP senders only.
AR0,1,2,4,7	R6 22-24,30,31 R6 22-24,30,31	A Right Character Pair Same as for AL0,1,2,4,7. (AMA)

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
ARET	S8,24,04 S8,24,04	Automatic Range Extension Test Trouble record perforated on an automatic range extension test call.
ARS	R6 21 R6 21	A Right Character Pair (Special) Same as for AL0,1,2,4,7. (AMA)
ASK	S2,23 S3,23	Amplifier Supervisory Relay Check Process information from the automatic range extension test circuit indicating that the supervisory relay in the range extension circuit has functioned properly.
ASP	SA5 44 SA6 44	After Splice Pattern The master timer timed out after completion of the splice pattern while perforating an end-of-tape pattern.
AT0,1,2	S3 40-42 S3 40-42	Area Transfer Identification of originating area. At present this should match the originating area indication. At some later date when it may be possible to have offices out of place in the recorders, this feature will be used to correctly identify the originating area. In these cases AT- will not always match OAR-. Derived from first translation of billing indexer circuit (CAMA).
AT0,1,2,4,7	R7 00-04 R7 00-04	A Digit The A code digit of the called party area code generated by the transverter on a 7-digit call. (AMA)
ATKT	S8 03 S8 03	Automatic Trunk Test Trouble record perforated on an automatic trunk test call.
ATT	S6 32 S6 31	Attendant Type Call
AVG	R6 13 R6 13	Advance Gate No available perferred trunks. Marker advances to the nonpreferred trunks and sends a gate signal to the gate signal to the gate control circuit (ACD office).
AVK1	SA7 34 SA7 24	Sender Advance Check Marker has checked that the sender AV relay had locked operated.
B	SA3 43 SA3 43	Master Timing Circuit Block B The master timer blocked when a plug was removed from the transfer jack of an AMA recorder.
B0,1,2,4,7	S1 10-14 S1 10-14	B Digit Same as for A digit.
B0,1,2,4,7		B Digit Same as for A digit. (S1, 00-04)
B'0,1,2,4,7	S0 10-14 S0 10-14	B' Digit (a) The B lead grounded between the transverter and an AMA recorder which may or may not be attached (AMA, CAMA). (b) Lead grounded by master timer, if attached to recorder (AMA, CAMA).

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
B'0,1,2,4,7		B' Digit Same as for A' digit.
BA	SA5,12 SA6,12	Buffer Attached While recording on the magnetic tape, a trouble was encountered, causing a trouble record to be requested by the trouble buffer, with a transverter or a trunk control attached. (AMA)
BAR	RA7,32 RA4,32	Buffer Attached Recognized The recorder connector circuit has recognized attachment to the connecting circuit for trouble recording. (AMA)
BBFC	S6 32 S6 32	Bulk Billing Free Call The billing indexer has determined that this call has been made to an area requiring bulk billing and/or diversion of free calls (CAMA).
BCN	SA4 41	Bit-Stream Continuity Check Indicates that the continuity test has been performed by bit-stream continuity check circuit.
BI0 BI0,1	S6 34 S6 34,40	Billing Indexer The billing indexer 0 or 1 selected by the transverter (CAMA).
BIRA	SA2 22 SA3 22	Billing Indexer Release The transverter has released the billing indexer circuit. (CAMA)
BL0,1,2,4,7	RA8 40-44 RA5 40-44	B Left Character Pair Data available at the recorder connector. (AMA)
BLDA	RA4 13 RA4 23	Busy Line and Don't Answer Transfer Transfer call to attandent if line is busy or does not answer.
BLT	RA4 12 RA4 21	Busy Line Transfer Transfer call to attendant if line is busy.
BN	RA2 13 RA1 14	Blank Number The marker recognized that this connection was to a blank (unassigned or unequipped) number and functioned to route this connection to a tone trunk or intercept operator.
BR0,1,2,4,7	RA8 50-54 RA5 50-54	B Right Character Pair Same as for BL0,1,2,4,7. (AMA)
BRL	SA6 52 R5 A	Busy Trunk Release Indicates the type of release (all trunks busy) given to the register to cause the register to monitor busy trunks.
BR0,1,2,4,7	S2 32-34, S2 40-44	Arbitrary Digit (BR0,1,2,4,7) - Tens Trunk (TT'0,1,2,4,7) (a) Marker transmitted to the outgoing sender an arbitrary digit for outpulsing. (b) Marker transmitted arbitrary digit information to the monitor for DP senders only. (c) Number outpulsed by sender for arbitrary B digit on monitored or test calls and a failure to check occurred.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
BSP	SA5 43 SA6 43	Before Splice Pattern The master timer timed out before completion of the splice pattern while perforating an end-of-tape pattern.
BT	SA6 51 SA6 53	Busy Tone The marker, by grounding BT lead to marker connector, requested: (a) Originating register to return busy tone to calling subscriber or to release because of a second trial failure. (b) Incoming register to release because of a second trial failure. (c) Line link to release because of a second trial failure.
BT0,1,2,4,7	R7 10-14 R7 10-14	B Digit Same as for AT0,1,2,4,7. (AMA)
BY	SA4 54 SA5 54	Service Busy of Recorder The requested AMA recorder is busy on a service or test call. (AMA, CAMA) Busy The automatic range extension test circuit attempted to select a range extension circuit that was busy.
BY	RA2 23 RA1 24	Busy Called line is busy; thus the marker is to set the incoming trunk for busy signal.
C0,1,2,4,7	S1 20-24 S1 20-24	C Digit Same as for A digit. The C digit will appear on trouble record cards in 2-digit offices, although not recorded by the pretranslator.
C0,1,2,4,7		C Digit Same as for A digit. (S1, 00-04)
C'0,1,2,4,7	S0 20-24 S0 20-24	C' Digit Same as for A' digit.
C'0,1,2,4,7		C' Digit Same as for B' digit. (S0 10-14)
CAMA	S7 41	Call being served by marker requires a CAMA sender.
CAMF	S3 33	CAMA Function (a) With CAMA punch, indicates that the call is a CAMA function call. (b) With TOG punch, indicates a through switched call entering over a CAMA incoming trunk.
CAMS	S3 34	CAMA Second Usage Indicates that the call is a CAMA completing function.
CC0-9	SA3 10-14 SA4 00-04,10-14	Compressed Code The area code received by the transverter is a compressed code. (CAMA) Customer Code Digit used by the route translator to identify the CCSA customer.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
CD0,1,2,4,7	S2 00-04 S(6-2) A	Control Digit (a) A control digit registered within the marker by a digit register. (ACD) (b) Control digit information to the marker from originating or incoming register connector.
CD'0,1,2,4,7	S2 12-14,20-23 SA6-2 B	Control Digit Control digit information from the marker to the sender.
CD'10,15	S2 22,23	Control Digit Control digit information from the marker to the sender.
CD 10,15	S2 10,11	Control Digit Control digit information to marker from originating or incoming register marker connector. (10 and 15 from originating only)
CDA0,1,2,4,7	R1 50-54 RA4 40-44	Code Routing Digit Control digit information to marker from incoming register connector. On an originating call this information is generated by the marker.
CDA'0,1,2,4,7	R0 50-54 RA4 50-54	Code Routing Control digit information from the marker to the sender.
CDN	RA6 11 S2 24	Customer Directory Number Type Call
CDP0,1,2,4 7,10,15	RA1 11-14, 20-22	Control Digit Priority Control digit information from originating or incoming register marker connector (CPD10 from originating only).
CPD'0,1,2,4 7,10,15	RA1 23,24 30-34	Control Digit Priority Control digit information from the marker to the sender (CDP'10 and 15 not used).
CD'	SA6 03 R6 A	Camp-on Established Indicates that the register has been set in the camp-on condition either on this or a previous marker usage.
CGA	SA2 24 R1 53	Class Group A In conjunction with the CS-, or CT- and CU- punches, identifies the class of service as being within the first 30 classes of service.
CTB	SA2 30 R1 54	Class Group B In conjunction with the CS-, or CT- and CU- punches, identifies the class of service as being within the second 30 classes of service.
CGC	SA2 31 R4 34	Class Group C For dial transfer identifies trunk link frame group 2.
CGT	SA6 54 SA7 54	Cancel Ground Test Marker canceled ground test as is required on certain types of connections, such as all originating and certain types of terminating calls, or if one of the cancel ground test keys is operated at the master test frame.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
CH0-9	RA7 24, 30-33 RA5 10-14,20-24	Channel Selected channel. The channel number corresponds to the number of the select magnet operated on the line link frame line switch. The channel number corresponds to the junctor switch number on both the line link and trunk link frame. The channel number corresponds to the vertical unit on the trunk link frame trunk switch.
CH0,1,2	RA7 02-04 RA4 03,04,10	Channel Identity Channel being served when a trouble record was taken. (AMA)
CI1	SA4 32 SA5 32	Cut-in First Line Perforation The transverter CI1 (cut-in perforator) lead has been grounded showing process of, or completion of, perforations for the last line of an entry. (AMA, CAMA)
CI2	SA4 30 SA5 30	Cut-in Second Line Perforation The transverter CI2 (cut-in perforation) lead has been grounded showing process of, or completion of, perforations for the third line of a 4-line entry or the first line of a 2-line entry. (AMA, CAMA)
CI3	SA4 23 SA5 23	Cut-in Third Line Perforation The transverter CI3 (cut-in perforation) lead has been grounded, showing process of, or completion of, perforations for the second line of a 4-line entry. (AMA, CAMA)
CI4	SA4 22 SA5 22	Cut-in Fourth Line Perforation The transverter CI4 (cut-in perforator) lead has been grounded, showing process of, or completion of, perforations for the first line of a 4-line entry. (AMA, CAMA)
CHE-JXP1	SA7 22 SA7 12	Channel End (CHE) - Junctor Crosspoints Check (JXP1) Channel selection not completed. (CHE) Junctor Crosspoints Check (JXP1) Junctor crosspoints closed.
CIFA	SA4 24 SA5 24	Cut-in Five Line Entry All codes were recorded on tape as dialed when foreign area codes, X0X and X1X were used. (AMA, CAMA)
CIK	S2,21 S3,21	Cut-In Check Progress information from the automatic range extension test circuit, indicating that the selected range extension circuit was cut-in.
CK	SA8 24 SA8 20	Check Marker preference (MP or E) relay on the selected trunk link frame operated.
CK	SA2 33 SA3 33	Check Billing indexer originating and terminating code check. (CAMA)

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
CK	SA5 24 SA6 24	Check (a) False ground on Check (CK) lead in transverter, when normal. (b) Transverter grounds CK lead to advance the AMA recorder from the trouble condition which caused it to block. (c) Master timer grounds CK lead to AMA recorder. (AMA, CAMA).
CK0	RA3 21 RA2 42	Check Operation The marker has begun a recycle of called line identification on a PBX, RI, TBI, or BN class.
CK1,2	SA4 03,04 SA5 03,04	Check 1 and 2 The operation of CK1 and CK2 relays in the transverter checks that the proper number of relays operated to register the information received from the sender. (AMA, CAMA, ANI)
CK1-5	R2 30-34 R2 30-34	Class Check 1-5 Class (type of traffic) information transmitted from the marker to the data line (ACD office).
CK4	SA4 10 SA5 10	Check 4 The operating paths for the transverter RST- (recorder start) relays have been opened and only one RST- relay is operated and held on its locking path, thereby insuring that only the selected AMA recorder will be served. (AMA)
CK7	SA4 02 SA5 02	Check 7 The transverter functioned to operated its CK7 (check) relay. (AMA)
CKG	SA8 10 SA8 01	Check Ground Closure The CKG2 (connector check ground) relay in the marker has operated. Check ground is closed from marker connector relays to provide off-normal grounds and remove certain standing tests.
CKG-GC	SA4 01 SA5 01	Check Ground (CKG) - Ground Control (GC) (a) The transverter connector closed the CKG lead to the transverter to provide off-normal ground and remove standing cross tests. (AMA, ANI) (b) Relay GC has operated. This relay supplies various grounds in the transverter for the purpose of preventing races in the transverter when it is released. (CAMA)
CKL0,1,2,4,7	RA7 40-44 RA4 40-44	Left Character Input Data Input data for character pair when a trouble was encountered. (AMA)
CKLS	RA7 33 RA4 33	Left Character Input Data (Special) Same as for CKL0,1,2,4,7. (AMA)
CK0	RA3 21 RA2 42	Check Operation The marker has begun a recycle of called line identification on a PBX, RI, TBI, or BN class.
CKR	RA3 22 RA2 43	Check Released The marker has completed the called line identification recycle described in line above (RA2 42).

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
CKR0,1,2,4,7	RA7 RA4	50-54 50-54	Right Character Input Data Same as for CKL0,1,2,4,7. (AMA)
CKRS	RA7 RA4	34 34	Right Character Input Data (Special) Same as for CKL0,1,2,4,7. (AMA)
CL0,1,2,4,7	SA0 RA6	40-44 40-44	C Left Character Pair Same as for BL0,1,2,4,7. (AMA)
CL1	R2 R2	41 41	Class 1 The marker indicates: (a) To DP and MF senders, that a 11 prefix is to be outpulsed. (b) To RP senders, that the call is a No. 1 crossbar office. (c) To monitor, the information is either line (a) or (b) above.
CL2	R2 R2	42 42	Class 2 The marker indicates: (a) To DP sender, that the call is to a community dial office or is a toll call or over a 2-way trunk. (b) To RP sender, that the call is to a 2-digit office in a 2- and 3-digit area. (c) To PCI sender, that the call is to an office with no numbers above 9999. (d) To MF sender, that this is a local call with a 2-way trunk or toll call; thus the sender gives immediate trunk closure. (e) To monitor, the information in one of the lines (a) through (d) above.
CL3	R2 R2	43 43	Class 3 The marker indicates: (a) To DP sender, to delay dialing until a start signal is received from the distant office. (b) To RP sender, that the call is to a nonrepeating incoming panel ground cutoff office and thus a marginal trunk test is required. (c) To PCI senders, that the call is to an office with numbers above 9999. (d) To monitor, the information in one of the lines (a) through (c) above.
CL4	R2 R2	44 44	Class 4 The marker indicates: (a) To DP sender, that 22 PPS dialing is to be used. No indication means 10 PPS is to be used. (b) To RP sender, that a 5 should be added to incoming group selection. (c) To monitor, the information in either line (a) or (b) above.
CL5	R2 R2	50 50	Class 5 The marker signals: (a) The DP sender, that battery-ground pulsing is required. No indication means dialing on a loop basis. (b) The automatic monitor, the above information.

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
CL6	R2 R2	51 51	Class 6 The marker signals: (a) Subscriber access to CX intertoll or CX 2-way trunk. (b) The automatic monitor, the above information.
CL7	R2 R7	52 52	Class 7 The marker indicates to a 2-way MF sender that an ANI dial "0" call is to be outpulsed.
CL8	R2 R7	53 53	Class 8 Prefix "0" ANI coin special toll call.
CLF	R4 R4	00 00	Control Lead Failure Billing data transmitter encountered a control lead failure.
CLG	RA6 RA7	44 42	Class Grounds The marker CLG (class ground) relay is functioning to apply ground to operate the class relays in the outgoing trunk or to transmit party class to outsender.
CLK	RA6 RA7	50 60	Class Check The marker satisfactorily checked the locking in of the trunk class relays.
CLT1	RA7	43	Class Timing 1 The marker is timing for the operation of trunk class relays.
CLT2	RA7	44	Class Timing 2 The marker completed timing for operation of trunk class relays and is now timing for their locking-in feature.
CM	RA6 RA5	32 51	Class-of-Service Match
CM3	S2 S6	00 40	Call Marker After Three Digits If perforated alone, the pretranslator signaled the register to call the marker after 3 digits and not to return the coin on coin lines. If accompanied by the SD perforation, the register is to call the marker after three digits, but before doing so, to return the coin on coin lines.
CMA,B,C	S2 S6	01-03 41-43	Call Marker Start - Indexes A, B, and C The pretranslator signals the originating register when to call the marker. This may represent any number of digits, as determined by the originating register cross-connections.
CMK	S4 S5	14 24	CM- Relay Check The incoming register pretranslator has indicated that a CM- relay in the incoming register has operated.
CN	RA6 R6	00 50	Coin Call The marker recognizes this as a coin call and proceeds to operate the CN relay in the selected trunk.

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
CN0-2	S5 S5	10-12 20-22	Connector Number (a) Connector number of following frames: line link marker connector, originating register marker connector, incoming register marker connector. (b) The originating register subgroup on a pretranslator trouble record.
CN0,1,2	R5 R5	10-12 10-12	Connector Number Particular connector number in the transverter connector frame (AMA, CAMA). Connector Number Particular connector number in outgoing sender connector frame.
CN3	R5 R5	13 13	Connector Number Particular connector number in the transverter connector frame (CAMA).
CN3	S5 S5	13 23	Connector Number Connector number of the following frames: line link marker connector, originating register marker connector, incoming register marker connector.
CN0,1	R5 R5	10,11 10,11	Connector Number (a) Particular connector number (letter) in the outgoing sender connector frame. (0 corresponds to A; 1 corresponds to B). (b) Particular connector number in outgoing sender connector frame.
CN-RG-0-2 CN-RG-0-19	S4 S4	00-02 00-04 10-14 20-24 30-34	Connector-Register (a) Number LLMC. (b) The position of a register in the originating register marker connector. (c) The position of a register in the incoming register marker connector. (d) The originating register position in the subgroup in a pretranslator connector.
CNR	S2 S2	24 11	Coin Return Marker signals the originating register to return the coin.
CNS	R6 R6	22 22	Coin Service The call is a coin class.
CON	SA7 SA7	30 20	Continuity Completion of line continuity test.
CP0,1,2,4,7	R4 R2	00-04 00-04	Code Pattern The called party area is transmitted from sender to transverter for AMA functions. The above information notifies the transverter as to the number of digits in the called office code (0 to 3) and the area, extended, local or foreign.
CP0,1,2,4,7	R4 R4	00-04 00-04	Code Pattern The called party area as transmitted from marker to sender for AMA functions.
CPTO	RA7 RA4	24 24	Character Pair Time-Out CP time-out has occurred in RRC. (AMA)

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
CR	S4 S2	21 03	Coin Returned Originating register signals the marker that the coin was satisfactorily returned.
CR0,1,2,4,7	SA0 RA6	50-54 50-54	C Right Character Pair Same as for BL0,1,2,4,7. (AMA)
CR0,1,2,4,7	S2 S2	50-54 50-54	Compensating Resistance - Arbitrary Digit (CR0,1,2,4,7) (a) Marker transmits to the outgoing sender (RP and PCI) the compensating resistance required for outgoing trunks. (b) Marker transmits to the outgoing sender (DP and MF) an arbitrary digit for outpulsing. (c) Marker transmits to the monitor the arbitrary digit and compensating resistance information. (d) Number pulsed by sender for arbitrary C digit on monitored or test calls and a failure to check occurred.
CRR0-2	R6	24,30,31	Coin Zone Reroute A marker CR- (coin zone reroute) relay was operated for rerouting a coin class of a call to an operator.
CRS	R5 RA1	54 B	Circuit Reserve The call-waiting customer line at the time the completing marker enters the CW link circuit is either connected to level zero or to a CW circuit - the CW link appearance is busy.
CRT	SA0 RA6	31 31	Channel Release Trouble (AMA)
CRU0,1,2,4,7	SA1 RA8	14, 20-23 51-54, R7 54	Class Rate Treatment Units of class rate treatment.
CS0-29	SA2 SA2	B, 00-04, 10-13 00-04, 10-14, 20-24, 30-34 40-44, 50-54	Class of Service - Translator (a) Class of service of the calling line on a dial tone connection, as signaled by the line link connector to the marker. (b) Class of service of a called ground start coin line on the terminating (call-forward) stage of an intraoffice or an incoming trunk connection. (c) On a line verification test marker stage, the class of service of the line being verified.
CSW	RA2 RA1	31 50	Cancel Ringing Switch Ringing selection switch not required on this call.
CT0,1,2,4,7	R7 R7	20-24 20-24	C Digit Same as for AT0,1,2,4,7. (AMA)
CT0,1,2	SA1 R1	B,00,01 50,51,52	Class Tens The Class Tens (CT-) of the calling line class of service as registered in the marker.
CT4,7	SA1 R2	02,03 52,53	Class Tens Class tens of the calling line class of service.
CT'0,1,2,4,7	S2 SA6	12-14,20-23 B	Class Tens Customer class of service tens information from marker to sender.
CTBL	RA8 RA5	31 31	Connector Channel Trouble Trouble signaled from a connector channel. (AMA)

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
CTI	RA4 21 RA4 13	Centrex Temporary Intercept
CTUK	RA6 41 RG 43	Class Tens Units Check
CU0,1,2,4,7	SA1 04, 10-13 R0 50-54	Class Units The C8- (class units) of the calling subscriber class of service, as registered in the marker.
CU'0,1,2,4,7	R2 10-14 R2 10-14	Class Units Customer class of service units information from marker to sender.
CWCN	SA6 30	Cancel Wideband Continuity Test The wideband continuity test has been forced to a PASS condition by (1) the MTF or, (2) a failure of the wideband continuity test circuit on a marker second trial.
CWF	S7 20 S7 14	Call-Waiting Feature/Failure The completing marker recognizes that the called customer has call-waiting service. On a dial tone marker operation a call-waiting failure has occurred.
CWK	R6 20 R6 20	Call-Waiting Check On a marker operation the call-waiting checks were properly completed.
D	SA3 44 SA4 44	Master Timing Circuit Block D The master timer blocked when a plug was inserted into the make-busy jack of an AMA recorder.
D	S6 54 S7 54	Dial Pulse Frame Line link frame originating this connection serves only subscriber sets equipped with dials. First Originating Register Group Indicates the first group of originating registers to the dial tone marker.
D0,1,2,4,7	S1 30-34 S1 30-34	D Digit Same as for A digit, excluding (c).
D0,1,2,4,7		D Digit Same as for A digit. (S1,00-04)
D'0,1,2,4,7	S0 30-34 S0 30-34	D' Digit Same as for A' digit.
D'0,1,2,4,7		D' Digit Same as for B' digit. (S0,10-14)
DA	SA5 50 SA6 50	Day Record The master timer timed perforating the day record on an end-of-tape-pattern.
DAC	RA4 21 R4 41	Direct Access The completing marker DAC relay operated indicates direct inward dialing to No. 101 ESS.
	SA0,03 RA7,23	Double Area Code The route translator has detected an invalid digit in the D position of a 6-digit translation code.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
DAT	RA4 14 RA4 22	Don't Answer Transfer Transfer call to attendant if line does not answer.
DAT1	S6 40 SA5 30	Don't Answer Transfer Called station has don't answer transfer.
DC	RA8 00 RA5 00	Day Change Entry An attempt has been made to write a day change label on the magnetic tape without a 3 a.m. transfer. (AMA)
DCC	RA8 01 RA5 01	Day Change Day change entry on active recorder.
DCK	S7 20 S7 14	Double-Connection Check The incoming register Double Connection Check (DCK) relay operated. Absence of this perforation indicates incoming register DCK relay encountered a double connection in the incoming register link and thus failed to operate.
DCKF	RA8 24 RA5 24	Data Check Failure Input data check failure from RRC.
DCT	SA7 32 SA7 32	Double-Connection Test Double connection did not exist on the selected channel.
DCT	SA5 54 SA6 54	Day Change Test Test of the 3 ANT label. (See 3 ANT punching.)
DCT1	SA7 40 SA7 30	Double-Connection Test 1 Locks in the indication of a successful double-connection test on terminating (call-forward) stage of an intraoffice trunk connection. Also successful similar test on a dial tone connection, an outgoing, or an incoming trunk connection.
DCT2	SA7 43 SA7 33	Double-Connection Test 2 Successful completion of a double-connection test on originating (call-back stage of an intraoffice trunk connection).
DCT3	SA7 41 SA7 31	Double-Connection Test 3 Successful completion of a double-connection test on a tandem or toll trunk connection and the successful check that the tandem or toll completion path to the outgoing trunk is set up.
DIS1	SA7 44 SA7 34	Disconnect Marker completed all its functions and is ready to request the associated marker connector to make a normal disconnect.
DL0,1,2,4,7	SA1 40-44 RA7 40-44	D Left Character Pair Same as for BL0,1,2,4,7. (AMA)
DL1,2,3,4,5,6	R2 30-34,40 R2 30-34,40	Deletion (a) The Delete (DL-) relay operated in the sender by the marker to inform the sender what digital information is to be deleted from outpulsing. The number of digits to be deleted corresponds to the DL- relay operated, starting with the A digit.

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
DL1,2,3,4,5,6 (Cont)			(b) The DL- relay operated in the monitor by the marker for checking sender performance when deletion is required.
DLT	RA6 RA4	10 32	Dial Transfer Dial transfer condition has been set in the trunk circuit.
DN	RA2	33	Directory Number Indicates the call terminated to a directory number.
DNC	R4 R3	42 52	Denied Code Indication to marker that the call contains a denied code. Denied Code The CAMA transverter has functioned to ground DNC lead to the CAMA transverter connector.
DNK	SA4 SA5	13 13	Directory Number Check The proper quota of directory number relays operated from the translator functions. (AMA)
DR-EMG	S8 S8	54 54	Display Registered - Emergency The emergency AMA recorder was connected to the trouble recorder.
DR	R6 R6	23 23	Denied Route A DR0-2 (denied route) relay was operated in the marker for denied service reroute.
DR0-9	S8 S8	44,50-53 34,40-44,50-55	Display Registered (a) Number of the pretranslator (DR0-2), or the units digit of the number of the marker circuit connected to the trouble recorder (DR0-9). (b) On line insulation tests, the number of the marker group with which the line insulation test circuit is associated. The trouble records for several marker groups may be processed at a common test center. Arbitrary numbers are assigned to these groups for identification purposes. (c) The number of the route translator (DR0,1) circuit connected to the trouble recorder.
DR0,1,2,4,7 DR0-5	S8 S8	44,50-53 34,40-44	Display Registered (d) Number of the ACD marker circuit connected to the ACD trouble indicator (ACD office). Display Registered The number of the transverter (DR0-9) (AMA, CAMA). Number of the AMA recorder (DR0-9) or master timing circuit (DR0,1) connected to the trouble recorder.
DR0,1,2,4,7	SA1 RA7	50-54 50-54	D Right Character Pair Same as for BL0,1,2,4,7. (AMA)
DRA-EMG	S7 S7,	54 54	Display Registered Auxiliary - Emergency Emergency AMA recorder was attached to the transverter. (AMA, CAMA)

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
DRA0-9	S7 S7	44,50-53 34,40-44,50-53	Display Registered Auxiliary (a) The AMA recorder associated with the transverter when a transverter failure was recorded. The tens number of the recorder is indicated by DRAT0 or 1. The transverter number is indicated by DR0-9 punch punches. (b) See (c) above for tens number on CAMA transverter TR. (c) The number of the completing marker associated with the route translator on a route translator trouble record.
DRC	S6 S6	32 31	Digit Register Connection Indicates a connection to a digit register. (ACD)
DRT	S8 S8	04 04	Digit Register Test Indicates a digit register test call. (ACD)
DRT0	S8 S8	54 54	Display Registered Tens The tens digit of the number of the marker circuit connected to trouble recorder.
DRT1	S8 S7	A 54	Display Registered Tens The tens digit of the number of the marker circuit connected to the trouble recorder.
DRT0-DRAT0 DRT1-DRAT1	S7 S7	42 32 43 33	Display Registered Tens (DRT0,1) - Display Registered (Auxiliary) Tens (DRAT0,1) (a) The tens number of the recorder on an AMA recorder trouble record (DRT0,1) (AMA). (b) The tens number of the AMA recorder (DRAT0,1) attached to the transverter when a transverter failure was detected. The transverter number is recorded in the DR0-9 punches. (c) CAMA transverter trouble records use only DRT0, DRAT0.
DRT2-DRAT2	S7 S7	41 31	Display Registered Tens (DRT0,1,2) - Display Registered (Auxiliary) Tens (DRAT0,1,2) (a) The tens number of the recorder on an AMA recorder on an AMA recorder trouble record (DRT0,1,2) (AMA). (b) The tens number of the AMA recorder (DRAT0,1,2) attached to the transverter when a transverter failure was detected. The transverter number is recorded in the DR0-9 or DR0,1,2,4,7 punches. (c) CAMA transverter trouble records use only DRT0 and DRAT0.
DS	SA5 SA6	32 32	Disconnect Start (a) False ground on Disconnect Start (DS) lead when transverter is normal. (b) Transverter grounds DS lead to AMA recorder as a disconnect signal after the AMA recorder signals that the last line is perforated. (c) Master timer grounds DS lead to AMA recorder as a disconnect signal after the AMA recorder signals that the last line is perforated. (AMA, CAMA)
DT0,1,2,4,7	RA0 RA0	00-04 00-04	Day Tens The day in tens, as received from the master timer or the time-of-day circuit.

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
DTF	S6 S7	33 42	Dial Transfer Dial Transfer Call
DTI	S6 SA5	34 23	Dial Transfer Identification Marker etablishing a transfer trunk connection.
DTK	SA8	51	Dial Tone Check Dial Tone (DT) relay in the line link connector has operated.
DTK	SA5 SA8	14 40	Trunk Check The operation of the AMA recorder DTK relay over DTK lead from transverter. This signals that the trunk involved had been identified and the AMA recorder is prepared for perforation of the last line of an entry. (AMA, CAMA)
DTN	SA5 SA6	21 21	Trunk Number (a) A false ground on DTN (trunk number) lead in transverter when normal (standing test). (b) Transverter ground DTN lead to AMA recorder to operate the AMA recorder DTN relay, when ready to perforate the last line, thus showing satisfactory trunk identification. (c) Master timer grounds DTN lead to AMA recorder. (AMA, CAMA)
DTW	R4 R4	04 24	Dial Teletypewriter Service The call has been identified as a teletypewriter call. (AMA)
DU0,1,2,4,7	RA0 RA0	10-14 10-14	Day Units The day in units, as received from the master timer or the time-of-day circuit.
E	SA3 SA4	50 50	Master Timing Circuit Block E The master timer blocked when a plug was removed from the make-busy jack of an AMA recorder.
E0,1,2,4,7	S1 S1	40-44 40-44	E Digit Same as for A digit, excluding (c). E Digit Same as for A digit. (S1,00-04)
E'0,1,2,4,7	S0 S0	40-44 40-44	E' Digit Same as for A' digit. E' Digit Same as for B' digit. (S0,10-14)
EA0,1,2	R0 R0	00-02 00-02	Encoder A-digit A-digit as registered in the billing data transmitter.
EB0,1,2,4,7	R0 R0	10-14 10-14	Encoder B-digit B-digit as registered in the billing on a 2-out-of-5.
EC0,1,2,4,7	R0 R0	20-24 20-24	Encoder C-digit See encoder B-digit.

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
EC0,1,2	S3 S3	50-54 50-52	Entry Combination These are patterns used in conjunction with the message billing index to determine the type of entry to be made. Derived from the 1st translation of the billing indexer circuit (CAMA).
ECN	S5 S4	53 53	Even Connector Even-numbered marker connector is associated with the incoming register. This steers the marker to a preferred number group to obtain the equipment location of a tandem or toll incoming trunk.
ECT	RA8 RA5	33 33	Entry Complete Trouble Start progress flip-flop in RRC does not reset.
ED0,1,2,4,7	R0 R0	30-34 30-34	Encoder D-digit See encoder B-digit.
EE0,1,2,4,7	R0 R0	40-44 40-44	Encoder E-digit See encoder B-digit.
EF	RA8 RA7	30 31	Extension Frame Marker functioned to operate the EF relay on the trunk link frame.
EF0,1,2,4,7	R0 R0	50-54 50-54	Encoder F-digit See encoder B-digit.
EG	RA3 RA2	32 52	End Group The number group signals the marker that the end of a PBX group (tens block) has been reached without finding an idle line and no further TB- relay operation is to be made.
EN	RA2 RA1	02 03	Extra-theoretical Number The Hundreds Block (HB-) relay operated in a number group serving an extra-theoretical office.
ENC0	R4	01	Encoder 0 Encoder 0 was primary encoder in the billing data transmitter when the record was taken.
ENC1	R4 R4	02 02	Encoder 1 Encoder 1 was primary encoder in the billing data transmitter when the record was taken.
EOL	SA5 SA6	41 41	Even on Line Even numbered master timer is in use.
EOR	RA8 RA5	21 21	End of Record End of record flip-flop set in RRC.
ERT0	RA7 RA4	31 31	End of Record Time Out (MAG AMA)
ESCK	RA6 R4	30 A	Echo Suppressor Check
ET	SA3 SA4	54 54	End of Tape The master timer was engaged in the end-of-tape operation for tape cutting pattern (3:00 A.M.)
ETM	SA0 RA6	32 32	Entry Time Out Time-out when performing functions of a connecting circuit, eg, labels, tests, etc.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
ETM0	RA7 30 RA4 30	Entry Time Out The RRC has timed out for the entry being written. (AMA)
EX	RA1 51 RA1 51	Extra Presence of battery or ground at particular circuit points. Temporary wiring connected to terminals EXB and EXG on terminal strips, to assist in the analysis of any particular trouble.
EX		Extra Presence of battery or ground at particular circuit points. Temporary wiring connected to terminals EXB and EXG on terminal strips, to assist in the analysis of any particular trouble. (AMA, CAMA)
EX1	RA4 34 RA4 01	Extra 1 Extra punching for troubleshooting. (AMA)
EX2	RA4 40 RA4 02	Extra 2 Extra punching for troubleshooting. (AMA)
EXT	SA4 52 SA5 52	Extend Timing The AMA recorder signaled for extended timing in the transverter if the AMA recorder was engaged in an end-of-tape or splice pattern function. (AMA, CAMA)
F0,1,2,4,7	S1 50-54 S1 50-54	F Digit Same as for A digit, excluding (c). F Digit Same as for A digit. (S1,00-04)
F'0,1,2,4,7	S0 50-54 S0 50-54	F' Digit Same as for A' digit. F' Digit Same as for B' digit. (S0,10-14)
FAA	R6 10 R6 10	Foreign Area A Foreign area translator A was associated with marker when trouble record was taken.
FAB	R6 11 R6 11	Foreign Area B Foreign area translator B was associated with marker when trouble record was taken.
FABC	SA4 11 SA5 11	Foreign Area Digit Check The transverter register relays operated in proper combination in registering the X0X and X1X codes. (AMA)
FAC	S3 21 S3 21	Direct Distance Dialing Call Originating register informed the marker that it is handling a direct distance dialing call.
FACK	SA4 12 SA5 12	Foreign Area Code Check Cut-in relays released and code translation (X0X and X1X) was completed. (AMA)

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
FAK	SA8 52 SA8 41	Frame A Appearance Check A Appearance (FA-) relay in the trunk link frame operated showing the selected trunk has an A appearance location in the selected trunk link frame.
FBK	SA8 53 SA8 42	Frame B Appearance Check B Appearance (FB-) relay in the trunk link frame operated showing the selected trunk has a B appearance location in the selected trunk link frame.
FC	R4 43 R3 53	Free Code Indication to the marker that the call contains a free code.
FC		Free Call The CAMA transverter functioned to ground FC lead to the CAMA transverter connector.
FCG	S7 12 S7 12	False Cross and Ground Marker FCG relay had operated due to trouble on tip and ring of selected channel prior to line hold magnet operation.
FCK	SA8 21 SA8 12	Frame Connector Check The cut-in relay of a selected route operated, thus closing the test leads to the trunk link connector frames serving this route.
RG0-2	S5 50-52 S4 50-52	Trunk Link Frame - Tens Ground on a Trunk Frame Group (FG-) lead from the incoming register provides the trunk link frame tens identification. (Equipped when there are more than ten trunk link frames.)
FG'0-2	R 00-03 R 00-03	Trunk Link Frame Tens Trunk link frame tens information transmitted to CAMA sender to identify trunk frame appearance of CAMA trunk.
FGA	RA1 03	First Group Advance Indicates that the marker has advanced out of the first group of route relays.
FK	SA8 44 RA7 20	LF Relay Check LF relay in the line link frame operated.
FLG	S7 44 S7 44	First Linkage Ground Marker is ready to set up the terminating stage of an intraoffice trunk connection or is ready to set up the linkage on an incoming trunk connection, thus in both cases it is ready to seize the number group. Also operated on a tandem or toll trunk connection.
FM	S6 14 S6 14	Failure to Match Functional failure of the marker to find an idle channel in available subgroups after permissible retesting.
FML	SA8 30 SA8 21	Frame Memory Lock Frame Memory Lock for trunk link connector (FML) relay in the marker operated to insure a different order of trunk link frame preference for succeeding marker usage.

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
FNA	RA2 RA1	04 10	Free Number - Group A The operated Free Number (FN-) relay in the number group is cross-connected to operate the marker FNA relay when 4-wire ringing selection switches are installed.
FNB	RA2 RA1	10 11	Free Number - Group B The operated FN- relay in the number group is cross-connected to operate the marker FNB relay when 6-wire or a combination of 4- and 6-wire ringing selection switches are installed.
FR0,1,2,3	S5 S5	00,01,02,03 00,01,02,03	Connector Frame (a) The incoming register marker connector frame number. (b) The originating register marker connector frame number. (c) The line link marker connector frame number. (d) The pretranslator connector frame number. Connector Frame (a) The originating register marker connector frame number. (b) The line link marker connector frame number. (c) The pretranslator connector frame number.
FR0-4	R5 R5	00-04 00-04	Sender Connector Frame The number of the outgoing sender connector frame. Transverter Connector Frame The number of the transverter connector frame (AMA or CAMA). (1-4) The number of the transverter connector frame (AMA).
FS0-29	SA2 SA0	21-24,30-33 00-04,10-14, 20-24,30-34, 40-44,50-54	Frame Selection (a) Trunk link frame selected. (b) On line insulation tests, the resistance band in which a failure occurred on an initial test of a line. (FS0-2)
FT0,1,2,3	R1 R1	00-03 00-03	Frame Tens The FT- of the line link frame associated with the calling line as registered in the marker or monitor. Frame Tens The FT- of the line link frame associated with the calling line as registered in the transverter. (AMA) (ANI) Frame Tens The FT- of the outsender link frame associated with the stuck sender and trunk identification.
FT'0,1,2,3	R0 R0	00-03 00-03	Frame Tens Prime (FT'0-3) The FT- of the line link frame associated with the calling line, as transmitted by the marker to originating register or AMA sender.
FTCK	SA8 SA8	22 13	Frame Test Check Trunk link frames have been tested for presence of an idle trunk or originating register and at least one frame has an idle trunk or register of the desired route.

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
FTK1	SA8 SA8	42 33	Vertical File Test Check Only one marker VFT0-4 is locked operated for vertical file selection.
FTT0-5	SA SA4	B,SA3 00-04 00-04,10	Frame Tens Test (a) Frame Tens Test (FTT-) relay operated in the marker to aid in closing through the Start (ST-) lead to the line link connector. One FTT- and one FUT- perforation identifies the line link frame. (b) Locates the line in trouble in terms of the tens digit of the line link frame on line insulation tests.
FU0,1,2,4,7	R1 R1	04, 10-13 04, 10-13	Frame Units The Frame Units (FU-) of the line link frame associated with the calling line as registered in the marker or monitor. Frame Units The FU- of the outsender link frame associated with the stuck sender and trunk identification.
FU0,1,2,4,7	R1 R0	04, 10-13 04, 10-13	Frame Units The FU- of the line link frame associated with the calling line as registered in the transverter. (AMA) (ANI)
FU'0,1,2,4,7	R0 R0	04, 10-13 04, 10-13	Frame Units Prime (FU'0,1,2,4,7) The FU- of the line link frame associated with the calling line, as transmitted by the marker to originating register or AMA sender.
FUT0-9	SA3 SA4	10-14 11-14,20-24,30	Frame Units Test (a) The FUT- relay operated in the marker to aid in closing through the ST- lead to the line link connector. One FFT- and one FUT- perforation identifies the line link frame. (b) Locates the line in trouble in terms of the units digit of the line link frame on line insulation tests.
FVD	S3 S3	03 03	Five-digit Translator A register has directed the marker to employ its 5-digit translator for this connection.
G	SA2 SA3	03 03	Ground Relay G in the transverter has operated. This indicates that the area code is shown as a single digit compressed code on the AMA tape. (CAMA)
G0,1,2,4,7	R8 R8	00-04 00-04	G Digit (a) The G code digit registered in the marker by a register. (b) The G code digit transmitted to the monitor by the marker.
G0,1,2,4,7	R8 R8	00-04 00-04	G Digit The G code digit transmitted to transverter by outsender via transverter connector. (AMA, CAMA, ANI).
G0-19	RA4 SA0	43,44,50-54 00-04,10-14, 20-24,30-34	Group On AMA calls, the G- (vertical group of 50 lines for line identification) relay operated in the selected translator.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
G'0,1,2,4,7	R7 00-04 R7 00-04	G' Digit (a) The G code digit transmitted to the outgoing sender by the marker. (b) The G code digit registered in the monitor by monitoring on the pulsing leads of either an outgoing sender, originating or incoming register.
GA,GB	RA4 41,42 SA0 40,41	Group A,B Group A or B for 2000 line translator. (AMA)
GC	SA4 01 SA5 01	See CKG lead.
GLA	RA2,23 RA3,02	Glare A TOG call - glare indication SOG call - glare occurred before channel selection.
GLB	RA2,30 RA3,04	Glare B Glare occurred after channel selection.
GLH	SA7 24 SA7 14	Ground Line Hold Magnet Marker started to operate the selected line hold magnet.
G0	RA8 10 RA5 10	G0 Go flip-flop set in RRC. (AMA)
GPA	R6 13 R6 13	Group Preference A The marker selected the subgroup A trunks or senders in an allotted group.
GPB	R6 14 R6 14	Group Preference B The marker selected the subgroup B trunks or senders in an allotted group.
GS1-5	R6 00-04 R6 00-04	Ground Supply The ground supply progress position of the marker at the time of trouble indication.
GT2	SA7 31 SA7 21	Ground Test Auxiliary Checks the operation of CON1, CON2, SL, and LLC1 and the nonoperation of LXP1, LXP, and SP relays.
GT5	S7 21 S7 20	Ground Test Ground test failure on a subscriber line.
GTL	SA8 14 SA8 10	Ground Transmitting Leads Ground Transmitting Lead (GTL) relay in the marker functions to apply ground on transmitting leads to registers or senders.
H0,1,2,4,7	R8 10-14 R1 14,20-23	H Digit Same as for G digit.
H0,1,2,4,7	R8 10-14 R8 10-14	H Digit The H code digit transmitted to transverter by outsender via transverter connector (AMA, CAMA).
H'0,1,2,4,7	R7 10-14 R7 10-14	H' Digit Same as for G' digit.
HDA	SA0 10 RA6 10	Hold A Recorder (AMA)

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
HDB	SA0 12 RA6 12	Hold B Recorder (AMA)
HDK	SA5 43 SA6 43	Hold Check The RRC hold feature has functioned properly.
HF	R4 54 R5 52	Hunt Feature Non-no-test call to PBX line in hunt group marker operates HF relay in no-test trunk.
HG0,1,2,4,7	R1 30-34 R1 30-34	Horizontal Group The Horizontal Group (HG-) of the calling line as registered in the marker or monitor.
HG'0,1,2,4,7	R0 30-34 R0 30-34	Horizontal Group Prime The HG- of the calling line, as transmitted by the marker originating register or AMA sender.
HGK	SA7 00 SA8 50	Horizontal Group Check One of the HC0-9 relays on associated line link frame operated.
HGT0-9	SA3 32-34,40-41 SA3 00-04,10-14	Horizontal Group Test (a) The marker Horizontal Group Identification Test (HGT-) relay operated from the number group to identify the horizontal group of the called line. (b) The marker HGT- relay operated on the originating (call-back) stage of a reverting, intraoffice, or subscriber outgoing trunk connection from the calling line location registered in the marker. (c) The marker HGT- relay operated on a dial tone connection from the line, line link, and connector. (d) Identifies the line in trouble in terms of its horizontal group location on line insulation tests.
HN0-9	RA5 13,14,20-22 RA3 20-24,30-34	Hundreds Digit That the marker had applied battery to the HB- relay in the number group.
HN0-9	RA5 23,24,30-32 RA3,20-24	Hundreds Digit (a) The Hundreds (HN-) relay operated in the transverter by the translator on an AMA or ANI call. (b) Contents of the hundreds digit registered in the route translator.
HMS	R5 A RA0 B	Hold Magnet Start The call-waiting customers line is either being connected to level zero on the CW link (dial tone marker in the CW link) or is being connected to a selected CW circuit (completing marker in the CW link).
HMS1	SA7 13 SA7 03	Hold Magnet Start 1 Marker initiated the operation of selected channel hold magnets.
HR	SA5 51 SA6 51	Hour Record The master timer timed out while perforating the hour record on an end-of-tape pattern.

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
HR1	SA3 SA4	40 40	Hour Entry Preference The operation of Hour Preference (HP) relay in the AMA recorder.
HT0,1,2,4,7	S5 S5	20-24 30-34	Hour Tens The hour in tens, as received from the master timer or the time-of-day circuit.
HT0,1,2,4,7	RA0 RA0	20-24 20-24	Hour Tens The hour in tens, as received from the master timer of the time-of-day circuit. Trunk Hundreds The Hundreds Trunk (HT-) lead grounded by the incoming register to aid the marker in locating the line appearance of this tandem or toll trunk for the completion of the call.
HT'0,1,2,4,7	S2 S2	30-34 30-34	Hundreds Trunk Hundreds trunk information transmitted to CAMA sender by marker to identify line appearance of CAMA trunk.
HTK1	SA8 SA8	41 32	Horizontal Group Test Check Only one marker HGT0-9 relay is locked operated for horizontal group selection.
HTR	SA7 SA7	12 02	Heavy Traffic Heavy traffic condition - the marker was idle less than one second from previous seizure or the marker is establishing the call-back stage of a PBX call.
HTUK	RA3 RA2	11 32	Hundreds, Tens, Units Check The satisfactory operation of the number group hundreds, tens, and units relays and that the marker has started a timing interval for registration of number group information in the marker.
HU0,1,2,4,7	RA0 RA0	30-34 30-34	Hour Units The hour in units, as received from the master timer of the time-of-day circuit.
IC	SA4 SA5	20 20	Identifier Check The continuity of the ICK lead through the AMA recorder call identity indexer and trunk is satisfactory. (AMA, CAMA)
IE	SA2 SA3	23 23	Initial Entry The transverter has operated IE relay and is ready to seize the recorder circuit and make an initial entry on the AMA tape. (CAMA)
IFK	S6 S6	24 24	Intraflow Check Intraflow IFL relay has operated in the trunk circuit (ACD office).
INC	S3 S3	22 22	Local Incoming Incoming register notified the marker that this connection is from an incoming trunk.
IOD	R0 R0	01 01	Identified Outward Dialing Operator identified type of call.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
IPA	SA3 33 SA4 33	Identifier Preference The call identity indexer preference relay operated in the AMA recorder.
IRY	SA4 31 SA5 31	Identifier Ready The operation of transverter Identifier Ready (IR) relay indicates that the trunk number has been checked by the AMA recorder. The transverter should now proceed to send its last line of information to the AMA recorder. (AMA, CAMA)
ITTR	SA4 44 SA5 44	Incoming Trunk Trouble Record Indicates an operator identified CAMA incoming trunk with poor transmission.
J0,1,2,4,7	R8 20-24 R8 20-24	J Digit Same as for G digit. J Digit The J code digit transmitted to transverter by outsender via transverter connector (AMA, CAMA).
J'0,1,2,4,7	R7 20-24 R7 20-24	J' Digit Same as for G' digit.
ITR	S7 31 S7 31	Intraoffice Marker establishing an intraoffice trunk connection. First Trial Check (a) Marker connector signals the marker that this is a first trial. (b) Pretranslation indicates that this is a first trial. Immediate Trouble Record Trouble record request by operation. (ACD)
JC0-9	RA8 32-34,40-44,50, 51 RA6 00-04,10-14	Junctor Cut-in The Junctor Cut-in (JC-) relay to be operated on the trunk link frame. The JC- relay operation closes the J0-9 leads, on the trunk link frame, to the marker for idle junctor selection. Also closes the operate paths to the junctor switch select magnets on the trunk link frame. The horizontal (operated select magnet) on the trunk link frame junctor switch is always the same as the JC- relay operated.
JCK	SA7 03 SA8 53	Junctor Connector Check Operation of a JC- relay in the selected trunk link connector has operated the JCK0 and JCK1 relays in the marker. If CH0 or CH1 operates, JCK0 and JCK1 will release.
JG0-4	RA7 44,50-53 RA6 20-24	Junctor Group The Junctor Group (JG-) relay operated in the marker, thus showing the junctor subgroup used for the call.
JSSF	SA2 51	Junctor Switch Seizure Failure The first selected wideband junctor switch group was seized by another marker.
JXPA	SA7 20 SA7 10	Junctor Crosspoints Check Auxiliary Junctor sleeve continuity to line link frame checked.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
JXP1	SA7 22 SA7 12	See CHE lead.
JXW1	SA6 22	Junctor Crosspoint (Wideband) -1 Operation of junctor switch hold magnet in the wideband link circuit.
JXWA	SA6 20	Junctor Hold Magnet (Wideband) The JXW relay in the marker has operated to indicate continuity of battery through the junctor switch hold magnet of the wideband link circuit.
K0,1,2,4,7	R8 30-34 R8 30-34	K Digit Same as for G digit.
K0,1,2,4,7	R8 30-34 R8 30-34	K Digit The K code digit transmitted to transverter by outsender via transverter connector (AMA, CAMA).
K'0,1,2,4,7	R7 30-34 R7 30-34	K' Digit Same as for G' digit.
KM	RA4 20 RA4 24	Cancel Match All PBXs have access to this test line on a four digit basis.
L0,1,2,4,7	R8 40-44 R4 40-44	L Digit Same as for G digit.
L0,1,2,4,7	R8 40-44 R7 40-44	L Digit The L code digit transmitted to transverter by outsender via transverter connector (AMA).
L'0,1,2,4,7	R7 40-44 R7 40-44	L' Digit Same as for G' digit.
L5D	R4 21 R3 30	Lettered Stations or Five Digits Operation of the L5D (lettered stations or five digits) relay in the outgoing sender for AMA functions. (A&M Only)
LB	S6 13 S6 13	Line Busy Called line found busy for an intraoffice or incoming trunk connection.
LC	SA5 31 SA6 31	Line Complete The AMA recorder has completed a single-line timing entry, with associated checks, and has started to release. (AMA, CAMA)
LC0-9	RA8 11-14,20 RA7 00-04,10-14	Line Connector The Link Cut-in (LC-) relay operated on the trunk link frame for link selection. This also indicates the trunk switch on the trunk link frame on which the selected trunk is located. Also indicates the vertical unit on the junctor switch of the trunk link frame.
LCD0-2	R3 42-44 R3 42-44	Local Code Dialed Call being served has seven digits.
LCD0,1,2	R3 42-44 R3 42-44	Local Code Dialed The CAMA transverter has grounded LCD- lead to the CAMA transverter connector.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
LCH	RA3 42 RA1 32	Local Charge The marker functioned its Local Charge (LCH) relay for setting up local charge supervision in an incoming, intraoffice, or reverting trunk.
LCK	SA8 54 SA8 43	Link Connector Check The LC- relay in the selected trunk link connector had operated.
LCP	SA4 23 SA5 23	Lost Character Pair The last character pair indication has been received by the transverter. (AMA)
LCPT	RA8 32 RA5 32	Lost Character Pair Trouble Trouble has occurred with lost CP in RRC.
LDN	RA4 01 RA4 11	Listed Directory Number
LDT	S7 04 S7 04	Long Delay Timer Marker time-out while trying to seize a line link, trunk link, sender group, or number group.
LFK	SA8 43 SA8 34	Line Link Frame Check Associated Marker Cut-in (MCA) relay operated on the selected line link frame.
LFK1	SA8 50 RA7 21	Connector Relay Operate Check The connector relay in the line link frame has operated.
LH	R4 20 R3 24	Left Hand Left hand side of outsender link switch.
LI	RA3 50 RA3 40	Line Idle Indicates to the marker that the called line is idle and there is an idle channel available for connection to this idle line.
LIN	RA2 11 RA1 12	Local Incoming The marker has prepared to serve an intercept condition on a connection served by an intraoffice, reverting, or local incoming trunk.
LI0	S7 54 SA5 34	Line Identifier 0
LI1	S7 A SA5 40	Line Identifier 1
LIT	S8 23 S8 23	Line Insulation Test Trouble record perforated on a line insulation test.
LK	SA7 02 SA8 52	Left Side Check Left Half Frame Check (LK) relay in the marker operated from an operated Left (L) relay on the selected trunk link frame. This causes the marker to test junctors serving the left half of the trunk link frame.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
LK1	SA7 42 SA7 32	Linkage Check 1 Successful completion of linkage between: (a) Calling line and originating register on a dial tone connection. (b) Called line and incoming trunk on an incoming trunk connection. (c) Called line and intraoffice trunk on an intraoffice trunk connection. (d) Calling line and outgoing trunk on an outgoing trunk connection.
LL0,1,2,4,7	RA7 14,20-23 RA5 00-04	See THT- leads. Line Link The line link used during a test call by the automatic range extension test circuit.
LLC0-3	SA1 50-53	Line Link Cut-Through Relays (a) Indicates which 1-out-of-4 LLC0-3 relays have operated and if there is more than 1-out-of-4 punches perforated, it indicates a cross on those leads. Absence of the punch indicates a loss of the ground of the C relay in the bit-stream link circuit. (b) LLC0-3 also indicates which 1-out-of-4 WTG0-3 relays have operated in the completing marker.
LLCK	SA1 44	Line Link Cut-Through Check Indicates that JXW1 relay has operated in the completing marker and at least one of the C- relays in the wideband/bit-stream link circuit has operated and locked.
LLCK	SA1 44 S6 32	Line Link Check Ground is closed from line link marker connector relays to the marker. (ACD)
LLP	RA4 00 RA4 10	Line Link Pulsing Line link pulsing from the number group.
LNP	RA2 41	Line Nonpreemptible Indicates line selected is not preemptible and line returns ringing.
LNPR	RA2 40	Line Prescribes Ringing Indicates line selected is not preemptible and trunk returns ringing.
LOLD	R4,40 R8,A	Long Loop Line The completing markers LOLD relay was operated, indicating a unigauge call of one of the following types: (a) No-test call. (b) Ring test call. (c) Test trunk call to or from local test desk. (d) Reverting call. (e) OLI call.
LOLL	R4,34 R7,A	Long Loop Line (Unigauge) A completing or dial-tone marker record occurred while connecting a long loop line.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
LOO	S6 23 S6 23	Line Observed A line observed signal was sent from part 0 of the line observing number matching circuit ot the transverter circuit (CAMA).
LO1	S7 23 S7 23	Line Observed A line observed signal was sent from part 1 of the line observing number matching circuit to the transverter circuit (CAMA).
LPI	RA4 B RA4 04	Line Link Pulsing Intercept The marker has functioned to route this connection to a tone trunk or intercept operator.
LPMK	RA5 53 _____	Line Precedence Memory Check Indicates correct status level stored in line circuit.
LR	S7 13 S7 13	Link Release Incoming register link has encountered a trouble condition and the incoming register, after a timing period, has sent a trouble indication to the marker.
LRA	RA3 23 S6 24	Line Link Pulsing Route Activate The marker is ready to function to establish a line link pulsing connection.
LRI	S7 14 SA5 11	Link Release Identifier Transfer register link has encountered a trouble condition and the transfer register, after a timing period, has sent a trouble indication to the marker.
LRL	RA2 53 _____	Line Release Indicates a ground on the RL lead to the line link connector from the marker.
LSK	SA4 42	Line Switch Steering Relay Check Indicates that at least one of the L- relays in the wideband/bit-stream line link connector circuit has operated.
LST	R4 20 R3 24	Lettered Stations (a) Operation of the LST (4 digits plus lettered stations) relay in the outgoing sender for AMA functions. (A&M Only) (b) Information code 411 call.
LST	R4 20 R3 24	Lettered Stations Operation of the LST relay in the outgoing sender for AMA functions.
LT	S3 00 S3 00	Local Translator (a) A register has directed the marker to employ its local translator for this connection. (b) The pretranslator signals the register that the translation is for a home are code. (LT is always perforated on pretranslator trouble records if LT and 11X relays are not equipped in the pretranslator.)
LT1	S3 40 S3 40	Local Translation Access 1 Digit 1 access code.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
LT2	S3 41 S3 41	Local Translator Two Person to person prefix 0 was dialed.
LT3	S3 42 S3 42	Local Translator 3 Private line network translation for distant office (Digit 8 access).
LTR	SA7 14 SA7 04	Light Traffic (LTR) Light traffic condition - the marker was idle more than one second from previous seizure.
LV0,1	RA8 B,00 RA8 53,54	Level Level (LV-) relay operated on the trunk link frame to show the horizontal level of the trunk switch on which the selected trunk appears.
LV2-9	RA8 01-03 RA8 40-44,50-52	Level The LV- relay operated on the trunk line frame to show the horizontal level of the trunk switch on which the selected trunk appears.
LVF	S8 13 S8 13	Line Verification Failure Line verification test failure (unsatisfactory test).
LVF		Line Verification Failure Line verification test failure. (unsatisfactory test). (AMA, CAMA)
LVM	S8 14 S8 14	Line Verification Match Line verification test match (satisfactory test). Line Verification Match Line verification test match (satisfactory test). (AMA, CAMA)
LVR	RA8 04 SA8 B	Level Regular Trunk encountering trouble is on a regular trunk link frame.
LVS	RA8 10 SA7 B	Level Supplementary Trunk encountering trouble is on a supplementary trunk link frame.
LWL	S6 30	Wideband Line Terminated Locally The wideband line is terminated on a line switch group of the wideband link circuit in the central office.
LXP1	SA7 23 SA7 13	Line Crosspoint 1 Relay LXP in the marker had not operated to indicate continuity of the line sleeve battery through the line hold magnet.
LXPA	SA7 14 SA7 04	Line Hold Magnet Operation of line hold magnet.
LXW1	SA6 21	Line Crosspoint (Wideband) -1 Operation of line switch hold magnet in the wideband link circuit.
LXWA	SA6 14	Line Hold Magnet (Wideband) The LXW relay in the marker has operated to indicate continuity of battery through the line switch hold magnet of the wideband link circuit.

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
M	S8	11	Monitored
	S8	11	The connection is being monitored.
M0,1,2,4,7	R8	50-54	M Digit
	RA4	40-44	Same as for G Digit.
M'0,1,2,4,7	R7	50-54	M' Digit
	RA4	50-54	Same as for G' Digit.
M7	R8	54	Maximum Digits
	R8	50	The last digit of a maximum of 11 digits was registered in the incoming or originating register.
			Maximum Digits
			The last digit of a maximum of 11 digits was registered (AMA).
M'7	R7	54	Maximum Digits
	R7	50	The marker signaled the completion of called number registration, which consisted of 11 digits from a register to the sender.
M11	R7	A	Monitor 11 Prefix
			The monitor had an 11 prefix registered from either a monitored sender or register. This is to be matched in the monitor with the 11 prefix signal from the marker when a register is monitored or the CL1 signal when a sender is monitored.
MAK1	SA8	31	Marker Connector Cut-in
	SA8	22	Both halves of the Marker Cut-in (MCA) relay in the selected trunk link connector operated.
MAN	S4	30	Manual
	S2	12	Marker has received the class-of-service group of a calling line and proceeds to signal the originating register, on a dial tone connection, that this is a manual class of call. This causes the register to cancel dial tone and immediately reseize a marker and request an operator trunk.
MB0,1,2,4,7	R2	10-14	Message Billing Index
			The message billing index as transmitted from sender to transverter for AMA functions.
MB0,1,2,4,7	R2	10-14	Message Billing Index
	R2	10-14	The message billing index as transmitted from marker to sender for AMA functions.
MBI0,1,2,4,7	S5	30-34	Message Billing Index Number
	S5	30-34	The messgae billing index number which is derived from the third translation in the billing indexer circuit (CAMA).
MBK	SA2	53	Message Billing Index Check
	SA3	53	The third translation in the billing indexer circuit has been completed. (CAMA)
MCS	RA6	31	Match Class of Service
	RA5	50	
ME	SA3	42	Minute Entry
	SA4	42	

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
MET	SA5 53 SA6 53	Minute Entry Test
MF	S6 A S7 30	Multifrequency Pulse Frame Line link frame originating this connection serves only subscriber sets equipped for multifrequency key pulsing. Second Originating Register Group Indicates the second group of originating registers to the dial tone marker.
MG	SA6 02 SA7 02	Marker Group Entry The master timer timed out while perforating the marker group entry on an end-of-tape pattern.
MIR	S8 21 S8 21	Monitored Incoming Register Automatic monitor was connected to an incoming register.
MKR	S8 30	Marker A marker engaged the trouble recorder.
MKR CM	S8 30	Marker A completing marker engaged the trouble recorder.
MKR DTM	S8 31	Marker A dial tone marker engaged the trouble recorder.
MLF	S6 53 S6 23	Mixed Line Frame Line link frame originating this connection serves both dial pulse and multifrequency pulse subscribers. The MLF perforation will be accompanied by either the D or MF perforation.
MLV	S8 12 S8 12	Marker - Line Verification Line verification test in the marker stage. The number group cross-connections and the subscriber class of service on the line link frame are checked.
MMK	SA6 04	Multilead Message Check The select magnet control signals for the wideband remote switch have been correctly encoded in the wideband remote switch signal control circuit.
MO	SA6 01 SA7 01	Month Entry The master timer timed out while perforating the month entry on an end-of-tape pattern.
MOR	S8 20 S8 20	Monitored Originating Register Automatic monitor was connected to an originating register.
MOS	S8 22 S8 22	Monitored Outgoing Sender Automatic monitor was connected to an outgoing sender.
MPT	R3 52 R4 54	Message Potential Test Message Potential Test (MPT) relay in the marker operated due to a message registration taking place while the marker was making a line sleeve potential check prior to establishing a no-test connection.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
MRI	RA4 03 RA4 13	Match Restricted Incoming Call Class of service match required.
MRL	SA6 53 SA6 54	Marker Release Marker signaled the marker connector over MRL lead to release the associated incoming or originating register.
MRRL	SA4 24 SA5 24	Magnetic Recorder Release The multicontact relay of the recorder connector has operated for a label or a minute entry. (AMA)
MRST	SA4 22 SA5 22	Magnetic Recorder Start The ST to the recorder and recorder control has been closed. (AMA)
MT0,1,2,4,7	RA0 40-44 RA0 40-44	Minutes Tens The minutes in tens, as received from the master timer or the time-of-day circuit.
MTFT	SA3 54 SA4 54	Master Test Frame Test Test started from the MTC circuit.
MTPT	S8 02 S8 02	Marker Pretranslator Subscriber Line Test Trouble record perforated on: (a) Marker test call. (b) Pretranslator test call. (c) Subscriber line test call. Transverter Line Test Trouble record perforated on a transverter test call. (AMA, CAMA)
MTR	S8 24 S8 31	Magnetic Tape Recorder (Trouble Buffer) The trouble buffer portion of the recorder and recorder control engaged the trouble recorder. (AMA)
MTRA	RA7 12 RA4 12	Magnetic Tape Recorder A Recorder A requested a trouble record. (AMA)
MTRB	RA7 13 RA4 13	Magnetic Tape Recorder B Recorder B requested a trouble record. (AMA)
MTRS	S8 30 S8 33	Magnetic Tape Recorder (System Control) The system control portion of the recorder and recorder control engaged the trouble recorder. (AMA)
MTTR	SA3 43 SA4 43	Master Timing Transfer A transfer has occurred in the master timer.
MU0,1,2,4,7	RA0 50-54 RA0 50-54	Minutes Units The minutes in units, as received from the master timer of the time-of-day circuit.
MXT	SA5 B SA6 34	Master Cross A cross relay is operated in the marker.
N7	S0 A R8 50	Maximum Digits The last digit of a maximum of 12 digits was registered in the incoming or originating register or AMA equipment.

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
N'7	R8 R7	A 50	Maximum Digits The marker signaled the completion of called number registration which consisted of 12 digits from the register to the sender.
NAC	R4 R4	14 34	Nonarea Code The transverter has determined that a 7-digit call was initiated. (AMA)
NC	R4 R3	30 34	No Console Customer identified class of service in a PBX not eqiupped with a console.
ND1	RA6 RA7	53 53	No Digits The marker prepares to send a "no digit to be pulsed" signal to the sender.
NDK	RA6 RA7	54 54	No Digits Check The marker had sent the "no digit to be pulsed" signal to the sender which was received and locked-in by the sender.
NE	SA8 SA8	12 03	Number End One of the N1A/N2A/N3A/N4A (number translator cut-in auxiliary) relays in the marker operated on an incoming or intraoffice trunk connection. These relays are operated for number group translation of the called number.
NGCT0	RA5 RA4	B 00	Number Group Connector Tens Digit (a) Identifies the number group connector tens digit. (b) Identifies A portion of the direct access pretranslator connector.
NGCT1	RA5 RA4	00 01	Number Group Connector Tens Digit (a) Identifies the number group connector tens digit. (b) Identifies B portion of the direct access pretranslator connector.
NGCT2,3	RA5 RA4	01,02 02,03	Number Group Connector Tens Digit Identifies the number group connector tens digit.
NGCU0-9	RA5 RA3	03,04,10-12 00-04,10-14	Number Group Connector Units (a) The NGCU- punch indicates the units digit of the number group connector. (b) Number of the direct access pretranslator connector (0-2).
NGCU0,1,2,4,7	RA5	03,04,10-12	Number Group Units The NGCU- punch indicates the units digit of the number group.
NGK	RA3 RA2	03 24	Number Group Check The marker had seized the number group and operated its Marker Cut-in (MCA) relay.
NGK1	RA3 RA2	04 30	Number Group Check Auxiliary The marker Number Group Check Auxiliary (NGK1) relay operated to supply battery to F, L, and G leads to number group.
NH	R4 R5	50 53	No Hunt The incoming trunk signals the marker that there is to be no PBX hunting on this call.

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
NID	R4 R5	51 54	No Identified Dialing Type of call having regular or translator identification.
NID	R0 R0	00 00	Not Automatically Identified Outward Dialing Calling party is not associated with 101 ESS group control.
NL00	S6 S6	24 24	No Line Observed A no line observed signal was sent from part 0 of the line observing number matching circuit to the transverter circuit (CAMA).
NL01	S7 S7	24 24	No Line Observed A no line observed signal was sent from part 1 of the line observing number matching circuit to the transverter circuit (CAMA).
NMB0	S6 S6	31 31	Number Matching Circuit Busy Part 0 of the matching circuit is made busy (CAMA).
NMB1	S7 S7	31 31	Number Matching Circuit Busy Part 1 of the matching circuit is made busy (CAMA).
NMF	S7 S7	04 04	Number Match Failure A failure was detected in the information received from parts 0 and 1 of the matching circuit (CAMA).
NMK	SA2 SA3	12 12	Number Match Check The information received from both parts of the line observing number matching circuit was checked as correct by the transverter. (CAMA)
NMR	RA6 RA5	33 52	No Match Required
NN	R5 R5	53 51	Non-No Test (N Incoming trunk signals the marker that there is a regular test incoming trunk arranged for PBX hunting.
NOB	R6 S2	53 22	Nonobserved (a) Originating register signals the marker that this call is not up on service observation. (b) Outgoing sender signals the transverter that this call is not up on service observation. Nonobserved Outgoing sender signals the transverter that this call is not up on service observation (AMA, CAMA, ANI).
NOB'	R4 R3	32 41	No Observation Operation of the No Observation (NOB) relay in the outgoing sender for AMA functions.
NOC	RA7	41	No Class No trunk class conditions are required for this call.
NPC	RA2	44	Nonpreemptible Connection Indicates that the trunk is not preemptible and it will not recognize line preemption.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
NPM	RA2 43	No Precedence Memory Indicates that trunk can recognize line preemption, but is not itself preemptible.
NR	RA3 34 RA2 54	Number Release Marker Release Number Group (RNG), Trouble Intercept (TBI), Regular Intercept (RI), Blank Number (GN), or Plugged-Up Line (PUL) relay operated to replace the number group.
NS	SA5 54 SA6 54	Not Synchronized The master timer and the AMA recorder were not in synchronism at the time of perforating an end-of-tape pattern.
NS0	S7 51 S7 51	No Sender Outgoing Outgoing trunk connection not requiring a sender.
NSI	S7 52 S7 52	No Sender Intraoffice Intraoffice trunk connection not requiring a sender.
NSP	R6 50 S2 14	Non-Sample Peg Count Call was not sampled for traffic purposes.
NTB	S2 20 S3 20	No-Test Connector Busy The automatic range extension test circuit has found the no-test connector link busy on the no-test vertical on the line link frame.
NT	R4 52 R5 50	No Test (NT) Incoming trunk signals the marker that this call is to be a no test connection.
NTT	R3 51 R4 53	No-test Train Marker uses a no-test linkage to complete this connection.
NW	R6 24	Nonwideband Class (Originating) The marker is requested to process a nonwideband call.
NWT	R6 30	Nonwideband Class (Terminating) The line is entitled to nonwideband service only.
OA0,1,2,4,7	R7 00-04 R7 00-04	Originating A Code Digits Same as for G code above. (R6 00-04)
OAR0,1,2	R2 42-44 R2 30-32	Originating Area Identification of the area in which the CAMA call has originated.
OB	S3 12 S3 12	Office B On an incoming trunk connection, the office unit to which a marker is to complete the connection. Office B The number group MCC relay for office B operated.
OB0,1,2,4,7	R7 10-14	Originating B Code Digits Same as for G code above. (R6 00-04)

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
OBS	R6 R2	52 21	Observed (a) Originating register signals the marker that this call is up on service observation. (b) Outgoing sender signals the transverter that this call is up on service observation. Observed Outgoing sender signals the transverter that this call is up on service observation (AMA, CAMA, ANI).
OBS'	R4 R3	31 40	Observation Operation of the Observation (OBS) relay in the outgoing sender for AMA functions (forces a 4-line entry).
OBS1,2	R6 S2	50,51 14,20	Observed Link indicates to dial tone marker this is an observed call.
OC0,1,2,4	R7	20-24	Originating C Code Digits Same as G above. (R6 00-04)
OCN	S5 S4	54 54	Odd Connector Odd-numbered marker connector is associated with the incoming register. This steers the marker to a preferred number group to obtain the equipment location of a tandem or toll incoming trunk.
OD0,1,2,4,7	R7 R7	30-34 30-34	Originating D Code Digits Same as G above. (R6 00-04)
OD-RNT0	R3 R3	20 20	Operator Identification (OD) Recorder Number Tens (RNT0) Indication from trunk link frame that calling customer must be identified by operator. Recorder Number Tens (RNT0) Tens number of recorder. Recorder tens number in offices having more than 10 recorders. Transmitted over OD lead from marker.
OD RNT0			Operator Identified Call (OD) - Recorder Number Tens (RNT0) The CAMA equipment has identified the calling number through the CAMA operator. (OD) Tens number of the recorder as registered in the transverter. (RNT0) (AMA)
OD'-RNT'0	R3 R3	22 22	Operator Identification (OD') Recorder Number Tens (RNT'0) Indication to CAMA sender that calling customer must be identified by operator. Recorder Number Tens (RNT'0) Tens number of recorder. Indication to sender of recorder tens number. Transmitted over OD lead from marker.
OE0,1,2,4,7	R7 R7	40-44 40-44	Originating E Code Digits Same as G above. (R6 00-04)
OF	SA4 SA5	50 50	Overflow The AMA translator cross-connection for the calling line transmits an overflow signal to the sender.

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
OF0,1,2,4,7	R7 R7	50-54 50-54	Originating F Code Digits Same as G above. (R6 00-04)
OFH	RA2 RA1	24 30	Overflow Hold Magnet The marker functioned to operate its OFH (overflow hold magnet, operate ringing switch) relay to reset the trunk ringing switch for busy or overflow conditions.
OFF0-9	RA5 RA8	03,04,10-12 00-04,10-14	Office Group On AMA or ANI calls, the OFF0-9 (office number) relay operated in the transverter by the attached translator to indicate the originating office group of a line location.
OFF'-CD-0,1, 2,4,7	R1 R1	50-54 50-54	Control Digit Control digit information to the transverter. Office Office index on a two-out-of-five basis to identify the PBX.
OFT0,1,2	RA5 RA8	00-02 20-22	Office Tens (ANI)
OG0,1,2,3,4	R6 R6	00-04 00-04	Originating G Code Digits The originating G code digits transmitted to CAMA transverter by sender via the CAMA transverter connector.
OHS	RA2	32	Off-Hook Service Indicates the call terminated to line having off-hook service.
OIK	SA2 SA3	11 11	Office Index Check The office index digits sent from the billing indexer to the transverter were correctly registered and checked in the transverter. (CAMA)
OIN0,1,2,4,7	S2 S2	50-54 50-54	Office Index Number The office index number that identifies the originating office of the ten offices which may be assigned to a recorder on the AMA tape (CAMA).
OIT0,1,2	S2 RA8	42-44 23,24,30	Office Indices Tens (CAMA)
ON	SA0 RA6	14 14	Off-Normal The system control portion of the recorder and recorder control is off-normal. (AMA)
OOL	SA5 SA6	42 42	Odd On Line Odd unit of the master timing circuit is in use.
OP1	SA5 SA6	02 02	Open P1 Lead This lead is used only on transverter test connections. The master test control circuit operates the transverter OP1 (open P1 lead) relay to stop progress of the transverter on a selected line of entry so that a trouble record may be taken of the transverter output for this line of entry. (AMA, CAMA)
OPR	R6 R6	21 21	Operator Route The marker routed the call to an operator.

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
OR	S3 S3	20 20	Originating The originating marker connector notified the marker that this is an originating connection.
ORC0,1,2	R4 R5	52-54 50-52	Originating Rate Class (a) The originating rate class as transmitted from the CAMA sender to the CAMA transverter. (b) Calling customer originating rate class indication to marker from trunk link frame.
ORC'0,1,2	R3 R4	53,54,A 50,51,52	Originatin Rate Class Calling customer originating rate class indication to CAMA sender.
ORK	SA8 SA8	33 24	Registers Check (ORK) Registers called number checked.
ORT0,1	S2 S2	30,31 30,31	Originating Rate Treatment - Tens The originating rate treatment tens digit derived from the first translation of the billing indexer circuit (CAMA).
ORU0,1,2,4,7	S2 S2	32-34,40,41 40-44	Originating Rate Treatment - Units The originating rate treatment units digit derived from the first translation of the billing indexer circuit (CAMA).
OS0-4	R3 R4	10-14 24,30-33	Outgoing Sender Selection Idle sender within the selected subgroup.
OSE	SA7 SA7	50 40	Outgoing Sender End Operation of marker Outgoing Sender End (OSE) relay to end outgoing sender selection.
OSG0-11	R4 R4	00-04,10,11 00-04,10-14, 20-21	Outgoing Sender Group Outgoing sender group selected by the marker.
OSK	SA7 SA7	51 41	Outgoing Sender Check Operation of marker Outgoing Sender Check (OSK) relay showing that selection of the sender is completed.
OST2	SA7 SA7	53 43	Outgoing Sender Timing 2 Sender registration timing is completed and the sender memory relays are being checked for holding before releasing the sender connector.
OTK	SA2 SA3	51 51	Originating Translation Check The first translation in the billing indexer has been completed. (CAMA)
OT0	SA3 SA4	34 34	OT0 Relay Operated The operation of the OT0 relay in the AMA recorder.
OTT	RA6 RA7	51 51	Operate Trunk Test Relay The marker functioned to operate the Trunk Test (TT) relay in the selected trunk for test connection functions.
OV	RA2 RA1	22 23	Overflow The marker is to set the incoming trunk for overflow (reorder) signal.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
P	SA5 13 SA6 13	Perforate (a) False ground on Perforator (P) lead in transverter is normal (standing test). (b) The AMA recorder grounds the P lead to transverter as a signal that it is ready to perforate. (c) The AMA recorder grounds the P lead to master timer as a signal that it is ready to perforate. (AMA, CAMA)
P0-9	RA7 B,00-04,10-13 RA6 44-44,50-54	Pattern Number The Pattern (P-) relay operated in the marker to identify the junctor subgroup pattern and to identify the junctors which are available within the junctor subgroup. The PA, PB, or PC punch together with a P0-9 determine the available junctors according to the pattern.
P1	SA5 30 SA6 30	Perforator Control 1 (a) False ground on Perforator Release (P1) lead when transverter is normal. (b) AMA recorder grounds P1 lead to transverter when transverter is to release its perforator magnet cut-in relay for that particular entry. (c) AMA recorder grounds P1 lead to master timer when master timer is to release its perforator magnet cut-in relay for that particular entry. (AMA, CAMA)
P2L	SA2 14 SA3 14	Perforate 2-Line Entry The transverter has directed the recorder to perforate a 2-line entry on the AMA tape. (CAMA)
P4L	SA2 20 SA3 20	Perforate 4-Line Entry The transverter has directed the recorder to perforate a 4-line entry on the AMA tape. (CAMA)
P5	SA4 33 SA5 33	Progress Fifth Line The transverter P5 (progress fifth line) relay had operated, indicating that the first line of entry had been sent from transverter to AMA recorder. (AMA, CAMA)
P5L	SA2 21 SA3 31	Perforate 5-Line Entry The transverter has directed the recorder to perforate a 5-line entry on the AMA tape. (CAMA)
PA	RA7 40 RA6 31	Pattern A The marker PA relay operated to signify the selected junctor subgroup consisted of less than ten junctors.
PAK	SA5 23 SA6 23	Paper Advance Check Operation of the perforator paper-advance magnet. (AMA, CAMA)
PAN	RA4 04 RA4 14	PBX Announcement PBX announcement for restricted incoming call.
PB	RA7 41 RA6 32	Pattern B The marker PB relay operated to signify the selected junctor subgroup consisted of less than ten junctors.
PBN	RA2 03 RA1 04	Permanently Busy Number The operation of marker Permanently Busy Number (PBN) relay when the called number is a permanently busy line.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
PBX	S6 42 R2 54	Private Branch Exchange The call is to a PBX subscriber or to other lines having PBX hunting.
PBX1	RA3 14 RA2 40	Private Branch Exchange The call is tc PBX customer.
PC	RA7 42 RA6 33	Pattern C The marker PC relay operated to signify the selected junctor subgroup consisted of less than ten junctors.
PCD	S3 31 S3 31	Pulse Conversion - Dial Incoming register has signaled the marker that it is serving a PCD class of trunk which requires dial outpulsing with the aid of a dial pulse outgoing sender in one group.
PCD1	S3 32 S3 32	Pulse Conversion - Dial Incoming register has signaled the marker that it is serving a PCD class of trunk which requires dial outpulsing with the aid of a dial pulse outgoing sender in a second group.
PCK	S2 10 S6 50	Pretranslator Connector Check Pretranslator connector was attached. Priority Class Check Priority signal to marker.
PCR	S3 30 S3 30	Pulse Conversion - Revertive Incoming register has signaled the marker that it is serving a PCR class of trunk which requires revertive outpulsing with the aid of a revertive pulse outgoing sender.
PD	S4 14 S2 01	Partial Dial Originating register signals the marker to select a partial dial route due to failure to complete dialing in the allotted time.
PE	RA7 43 RA6 34	Pattern E The marker PE relay operated to signify the selected junctor subgroup consisted of less than 10 junctors.
PERF0,1,2	RA1 52-54 RA1 52-54	Perforator Indicates cards associated with a particular trouble recorder in a building having more than one trouble recorder.
PHC	S3 13 S3 13	Physical Office The incoming register directed the marker to complete the connection to the physical subdivision of the directory number series for an office unit.
PK	S4 20 S2 02	Partial Dial and Permanent Signal Check Originating register signals the marker that the dialing functions were completed in the allotted time.
PK1	S3 43	PICTUREPHONE® Call Prefix P received by originating register.
PKA	SA0 11 RA6 11	Preempt Check A Recorder (AMA)

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
PKB	SA0 13 RA6 13	Preempt Check B Recorder (AMA)
PBL	RA2 34	Priority Line Busy Indicates a priority calling customer has reached a line busy indication.
PML	RA2 42	Preemptible Line Indicates line is arranged for multilevel preemption.
PN	RA2 00 RA1 01	Physical Number The Hundreds Block (HB-) relay operated in a number group serving a physical office.
PNR	RA7 34 RA6 30	Pattern Normal The marker Pattern Normal (PNR) relay operated signifying the selected junctor subgroup consisted of a full group of ten junctors.
POTS	RA4 02 RA4 12	Oridinary Terminating Service No special terminating service required.
POTS	R4 03 R4 23	Oridinary Terminating Service No special terminating service required. (AMA)
PR	RA8 22 RA7 23	Paired Frame The trunk link frame signals the marker to function for paired frame operation.
PRCY	S6 22 S6 22	Marker Recycle on PBX Connection The marker RCY2 relay has operated indicating a marker recycle on a PBX connection.
PRE	SA5 11 SA6 11	Progression Error The steering relays that control the presentation of data transmitted to the magnetic recorder were operated in the wrong sequence. (AMA)
PRL	S2 11 S6 51	Pretranslator Release Pretranslator signaled the originating register to release.
PRL	SA2 30 SA3 30	Position Release The billing indexer circuit has directed the transverter to release the operator's position. (CAMA)
PRLK	SA2 13 SA3 13	Position Release Check The sender signals that it has received a position release signal. (CAMA)
PRR	S7 44 S7 44	Primary Route Connection Indicates a connection to a primary route.
PRT	S8 20 S8 24	Pretranslator A pretranslator engaged the trouble recorder.
PS	S4 13 S2 00	Permanent Dignal Originating register signals the marker to select a permanent signal route due to failure to start dialing in the allotted time.
PS1	S7 23 R3 A	Permanent Signal Auxiliary Passed first permanent signal ground test.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
PSR	S7 22	Permanent Signal Record A permanent signal caused the trouble record to be taken after the marker has made linkage check.
PSR	RA8 23 RA5 23	Premature Start Removal Premature start removal flip-flop set in RRC.
PT	SA5 22 SA6 22	Perforator Timing (a) False ground on Perforating Timing (PT) lead in transverter while normal (standing test). (b) Transverter grounds PT lead to AMA recorder to operate the AMA recorder PTC relay when perforating any but the last line entry. (c) Master timer grounds PT lead to AMA recorder. (AMA, CAMA)
PT1	SA5 20 SA6 20	Perforation Timing 1 (a) False ground on PT1 lead in transverter while normal (standing test). (b) Transverter grounds PT1 lead to AMA recorder to operate PTC relay in the AMA recorder when perforating the last line of an entry. (c) Master timer grounds PT1 lead in AMA recorder to control timing for perforating in the recorder number entry. (AMA, CAMA)
PTK	RA3 12 RA2 34	Physical-Theoretical Check The connection has satisfactorily completed the physical and theoretical office check.
PTN	RA2 B RA1 00	Physical-Theoretical Number The HB- relay operated in a number group serving a nondiscriminating office.
PUL	RA2 30 RA1 31	Plugged up Line The called line was plugged up for reroute to intercept or special trial.
PTR	S2 13 S6 53	Pretranslator Connector Second Trial Pretranslator signaled pretranslator connector to make a second trial.
PTS	SA5 40 SA6 40	Perforator Trouble Start (a) False operation of a perforator magnet when AMA recorder is normal. (b) The AMA recorder functions to begin a trouble entry on a trouble encountered by the AMA recorder on answer-disconnect entries. (AMA, CAMA)
RA	S6 21 S6 21	Route Advance Marker had prepared for route advancing.
RA0-4	S6 03,04,10-12 S6 03,04,10-12	Route Available Indicates routes available for intraflow (ACD office).
RA1-5	SA1 00,04,13,22,31 RA7 00,04,13,22,31	Rail A Level 1-5 To show the progress of the character pairs available to the RRC recorder and recorder control circuit.
RB	SA4 53 SA5 53	Recorder Busy The requested AMA recorder is plugged busy. (AMA, CAMA)

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
RB1-4	SA1 01,10,14,23 RA7 01,10,14,23	Rail B Level 1-4 Same as for RA1-5 designation.
RC1-4	SA1 02,11,20,24 RA7 02,11,20,24	Rail C Level 1-4 Same as for RA1-5 designation.
RCK2	RA3 53 RA1 43	Ringing Switch Crosspoint Check The operation of the marker RCK1 relay indicates crosspoint closure of the ringing selection switch. This also checks the holding ground for the trunk RC relay.
RCK3	RA3 54 RA1 44	Ringing and Charging Function The marker functions to operate its RCK3 relay to show a satisfactory check of the charge and ringing conditions.
RCT1-15	RA4 43,44,50-55 SA3 30-34,40-44, 50-54	Ringing Control Ringing Control (RCT-) relay operated in the marker from the number group, for proper ringing control.
RCY	S6 20 S6 20	Recycle Functional Failure of the marker during an attempt to recycle because of: (a) Subscriber line, other than PBX, on a plugged up basis. (b) Made-busy line link frame on toll trunk connection. (c) Failure to match.
RD	SA5 33 SA6 33	Release Call Identity Indexer The operation of the AMA recorder RD relay indicates the talking charge relay had functioned in the trunk and the AMA recorder is now to release the call identity indexer. Also operated on initial entries upon seizure of the AMA recorder by transverter. This releases any previously operated tens and units relays in the call identity indexer. (AMA, CAMA)
RD1-4	SA1 03,12,21,30 RA7 03,12,21,30	Rail D Level 1-4 Same as for RA1-5 designation.
RDCK	SA6 43	WRS Double-Connection Check A double-connection check was made at the wideband remote switch.
RDR	RA6 34 RA4 30	Read In Recycle The marker is ready to read class of service into the transfer registers.
RDS	RA6 40 RA4 31	Read In Start The marker is ready to read class of service into the transfer trunks.
RE0	S6 30 S6 30	Registration Error A registration error signal was sent from part 0 of the line observing number matching circuit to the transverter circuit (CAMA).
RE1	S7 30 S7 30	Registration Error A registration error signal was sent from part 1 of the line observing number matching circuit to the transverter circuit (CAMA).

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
REC	S8 22 S8 32	Recorder An AMA recorder engaged the trouble recorder.
RF	RA8 24 RA7 30	Regular Frame Marker functioned to operate the RF relay on the trunk link frame.
RG0-19	S4 00-04,10-12 S4 00-04,10-14, 20-24,30-34	Register Group The position of a register in the subgroup of a register connector
RG20-23	S4 40-43	The originating register position in the subgroup in a pretranslator connector.
RG0,1,2,4,7	S3 30-34 S3 30-34	Recorder Group Number The recorder group number with which the selected AMA recorder is associated (CAMA).
RGK	SA2 02 SA3 02	Recorder Group Check RG relays have been checked operated correctly on a 2/5 basis. (CAMA)
RH	R4 21 R3 30	Right Hand Right hand side of outsender link switch.
RI	RA2 14 RA1 20	Regular Intercept The marker functions to route this connection to regular intercept trunk.
RIK	SA6 02 SA6 13	Release Identifier Identifier has received a valid line location from the line link frame. Only applies on dial transfer marker usage.
RIP	RA4 10 RA4 20	PBX and Restricted Intercept Call Call is routed to a PBX recorded announcement.
RIW	RA3 00	Regular Intercept Wideband A requested wideband call has been routed to special intercept announcement because of wideband class mismatch.
RK	SA7 01 SA8 51	Right-side Check Right-half Frame Check (RK) relay in the marker operated from an operated Right (R) relay on the selected trunk link frame. This causes the marker to test junctors serving the right half of the trunk link frame.
RK	SA4 14 SA5 14	Recorder Check The AMA recorder is attached to the transverter. (AMA, CAMA)
RK	S2, 22 S3, 22	Ring Check Progress information from the automatic range extension test circuit indicating that the selected range extension circuit passed the ringing tests.
RK1-ORK	SA8 33 SA8 24	Registration Check 1 (RK1) Registers Check (ORK) No false ground on calling line identification integrity path.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
RK2	SA8 34 SA8 30	Registration Check 2 No false battery on calling line identification integrity path. The operation of RK1 and RK2 relays in the marker is a check that all the information that is to be forwarded to the originating register has been transmitted.
RK3	SA7 B SA8 44	Registration Check 3 RK3 relay in the marker has operated to show that all necessary information has been forwarded and is locked into the originating register. With the RK1 and RK2 punched, an absence of the RK3 indicates that the check of locking path in register is incomplete.
RL	SA7 11 SA7 01	RL Relay Operation The transverter Release (RL) relay operated (AMA, CAMA, ANI).
RL	S7 13 S7 13	Release Marker grounded the RL lead to the originating register marker connector.
RL	SA5 44 SA6 44	Release Release signal from RRC for label entries.
RL1	S7 14 S7 14	Release 1 Transverter has grounded regular release lead after taking a trouble record (CAMA).
RL1	SA5 50 SA6 50	Release 1 Minute entry was successfully entered and release signal returned.
RL1	SA0 23 RA6 23	Release 1 First release has occurred in RCC. (AMA)
RL2	SA5 51 SA6 51	Release 2 Final release on a minute entry.
RL2	SA0 24 RA6 24	Release 2 Second release has occurred in RRC. (AMA)
RLK	S2 12 S6 52	Release Check (Pretranslator Function) Release relay in the originating register operated; also used for a trouble release.
RLK	SA0 22 RA6 22	Release Check (AMA)
RLR	SA4 34 SA5 34	Release Transverter The transverter grounded the RL lead to the transverter connector as a signal to release. (AMA)
RN	SA6 00 SA7 00	Recorder Number Entry The master timer timed out while perforating the recorder number entry on an end-of-tape pattern.
RN-SPC-ITC 0-9	R3 00-04 R3 00-04,10-14	Recorder Number 0 - Sender Pulsing Class - Incoming Class (a) AMA recorder (0) associated with intraoffice or outgoing trunk.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
RN-SPC-ITC (Cont) 0-9		(b) Sender pulsing class (pulse conversion calls): (1) DP to tandem or nonlink-type step-by-step over any 1-way trunk except intertoll. (2) RP to No. 1 crossbar or panel (battery cutoff, repeated incoming ground cutoff) over any 1-way trunk. (c) Incoming trunk class (NN - no numbers in this marker group). Recorder Number 1 - Sender Pulsing Class - Incoming Class (a) AMA recorder (1) associated with intraoffice or outgoing trunk. (b) Incoming trunk class (SE - supervision, EN number). (c) Incoming trunk class (TB - toll, physical and theoretical). Recorder Number 2 - Sender Pulsing Class - Incoming Class (a) AMA recorder (2) associated with intraoffice or outgoing trunk. (b) Sender pulsing class (pulse conversion calls): (1) DP to nonlink-type step-by-step local or tandem, sender-type or link-type CDOs over any 1-way IT or 2-way trunk. (c) Incoming trunk class (SA - supervision, nondiscriminating numbers). (d) Incoming trunk class (MB - manual, physical and theoretical). Recorder Number 3 - Sender Pulsing Class - Incoming Class (a) AMA recorder (3) associated with intraoffice or outgoing trunk. (b) Sender pulsing class (pulse conversion calls): (1) DP to sender-type local or tandem over any 1-way trunk except IT. (2) RP to panel ground incoming without repeating incoming over any 1-way trunk. (c) Incoming trunk class (NA - no supervision, nondiscriminating numbers). (d) Incoming trunk class (FB - full selector, physical and theoretical). Recorder Number 4 - Incoming Class - Sender Pulsing Class (a) AMA recorder (4) associated with intraoffice or outgoing trunk. (b) Incoming trunk class (NE - no supervision, extra-theoretical). (c) Incoming trunk class (TT - toll theoretical). Recorder Number 5 - Incoming Class - Sender Pulsing Class (a) AMA recorder (5) associated with intraoffice or outgoing trunk. (b) Incoming trunk class (ST - supervision. theoretical). (c) Incoming trunk class (MT - manual, theoretical). (d) Sender pulsing class. Battery-ground pulsing to nonlink-type step-by-step (local or tandem).

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
RN-SPC-ITC (Cont) 0-9			Recorder Number 6 - Incoming Class - Sender Pulsing Class (a) AMA recorder (6) associated with intraoffice or outgoing trunk. (b) Incoming trunk class (NT - no supervision, theoretical). (c) Incoming trunk class (FT - full selector, theoretical). Recorder Number 7 - Incoming Class - Sender Pulsing Class (a) AMA recorder (7) associated with intraoffice or outgoing trunk. (b) Incoming trunk class (TP - toll, physical). Recorder Number 8 - Incoming Class - Sender Pulsing Class (a) AMA recorder (8) associated with intraoffice or outgoing trunk. (b) Incoming trunk class (SP - supervision, physical). (c) Incoming trunk class (MP - manual, physical). Recorder Number 9 - Incoming Class - Sender Pulsing Class (a) AMA recorder (9) associated with intraoffice or outgoing trunks. (b) Incoming trunk class (NP - no supervision, physical). (c) Incoming trunk class (FP - full selector, physical).
RN0,1,2,4,7	R2 R2	20-24 20-24	Recorder Number The number of the AMA recorder associated with a selected trunk, as transmitted from marker to sender. Recorder Number The number of the AMA recorder associated with a selected trunk, as transmitted from sender to transverter. (AMA, or CAMA)
RNG	RA3 RA2	33 53	Release Number Group The called line identification has been successfully recorded and the number group is to be released by the marker.
RNK	SA6 SA7	B 50	Recorder Number Check (a) Marker has satisfactorily completed the check of the AMA recorder number relay operation in the sender. (b) Marker has satisfactorily completed the condition of pulsing check.
RNT0	R3 R3	20 20	See OD lead.
RNT'0	R3 R3	22 22	See OD' lead.
RNT1	R3 R3	21 21	See AD lead.
RNT'1	R3 R3	23 23	See AD' lead.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
RNT2	SA7 54 SA7 44	Recorder Number Timing (a) Timing interval for operation of AMA recorder number relays in the sender is completed and a check is being made of their holding ability. (b) Timing interval for operation of pulse conversion class relays in sender is completed.
RNT'2	R3 53 R4 50	Recorder Number Tens (RNT'2) Tens number of recorder. Indication to sender of recorder tens number. Punch indication transmitted over ORC'0 lead from marker.
RNT20/RNT2	R3 24 S2 00	Recorder Number Tens (RNT20/RNT2) Tens number of recorder. Recorder tens number in offices having more than 20 recorders.
R0	S3 44 S3 44	Reorder Incoming register signaled the marker for a reorder (overflow) signal.
R01,2,3	RA1 B,00,01	Rotation Indicates the order of selection of routes.
R0'	R4 14 R4 40	Reorder Operation of the Recorder (RO) relay in the outgoing sender to set the outgoing trunk for reorder.
ROA	(S7 10)(S7 43) (S7 43)	Reorder Completing marker received reorder indication. Dial tone marker received overload announcement indication.
ROP	SA2 24 SA3 24	Recall Operator's Position The billing indexer circuit has directed the transverter to recall the operators position. (CAMA)
ROP1	SA2 42 SA3 42	Recall CAMA Operator Relay ROP1 has operated in the billing indexer circuit. (CAMA)
ROT	RA1 02	Rotation Indicates priority skip because not equipped.
ROTL	S8 02 S8 02	Remote Office Test Line Trouble record perforated on: (a) Remote office test line call or (b) Remote office test line register call.
RP	RA6 03 R6 53	Ring Party The originating register signaled the marker that this is a ring party call.
RP0-4	S6 03,04,10-12 S6 03,04,10-12	Register Preference Trunk preference for incoming register in a selected horizontal link group.
RPAB	S6 01 S6 01	Register Preference Auxiliary Basic Incoming trunk appears on the first auxiliary basic or the associated supplementary incoming register link frame.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
RPB	S6 00 S6 00	Register Preference Basic Incoming trunk appears on the basic or the associated supplementary incoming register link frame.
RPK	RA6 04 R6 54	Ring Party Check (a) Checks RP lead from marker to outsender on AMA calls (Mfr Disc.). (b) Indicates a one up check of TP and RP leads from marker to outsender on AMA calls (Std.).
RPSA	S6 02 S6 02	Register Preference Second Auxiliary Incoming trunk appears on the second auxiliary basic or the associated supplementary incoming register link frame.
RPT	SA3 30 SA4 30	Ring Party Translator The transverter is signaled that this is a ring party call. (AMA, ANI)
RR	S6 22 S6 22	Release Route Marker starts route advance by releasing original route relay (ACD office).
RS0-9	RA4 23,24,30-34, 40-42 RA5 30-34,40-44	Ringing Selection Which two Ringing Selection (RS-) relays operated in the marker to operate the ringing switch select magnets on the ringing control switch associated with selected trunk. Should be either an RS0 and one of RS2-9.
RS0-2	SA3 52-54	Remote Switch Indicates which of three wideband remote switch circuits (associated with a line link frame) was involved in the call.
RS1	RA8 14 RA5 14	Reset 1 Reset 1 flip-flop is set.
RS2	RA8 20 RA5 20	Reset 2 Reset 2 flip-flop is set.
RSC	SA7 33 SA7 23	Release Sender Connector Sender registration was satisfactory and the marker is to release the sender connector.
RSG1	SA2 43 SA3 43	Ring Surge 1 Relay RSG1 has operated in the billing indexer circuit indicating that the ring surge for the first translation has been initiated. (CAMA)
RSG2,3	SA2 44,50 SA3 44,50	Ring Surge 2,3 Same as RSG1 but used for second and third translations. (CAMA)
RSK	RA3 44 RA1 34	Ringing Switch Select Magnet Check A ringing switch select magnet had operated.
RSMK	SA6 31	Remote Select Magnet Check One select magnet has operated at the wideband remote switch.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
RST/T0,1,2 RST/U0,1,2,4,7 RST0-9 RST10-19 RST20-29	S4 00-02 S4 03,04,10-12 S4 00-04,10-14 S4 20-24,30-34 S3 00-04,10-14	Recorder Start (a) The AMA recorder start lead closed to the master timer when the master timer requested the trouble recorder. (b) The AMA recorder start lead closed to the transverter when the transverter requested the trouble recorder. (c) The regular AMA recorder which has been transferred to the emergency recorder prior to the time the regular AMA recorder called for the trouble recorder. If no AMA recorder transfer takes effect during this call, an operates RST- position will be matched by a correspondingly numbered perforation in the DR- group. (In offices having more than 10 recorders the RST perforation will also be accompanied by a DRT0 or 1 perforation to indicate the tens group of the recorder when an AMA recorder calls for trouble record or by a DRAT0 or 1 perforation when a transverter calls for the trouble record and has recorder attached). If there is a transfer of an AMA recorder to the emergency recorder while handline this call, the RST- perforation will indicate the AMA recorder transferred and the DR-EMG will be perforated to indicate that the emergency recorder is associated and involved in the trouble record.
RST-EMG	S5 00 S5 00	Recorder Start Emergency The emergency recorder was associated with the master timer when the master timer called for a trouble record (AMA, CAMA).
RSW	S7 42	Remotely Switched Wideband (Intra-WRS) The wideband linkage is to be set entirely in the wideband remote switch for an intercom call.
RT	SA3 52 SA4 52	Recorder Master Timing The AMA recorder was attached to the master timer for an end-of-tape function.
RT0-4	R6 33,34,40-42 R6 33,34,40-42	Route Transfer An RT relay is operated at the master test frame in order to transfer a regular route to an alternate route.
RTE0,1,2,4	SA2 4,20-22 SA4 00-03	Class Transmission Method The method by which the class information is transmitted.
RET0,1,2,4,7	SA2,14,20-23	Rate Treatment
RTRS	SA3 50 SA4 50	Recorder Transfer RRC requests an irregular transfer of tape units.
RTST	SA3 53 SA4 53	Recorder Test RRC requests start of test entry.
RTK	RA4,22 R4,43	Route Translator Check Route translator was connected to the marker when the marker made a trouble record.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
RV	S7 40 S7 40	Revertive Marker establishing a reverting trunk connection.
RV1	S4,33 R4,44	Reverse Toll diversion signal from the completing marker to the originating register.
RUK1	SA6 32	WRS Check Indicates that the RUK relay in the marker released correctly between select and hold magnet operation at the wideband remote switch.
RWL	S6 24	Remote Wideband Line The wideband line is terminated on a wideband remote switch.
RYK	RA6 42 SA5 13	Read in Recycle Check The marker is ready to read class of service into the transfer registers.
S1-9	R5 14,20-24,30 R5 20-24,30-33	Sender (a) Position of the particular sender in the outgoing sender connector. (b) Indicates the type of test and the range used on line insulation tests.
S10-14	R5 34,40-43	Sender Position of the particular sender in the outgoing sender connector.
S0-14	R5 14,20-24, 30-34,40-43	Sender Position of particular sender in the transverter connector (AMA, CAMA).
S(A-D)	RA7 14,20-22 RA4 14,20-22	State of the Machine (A-D) A 5-ms interval during which the A, B, C, or D character pairs were written on the magnetic tape. (AMA)
SAE	RA3 31 RA2 51	Sleeve Auxiliary End There is at least one idle PBX line available within a tens block.
SC	R4 24 R3 33	Straddle Call The master timer timed out while perforating a straddle call entry on a transferred end-of-tape pattern.
SC	R4 24	Service Call Operation of the Service Call (SC) relay in the outgoing sender for AMA functions.
SC	SA5 52 SA6 52	Service Call Operation of the SC relay in the outgoing sender for AMA or CAMA functions.
SCB	S7 50 S7 50	Start Call Back Marker is establishing the originating stage of an intraoffice trunk connection. Start Call Back Marker in establishing a call back connection to a supplementary route. (ACD)

Punch Designation (Cont)	Card Coordinates			Functional Meaning and Indication
SCH	R4 R4	11 31		Sampled Call Chargeable A billable call was sampled for traffic purposes. (AMA)
SCK	S4 S2	23 10		Stuck Coin Check Originating register signals the marker that there is no stuck coin or coin return failure.
SCN	S4 S2	22 04		Stuck Coin Originating register signals the marker that the coin failed to return.
SD	S2 S6	04 44		Station Delay (a) Pretranslator set the originating register for stations delay when either CMA, CMB, or CMC is perforated. (b) Pretranslator signals the originating register to return the coin on coin lines when CM3 is perforated.
SDG	S3 S3	00 00		Single Digit Indicates a single digit call. (ACD)
SDT	S7 S7	03 03		Short Delay Timer Marker time-out while trying to seize a line link, trunk link, sender group, or number group.
SEF	RA8 RA7	31 32		Second Extension Frame Marker functioned to operate the SEF relay on the trunk line frame.
SF	RA8 RA7	21 22		Single Frame The trunk link frame signals the marker to function for single frame operation.
SGA	RA1	04		Second Group Advance Indicates that the marker has advanced out of the second group of route relays.
SK0,1	R3 R4	41,R4 50,51	40	Sender Check The sender has signaled the CAMA transverter that it has properly registered various bits of information received from the transverter.
SKP	SA6 SA7	04 04		Skip Splice Entry The master timer timed out while perforating the skip splice entry on an end-of-tape pattern.
SL	SA7 SA7	21 11		Sleeve (trunk link frame) Closure of trunk link frame switch crosspoints.
SLCK	RA3 RA2	20 41		Sleeve Check The Sleeve Connector (SC) relay in the number group had operated and locked, in series with the Sleeve Connector Check (SLCK) relay in the marker.
SLK1	SA6 SA7	00 51		Sender Link Check 1 Lead from the sender link hold magnet is continuous.
SLK2	SA6 SA7	01 52		Sender Link Check 2 Sender link hold magnet operated and closed the crosspoints.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
SM	RA8 11 RA5 11	Step Memory Step memory flip-flop set in RRC. (AMA)
SNC	R4 12 R4 32	Sampled Call Nonchargeable A nonbillable call was sampled for traffic purposes. (AMA)
SNG	RA3 02 RA2 23	Seize Number Group The marker is preparing to seize the number group.
SNK	SA8 23 SA8 14	Selection Normal Check If not perforated, the marker released the selections made before a recycle takes place.
SNR	S6 23 S6 23	Select New Route Marker is ready to select new route (ACD office).
SOG	S7 32 S7 32	Subscriber Outgoing Marker establishing an outgoing trunk connection.
SON	S7 53 S7 53	Sender Outgoing Outgoing trunk connection requiring a sender or an intraoffice trunk connection with AMA requiring a sender.
SP	SA3 51 SA4 51	Splice The master timer blocked during a splice operation.
SP	SA0 33 RA6 33	Stop Progress While recording an entry on the magnetic tape, the recorder encountered a trouble, causing an attempt to be made to perforate a trouble card. (AMA)
SPA	SA6 03 SA7 03	Splice Pattern Applied Entry The master timer timed out while perforating the splice pattern on an end-of-tape pattern.
SPC	R6 51 S2 20	Sample Peg Count WADS call was sampled for traffic purposes.
SPL	R4 51	Special Combined ANI-LAMA transverter call.
STP1	RA8 52 RA5 53	Junctor Step 1 The marker had made a first test of the junctor subgroups, as is normally done.
STP2	RA3 53 RA5 54	Junctor Step 2 The marker recycled to make a second test of the junctor subgroups when a channel retest was necessary due to an all busy condition encountered.
SQ1	S6 30 S6 30	Sequence One Trunk sequence recycle position, ACD office.
SQA	S7 22 S7 21	Sequence Advance Marker Sequence Advance (SQA) relay remained operated long enough for SQA1 relay to release (an abnormal length of time), thus indicating a failure in the sequence advance circuit.
SR1	R5 42 R2 A	Select Route Select programmed routing choice 1.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
SR2	R5 43 R1 A	Select Route Select programmed routing choice 2.
SR3	R5 44 R0 A	Select Route Select programmed routing choice 3.
SRK	RA3 52 RA1 42	Start Ringing Check The marker had checked the operation of the ringing switch select magnet and also found clear and continuous the RC lead to RC relay in the associated trunk. The operation of the RC relay in the trunk caused the operation of the ringing switch hold magnet associated with this trunk.
SRT	S8 04 S8 04	Sender-Register Test Trouble record perforated on: (a) Outgoing sender test call. (b) Intermarker group sender test call. (c) Originating register test call. (d) Incoming register test call.
SPL	R4 51 R5 54	Special Incoming register signals that this is a no-test or no-hunt call requiring a special marker.
SSA	R4 12 R4 22	Sender Subgroup A Outgoing sender subgroup A was seized by the marker.
SSB	R4 13 R4 23	Sender Subgroup B Outgoing sender subgroup B was seized by the marker.
SSTI	(S8 22)(S8 22)	Stuck Sender Trunk Identifier The trouble record was made by the stuck sender trunk identifier circuit.
STL0,1,2,3, 4,5	RA1 40-44,50	Status Level Indicates the precedence level available on the call.
STMM	RA5 54	Status Mismatch Indicates the trunk selected is lower in status than that indicated by the status circuit.
SW	SA0 20 RA6 20	Switch Start lead switch.
SW0,1,2,4,7	R0 04,10-13 R0 04,10-13	Switch (Units) The outsender link switch units number identified by the stuck sender trunk identifier circuit.
SW1	SA0 21 RA6 21	Switch 1 Start lead switch completed.
SW0,1,2,4,7	R1 30-34 R1 30-34	Switch The SW- (switch or horizontal group) of the calling line as registered in the translator and outgoing sender on an AMA call.
SWAT	SA1 54	Store Wideband Audio-only Transfer Store WAT mark. (See WAT punch.)
SWT0,1	R0 00,01 R0 00,01	Switch Tens 0,1 The outsender link switch tens number identified by the stuck sender trunk identifier circuit.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
SXT	SA5 54 SA5 14	Standing Cross Test There is a false ground on the CWK lead between the marker and the call-waiting circuit.
SY	SA5 53 SA6 53	Synchronized The master timer and the AMA recorder were in synchronism at time of perforating an end-of-tape pattern.
T0-9	RA5 23,24,30-32 S5 40-44	Tens Digit That the marker had applied battery to the TB- lead to operate the corresponding TB- relay in the number group.
T0-9	RA5 33,34 40-42 RA3 40-44,50-54	Tens Digit (a) The Tens (T-) relay operated in the transverter by the translator on an AMA or ANI call. (b) Contents of tens digit register in the route translator.
T0,1,2,4,7	S4 00-02 R1 30-34	Trunk Tens The Tens (T-) lead grounded by call identity indexer via the AMA recorder for identifying the trunk attached to the AMA recorder (AMA, CAMA).
T0,1,2,4,7	S5 40-44 S5 40-44	Trunk Tens The T- leads grounded by the call identity indexer to the trunk control circuit for identifying the trunk attached to the trunk control. (AMA)
T'0,1,2,4,7	R1 30-34 R1 30-34	Trunk Tens The T- leads grounded by the call identity indexer through the trunk control circuit to the transverter for identifying the trunk attached. (AMA) Tens Digit Tens digit of 4-wire tandem trunk number or of calling party directory number for persion to person.
T4L	SA2 10 SA3 10	Toll 4-Line Entry The transverter has determined from the area code that a 4-line entry is required on the AMA tape. (CAMA)
T5L	SA2 04 SA3 04	Toll 5-Line Entry The transverter has determined from the area code that a 5-line entry is required on the AMA tape. (CAMA)
TA	RA2 52	Trunk Available Indicates an available trunk.
TA	SA7 52 SA7 42	Trunk Available There was at least one idle trunk available on an idle trunk link frame (ACD office).
TAN	S3 23 S3 23	Tandem The incoming register notified the marker that this connection is from a tandem trunk.
TAN0-5	S4,34,40-44 S6,44,50-54	Tandem Incoming class mark units registered in completing marker from incoming register.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
TAR0,1,2,3	R2 50-53 R2 50-53	Terminating Area Identification of terminating area in which called number is located. (CAMA)
TB0,1,2,4,7 TB0-5	SA0 B 00-03 SA1 00-04,10	Trunk Block Which Trunk Block (TB-) relay in the marker operated to cause the operation of corresponding relay in trunk link frame.
TB6	$\overline{\text{SA1}}$ B	Trunk Block Which TB- relay in the marker operated to cause the operation of corresponding relay in trunk link frame.
TB7	$\overline{\text{SA0}}$ B	Trunk Block Which TB- relay in the marker operated to cause the operation of corresponding relay in trunk link frame.
TB8	$\overline{\text{RA}}$	Trunk Block Which TB- relay in the marker operated to cause the operation of corresponding relay in trunk link frame.
TB9	$\overline{\text{RA7}}$ B	Trunk Block Which TB- relay in the marker operated to cause the operation of corresponding relay in trunk link frame.
TBH	RA2 21 RA1 22	Trouble Intercept Hold Magnet The marker functioned to operate its TBH (trouble intercept, hold magnet, operate ringing switch) relay to reset the trunk ringing switch for ringing into a trouble intercept trunk.
TBI	RA2 20 RA1 21	Trouble Intercept The marker functions to route this connection to a trouble intercept trunk.
TBK	SA8 32 SA8 23	Trunk Block Check A TB- relay of the selected trunk line connector operated.
TBL	SA5 34 SA6 34	Trouble Encountered The AMA recorder functioned to notify the transverter or master timer that a trouble had been encountered and that the trouble recorder should be seized and an appropriate trouble entry should be perforated. (AMA, CAMA)
TBL	SA2 52	Trouble at WRS The marker work timer has elapsed with a failure in the remote switch check sequence (see RUK1, RSMK, and RDCK).
TBS0-3	RA5 43,44,50,51 SA1 51-54	Tens Block Screening Provide terminating treatment from number group.
TBY	SA4 51 SA5 51	Translator Busy The requested AMA translator is plugged busy.
TC	RA6 B R6 44	Talking Charge The marker operated its TC relay and grounded the TC or RC lead to the selected trunk.
TC	R5 54 R4 54	Test Code The billing indexer has informed the CAMA transverter that a 10X test call has been made.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
TC1	SA8 11 SA8 02	Traffic Control 1 Marker assumed control of line link marker connector.
TCA	S4, 30 S2, 12	Trunk Class A Incoming class mark tens registered in completing marker from incoming register.
TCB	S4, 31 S2, 13	Trunk Class B Incoming class mark tens registered in completing marker from incoming register.
TCGA TCGB	SA2 32 RA4 33 SA2 33 RA4 34	Terminating Class Groups A, B (a) Identifies the class of service as being within the first or second 30 classes of service. (b) For PAD control identifies the first or second groups of 10 rate treatments.
TCHK	SA7 04 SA8 54	Test Channel Check Marker Test Channel (TCH0-9) relay operated to indicate channel numbers in the selected junctor subgroup associated with the trunk link frame.
TCK	RA6 50 RA7 50	Transmit Class Check Check for proper class registration (ACD office).
TCK1	RA3 51 RA1 41	Talking Charge Check The operation of the marker Talking Charge Check (TCK) relay indicates continuity of the TC lead from marker to associated trunk.
TCH	RA3 43 RA1 33	Toll Charge The marker functioned its Toll Charge (TCH) relay for setting toll charge supervision in an incoming trunk.
TEA	SA5 00 SA6 00	Trouble Entry-transverter The operation of the transverter Trouble Entry Cut-in (TEA) relay for closing a trouble entry to an associated AMA recorder. (AMA, CAMA)
TEN	SA3 53 SA4 53	Test Entry The master timer is being used for test purposes.
TER	S7 33 S7 33	Terminating Marker establishing an incoming trunk connection.
TF0,1,2,4,7	S4 51-54,A S3 50-54	Trunk Link Frame - Units Ground on Trunk Frame Units (TF-) leads from the incoming register provides the trunk link frame units identification.
TF'0,1,2,4,7	R0 04,10-13 R0 04,10-13	Trunk Frame Units Trunk frame units information transmitted to CAMA sender to identify trunk frame appearance of CAMA trunk.
TG0-19	SA0 04,10-14,20 SA1 11-14,20-24, 30-34,40-44,50	Trunk Group The TG- relay operated in the marker by the Route (R-) relay.
TGA	RA1 10	Third Group Advance Indicates that the marker has advanced out of the third group of route relays.

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
TGR	SA5 SA6	01 01	Test Group Relay The UG relay (in the transverter) which verifies the path of the cross detection feature XG relay (in the transverter) failed to operate. (AMA, AN1)
TGT	S4 S7	11 11	Trunk Guard Test The outgoing sender failed to complete trunk test in the allotted time.
TH0-3	RA7 RA5	14,20-23 00-03	Trunk Thousands Thousands digit of the trunk number.
TH'0,1,2,4,7	R1 R1	04,10-13 04,10-13	Thousands Digit Thousands digit of 4-wire tandem trunk number or of calling party directory number for person to person.
TH'0,1	R6 S6	43,44 33,34	Thousands Digit Trunk thousands number (0,1) has been stored in the sender.
TH'2,3	R5 AB1 AB0	43,44 10, 10	Thousands Digit Trunk thousands number (3.4) has been stored in the sender.
TH0-9	RA5 RA3	13,14,20-22 00-04,10-14	Thousands Digit (a) The Thousands (TH-) relay operated in the transverter by the translator on an AMA or ANI call. (b) Contents of thousands digit register in the route translator.
THC	S3 S3	14 14	Theoretical Office The incoming register directed the marker to complete the connection to the theoretical subdivision of the directory number series for an office unit.
THT0-LL0 THT1-LL1 LL2 4 7	RA7 RA5	14,20-23 00-04	Line Linkage The line link used on a dial tone connection. This information, which was stored in the register while the call was being set up, is passed back to the marker after dialing, to indicate that this part of the channel is to be considered idle when making channel test for the originating (call-back) stage of an intraoffice trunk connection or a subscriber outgoing trunk connection. Trunk Thousands Thousands digit of the trunk number.
TI	S8 S8	00 00	Trouble Indication Trouble encountered on a service, monitored, or test call.
TIA0-3	S6 S6	03,04,10,11 03,04,10,11	Trouble Indicating (CAMA) Sender informs the transverter that: No trouble; used by transverter as a check. Sender trouble. Automatic identification failure. CAMA suspension call.
TIN	RA2 RA1	12 13	Toll Incoming The marker has prepared to serve an intercept condition on a connection served by a toll incoming trunk.

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
TIR	SA6 SA7	44 53	Trouble Identifier Release Ground placed on TIR lead to marker connector by the marker when an incomplete line location is received from the transfer register.
TK	SA7 SA7	10 00	Test Check Necessary functions in the marker have been completed to close a channel. The TK (test check for channels) relay in operating will initiate marker functions for channel test.
TKT	S8 S8	10 10	Trunk Test Trouble record perforated on a trunk test call. Trunk Test Trouble record perforated on a trunk test call. Test Call A route translator test call was in progress.
TLR0-29	SA2 RA6	00-04,10-14, 20-24,30-34, 40-44,40-54 00-04,10-14, 20-24,30-34, 40-44,50-54	Translator Number of the translator associated with a transverter on an AMA call.
TLR30,31	RA7 SA1	00, 01 53, 54	Translator Number of the translator associated with a transverter on an AMA call.
TLT	RA4 R4	22 43	Translation Trouble The direct access pretranslator control TLT relay operated indicates pretranslator translation trouble on a direct inward dialing call to No. 101 ESS.
TLV	S8 S8	12 12	Transverter Line Verification Line verification test in the transverter stage. Translator cross-connections are checked. (AMA, CAMA)
TM	SA8 SA8	04 00	Timing Closure (a) Lead Timing (TM) grounded by a marker connector to which the marker is connected. (b) Lead TM grounded by released MSK/MCK/MAK relays in the marker, indicating a marker connector is attempting to seize this marker or the preference chain through the MSK, MCK, MAK relays is open.
TM	SA4 SA5	00 00	Transverter Timing The transverter connector upon seizing a transverter had grounded the TM lead to the transverter to supplement the ground supplied by the transverter for actuating the transverter alarm. (AMA, CAMA, ANI)
TM1,2	S7 S7	02,03 02,03	Time-out 1 (TM1) A time-out function of transverter TM1 tube timer which covers the following intervals: (a) From seizure of transverter to seizure of translator. (AMA) (b) From seizure of AMA recorder until perforating functions are complete. (AMA)

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
TM1,2 (Cont)		Time-out 2 (TM2) A time-out function of transverter TM2 tube timer which covers the following intervals: (a) From seizure of translator to seizure of AMA recorder. (AMA) (b) From operation of Release (RL) relay to restoration of the transverter to normal (AMA, ANI).
TM2T,3T	S7 02,03 S7 02,03	TM2 Timing (TM2T) A TM2 time-out has occurred in the transverter which covers the following intervals: (a) Seizure of transverter to billing indexer connected (CAMA). (b) Billing indexer release to transverter release if no initial entry is required and billing indexer release to recorder connected if an initial entry is required (CAMA). (c) Operation of a release relay to transverter release (CAMA). TM3 Timing (TM3T) A TM3 time-out has occurred in the transverters. This time covers the following intervals: (a) Billing indexer connected, to billing indexer released (CAMA). (b) Recorder connected, to operation of a release relay (CAMA).
TMG	S8 23 S8 23	Timing The master timing circuits engaged the trouble recorder.
TN	RA2 01 RA1 02	Theoretical Number The HB- relay operated in a number group serving a theoretical office.
TNK	RA3 12 RA2 33	Trunk Number Check AI00 translator has derived a trunk number from eqiupment location information.
TNK	SA5 42 SA6 42	Tens Number Check On a toll or tandem trunk connection, that a trunk number is involved.
TNR	SA5 34 SA6 34	Transfer Start The substitution of the emergency trunk control for the trunk control which is to be transferred has begun. (AMA)
TOB	R6 51 S2 20	Trunk Observed (TOB) Call is being trunk observed.
TOBS	R6 50 S2 14	Trunk Observed (TOBS) Call may be trunk observed.
TOG	S7 34 S7 34	Toll-Tandem Outgoing Marker establishing a toll or a tandem trunk connection.
TOK	RA2 51	Status Test OK Indicates status connector leads TSG, TS1-5, LSG, and LS1-5 are all right.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
TOK	SA4 21 SA5 21	Trunk Okay The transverter Trunk Okay (TOK) relay operated showing the ICK lead checks clear of false battery and ground. (AMA, CAMA)
TOK	S4 14 S5 24	Translation OK Progress mark indicating the pretranslator has successfully performed code translation.
TOL	S3 24 S3 24	Toll The incoming register notified the marker that this connection is from a toll trunk.
TP	RA6 01 R6 51	Tip Party The originating register signaled the marker that this is a tip party call.
TP'	RA6 02 R6 52	Tip Party Prime - Incoming Trunk Ringing Switch Hold Magnet (a) The marker operated the proper class relay in the selected trunk. (b) The marker operates TP relay in register-sender for AMA information on tip party calls. (c) The marker operates the ringing switch hold magnet associated with the incoming trunk.
TP0-4	RA4 23,24,30-32 RA5 30-34	Trunk Preference The trunk preference used by the marker for routing selection (the TPA0-4 relay operated in the marker), (ACD office).
TPMK	RA5 52	Trunk Precedence Memory Check Indicates correct status level stored in trunk circuit.
TPT-4WT	SA3 24 SA4 24	Tip Party Translator The transverter is signaled that this is a tip party call. (AMA, ANI) Four Wire Tandem Four wire tandem call. (A&M Only)
TR	S7 11 S7 11	Trouble Release Trouble release signal sent from transverter to transverter connector. Second trial initiated by transverter connector (AMA, CAMA, ANI).
TR1T	S7 12 S7 12	Trouble Release Trouble release signal sent from transverter to sender. No second trial initiated by transverter connector (CAMA, ANI).
TRA	SA0 03 RA6 03	Transfer Advance The first step in transfer from the active to the standby recorder has been completed. (AMA)
TRA2	SA0 04 RA6 04	Transfer Completed The transfer from the active recorder to the standby recorder has been completed. (AMA)
TRE	SA0 00 RA6 00	Transfer Entry (AMA)
TRF	S6 31 S6 30	Transfer Type Call

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
TRL	SA6 50 SA6 52	Trouble Release Ground placed on TRL lead to marker connector by the marker after a trouble record or an attempt to seize the trouble recorder on first trial failures. This causes the connector to reseize a marker on a second trial basis.
TRL	SA5 41 SA6 41	Transverter Release Failure to match trunk number to station number. Trouble Release The automatic range extension test circuit failed to test the selected range extension circuit because the marker gave a trouble release.
TRL	SA5 52 SA6 52	Trouble Release Trouble release on a label attempt.
TRMF	S2, 24 S3, 24	Transmission Failure The automatic range extension test circuit has found a transmission test failure on the selected range extension circuit.
TRN	SA8 13 SA8 04	Trunk Number Identification The Trunk Number (TRN) relay in the marker, operated to pass the trunk number (numerical digits) into the number group for a tandem or toll trunk connection.
TRS	S7 10 S7 10	Transfer Start Marker start lead in a marker connector or a pretranslator start lead in a pretranslator connector was transferred. This record will not indicate a service call failure, but with the information given elsewhere in the trouble record, will indicate a connector trouble in the normal access paths.
TRS	S7 10 S7 10	Transfer Start Transverter start lead in a transverter connector was transferred. This record will not indicate a service call failure, but with the information given elsewhere in the trouble record, will indicate a connector trouble in the normal access paths (AMA, CAMA, ANI).
TRSA	SA0 01 RA6 01	Transfer Start A An irregular transfer start of A recorder. (AMA)
TRSB	SA0 02 RA6 02	Transfer Start B An irregular transfer start of B recorder. (AMA)
TRT0,1,2,4,7	S4 40-44 S4 40-44	Terminting Rate Treatment (Tens Digit) Derived from the second translation of the billing indexer circuit (CAMA).
TRU0,1,2,4,7	S4 50-54 S4 50-54	Terminating Rate Treatment (Units Digit) Derived from the second translation of the billing indexer circuit (CAMA).
TS	S6 33 S6 33	Toll Statement Area The billing indexer has determined that this call has been made to an area requiring toll statement treatment (CAMA).

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
TS0-19	SA0 RA8	34,40-44,50 00-04,10-14, 20-24,30-34	Trunk Selected The TS0-19 (trunk or originating register selected) relay operated in the marker.
TS0-3	SA0	51-54	Trunk Switch Which wideband trunk switch of four (associated with a trunk link frame) was used on the call.
TSA	SA1 RA4	54 04	Trunk Sequence A Multiplier trunk sequence relays TSQ-. (ACD)
TSE	SA8 SA8	20 11	Trunk Selection End None of the marker TS0-19 (trunk selection) relays operated to indicate that a trunk was selected.
TSK	SA6	33	Trunk Switch Check The wideband trunk link connector has operated to provide access to the trunk switch.
TSQ0,1,2,4,7	SA1 RA4	34,40-43 00-03,B	Trunk Sequence Indicates a position of a trunk sequence walking circuit. (ACD)
TSR	SA7 SA7	52 42	Timing Sender Registration All sender connector relays had operated and the marker is to start timing for the operation of the sender memory relays.
TST	S8 S8	01 01	Test Call Incoming register signals marker that this is a test call.
TST	RA4 SA4	33 44	Test A day change or minute entry test started by MTC.
TST	RA4 RA4	33 00	Test Set Entry An attempt has been made to write a test set entry (initiated by the recorder and recorder control circuit) on the magnetic tape. (AMA)
TSTI	RA8 RA5	02 02	Test (Inactive) An inactive unit test.
TT	S3 S8	01 01	Toll Translator A register has directed the marker to employ its toll translator for this connection.
TT0,1,2,4,7	S5 S5	30-34 40-44	Trunk Tens The Tens Trunk (TT-) lead grounded by the incoming register to aid the marker is locating the line link appearance of this tandem or toll trunk for the completion of the call.
TT0	R4 R4	34 34	
TT'0,1,2,4,7	S2 S2	32-34,40-41 40-44	Tens Trunk Tens trunk information transmitted to CAMA sender by marker to identify line appearance of CAMA trunk.
TTF	RA8 RA7	23 24	Tripled Frame The trunk link frame signals the marker to function for tripled frame operation.
TTG0	SA6 SA1	04 51	Transmission Test Guard Transmission test tone detected. The marker started to recycle when setting up to a test trunk but did not complete recycling (ACD office).

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
TTG1	SA6 10 SA1 52	Transmission Test Guard The marker completed recycling when setting up to a test trunk (ACD office).
TTK	RA6 52 RA7 52	Trunk Test Relay Check The TT relay in the selected trunk operated and establishing a locked circuit.
TTK	SA2 52 SA3 52	Terminating Translation Check The second translation in the billing indexer circuit has been completed. (CAMA)
TTKL	SA4 30 SA5 30	APTT Trunk Test A trunk test call has been initiated through the trunk control circuit by the APTT. (AMA)
TTR	R6 32 R6 32	Trunk Test Register Indicates a trunk test register call.
TTT	S6 02 S6 02	Transverter Translator Trap The number setting on the AMA line verification test circuit (transverter) matches a number in the translator.
TURNOVER	S8 42,43	Turn Over A perforation in one of these location indicates AMA or CAMA trouble record. Read card on reverse side.
TV	SA3 32 SA4 32	Transverter Connected to AMA Recorder (a) The Transverter Connector (TC) relay operated in the recorder connector showing connection to a transverter. (AMA, CAMA) (b) On recorder test connections, the master timer grounded TV lead to simulate a transverter by operating the AMA recorder TVM relay. (AMA, CAMA)
TV	S8 21 S8 31	Transverter A transverter engaged the trouble recorder. (AMA, CAMA)
TVT	R4 30 R3 34	Transverter Test Operation of the Transverter Test (TVT) relay in the outgoing sender for AMA functions. Transverter Test Operation of the TVT relay in the outgoing sender for ANI, AMA, or CAMA functions.
TWT	R6 20 R6 20	Two-way Trunk Route A 2-Way Trunk (TWT0-5) relay was operated in the marker for 2-way trunk operation.
U0-9	S5 50-54 S5 50-54	Units Digit That the marker had applied battery to the Units (U-) lead to operate the corresponding U- relay in the number group.
U0,1,2,4,7	RA5 43,44,50-52 RA2 00-04	Trunk Units The U- lead grounded by call identity indexer via AMA recorder for identifying the trunk attached to the AMA recorder (AMA, CAMA).

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
U0,1,2,4,7 (Cont)			Units Digit Contents of the units digit register in the route translator.
U0-9	RA5 RA2	33,34,40-42 00-04,10-14	Units Digit The U- relay operated in the transverter by the translator on an AMA or ANI call.
U'0,1,2,4,7 VF0,1,2,3,4	R1 R1	40-44 40-44	Vertical File The Vertical File (VF-) of the calling line as registered in the translator, and outgoing sender on an AMA call. Units Digit Units digit of 4-wire tandem trunk number or of calling party directory number for person to person.
UK	RA3 RA2	10 31	Units Check The U- relay in the number group operated.
UT0,1,2,4,7	RA5 S5	33,34,40-42 50-54	Trunk Units The Units Trunk (UT-) lead grounded by the incoming register to aid the marker in locating the line link appearance of this tandem or toll trunk for the completion of the call.
UT'0,1,2,4,7	S2 S2	50-54 50-54	Units Trunk Units trunk information transmitted to CAMA sender by marker to identify line appearance of CAMA trunk.
VF0,1,2,3,4	R1 R1	40-44 40-44	Vertical File The VF- of the calling line as registered in the marker or monitor.
VF'0,1,2,3,4	R0 R0	40-44 40-44	Vertical File Prime The VF- of the calling line, as transmitted by the marker to originating register or AMA sender.
VFT0-4	SA3 SA3	42-44,50,51 20-24	Vertical File Test (a) The marker Vertical File Identification Test (VFT-) relay operated from the number group to identify the vertical file of the called line. (b) The marker VFT- relay operated on the originating (call-back) stage of a reverting, intraoffice, or subscriber otugoing trunk connection from the calling line location registered in the marker. (c) The marker VGT- relay operated on a dial tone connection from the line, line link, and connector. (d) Identifies the line in trouble in terms of its vertical file location on line insulation tests.
VG0,1,2,4,7,10	R1	14,20-24	Vertical Group The Vertical Group (VG-) of the calling line as registered in the marker or monitor.
VG-H'-0,1,2,4, 7,10	R1	14,20-24	Vertical Group The VG- of the calling line as registered in the transverter. (AMA)(ANI) Hundreds Digit Hundreds digit of 4-wire tandem trunk number or of calling party directory number for person to person.

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
VG-0,1,2,4,7, 10	R0 R0	14,20-24 14,20-24	Vertical Group Prime The VG- of the calling line, as transmitted by the marker to originating register or AMA sender.
VGT0-11	SA3 SA4	20-24,30,31 31-34,40-44, 50-52	Vertical Group Test (a) The marker Vertical Group Identification Test (VGT-) relay operated from the number group to identify the vertical group of the called line. (b) The marker VGT- relay operated on the originating (call-back) stage of a reverting, intraoffice, or subscriber outgoing trunk connection from the calling line location registered in the marker. (c) The marker VGT- relay operated on a dial tone connection from the line, line link, and connector. (d) Identifies the line in trouble in terms of its vertical group location on line insulation tests.
VTC	R3	51	Vacant Terminating Code Indication to marker that call contains a vacant terminating code.
VTC	SA2 SA3	40 40	Vacant Terminating Code The billing indexer has determined that this call has been made to a vacant terminating code. (CAMA)
VTC	R4	41	Vacant Terminating Code The CAMA transverter has functioned to ground VTC lead to CAMA transverter connector.
VTK1	SA8 SA8	40 31	Vertical Group Test Check Only one VGT0-11 relay is locked operated in the marker for vertical group selection.
VU0,1,2,4,7	R2 R2	20-24 20-24	Vertical Unit The vertical unit number of the outsender link switch identified by the stuck sender trunk identifier circuit.
W	R4 R4	10 30	Wide Area Telephone Service The call has been identified as a WATS call. (AMA)
WAT	S6	51	Wideband Audio-Only Transfer Incoming wideband call completed to WB/CTX station and subsequently transferred on an audio-only basis.
WB0-2	SA2	34,40,41	Wideband Class (Originating) The marker is requested to process a wideband call.
WBT0-2	SA2	42-44	Wideband Class (Terminating) The line is entitled to wideband service.
WC	R6 S2	54 23	WADS Line Concentrator 2A Trouble record on a line concentrator 2A call. A trouble recorder card mask is required to identify the trouble.
WCH0 1,2,4,7	SA1	24,30-33	Wideband Channel The wideband channel used through the wideband link (also the junctor switch group used in the wideband link).

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
WCK	SA6 23	Wideband Channel Check All checks are satisfied prior to setting the wide band channel.
WCK	RA8 13 RA5 13	Write Check The write check flip-flop in RRC is set (echo check of written data). (AMA)
WCN	SA6 24	Wideband Continuity Indicates that the signal received by the wideband continuity test circuit has correct level.
WCV	SA6 10	Wideband Class Matched The originating and terminating wideband classes are the same.
WDC1	SA6 34	Wideband Double - Connection Test 1 Locks in the indication of successful double-connection test following the setting of any wideband linkage.
WDT1	S6 50	Wideband Dial Transfer Identification Wideband DTI punch. (See DTI punching)
WDTF	S6 44	Wideband Dial Transfer Wideband DTF punch. (See DTF punching.)
WFCK	SA6 11	Wideband False Cross and Ground Check Locks in the indication that the wideband false cross and ground check was satisfied.
WGA	SA2 53	Wideband Group A The A group of the wideband transfer link.
WGB	SA2 54	Wideband Group B The B group of the wideband transfer link.
WHS1	SA6 13	Wideband Hold Magnet Start 1 Marker initiated the operation of selected wideband channel hold magnets.
WKC	R4 44 R3 54	Working Code Indication to marker that the call contains a working code.
		Working Code The CAMA transverter functioned to ground WKC lead to the CAMA transverter connector.
WL0 1,2,4,7	SA1 34,40-43	Wideband Link to WRS Identification of the remote link (to a wideband remote switch) used in the channel.
WLFK	SA6 12	Wideband Line Link Frame Check Associated MCA (marker cut-in) relays are operated in the selected wideband line link connector.
WMM	SA2 50	Wideband Class Mismatch The originating and terminating wideband classes do not match.
WMXT	SA4 54	Wideband Master Cross Test A wideband cross relay has operated in the marker.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
WSF	RA8 30 RA5 30	Write Strobe Failure Write strobe failure flip-flop set in RRC (multiple write strobes).
WSL	SA6 42	Sleeve (Wideband Trunk Link Frame) Closure of wideband trunk switch crosspoints.
WSM	RA8 12 RA5 12	Write Strobe Memory The write strobe memory flip-flop is set in RRC. (AMA)
WT	S7 02 S7 02	Work Timer The marker timed out while trying to complete a function or a group of functions.
WTFK	SA6 41	Wideband Trunk Link Frame Check The associated MC (marker cut-in) relays are operated in the selected wideband trunk link connector.
WTK	SA6 40	Wideband Total Check Necessary functions in the marker have been completed to test for an idle wideband channel.
WTL	SA0 34 RA6 34	Writer Trouble A trouble was encountered in the steering circuit of the system control portion of the recorder and recorder control circuit. (AMA)
X11	S3 04 S3 04	Service Code Translator Register has directed the marker to employ its service code translator for this connection.
X2P	SA6 51 SA7 51	Crossed Perforator Check The transverter detected operation of more than one P1K-P4K (perforator check) relay for the same line of entry. (AMA, CAMA)
X	SA6 13 SA7 13	Cross-detected A transverter cross-detecting relay operated, in turn operating the X relay of the transverter as a trouble signal. (AMA, ANI)
XAB	SA4 34 SA6 34	Crossed A-B Group Relays (a) A cross exists in the A-B relays for group A, B selection of the WB transfer link. (b) Simultaneous operation of FAK and FBK relays in marker.
XAN	SA4 11 SA5 51	Crossed Allotter Number (a) Failure to match between marker and number group indications on allotted PBX numbers. (b) Two or more allotted number relays operated.
XBRL	SA4 23 RA5 B	Cross Busy Trunk Release Lead Cross or false ground on the BRL lead.
XBT	SA5 10 SA5 43	Cross-Busy Tone False ground on Busy Tone (BT) lead to marker connector.
XCE	SA4 22 RA6 B	Crossed Camp On Established Lead Cross or false ground on the CE lead.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
XCH	SA4 12 SA5 52	Cross-Channel Test False ground on any J0-9 and/or LH0-9 lead to trunk link frame and/or LL0-9 lead to line link frame.
XCK	SA6 44 SA7 44	Crossed CK Lead The transverter detected a falsely ground CK lead to an AMA recorder. (AMA, CAMA)
XCKR	SA4 04 SA5 33	Cross or Ground on Class-Check Circuit False ground on class-check circuit during a dial tone connection. Ground is on the class-check circuit during intraoffice and outgoing trunk connections.
XCL	SA5 00 SA6 00	Cross-Class More than one CL- (0/5P or CL 0/5S) lead in the marker is grounded.
XCLC	SA5 21 SA5 32	Cross-Class Control Operation of more than one class control (OR, TAN, TOL, INC, RO) relay in the marker.
XCP	SA5 04 SA6 04	Cross-Code Pattern More than one CP- (0/4P, 0/4S) lead in the marker is grounded.
XCR	SA5 01 SA6 01	Cross-Code Route More than one CR- (0/4P, 0/4S) lead in the marker operated.
XCW	SA4 13 SA5 54	Cross Call-Waiting A cross exists in the call-waiting link circuit.
XCS	SA5 44 SA5 02	Cross-Class of Service More than one Class of Service (CS-) relay in the marker had operated due to crossed CS- lead in the link frame. Cross-Class Information False ground or a cross on a class-of-service leads to digit register. (ACD)
XDL	SA5 02 SA6 02	Cross-Deletion More than one DL- (0/6P, 0/6S) lead in the marker operated.
XDS	SA6 30 SA7 30	Crossed DS Lead
XET	SA6 53 SA7 53	Crossed Equipment Terminals The transverter detected a false ground on or cross between two or more equipment terminals in the translator. (AMA, ANI)
XF	SA5 30 SA6 40	Cross-Frame Crossed Regular Frame (RF) and Extension Frame (EF) leads to trunk link frame.
XFG	SA5 23	Cross-Frame Group (Mfr Disc.) Simultaneous operation of FG0 and FG1 (trunk frame group) relays in the marker.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
XFT	SA5 41 SA6 51	Cross FTC Leads An unused FTC lead in the selected trunk link frame is falsely grounded or that the marker had been directed to a trunk link frame which does not include any trunks for the route.
XFUT	SA5 53 SA5 12	Cross-Frame Units and Tens Test More than one Frame Units Test (FUT-) or Frame Tens Test (FTT-) relay in the marker had operated.
XHG	SA5 42 SA5 00	Cross-Horizontal Group More than one Horizontal Group (HG-) relay operated in line link connector. Crossed line link switch steering relay.
XHG1	SA4 31 SA6 03	More than one HB (A,B) 0-9 relay in the line link is operated.
XHGA	SA4 32 SA5 53	More than one HGA0-9 relay in the identifier is operated.
XHM	SA4 00 SA5 21	Cross Hold Magnet More than one CWH hold magnet in the call-waiting link are crossed - the magnets are not operated.
XI	SA4 24 SA6 11	Cross Identifier More than one identifier connector relay is operated in the same identifier. Cross on ITR Lead False ground on the Immediate Trouble Record (ITR) lead to digit register.
XIC	SA6 22 SA7 22	Crossed Identifier Control Leads A transverter detected: (a) a falsely grounded Trunk Identification Control (TIC) lead toward the trunk. (b) A premature operation of transverter Trunk Okay (TOK) relay of RK relay. (c) A flase battery on ground on XICA (identification control) lead within the transverter. (AMA)
XICK	SA6 23 SA7 23	Crossed Identifier Control Check The transverter detected a premature operation of either its IC, ICK, or DCB relays. (AMA, CAMA)
XIN1	SA7 40 SA8 40	Crossed Billing Indexer Lead 1 Relay XIN1 was operated in the transverter by the billing indexer circuit. This indicates that a cross is present on either the ROP or PRL lead between the billing indexer and the transverter. (CAMA)
XIN2	SA7 41 SA8 41	Crossed Billing Indexer Lead 2 Relay XIN2 was operated in the transverter by the billing indexer circuit. This indicates that a cross is present on either the 2L, 4L, TC, VTC, or DNC lead between the billing indexer and the transverter. (CAMA)

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
XIN3	SA7 42 SA8 42	Crossed Billing Indexer Lead 3 Relay XIN3 was operated in the transverter by the billing indexer circuit. This indicates that a cross is present on either the OIN0,1,2,4,7 or MBI0,1,2,4,7 leads between the billing indexer and the transverter. (CAMA)
XJC	SA5 02 SA6 22	Cross-Junctor Connector Leads Crossed Junctor Connector (JC-) leads to trunk link frame.
XJG	SA5 14 SA6 23	Cross-Junctor Group Leads Crossed Junctor Group (JG-) leads to trunk link frame. Crossed line link cut-through relays.
XJS	SA5 20 SA6 24	Cross-Junctor Select Magnets Crossed Junctor Switch Select Magnet (JS-) leads to trunk link frame.
XLC	SA5 23 SA6 32	Cross-Link Connector Crossed Link Connector (LC-) leads to trunk link frame.
XLG	SA5 43 SA5 01	Cross-Line Group More than one Line Group Connector (LG-) relay operated in line link connector.
XLH	SA5 51 SA5 04	Cross-Line Hold Magnets Crossed Link Hold (LH-) leads to line link frame on dial tone job under light traffic condition (provisional).
XL	SA4 30 SA6 04	Crossed LC Leads More than one line link relay is operated.
XLF	SA4 20 SA4 53	Crossed LF Relays (line link frame) Two line circuits have been seized.
XL0	SA5 52 SA5 10	Cross-Lockout False ground on LO/LOB/LOK/G lead to LO (lockout for dial tone calls) relay in line link frame.
XLR	SA5 21 SA6 30	Cross-Left and -Right Sides Crossed Left (L) and Right (R) leads to their respective relays on the trunk link frame.
XLS	SA5 20 SA5 03	Cross-Line Select Magnets Crossed Select Magnet (SM-) leads to line link frame.
XLV	SA5 24 SA6 33	Cross-Level Leads Crossed Level (LC-) leads to trunk link frame.
XMB	SA5 03 SA6 03	Cross-Message Billing More than one message billing index is recorded in the marker.
XMRL	SA4 11 SA5 50	Cross-Marker Release False ground on Marker Release (MRL) lead to marker connector.
XN	SA4 01 SA5 22	Cross-Number Control Mismatch due to more than one called-number control relay (TBIA, RIA, TNRI, NE, OAN, OBN) being operated in the marker.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
XNL	SA6 24 SA7 24	Crossed Number Leads The transverter, while normal, detected a false ground on one or more of the following leads to the transverter connector: A0-A7, B0-B7, C0-C7, D0-D7, E0-E7, F0-F7, G0-G7, H0-H7, J0-J7, and M'7. (AMA)
XOB	SA6 10	Cross-Service Observation (Mfr Disc.) Both the NOB and Observation (OBS) relays in the marker operated.
XOF	SA6 50 SA7 50	Crossed Overflow Lead The transverter detected a falsely grounded OF lead to a transverter connector. (AMA)
XOST	SA7 32 SA8 32	Cross or open or battery on start lead to recorder and recorder control circuit.
XP	SA6 30 SA7 30	Crossed Perforato Leads The transverter, while normal, detected a false battery or ground on one or more of the following perforating and signaling leads from the transverter to the AMA recorder: A'0, A'2, B'0-B'7, C'0-C'7, D'0-D'7, E'0-E'7, F'0-F'7, P, P1, PA, PT, PT1, TCT, DS, and DTN. If the P, P1, DS, DTW, PT, or PT1 indications are perforated on the trouble recorder card, it indicates that these leads are grounded, otherwise they had false battery on them to cause a trouble reaction. (AMA, CAMA)
XP1	SA6 41 SA7 41	Crossed Preference Chain The AMA recorder detected a cross on the contacts of its preference chain relays IP, HP, TP-, and MTP. (AMA, CAMA)
XPG	SA5 00 SA5 24	Cross-Pattern Group Operation of more than one pattern (PA, PB, PC, PNR) relay in the marker.
XPL	SA6 14 SA7 14	Crossed Perforator Leads The master timer, while normal, detected a false battery or ground on the perforator leads toward an AMA recorder or had detected false ground on perforator leads within the master timer. (A false ground on the perforator leads toward an AMA recorder will register A' to F' indications, but a false battery on the perforator leads toward an AMA recorder or a false ground on the perforator within the master timer is not registered on the A' to F' indications.)
XPT	SA5 33 SA6 43	Cross-Incoming Trunk Class Crossed or falsely grounded incoming trunk class and AMA recorder number leads to trunk link frame.
XPTN	SA5 30	Cross-Pattern Relays (Mfr Disc.) Operation of more than one Pattern (P-) relay in the marker.
XRA	SA7 43 SA8 43	Cross-Recorder Start Leads The transverter has detected a falsely grounded recorder start lead or a falsely operates RST- relay. (CAMA)

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
XRB	SA6 31 SA7 31	Crossed Recorder Busy Leads The transverter had detected a falsely grounded Recorder Busy (RB) lead to an AMA recorder. (AMA, CAMA)
XRD	SA6 51 SA7 51	Crossed Recorder or Trunk Control Leads A false ground on the data leads to the recorder or trunk control. (AMA)
XRE	SA7 51 SA8 51	Registration Error An overregistration error was encountered on the registers operated by the sender or translator. (AMA)
XRL	SA6 21 SA5 44	Cross-Release False ground on Release (RL) lead to originating register marker connector.
XRL	SA5 33 SA7 21	Crossed Release Lead A transverter detected: (a) A falsely grounded RL lead. (b) A premature operation of the RL relay. (c) A falsely grounded TR lead. (d) A premature operation of the P5 relay. (e) Contacts crossed on the RTR, TAL, TM3, SDT2, RL, TRBA, TBY, or TEC relays. (AMA, CAMA, ANI)
XRL1	SA7 31 SA8 31	Cross Release Cross recorder and recorder control release lead.
XRN	SA7 50 SA8 50	Trunk Control Number Register Error An overregistration error was encountered on the trunk control number registers operated by the sender. (AMA)
XRS	SA5 34 SA6 44	Cross-Ringing Select Magnet Leads Cross Ringing Selection Magnet (RS-) leads to trunk link frame.
XRS1	SA5 40 SA6 50	Cross-Ringing Select Magnet Selections Both RS0 and RS1 and/or more than one RS2-9 relays in the marker had operated.
XRST	SA6 20 SA7 20	Crossed Recorder Start Lead The transverter detected a falsely grounded AMA recorder start lead. (AMA)
XRTL	SA7 34 SA8 34	Falsely Operated RTL Reservation too late relay.
XS	SA4 B SA5 20	Cross-Sender Connector More than one Sender (S-) relay in an outgoing sender connector operated.
XS	SA7 44 SA8 44	Cross-Sender Connector More than one S- relay in an outgoing sender connector operated. (CAMA)
XS	SA4 B SA5 20	Cross Select More than one S- magnet in the call-waiting link operated.

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
XSA	SA4 00 SA5 21	Cross-Sender Connector Relay (a) More than one AMA relay in an outgoing sender connector operated. (b) More than one Pluse Conversion Control (PC) relay in an outgoing sender connector operated.
XSC	SA4 21 SA4 54	Crossed SC Relay Two Sleeve Connector (SC) relays have been operated in the number group.
XSL	SA5 31 SA6 41	Cross-Sleeve Trunk False ground on AST or BST leads to trunk link frame.
XSS	SA5 54 SA5 14	Cross-Sender Select Magnets Crossed Sender Select Magnet (SS-) leads to sender link via trunk link frame.
XST	SA4 33	Crossed Status Indicates false ground on status connector leads TSG, TS1-5, LSG, or LS1-5.
XST	SA6 14 SA7 14	Crossed Start Lead False battery on the start lead to the recorder. (AMA)
XT	SA4 10 SA5 31	Cross-Translation Control Operation of more than one translation control (THC, PHC, OA, OB X11, 11X, TC5, TC6, TC7) relay in the marker.
XT1	SA6 42 SA7 42	Crossed Tens The AMA recorder detected: (a) Crossed top 1 and 2 contacts of a T- relay in the call identity indexer when that particular T- relay is operated. (b) Open bottom 1 and 2 contacts of AT- relay in the call identity indexer. (AMA, CAMA)
XT5	SA5 11 SA6 12	Cross-Transmission False grounds on unused transmission leads to outgoing sender connector.
XTB	SA6 13	Cross-Trunk Block (Mfr Disc.) More than one Trunk Block (TB-) relay in the marker operated.
XTB1	SA5 12 SA6 20	Cross-Trunk Block Leads Crossed TB- leads to trunk link frame. (Check for false battery.)
XTC	SA6 33 SA7 33	Cross-Traffic Control (Mfr Disc.) False ground on Traffic Control (TC) lead to line link marker connector.
XTC	SA4 02 SA5 34	Crossed Trunk Control The AMA recorder detected: (a) False ground on XTC or XTC1 leads to the call identity indexer. An XTC indication without an XTL shows that two or more TL- relays in the call identity indexer had operated. (b) False ground on XTC or TC1 leads on a transverter type of call. (AMA, CAMA)

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
XTC1	SA4 03 SA5 40	Cross-Traffic Control Auxiliary (Mfr Disc.) False ground on TC1 lead to line link marker connector.
XTG	SA6 14	Cross-Trunk Group (Mfr Disc.) More than one Trunk Group (TG-) relay in the marker operated.
XTG1	SA5 13 SA6 21	Cross-Trunk Group Leads Crossed Trunk Group (TG-) leads to trunk link frame. (Checks for false grounds.)
XTKK	SA6 40 SA7 40	Crossed Trunk Check The transverter detected a false ground on DTK or DTKA leads to the recorder. (AMA, CAMA)
XTL	SA6 32 SA7 32	Crossed Tens Leads The AMA recorder detected a cross between two TC lead contacts on the same TL- relay in the call identity indexer. The XTL is always accompanied by XTC, but an XTC is not always accompanied by the XTL. (AMA, CAMA, ANI)
XTOK	SA7 33 SA8 33	Cross TOK Lead Cross TOK lead to the transverter.
XTP	SA6 41 SA7 41	Cross Preference Cross in the transverter preference chain.
XTRK	SA4 04 SA5 41	Cross First-Trial Check Lead False ground on First-Trial Check (TRK) lead to marker connectors when marker is functioning on a second trial.
XTRL	SA4 10 SA5 42	Cross-Trouble Release False ground on Trouble Release (TRL) lead to marker connectors.
XTS	SA5 22 SA6 31	Cross-Trunk Switch Select Magnets A false cross to battery on ASM, BSM, or TSX (select magnet battery) leads to trunk link frame.
XTS	SA6 22 SA7 22	Crossed Translator Start More than one translator start relay operated.
XTS1	SA5 32 SA6 42	Cross-Trunk Selection False ground on Trunk Select Magnet (TSX-) lead to trunk link frame during trunk selection.
XTV	SA5 10 SA6 11	Cross-Transverter - Service Class Both the Transverter Test (TVA) and Service Class (SCC) relays in the marker operated.
XU	SA6 34 SA7 34	Crossed Units Leads The transverter detected: (a) False battery on XT lead to the AMA recorder. (b) False ground on UK lead to the AMA recorder. (c) More than one units relay in the call identity indexer had operated. (AMA, CAMA)
XUL	SA6 43 SA7 43	Crossed Units The AMA recorder detected an open or a cross at the top 1 and 3 and bottom 2 and 3 contacts of a U-relay in the call identity indexer. (AMA, CAMA)

Punch Designation (Cont)	Card Coordinates	Functional Meaning and Indication
XVF	SA6 52 SA7 52	Crossed Vertical File The transverter detected the operation of more than one VF- relay in the translator. (AMA, ANI)
XVG	SA6 54 SA7 54	Crossed Vertical Group The transverter detected the operation of more than one Group (G-) relay in the translator. (AMA, ANI)
XVGA	SA4 13 SA5 53	Cross-Vertical Group A Crossed VGA- (vertical group relay for originating call) leads to line link marker connector.
XVGB	SA4 14 SA5 54	Cross-Vertical Group B Crossed VGB- (vertical group relay for class of service) leads to line link marker connector.
XWB	SA4 40	Cross in Wideband Link Switch Indicates either crossed select magnets or double connection on sleeve in WB link circuit.
XX	S2 14 S6 54	Cross-Detection Operation of a cross-detecting relay within the pretranslator circuit.

2.06 The following trouble record punch designations do not appear on the trouble record card, however, they are still shown in Schematic Tables 1A, 1B, 1E, and 1F of this SD or Mfr Disc. trouble record punchings.

Punch Designation	Card Coordinates	Functional Meaning and Indication
BE	SA0 02 RA7 22	Bias Error A bias error was detected in a piggyback twistor memory unit of the route translator.
CF0,1,2,4,7	RA7 02-04,10,11 RA8 00-04	Clock Phase Major division of timing control in route translator (CP0-7 is minor division).
CKF	SA0 00 RA7 20	Check Failure A 2-out-of-5 check circuit has indicated a registration failure in the route translator.
CP0-7	SA1 00-04,10-12 SA0 00-04,10-12	Clock Pulse Used in timing control in the route translator. The clock pulse is a subdivision of clock phase (CF0-4).
CST0,1,2,4,7	S4 40-44 S4 40-44	Class-of-Service Tens The tens digit of the class of service of the CCSA customer. Used with route translator.
CSU0,1,2,4,7	S4 50-54 S4 50-54	Class-of-Service Units The units digit of the class of service of the CCSA customer. Used with route translator.
FWR	S8 12 S8 12	Full Word Read A full word is read in memory of the route translator on a test call.
ID0,1,2,4,7	SA1 50-54 RA7 10-14	Index Contents of the Index register in the route translator.

Punch Designation (Cont)	Card Coordinates		Functional Meaning and Indication
N0,1,2,4,7	R6 R6	00-04 00-04	N Digit Same as for A digit.
OA0,1,2,4,7	S5 S5	30-34 30-34	Output A The contents of the piggyback twistor output register A associated with the route translator.
OB0,1,2,4,7	S5 S5	40-44 40-44	Output B The contents of the piggyback twistor output register B associated with the route translator.
OC0,1,2,4,7	S5 S5	50-54 50-54	Output C The contents of the piggyback twistor output register C associated with the route translator.
OT	SA0 RA7	01 21	Overall Timing An overall timing failure has occurred in the route translator.
RT	S8 S8	32 11	Route Translator A route translator engaged the trouble recorder.
S0-4	RA5 RA2	03,04,10-12 20-24	Sector The sector of the output table in the route translator.
TA0,1,2,4,7	SA0 RA6	40-44 00-04	Temporary A Contents of the temporary register A in the route translator.
TB0,1,2,4,7	SA0 RA6	50-54 10-14	Temporary B Same as TA.
TC0,1,2,4,7	SA1 RA7	40-44 00-04	Temporary C Same as TA.
TCA	S2 S5	01 01	Trunk Class A Incoming class mark tens digit 0 registered in completing marker from incoming register. The trunk class of the CCSA customer. Used by the route translator.
TCB	S2 S5	02 02	Trunk Class B Incoming class mark tens digit 1 registered in completing marker from incoming register. The trunk class of the CCSA customer. Used by the route translator.
TSC0,1,2,4,7 TSC0-9	S4 10-12 S4	03,04 00-04,10-14	Trunk Screening Class Used in conjunction with TCA, TCB to identify the trunk class registered in the route translator.
WR	S8 S8	14 14	Write Indicates a test call in which a word is written into the piggyback twistor memory of the route translator.

3. FUNCTIONS

3.01 This circuit is designated to perform the following functions some of which may be omitted if not required.

GENERAL

3.02 To allow only one call to enter the connector at a time, except that an AMA recorder test or special pattern call may proceed concurrently with a trouble record or test call involving a marker, a pretranslator, or the automatic monitor circuit.

3.03 In case of simultaneous calls from two or more circuits, except as in 3.01 above, to prefer one such call in accordance with the positions of the calling circuits in the preference relay chain.

A. Marker Trouble Record

3.04 To recognize a start signal from a marker (battery TRST lead).

3.05 To allow the call to proceed if it obtains preference (ground CI lead to marker).

3.06 To recognize that the marker is calling for a trouble record (ground MKA and MKB leads from marker).

3.07 To signal the trunk link and connector circuit or trunk link connector circuit to close switch and level recording leads (battery TRA lead).

3.08 To prepare for identifying number group and connector circuit, or number group connector circuit, senders, and registers which may be connected to the calling combined or completing marker, and for identifying line link frames which may be connected to the combined, completing, or dial-tone marker (ground on following leads), NG and NG1 to number group and connector circuit or number group connector circuit; FRG, CNG, and SG leads to outgoing sender connector circuit, or outgoing sender connector marker part; FRG, CNG, and RGG leads to originating register marker connector or originating register marker connector marker part of circuit, and incoming register marker connector circuit, and FRG and CNG leads to line link marker connector circuit.

3.09 To convert battery signals received over any of the HN, T, U, JC, EF, and RF and SEF (if provided) leads from the marker into ground signals.

3.10 To convert low-voltage ground signals received over any of the CH leads or the SL lead from the marker into direct ground signals.

3.11 To convert battery signals received over the EXB lead from the marker into direct ground signals, or to use ground signals from the marker passed over the EXG lead and over the EX lead to the trouble recorder for an indication to be used by the maintenance force for trouble shooting purposes.

3.12 To signal the markers to extend their frame delay timing (ground RON leads).

3.13 To prepare for recording operated route transverter relays (ground RTG lead to jack, lamp, and key circuit).

3.14 To provide a busy indication to each marker, pretranslator, route translator, transverter and AMA recorder, to the even and odd parts of the master timing circuit, and the automatic range extension test circuit, except for the circuit involved in the call (ground TRB or TRB1 leads).

3.15 To provide a busy indication to the automatic monitor circuit (ground TRB lead).

3.16 To signal the calling circuit that it has entered the preference chain (ground RCCK lead).

3.17 To start the trouble recorder (ground STR lead to trouble recorder control circuit or to trouble recorder control and test circuit).

3.18 To connect the required recording leads in nine successive steps to leads BW0 to BW119 to the trouble recorder circuit or to the trouble recorder control and test circuit, under control of ground closures on leads S0 to S8.

3.19 When the trouble record is completed (ground TRC lead from trouble recorder circuit or trouble recorder control and test circuit), to open the trouble recorder start lead and to release the calling circuit (ground TRB lead). Ground is connected to the TRC lead to the automatic monitor circuit at this time.

3.20 To prevent restarting the trouble recorder if the calling circuit should fail to release, due to trouble.

3.21 To restore to normal when the connecting circuits release.

3.22 In restoring to normal, to remove ground from the TRC lead to the monitor circuit before removing ground from the TRB lead to that circuit.

3.23 To permit another call to enter the connector when the calling circuit releases, and to delay the start of the trouble record for such a call until the trouble recorder is normal (ground removed from TRC lead).

B. Marker, Originating Register and Sender Test Calls, Intraoffice and Outgoing Trunk Test Calls, and Incoming Trunk Test Calls - Pulsing Class

3.24 To recognize a start signal from the master test control circuit (battery MTP lead).

3.25 To signal the master test control circuit that the call may proceed, if it obtains preference and provided that all MKT relays (Fig. 6) are normal (ground MKS lead).

3.26 To recognize the identity of the marker to be connected (ground from master test control circuit on lead MKT01--11).

3.27 To make the marker busy or to hold it busy if it is engaged (ground MB lead).

3.28 To perform functions 3.12 through 3.15.

3.29 To measure a time interval, and to proceed as in 3.30 or 3.33 as required.

3.30 At the end of the time interval, to delay the test call if the marker is busy on a service call, as indicated by ground on the MIT lead.

3.31 To close the circuit from the TTG lead to the TTM lead, when Fig. 43 is provided. The MTP1 relay will be operated when this figure is provided and these types of tests are being made.

3.32 If the marker to be connected should call for a trouble record under these conditions, to perform functions shown in 3.04, 3.06 through 3.11, and 3.16 through 3.20, and to restore to normal except for the equipment previously operated for the test calls.

3.33 To allow the test call to proceed as follows at the end of the above time interval (see function 3.29) if the marker is not busy on a service call or when it is subsequently released (ground removed from MIT lead).

3.34 To signal the master test control circuit that the call may proceed (ground TS lead).

3.35 To indicate to the marker that the call is a test call (ground MT lead).

3.36 To connect the leads required for the test from the marker to the master test control circuit and from combined or completing markers to the trunk test circuit (controlled by ground on CIB lead from the master test control circuit).

3.37 If a record is not to be taken, to restore to normal when the test is completed.

3.38 If a record is to be taken, to recognize ground on the MKA lead from the marker, and to perform functions 3.07 through 3.11, and 3.16 through 3.21, except that the STRA lead to the trouble recorder control circuit or to the trouble recorder control and test circuit is used instead of the STR lead.

C. Incoming Trunk Test Call - No Pulsing Class

3.39 To recognize a start signal from a marker (battery TRST lead).

3.40 To allow the call to proceed if it obtains preference (ground CI lead to marker).

3.41 To recognize that the marker is calling for a test call (ground MKT lead from marker).

3.42 To hold the marker busy (ground MB lead).

3.43 To perform functions shown in 3.12 through 3.15.

3.44 To permit the call to proceed regardless of the busy condition of the marker (due to ground on SKT lead from the master test control circuit).

3.45 When Fig. 43 is provided this ground is supplied from SKT relay, operated from battery in the master test control circuit.

3.46 To close the circuit from the TTG lead to the TTM lead (when Fig. 43 is provided and relay SKT is operated).

3.47 To perform functions 3.34 through 3.36.

3.48 If a record is not to be taken, to restore to normal when the test is completed.

3.49 If a record is to be taken, to recognize ground on the MKA lead from the marker, and to perform functions 3.07 through 3.11, and 3.16 through 3.21, except that the STRA lead to the trouble recorder control circuit or to the trouble recorder control and test circuit is used instead of the STR lead.

D. Monitor and Test Calls - Automatic Monitor Circuit

3.50 To recognize a start signal from the monitor circuit (battery TRST lead).

3.51 To allow the call to proceed if it obtains preference (ground CI lead to monitor circuit).

3.52 Due to connection of ground to the ON lead from the monitor circuit, to provide a busy indication to each marker, pretranslator, transverter, AMA recorder and to even and odd parts of the master timing circuit (ground TRB leads), and to signal the monitor circuit so that it may make the TRB lead ineffective in the marker to which it is connected (ground MTR1 lead).

3.53 To identify the marker to which the monitor is connected (ground MKB lead from marker).

3.54 To indicate the number of the marker to the monitor circuit (ground DR0, 1--9 lead and DRT0 or DRT1 lead if provided).

3.55 To connect the TRA lead from the monitor circuit to the TRA lead to the trunk link and connector circuit, or trunk link connector circuit.

3.56 To connect the leads required for the call from the marker to the monitor circuit.

3.57 To indicate to the monitor circuit that certain of the above leads have been closed (ground SCT lead).

3.58 To restore to normal when the connecting circuits release.

E. Monitor Trouble Record

3.59 To perform functions shown in 3.50 through 3.52.

3.60 To start the trouble recorder (ground on STR lead from monitor forwarded to STRA lead to trouble recorder control circuit or to trouble recorder control and test circuit).

3.61 To connect the required recording leads in nine successive steps to leads BW0 through BW119 to the trouble recorder circuit or to the trouble recorder control and test circuit under control of ground closures on leads S0 and S8.

3.62 When the trouble record is completed (ground TRC lead from trouble recorder circuit or trouble recorder control and test circuit), to open the trouble recorder start lead and to release the monitor circuit (ground TRC lead).

3.63 To prevent restarting the trouble recorder if the monitor circuit should fail to release due to trouble.

3.64 To restore to normal when the connecting circuits release.

3.65 To permit another call to enter the connector when the monitor circuit releases, and to delay the start of the trouble record for such a call until the trouble recorder is normal (ground removed from TRC lead).

F. Pretranslator Trouble Record

3.66 To recognize a start signal from a pretranslator (battery TRST lead).

3.67 To allow the call to proceed if it obtains preference.

3.68 To prepare for identifying the pretranslator connector, register subgroup, and register involved in the call (ground FRG, CNG, and RGG leads to pretranslator connector circuit).

3.69 To perform functions shown in 3.14 through 3.28.

G. Pretranslator Test Call

3.70 To recognize a start signal from the master test control circuit (battery PTP lead).

3.71 To signal the master test control circuit that the call may proceed if it obtains preference and provided all PTT relays (Fig. 36) are normal (ground PTS lead).

3.72 To recognize the identity of the pretranslator to be connected (ground from master test control circuit on lead PTT0,1,2).

3.73 To make the pretranslator busy, or to hold it busy if it is engaged (ground MB lead).

3.74 To prevent the pretranslator from actuating the trouble recorder request alarm (LK lead to jack, lamp, and key circuit disconnected from LK lamp to pretranslator).

3.75 To provide busy indications as in 3.14 and 3.15.

3.76 To measure a time interval, and to proceed as in 3.77 or 3.79 as required.

3.77 At the end of the time interval, to delay the test call if the pretranslator is busy on a service call, as indicated by ground on the TM lead.

3.78 If the pretranslator to be connected should call for a trouble record under these conditions, to perform functions shown in 3.66, 3168, and 3.15 through 3.20, and to restore to normal except for the equipment previously operated for the test call.

3.79 To allow the test call to proceed as follows at the end of the above time interval (see function 3.76) if the pretranslator is not busy on a service call, or when it is subsequently released (ground removed from TM lead).

3.80 To signal the master test control circuit that the call may proceed (ground TS lead).

3.81 To connect the leads required for the test from the pretranslator to the master test control circuit (controlled by ground on CIB lead from master test control circuit).

3.82 If no trouble is encountered to restore to normal when the test is completed.

3.83 If trouble is encountered to perform functions 3.66, 3.68 and 3.15 through 3.21 except that the STRA lead to the trouble recorder control circuit or to the trouble recorder control and test circuit is used instead of the STR lead.

H. Transverter Trouble Record (Local or CAMA)

3.84 To recognize a start signal from a transverter (battery TRST lead).

3.85 To signal the master timing circuit to remove the standing test from the AMA recorder perforator leads (ground C0 lead) if the call obtains preference.

3.86 To signal the transverter when the standing test has been removed (ground CI lead from master timing circuit forwarded to CI lead to transverter).

3.87 To recognize that the transverter is calling for a trouble record (ground TVA and TVB leads from transverter).

3.88 To prepare for recognizing that an AMA recorder is not attached to the transverter or the identity of a recorder that is so attached (ground RC1 lead to transverter).

3.89 To prepare for identifying a translator, a translator group, and a sender which may be connected to the calling transverter (ground TRG and GG leads to translator circuit and FRG, CNG, and SG leads to transverter connector circuits).

3.90 To convert battery signals received over the EXB lead from the transverter into direct ground signals, or to use ground signals from the transverter passed over the EXG lead, and over the EX lead to the trouble recorder for an indication to be used by the maintenance force for trouble shotting purposes.

3.91 To provide a busy indication to each marker, pretranslator, transverter and AMA recorder, and to the even and odd parts of the master timing circuit, except for the transverter involved in the call and an associated AMA recorder if attached (ground TRB lead).

3.92 To provide a busy indication to the automatic monitor circuit (ground TRB lead).

3.93 To recognize that an AMA recorder is not attached to the transverter (ground RNA lead from transverter) or that a particular AMA recorder is to attached (ground RC lead from AMA recorder and recorder connector circuit).

3.94 If an AMA recorder is attached to the transverter, to operate its recorder multiple connector relays (ground TRCA, TRCB, and TRCC leads).

3.95 To perform functions shown in 3.16 through 3.23.

I. Transverter Test Call (Local or CAMA)

3.96 To recognize a start signal from the master test control circuit (battery TTP lead).

3.97 To signal the master timing circuit to remove the standing test from the AMA recorder perforator leads (ground C0 lead), if the call obtains preference.

3.98 To signal the master test control circuit when the standing test has been removed (ground CI lead form master timing circuit forwarded to TVS lead to master test control circuit), provided that all TVT relays (Fig. 25) are normal.

3.99 To recognize the identity of the transverter to be connected (ground from master test control circuit on one of leads TVT0 through 9).

3.100 To make the transverter busy, or to hold it busy if it is engaged (ground MB lead).

3.101 To provide busy indications as in 3.14 and 3.15.

3.102 To measure a time interval and to proceed as in 3.103 or 3.105 as required.

3.103 At the end of the time interval, to delay the test call if the transverter is busy on a service call, as indicated by ground on the TM lead.

3.104 If the transverter to be connected should call for a trouble record under these conditions, to recognize a start signal (battery TRST lead) to signal the transverter to proceed ground CI lead), to perform functions 3.87 through 3.89, 3.93, 3.94, and 3.16 through 3.20, and to restore to normal except for the equipment previously operated for the last test call.

3.105 To allow the test call to proceed as follows at the end of the above time interval (function 3.102) if the transverter is not busy on a service call, or when it is subsequently released (ground removed from TM lead).

3.106 To signal the master test control circuit that the call may proceed (ground TS lead).

3.107 To indicate to the transverter that the call is a test call ground TVT lead).

3.108 To recognize that an AMA recorder is not to be attached to the transverter if the test call is of this class (ground TVT3 lead from the transverter).

3.109 To connect the leads required for the test from the transverter to the master test control circuit (controlled by ground on CIB lead from master test control circuit).

3.110 If a record is not to be taken, to restore to normal when the test is completed.

3.111 If a record is to be taken, to recognize ground on the TVA lead from the transverter, and to perform functions shown in 3.88, 3.89, 3.93, 3.94, and 3.16 through 3.21, except that the STRA lead to the trouble recorder control circuit or the trouble recorder control and test circuit is used instead of the STR lead.

J. Sender Test Calls and Line Verification - AMA

3.112 To recognize a start signal from a transverter (battery TRST lead).

3.113 To perform functions 3.85 and 3.86.

3.114 To recognize that the transverter is calling for a test call (ground TVTA lead from transverter).

3.115 To hold the transverter busy (ground MB lead).

3.116 To provide busy indications as in 3.14 and 3.15.

3.117 To permit the call to proceed regardless of the busy condition of the transverter (due to ground on SKT lead from master test control circuit). When Fig. 43 is provided this ground is supplied from SKT relay operated. The SKT relay being operated from battery in master test control circuit.

3.118 To recognize that an AMA recorder is not to be attached to the transverter (ground TVT3 lead from transverter).

3.119 To perform functions shown in 3.106, 3.107, and 3.190.

3.120 If a record is not to be taken, to restore to normal when the test is completed.

3.121 If a record is to be taken, to recognize ground on the TVA lead from the transverter, to perform functions 3.88 and 3.89, to recognize that an AMA recorder is not attached to the transverter (ground RNA lead), and to perform functions 3.16 through 3.21, except that the STRA lead to the trouble recorder control circuit or to the trouble control and test circuit is used instead of the STR lead.

K. Transverter Trouble Record (ANI)

3.122 To recognize a start signal from a transverter (battery TRST lead).

3.123 To allow the call to proceed if it obtains preference (ground CI lead to transverter).

3.124 To recognize that the transverter is calling for a trouble record (ground TVA and TVB leads from transverter).

3.125 To prepare for identifying a translator, a translator group and a sender which may be connected to the calling transverter (ground TRG and GG leads to translator circuit and FRG, CNG, and SG leads to transverter connector circuits).

3.126 To provide a busy indication to each marker and transverter except for the transverter involved in the call.

3.127 To perform functions 2.16 through 2.21 and 2.23.

L. Transverter Test Call (ANI)

3.128 To recognize a start signal from the master test control circuit (battery TTP lead).

3.129 To allow the call to proceed if it obtains preference (ground CI lead to transverter).

3.130 To recognize the identity of the transverter to be connected (ground from master test control circuit on one of leads TVT0 or TVT1).

3.131 To make the transverter busy, or to hold it busy if it is engaged (ground MB and MB1 leads).

3.132 To provide busy indications as in 3.14.

3.133 To measure a time interval and to proceed as in 3.134 or 3.135 as required.

3.134 At the end of the time interval, to delay the test call if the transverter is busy on a service call, an indicated by ground on the TM lead.

3.135 If the transverter to be connected should call for a trouble record under these conditions, to recognize a start signal (battery TRST lead) to signal the transverter to proceed (ground CI lead), to perform functions 3.124, 3.125, and 3.16 through 3.20, and to restore to normal except for the equipment previously operated for the test call.

3.136 To allow the test call to proceed as follows at the end of the above time interval (function 3.133) if the transverter is not busy on a service call, or when it is subsequently released (ground removed from TM lead).

3.137 To signal the master test control circuit that the call may proceed (ground TS lead).

3.138 To indicate to the transverter that the call is a test call (ground TVT lead).

3.139 To connect the leads required for the test from the transverter to the master test control circuit (controlled by ground on CIB lead from master test control circuit).

3.140 If a record is not to be taken, to restore to normal when the test is completed.

3.141 If a record is to be taken, to recognize ground on the TVA lead from the transverter, and to perform functions 3.125 and 3.16 through 3.21, except that the STRA lead to the trouble recorder control circuit or the trouble recorder control and test circuit is used instead of the STR lead.

M. AMA Recorder Trouble Record

3.142 To recognize a start signal from an AMA recorder and recorder connector circuit (battery TRST lead).

3.143 To signal the master timing circuit to remove the standing test from the AMA recorder perforator leads (ground C0 lead), if the call obtains preference.

3.144 To recognize that the standing test has been removed (ground CI lead from master timing circuit).

3.145 To operate the recorder multiple connector relays for the recorder (ground TRCA, TRCB, and TRCC leads).

3.146 To perform functions 3.14 through 3.23.

N. Master Timing Circuit Trouble Record

3.147 To recognize a start signal from the even or odd part of the master timing circuit (battery TRST lead).

3.148 To perform functions 3.143 and 3.144.

3.149 To prepare for scanning the even or odd AMA recorder multiple, if required, as indicated by the master timing circuit (ground RT1E or RT10 lead to master timing circuit returned on RT3E lead from even part of master timing circuit or on RT30 lead from odd part).

3.150 To perform functions 3.14 through 3.21.

O. AMA Recorder Test and Special Pattern Calls

3.151 To recognize a start signal from the master timing circuit (battery PCN lead).

3.152 To signal the master timing circuit to remove the standing test from the AMA recorder perforator leads (ground C0 lead), if the call obtains preference.

3.153 To signal the master timing circuit when the standing test has been removed (ground CI lead from master timing circuit returned on TPR lead).

3.154 To provide a busy indication to each transverter and AMA recorder (ground TRB leads).

3.155 To restore to normal when the connecting circuits release.

P. Miscellaneous

3.156 To recognize start signals from the special markers and from the master test control circuit (battery SP lead), for connection to the no-test connector circuit.

3.157 To permit only one such connection to be made at a time (ground SPC lead).

3.158 To allow the special markers access to the no-test connector after the line insulation test circuit has released the no-test select magnets, but to lock out the master test frame connector.

3.159 If an excessive number of trouble records is made within a certain time interval (ground RTOS lead from trouble recorder control and test circuit), to provide a busy indication to each marker, pretranslator, transverter, and AMA recorder and to the even and odd parts of the master timing circuit (ground TRB leads), to cause a minor trouble recorder request alarm to actuate the major alarm (MN and MJ leads to jack, lamp, and key circuit bridged) and to prevent the connection of ground to the MTR1 lead to the monitor circuit.

3.160 If the trouble recorder is made busy or if it times out due to trouble (ground ROS lead from trouble recorder circuit to trouble recorder control and test circuit), to provide a busy indication to each marker, pretranslator, transverter, and AMA recorder and to the even and odd parts of the master timing circuit (ground TRB leads), to provide a busy indication to the monitor circuit (ground TRB1 lead, to cause a minor trouble recorder request alarm to actuate the major alarm (MN and MJ leads to jack, lamp, and key circuit bridged), and to indicate to the trouble recorder control and test circuit that the out-service condition has been recognized (ground MB lead).

3.161 If this circuit is made busy indivdually to a marker, pretranslator, transverter, AMA recorder, or to the even or odd part of the master timing circuit to forward the make-busy indication, except that this signal is delayed until a trouble record for the circuit involved is completed if one is in progress (ground on individual TRB1 lead from jack, lamp, and key circuit forwarded to TRB lead to marker, pretranslator, or etc).

3.162 If this circuit is made busy individually to the monitor circuit, to forward the make-busy indication whether or not a trouble record for the monitor circuit is in progress (ground TRB1 lead from jack, lamp, and key circuit, Fig. 1, forwarded to TRB1 lead to monitor circuit).

3.163 If the trouble recorder should be moved off-normal with this circuit normal (ground ON lead from trouble recorder circuit or trouble recorder control and test circuit), to provide a busy indication to each marker, pretranslator, transverter, and AMA recorder, to the even and odd parts of the master timing circuit and to the automatic monitor circuit (ground TRB leads).

3.164 To recognize a signal from the line insulation test control circuit to extend the marker frame delay timing (ground on RON lead from line insulation test control circuit).

Q. Line Insulation Test Frame Trouble Records

3.165 To recognize a start signal from the line insulation test control circuit (battery TRST lead).

3.166 To allow the call to proceed if it obtains preference (ground LA lead to line insulation test control circuit).

3.167 Due to connection of ground to the ON lead, from the line insulation test control circuit, to provide a busy indication to each marker, pretranslator, transverter and AMA recorder, and to the even and odd parts of the master timing circuit (ground TRB leads).

3.168 To start the trouble recorder (ground on STR lead from the line insulation test control circuit forwarded to the STRA lead to the trouble recorder control circuit, or to trouble recorder control and test circuit).

3.169 To connect the required recording leads in nine successive steps to leads BW0 through BW119 to the trouble recorder control and test circuit, under control of ground closures on leads S0 through S8.

3.170 When the trouble record is completed (ground TRC lead from the trouble recorder circuit or trouble recorder control and test circuit) to open the trouble recorder start lead and to release the line insulation test control circuit (ground TRC lead).

3.171 To prevent restarting the trouble recorder if the line insulation test control circuit should fail to release due to trouble.

3.172 To restore to normal when the connecting circuits release.

3.173 To permit another call to enter the connector when the line insulation test control circuit disconnects from this circuit, and to delay the start of the trouble recorder for such a call until the trouble recorder is normal (ground removed from TRC lead).

R. Automatic Progression Trunk Test

3.174 To recognize a start signal from the automatic progression trunk test (battery ATP lead).

3.175 To close the circuit for the TTG lead to the TTA lead (ATP1 relay operated).

3.176 After the automatic progression trunk test has gained preference to recognize ground on the RTST lead from any marker as a signal that some marker has been seized by a register being tested by the monitor.

3.177 Upon recognizing an RTST signal, to release the automatic progression trunk test relays, to permit the register test call to be handled.

3.178 When the register test has been completed the automatic progression trunk test may again bid for preference.

3.179 If preference is gained by the automatic progression trunk test without interference, to signal the automatic progression trunk test circuit, that the call may proceed, provided that all MKT relays (Fig. 6) are normal (ground AMKS lead to automatic progression trunk test.

3.180 To recognize the identity of the marker to be connected (ground from the automatic progression trunk test on lead MKT0-11).

3.181 To make the marker busy or to hold it busy if it is engaged (ground MB lead).

3.182 To perform functions 3.12 through 3.15.

3.183 To measure a time interval and to proceed as in 3.184 or 3.187 as required.

3.184 At the end of the time interval to delay the test call if the marker is busy on a service call, as indicated by ground on the MIT lead.

3.185 If the marker to be connected should call for a trouble record under these conditions, to perform functions 3.04, 3.06 through 3.11, and 3.16 through 3.20 and to restore to normal except for the equipment previously operated for the test call.

3.186 To prepare the TS lead for later connection to the automatic progression trunk test (ATP1 operated).

3.187 To allow the test call to proceed as follows at the end of the above time interval (function 3.183) if the marker is not busy on a service call, or when it is subsequently released (ground removed from MIT lead).

3.188 To signal the automatic progression trunk test that the call may proceed (ground TS lead).

3.189 To indicate to the marker that the call is a test call (ground MT lead).

3.190 To connect the leads required for the test from the marker to the automatic progression trunk test. (Controlled by ground on the CIB lead from the automatic progression trunk test.)

3.191 If a record is not to be taken to restore to normal when test is completed.

3.192 If a record is to be taken to recognize ground on the MKA lead from the marker, and to perform functions 3.07 through 3.11 and 3.16 through 3.21 except that the STRA lead to the trouble recorder control circuit or to the trouble recorder control and test circuit is used instead of the STR lead.

S. Line Verification Test - Marker (Using Line Verification Test Circuit)

3.193 To recognize a start signal from the line verification circuit (battery LVP lead).

3.194 After the line verification circuit has gained preference, but before any further connector action, to recognize ground on the RTST lead from any marker as a signal that some marker has just been seized by a register being tested by the monitor.

3.195 Upon recognizing an RTST signal, to release the line verification preference relays and permit the register test call to be handled. When the register test has been completed, the line verification circuit may again bid for preference.

3.196 If preference is gained by the line verification circuit (3.194), and provided that all MKT relays (Fig. 6) are normal (ground MKS lead to line verification circuit), to recognize the identity of the marker to be connected (ground from the line verification circuit on lead MKT0 or 1).

3.197 To make the marker busy or to hold it busy if it is engaged (ground MB lead).

3.198 To perform functions shown in 3.12 through 3.15.

3.199 To measure a time interval and to proceed as in 3.200 or 3.203 as required.

3.200 At the end of the time interval to delay the test call if the marker is busy on a service call, as indicated by ground on the MIT lead.

3.201 If the marker to be connected should call for a trouble record, to perform functions 3.04, 3.06 through 3.11 and 3.16 through 3.20 and to restore to normal except for the equipment previously operated for the test call.

3.202 To prepare the TS lead for later closure to the line verification circuit (LVP1 operated).

3.203 To allow the test call to proceed as follows at the end of the above time interval (function 3.199) if the marker is not busy on a service call, or when it is subsequently released (ground removed from MIT lead).

3.204 To signal the line verification circuit that the call may proceed (ground TS lead).

3.205 To indicate to the marker that the call is a test call (ground MT lead).

3.206 To connect the leads required for the test from the marker to the line verification circuit. (Controlled by ground on the CIB lead from the line verification circuit.)

3.207 If a record is not to be taken to restore to normal when the test is completed.

3.208 If a record is to be taken to recognize ground on the MKA lead from the marker, and to perform functions 3.07 through 3.11 and 3.16 through 3.21 except that the STRA lead to the trouble recorder control circuit or to the trouble recorder control and test circuit is used instead of the STR lead.

T. Line Verification Test - Transverter (Using Line Verification Test Circuit)

3.209 To recognize a start signal from the line verification circuit (battery LTP lead).

3.210 To signal the master timing circuit to remove the standing test from the AMA recorder perforator leads (ground C0 lead), if the call obtains preference.

3.211 To signal the line verification circuit when the standing test has been removed (ground CI lead from master timing circuit for operation of LTP1). The LTP1 closes TVS lead over which ground is forwarded to the line verification circuit provided that all TVT relays (Fig. 25) are normal.

3.212 To recognize the identity of the transverter to be connected (ground from line verification circuit on one of leads TVT0 or 1).

3.213 To make the transverter busy, or to hold it busy if it is engaged (ground MB lead).

3.214 To provde busy indications as in 3.14 and 3.15.

3.215 To measure a time intervaland to proceed as in 3.216 or 3.217 as required.

3.216 At the end of the time interval, to delay the test call if the transverter is busy on a service call, as indicated by ground on a service call, as indicated by ground on the TM lead.

3.217 If the transverter to be connected should call for a trouble record under the conditions in 3.215, to recognize a start signal (battery TRST lead) to signal the transverter to proceed (ground CI lead to transverter) to perform functions shown in 3.87 through 3.89, 3.93, 3.94, and 3.16 through 3.20, and to restore to normal except for the equipment previously operated for the test call.

3.218 To allow the test call to proceed as follows at the end of the above time interval (function 3.215) if the transverter is not busy on a service call, or when it is subsequently released (ground removed from TM lead).

3.219 To signal the line verification circuit that the call may proceed (ground TS lead).

3.220 To indicate to the transverter that the call is a test call (ground TVT lead).

3.221 To recognize that an AMA recorder is not to be attached to the transverter (ground TVT3 lead from transverter).

3.222 To connect the leads required for the test from the transverter to the line verification circuit (controlled by ground on CIB lead from line verification circuit).

3.223 If a record is not to be taken, to restore to normal when the test is completed.

3.224 If a record is to be taken, to recognize ground on the TVA lead from the transverter, and to perform functions 3.88, 3.89, 3.93, 3.94, and 3.16 through 3.21, except that the STRA lead to the trouble recorder control circuit or the trouble recorder control and test cicuit is used instead of the STR lead.

U. Route Translator Trouble Record

3.225 To recognize a start signal from a route translator (battery TRST lead).

3.226 To allow the call to proceed if it obtains preference (ground CI lead to route translator).

3.227 To perform functions 3.14, 3.15, and 3.17 through 3.23.

V. Automatic Range Extension Test Circuit Trouble Record

3.228 To recognize a start signal from the automatic range extension test circuit (battery TRST lead).

3.229 To allow the call to proceed if it obtains preference (ground CI lead to automatic range extension test circuit).

3.230 To perform functions 3.14, 3.15, and 3.17 through 3.23.

W. Automatic Range Extension Test

3.231 To recognize a start signal from the automatic range extension test circuit (battery REP lead).

3.232 After the automatic range extension test circuit has gained preference to recognize ground on the RTST lead from any marker as a signal that some marker has been seized by a register being tested by the monitor.

3.233 Upon recognizing an RTST signal, to release the automatic range extension test circuit preference relays, to permit the register test call to be handled.

3.234 When the register test has been completed the automatic range extension test circuit may again bid for preference.

3.235 When preference is gained by the automatic range extension test circuit, to signal the automatic range extension test circuit that the call may proceed, provided that all MKT relays (Fig. 6) are normal (ground MKS lead to the automatic range extension test circuit).

3.236 To recognize the identity of the marker to be connected (ground from the automatic range extension test circuit on lead MKT0-11).

3.237 To perform functions 3.12 through 3.15 and 3.181 through 3.185.

3.238 To prepare the TS lead for later connection to the automatic range extension test circuit (REP1 operated).

3.239 To perform function 3.187.

3.240 To signal the automatic range extension test circuit that the call may proceed (ground TS lead).

3.241 To indicate to the marker that the call is a test call (ground MT lead).

3.242 To connect the leads required for the test from the marker to the automatic range extension test circuit (controlled by ground on the CIB lead from the automatic range extension test circuit).

3.243 To perform Functions 3.191 and 3.192.

X. Remote Office Test Line or Remote Office Test Line Register Tests

3.244 To recognize a start signal from the remote office test line circuit or remote office test line register circuit (battery RTP lead).

3.245 To close the circuit for the TTG lead to the TTA lead (RTP2 relay operated).

3.246 After the remote office test line circuit or remote office test line register circuit has gained preference to recognize ground on the RTST lead from any

marker as a signal that some marker has been seized by a register being tested by the monitor.

3.247 Upon recognizing an RTST signal, to release the remote office test line circuit or remote office test line register circuit preference relays, to permit the register test call to be handled.

3.248 When the register test has been completed the remote office test line circuit or remote office test line register circuit may again bid for preference.

3.249 If preference is gained by the remote office test line circuit or remote office test line register circuit without interference, to signal the remote office test line circuit or remote office test line register circuit, that the call may proceed provided that all MKT relays (Fig. 6) are normal (ground AMKS lead to the remote office test line circuit or remote office test line register circuit).

3.250 To recognize the identity of the marker to be connected (ground from the remote office test line circuit or remote office test line register circuit on lead MKT0,1).

3.251 To make the marker busy or to hold it busy if it is engaged (ground MB lead).

3.252 To perform functions 3.12 through 3.15.

3.253 To measure a time interval and to proceed as in 3.184 or 3.187 as required.

3.254 At the end of the time interval to delay the test call if the marker is busy on a service call, as indicated by ground on the MIT lead.

3.255 If the marker to be connected should call for a trouble record under these conditions, to perform functions 3.04, 3.06 through 3.11, and 3.16 through 3.20 and to restore to normal except for the equipment previously operated for the test call.

3.256 To prepare the TS lead for later connection to the remote office test line circuit or remote office test line register circuit (RTP2 operated).

3.257 To allow the test call to proceed as follows at the end of the above time interval (function 3.183) if the marker is not busy on a service call, or when it is subsequently released (ground removed from MIT lead).

3.258 To signal the remote office test line circuit or remote office test line register circuit that the call may proceed (ground TS lead).

3.259 To indicate to the marker that the call is a test call (ground MT lead).

3.260 To connect the leads required for the test from the marker to the remote office test line circuit or remote office test line register circuit. (Controlled by ground on the CIB lead from the remote office test line circuit or remote office test line register circuit).

3.261 If a record is not to be taken to restore to normal when test is completed.

3.262 If a record is to be taken to recognize ground on the MKA lead from the marker, and to perform functions 3.07 through 3.11 and 3.16 through 3.21 except that the STRA lead to the trouble recorder control circuit or to the trouble recorder control and test circuit is used instead of the STR lead.

Y. Transverter Trouble Record (Local) - MAG AMA

3.263 To recognize a start signal from a transverter (battery TRST lead).

3.264 To signal the transverter that it has obtained preference (ground CI lead to the transverter).

3.265 To recognize that the transverter is calling for a trouble record (ground TVA and TVB leads from transverter).

3.266 To prepare for recognizing that a trunk control is not attached to the transverter or the identity of a trunk control that is so attached (ground RCI lead to transverter).

3.267 To prepare for identifying a translator, a translator group and a sender which may be connected to the calling transverter (ground TRG and GG leads to translator circuit and FRG, CNG, and SG leads to transverter connector circuits).

3.268 To convert battery signals received over the EXB lead from the transverter into direct ground signals, or to use ground signals from the transverter passed over the EXG lead, and over the EX lead to the trouble recorder for an indication to be used by the maintenance force for trouble shooting purposes.

3.269 To provide a busy indication to each marker, pretranslator, transverter, trunk control, and the recorder and recorder control circuit, except for the transverter involved in the call and an associated trunk control if attached (ground TRB and TRB1 leads).

3.270 To provide a busy indication to the automatic monitor circuit (ground TRB lead).

3.271 To recognize that a trunk control is not attached to the transverter (ground RNA lead from the transverter) or that a particular trunk control is so attached (ground RC lead from the trunk control circuit).

3.272 If a trunk control is attached to the transverter, to operate its trunk control multiple connector relays (ground TRCA lead).

3.273 To perform functions 3.16 through 3.23.

Z. Transverter Test Call (Local) - MAG AMA

3.274 To recognize a start signal from the master test control circuit (battery TTP lead).

3.275 To signal the master test control circuit when the call obtains preference (ground to the TVS lead to the master test control circuit), provided that all TVT relays are normal.

3.276 To recongize the identity of the transverter to be connected (ground from master test control circuit on one of leads TVT0 through 9).

3.277 To make the transverter busy, or to hold it busy if it is engaged (ground MB lead).

3.278 To provide busy indications as in 3.14 and 3.15.

3.279 To measure a time interval and to proceed as in 3.280 or 3.282 as required.

3.280 At the end of the time interval, to delay the test call if the transverter is busy on a service call, as indicated by a ground on the TM lead.

3.281 If the transverter to be connected should call for a trouble record under these conditions, to recognize a start signal (battery TRST lead) to signal the transverter to proceed (ground CI lead), to perform functions 3.265 to 3.267, 3.271, 3.272, and 3.16 through 3.20, and to restore to normal except for equipment previously operated for the test call.

3.282 To allow the test call to proceed as follows at the end of the above time interval (3.279) if the transverter is not busy on a service call, or when it is subsequently released (ground removed from TM lead).

3.283 To signal the master test control circuit that the call may proceed (ground TS lead).

3.284 To indicate to the transverter that the call is a test call (ground TVT lead).

3.285 To recognize that a trunk control is not to be attached to the transverter, if the test call is of this class (ground RNA lead from transverter).

3.286 To connect the leads required for the test from the transverter to the master test control circuit (controlled by ground on CIB lead from the master test control circuit).

3.287 If a record is not taken, to restore to normal when the test is completed.

3.288 If a record is to be taken, to recognize ground on the TVA lead from the transverter, and to perform functions 3.266, 3.267, 3.271, 3.272, and 3.16 through 3.21, except that the STRA lead to the trouble recorder control and test circuit is used instead of the STR lead.

AA. Trunk Control Trouble Record

3.289 To recognize a start signal from a trunk control circuit (battery TRST lead).

3.290 To operate the trunk control multiple connector relays for the trunk control circuit (ground TRCA lead).

3.291 To perform functions 3.14 through 3.23.

AB. Trunk Control Test Call

3.292 To perform functions 3.289 and 3.290.

3.293 To recognize that the call is a test call (ground TS0 lead from master test control circuit).

3.294 To perform functions 3.14 through 3.23, except that the STRA lead to the trouble recorder control and test circuit is used instead of the STR lead.

AC. Trouble Buffer Trouble Record

3.295 To recognize a start signal from the recorder and recorder control circuit (battery TRST1 lead).

3.296 To prepare for recognizing that a trunk control is attached to the trouble buffer (ground TC1 lead to the trunk control).

3.297 To prepare for recognizing that a transverter is attached to the trouble buffer (ground TC1 lead to the transverter).

3.298 To prepare for recognizing that the system control is attached to the trouble buffer (ground CISC lead).

3.299 To operate the trouble buffer connector relay (ground CIS lead).

3.300 To provide a busy indication to each marker, pretranslator, transverter, trunk control, and the system control portion of the recorder and recorder control circuit, except for the trunk control, transverter, and the system control if attached (ground TRB leads).

3.301 To provide a busy indication to the automatic monitor circuit (ground TRB lead).

3.302 To recognize that a trunk control is attached to the trouble buffer (ground RC lead from the trunk control).

3.303 If a trunk control is attached to operate its multiple connector relays (ground TRCA lead).

3.304 To recognize that a transverter is attached to the trouble buffer (ground TVA and TVB leads).

3.305 If the system control is attached to the trouble buffer to operate the system control connector relays.

3.306 To perform functions 3.17 through 3.23.

AD. System Control Trouble Record

3.307 To recognize a start signal from the recorder and recorder control circuit, (battery TRST lead).

3.308 To operate the system control connector relays (ground CISC lead).

3.309 To perform functions 3.14, 3.15, and 3.17 through 3.23.

AE. Master Timing Circuit Trouble Record - MAG AMA

3.310 To recognize a start signal from the master timing circuit (battery TRST lead).

3.311 To signal the master timing circuit to operate the cut in relays, TRCI (ground on CI lead).

3.312 To perform functions 3.14 through 3.23.

4. CONNECTING CIRCUITS

4.01 When this circuit is listed on a keysheet the connector information thereon is to be followed.

(a) Marker Circuit - SD-25550-01.

(b) Transverter Circuit - SD-25591-01.

(c) AMA Recorder and Recorder Connector Circuit - SD-25872-01.

(d) Trouble Recorder Circuit - SD-25735-01.

(e) Trouble Recorder Control Circuit - SD-25679-01.

(f) Translator Circuit - SD-25754-01.

(g) AMA Master Timing Circuit - SD-25633-01.

(h) Incoming Register Marker Connector Circuit or SD-26026-01 - (Reg. Part), SD-26025-01 (Mkr. Part) - SD-25586-01.

(i) Incoming Register Circuit Dial Pulsing - SD-25729-01.

(j) Incoming Register Circuit, Multifrequency Pulsing - SD-25730-01.

(k) Incoming Register Circuit, Revertive Pulsing - SD-25731-01.

(ℓ) "B" Switchboard Revertive Pulse Register Circuit - SD-25794-01.

(m) Jack, Lamp, and Key Circuit - SD-25762-01.

(n) Trunk Circuit - SD-25918-01.

(o) Trunk Link and Connector Circuit or SD-26033-01 Trunk Link Connector Circuit - SD-25549-01.

(p) Line Link Marker Connector Circuit - SD-25586-01 or SD-26022-01.

(q) Automatic Monitor Circuit - SD-25680-01.

(r) Number Group and Connector Circuit - SD-25556-01 or Number Group Connector Circuit - SD-26035-01.

(s) Originating Register Marker Connector Circuit - SD-25586-01 or SD-26023-01.

(t) Originating Register Circuit, Dial Pulsing - SD-25551-01.

(u) Originating Register Circuit, Multifrequency - SD-25811-01.

(v) Outgoing Sender Circuit, Dial Pulsing - SD-25579-01.

(w) Outgoing Sender Circuit, Multifrequency - SD-25580-01.

(x) Outgoing Sender Circuit, Revertive Pulsing - SD-25732-01.

(y) Outgoing Sender Circuit, PCI Pulsing - SD-25733-01.

(z) Outgoing Sender Connecting Circuit - SD-25587-01 or Outgoing Sender Connector Circuit (Sender Part) - SD-26057-01 or Outgoing Sender Connector Circuit (Marker Part) - SD-26059-01.

(aa) Master Test Control Circuit - SD-25800-01.

(ab) Transverter Connector Circuit - SD-25592-01.

(ac) Pretranslator Circuit - SD-25568-01.

(ad) Pretranslator Connector Circuit - SD-25569-01 or Pretranslator Connector (Org-Reg Part) SD-26038-01.

(ae) Trouble Recorder Control and Test Circuit - SD-25572-01.

(af) Intermarker Group Sender Marker Connector Circuit - SD-25586-01.

(ag) Line Insulation Test Control Circuit - SD-25796-01.

(ah) Atuomatic Progression Trunk Test Circuit - SD-25938-01.

(ai) Foreign Area Translator Connector Circuit - SD-25864-01.

(aj) Marker PBX Allotter Circuit - SD-25714-01.

(ak) Incoming Register Test Circuit - SD-25988-01.

(aℓ) CAMA Transverter Circuit - SD-26010-01.

(am) CAMA Transverter Connector Circuit - SD-26011-01.

(an) Billing Indexer - SD-26012-01.

(ao) Line Verification Circuit - SD-26181-01.

(ap) Register Priority Link Circuit - SD-25731-01.

(aq) Trunk Link Circuit for Use with 4-Wire Trunks - SD-26037-01.

(ar) ANI Transverter Circuit - SD-26161-01.

(as) Sender Test Circuit - SD-25675-01.

(at) Dial Tone Marker Circuit - SD-26001-01.

(au) Completing Marker Circuit - SD-26002-01.

(av) Line Link Connector Circuit - SD-26031-01.

(aw) Remote Switch Signal Control Circuit - SD-27902-01.

(ax) Wideband Line Link Connector Circuit - SD-27905-01.

(ay) Wideband Trunk Link Connector Circuit - SD-27906-01.

(az) Trunk Test Register Circuit (For Wideband Switching) - SD-27881-01.

(ba) Transverter Circuit (MAC) - SD-27809-01.

(bb) Recorder and Recorder Control Circuit - SD-94805-01.

(bc) Trunk Control Circuit - SD-94810-01.

(bd) Master Timing Circuit (MAG) - SD-94811-01.

(be) Program Controlled Transverter Circuit - SD-28085-01.

(bf) Billing Data Transmitter Circuit - SD-94850-01.

(bg) Office Test Frame Trouble Indicator and Connector Circuit - SD-27634-01.

(bh) Trunk Test Register Circuit - SD-27643-01.

(bi) Line Concentrator 2A Control Circuit - SD-94815-01.

(bj) Translator Circuit for Automatic Identified Outward Dialing - SD-99319-01.

(bk) Translator Connector Circuit for Automatic Identified Outward Dialing - SD-99320-01.

(bℓ) Direct Access Pretranslator Connector Circuit - SD-27801-01.

(bm) Route Translator Circuit - SD-27781-01.

(bn) Translator Administration and Test Circuit - SD-27782-01.

(bo) Route Distributor Circuit - SD-27783-01.

(bp) Route Translator Connector Circuit - SD-27784-01.

(bq) Automatic Rnage Extension Test Circuit - SD-27831-01.

(br) Remote Office Test Line Circuit - SD-27698-01.

(bs) Remote Office Test Control Circuit - SD-27727-01.

(bt) Incoming Register Pretranslator - SD-27969-01.

(bu) Calendar and Clock Circuit - SD-68591-01.

(bv) Jack, Lamp, and Key Circuit for ACD (Automatic Call Distribution) - SD-27999-01.

(bw) Remote Office Test Line Trunk Make-Busy Circuit - SD-28037-01.

(bx) Remote Office Test Line Register Circuit - SD-28036-01.

(by) Test Connector Circuit for ACD (Automatic Call Distribution) - SD-28033-01.

(bz) Distributor and Scanner Circuit - SD-28083-01.

5. MANUFACTURING TESTING REQUIREMENTS

5.01 None.

6. ALARM INFORMATION

6.01 The only alarm directly associated with the master test frame connector is the 48-volt fuse alarm which, if activated, results in a major alarm and a lighted fuse alarm lamp at the frame.

6.02 Under normal operation, circuits having access to the trouble recorder encounter one of two conditions as follows:

(a) Where access to the trouble recorder is gained, a trouble card is punched, a major or minor alarm is sounded, and the trouble recorder request lamp (TRR) at the master test frame is lighted.

(b) In the case where the trouble recorder is either busy because it is engaged on another trouble record, is out of service for any reason, or is unavailable because the master test frame connector has been taken out of service, the requesting circuit brings in a major or minor alarm, lights the trouble recorder request lamp (TRR), and also lights an identifying display lost lamp (DL-) at the master test frame.

6.03 In the event that a trouble develops in the master test frame connector which results in a requesting circuit being unable to successfully establish a connection to the trouble recorder, or should the trouble recorder be busy for any reason and the requesting circuit is unable to recognize this condition due to the trouble in the master test frame connector, the following action takes place and alarm indications are given by the types of requesting circuits.

MARKERS, TRANSVERTERS, AND PRETRANSLATORS

6.04 Any of these circuits will time out and, thereupon, release bringing in their own major alarm and lighting the trouble recorder timing lamp (TRT) at their respective frame.

MASTER TIMING CIRCUIT

6.05 This circuit will time out and bring in a major alarm and light a time alarm lamp (TAO or TAE) at the master timing frame.

AUTOMATIC MONITOR, REGISTER, AND SENDER TEST CIRCUIT

6.06 This circuit will bring in a minor alarm and light the trouble recorder request lamp (TRR) and its display lost lamp (DL) at the master test frame. The monitor will release unless its hold key (HLD) was operated, in which case, both the monitor and register are held.

AMA RECORDER AND RECORDER CONNECTOR

6.07 This circuit will bring in a minor or major alarm and light the trouble recorder request lamp (TRR) at the master test frame. Should the recorder fail to release it may be identified at the master test frame by its lighted "in use" lamp (R-).

ACD TEST CONNECTOR CIRCUIT

6.08 This circuit will time out and, thereupon, release and light the colocated trouble lamp TRB at the ACD jack, lamp, and key circuit.

6.09 If one of the conditions described in 6.02 (b) is encountered, the ROS lamp will be lighted in the ACD jack, lamp, and key circuit in addition to TRR and DL- lamps at the master test frame.

TRUNK CONTROL CIRCUIT

6.10 This circuit will bring in a minor or major alarm and light the trouble recorder request lamp TRR at the master test frame.

7. TAKING EQUIPMENT OUT OF SERVICE

7.01 To take the master test frame connector out of service, insert 322A plugs into the TRMB- jacks at the master test frame, there being one such jack for each marker, transverter, pretranslator, AMA recorder, route translator, and for the master timing circuit and the automatic monitor. This makes the trouble recorder appear busy at all circuits having access to it. The master test frame connector therefore cannot be seized as the TRST lead in each of these circuits will be opened during any bid for the trouble recorder.

7.02 Tests should not be initiated by the master test control circuit, by the automatic progression trunk test or remote office test line circuit, the automatic range extension test circuit or the line verification circuit while work is being done on the master test frame connector.

7.03 Line insulation testing cannot proceed while the master test frame connector is out of service.

7.04 With the trouble recorder made busy as stated in SECTION II, 21.01, a request for the trouble recorder by a marker, transverter, route translator, or a pretranslator results in an alarm (minor for a first-trial trouble bid and major for a second-trial trouble bid), and in the lighting of the trouble recorder request lamp (TTR) and a circuit identifying display lost lamp (DL-) at the master test frame.

7.05 Any request for the trouble recorder by the automatic monitor results in a minor alarm and lighted TRR and DL- lamps. Any request by the master timing circuit results in a major alarm and lighted TRR and DL- lamps.

7.06 A request by an AMA recorder results in a minor alarm and lighted TRR and DL- lamps, except in the event that the same recorder again requests the trouble recorder before the minor alarm, produced as a result of its first request, has been retired, in which case, the alarm is changed from a minor to a major.

7.07 In all cases, the minor or major alarm can be retired and the lighted TRR and DL- lamps can be extinguished by the operation of the TRR-AR key at the master test frame.

SECTION IV - REASONS FOR REISSUE

D. Description of Changes

D.01 Adds DCT1 lead (option JZ) when testing of the 600 milliseconds open feature of the permanent signal or common overflow trunk is provided.

D.02 Corrects MKR lead on FS2.

D.03 Rate App Fig. 52 and 185 plus options NI, NH, OH, PU, and PT Mfr Disc. The above are associated with the wideband/bit-stream features.

D.04 Minor changes and corrections to the circuit, ordering information, and CADs.

D.05 The DLTK and LHMT leads are changed to agree with WE drawings.

D.06 Clarifies the wiring of the first three AMA recorders (EMERG 0, 1).

D.07 Modify cabling information to agree with connecting circuits.

D.08 Corrects Note 102 for when AMA is provided.

D.09 Corrects Notes 102 and 146 for application of options JH, JJ, JM, and JN.

D.10 Corrects the OP and CI preference chains when App Fig. 34 is not provided.

D.11 Rates PSR lead from completing marker Mfr Disc. in order to agree with the connecting circuit.

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