TROUBLE TICKETER ALARM ROUTINE AND TROUBLE ANALYSIS STEP-BY-STEP INTERTOLL DIALING OFFICES ARRANGED FOR CAMA

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1. GENERAL

1.01 This section covers the procedure to be followed in response to the trouble ticketer request alarm and the procedures involved in analyzing troubles indicated on a trouble ticket.

1.02 This section is reissued to provide additional information on decoder and transverter trouble tickets. This revision affects positions 13 through 23 of the transverter trouble ticket and positions 7, 13 through 18 and 23 of the decoder trouble ticket. These changes were made to bring the trouble ticket up to date for offices equipped with interchangeable and toll information (NXX+411) features.

1.03 The purpose of the trouble ticketer is to indicate as nearly as practicable the source of trouble encountered during the completion of a service call or test call. The trouble ticketer may also be used for verification on test calls by forcing a trouble ticket although no trouble exists.

2. GENERAL OPERATION OF TROUBLE TICKETER

2.01 Whenever a decoder, transverter, or master timer encounters trouble in the completion of a service or test call, the circuit in trouble attempts to connect to the trouble ticketer and print a trouble ticket. The recorder and recorder connector circuit can also seize the trouble ticketer if it is not attached to a transverter or is not under control of the master timer. A transverter may request the trouble ticketer with or without a recorder circuit attached. If a recorder is attached, the occurrence of trouble in either circuit causes the transverter to request the trouble ticketer. If a recorder and recorder connector circuit is attached to the master timer for a test call or a special entry on the AMA tape and a trouble is encountered, the master timer requests the trouble ticketer, regardless of the location of the trouble.

2.02 When the circuit requesting the trouble ticketer seizes it, an office alarm is sounded, the trouble ticketer (TT) lamp lights, and a trouble ticket is printed. If the circuit requesting the trouble ticketer is unsuccessful in obtaining access to it, an office alarm is sounded and a display lost

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(DL-) lamp is lighted. In the case of the transverter or decoder, either the minor or major alarm is sounded, depending on whether the circuit requesting the ticketer is in its first or second trial stage, respectively. A master timer always sounds a major alarm. The recorder and recorder connector sounds a minor alarm. However, if a second recorder alarm is received before the first alarm is retired, the minor alarm is changed to a major alarm.

2.03 The trouble ticketer request alarm may be retired at the trouble ticketer frame by operation of the alarm release (AR) key or from remote locations where there is a spare (SP) jack. The AR jack on the trouble ticketer frame may be patched to the SP jack on the same frame to permit releasing the alarm from the remote location. To release the alarm remotely, a short-circuited plug is inserted momentarily into the SP jack on the equipment frame.

2.04 When the trouble ticketer is made busy to all connecting circuits, any circuit requesting a trouble ticket will cause the major alarm to function.

2.05 If the trouble ticketer encounters trouble in printing a trouble ticket and remains off-normal for more than 12 to 24 seconds, the timing circuit functions to cause an alarm and to light the time-out (TO) lamp on the jack, key, and lamp circuit on the trouble ticketer frame.

2.06 The trouble ticketer can be made busy to all connecting circuits by placing a make-busy plug in the trouble ticketer make-busy (TTMB) jack on the trouble ticketer frame. The associated trouble ticketer busy (TTB) lamp is lighted while the plug is in the jack.

2.07 At the jack, key, and lamp panel of the trouble ticketer frame, there are make-busy jacks for making the trouble ticketer busy to each decoder, transverter, recorder and recorder connector, and master timing circuit. Insertion of a make-busy plug into one of these jacks makes the trouble ticketer appear busy to the associated circuit. When the trouble ticketer is made busy to a particular circuit and that circuit requests the trouble ticketer, the alarm sounds and a DL- lamp lights as outlined in 2.02.

3. TROUBLE ALARM ROUTINE METHODS

3.01 If in response to a major alarm, it is found that a series of trouble tickets is being printed, analyze a sufficient number of them to obtain a common item. Such common items can be a particular circuit, code, digit, or lead, or an originating office. Remove the defective circuit from service. ANI failures may be bypassed by operating the CIFT key. When ticket analysis is not conclusive, a rapid check can be made by removing from service for short periods of time certain suspected circuits or groups. Care is necessary in this situation not to remove a number of circuits that would cause a more serious service reaction.

3.02 If in response to a major alarm, lighted TTB and TT lamps on the jack, key, and lamp panel are found, momentarily operate the AR key to retire the alarm. If the alarm is retired but the TTB lamp remains lighted, there is a plug in the TTMB jack. Determine if it is satisfactory to remove the plug.

3.03 If in response to an alarm, a lighted no paper (NP) lamp is observed, replace the trouble ticketer paper tape with a new roll of paper.

3.04 If in response to an alarm, lighted TT and DL- lamps on the trouble ticketer jack, key, and lamp panel are found, make a record of the DL- lamp in accordance with local instructions. Operate the AR key on the trouble ticketer frame to retire the alarm.

3.05 If in response to an alarm a lighted TT lamp is found without a DL- lamp being lighted, a trouble ticket has been printed. The last trouble ticket is not ejected from the trouble ticketer. If it is desired to use the trouble ticket immediately, momentarily operate the eject trouble ticket (ETT) key. Operate the AR key to retire the alarm and to extinguish the TT lamp.

3.06 If in response to an alarm, lighted TO and printer time-out (PTO) lamps are found, the trouble ticketer blocked and timed out. The alarm could be caused either by the operation of the printer timer (PTM) on information storage without progressing to the point where printing of the trouble ticket occurs, or if ticket printing has started, the PTM relay has operated and has

not released. The alarm may be released and the TO and PTO lamps extinguished by operating the AR key.

4. MATERIAL AND EQUIPMENT TO ANALYZE AND LOCATE SERVICE CIRCUIT TROUBLES

4.01 The analysis and location of troubles are based on the SD drawings. On detached contact schematics this information is in the form of functional schematics and sequence charts. The sequence charts and circuit description indicate the order of operation of the relays and other equipment in the circuit. The functional schematics give the circuit wiring information in an easy-to-read form. If attached-type SD drawings are used, the circuit description will supply information on the order of operation of relays in the circuit. Section 030-360-701 covers procedures to be followed for No. 1 type ticketer.

4.02 The CAMA test circuit can be used to reproduce the conditions under which a trouble ticket was printed. Circuit functions and tests are covered in the circuit description of the test circuit. BSPs are available covering the tests of the AMA circuits. When the test circuit is used, the portable test box is plugged into a belt-line connector appearance and the necessary test made.

4.03 Incoming registers, trunk class circuit, and senders have no access to the trouble ticketer; however, they may be connected to a circuit having access to the trouble ticketer at the time that circuit fails. For circuits not having access to the trouble ticketer, routine tests will be valuable in decreasing service troubles originating in these circuits. The manual test circuit is arranged to provide operational tests of equipment used on service calls. Forced trouble tickets can be made from the transverter and decoder to provide a record of circuit operation although no trouble exists.

4.04 The existence of trouble may also be indicated by reports from testboards or service traffic operators and by the results of routine testing procedures.

4.05 Troubles that affect the continuity of a circuit should be located with the use of a high resistance head receiver. Troubles that require voltage, current, and resistance measurement should be located with the aid of a KS-14510, List 1 volt-ohm-milliammeter or similar test meter.

4.06 Trouble in a long chain of make or break contacts generally can be located more quickly if testing is started in the middle of the chain. This will reduce the average number of trials necessary to locate the source of the trouble. However, such a procedure will depend upon the physical location of the equipment. When using a head receiver to locate the source of a trouble in which a relay with battery connected to its winding is missing an operating ground, one side of the receiver should be connected to battery and the missing ground traced out. This will prevent false operation of the relay. Where the opposite condition exists, ground one side of the receiver and trace for the missing battery.

5. TROUBLE TICKETS

5.01 The trouble ticketer circuit description lists in detail the indications on the ticket produced by the different circuits and should be referred to for trouble analysis.

5.02 Because of the large amount of information supplied by the different circuits, four different trouble tickets are printed. These are transverter, decoder, master timer, and AMA recorder trouble tickets and are distinguished by the number printed at position 3 on the trouble ticket. Each ticket has 42 positions.

5.03 Digits 0 and 1 in position 3 indicate even or odd master timer. Digits 2 to 5 indicate transverters 0 to 3; digits 6 or 7 indicate decoder 0 or 1. Digit 8 indicates a regular recorder, and digit 9 the emergency recorder. When a regular recorder indication is given in position 3, the digit in position 5 of the ticket indicates the specific recorder number 0 to 4. On an emergency recorder ticket, the digit in position 5 will be 9. When the type of circuit originating the trouble ticket is determined, refer to the charts shown on the trouble ticketer schematic drawing covering the particular type of circuit involved. The information on the different charts provides assistance in locating the source of trouble. It indicates how far the circuit has progressed, time-out conditions, and false grounds or crosses.

5.04 In general these indications can be broken into four categories of information: (a) information associated with the particular call in progress at the time the circuit called for the trouble ticketer, (b) time-out indications due to

the circuit being unable to perform its functions within a given time, (c) cross indications or false grounds on leads arranged for standing tests, and (d) progress indications to provide information on how many of the circuit functions were performed before failure occurred. The analysis of a trouble ticket may depend upon cross checking of the different types of information. For example, a time-out condition may be due to an incorrect registration of information associated with a particular call, or it may be due to failure of a contact in the check path of those register relays, which would prevent the circuit from completing its functions. Standing test failure indications normally occur with the circuit idle or immediately on seizure, and point directly to the source of the trouble. However, as some standing test indications are associated with several leads in a circuit, it may require considerable checking of leads to locate the actual source of trouble.

6. ANALYSIS OF TYPICAL TROUBLES

6.01 In the step-by-step CAMA system most circuits are in detached contact form with the exception of the master timer, AMA recorder, and call identity indexer. For trouble analysis the detached contact schematics are useful. Until reissue of the AMA circuits in detached form the use of operation schematics originally issued for the No. 5 crossbar system is recommended. Although not completely applicable on all sheets, they can be used provided differences associated with the CAMA trunks, senders, and transverters are considered. When the CAMA trunks, senders, and transverters are involved, the functional schematics and sequence charts for these circuits should be used.

6.02 Attached are examples of trouble tickets which are analyzed to indicate the procedure involved in locating trouble by using the trouble ticketer. For information regarding the digit printed and its meaning, refer to the trouble ticketer CD-32274-01, Section III.

A. CAMA Recorder Trouble Ticket

6.03 Analyzing the ticket in Fig. 1, the digits in positions 3 and 5 indicate that it was originated by regular CAMA recorder 0. At the time the recorder failed, it was connected to trunk 42 of the recorder trunk group to make an answer or disconnect entry. This is indicated by digits 4 and 2 in position 6 and 7 of the ticket. Positions 8 through 11 are not used on the ticket and position 12 has no information. Digit 1 in position 13 indicates IPA relay operated in the recorder under control of the call identity indexer. In positions 14, 15, and 16, the digit 1 indicates OTO, DTK, and DTN relays operated in the recorder. The asterisk in position 17 indicates both XTL and PAK were registered in the ticketer. No information is recorded at position 18. Positions 19 and 20 register 0 to indicate TBL and PTS. Considering the sequence chart for Fig. 1, it can be seen that the circuit progressed to the point where the DTN relay operated and the A'-, B'-, F'-2/5, PT PT1 and PAK registrations were made. Referring to the circuit schematic and sequence chart sketch, it is seen that relay DTN, operated, closes the operate path for the E- and F-2/5 relays and perforator magnets. Relay M, operated, closes the operate path of the A- and of the B- to D-2/5 relays and magnets. Relays DTN and M, operated, close the operate path for relay PTC which starts timing of the PTO relay circuit. PTC also partially closes the operate path of relay CK through check path contacts of relays A- to F-. If a check path is completed through relays A- to F-, then relay CK will operate before timing relay PTO operates. However, if relay CK does not operate, then relay TBL will operate when relay PTO operates. Operation of relay TBL will cause the recorder to time and call in the trouble ticketer. Relays PR1, PR2, and PR3 will operate when relay CK operates. Relay PR2 operated will operate relay LC which provides a registration on a trouble ticket. The LC indication is missing from the trouble ticket, indicating that the LC relay did not operate. It appears, therefore, that the trouble condition exists somewhere between the point where relay DTN operates and relay LC operates.

6.04 If several trouble tickets are obtained from the same recorder with the same trouble indications on the ticket, it would be advisable to keep a close check on the digit information in positions 24 through 29. Check for repetition of the same digit in one of the positions on all the trouble tickets. This may indicate that every time digit is registered in a particular position, the AMA recorder fails. If any of these positions does not register a digit, there is no check path for operation of relay CK. Note that the digit 3 in position 24 indicates that the A0, A1, and A2 relays were operated in the AMA recorder. This

is an indication that a timed release disconnect entry was in progress.

Trouble Tracing in AMA Recorder

6.05 If office conditions permit, transfer the AMA recorder and operate the A- to F- relays in the same pattern as indicated by the trouble ticket. Ground GT of relay PTC, and check with a headset for ground on 4T of relay A0. In this case no ground is found. Checking at 4T of the B0, C0, D0, E0, and F0 relays, ground is detected at F0 only. As the E' digit is a 4, the contacts of relays E4 and E0 are checked and contact 1/2 bottom of relay E4 is found to be open. The contact is cleaned and the recorder is put back into service. Subsequent usage of this recorder indicates that it operates correctly.

B. Transverter Trouble Ticket—Trouble in Transverter

6.06 In Fig. 2 a transverter trouble ticket is shown. The digits in positions 3 and 4 indicate that this ticket was originated by transverter No. 1 on a first trial servie call. Recorder 0, trunk 65, and sender 04 were associated with the transverter on the call. If several transverter trouble tickets are available, it is quite important to see if a particular sender, recorder, or trunk is associated at time of failure. An associated circuit which appears on all the trouble tickets could be the cause.

6.07 Positions 10, 11, and 12 on the trouble ticket indicate that the transverter has progressed to the point of printing a 4 in position 11 and there are no cross failures. Turning to the sequence charts for the transverter, digit 4 in position 11 indicates the P1 relay operated to print the last line of entry on the AMA tape but the P1A relay did not operate. Looking at the trouble ticket it can be seen that the called and calling number information is complete, but the recorder input leads show an asterisk in position 26. This is an indication of the source of trouble. Turning to the schematic of the transverter, it can be seen that the C' indication for the last line of entry is obtained through contacts of the C1A relay. This relay normally grounds leads C'2 and C'7 when it operates, and therefore an asterisk in position 26 indicates either an open contact or a cross on leads C0, C1, or C4.

Trouble Tracing in Transverter

6.08 As the transverter was failing repeatedly, it was removed from service. At the transverter, relay C1A was operated manually and contacts 22 and 24 were checked for ground. Ground was obtained on leads C2 and C7 only, but it was noticed on the C1A relay that the lower movable spring of contact 23 was touching the top movable spring of contact 13. The spring was replaced in its indexing slot and the transverter placed into service.

6.09 At the trouble ticketer and test frame, the transverter and the sender shown on the trouble ticket in Fig. 2 were patched for test*; and timers in the transverter were made inoperative.† The called and calling numbers shown on the selected trouble ticket were keyed at the test set. The transverter progressed to the P1 operation. At the test circuit the C2, 4, and 7 relays were operated; C4 was falsely operated. Since the transverter progressed to P1 operation on all failures, the analysis indicated a cross when the C1A relay operated. It was found at C1A contacts that the lower make spring of 23 was resting on the top make of contact 13. The spring was replaced in its comb slot, the call progressed, and an IE lamp lighted on the test set. Timing was restored in the transverter and retests were completed without trouble.

C. Transverter Trouble Tickets—Trouble in Associated Circuit

6.10 Several transverter trouble tickets were obtained similar to the ticket in Fig. 3. The tickets involved all transverters which were in each case associated with recorder No. 4. It was observed that recorder No. 4 was failing on all calls, therefore it was transferred.

6.11 In checking circuit progress it was noted that all transverters failed with a digit 2 in

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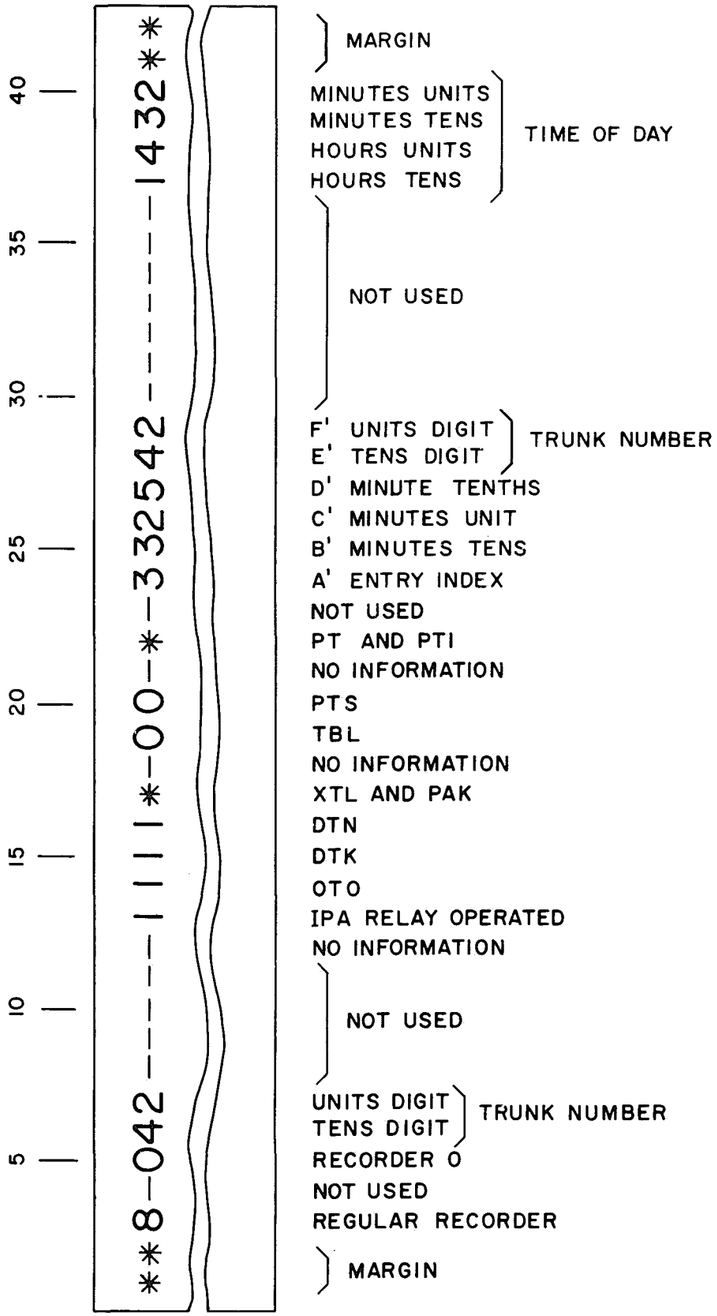
* If method in 6.09 is followed, make busy all senders in associated transverter connector during test.

† Timers in a transverter should not be made inoperative if the call or test causes the transverter to connect to an AMA recorder.



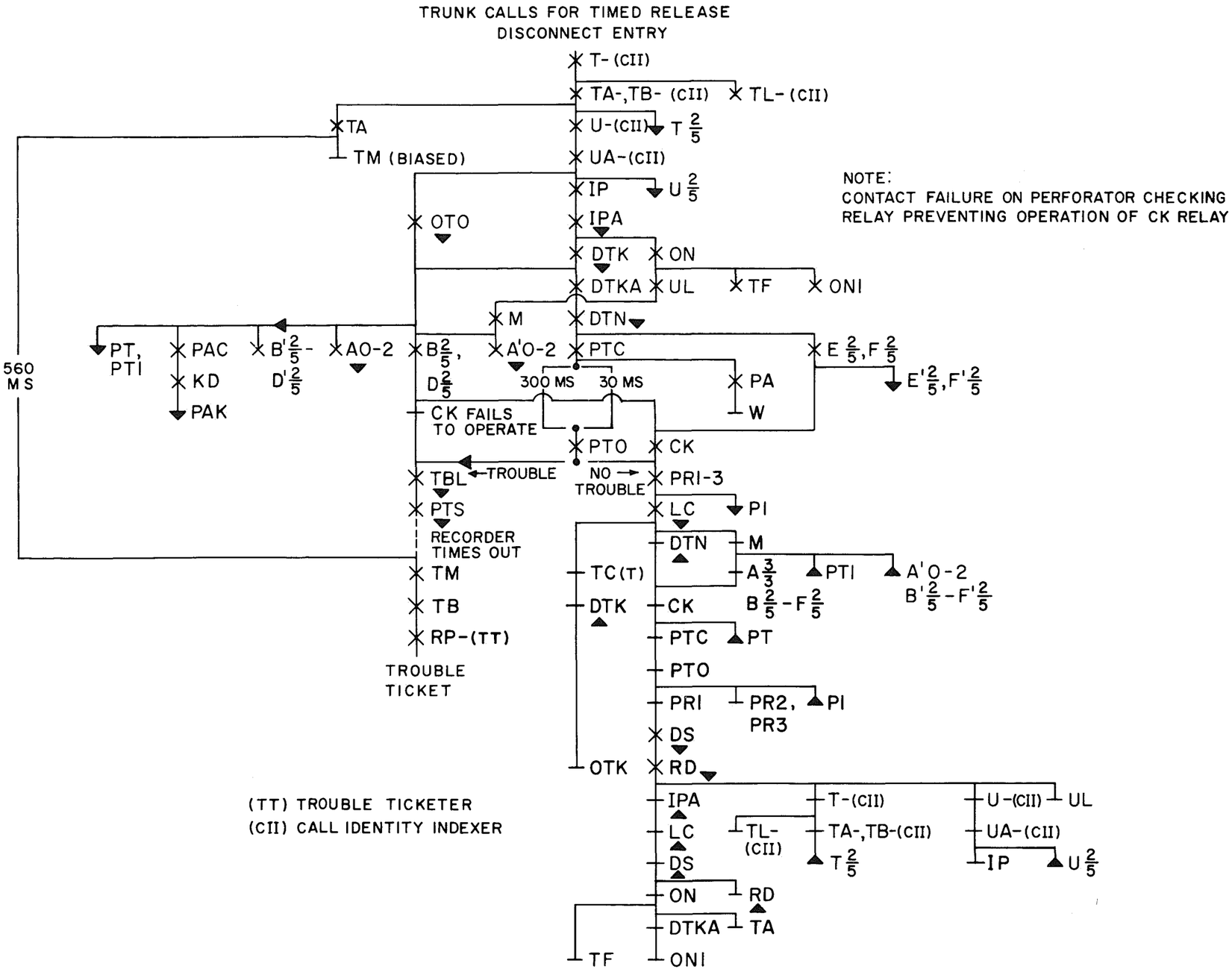


Fig. 1—AMA Recorder Trouble Ticket

position 11 of the ticket. This is a P2A indication which, according to the sequence chart notes, is an indication that the P2A relay operated but that the check of the TIC and ICK leads failed. If this test was satisfied, relay ICK would be released and IC operated. Since the ICK must operate on this check in order to operate the IC relay, the operate path of necessity must be open in recorder 4 or in the call identity indexer associated with that recorder as these are the only circuits common to all the trouble tickets.

Trouble Tracing

6.12 When AMA recorder trunks were transferred to the emergency recorder, no trouble in making AMA records was encountered. This eliminated the call identity indexer as a source of the trouble and the open in the operate path of the ICK relay must have been in the AMA recorder itself. Checking the ICK path through the TC-, TVM1, and TN6 relays in the AMA recorder, an open contact on the TVM1 relay was found.

Summary

6.13 By observing that on several transverter trouble tickets different transverters encountered the same trouble when associated with a particular recorder, the source of trouble pointed to the recorder circuit. By observing that the IC relay had not been operated by the ICK relay, the most logical source of trouble was traced. This was the ICK relay operate path which passed through the AMA recorder.

D. Decoder Trouble Ticket

6.14 Trouble tickets were being printed by decoder 0. One of these tickets is shown in Fig. 4. Checking through the ticket with the recoder trouble ticket chart, a digit 8, an XT indication, is found in position 12 and an asterisk is found in position 25.

6.15 The asterisk in position 25 indicates a mutilated first arbitrary digit causing the XT indication. The circuit progressed to the point where the route relay operated. This is indicated by information from the route relay contacts on the trouble ticket.

6.16 Checking the circuit schematic, it can be seen that a false ground on the arbitrary digit leads which are not grounded by the ARN-relays will cause the XT relay to operate. The false ground will also cause the trouble ticketer to print an asterisk. A contact failure on one of the ARN-relays will cause an asterisk to appear on the trouble ticket but will not operate the XT relay to give an XT indication.

Trouble Tracing in Decoder

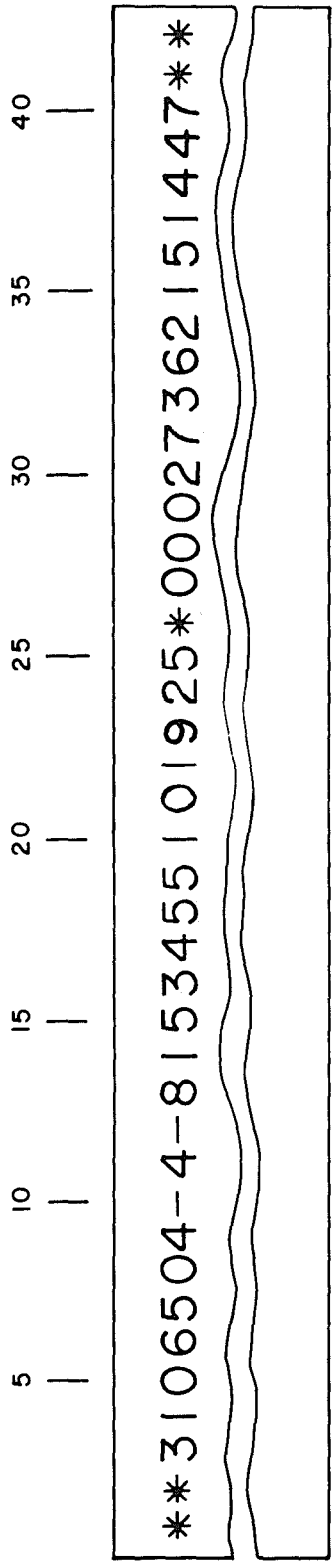
6.17 Decoder 0 was made busy and relays ARP, TGS2, and ARN0 operated. Leads AR0, 1, 2, 4, and 7 were checked for ground and leads 4 and 7 only were grounded. The ARN0 relay was released and the ARN1 operated. The AR0 and AR1 leads were grounded. The ARN1 relay was released and the ARN2 relay operated. Again only two leads AR0 and AR2 were grounded. The ARN2 relay was released and the ARN4 operated. At this point the AR0, AR4. amd AR7 leads were grounded indicating a cross between the AR4 and AR7 leads. Checking these leads on the relay network, a wire clipping was found to be crossing the AR4 and AR7 leads. The trouble was cleared and the decoder put back into service.

E. Master Timer Trouble Ticket

6.18 While attempting to make a recorder busy, a trouble ticket was obtained which was originated by an even numbered recorder. The ticket is shown in Fig. 5. Fig. 6* shows the circuit sequence after inserting a plug in the recorder make-busy jack.

6.19 Analyzing the trouble ticket indicates that the even master timer blocked when recorder 0 was made busy (recorder 0 position 5, block D position 10). The information in positions 24 through 29 indicates directly that the master timer progressed to the point where the P6 relay operated in the timer and the RN relay operated in the AMA recorder (refer to location RJ22 on Fig. 6 attached). The number 280500 on the trouble ticket indicates that the timer had primed the recorder to perforate this information when it blocked. Since the 280500 information was not released in the recorder when the trouble ticket was printed, it

* Fig. 6 is to be used only until the reissue of AMA circuits in detached form.



MARGIN

MINUTES UNITS
MINUTES TENS
HOURS UNITS
HOURS TENS
TIME OF DAY

G
F
E
D
C
B
A
CALLING NUMBER

F'
E'
D'
C'
B'
A'
RECORDER INPUT

INDICATES AREA CODE CALL

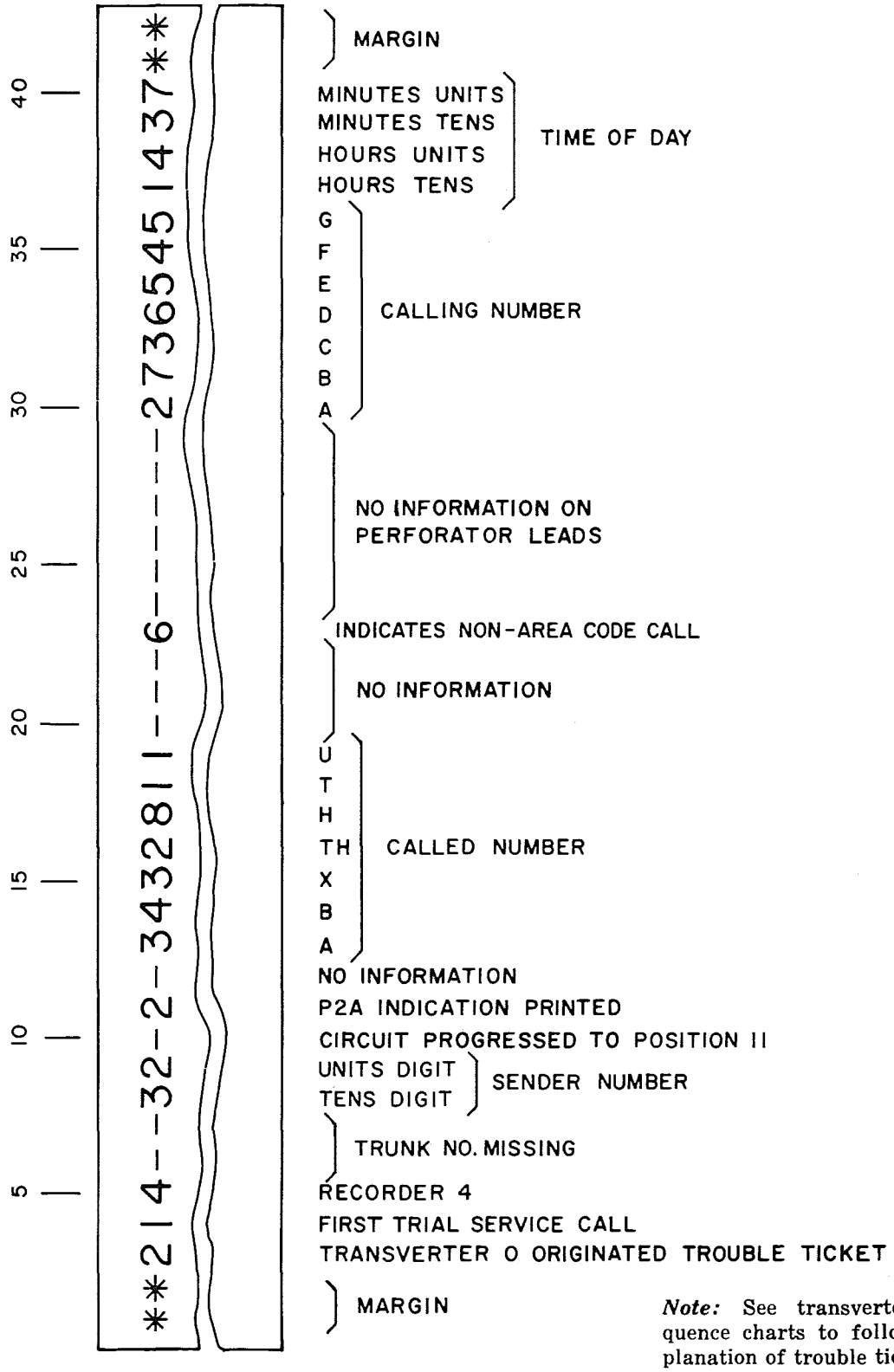
CALLED NUMBER INFORMATION
1ST THROUGH TENTH DIGITS

NO CROSS CONDITIONS
PI PROGRESS INDICATION
CIRCUIT PROGRESSED TO POS 11
UNITS DIGIT
TENS DIGIT
SENDER NUMBER
UNITS DIGIT
TENS DIGIT
TRUNK NUMBER
RECORDER 0
FIRST TRIAL SERVICE CALL
TRANSVERTER NO.1 ORIGINATED TICKET

MARGIN

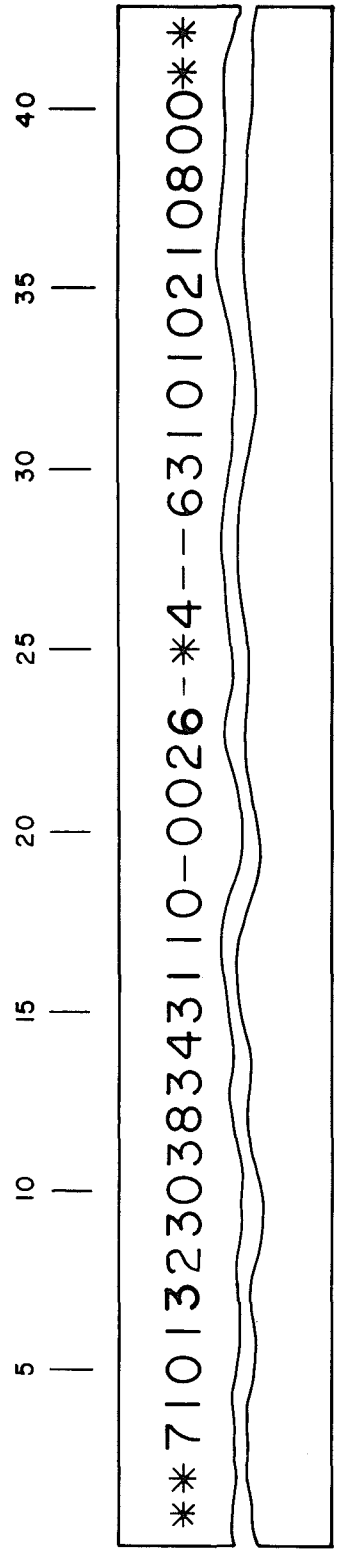
· *Note:* See transverter sequence charts to follow explanation of trouble ticket in text.

Fig. 2—Transmitter Trouble Ticket



Note: See transverter sequence charts to follow explanation of trouble ticket in text.

Fig. 3—Transmitter Trouble Ticket



MARGIN

MINUTES UNITS
MINUTES TENS
HOURS UNITS
HOURS TENS
TIME OF DAY

ROUTE ADVANCED RAI RELAY OPERATION
OPERATOR IDENTIFIED CALL INFO TO SENDER
NO 2-WAY TRUNKS INVOLVED ON CALL
ALTERNATE ROUTE AVAILABLE
RATE CLASS
OUTPULSE DIAL PULSE TO SXS OFFICE
DELETE 3 DIGITS

ER
DR
CR
BR
AR
ARBITRARY DIGITS TO BE OUTPULSED
DIGITS AR- TO ER-

NOT USED
NON-AREA CODE CALL
OPERATOR IDENTIFIED CALL
RATE CLASS
AREA OF ORIGIN OF CALL
TRUNK CLASS CIRCUIT NOT CONNECTED

FIRST SIX DIGITS OF CALLED NUMBER
REGISTERED AT TIME OF
TROUBLE TICKETER REQUEST

XT INDICATION
DECODER PROGRESSED TO OPERATE A ROUTE REL.
RECORDER NO. 0 SENT TO SENDER

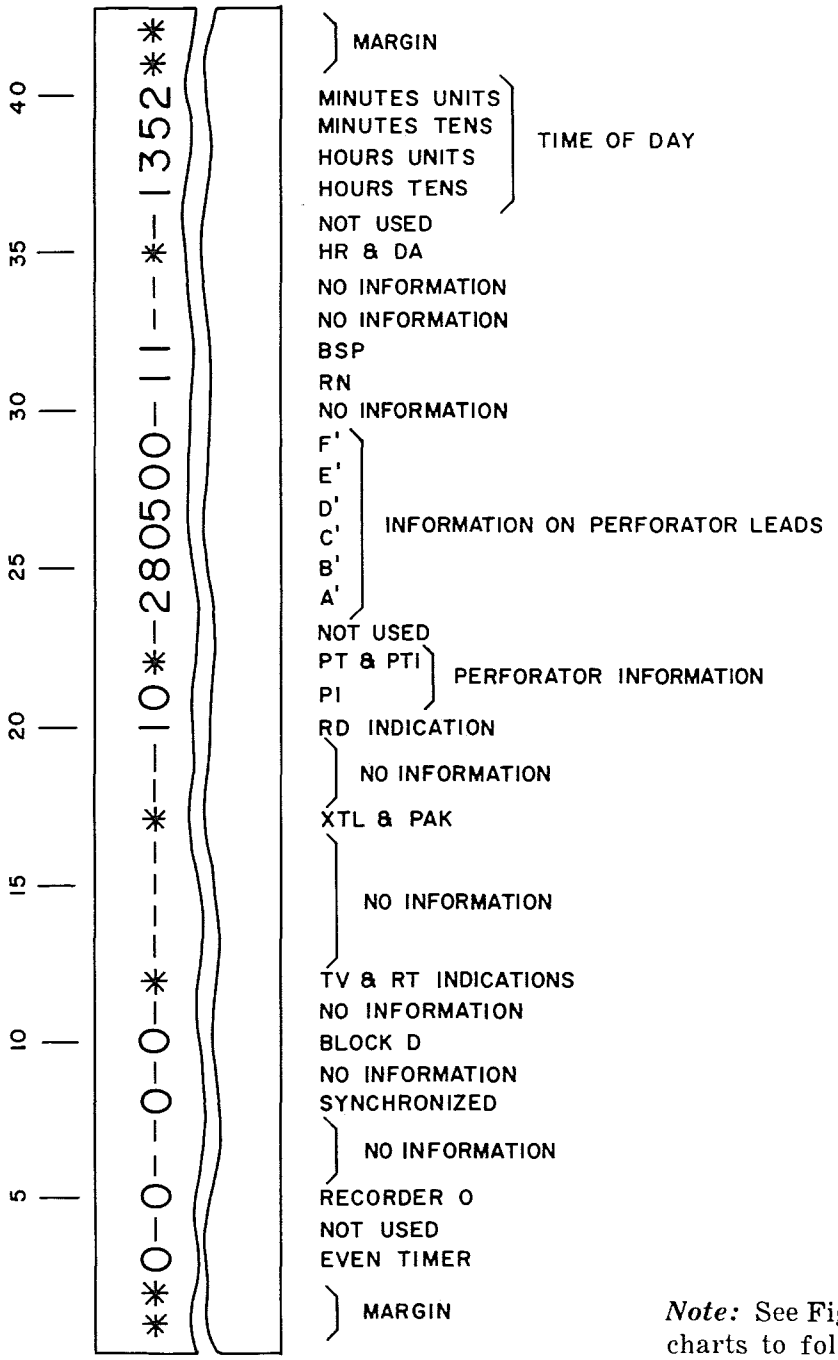
UNITS DIGIT
TENS DIGIT
SENDER NUMBER

TRAFFIC SCREENING CLASS
FIRST SEIZURE OF THE DECODER
TRUNK CLASS CKT INDICATES RECORDER 0 ASSOCIATED WITH TRUNK
FIRST TRIAL SERVICE CALL
DECODER NO. 1 ORIGINATED TICKET

MARGIN

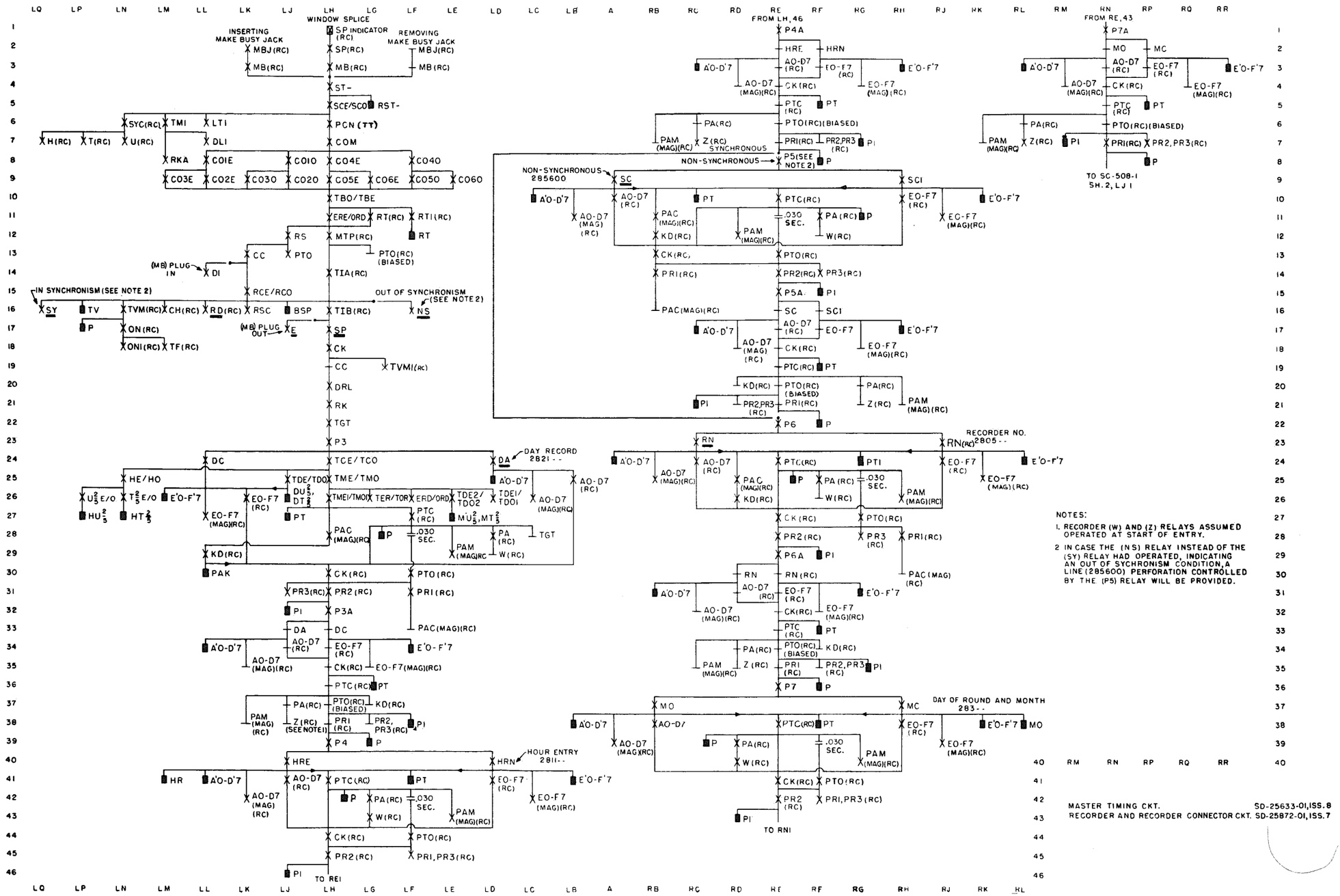
Note: See decoder sequence charts to follow explanation of trouble ticket in text.

Fig. 4—Decoder Trouble Ticket



Note: See Fig. 6 for sequence charts to follow explanation of trouble ticket in text.

Fig. 5—Master Timer Ticket



NOTES:

1. RECORDER (W) AND (Z) RELAYS ASSUMED OPERATED AT START OF ENTRY.
2. IN CASE THE (NS) RELAY INSTEAD OF THE (SY) RELAY HAD OPERATED, INDICATING AN OUT OF SYCHRONISM CONDITION, A LINE (285600) PERFORATION CONTROLLED BY THE (P5) RELAY WILL BE PROVIDED.

MASTER TIMING CKT. SD-25633-01,ISS.8
RECORDER AND RECORDER CONNECTOR CKT. SD-25872-01,ISS.7

Fig. 6—Recording of End Tape Window Splice and Make Busy

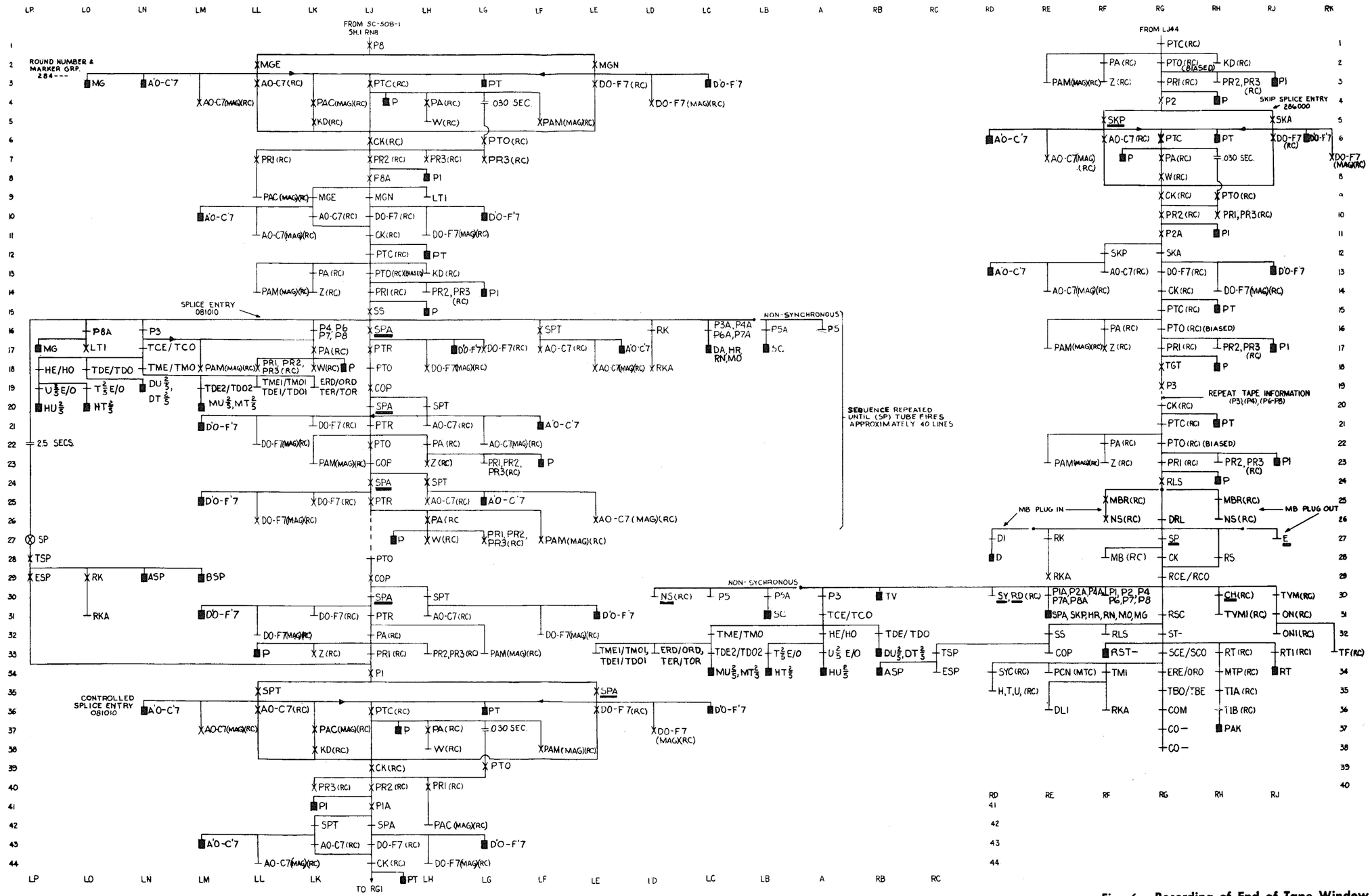


Fig. 6 – Recording of End of Tape Window Splice and Make-Busy (Cont)

indicates that the RN relay in the recorder or master timer has not released. In addition, the P1 indication printed on the trouble ticket indicates that the PR2 relay in the recorder had operated.

Trouble Tracing

6.20 At the master timer the P6A relay was observed while transferring recorder 0. It was noted that the P6 relay operated but not the P6A. This indicated an incomplete operate path for the P6A relay. Since the P2A and P3A relays had operated, the operate path for P6A must be open only at the winding of the P6A relay or the 1B contact of the P6 relay. Contact 1B of the P6 relay was found to be open.