

MASTER TIMING CIRCUIT  
NO. 5 CROSSBAR OFFICES  
ARRANGED FOR AMA

1. GENERAL

1.01 This section describes a method of testing the master timing circuit SD-25633-01 in No. 5 crossbar offices arranged for automatic message accounting. It also covers the purpose of each test.

1.02 This section is reissued to:

- (a) Add the purpose of each test.
- (b) Add checks in Test (B) for a splice record occurring during the last twelve seconds of any hour and for a splice record occurring during a recorder transfer or make busy operation.
- (c) Add tape marking procedure to test (B).
- (d) Cover checks of optional features in Test (B) for round, day of round and skip splice entries and add test of local control after time out.
- (e) Change all references to designations of apparatus at the master test frame to agree with the actual apparatus designations.
- (f) Add operations to Test (C) to cover application of end of tape patterns before making routine end of tape test.
- (g) Cover checks of optional features in Test (E) for flexible round operation.
- (h) Add a caution and tape marking procedure to Test (I) for multiple transfers made from the same recorder during the same hour period.
- (i) Add to Test (J) a check of the feature that prevents the perforation of an hour entry when a selector synchronism failure occurs.
- (j) Change reference to positions of the MSO, MSE and TT keys to agree with the designations on this apparatus.
- (k) Add to Test (M) a check of the auxiliary long timer.

- (l) Add Test (O) to check the end of tape failure alarm.
- (m) Add Test (P) to check the fuse alarm make busy feature.
- (n) Make minor revisions in the text to clarify the wording and improve the arrangement.

Since this reissue covers a general revision, the arrows ordinarily used to indicate changes have been omitted.

1.03 The tests covered are:

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	Page	Digit Designations Punched		Number Indicated
		Digit A'	Digits B' to F'	
(I) Transfer Control Features and Timer Synchronism Failure Alarm	19	2	0 and 2	2
(J) Selector Synchronism Check and Selector Synchronism Check Failure Alarm	22	-	1 and 2	3
		-	0 and 4	4
		-	1 and 4	5
		-	2 and 4	6
(K) Both Master Timing Circuits Made Busy Alarm	23	-	0 and 7	7
		-	1 and 7	8
		-	2 and 7	9
(L) Timer Start Control	23	1.09 While performing tests (B), (E), (M) or (N) and during the time that the trouble recorder is engaged with a trouble record as a result of one of these tests, a recorder or transverter attempting to seize the trouble recorder will cause a DL (display lost) lamp to light. In this case, make a record of the circuits with display lost indications and then momentarily operate the TRRAR (trouble recorder request alarm release) key at the master test frame. However, if another circuit seizes the trouble recorder first and the DL lamp is associated with the circuit under test, momentarily operate the TRRAR key and then repeat the test operations required to bring in the trouble record that was lost.		
(M) Time Out Alarm Features	23	1.10 In performing tests requiring the operation of relays, the relays should be operated manually unless otherwise specified.		
	Short Time Out Alarm	24		
	Display Lost Alarm	24		
	Long Time Out and Auxiliary Long Time Out Alarm	24		
(N) Perforator Lead Cross Detection Feature	25	1.11 Local instructions should be followed with reference to recording any register operations caused by performing these tests.		
(O) End of Tape Failure Alarm Test	26			
(P) Fuse Alarm Make Busy Features	26			

1.04 Tests (B), (E), (F), (I), (J), (M), and (N) should preferably be made during periods of light traffic.

1.05 An assistant at the maintenance center will facilitate making tests (B), (D), (E), (M) and (N).

1.06 A different recorder should be used each time that test (B) is performed so that eventually all recorders will have been tested in combination with each master timing circuit.

1.07 If tests (B) or (M) indicate trouble in the timing networks of cold cathode tubes SP or TM2, check the timing intervals as covered on the circuit requirements table.

1.08 In connection with tests (B) and (E), it will be necessary to translate the digit designations punched on the trouble recorder cards to determine the proper functioning of the master timing circuit. All designations on the trouble recorder card which include the numbers 0, 1, 2, 4 and 7 only should be punched on a 2 out of 5 basis except those with the A' designation which are punched on a 1 out of 3 basis for these tests. The translation is as follows:

Digit Designations Punched		Number Indicated
Digit A'	Digits B' to F'	
0	4 and 7	0
-	0 and 1	1

2. APPARATUS

2.01 The apparatus required for each test is shown in the following list. The details for each item are covered in the indicated paragraphs.

Apparatus	No. Required for Tests									
	(A)	(B)	(D)	(E)	(F)	(H)	(I)	(J)	(M)	(N)
Testing cord (2.02)	-	-	-	-	2	-	-	-	-	-
Testing cord (2.03)	-	1	-	-	-	1	-	1	-	-
Testing cord (2.04)	-	-	-	-	-	-	-	-	1	-
Testing cord (2.05)	-	-	-	-	-	-	-	-	-	1

Apparatus	No. Required for Tests											
	(A)	(B)	(C)	(D)	(E)	(F)	(H)	(I)	(J)	(M)	(N)	(O)
Stop watch (2.06)	1	1	-	-	-	1	1	1	1	-	-	-
Make busy plugs (2.07)	-	✓	✓	✓	✓	-	✓	-	✓	-	-	-
No. 411A tool	-	-	-	-	-	-	-	-	-	1	-	-
Test Re- ceiver (2.08)	-	-	-	-	1	-	-	-	-	-	-	-
No. 32A Test Set	-	1	-	1	-	-	-	-	-	-	-	-
Diagonal Pliers (2.09)	-	1	-	1	-	-	-	-	-	-	-	-
Red pencil (2.10)	-	1	-	1	-	-	-	-	-	-	-	-
2.02 No. 893 cord, 6 feet long, equipped with two No. 360A tools (1W13B cord), one KS-6278 tool and one No. 509A tool (for use in establishing test connections to relay windings).												
2.03 No. 893 cord, 6 feet long, equipped with two No. 360A tools (1W13B cord), one KS-6278 tool and one No. 419A tool (for use in establishing test connections to relay springs).												
2.04 No. 893 cord, 3 feet long, equipped with two No. 360A tools (1W13A cord) and two No. 419A tools (for use when inter-connecting relay springs).												
2.05 No. 893 cord, 6 feet long, equipped with two No. 360A tools (1W13B cord), one KS-6278 tool and one No. 411A tool (for use in establishing momentary test connections to relay springs and selector brushes).												
2.06 KS-3008 stop watch or equivalent.												
2.07 No. 322A (make busy) plugs as required. Indicated by check marks.												
2.08 No. 716E or No. 528 receiver, attached to a W2AB cord equipped with two No. 360A tools (2W21A cord), one KS-6278 tool and one No. 411A tool.												
2.09 5 inch diagonal pliers.												
2.10 Red china marking pencil.												

## 3. METHOD

## (A) Time Indication Check

3.01 This test checks that the selectors of both master timing circuits are in the correct positions with reference to the month, day, hour, minute, round and day of round.

3.02 Operate the CKL (check lamp) key and check that the month, day and hour are correctly indicated by lighted M-(month), DT-(day tens), DU-(day units), HT-(hour tens) and HU-(hour units) check lamps, respectively. When the round and day of round feature is provided, check that the proper RD-(round) and DR-(day of round) check lamps are lighted for the day of the month in accordance with Table A. The day of the month on this basis is assumed to start at 3 AM of one day and end at 3 AM of the following day.

Table A-Round and Day of Round Checks Lamps

Day of Month	Check Lamps Lighted			
	6 Rounds per Month		10 Rounds per Month	
	RD-	DR-	RD-	DR-
1	0	1	0	1
2	0	2	0	2
3	0	3	0	3
4	0	4	1	1
5	0	5	1	2
6	1	1	1	3
7	1	2	2	1
8	1	3	2	2
9	1	4	2	3
10	1	5	3	1
11	2	1	3	2
12	2	2	3	3
13	2	3	4	1
14	2	4	4	2
15	2	5	4	3
16	3	1	5	1
17	3	2	5	2
18	3	3	5	3
19	3	4	6	1
20	3	5	6	2
21	4	1	6	3
22	4	2	7	1
23	4	3	7	2
24	4	4	7	3
25	4	5	8	1
26	5	1	8	2
27	5	2	8	3
28	5	3	9	1
29	5	4	9	2
30	5	5	9	3
31	5	6	9	4

3.03 When the TT (transfer timer) key is in its E position, the check lamps are lighted under control of the even master timing circuit selectors and when the TT key is in its O position, the check lamps are lighted under control of the odd master timing circuit selectors.

3.04 To check the minutes and tenths of minutes, start the stop watch precisely at the beginning of any minute as noted on the building master clock and note the time in minutes indicated by the clock. Precisely at the moment that a U- check lamp is extinguished and another U- check lamp is lighted, stop the stop watch. Note which H-, T- and U- check lamps are lighted.

3.05 Check that the time in minutes and seconds recorded on the stop watch plus the time in minutes noted on the building master clock when the watch was started agree within 30 seconds of the time indicated by the H-, T- and U- lamps at the time that the stop watch was stopped. If the time indicated by the check lamps is incorrect by more than 30 seconds, set the selectors to the correct time as described in the pulse failure procedures in BSP Section A374.931.

3.06 Operate and hold operated the CLT (check lamp transfer) key. Observe that there is no change in the lighted check lamps. Observe that the TS and CO1 relays are operated if the TT key is in the E position or that these relays are released if this key is in its O position. Release the CLT key.

3.07 Operate the TT key to its opposite position. Operate and hold operated the CLT key. Observe that the TS and CO1 relays are operated when the TT key is in the E position or that these relays are released when the TT key is in the O position. Then release the CLT key.

3.08 Restore the CKL key. Observe that the check lamps are extinguished.

(B) End of Tape Features

3.09 This test checks:

- (a) That the master timing circuit provides the correct information in the proper sequence when perforating the recorder tapes for recorder transfer, make busy or window patterns.
- (b) That perforator lead information and additional information required for circuit identification (such as master timing circuit, recorder number, progress indication, class of call, etc.) is transmitted to the trouble recorder when the master timing circuit is blocked because of a trouble condition.
- (c) That recorder transfer, make busy or window patterns cannot be made during the last twelve seconds of any hour when "ZD" wiring option is provided in the master timing circuit.

(d) That the length of splice pattern is increased when a tape window is encountered while perforating the splice pattern of a recorder transfer or make busy.

(e) That an additional splice pattern and tape identity group is perforated when a tape window is encountered during the perforation of the second tape identity group of a recorder transfer or make busy pattern.

(f) That the master timing circuit furnishes the end of tape information under local control after a time out has occurred due to the inability of the master timing and recorder circuits to complete the perforation of an end of tape pattern in the regular manner.

3.10 Remove from service all trunks associated with the even or the odd recorders, depending upon whether the even or the odd master timing circuit, respectively, is to be tested. Remove the trunks from service as covered in BSP Sections A375.301 and A375.321.

Caution: Do not make these tests during the 5 minutes before or after any hour to prevent interference with the placing of the hour record on the recorders.

3.11 Mark the tape of the recorder used for the test as follows:

- (a) At the master test frame;
  - (1) Insert make busy plugs into the R-MB and R-TST jacks of the recorder used for the test.
  - (2) After inserting the plug of a No. 32A test set into the R jack, momentarily operate the white button of the test set to cause a test call group to be perforated on the recorder tape. Observe that the RUT (recorder under test) lamp is lighted while the test call group is being perforated.
  - (3) When the RUT lamp is extinguished, again momentarily operate the white button of the test set to cause a second test call group to be perforated on the recorder tape.
  - (4) When the RUT lamp is again extinguished, remove the plugs from the R-MB and R-TST jacks.

- (b) At the perforator associated with the recorder used for the test;
- (1) Raise the reel clutch release arm and hook it over the catch.
  - (2) Pull back some slack in the tape and, if necessary to obtain access, disengage the tape from the tape guides.
  - (3) Then, using a red china marking pencil, place two large crosses on the smooth side of the tape over the splice entries of the make busy pattern adjacent to the diamond pattern farthest from the perforator drum.
  - (4) Replace the tape in the tape guides, wind the tape back on the reel and lower the reel clutch release arm.
- (7) RT (recorder-master timer) indication.
  - (8) PT (perforator timing).
  - (9) PAK (paper advance check).
  - (10) P1 (perforator control 1).
  - (11) RD (recorder disconnect).
  - (12) BSP (before splice pattern).
  - (13) DA (day) progress indication.
  - (14) SY (in synchronism).
  - (15) Day and time in hours and minutes that the trouble recorder card was punched.

#### Recorder Transfer

- 3.12 At a time when the emergency recorder is available as indicated by the absence of make busy plugs in any of the R-TN jacks at the master test frame, block non-operated the P3A relay of the recorder record controller circuit of the master timing circuit to be tested.
- 3.13 At the master test frame, insert a make busy plug into the R-TN jack of an even or odd recorder depending upon whether the even or the odd master timing circuit is being tested. After a short interval, observe that the aisle pilot lamp and the TRR (trouble recorder request) lamp at the master test frame light and the major alarm sounds. Immediately remove the blocking tool from the P3A relay to permit the completion of the record on the tape.
- 3.14 At the master test frame, momentarily operate the TRRAR key and observe that the lamps are extinguished and the alarm is silenced.
- 3.15 At the trouble recorder, observe that a card has been punched recording the following information:
- (1) TMG (master timing circuit trouble record).
  - (2) DRO or DR1 (master timing circuit even or odd).
  - (3) RG-RST 0-9 (recorder number 0 to 9).
  - (4) Number 282LXX, XX representing the day tens and day units corresponding to the day of the month in the A' to F' line.
  - (5) TV (transverter) indication.
  - (6) A (class) indication
- 3.16 Block non-operated the P4A relay of the master timing circuit under test.
- 3.17 Remove the plug from the R-TN jack and, after a short interval, observe that the TRR lamp lights and the major alarm sounds. Immediately remove the blocking tool from the P4A relay.
- 3.18 At the master test frame, momentarily operate the TRRAR key to extinguish the TRR lamp and silence the alarm.
- 3.19 At the trouble recorder, observe that a card has been punched recording the date and time that the card was punched and the number 281LXX, the XX representing the hour tens and the hour units. Also observe that the TMG, DR-, RG-RST-, TV, B (class), RT, PT, PAK, P1, RD, BSP, DA, HR (hour) and SY indications are punched and if XA wiring option is provided, that the P (perforator control) indication is punched.
- 3.20 Block non-operated the P5A relay of the master timing circuit under test.
- 3.21 Insert a make busy plug into the R-TN jack of the recorder used for the test and, after a short interval, observe that the TRR lamp lights and the major alarm sounds. Immediately remove the blocking tool from the P5A relay.
- 3.22 Momentarily operate the TRRAR key to extinguish the TRR lamp and silence the alarm.
- 3.23 At the trouble recorder, observe that a card has been punched recording the number 285500, representing the transfer synchronous entry. Also observe that the TMG, DR-, RG-RST-, TV, A, RT, PT, PAK, P1 RD, BSP, DA, HR, SC (straddle call) and SY indications are punched and if XA wiring option is provided, that the P indication is punched.
- 3.24 Remove the plug from the R-TN jack.

- 3.25 Block non-operated the P5A relay of the master timing circuit under test.
- 3.26 Block non-operated the U relay of the recorder used for the test. This may result in a selector synchronism failure alarm (SSF lamp), in which case, operate the AR key at the master timing circuit to retire the alarm.
- 3.27 Insert a make busy plug into the R-TN jack of the recorder used for the test and, after a short interval, observe that the TRR lamp lights and the major alarm sounds. Immediately remove the blocking tool from the P5A relay of the master timing circuit and then remove the blocking tool from the U relay of the recorder.
- 3.28 Momentarily operate the TRRAR key to extinguish the TRR lamp and silence the alarm.
- 3.29 At the trouble recorder, observe that a card has been punched recording the number 285700, representing the transfer nonsynchronous entry. Also observe that the TMG, DR-, RG-RST-, TV, A, RT PT, PAK, P1, RD, BSP, DA, HR, SC and NS (not in synchronism) indications are punched and if XA wiring option is provided, that the P indication is punched.
- 3.30 Remove the plug from the R-TN jack.
- 3.31 Block non-operated the P6A relay of the master timing circuit under test.
- 3.32 Insert a make busy plug into the R-TN jack of the recorder used for the test and, after a short interval, observe that the TRR lamp lights and the major alarm sounds. Immediately remove the blocking tool from the P6A relay.
- 3.33 Momentarily operate the TRRAR key to extinguish the TRR lamp and silence the alarm.
- 3.34 At the trouble recorder, observe that a card has been punched recording the number 28050X, the X representing the recorder number (0 to 9). Also observe that the TMG, DR-, RG-RST-, TV, A, RT, PT1 (perforator timing 1), PT, PAK, P1, RD, BSP, DA, HR, SC, SY and RN (recorder number) indications are punched and if XA wiring option is provided, that the P indication is punched.
- 3.35 Block non-operated the P7A relay of the master timing circuit under test.
- 3.36 Remove the plug from the R-TN jack and, after a short interval, observe that the TRR lamp lights and the major alarm sounds. Immediately remove the blocking tool from the P7A relay.
- 3.37 Momentarily operate the TRRAR key to extinguish the TRR lamp and silence the alarm.
- 3.38 At the trouble recorder, observe that a card has been perforated recording the number 283DRXX or 283DUXX. When the master timing circuit provides the day of round and round indication (ZJ wiring option), the DR represents the day of round as indicated in Table A. When the master timing circuit is arranged for flexible round indication (ZK wiring option), the DU represents the day units of the day of the month. The XX for both numbers represent the month tens and month units. Also observe that the TMG, DR-, RG-RST-, TV, B, RT, PT, PAK, P1, RD, BSP, DA, HR, SC, SY, RN and MO (month) indications are punched and if XA wiring option is provided, that the P indication is punched.
- 3.39 Block non-operated the P8A relay of the master timing circuit under test.
- 3.40 Insert a make busy plug into the R-TN jack of the recorder used for the test and, after a short interval, observe that the TRR lamp lights and the major alarm sounds. Immediately remove the blocking tool from the P8A relay.
- 3.41 Momentarily operate the TRRAR key to extinguish the TRR lamp and silence the alarm.
- 3.42 At the trouble recorder observe that a card has been perforated recording the number 284RDXX or 284DTXX. The RD represents the round as indicated in Table A when ZJ wiring option is provided or the DT represents the day tens of the day of the month when ZK wiring option is provided. The XX for both numbers represent the number of the marker group. Also observe that the TMG, DR-, RG-RST-, TV, A, RT, PT, PAK, P1, RD, BSP, DA, HR, SC, SY, RN, MO and MG (marker group) indications are punched and if XA wiring option is provided, that the P indication is punched.
- 3.43 Block non-operated the COP relay of the master timing circuit under test.
- 3.44 Remove the plug from the R-TN jack and, after a short interval, observe that the TRR lamp lights and the major alarm sounds. Immediately remove the blocking tool from the COP relay.
- 3.45 Momentarily operate the TRRAR key to extinguish the TRR lamp and silence the alarm.
- 3.46 At the trouble recorder, observe that a card has been punched recording the number 081010, representing the splice

pattern number. Also observe that the TMG, DR-, RG-RST-, TV, B, RT, PT, PAK, Pl, RD, ASP, SY and SPA (splice pattern applied) indications are punched and if XA wiring option is provided, that the P indication is punched.

3.47 Block non-operated the SS relay of the master timing circuit under test.

3.48 Insert a make busy plug into the R-TN jack of the recorder used for the test and, after a short interval observe that the TRR lamp lights and the major alarm sounds.

3.49 Remove the blocking tool from the SS relay and start the stop watch. Observe the TSP relay and when it operates, stop the stop watch. Check that the timing interval is within 2.5 to 4.5 seconds.

3.50 Momentarily operate the TRRAR key to extinguish the TRR lamp and silence the alarm.

3.51 Remove the plug from the R-TN jack.

3.52 Block non-operated the P1A relay of the master timing circuit under test.

3.53 Insert a make busy plug into the R-TN jack of the recorder used for the test and, after a short interval, observe that the TRR lamp lights and the major alarm sounds. Immediately remove the blocking tool from the P1A relay.

3.54 Momentarily operate the TRRAR key to extinguish the TRR lamp and silence the alarm.

3.55 At the trouble recorder, observe that a card has been punched recording the number 081010, representing the last line of the splice pattern. Also observe that the TMG, DR-, RG-RST-, TV, A, RT, PT, PAK, Pl, RD, ASP (after splice pattern), SY and SPA indications are punched and if XA wiring option is provided, that the P indication is punched.

3.56 If the master timing circuit is arranged (with ZL wiring and apparatus) to provide a skip splice entry as part of an end of tape pattern, block non-operated the P2A relay of the master timing circuit under test. Otherwise, disregard the procedure in 3.57 to 3.59 inclusive except to remove the plug from the R-TN jack.

3.57 Remove the plug from the R-TN jack and, after a short interval, observe that the TRR lamp lights and the major alarm sounds. Immediately remove the blocking tool from the P2A relay.

3.58 Momentarily operate the TRRAR key to extinguish the TRR lamp and silence the alarm.

3.59 At the trouble recorder, observe that a card has been punched recording the number 286000, representing the skip splice entry. Also observe that the TMG, DR-, RG-RST-, TV, B, RT, PT, PAK, Pl, RD, ASP, SY, SPA and SKP (skip splice) indications are punched and if XA wiring option is provided, that the P indication is punched.

3.60 Insert a make busy plug into the R-TN jack of the recorder used for the test, then observe the following circuit operations:

- (1) MO relay operates and releases four times.
- (2) EW (emergency working) lamp is lighted at the emergency recorder.

3.61 Remove the plug from R-TN jack, then observe the following circuit operations:

- (1) MO relay operates and releases four times.
- (2) EW lamp is extinguished.

Recorder Make Busy

3.62 Block non-operated the P5A relay of the master timing circuit under test.

3.63 Insert a make busy plug into the R-MB jack of the recorder used for the test. Check that the TRR lamp at the master test frame does not light as a result of this test operation.

Note: If the TRR lamp at the master test frame is found to be lighted, check that the DL MTE or DL MTO lamp is not lighted at the master test frame and that no trouble record card has been made with the TMG and DRO or DR1 punches recorded for the master timing circuit under test.

3.64 Remove the plug from the R-MB jack, then observe that the MO relay operates and releases twice.

3.65 Block non-operated the U relay of the recorder used for the test. This may result in a selector synchronism failure alarm (SSF lamp), in which case, momentarily operate the AR key at the master timing frame to extinguish the lamp and silence the alarm.

3.66 Insert a make busy plug into the R-MB jack of the recorder and, after a short interval, observe that the TRR lamp lights and the major alarm sounds. Immediately remove the blocking tool from the P5A relay.

- 3.67 Momentarily operate the TRRAR key to extinguish the TRR lamp and silence the alarm.
- 3.68 At the trouble recorder, observe that a card has been punched recording the number 285600 representing the make-busy nonsynchronous entry. Also observe that the TMG, DR-, RG-RST-, TV, D (class), RT, PT, PAK, Pl, RD, BSP, DA, HR, SC and NS indications are punched and if XA wiring option is provided, that the P indication is punched.
- 3.69 Block non-operated the P6A relay of the master timing circuit under test. Remove the blocking tool from the U relay of the recorder.
- 3.70 Remove the plug from the R-MB jack and, after a short interval, observe that the TRR lamp lights and the major alarm sounds. Immediately remove the blocking tool from the P6A relay.
- 3.71 Momentarily operate the TRRAR key to extinguish the TRR lamp and silence the alarm.
- 3.72 At the trouble recorder, observe that a card has been punched recording the number 28050X, X representing the recorder number 0 to 9. Also observe that the TMG, DR-, RG-RST-, TV, E (class), RT, PT1, PT, PAK, Pl, RD, BSP, DA, HR, SY and RN indications are punched, and if XA wiring option is provided, that the P indication is punched.
- Splice Record During Last Twelve Seconds of Any Hour
- 3.73 When testing the even master timing circuit, operate the TT key to its O position and operate the CMBE key. When testing the odd master timing circuit, operate the TT key to its E position and operate the CMBO key.
- 3.74 Block non-operated the PE relay when working on the even master timing circuit or, block non-operated the PO relay when working on the odd master timing circuit.
- 3.75 Block non-operated the HRT relay. Operate and release the UH relay successively to step the U selector to position 9. Operate and release the TH relay successively to step the T selector to position 10. Operate and release the HH relay successively to step the H selector to position 6 and then observe that the SR relay is operated.
- 3.76 Operate and release the HH relay successively to step the H selector to position 13 and observe that the SR relay is operated.
- 3.77 Operate and release the HH relay successively to step the H selector to position 20 and observe that the SR relay is operated.
- 3.78 Operate and release the TH relay successively to step the T selector to position 20 and observe that the SR relay is operated.
- 3.79 Block non-operated the TH relay and then operate and release the UH relay successively to step the U selector to position 10. Observe that the SR relay is operated.
- 3.80 Operate and release the UH relay successively to step the U selector to position 19 and observe that the SR relay is operated.
- 3.81 Operate and release the UH relay to step the U selector to position 20 and observe that the SR relay is operated.
- 3.82 Remove the blocking tool from the HRT relay and observe that this relay is operated.
- 3.83 At the recorder used for the test, momentarily operate the SP relay. At the master timing circuit, observe that the ST- relay for the recorder used for the test does not operate.
- 3.84 Remove the blocking tools from the PE or PO relay and the TH relay.
- 3.85 Resynchronize the selectors of the master timing circuit under test as follows:
- (1) Operate the CKL key.
  - (2) Momentarily operate the S key. The SO lamp will be lighted while the even selectors are stepping to synchronized positions or the SE lamp will be lighted while the odd selectors are stepping to synchronized positions.
  - (3) When the SO or SE lamp is extinguished, the selectors are synchronized; then restore the operated CMBE or CMBO key and the CKL key.
- Splice Record (Regular)
- 3.86 Block non-operated the P3A relay of the master timing circuit under test.
- 3.87 Operate and then immediately release the SP relay of the recorder used for the test. After a short interval, observe that the TRR lamp lights and the major alarm sounds. Immediately remove the blocking tool from the P3A relay.
- 3.88 Momentarily operate the TRRAR key to extinguish the TRR lamp and silence the alarm.

3.89 At the trouble recorder, observe that a card has been punched recording the number 2821XX, XX representing the day tens and day units corresponding to the day of the month in the A' to F' line. Also observe that the TMG, DR-, RG-RST-, TV, SP (Splice Class) RT, PT, PAK, Pl, RD, BSP, DA and SY indications are punched.

#### No Paper Alarm

3.90 Block operated the SP relay of the recorder used for the test. After a short interval, observe that the red NP (no paper) lamp at the recorder frame is lighted and the major alarm sounds.

3.91 Remove the blocking tool from the SP relay.

3.92 Momentarily operate the AR key at the recorder frame to extinguish the NP lamp and silence the alarm.

#### Splice Record During Recorder Transfer or Make Busy

3.93 To check the operation when a splice window is encountered during the application of the splice entries, insert a make busy plug into the R-MB jack at the master test frame. When the SS relay operates, start the stop watch. Then, when the TSP relay operates, stop the stop watch and note the elapsed time.

3.94 Remove the plug from the R-MB jack. When the SS relay operates, start the stop watch. One and one half seconds later operate the SP relay. Then, when the TSP relay operates, stop the stop watch and note that the reading is 1.5 seconds greater than the elapsed time noted in 3.93.

3.95 To check the operation when a splice window is encountered during the perforation of the second tape identity group of a recorder transfer or make busy pattern, block operated the ESP relay.

3.96 Connect ground to the 10B spring of the RLS relay.

3.97 Operate and release the RCT relay. Observe that the ROS and SP relays operate and then release.

3.98 Remove the test connection from the RLS relay and then remove the blocking tool from the ESP relay.

3.99 At the master test frame, insert a make busy plug into the R-MB jack of the recorder used for the test. When the ESP relay operates, immediately operate the ROS relay (which locks) and observe that, after a short interval, the ESP relay operates a second time.

#### Local Control After Time Out

3.100 At the master timing circuit under test, insulate the 8B contact of the LCl relay.

3.101 At the master test frame, remove the plug from the R-MB jack of the recorder used for the test and, after a short interval, observe that the MTE or MTO and TRR lamps light and the major alarm sounds. Approximately 5 seconds later, observe that the MTE or MTO lamp is extinguished.

3.102 Momentarily operate the TRRAR key to extinguish the TRR lamp and silence the alarm.

3.103 At the trouble recorder, observe that a card has been punched with the TMG, DR-, RG-RST-, TV, E, RT, P, PT, PAK, RD, BSP and SY indications.

3.104 Remove the insulator from the LCl relay.

3.105 Mark the tape of the recorder used for the test as follows:

- (a) At the master test frame;
  - (1) Insert a make busy plug into the R-MB and R-TST jacks of the recorder under test.
  - (2) Momentarily operate the white button of the No. 32A test set to cause a test call group to be perforated on the recorder tape. The RUT lamp will be lighted while the test call group is being perforated.
  - (3) When the RUT lamp is extinguished, again momentarily operate the white button of the test set to cause a second test call group to be perforated on the recorder tape.
  - (4) When the RUT lamp is again extinguished, remove the plugs from the R-MB and R-TST jacks and the plug of the test set from the R jack.
- (b) At the perforator associated with the recorder used for the test;
  - (1) Raise the reel clutch release arm and hook it over the catch.
  - (2) Pull back some slack in the tape and, if necessary to obtain access, disengage the tape from the tape guides.
  - (3) Then, using a red china marking pencil, place two large

crosses on the smooth side of the tape over the lower of the two diamond patterns, that is, the diamond pattern farthest from the perforator drum.

(4) In the splice entry area of the make busy pattern and about 3 inches below the lowest part of the diamond pattern that has been marked (in the direction farthest from the perforator drum) fold back the tape on itself so that the smooth side is exposed. Then, using the diagonal pliers, make two cuts in the folded tape at angles to form a V so that a square or diamond shaped hole will be left in the tape. This hole, as shown in Fig. 1, shall be located on the right hand side of the tape (E and F perforator positions) as viewed from the front of the perforator.

Caution: When cutting this hole, use care that the cuts end at a common point and that no slivers are left in the paper; otherwise trouble may result when the tape is processed at the accounting center.

(5) Replace the tape in the tape guides, wind the tape back on the reel and lower the reel clutch release arm. Using an ordinary shipping tag, make a record that Test (B) or (E) etc. was performed, listing the recorder number, the marker group number and a notation that diamond patterns or make busy patterns specially marked with red crosses were placed on the tape both before and after performing the test. Attach this tag to the associated reel support bar.

**Note:** This tag or its information is to accompany the tape when it is shipped to the accounting center.

3.106 Restore to service all trunk circuits associated with the even or the odd recorders as covered in BSP Sections A375.301 and A375.321.

#### (C) Routine End of Tape Record

3.107 This test checks the ability of the master timing circuit to control the perforation of the 3:00 AM end of tape entries and also checks the recorder start sequence for all recorders with which it is normally associated.

Caution: Do not make this test during the 5 minutes before or after any hour.

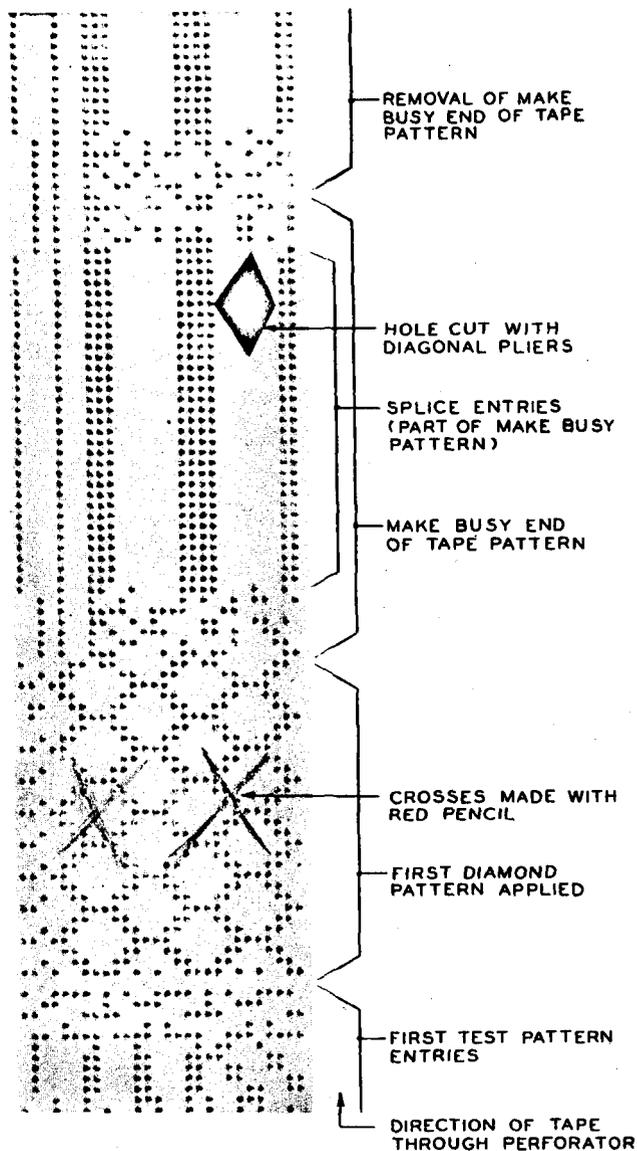


FIG. 1- SECTION OF PERFORATED TAPE AS SEEN FROM THE SMOOTH SIDE (PERFORATIONS INTO PAPER)

3.108 Check the ability of each master timing circuit to apply an end of tape pattern on a recorder tape. To make this check, insert make busy plugs in the R-MB jacks of an even and an odd recorder at the master test frame. Observe that the TRR lamp does not light as a result of these operations. If the TRR lamp does light, check that the DL MTE or DL MTO lamps are not lighted and that no trouble record cards are punched with the TMG and DRO or DRI punches recorded.

If a trouble record or display lost is indicated for one or both of the recorders made busy, do not make this test until the trouble is cleared and a make busy pattern can be applied to both an even and an odd recorder tape.

3.109 Make sure that the emergency recorder is not serving in the place of a regular recorder as indicated by the absence of a make busy plug in any R-TN jack at the master test frame. Then insert a make busy plug into the RETE (routine end of tape even) or RETO (routine end of tape odd) jack at the master timing frame depending upon whether the odd or the even master timing circuit is to be tested.

3.110 When testing the even master timing circuit, observe at the master test frame that the R- (recorder in use) lamp of the highest numbered even recorder is lighted for approximately 4 to 5 seconds and is then extinguished followed by a similar action for each of the lower numbered even R- lamps. Observe also that the MTE (master timing circuit even) lamp is lighted for the period of the test. Then remove the plug from the RETE jack.

Note: If any initial, answer or disconnect entries occur during this test, they may be recognized from the end of tape entry by the lighting of the R- lamp for a period of less than 1 second and should be disregarded.

3.111 When testing the odd master timing circuit, observe at the master test frame that the highest numbered odd R- lamp is lighted for approximately 4 to 5 seconds followed by a similar action for each of the lower numbered odd R- lamps and then for the R- lamp associated with the emergency recorder. Observe also that the MTO (master timing circuit odd) lamp is lighted for the period of the test. Then remove the plug from the RETO jack.

#### (D) Grouping Features

3.112 This test checks the grouping features in which the functions of providing perforating information for recorders under conditions of transfer, make busy, splice and end of tape are taken over by one master timing circuit when the other master timing circuit is made busy.

Caution: Do not make these tests during the 5 minutes before or after any hour.

3.113 Make sure that the emergency recorder is not serving in the place of a regular recorder as indicated by the absence of a make busy plug in any R-TN jack at the master test frame. Then

operate the CMBE (controller make busy even) key at the master timing frame and observe that the CMBE lamps light at the master timing frame and at the master test frame.

3.114 Insert a make busy plug into the RETO jack at the master timing frame and then remove the plug.

3.115 Observe that the end of tape record is applied on each recorder as indicated by the lighting of the associated R- lamps, for a period of approximately 4 to 5 seconds for each recorder in the following succession. Highest numbered odd recorder to the lowest numbered odd recorder followed by the emergency recorder and then the highest numbered even recorder to the lowest numbered even recorder.

3.116 At the master test frame, insert a make busy plug into the R-MB jack of an even recorder. Observe that the MO relay of the odd master timing circuit operates and releases twice; indicating correct operation of the grouping features involving the make busy condition. Then remove the plug from the R-MB jack.

3.117 Restore the CMBE key and observe that the CMBE lamps are extinguished.

3.118 Operate the CMBO (controller make busy odd) key at the master timing frame and observe that the CMBO lamps light at the master timing frame and at the master test frame.

3.119 Insert a make busy plug into the RETE jack at the master timing frame and then remove the plug.

3.120 Observe that the end of tape record is applied on each recorder in the same succession as described in 3.115.

3.121 At the master test frame, insert a make busy plug into the R-MB jack of an odd recorder. Observe that the MO relay of the even master timing circuit operates and releases twice; indicating correct operation of the grouping features involving the make busy condition. Then remove the plug from the R-MB jack.

3.122 Restore the CMBO key and observe that the CMBO lamps are extinguished.

#### (E) Selector Position, Check Lamps and Trouble Recorder Card Time Record

3.123 This test checks the following features of the master timing circuit:

(1) That correct information is provided to the recorders for every position of every selector with respect to month, day, hour, rounds and day of round.

(2) That the check lamps provide the correct indication for each position of the selectors.

(3) That the correct information is provided for the day, hour and minutes on the trouble recorder card time record.

(4) That the control of end of tape records is transferred to the other master timing circuit when a master timing circuit is made busy.

(5) That nonsynchronized selectors in the master timing circuit may be synchronized.

3.124 Do not make these tests during the 5 minutes before or after any hour to prevent interference with the placing of the hour record on the recorders. If the test is in progress at 55 minutes after the hour or it becomes necessary to apply a make busy or transfer pattern to any of the recorders served by the master timing circuit not under test, operate the TT key to the opposite position to that established for the test. The tests may be resumed 5 minutes after the hour or when the transfer or make busy operations are completed by again operating the TT key to the position established for the test.

3.125 Any trouble recorder cards that may be made during the course of this test other than those associated with the test, should be removed and then dated and timed by hand since the time punches on the cards will probably be incorrect.

3.126 Remove all punched trouble recorder cards that may be in the trouble recorder bin.

3.127 Depending upon whether the even or odd master timing circuit is to be tested, remove from service all trunks associated with the even or odd recorders as covered in BSP Sections A375.301 and A375.321. When testing the even master timing circuit, operate the TT key to its E position. When testing the odd master timing circuit, operate the TT key to its O position.

3.128 Assuming that the even master timing circuit is under test, examine approximately 3 feet of unperforated tape of each odd recorder and of the emergency recorder if it is in use and serving in place of an odd recorder. If any splices are found, advance the tape of the recorder

involved by inserting a make busy plug into the R-MB jack and then removing the plug until the splice has advanced beyond the drum. To examine those parts of the tapes that are over the drums of the recorders involved, insert and remove a make busy plug into the R-MB jack of each of these recorders in succession. Make sure that there are no splices in these parts of the tapes. If the odd master timing circuit is under test, perform the above operations on the even recorders and the emergency recorder if it is serving in place of an even recorder.

3.129 Operate the CKL key. While making this test, the selectors of all recorders and the master timing circuit not in control will be out of synchronism with the master timing circuit under test, thereby bringing in the SSF alarm and lighting the OS- lamps for all recorders and the OSE or OSO lamp. When the major alarm sounds and the SSF lamp lights, momentarily operate the ACO key at the master timing frame to silence the alarm.

3.130 Depending upon whether the even or the odd master timing circuit is being tested, select an even or an odd recorder to be used for the test. Then mark the tape of this recorder as described in 3.11.

#### M Selector

3.131 Block non-operated the P7A relay of the recorder record control circuit of the master timing circuit under test.

3.132 Operate and release the MOH relay of the month, day and hour control circuit of the master timing circuit under test until the associated M selector is in position 1 and check lamp M1 is lighted.

3.133 At the master test frame, insert a make busy plug into the R-MB jack of the recorder used for the test and after a short interval, observe that the TRR lamp lights and the major alarm sounds. Then immediately remove the blocking tool from P7A relay.

3.134 Momentarily operate the TRRAR key to extinguish the TRR lamp and silence the alarm. Then remove the plug from the R-MB jack.

3.135 At the trouble recorder, observe that a card has been punched with the number 283X01 recorded in the A' to F' line. The X refers to the day of round or day units and may be disregarded at this time. Also observe that the TMG, DR- and RG-RST- indications are punched.

However, the TV, D, RT, PT, PAK, Pl, RD, BSP, DA, HR, SC, SY, RN and MO punches on the card and if XA wiring option is used, the P punch also are not pertinent to this test.

3.136 Proceed as in 3.131 to 3.135 inclusive, for each of positions 2 to 12 of the M selector. Observe that the recordings on the trouble recorder cards correspond with the punches indicated in Table B.

Table B - M Selector Positions

Position of M Selector	M-Check Lamp Lighted	Digits A' to F' Designations Punched on Trouble Recorder Card
1*	1	283X01
2	2	283X02
3*	3	283X03
4	4	283X04
5	5	283X05
6*	6	283X06
7	7	283X07
8	8	283X08
9	9	283X09
10*	10	283X10
11	11	283X11
12	12	283X12

\*Selector positions for tests to be made as specified in 3.192

## DT and DU Selectors

3.137 When the master timing circuit provides the round and day of round entries, the RD selector is provided. In this case proceed as in 3.138 to 3.144 inclusive, and disregard 3.145 to 3.163 inclusive. When the master timing circuit is arranged for flexible round operation, the RD selector is not provided. In this case, disregard 3.138 to 3.144 inclusive, and proceed as in 3.145 to 3.163 inclusive.

3.138 Block non-operated the P3A relay of the master timing circuit under test.

3.139 Operate and release the DTH relay as required until the associated DT selector is in position 1 and the DTO check lamp is lighted.

3.140 Operate and release the DH relay as required until the associated DU selector is in position 1 and the DU1 check lamp is lighted.

3.141 At the master test frame, insert a make busy plug into the R-MB jack of the recorder used for the test and, after a short interval, observe that the TRR lamp lights and the major alarm sounds. Remove the blocking tool from the P3A relay.

3.142 At the master test frame, momentarily operate the TRRAR key to extinguish the TRR lamp and silence the alarm. Then remove the plug from the R-MB jack.

3.143 At the trouble recorder, observe that a card has been punched with the number 282101 recorded in the A' to F' line. Also observe that the TMG, DR- and RG-RST- punches are recorded and on the last line, that the number 0 in the DT (day tens) and the number 1 in the DU (day units) are punched to correspond to the lighted check lamps. However, the TV, D, RT, PT, PAK, Pl, RD, BSP, DA and SY punches on the card are not pertinent to this test.

3.144 Proceed as in 3.138 to 3.143 inclusive, for each of the positions 1 to 4 of the DT selector and positions 2 to 20 of the DU selector. Observe that the recordings on the trouble recorder cards correspond to the punches and lighted check lamps indicated in Table C.

Table C - DT and DU Selector Positions

Position of Selectors		Check Lamps Lighted		Digits A' to F' Designations Punched on Trouble Recorder Card
DT	DU	DT-	DU-	
1*	1*	0	1	282101
1	2	0	2	282102
1*	3*	0	3	282103
1	4	0	4	282104
1	5	0	5	282105
1*	6*	0	6	282106
1	7	0	7	282107
1	8	0	8	282108
1	9	0	9	282109
2*	10*	1	0	282110
2	11	1	1	282111
2	12	1	2	282112
2	13	1	3	282113
2	14	1	4	282114
2	15	1	5	282115
2	16	1	6	282116
2	17	1	7	282117
2	18	1	8	282118
2	19	1	9	282119
3*	20*	2	0	282120
4*	11*	3	1	282131

\*Selector positions for tests to be made as specified in 3.192

3.145 Block non-operated the P3A relay of the master timing circuit under test.

3.146 Operate and release the DTH relay as required until the associated DT selector is in position 1 and the DTO check lamp is lighted.

3.147 Operate and release the DH relay as required until the associated DU selector is in position 1 and the DUL check lamp is lighted.

3.148 At the master test frame, insert a make busy plug into the R-MB jack of the recorder used for the test and, after a short interval, observe that the TRR lamp lights and the major alarm sounds. Then, immediately remove the blocking tool from the P3A relay.

3.149 At the master test frame, momentarily operate the TRRAR key to extinguish the TRR lamp and silence the alarm. Then remove the plug from the R-MB jack.

3.150 At the trouble recorder, observe that a card has been punched with the number 282101 recorded in the A' to F' line. Also observe that the TMG, DR- and RG-RST- punches are recorded and on the last line, that the numbers in the DT (day tens) and DU (day units) positions on the last line of the card are punched to correspond to the lighted check lamps. However, the TV, D, RT, PT, PAK, P1, RD, BSP, DA and SY punches on the card are not pertinent to this test.

3.151 Block non-operated the P7A relay of the master timing circuit under test.

3.152 At the master test frame, insert a make busy plug into the R-MB jack of the recorder used for the test and, after a short interval, observe that the TRR lamp lights and the major alarm sounds. Then, immediately remove the blocking tool from the P7A relay.

3.153 At the master test frame, momentarily operate the TRRAR key to extinguish the TRR lamp and silence the alarm. Then remove the plug from the R-MB jack.

3.154 At the trouble recorder, observe that a card has been punched with the number 2831XX recorded in the A' to F' line and also the TMG, DR- and RG-RST- indications. The number 1 in the D' position corresponds to the DU check lamp. The XX in the E' and F' positions represent the month tens and month units which may be disregarded at this time. Also, the TV, D, RT, PT, PAK, P1, RD, BSP, DA, HR, SC, SY, RN and MO punches on the card and if XA wiring option is used, the P punch also are not pertinent to this test.

3.155 Block non-operated the P8A relay of the master timing circuit under test.

3.156 At the master test frame, insert a make busy plug into the R-MB jack of the recorder used for the test and, after

a short interval, observe that the TRR lamp lights and the major alarm sounds. Then, immediately remove the blocking tool from the P8A relay.

3.157 At the master test frame, momentarily operate the TRRAR key to extinguish the TRR lamp and silence the alarm. Then remove the plug from the R-MB jack.

3.158 At the trouble recorder, observe that a card has been punched with the number 2840XX recorded in the A' to F' line and also the TMG, DR- and RG-RST- indications. The number 0 recorded in the D' position corresponds to the DT check lamp. The XX in the E' and F' positions represents the marker group tens and marker group units which may be disregarded at this time. Also, the TV, D, RT, PT, PAK, P1, RD, BSP, DA, HR, SC, SY, RN, MO and MG punches on the card and if XA wiring option is used, the P punch also are not pertinent to this test.

3.159 Proceed as in 3.145 to 3.150 inclusive, for position 1 of the DT selector with each of positions 2, 4, 5 and 7 to 9 inclusive, of the DU selector. Observe that in each case the record on the A' to F' line of the trouble recorder card corresponds to the number listed in Table D

Table D - DT and DU Selector Positions

Position of Selectors		Check Lamps Lighted		A- to F- Line on Trouble Card	Relay Blocked Non-Optd.
DT	DU	DT-	DU-		
1*	1*	0	1	282101	P3A
1	1	0	1	2831XX	P7A
1	1	0	1	2840XX	P8A
1	2	0	2	282102	P3A
1*	3*	0	3	282103	P3A
1	3	0	3	2833XX	P7A
1	4	0	4	282104	P3A
1	5	0	5	282105	P3A
1*	6*	0	6	282106	P3A
1	6	0	6	2836XX	P7A
1	7	0	7	282107	P3A
1	8	0	8	282108	P3A
1	9	0	9	282109	P3A
2*	10*	1	0	282110	P3A
2	10	1	0	2830XX	P7A
2	10	1	0	2841XX	P8A
2	11	1	1	282111	P3A
2	12	1	2	282112	P3A
2	13	1	3	282113	P3A
2	14	1	4	282114	P3A
2	15	1	5	282115	P3A
2	16	1	6	282116	P3A
2	17	1	7	282117	P3A
2	18	1	8	282118	P3A
2	19	1	9	282119	P3A
3*	20*	2	0	282120	P3A
3	20	2	0	2842XX	P8A
4*	11*	3	1	282131	P3A
4	11	3	1	2843XX	P8A

\*Selector positions for tests to be made as specified in 3.192.

3.160 Proceed as in 3.145 to 3.154 inclusive, for position 1 of the DT selector with each of positions 3 and 6 of the DU selector. Observe that in each case the records on the A' to F' line of the trouble recorder card correspond to the numbers listed in Table D.

3.161 Proceed as in 3.145 to 3.158 inclusive, for position 2 of the DT selector with position 10 of the DU selector. Observe that the records on the A' to F' line of the trouble recorder cards correspond to the numbers listed in Table D.

3.162 Proceed as in 3.145 to 3.150 inclusive, for position 2 of the DT selector with each of positions 11 to 19 inclusive, of the DU selector. Observe that in each case the record on the A' to F' line of the trouble recorder card corresponds to the number listed in Table D.

3.163 Proceed as in 3.145 to 3.150 and 3.155 to 3.158 inclusive for each of position 3 of the DT selector with position 20 of the DU selector and position 4 of the DT selector with position 11 of the DU selector. Observe that in each case the record on the A' to F' line of the trouble recorder card corresponds to the number listed in Table D.

#### RD Selector

3.164 When the master timing circuit is arranged to furnish the round and day of round information, block non-operated the P8A relay of the master timing circuit under test. Otherwise disregard 3.165 to 3.173 inclusive.

3.165 Operate and release the RH relay until the associated RD selector is in position 1 and check lamps RDO and DR1 are lighted.

3.166 Insert a make busy plug into the R-MB jack of the recorder used for the test and, after a short interval, observe that the TRR lamp lights and the major alarm sounds. Then, immediately remove the blocking tool from the P8A relay.

3.167 Momentarily operate the TRRAR key to extinguish the TRR lamp and silence the alarm.

3.168 At the trouble recorder, observe that a card has been punched with the number 2840XX recorded in the A' to F' line and also the TMG, DR- and RG-RST-indications. The number 0 recorded in the D' position represents the round (0). The XX in the E' and F' positions represents the marker group number which may be disregarded at this time. Also, the TV, D, RT, PT, PAK, Pl, RD, BSP, DA, HR, SC, SY, RN, MO and MG punches on the card and if XA wiring option is used, the P punch also are not pertinent to this test.

3.169 Block non-operated the P7A relay.

3.170 Remove the make busy plug from the R-MB jack and, after a short

interval, observe that the TRR lamp lights and the major alarm sounds. Then, immediately remove the blocking tool from the P7A relay.

3.171 Momentarily operate the TRRAR key to extinguish the TRR lamp and silence the alarm.

3.172 At the trouble recorder, observe that a card has been punched with the number 2831XX recorded in the A' to F' line and also the TMG, DR- and RG-RST-indications. The number 1 in the D' position represents the day of round (1). The XX represents the month which may be disregarded at this time. Also, the TV, D, RT, PT, PAK, Pl, RD, BSP, DA, HR, SC, SY, RN and MO punches on the card and if XA wiring option is used, the P punch also are not pertinent to this test.

3.173 Proceed as in 3.165 to 3.172 inclusive, for positions 2 to 31 of the RD selector as shown in Table E. In each case, the fourth digit on the card obtained as in 3.168 corresponds to the number of the lighted RD-check lamp and the fourth digit on the card obtained as in 3.172 corresponds to the lighted DR-check lamp.

Table E - RD Selector Positions

Position of RD Selector	Check Lamps Lighted			
	6 Rounds Per Month		10 Rounds Per Month	
	RD-	DR-	RD-	DR-
	(3.168)†	(3.172)†	(3.168)†	(3.172)†
1*	0	1	0	1
2	0	2	0	2
3	0	3	0	3
4	0	4	1	4
5	0	5	1	5
6*	1	1	1	3
7	1	2	2	1
8	1	3	2	2
9	1	4	2	3
10*	1	5	3	1
11	2	1	3	2
12	2	2	3	3
13*	2	3	4	1
14	2	4	4	2
15	2	5	4	3
16	3	1	5	1
17	3	2	5	2
18	3	3	5	3
19*	3	4	6	1
20	3	5	6	2
21*	4	1	6	3
22	4	2	7	1
23	4	3	7	2
24	4	4	7	3
25	4	5	8	1
26	5	1	8	2
27	5	2	8	3
28	5	3	9	1
29	5	4	9	2
30	5	5	9	3
31	5	6	9	4

\* Selector positions for tests to be made as specified in 3.192.

† Paragraphs in which lighted check lamps are noted.

HT and HU Selectors

- 3.174 Block non-operated the P4A relay of the master timing circuit under test.
- 3.175 Operate and release the HTH relay as required until the HT selector is in position 1 and the HTO check lamp is lighted.
- 3.176 Operate and release the HUH relay as required until the HU selector is in position 1 and the HVO check lamp is lighted.
- 3.177 Insert a make busy plug into the R-MB jack of the recorder used for the test and, after a short interval, observe that the TRR lamp lights and the major alarm sounds. Then, immediately remove the blocking tool from the P4A relay.
- 3.178 Momentarily operate the TRRAR key to extinguish the TRR lamp and silence the alarm.
- 3.179 Remove the plug from the R-MB jack.
- 3.180 At the trouble recorder, observe that a card has been punched with the TMG, DR- and RG-RST- indications, the number 281100 recorded in the A' to F' line and on the last line, the number 0 in the HT (hour tens) position and the number 0 in the HU (hour units) position, corresponding to the lighted HT- and HU-check lamps, respectively. However, the TV, D, RT, PT, PAK, Pl, RD, BSP, DA, HR and SY punches on the card and if XA wiring option is used, the P punch also are not pertinent to this test.

3.181 Proceed as in 3.174 to 3.180 inclusive, for each of the positions 1 to 3 of the HT selector and positions 2 to 10 of the HU selector as shown in Table F.

Table F - HT and HU Selector Positions

Position of Selector	Check Lamps Lighted		Digits A' to F' Designations Punched on Trouble Ticket
	HT-	HU	
HT 1*	0	0	281100
HT 2*	1	1	281111
HT 3*	2	2	281122
HT 1*	0	3	281103
HT 1	0	4	281104
HT 1	0	5	281105
HT 1*	0	6	281106
HT 1	0	7	281107
HT 1	0	8	281108
HT 1	0	9	281109

\*Selector positions for tests to be made as specified in 3.182 and 3.192

- 3.182 Repeat the tests in 3.174 to 3.180 inclusive, for the selector positions in Table F marked by an asterisk (\*), using each of the other even recorders if the even master timing circuit is under test or using each of the other odd recorders and the emergency recorder if the odd master timing circuit is under test. On each recorder used, mark the recorder tape as described in 3.11.

H-, T- and U- Check Lamps

3.183 Operate and release the HH, TH and UH relays as necessary to step each of the H, T and U selectors to position 1. Observe that the HO, TO and UO check lamps are lighted. Again operate and release the HH, TH and UH relays to step the selectors in succession to each of the other positions listed in Table G. In each case, observe that the H-, T- and U- check lamps are lighted as indicated in this table.

Note: It may be necessary to block the UH relay non-operated while checking each selector position to insure that the selectors remain in the positions set up for the test.

Table G - H, T and U Selector Positions

H, T or U Selector Position	Check Lamps Lighted		
	H-	T-	U-
1*	0	0	0
2*	1	1	1
3	2	2	2
4*	3	3	3
5*	4	4	4
6	5	5	5
7	+	6	6
8	0	7	7
9	1	8	8
10	2	9	9
11	3	0	0
12	4	1	1
13	5	2	2
14	+	3	3
15	0	4	4
16	1	5	5
17*	2	6	6
18	3	7	7
19	4	8	8
20	5	9	9
21	+	+	+
22	+	+	+

+Indicates positions from which the selector automatically steps.

\*H and T selector positions for tests to be made as specified in 3.192.

## Trouble Recorder Card Time Record - Minutes

- 3.184 Block non-operated the P3A relay of the master timing circuit under test.
- 3.185 Operate and release the HH and TH relays as necessary to step each of the H and T selectors to position 1.
- 3.186 Insert a make busy plug into the R-MB jack of the recorder used for the test and, after a short interval, observe that the TRR lamp lights and the major alarm sounds. Then, immediately remove the blocking tool from the P3A relay.
- 3.187 Momentarily operate the TRRAR key to extinguish the TRR lamp and silence the alarm.
- 3.188 Remove the plug from the R-MB jack.
- 3.189 At the trouble recorder, observe that a card has been punched recording the TMG, DR- and RG-RST- indications and on the last line, the number 0 recorded in the MT (minutes tens) position and the number 0 recorded in the MU (minutes units) position, corresponding to position 1 of the H and T selectors. All other punches on the card are not pertinent to the test at this time.
- 3.190 Proceed as in 3.184 to 3.189 inclusive for each of positions 2 to 20 on the H and T selectors, matching the H and T selector positions with the time in minutes as shown in Table H.

Table H - H and T Selector Positions

H and T Selector Positions	Time in Minutes	
	Tens	Units
1*	0	0
2*	1	1
3	2	2
4*	3	3
5*	4	4
6	5	5
7*	+	6
8	0	7
9	1	8
10	2	9
11	3	0
12	4	1
13	5	2
14	+	3
15	0	4
16	1	5
17	2	6
18	3	7
19	4	8
20	5	9
21	+	+
22	+	+

\*Selector positions for tests to be made as specified in 3.191 and 3.192  
+Selector steps automatically

## Recorder Record Control

- 3.191 When testing the even master timing circuit, operate the CMBE key. When testing the odd master timing circuit, operate the CMBO key. Operate the TT key to its opposite position. Then proceed as in 3.184 to 3.189 inclusive for each of the selector positions marked by an asterisk (\*) in Table H.
- 3.192 Operate the TT key to its opposite position and except for blocking the mentioned relays in the other master timing circuit, proceed as in 3.131 to 3.136 inclusive. Also, if an RD selector is provided proceed as in 3.138 to 3.144, 3.164 to 3.181 and 3.184 to 3.190 inclusive or if an RD selector is not provided, proceed as in 3.145 to 3.181 and 3.184 to 3.190 inclusive. For example, when testing the even master timing circuit block the relays in the odd master timing circuit but set the timing selectors of the even master timing circuit in the positions indicated by asterisks (\*) in Tables B, C or D, E, F and G.

## Selector Synchronizing

- 3.193 Operate the TT key to its opposite position
- 3.194 Momentarily operate the S (synchronize) key to synchronize the selectors of the master timing circuit under test. While the selectors are stepping to synchronized positions, observe that the SO and OSE lamps are lighted if the TT key is now in the O position or, that the SE and OSO lamps are lighted if the TT key is now in the E position.
- 3.195 When the SO and OSE lamps or the SE and OSO lamps become extinguished, the selectors are synchronized. Then restore the CKL and the CMBE or CMBO keys.
- 3.196 Mark the tapes of all recorders used in performing this test, following the procedure described in 3.105.

- 3.197 Restore to service all trunks associated with the even or odd recorders as covered in BSP A375.301 and A375.321.

(F) Preference and Lock Out Features

- 3.198 This test checks the preference and lock out features of the start relays. Also, checks are made of the start relay chain circuits for continuity and freedom from crosses.

- 3.199 Make sure that the emergency recorder is not serving in the place of a regular recorder as indicated by the absence of a make busy plug in any R-TN jack at the master test frame.
- 3.200 Remove from service all trunks associated with all odd recorders as covered in Sections A375.301 and A375.321.
- 3.201 Block non-operated the SCO relay.
- 3.202 Connect battery to the BF terminal of the EST relay. Observe that the EST relay operates. Check for the absence of battery on contacts 9T, 3B and 6B of the EST relay.
- 3.203 Connect battery to the BF terminal of the lowest numbered odd ST-relay. Observe that the lowest numbered odd ST-relay operates and that the EST relay remains operated. Open the 1T and 2T contacts of the EST relay and observe that this relay releases.
- 3.204 Remove the test connection from the EST relay.
- 3.205 Check for the absence of battery on contacts 9T, 3B and 6B of the ST1 relay.
- 3.206 When the office is equipped with more than one odd recorder, connect battery to the BF terminal of the next higher numbered odd ST-relay. Observe that this relay operates and the lower numbered odd ST-relay remains operated. Open the 1T and 2T contacts of the lower numbered odd ST-relay and observe that this relay releases.
- 3.207 Check for the absence of battery on contacts 9T, 3B and 6B of the higher numbered ST-relay.
- 3.208 Proceed as in 3.206 and 3.207 for all other odd ST-relays in the preference chain.
- 3.209 Remove all test connections.
- 3.210 Restore to service all trunks associated with the odd recorders as covered in BSP A375.301 and A375.321.
- 3.211 Remove from service all trunks associated with the even recorders as covered in BSP A375.301 and A375.321.
- 3.212 Block non-operated the SCE relay.
- 3.213 On the even ST-relays, proceed as in 3.203 to 3.208 inclusive, except omit checks on the EST relay at this time.
- 3.214 Remove all test connections.
- 3.215 Operate the CMBE key.
- 3.216 Connect battery to the BF terminal of the highest numbered even ST-relay. Observe that this relay operates. Check for the absence of battery on the 9T, 3B and 6B contacts of this relay.
- 3.217 Connect battery to the BF terminal of the EST relay. Observe that this relay operates and the highest numbered even ST-relay remains operated. Open the 1T and 2T contacts of the highest numbered even ST-relay and observe that this relay releases.
- 3.218 Check for the absence of battery on contacts 9T, 3B and 6B of the EST relay.
- 3.219 Remove the test connections from the highest numbered even ST-relay and from the EST relay.
- 3.220 Restore the CMBE key.
- 3.221 Remove the blocking tools from the SCE and SCO relays and restore to service all trunks associated with the even recorders as covered in BSP A375.301 and A375.321.
- (G) Selector Exercise Feature
- 3.222 This test checks the operation of the master timing circuit selectors by using the exercise keys.

**Odd Master Timing Circuit**

- 3.223 With the TT key in the E position, operate the CMBO key.
- 3.224 Operate and hold operated the EXM (exercise month) key. Observe that the M selector of the odd master timing circuit steps steadily and uniformly throughout the arc.
- 3.225 When the M selector has been exercised for approximately 10 seconds, release the EXM key.
- 3.226 Operate and hold operated the EXD (exercise day) key. Observe that the DT and DU selectors step steadily and uniformly throughout their arcs.
- 3.227 When the DT and DU selectors have been exercised for approximately 10 seconds, release the EXD key.
- 3.228 Operate and hold operated the EXH (exercise hour) key. Observe that the HT and HU selectors step steadily and uniformly throughout their arcs.
- 3.229 When the HT and HU selectors have been exercised for approximately 10 seconds, release the EXH key.
- 3.230 Operate and hold operated the EXR (exercise rounds) key if provided. Observe that the RD selector steps steadily and uniformly throughout the arc.
- 3.231 When the RD selector has been exercised for approximately 10 seconds, release the EXR key.
- 3.232 Momentarily operate the S key. Observe that the SE lamp is lighted while the M, DT, DU, HT, HU and RD selectors are stepping to the synchronized positions.
- 3.233 When the SE lamp is extinguished, restore the CMBO key.

**Even Master Timing Circuit**

- 3.234 Operate the CMBE key and operate the TT key to its O position.
- 3.235 Proceed as in 3.224 to 3.231 inclusive, for the even master timing circuit selectors.
- 3.236 Momentarily operate the S key. Observe that the SO lamp is lighted while the selectors are stepping to the synchronized positions.
- 3.237 When the SO lamp is extinguished, restore the CMBE key and operate the TT key to its E position.

**(H) Pulse Failure Alarm**

- 3.238 This test checks that an alarm will operate when the TE or TO

timer fails to provide a pulse every six seconds to step the selectors of the master timing circuits and the recorders. A check is also made that the audible part of the alarm may be silenced when desired.

- 3.239 With the TT key in its E position, connect ground to the 8B spring of the PE relay and start the stop watch.
- 3.240 When the PF(pulse failure) lamp lights, stop the stop watch and observe that the reading is within 6 to 11 seconds. Also observe that the major alarm sounds and that the aisle pilot lamp is lighted at the master timing frame.
- 3.241 At the master timing frame, momentarily operate the ACO key. Observe that the major alarm is silenced and the aisle pilot lamp is extinguished.
- 3.242 Remove the test connection from the PE relay.
- 3.243 Momentarily operate the AR key. Observe that the PF lamp is extinguished.
- 3.244 Insulate the 8B contact of the PE relay and start the stop watch.
- 3.245 When the PF lamp lights, stop the stop watch and observe that the reading is within 6 to 11 seconds.
- 3.246 Remove the insulator from the PE relay.
- 3.247 Momentarily operate the AR key to extinguish the lamps and silence the alarm.
- 3.248 Operate the TT key to its O position.
- 3.249 Proceed as in 3.244 to 3.247 inclusive, except apply to the PO relay.
- 3.250 Operate the TT key to its E position.
- (I) Transfer Control Features and Timer Synchronism Failure Alarm**
- 3.251 This test checks that an alarm will be brought in if the TE and TO timers become out of synchronism with each other. A check is made that the audible part of the alarm may be silenced when desired. A check is also made of the feature that drops a pulse when a transfer from one master timing circuit to the other is made at a time when the TE and TO timers are out of synchronism with each other.
- 3.252 With the TT key in its E position, insulate the 4T contact of the PO relay. When the CSY relay releases, block it non-operated.

3.253 Observe that the TSF (timer synchronism failure) and the aisle pilot lamps light and the major alarm sounds. Momentarily operate the ACO key to silence the audible alarm and extinguish the aisle pilot lamp.

3.254 Remove the insulator from the PO relay.

3.255 Operate the CKL key, operate the TT key to its 0 position and start the stop watch. When the SSF lamp and the OS- lamp for each recorder are lighted, stop the stop watch and observe that the reading is within 6 to 12 seconds.

3.256 At the master test frame, check if there is a make busy plug in any R-TN jack. If so, momentarily operate the S key at the master timing frame to synchronize the selector of the associated recorder. The SO lamp will be lighted while the recorder selector is stepping to a synchronized position followed by the extinguishing of the recorder OS- lamp.

3.257 At the master test frame, insert a make busy plug into the R EM MB jack. Then momentarily operate the S key at the master timing frame. The SO lamp will be lighted while the emergency recorder selectors are stepping to the synchronized position, followed by the extinguishing of the EM OS lamp.

3.258 Remove the plug from the R EM MB jack.

3.259 If the emergency recorder is available, insert a make busy plug into the R-TN jack of one of the regular recorders whose OS- lamp is lighted or, if the emergency recorder is not available, insert a make busy plug into the R-MB jack of this recorder. Momentarily operate the S key at the master timing frame to synchronize the recorder selectors. When the SO lamp is extinguished, remove the plug from the R-TN or R-MB jack.

Caution: When more than one transfer is made from the same recorder to the emergency recorder during the period covered by the same hour entry (from 1 to 2, 2 to 3, etc.), it may not be possible for the accounting center to associate the entries for two or more calls on the same trunk which have their initial entries on one tape and the answer and disconnect time entries on the other tape. Therefore, while making this test, avoid (if possible) making more than one transfer from the same recorder during the same hour period.

3.260 If it is necessary to make multiple transfers from the same recorder during the same hour period because of

encountering trouble conditions or for any other reason, proceed as described in 3.261 to 3.263 inclusive. Otherwise, disregard 3.261 to 3.263 inclusive, and proceed as in 3.264.

3.261 Mark the tapes of the regular and emergency recorders as follows:

(a) At the master test frame;

(1) After the regular recorder has been transferred the first time, insert a make busy plug into the R-TST jack of the recorder used for the test.

(2) After inserting the plug of a No. 32A test set into the R Jack, momentarily operate the white button of the test set to cause a test call group to be perforated on the recorder tape. The RUT lamp will be lighted while the test call group is being perforated.

(3) When the RUT lamp is extinguished, again momentarily operate the white button of the test set to cause a second test call group to be perforated on the recorder tape and relight the RUT lamp.

(4) When the RUT lamp is again extinguished, remove the plug from the R-TST jack.

(b) At the perforator associated with the recorder used for the test;

(1) Raise the reel clutch release arm and hook it over the catch.

(2) Pull back some slack in the tape and, if necessary to obtain access, disengage the tape from the tape guides.

(3) Then, using a red china marking pencil, place two large crosses on the smooth side of the tape over the splice entries adjacent to the diamond pattern farthest from the perforator drum.

(4) Replace the tape in the tape guides, wind the tape back on the reel and lower the reel clutch release arm.

(c) At the master test frame;

(1) Remove the plug from the R-TN jack of the recorder used for the test.

(2) Insert make busy plugs into the R EM MB and R EM TST jacks.

(3) Momentarily operate the white button of the No. 32A test set to cause a test call group to be perforated on the emergency recorder tape and light the RUT lamp while the tape is being perforated.

(4) When the RUT lamp is extinguished, again momentarily operate the white button of the test set to cause a second test call group to be perforated on the emergency recorder tape and relight the RUT lamp.

(5) When the RUT lamp is again extinguished, remove the plugs from the R EM MB and R EM TST jacks.

(d) At the perforator associated with the emergency recorder, mark the tape over the splice entries of the make busy pattern nearest the perforator drum in the same manner as for steps (b1) to (b4) inclusive of this paragraph.

3.262 At this time, one or more transfer patterns may be applied as necessary, after which the regular and emergency recorder tapes must again be marked to indicate the end of tape area containing multiple transfer patterns within the same hour period.

3.263 Before the last transfer back to the regular recorder is made, mark the tapes as follows:

(a) At the master test frame;

(1) Insert a make busy plug into the R-TST jack of the recorder used for the test.

(2) Momentarily operate the white button of the No. 32A test set to cause a test call group to be perforated on the recorder tape and light the RUT lamp while the tape is being perforated.

(3) When the RUT lamp is extinguished, again momentarily operate the white button of the test set to cause a second test call group to be perforated on the recorder tape and relight the RUT lamp.

(4) When the RUT lamp is again extinguished, remove the plug from the R-TST jack.

(b) At the perforator associated with the recorder used for the test;

(1) Raise the reel clutch release arm and hook it over the catch.

(2) Pull back some slack in the tape and, if necessary to

obtain access, disengage the tape from the tape guides.

(3) Then, using a red china marking pencil, place two large crosses on the smooth side of the tape over the lower of the two diamond patterns, that is, the diamond pattern farthest from the perforator drum.

(4) In the splice entry area of the transfer pattern and about 3 inches below the lowest part of the diamond pattern which has been marked, that is, in the direction farthest from the perforator drum, fold the tape back on itself so that the smooth side is exposed. Then, using the diagonal pliers, make two cuts in the folded tape at angles to form a V so that a square or diamond shaped hole will be left in the tape. This hole shall be located on the right hand side of the tape (E and F perforator positions) as viewed from the front of the perforator and is similar to the tape illustrated in Fig. 1 for paragraph 3.105.

Caution: When cutting this hole, use care that the cuts end at a common point and that no slivers are left in the paper; otherwise trouble may result when the tape is processed at the accounting center.

(5) After the tape has been marked and cut as described, replace the tape in the tape guides, wind the tape back on the reel and lower the reel clutch release arm. Then, using an ordinary shipping tag, make a record that multiple transfers were made in the same hour period, listing the recorder number, marker group number and a notation that diamond patterns, make busy or transfer patterns specially marked with red crosses were placed on the tape at the beginning and end of the tape area containing the multiple transfer patterns. Then attach this tag to one of the support bars associated with the reel containing the specially marked tape.

(c) At the master test frame;

(1) Remove the plug from the R-TN jack of the recorder used for the test.

(2) Insert make busy plugs into the R EM MB and R EM TST jacks.

(3) Momentarily operate the white button of the No. 32A test set

to cause a test call group to be perforated on the emergency recorder tape and light the RUT lamp while the tape is being perforated.

(4) When the RUT lamp is extinguished, again momentarily operate the white button of the test set to cause a second test call group to be perforated on the emergency recorder tape and relight the RUT lamp.

(5) When the RUT lamp is again extinguished, remove the plugs from the R EM MB and R EM TST jacks.

(d) At the perforator associated with the emergency recorder, mark the tape in the same manner as described in steps (b1) to (b5) inclusive of this paragraph except that the diamond window should be placed in the splice entry area of the make busy pattern.

3.264 Proceed as in 3.259 and 3.260 for each of the other regular recorders which has its OS- lamp lighted.

3.265 Operate the TT key to its E position. Observe that within 6 to 12 seconds the SSF lamp and the OS- lamp of each recorder are lighted, then proceed as in 3.256 to 3.260 inclusive, and 3.264.

3.266 Remove the blocking tool from the CSY relay and momentarily operate the AR key to extinguish the TSF and SSF lamps.

3.267 Restore the CKL key.

(J) Selector Synchronism Check and  
Selector Synchronism Check Failure  
Alarm

3.268 This test checks that the selectors are checked for synchronism once each minute and that an alarm will be brought in if one or more selectors associated with a master timing circuit or recorder become out of synchronism with the corresponding selector of the controlling master timing circuit. Also, checks are made that the hour entry will not be perforated when a selector synchronism failure alarm occurs and that the audible part of the alarm may be silenced when desired.

3.269 With the CMBE, CMBO and CKL keys normal and the TT key in the E position, observe that the check lamps RD- and DR- if provided and M-, DT-, DU-, HT-, HU-, H-, T- and U- light and are extinguished once each minute.

3.270 Operate and then release the UH relay of the odd master timing circuit

and start the stop watch. When the SSF lamp lights, stop the stop watch and observe that the reading is within one minute. Also observe that the major alarm sounds and that the aisle pilot and check lamps light.

3.271 Operate the CKL key. Observe that the OSO lamp lights but the OSE lamp does not light.

3.272 Momentarily operate the ACO key. Observe that the major alarm is silenced and the aisle pilot lamp is extinguished.

3.273 If "ZD" wiring option is provided, connect ground to the 3T spring of the TCE relay. Observe that the HE relay does not operate.

3.274 Remove the test connection from the TCE relay.

3.275 Operate the CMBO key and observe that the CMBO lamp lights.

3.276 Momentarily operate the S key. Observe that the SE lamp is lighted while the odd master timing selector is stepping to a synchronized position and is then extinguished. Observe that the OSO lamp is extinguished. Momentarily operate the AR key and observe that the SSF lamp is extinguished. Restore the CKL key.

3.277 Restore the CMBO key and observe that the CMBO lamp is extinguished.

3.278 Proceed as in 3.270 to 3.272 and 3.275 to 3.277 inclusive, for the RH and DH relays if provided and the TH, HH, HUH, HTH, DTH and MOH relays of the odd master timing circuit in succession.

3.279 Operate the TT key to the O position. Observe that the check lamps RD- and DR- if provided and M-, DT-, DU-, HT-, HU-, H-, T- and U- light and are extinguished once each minute.

3.280 Operate and then release the UH relay of the even master timing circuit and start the stop watch. When the SSF lamp lights, stop the stop watch and observe that the reading is within one minute. Also observe that the major alarm sounds and that the check lamps light.

3.281 Operate the CKL key. Observe that the OSE lamp lights but the OSO lamp does not light.

3.282 Momentarily operate the ACO key. Observe that the major alarm is silenced.

- 3.283 If "ZD" wiring option is provided, connect ground to the 3T spring of the TCO relay. Observe that the HO relay does not operate.
- 3.284 Remove the test connection from the TCO relay.
- 3.285 Operate the CMBE key and observe that the CMBE lamp lights.
- 3.286 Momentarily operate the S key. Observe that the SO lamp is lighted while the even master timing circuit selector is stepping to a synchronized position and is then extinguished. Observe that the OSE lamp is extinguished. Momentarily operate the AR key and observe that the SSF lamp is extinguished. Restore the CKL key.
- 3.287 Restore the CMBE key and observe that the CMBE lamp is extinguished.
- 3.288 Proceed as in 3.280 to 3.282 and 3.285 to 3.287 inclusive, for the RH and DH relays if provided and the TH, HH, HUH, HTH, DTH and MOH relays of the even master timing circuit in succession.
- 3.289 Operate the TT key to the E position.

(K) Both Master Timing Circuits Made Busy Alarm

- 3.290 This test checks that an alarm will be brought in if the CMBE and CMBO keys are both operated at the same time.
- 3.291 Operate the CMBO key and observe that the CMBO lamp lights.
- 3.292 Operate the CMBE key. Observe that the CMBE lamp is lighted but the MBE relay is not operated. Observe that the major alarm sounds and the aisle pilot lamp is lighted.
- 3.293 Restore the CMBO key. Observe that the major alarm is silenced and the aisle pilot lamp is extinguished.
- 3.294 Operate the CMBO key. Observe that the major alarm sounds and the aisle pilot lamp is lighted but the MBO relay is not operated.
- 3.295 Restore the CMBO and CMBE keys. Observe that the alarm is silenced and the aisle pilot lamp is extinguished.

(L) Timer Start Control

- 3.296 This test checks the ability of the TE or TO timer to start and run in synchronism with its mate timer when one of the timers has been stopped and is therefore in an unsynchronized position.

3.297 With the TT key in the E position, operate the MSO (master timer start or stop odd) key to the STP (stop) position. Observe that the major alarm sounds and the TSF and aisle pilot lamps are lighted. Observe also that the TO timer is stopped. The SSF lamp will also light within one minute.

3.298 Momentarily operate the ACO key to silence the alarm and extinguish the aisle pilot lamp.

3.299 Operate the CMBO and CKL keys.

3.300 Grasp the hub of the TO timer and turn the cam shaft manually very slowly in the direction in which it normally rotates until the small cam passes under and beyond the contact operating finger and clears it by approximately 3/32 of an inch.

3.301 At any time except when the U8 or U9 lamp is lighted, operate the MSO key to the ST (start) position. Within one minute observe that the TO timer starts. Then operate the MSO key to the R (run) position.

3.302 Momentarily operate the S key. Observe that the SE lamp is lighted while the odd master timing circuit selectors are stepping to the synchronized position and is then extinguished.

3.303 Momentarily operate the AR key to silence the alarm and extinguish the TSF, SSF and aisle pilot lamps.

3.304 Restore the CMBO key.

3.305 Operate the TT key to its O position, then apply the tests in 3.297 to 3.304 inclusive, to the TE timer using the MSE (master timer start or stop even) key and the CMBE key.

3.306 Operate the TT key to its E position and restore the CKL key.

(M) Time Out Alarm Features

3.307 This test checks the following:

- (a) That an alarm is brought in by the master timing circuit upon failure to complete the recording of a make busy, transfer, splice or 3:00 AM end of the tape pattern.
- (b) That the long time out feature as applied to make busy, transfer and splice patterns brings in an alarm in 18 to 30 seconds.
- (c) That the splice pattern of 3:00 AM end of tape patterns is timed for a 66 to 78 second period.

(d) That the long time out feature as applied to the 3:00 AM end of tape pattern brings in the trouble recorder request alarm within 78 to 90 seconds in case of failure of the short timeout feature.

(e) That the auxiliary long time out feature will provide a trouble indication within 2 to 5 minutes when a failure occurs in the long time out as applied to a 3:00 AM end of tape pattern.

Caution: Do not make this test during the five minutes before or after any hour or while the master timing circuit is engaged in making 3:00 AM end of tape entries.

3.308 Remove from service all trunks associated with the even or odd recorders as covered in BSP Sections A375.301 and A375.321, depending upon whether the even or odd master timing circuit, respectively, is to be tested.

#### Short Time-Out Alarm

3.309 Block non-operated the P3A relay of the master timing circuit to be tested.

3.310 At the master test frame, insert a make busy plug into the R-MB jack of an even or odd recorder, depending upon whether the even or the odd master timing circuit is being tested and at the same time start the stop watch. When the TRR lamp lights, stop the stop watch and observe that the reading is within 4 to 7 seconds. Also observe that the major alarm sounds.

3.311 Momentarily operate the TRRAR key and observe that the TRR lamp is extinguished and the alarm is silenced.

3.312 Remove the blocking tool from the P3A relay to permit completion of the record on the tape.

3.313 Remove the plug from the R-MB jack.

3.314 Block non-operated the P3A, TMR, TM5 and TM6 relays.

3.315 Insert a make busy plug into the R-MB jack of the recorder used for the test. Observe that the TM2 relay operates, then when it releases start the stop watch. When the TM2 relay again operates, stop the stop watch and note that the reading is within 2 to 4 seconds.

3.316 Using a No. 411A tool, check that the TM6 relay is not energized.

3.317 Remove the blocking tool from the TM5 relay. When the TM2 relay

releases, start the stop watch. When the TM2 relay again operates, stop the stop watch and note that the reading is within 2 to 4 seconds. Observe that the TM5 and TIB relays are operated and that the TM6 relay is energized.

3.318 Remove the blocking tool from the P3A relay and, after approximately 5 seconds, remove the blocking tools from the TMR and TM6 relays.

3.319 Remove the plug from the R-MB jack.

#### Display Lost Alarm

3.320 Make the trouble recorder busy to the master timing circuit by inserting a make busy plug into the TRMB MTE (trouble recorder make busy master timing circuit even) or TRMB MTO (trouble recorder make busy master timing circuit odd) jack at the master test frame, depending upon whether the even or the odd master timing circuit is under test.

3.321 Block non-operated the P3A relay of the master timing circuit under test.

3.322 Insert a make busy plug into the R-MB jack of an even or odd recorder depending upon whether the even or odd master timing circuit is being tested. Within 4 to 7 seconds, observe that the major alarm sounds. Also observe that the TRR and the DL MTE (display lost master timing circuit even) or DL MTO (display lost master timing circuit odd) lamps are lighted at the master test frame.

3.323 Remove the blocking tool from the P3A relay.

3.324 At the master test frame, momentarily operate the TRRAR key and observe that the TRR and DL MTE or DL MTO lamps are extinguished and the alarm is silenced.

3.325 Remove the plugs from the TRMB MTE or TRMB MTO and R-MB jacks.

#### Long Time Out and Auxiliary Long Time Out Alarm

3.326 Block non-operated the TM1 and TM6 relays and insulate the 1T and 9T contacts of the ET1 relay and 1T contact of the LTB relay of the master timing circuit under test.

3.327 Insert a make busy plug into the R-MB jack of an even or odd recorder, depending upon whether the even or odd master timing circuit is under test and, at the same time, start the stop watch. Observe the following:

- (1) That within 18 to 30 seconds the LT4 relay operates but the major alarm does not sound.
  - (2) That within 66 to 78 seconds the TSP relay operates.
  - (3) That within 78 to 90 seconds the LT9 relay operates.
- 3.328 Interconnect the 10B and 11B springs of the ETL relay and using a No. 411A tool, observe that the TMI relay is energized.
- 3.329 Insulate the 7B contact of the LT9 relay. Check that the TMI relay is not energized.
- 3.330 Remove the insulator from the LTB relay and observe that within 2 to 5 minutes the TMI relay is energized (when "E" wiring option is used) or the TM6 relay is energized (when "B" wiring option is used).
- 3.331 Remove the test connection from the ETL relay. Remove the insulators from the LT9 and ETL relays and the blocking tool from the TMI relay.
- 3.332 When the TMI relay is released, remove the blocking tool from the TM6 relay.
- 3.333 Remove the plug from the R-MB jack of the recorder used for the test.
- 3.334 Momentarily operate the LT4 relay. Observe that the major alarm sounds. At the master timing frame, observe that the TAE (time alarm even) and ETFE (end of tape failure even) or the TAO (time alarm odd) and ETFO (end of tape failure odd) lamps are lighted to correspond with the even or odd master timing circuit under test.
- 3.335 At the master test frame, observe that the CMBE and MTE (master timing even) or the CMBO and MTO (master timing odd) lamps are lighted to correspond with the even or odd master timing circuit under test.
- 3.336 At the master timing frame, momentarily operate the AR key to silence the alarm and extinguish the lamps at the master timing frame and master test frame.
- (N) Perforator Lead Cross Detection Feature
- 3.337 This test checks the ability of the master timing circuit to:
- (a) Detect false battery or ground on the perforator leads to the recorders.
  - (b) Detect false grounds on the perforator leads within the master timing circuit.
  - (c) Call in the trouble recorder to register trouble conditions detected by the standing test.
  - (d) Make itself busy under control of the AR key when it has detected a trouble on one or more of the perforator leads.
- 3.338 Momentarily connect ground to stationary spring 2 of the RCE relay of the even master timing circuit. Observe that the major alarm sounds and the TRR and CMBE lamps at the master test frame and the aisle pilot lamp light. Also, observe that the CMBE lamp lights at the master timing frame.
- 3.339 At the master test frame, momentarily operate the TRRAR key and observe that the alarm is silenced and the TRR and aisle pilot lamps are extinguished.
- 3.340 At the master timing frame, momentarily operate the AR key and observe that the CMBE lamps are extinguished.
- 3.341 At the trouble recorder, observe that a card has been punched recording the TMG and DR- indications and the XPL trouble indication.
- 3.342 Block non-operated the PLXE relay.
- 3.343 Momentarily connect ground to each of the following stationary springs of the RCE relay and in each case observe that while the ground is applied the XPE relay is operated: 3, 4, 10, 11, 12, 13, 14, 20, 21, 22, 23, 24, 30, 31, 32, 33, 34, 40, 41, 42, 43, 44, 50, 51, 52, 53, 54.
- 3.344 Momentarily connect battery to stationary spring 2 of the RCE relay of the even master timing circuit and observe that the XPE relay is operated while the battery is applied.
- 3.345 Remove the blocking tool from the PLXE relay.
- 3.346 Proceed as in 3.338 to 3.345 inclusive, for the RCO relay of the even master timing circuit using the PLXO and XPO relays and the CMBO lamps.
- 3.347 Momentarily connect ground to operating spring 2 of the RCE relay of the even master timing circuit. Observe that the major alarm sounds and the TRR and CMBE lamps at the master test frame light. Also, observe that the CMBE

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lamp lights at the master timing frame.

3.348 At the master test frame, momentarily operate the TRRAR key and observe that the alarm is silenced and the TRR and CMBE lamps are extinguished.

3.349 At the trouble recorder, observe that a card has been punched recording the TMG and DR- indications and the XPL trouble indication.

3.350 Block non-operated the PLXE relay.

3.351 Momentarily connect ground to each of the following operating springs of the RCE relay and in each case observe that while the ground is applied the XPEL relay is operated: 3, 4, 10, 11, 12, 13, 14, 20, 21, 22, 23, 24, 30, 31, 32, 33, 34, 40, 41, 42, 43, 44, 50, 51, 52, 53, 54.

3.352 Remove the blocking tool from the PLXE relay.

3.353 Proceed as in 3.347 to 3.352 for the RCO relay of the even master timing circuit using the PLXO and XPO1 relays and the CMBO lamps.

3.354 Proceed as in 3.338 to 3.353 for the odd master timing circuit.

(0) End of Tape Failure Alarm Test

3.355 This test checks that a major alarm sounds in case the master timing circuit fails to start the 3:00 AM end of tape record.

3.356 Momentarily connect ground to the brush contact on arc 2 on the U selector of the even master timing circuit when the brush reaches terminal 5 or 15. Observe that the major alarm sounds and the ETFO lamp lights.

3.357 Momentarily operate the AR key. Observe that the alarm is silenced and the ETFO lamp is extinguished.

3.358 Momentarily connect ground to the brush contact on arc 2 on the U selector of the odd master timing circuit when the brush reaches terminal 5 or 15. Observe that the major alarm sounds and the ETFE lamp lights.

3.359 Momentarily operate the AR key. Observe that the alarm is silenced and the ETFE lamp is extinguished.

3.360 Operate the CMBO key and then momentarily connect ground to the

brush contact on arc 2 on the U selector of the even master timing circuit when the brush reaches terminal 5 or 15. Observe that the major alarm sounds and the ETFE lamp lights.

3.361 Momentarily operate the AR key. Observe that the alarm is silenced and the ETFE lamp is extinguished.

3.362 Restore the CMBO key and then operate the CMBE key.

3.363 Momentarily connect ground to the brush contact on arc 2 on the U selector of the odd master timing circuit when the brush reaches terminal 5 or 15. Observe that the major alarm sounds and the ETFO lamp lights.

3.364 Momentarily operate the AR key. Observe that the alarm is silenced and the ETFO lamp is extinguished. Then restore the CMBE key.

(P) Fuse Alarm Make Busy Feature

3.365 This test checks that the master timing circuit is made busy when one of its 48 volt supply fuses or its +130 volt supply fuse operates.

Even Master Timing Circuit

3.366 Momentarily operate the FA relay. At the master timing frame, observe that the FGE and CMBE lamps light. At the master test frame, observe that the MTFG lamp lights.

3.367 At the master timing frame, momentarily operate the AR key. Observe that the FGE, CMBE and MTFG lamps are extinguished.

3.368 If the FA2 relay is provided, momentarily operate it. Observe that the FA1 relay is operated.

3.369 At the master timing frame, momentarily operate the AR key. Observe that the FA1 relay is released.

Odd Master Timing Circuit

3.370 Proceed as in 3.366 to 3.369 inclusive, except that the FA and FA2 relays in the odd circuit and the FGO and CMBO lamps are used.

4. REPORTS

4.01 The required record of these tests shall be entered on the proper form.