MASTER TIMING CIRCUIT SD-25633-01
ONE SECOND TIMING FEATURES
TESTS
NO. 5 CROSSBAR OFFICE

1. GENERAL

1.001 This addendum supplements Section 218-772-502, Issue 2. Place this pink sheet ahead of Page 1 of the BSP.

1.002 This addendum is issued for the following reason; where the master timing circuit (MTC) is equipped with a 4E-type timer, the correct time indication check is changed from ±12 seconds to ±5 seconds of the precise time source. Where the 4B-type timer is in use the tolerance of ±12 seconds remains unchanged.

This addendum does not affect the Equipment Test Lists.

2. CHANGES TO SECTION

2.001 On Page 5, Test A, Step 3, Verification, change to read: Where the master timing circuit is equipped with option UC (***4E-type timer***)—Check that the sum of the elapsed time on the stopwatch agrees within 5 seconds of the time displayed on the H_, T_, ST_, U_ check lamps, at the instant the watch was stopped.

Where the master timing circuit is equipped with option UB (***4B-type timer***)—Check that the sum of the elapsed time on the stopwatch agrees within 12 seconds of the time displayed on the H_, T_, ST_, U_ check lamps, at the instant the watch was stopped.

2.002 On Page 5, Test A, Step 4a, Action, change to read: If time indication is incorrect by more than 5 seconds (4E-type timer) or 12 seconds (4B-type timer)—Reset master timing circuits to correct time as described in section titled "MASTER TIMING CIRCUIT—METHOD OF HANDLING ALARMS" under "Pulse Failure Alarm."

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1. GENERAL

1.01 This section describes the procedures to be followed to test the master timing circuit SD-25633-01 and its features using one-second timing.

1.02 The reasons for reissuing this section are listed below. Revision arrows show the more significant changes. Equipment Test Lists are not affected.

(a) To correct errors in test J.

(b) To make minnor changes as required.

1.03 The tests covered are:

Ability of the master timing circuit to make itself busy under control of the AR key when it has detected a trouble on one or more of the perforator leads. 39

O. End-of-Tape Failure Alarm Test: This test checks that a major alarm sounds in the event the master timing circuit fails to start the 3:00 A.M. end-of-tape record. 41

P. FA, FA1 Fuse Alarm Relays and Make-Busy Feature: 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. 42

Q. LT1 Through LT9 Relays (Long Timer): This test checks the LT1-LT9 chain circuit of the master timer. 42

R. Paper Take-Up and Jammed Paper Alarms: This test checks that the major alarm sounds and a visual indication is given when the punched paper tape fails to accumulate properly on the storage reel. 43

1.04 Tests covered in this section should not be made during the time any recorders are perforating the 3:00 A.M. end-of-tape entry.

1.05 The performance of Tests B, E, and M can result in the loss of charge records for service calls.

1.06 Tests B, D, E, M, and N require actions and verifications at the trouble recorder frame and the master timing frame at the same time.

1.07 A different recorder should be used each time that Test B is performed so that eventually all recorders will have been tested.

1.08 If Test B or M indicates trouble in the timing network of the SP or TM2 cold cathode tube, check the timing interval as covered in the circuit requirements table.

1.09 The term "trouble record" used in this section means a perforated trouble card when a trouble recorder is provided.

1.10 Reference should be made to the section which covers precautions to be observed for limiting stoppages at the accounting center caused by central office tape irregularities.

1.11 A regular recorder should not be transferred to the emergency recorder during the interval from 2 minutes before or 1 minute after any 10 minute period or more than once during the same 10 minute period. (Recorders perforate 5 ten minute entries, and 1 hour entry. See Fig. 1 for examples of non transfer times.)

1.12 Before starting any test which will cause the perforation of transfer, make-busy, window splice patterns, or trouble entries on the associated tape, use a red china marking pencil and draw a line across the unperforated tape at the point where it enters the chute. On completion of testing, proceed as follows at the associated perforator.

	ENTRIES					
	HOUR	TEN MINUTE				
	* 0500	0510	0520	0530	0540	0550
Do Not Transfer During This Interval	0458 To 0501	0508 To 0511	0518 To 0521	0528 To 0531	0538 To 0541	0548 To 0551

* Example only — could be any hour and appropriate ten minute entries.

Fig. 1—

(1) Raise the slack arm and hook it over the catch provided.

(2) Pull back some slack in the tape and disengage the tape from the tape guides.

(3) 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) Find the red mark placed on the tape at the start of testing. Mark two large crosses on the smooth side of the tape so that the center of the crosses is 4-1/2 inches from the red mark in a direction away from the perforator drum.

(5) Replace the tape in the tape guides and remove the slack tape arm from the catch.

(6) Record on the accounting center notification form the recorder group, recorder number, date, time, and a note that the tape was marked with red crosses to indicate that all entries between these crosses should be skipped.

1.13 In Part 3 of this section, only those trouble verifications, lamps, and alarms requiring verification as part of the test are listed.

1.14 In offices provided with a master test frame (MTF) trouble recorder, while performing Tests B, E, and M, a DL (display lost) lamp will be lighted at the MTF and a major alarm sounded. To extinguish the lamp and to silence the alarm, operate the TRR-AR key at the MTF. The alarm release may also be handled by remote control by patching the MTF AR jack to the SP jack. To silence the alarm, momentarily insert a 349A plug into the SP jack associated with the frame at which the test is being made.

1.15 In offices equipped with 1-second timing features, it is suggested that the employee performing these tests familiarize himself with this section before actually starting the tests. These tests must be performed in rapid succession due to the short interval between certain functions of this circuit.

1.16 ***Lettered Steps:*** A letter a, b, c, etc, added to a step number in Part 3 of this section indicates an action which may or may not be required, depending on local conditions. The condition under which a lettered step or series of lettered steps should be made is given in the ACTION column, and all steps governed by the same condition are designated by the same letter within a test. Where a condition does not apply, all steps designated by that letter should be omitted.

2. APPARATUS

2.01 The apparatus required for each test is listed in Table A. The details of each item are covered in the paragraph indicated by the number in parentheses.

2.02 Testing cord, 6 feet long, equipped with two 360A tools (1W13B cord), one KS-6278 connecting clip, and one 509A (relay winding connector) tool (for use in establishing test connections to relay windings).

2.03 Testing cord, 893 cord, 6 feet long, equipped with two 360A tools (1W13B cord), one KS-6278 connecting clip, and one 419A (test connector) tool (for use in establishing test connections to relay springs).

2.04 Testing cord, 893 cord, 3 feet long, equipped with two 360A tools (1W13A cord) and two 419A (test connector) tools (for use when interconnecting relay springs).

2.05 Testing cord, 893 cord, 6 feet long, equipped with two 360A tools (1W13B cord), one KS-6278 connecting clip, and one 411A (test pick) tool (for use in establishing momentary test connections to relay springs and selector brushes).

2.06 67C test set or equivalent, equipped with one KS-6278 connecting clip (to check for presence of battery or ground).

2.07 Blocking and insulating tools as required. Use tools and apply as covered in Section 069-020-801.

TABLE A

APPARATUS	TESTS													
	A	B	C	D	E	F	H	I	J	M	N	O	Q	R
322A (make-busy) Plug		√	√	√	√			√		√				
KS-3008 Stopwatch or equivalent	1	1					1	1	1	1			1	1
32A Test Set		1			1					1				
Cord (2.02)						2								
Cord (2.03)		1					1		1					
Cord (2.04)										1			1	
Cord (2.05)											1	1		
Test Set (2.06)		1				1								
Red China Marking Pencil		1			1					1				
Tools (2.07)		√			√	√	√	√		√	√		√	

√ As required.

3. METHOD

STEP	ACTION	VERIFICATION
A. Time Indication Check		
1	▶Check precise time source per local procedures and start the stopwatch precisely at the beginning of any minute and record the time.◀	
2	At master timing frame— Operate CKL key.	M_, DT_, DU_, HT_, HU_ lamps lighted. These check lamps indicate correct month, day tens, day units, hour tens, hour units, respectively. H_, T_, ST_, U_ lamps lighted. These check lamps indicate time in minutes and seconds up to 59.59, respectively, and are read as a unit.
3	▶When U_ check lamp has just extinguished— Stop timing and record time as indicated by H_, T_, ST_, U_ check lamps.◀	▶Check that the sum of the elasped time on the stopwatch agrees within 12 seconds (±0.2 minute) of the time displayed on the H_, T_, ST_, U_ check lamps, at the instant the watch was stopped.◀
4a	If time indication is incorrect by more than 12 seconds— Reset master timing circuits to correct time as described in section titled "MASTER TIMING	

STEP	ACTION	VERIFICATION
	CIRCUIT—METHOD OF HANDLING ALARMS" under "Pulse Failure Alarm".	
5	Depress CLT key.	Lighted check lamps indicate time provided by master timer not in control.
6	Restore and depress CLT key several times.	Comparison of lighted check lamps indicates both timers are in synchronism.
7	Restore CLT and CKL keys.	Check lamps extinguished.

B. End-of-Tape Feature

Caution: The charge records on recorder tapes for service calls made during the time this test is in progress cannot be properly processed by the accounting center. The tapes are marked for the accounting center to disregard the tape area covering both service call entries as well as improper test entries.

1	Select an AMA recorder associated with master timing circuit to be tested; mark tape as indicated in paragraph 1.12.	
2	At master timing circuit under test— Block nonoperated P3A relay.	
3	At trouble recorder frame— Insert make-busy plug into recorder MB jack associated with AMA recorder being used for testing.	Trouble record taken. Indications as listed in Table B for P3A relay.
4	At master timing circuit under test— When TIB relay operates— Remove blocking tool from P3A relay.	
5	Block nonoperated P4A relay.	
6	At trouble recorder frame— Remove make-busy plug.	Trouble record taken. Indications as listed in Table B for P4A relay.
7	At master timing circuit under test— When TIB relay operates— Remove blocking tool from P4A relay.	
8	At master timing circuit under test— Block nonoperated P5A relay.	

STEP	ACTION	VERIFICATION
9	At trouble recorder frame— Insert make-busy plug into recorder MB jack associated with AMA recorder being used for testing.	
10	Remove make-busy plug from MB jack.	At master timing circuit under test— MO relay operated, released twice.
11	At AMA recorder being used for testing— Block nonoperated U relay. ***Note:*** This may cause a selector synchronism failure alarm (at master timing frame, SSF lamp lighted). If this occurs, momentarily operate the ACO key at the master timing frame to silence the audible alarm. If option VM is provided, the alarm will reinstate at 10 minute intervals. Reoperate the ACO key to silence the audible alarm.	
12	Repeat Step 3, substituting P5A relay for P3A relay.	Trouble record taken. Indications as listed in Table B for P5A relay.
13	At AMA recorder being used for testing— Remove blocking tool from U relay.	
14a	If SSF lamp is lighted at master timing frame— Momentarily operate AR key.	SSF lamp extinguished.
15	Repeat Steps 4, 5, 6, 7 substituting P6A for P4A relay and substituting P5A for P3A relay.	Trouble record taken. Indications as listed in Table B for P6A relay.
16	Repeat Steps 2 through 7, substituting P7A for P3A relay, P8A for P4A relay.	Trouble record taken. Indications as listed in Table B for P7A, P8A relays.
17	Repeat Steps 2, 3, 4 substituting COP relay for P3A relay.	Trouble record taken. Indications as listed in Table B for COP relay.
18	At master timing circuit under test— Block nonoperated SS relay.	
19	At trouble recorder frame— Remove make-busy plug from MB jack.	
20	At master timing circuit under test— Remove blocking tool from SS relay; ***start timing.***	
21	When TSP relay operates, ***stop timing.***	Elapsed time within 2.5 to 4.5 seconds.

STEP	ACTION	VERIFICATION
22	Repeat Steps 2, 3, substituting P1A relay for P3A relay.	Trouble record taken. Indications as listed in Table B for P1A relay.
23b	If P2A relay is provided— Repeat Steps 4, 5, 6, 7 substituting P2A relay for P4A relay and substituting P1A for P3A relay.	Trouble record taken. Indications as listed in Table B for P2A relay.
24c	If P2A relay is ***not*** provided— Remove blocking tool from P1A relay. At trouble recorder frame— Remove make-busy plug from MB jack.	
25	At perforator associated with emergency recorder or at other regular recorder where trunk transfer is used— Mark tape and proceed as indicated in paragraph 1.12.	
26	At trouble recorder frame— Insert make-busy plug into recorder TN or RTN jack associated with AMA recorder being used for testing.	At master timing circuit under test— MO relay operated, released four times. At emergency recorder frame— EW lamp lighted.
27	At trouble recorder frame— Remove make-busy plug from TN or RTN jack.	At master timing circuit under test— MO relay operated, released four times. At emergency recorder frame— EW lamp extinguished.
28	At master timing circuit under test— Block nonoperated P5A relay.	
29	At trouble recorder frame— Insert make-busy plug into recorder TN or RTN jack associated with AMA recorder being used for testing.	Trouble record taken. Indications as follows: Perforator magnets A- through F- representing numerals 285500, TV, PT, PAK, P1, RD, A, RT, BSP, DA, HR, SC, SY. P indication if XA wiring is provided.
30	At master timing circuit under test— When TIB relay operates— Remove blocking tool from P5A relay.	
31	At trouble recorder frame— Remove make-busy plug from TN or RTN jack.	
32	At master timing circuit under test— Block nonoperated P5A relay.	
33	At AMA recorder used for testing— Block nonoperated U relay.	

STEP	ACTION	VERIFICATION
	Note: This may cause a selector synchronism failure alarm (at master timing frame, SSF lamp lighted). If this occurs, momentarily operate the ACO key at the master timing frame to silence the audible alarm. If option VM is provided, the alarm will reinstate at 10 minute intervals. Reoperate the ACO key to silence the alarm.	
34	At trouble recorder frame— Insert make-busy plug into recorder TN or RTN jack associated with AMA recorder being used for testing.	Trouble record taken. Indications as follows: Perforator magnets A- through F- representing numerals 285700, TV, PT, PAK, P1, RD, A, RT, BSP, DA, HR, SC, NS. P indication if XA wiring is provided.
35	At master timing circuit under test— When TIB relay operates— Remove blocking tool from P5A relay.	
36	At AMA recorder being used for testing— Remove blocking tool from U relay.	
37a	If SSF lamp is lighted at master timing frame— Momentarily operate AR key.	SSF lamp extinguished.
38	At trouble recorder frame— Remove make-busy plug from TN or RTN jack.	
39	At master timing circuit under test— Block nonoperated P6A relay.	
40	At trouble recorder frame— Insert make-busy plug into recorder TN or RTN jack associated with AMA recorder being used for testing.	Trouble record taken. Indications as follows: Perforator magnets A- through F- representing numerals 2805XX (with XX representing the recorder number), TV, PT, PT1, PAK, P1, RD, A, RT, BSP, DA, HR, SY, SC, RN. P indications if XA wiring is provided.
41	At master timing circuit under test— When TIB relay operates— Remove blocking tool from P6A relay.	
42	At master timing circuit under test— Block nonoperated P6A relay.	
43	At trouble recorder frame— Remove make-busy plug from TN or RTN jack.	Trouble record taken. Indications as follows: Perforator magnets A- through F- representing numerals 2806XX

STEP	ACTION	VERIFICATION
		(with XX representing the recorder number), TV, PT, PT1, PAK, P1, RD, B, RT, BSP, DA, HR, SY, SC, RN. P indication if XA wiring is provided.
44	At master timing circuit under test— When TIB relay operates— Remove blocking tool from P6A relay.	
45	At trouble recorder frame— Insert make-busy plugs into recorder MB and TST or T jacks associated with emergency recorder or other regular recorder where trunk transfer is used.	
46	Insert plug of 32A test set into R jack.	
47	Momentarily operate white (ST) button of 32A test set.	RUT lamp lighted while test entries are perforated.
48	When RUT lamp is extinguished— Momentarily operate white (ST) button of 32A test set.	RUT lamp lighted while test entries are perforated.
49	When RUT lamp is extinguished— Remove make-busy plugs from MB and TST or T jacks.	
50	Remove plug of 32A test set from R jack.	
51	At perforator associated with emergency AMA recorder or other regular recorder where trunk transfer is used— Mark tape and proceed as indicated in paragraph 1.12.	
52d	If ZD option is provided— At master timing frame— Operate TT key to O.	
53	Operate CMBE, CKL keys.	CMBE lamp lighted.
54e	If 4B timer in use— Insulate 4-5 of TE motor.	
55f	If 4E timer is in use— No action is required.	
56	Block nonoperated HRT, TMT relays.	
57	Operate, release PE/PO relay successively until UA-UD relays indicate 5 seconds, by	With CLT key held operated— U5 lamp lighted.

STEP	ACTION	VERIFICATION
	applying ground to the upper winding terminal of the PE/PO relay using the 67C test set or equivalent.	UB, UC relays operated.
58	Operate, release TH relay successively until T selector reaches position 10, and operate, release UH relay successively until U selector reaches position 10.	
59	Operate, release STH relay successively until ST selector reaches position 6.	
60	Operate, release HH relay successively until H selector reaches position 6.	SR, PRE, EPG relays operated.
61	Operate, release HH relay successively until H selector reaches position 13.	SR, PRE, EPG relays operated.
62	Operate, release HH relay successively until H selector reaches position 20.	SR, PRE, EPG relays operated.
63	Operate, release TH relay successively until T selector reaches position 20.	SR, PRE, EPG relays operated.
64	Block nonoperated TH relay.	
65	Block nonoperated STH relay.	SR, PRE relays operated.
66	Operate, release PE/PO relay successively until UA-UD relays indicate 6 seconds, by applying ground to the upper winding terminal of the PE/PO relay using the 67C test set, or equivalent.	With CLT key held operated— U6 lamp lighted. UB, UC, UD relays operated. SR, PRE, EPG relays operated.
67	Repeat Step 65 for 7, 8, and 9 seconds until UA-UD relays indicate 9 seconds.	With CLT key held operated— U_ lamp lighted. UC, UD relays operated. SR, PRE, EPG relays operated.
68	Operate, release UH relay to step U selector to position 20.	SR, PRE relays operated.
69	Block nonoperated UH relay.	
70	Remove blocking tool from STH relay.	
71	Operate, release STH relay successively until ST selector reaches position 13.	
72	Operate, release STH relay successively until ST selector reaches position 20.	SR, PRE, EPG relays operated.

STEP	ACTION	VERIFICATION
73	Remove blocking tools from HRT, TMT relays.	HRT relay operated.
74	Momentarily apply ground to 7B of HRT relay.	HRT1 relay operated.
75	Operate, release PE/PO relay successively until UA-UD relays indicate 7 seconds, by applying ground to upper winding terminal of PE/PO relay using 67C test set, or equivalent.	With CLT key held operated— HRT relay operated during 0 to 6 seconds, as indicated by U0-U6 lamps, and released at 7 seconds as indicated by the lighted U7 lamp.
76	Operate, release HH relay successively until H selector reaches position 1.	TMT relay operated.
77	Repeat Step 76 for positions 2 through 5, 8 through 12, 15 through 19 of the H selector.	TMT relay operated.
78e	If 4B timer in use— Remove insulator from TE motor.	
79f	If 4E timer in use— No action required.	
80	Remove blocking tool from UH relay.	
81	Operate CKL key.	
82	Momentarily operate S key.	SO lamp lighted.
83	When SO lamp is extinguished— Restore CMBE, CKL keys.	CMBE lamp extinguished.
84	Operate TT key to E.	ET lamp lighted within 6 seconds.
85	Operate CMBO key.	CMBO lamp lighted.
86e	If 4B timer in use— Insulate 4-5 of TO motor.	
87f	If 4E timer in use— No action is required.	
88	Block nonoperated HRT, TMT relays.	SR, PRO, OPG relays operated.
89	Remove blocking tool from TH relay.	
90	Remove insulator from PO relay.	
91	Remove blocking tool from UH relay.	
92e	If 4B timer in use— Remove insulator from TO motor.	

STEP	ACTION	VERIFICATION
93f	If 4E timer in use— No action is required.	
94	Operate CKL key.	
95	Momentarily oprate S key.	SE lamp lighted. When 4E timer is in synchronized position— SE lamp will extinguish.
96	When SE lamp is extinguished— Restore CMBO, CKL keys.	CMBO lamp extinguished.
97	Block nonoperated P3A relay.	
98	At AMA recorder used for testing— Momentarily operate SP relay.	Trouble record taken. Indications as follows: Perforator magnets A_ through F_ representing numerals 2821XX (with XX representing the day tens and day units corresponding to the day of the month), TV, PT, PAK, P1, RD, SP, RT, BSP, DA, SY.
99	At master timing circuit under test— When TIB relay operates— Remove blocking tool from P3A relay.	
100	At AMA recorder used for testing— Block operated SP relay.	At AMA recorder frame— NP lamp lighted. Aisle pilot lamp lighted. Major alarm sounds.
101	At AMA recorder used for testing— Remove blocking tool from SP relay.	If recorder has XO option— At AMA recorder frame— NP lamp extinguished. Aisle pilot lamp extinguished. Major alarm silenced.
102g	If recorder has XN option— Momentarily operate AR key.	NR lamp extinguished. Aisle pilot lamp extinguished. Major alarm silenced.
103	At trouble recorder frame— Insert make-busy plug into recorder MB jack associated with AMA recorder used for testing; ***start timing.*** ***Note:*** Steps 104, 105 must be performed in rapid succession.	At master timing circuit under test— SS relay operated. In 2.5 to 4.5 seconds— TSP relay operated. RLS relay momentarily operated. SS, TSP relays released.
104	At trouble recorder frame— Remove make-busy plug from MB jack; ***start timing.***	At master timing circuit under test— SS relay operated.

STEP	ACTION	VERIFICATION
105	After 1.5 seconds— Operate SP relay.	In 4 to 6 seconds after SS relay operated— RSP relay operated. RLS relay momentarily operated. SS, TSP relays released.
106	Block operated ESP relay.	
107	Connect ground to 10B of RLS relay.	
108	Momentarily operate RCT relay.	ROS, SP relays operated, released.
109	Remove test connection from RLS relay.	
110	Remove blocking tool from ESP relay.	
	Note: Steps 112, 113 must be performed in rapid succession.	
111	At trouble recorder frame— Insert make-busy plug into recorder MB jack associated with AMA recorder used for testing.	At master timing frame— ESP relay operated momentarily.
112	At master timing circuit under test— When ESP relay operates— Momentarily operate ROS relay.	At master timing frame— ESP relay released, operated, and released again.
113	At master timing circuit under test— Insulate 8B of LC1 relay.	
114	At trouble recorder frame— Remove make-busy plug from MB jack.	Trouble record taken. Indications as follows: Perforator magnets A_ through F_ representing numerals 2821XX (with XX representing day tens, day units), TV, PT, PAK, P1, RD, E, RT, BSP, DA, SY.
115	At master timing circuit under test— Remove insulator from LC1 relay.	
116	At trouble recorder frame— Insert make-busy plugs into recorder MB and TST or T jacks associated with AMA recorder being used for test.	
117	Insert plug of 32A test set into R jack.	
118	Momentarily operate white (ST) button of 32A test set.	RUT lamp lighted while test entries are perforated.
119	When RUT lamp is extinguished— Momentarily operate white (ST) button of 32A test set.	RUT lamp lighted while test entries are perforated.

STEP	ACTION	VERIFICATION
120	When RUT lamp is extinguished— Remove make-busy plugs from MB and TST or T jacks.	
121	Remove plug of 32A test set from R jack.	
122	At perforator associated with AMA recorder being used for testing— Mark tape and proceed as indicated in paragraph 1.12.	

C. Routine End-of-Tape Record

Caution: Do not make this test during the interval of 1 minute before or after any 10 minute period.

1a	If testing even master timing circuit— At master timing frame— Insert make-busy plug into RETE jack.	At trouble recorder frame— RCDR_ or R_ lamp for highest even-numbered recorder lighted for approximately 5 seconds followed by similar action for each of lower even-numbered recorders. MTE lamp lighted during entire period of test. ***Note:*** If any initial, answer, or disconnect entries for service calls occur during this test, they may be distinguished from the end-of-tape entries by the lighting of RCDR_ or R_ lamp for a period of less than 1 second and should be disregarded.
2a	At master timing frame— Remove make-busy plug from RETE jack.	
3b	If testing odd master timing circuit— At master timing frame— Insert make-busy plug into RETO jack.	At trouble recorder frame— RCDR_ or R_ lamp for highest odd-numbered recorder lighted for approximately 5 seconds followed by similar action for each of lower odd-numbered recorders and EMG RCDR R or EMG R lamps. MTO lamp lighted during entire period of this test. ***Note:*** If any initial, answer, or disconnect entries for service calls occur during this test, they may be distinguished from the end-of-tape entries by the lighting of RCDR_ or R_ lamp for a period of less than 1 second and should be disregarded.
4b	At master timing frame— Remove make-busy plug from RETO jack.	

TABLE B			
RELAY BLOCKED NONOPERATED		TROUBLE RECORD	
MASTER TIMING CIRCUIT	AMA RECORDER CIRCUIT	PERFORATOR MAGNET INDICATIONS A- THROUGH F-	PROGRESS INDICATIONS
P3A	—	2821XX (XX corresponding to day tens, day units).	TV, PT, PAK, P1, RD, D, RT, BSP, DA, SY.
P4A	—	2812XX (XX corresponding to hours tens, hours units).	TV, PT, PAK, P1, RD, E, RT, BSP, DA, HR, SY, also P (if XA wiring is provided).
P5A	U	285600	TV, PT, PAK, P1, RD, D, RT, BSP, DA, HR, SC, NS, also P (if XA wiring is provided).
P6A	—	2805XX (XX corresponding to recorder number in recorder group).	TV, PT, PT1, PAK, P1, RD, E, RT, BSP, DA, HR, SY, RN, also P (if XA wiring is provided).
P7A	—	283 (MT) XX (MT represents minutes-tens. XX represents month tens, months units.	TV, PT, PAK, P1, RD, D, RT, BSP, DA, HR, SY, RN, MO also P (if XA wiring is provided).
P8A	—	284 (DT) XX (ZY option) (DT) represents day tens or recorder group hundreds. XX represents marker group.	TV, PT, PAK, P1, RD, E, RT, BSP, DA, HR, SY, RN, MO, RG, MG, also P (if XA wiring is provided).
P8A	—	289 (DT) XX (ZZ option) (DT) represents day tens or recorder group hundreds. XX represents recorder group.	TV, PT, PAK, P1, RD, E, RT, BSP, DA, HR, SY, RN, MO, RG, also P (if XA wiring is provided).
COP	—	81010	TV, P1, RD, D, RT, ASP, SY, SPA, also P (if XA wiring is provided).
P1A	—	081010	TV, PT, PAK, P1, RD, D, RT, ASP, SY, SPA, also P (if XA wiring is provided).
P2A (if provided)	—	286000	TV, PT, PAK, P1, RD, E, RT, ASP, SY, SPA, SKP, also P (if XA wiring is provided).

STEP	ACTION	VERIFICATION
D. Grouping Feature		
	Caution: Do not make this test during the interval of 1 minute before or after any 10 minute period.	
1	At master timing frame— Operate CMBE key. ***Caution: This test requires the use of both master timing circuits. Therefore, do not make this test if the CMBE or CMBO key is found operated. Determine if satisfactory to restore the operated key, or clear the trouble, then restore the operated key before proceeding with the test.***	CMBE lamp lighted. At trouble recorder frame— CMBE lamp lighted.
2	At master timing frame— Momentarily insert make-busy plug into RETO jack.	At trouble recorder frame— RCDR_, EMG RCDR R, R_, or EMG R lamp lighted for approximately 5 seconds for each recorder in following sequence: highest odd-numbered recorder to lowest odd-numbered recorder, emergency recorder, highest even-numbered recorder to lowest even-numbered recorder.
3	Insert make-busy plug into recorder MB jack for an even-numbered recorder.	At master timing frame— MO relay in odd master timing circuit operated, released twice.
4	At trouble recorder frame— Remove make-busy plug from MB jack.	
5	At master timing frame— Restore CMBE key.	CMBE lamp extinguished.
6	Operate CMBO key.	CMBO lamp lighted. At trouble recorder frame— CMBO lamp lighted.
7	At master timing frame— Momentarily insert make-busy plug into RETE jack.	At trouble recorder frame— RCDR_, EMG RCDR R, R_, or EMG R lamp lighted in same sequence as for Step 2.
8	Insert make-busy plug into recorder MB jack for an odd-numbered recorder.	At master timing frame— MO relay in even master timing circuit operated, released twice.
9	At trouble recorder frame— Remove make-busy plug from MB jack.	

STEP	ACTION	VERIFICATION
10	At master timing frame— Restore CMBO key.	CMBO lamp extinguished.

E. Selector Position and Check Lamp Features

Caution: The charge records on recorder tapes for service calls made during the time this test is in progress cannot be properly processed by the accounting center. The tapes are marked for the accounting center to disregard the tape area covering both service call entries as well as improper test entries.

1a If testing even master timing circuit—
At master timing frame—
Operate TT key to E.

2b If testing odd master timing circuit—
At master timing frame—
Operate TT key to O.

Caution: Do not perform the following steps 1 minute before or after any 10 minute period. This is to prevent interference with the placing of 10 minute records, or hour records, on the recorders. If the test is in progress at 8 minutes after any 10 minute period, 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 test may be resumed 1 minute after the 10 minute period, or when the transfer or make-busy operation is completed, by again operating the TT key to the position established for the test.

3a If testing even master timing circuit—
At even-numbered AMA recorder—
Examine unperforated tape of each even-numbered AMA recorder and of the emergency recorder, or the other regular recorders where trunk transfer is used (if emergency recorder is serving in place of an even recorder) for a distance of approximately 3 feet from input chute.

No splices in unperforated tapes.

STEP	ACTION	VERIFICATION
4b	If testing odd master timing circuit— At odd numbered AMA recorder— Examine unperforated tape of each odd-numbered AMA recorder and of the emergency recorder, or the other regular recorders where trunk transfer is used (if emergency recorder is serving in place of an odd recorder) for a distance of approximately 3 feet from input chute.	No splices in unperforated tapes.
5c	If splice in unperforated tape is found— At trouble recorder frame— Momentarily insert make-busy plug into recorder MB jack associated with AMA recorder, as required, to advance splice beyond perforator drum.	
6	Select AMA recorder associated with master timing circuit to be tested; mark associated tape as indicated in paragraph 1.12.	
7	At master timing frame— Operate CKL key. ***Note:*** While performing the following steps, 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 SSF lamp lights, momentarily operate the ACO key at the master timing frame to silence the alarm. If option VM is provided, the alarm will reinstate at 10 minute intervals. Reoperate the ACO key to silence the audible alarm.	
8	At master timing circuit under test— Block nonoperated P7A relay.	
9	Operate, release MOH relay successively until M selector reaches position 1.	M1 check lamp lighted.
10	At trouble recorder frame— Insert make-busy plug into recorder MB jack associated with AMA recorder being used for testing.	Trouble record taken. Perforator magnet indications A_ through F_ representing numerals 283X01. (X represents minute tens, the X may be disregarded for this test.)

STEP	ACTION	VERIFICATION
11	At master timing circuit under test— When TIB relay operates— Remove blocking tool from P7A relay.	
12	At trouble recorder frame— Remove make-busy plug from MB jack.	
13	Repeat Steps 8 through 12 for each of M selector positions 2 through 12.	Same as Steps 9, 10 with M_ check lamp, E, F indications corresponding to position of M selector.
14	At master timing circuit under test— Block nonoperated P3A relay.	
15	Operate, release DTH relay successively until DT selector reaches position 1.	DT0 check lamp lighted.
16	Operate, release DH relay successively until DU selector reaches position 1.	DU1 check lamp lighted.
17	Operate, release HH relay successively until H selector reaches position 2.	H1 check lamp lighted.
18	At trouble recorder frame— Insert make-busy plug into recorder MB jack associated with AMA recorder being used for testing.	Trouble record taken. Perforator magnets A_ through F_ indications representing numerals 282101. If trouble recorder is provided— Perforations representing day tens 0, day units 1.
19	At master timing circuit under test— When TIB relay operates— Remove blocking tool from P3A relay.	
20	At MTF— Momentarily operate RL key.	
21	At trouble recorder frame— Remove make-busy plug from MB jack.	
22	At master timing circuit under test— Block nonoperated P7A relay.	
23	At trouble recorder frame— Insert make-busy plug into recorder MB jack associated with AMA recorder being used for test.	Trouble record taken. Perforator magnet indications A_ through F_ representing numerals 2831XX (digits represented by XX may be disregarded).
24	At master timing circuit under test— When TIB relay operates— Remove blocking tool from P7A relay.	

STEP	ACTION	VERIFICATION
25	At MTF— Momentarily operate RL key.	
26	At trouble recorder frame— Remove make-busy plug from MB jack.	
27	At master timing circuit under test— Block nonoperated P8A relay.	
28	At trouble recorder frame— Insert make-busy plug into recorder MB jack associated with AMA recorder being used for test.	Trouble record taken. Perforator magnet indications A_ through F_ representing numerals 2840XX (digits represented by XX may be disregarded and digit 0 may represent day tens or recorder group hundreds, depending on office wiring).
29	At master timing circuit under test— When TIB relay operates— Remove blocking tool from P8A relay.	
30	At MTF— Momentarily operate RL key.	
31	At trouble recorder frame— Remove make-busy plug from MB jack.	
32	Repeat Steps 14 through 21, except set DU selector in position 2 as indicated in Table C.	At master timing circuit under test— DT_, DU_ check lamps lighted and perforator magnet indications A_ through F_ as listed in Table C. At trouble recorder frame— DT_, DU_ indications as listed in Table C.
33	Repeat Steps 14 through 21, except set DU selector in position 3, and Steps 22 through 26 with H selector in position 4, as indicated in Table C.	At master timing circuit under test— DT_, DU_, H_ check lamps lighted and A_ through F_ indications as listed in Table C. At trouble recorder frame— DT_, DU_, H_ indications as listed in Table C.
34	Repeat Steps 14 through 21 for each of DU selector positions 4, 5, 6 as applicable to Table C.	At master timing circuit under test— DT_, DU_ check lamps lighted and A_ through F_ indications as listed in Table C. At trouble recorder frame— DT_, DU_ indications as listed in Table C.
35	Repeat Steps 14 through 21 for each of DU selector positions 7, 8, 9 as applicable to Table C.	At master timing circuit under test— DT_, DU_ check lamps lighted and A_ through F_ indications as listed in Table C. At trouble recorder frame— DT_, DU_ indications as listed in Table C.

STEP	ACTION	VERIFICATION
36	Repeat Steps 14 through 31 except set DU selector in position 10, and H selector in position 1, as indicated in Table C.	At master timing circuit under test— DT_, DU_, H_ check lamps lighted and A_ through F_ indications as listed in Table C. At trouble recorder frame— DT_, DU_, H_ indications as listed in Table C.
37	Repeat Steps 14 through 21 for each of DU selector positions 11 through 20, DT selector in position 2 as applicable in Table C.	At master timing circuit under test— DT_, DU_ check lamps lighted and A_ through F_ indications as listed in Table C. At trouble recorder frame— DT_, DU_ indications as listed in Table C.
38	Repeat Steps 14 through 21, 27 through 31, except set DT selector in position 7, DU selector in position 20 as applicable in Table C.	At master timing circuit under test— DT_, DU_ check lamps lighted and A_ through F_ indications as listed in Table C. At trouble recorder frame— DT_, DU_ indications as listed in Table C.
39	Repeat Steps 14 through 21, 27 through 31, except set DT selector in position 4, DU selector in position 11 as applicable in Table C.	At master timing circuit under test— DT_, DU_ check lamps lighted and A_ through F_ indications as listed in Table C. At trouble recorder frame— DT_, DU_ indications as listed in Table C.
40	At master timing circuit under test— Block nonoperated P4A relay.	
41	Operate, release HTH relay successively until HT selector reaches position 1.	HT0 check lamp lighted.
42	Operate, release HUH relay successively until HU selector reaches position 1.	HU0 check lamp lighted.
43	At trouble recorder frame— Insert make-busy plug into recorder MB jack associated with AMA recorder being used for test.	Trouble record taken. Perforator magnet indications A_ through F_ representing numerals 281200. At trouble recorder frame— Indications representing hours tens 0, hours units 0.
44	At master timing circuit under test— When TIB relay operates— Remove blocking tool from P4A relay.	
45	At MTF— Momentarily operate RL key.	
46	At trouble recorder frame— Remove make-busy plug from MB jack.	

STEP	ACTION	VERIFICATION

TABLE C

RELAY BLOCKED NONOPERATED	POSITION OF SELECTORS			CHECK LAMPS LIGHTED			PERFORATOR MAGNET INDICATIONS A- THROUGH F-	DAY INDICATIONS	
	DT	DU	H	DT	DU	H		DT-	DU-
P3A	1	1		0	1		282101	0	1
P7A	1	1	2	0	1	1	2831XX		
P8A	1	1		0	1		† 2840XX		
P3A	1	2		0	2		282102	0	2
P3A	1	3		0	3		282103	0	3
P7A	1	3	4	0	3	3	2833XX		
P3A	1	4		0	4		282104	0	4
P3A	1	5		0	5		282105	0	5
P3A	1	6		0	6		282106	0	6
P3A	1	7		0	7		282107	0	7
P3A	1	8		0	8		282108	0	8
P3A	1	9		0	9		282109	0	9
P3A	2	10		1	0		282110	1	0
P7A	2	10	1	1	0	0	2830XX		
P8A	2	10		1	0		† 2841XX		
P3A	2	11		1	1		282111	1	1
P3A	2	12		1	2		282112	1	2
P3A	2	13		1	3		282113	1	3
P3A	2	14		1	4		282114	1	4
P3A	2	15		1	5		282115	1	5
P3A	2	16		1	6		282116	1	6
P3A	2	17		1	7		282117	1	7
P3A	2	18		1	8		282118	1	8
P3A	2	19		1	9		282119	1	9
P3A	3	20		2	0		282120	2	0
P8A	3	20		2	0		† 2842XX		
P3A	4	11		3	1		282131	3	1
P8A	4	11		3	1		† 2843XX		

Note: Digits represented by XX may be disregarded.

† Digit preceding XX represents day tens or recorder group hundreds.

47 Repeat Steps 39 through 45 except set HT selector in positions 1, 2, 3 successively, HU selector in positions 2 through 10 successively as indicated in Table D.

At master timing circuit under test—
HT_, HU_ check lamps lighted and perforator magnet indications A_ through F_ as listed in Table D.
At trouble recorder frame—
HT_, HU_ indications as listed in Table D.

48a If testing even master timing—
Operate TT key to position O or if testing odd master timer operate TT key to position E.

STEP	ACTION	VERIFICATION
49	At master timing circuit under test— Operate, release HH, TH, UH relays successively until H, T, U selectors reach position 1.	With CLT key held operated— H0, T0, U0 check lamps lighted.
50	Depending on master timing circuit under test— Insulate 2M of PE/PO relay.	
51	Operate, release HH, TH, STH, PE/PO relays successively until H, T, ST selectors reach position 1, and UA-D relays indicate 0. (UD only operated.)	With CLT key held operated— H0, T0, ST0, U0 check lamps lighted.
52	Repeat Step 51 for each of the UA-D relay operations as indicated in Table E.	H_, T_, ST_ U_ check lamps lighted as indicated in Table E.
53	At master timing circuit under test— Block nonoperated P3A relay.	
54	Operate, release HH, TH relays successively until H, T selectors reach position 1.	
55	At trouble recorder frame— Insert make-busy plug into recorder MB jack associated with AMA recorder being used for test.	Trouble record taken. MT0, MU0 indications as listed in Table F.
56	At master timing circuit under test— When TIB relay operates— Remove blocking tool from P3A relay.	
57	At trouble recorder frame— Remove make-busy plug from MB jack.	

TABLE D

POSITION OF SELECTORS		CHECK LAMPS LIGHTED		TROUBLE RECORD		
				PERFORATOR MAGNET INDICATIONS	HOUR INDICATIONS	
HT	HU	HT	HU	A- THROUGH F-	HT-	HU-
1	1	0	0	281200	0	0
2	2	1	1	281211	1	1
3	3	2	2	281222	2	2
1	4	0	3	281203	0	3
1	5	0	4	281204	0	4
1	6	0	5	281205	0	5
1	7	0	6	281206	0	6
1	8	0	7	281207	0	7
1	9	0	8	281208	0	8
1	10	0	9	281209	0	9

STEP	ACTION	VERIFICATION

TABLE E

H, T, OR ST SELECTOR POSITIONS	UA-UD RELAY OPERATIONS	CHECK LAMPS LIGHTED CORRESPONDING TO POSITIONS OF H, T, ST SELECTORS AND UA-UD RELAYS RESPECTIVELY			
		H-	T-	ST-	U-
1	UD	0	0	0	0
2	UB, UD	1	1	1	1
3	UB	2	2	2	2
4	UA, UB	3	3	3	3
5	UA, UB, UD	4	4	4	4
6	UA, UB, UC, UD	5	5	5	5
7	UA, UB, UC	‡	6	+	6
8	UB, UC	0	7	0	7
9	UB, UC, UD	1	8	1	8
10	UC, UD	2	9	2	9
11	UD	3	0	3	0
12	UB, UD	4	1	4	1
13	UB	5	2	5	2
14	UA, UB	‡	3	+	3
15	UA, UB, UD	0	4	0	4
16	UA, UB, UC, UD	1	5	1	5
17	UA, UB, UC	2	6	2	6
18	UB, UC	3	7	3	7
19	UB, UC, UD	4	8	4	8
20	UC, UD	5	9	5	9
21		‡	+	+	
22		‡	+	+	

‡ Indicates H lamp not lighted when H selector in positions 7, 14, 21, and 22.

+ Indicates positions from which the selector steps automatically.

58	Repeat Steps 50 through 53 for each of H, T selector positions.	Trouble record taken. MT_, MU_ indications as listed in Table F.
59	Remove insulator from PE/PO relay.	
60b	If testing odd master timing circuit— At master timing circuit under test— Operate TT key to E.	
61	Operate CMBO key.	CMBO lamp lighted.
62	Momentarily operate S key.	SE, OSO lamps lighted.

STEP	ACTION	VERIFICATION
63	When SE, OSO lamps are extinguished— Restore CKL, CMBO keys.	CMBO lamp extinguished.
64a	If testing even master timer— Operate TT key to O.	
65	Operate CMBE key.	CMBE lamp lighted.
66	Momentarily operate S key.	SO, OSE lamps lighted.
67	When SO, OSE lamps are extinguished— Restore CKL, CMBE keys.	CMBE lamp extinguished.
68	Momentarily operate AR key.	SSF lamp extinguished.
69	At trouble recorder frame— Insert make-busy plugs into recorder MB and TST or T jacks associated with AMA recorder being used for testing.	
70	Insert plug of 32A test set into R jack.	
71	Momentarily operate white (ST) button of 32A test set.	RUT lamp lighted while test entries are perforated.
72	When RUT lamp is extinguished— Momentarily operate white (ST) button of 32A test set.	RUT lamp lighted while test entries are perforated.
73	When RUT lamp is extinguished— Remove make-busy plug from MB and TST or T jack.	
74	Remove plug of 32A test set from R jack.	
75	At MTF— Momentarily operate RL key.	
76	At perforator associated with AMA recorder being used for testing— Mark tape and proceed as indicated in paragraph 1.12.	

F. Preference and Lockout Features

Caution: Do not make busy or transfer any recorders while this test is in progress. Also do not perform this test if window splice in the paper tape is near enough to being perforated since a splice pattern will not be perforated during this test.

STEP	ACTION	VERIFICATION

TABLE F

H, T SELECTOR POSITIONS	TROUBLE RECORD MINUTE INDICATIONS	
	MT-	MU-
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	+	+

+ Indicates positions from which the selector steps automatically.

1	At master timing frame— Block nonoperated SCO relay.	
2	Connect battery to 9BF of EST relay.	EST relay operated. No battery on 9T, 3B, 6B of EST relay.
3	Connect battery to 9BF of ST1 relay.	ST1 relay operated. EST relay remains operated.
4	Open 1-2T of EST relay.	EST relay released. No battery on 9T, 3B, 6B, of ST1 relay.
5	Remove test connection from EST relay.	
6	Connect battery to 9BF of ST3 relay.	ST3 relay operated. ST1 relay remains operated.

STEP	ACTION	VERIFICATION
7	Open 1-2T of ST1 relay.	ST1 relay released. No battery on 9T, 3B, 6B, of ST3 relay.
8	Remove test connection from ST1 relay.	
9	Repeat Steps 6 through 8 on all higher odd-numbered ST_ relays in succession.	Higher odd-numbered ST_ relays operated. Lower odd-numbered ST_ relays remain operated. No battery on 9T, 3B, 6B of higher odd-numbered ST_ relays after lower numbered ST_ relays have released.
10	After testing highest odd-numbered ST_ relay— Remove test connection from ST_ relay.	
11	Block nonoperated SCE relay.	
12	Connect batery to 9BF of ST0 relay.	ST0 relay operated. No battery on 9T, 3B, 6B of ST0 relay.
13	Connect battery to 9BF of ST2 relay.	ST2 relay operated. ST0 relay remains operated.
14	Open 1-2T of ST0 relay.	ST0 relay released. No battery on 9T, 3B, 6B, of ST2 relay.
15	Remove test connection from ST0 relay.	
16	Repeat Steps 13 through 15 on all higher even-numbered ST_ relays in succession.	Higher even-numbered ST_ relays operated. Lower even-numbered ST_ relays remain operated. No battery on 9T, 3B, 6B of higher even-numbered ST_ relays after lower-numbered ST_ relays have released.
17	After testing highest even-numbered ST_ relay— Remove test connection from ST_ relay.	
18	Operate CMBE key.	CMBE lamp lighted.
19	Connect battery to 9BF of highest even-numbered ST relay.	Highest even-numbered ST_ relay operated. No battery on 9T, 3B, 6B of highest even-numbered ST_ relay.
20	Connect battery to 9BF of EST relay.	EST relay operated. Highest even-numbered ST relay remains operated.
21	Open 1-2T of highest even-numbered ST relay.	Highest even-numbered ST_ relay released. No battery on 9T, 3B, 6B of EST relay.

STEP	ACTION	VERIFICATION
22	Remove test connection from ST_, EST relays.	
23	Restore CMBE key.	CMBE lamp extinguished.
24	Remove blocking tools from SCE, SCO relays.	

G. Selector Exercise Features

1a	If testing odd master timing circuit— Operate TT key to E.	
2b	Operate CMBO, CKL keys.	CMBO lamp lighted.
3a	Operate, hold operated EXM key.	M selector steps steadily and uniformly throughout its arc.
4a	After approximately 10 seconds— Release EXM key.	
5a	Operate, hold operated EXD key.	DT, DU selector step steadily and uniformly throughout their arcs.
6a	After approximately 10 seconds— Release EXD key.	
7a	Operate, hold operated EXH key.	HT, HU selectors step steadily and uniformly throughout their arcs.
8a	After approximately 10 seconds— Release EXH key.	
9a	Momentarily operate S key.	SE lamp lighted while selectors resynchronize.
10a	When SE lamp is extinguished— Restore CMBO, CKL keys.	CMBO lamp extinguished.
11b	If testing even master timing circuit— Operate TT key to O.	
12b	Operate CMBE, CKL keys.	CMBE lamp lighted.
13b	Repeat Steps 3a through 8a, except for even master timing circuit.	Selectors step in even master timing circuits.
14b	Momentarily operate S key.	SO lamp lighted while selectors resynchronize.
15b	When SO lamp is extinguished— Restore CMBE, CKL keys.	CMBE lamp extinguished.

STEP	ACTION	VERIFICATION
H. Pulse Failure Alarm		
1	At master timing frame— Block nonoperated PF relay; ***start timing.***	After 6 to 11 seconds— PF lamp lighted. Major alarm sounds. Aisle pilot lamp lighted.
2	Momentarily operate ACO key.	Major alarm silenced. Aisle pilot lamp extinguished.
3	Remove blocking tool from PF relay.	
4	Momentarily operate AR key.	PF lamp extinguished.
5	Block operated PF relay; ***start timing.***	After 6 to 11 seconds— PF lamp lighted. Major alarm sounds. Aisle pilot lamp lighted.
6	Momentarily operate ACO key.	Major alarm silenced. Aisle pilot lamp extinguished.
7	Remove blocking tool from PF relay.	
8	Momentarily operate AR key.	PF lamp extinguished.
I. Transfer Control Features and Timer Synchronism Failure Alarm		
	Caution: Do not perform this test during 1 minute before or after any 10 minute period.	
1	At master timing frame— Operate TT key to E.	
2	Insulate 9M of PO relay.	CSY relay released. TSF lamp lighted. Major alarm sounds.
3	When CSY relay releases— Block nonoperated CSY relay.	
4	Momentarily operate ACO key.	Major alarm silenced.
5	Remove insulator from PO relay.	
6	Operate CKL key.	
7	Operate TT key to O; ***start timing.***	Within 1 minute— SSF, OS_ lamps for each recorder lighted.

STEP	ACTION	VERIFICATION
8a	If emergency recorder or the other regular recorder where trunk transfer is used is substituting for regular recorder— At master timing frame— Momentarily operate S key.	SO lamp lighted while selectors of regular recorder are stepping to synchronized position. OS_ lamp extinguished when selectors are synchronized.
9	At trouble recorder frame— Insert make-busy plug into emergency recorder MB jack.	
10	At master timing frame— Momentarily operate S key.	SO lamp lighted while selectors of emergency recorder are stepping to synchronized position. EM OS lamp extinguished when selectors are synchronized.
11	At trouble recorder frame— Remove make-busy plug from MB jack.	
12a	If emergency recorder or the other regular recorder where trunk transfer is used is substituting for regular recorder— Insert make-busy plug into recorder MB jack for one of the recorders with lighted OS_ lamp.	
13	At master timing frame— Momentarily operate S key.	SO lamp lighted while selectors of regular recorder are stepping to synchronized position. OS_ lamp extinguished when selectors are synchronized.
14	At trouble recorder frame— Remove make-busy plug from MB jack.	
15	Repeat Steps 12a, 13, 14 for each of the remaining regular recorders with lighted OS_ lamp.	
16b	If emergency recorder or the other regular recorder where trunk transfer is used is not substituting for regular recorder— Insert make-busy plug into recorder TN or RTN jack for one of the recorders with lighted OS_ lamp. ***Caution: Do not make more than one transfer from the same recorder during the same 10 minute period. If more than one transfer is made during either of these periods, it may not be possible for the accounting center to associate the entries for two or more calls on the same trunk***	

STEP	ACTION	VERIFICATION
	which have their initial entries on one tape and the answer and disconnect entries on the other tape.	
17	At master timing frame— Momentarily operate S key.	SO lamp lighted while selectors of regular recorder are stepping to synchronized position. OS_ lamp extinguished when selectors are synchronized.
18	At trouble recorder frame— Remove make-busy plug from TN or RTN jack.	
19	Repeat Steps 16B, 17, 18 for each of the remaining recorders with lighted OS_ lamp.	
20	At master timing frame after next 10 minute entry has been perforated— Operate TT key to position E.	Within 1 minute— SSF, OS_ lamps for each recorder lighted.
21	Repeat Steps 8 through 19.	
22	Remove blocking tool from CSY relay.	
23	Momentarily operate AR key.	TSF, SSF lamps extinguished.
24	Restore CKL key.	
25	Insulate 1M of OCHA relay.	CSY relay released. TSF lamp lighted. Major alarm sounds.
26	Remove insulator from OCHA relay.	CSY relay operated.
27	Momentarily operate AR key.	TSF lamp extinguished. Major alarm silenced.

J. Selector Synchronism Check and Selector Synchronism Check Failure Alarms

Caution: Do not perform this test during 1 minute before or after any 10 minute period.

1	At master timing frame— Operate TT key to E.	

Caution: This test requires the use of both master timing circuits. Therefore, do not make this test if the CMBE or CMBO key is found operated. Determine if satisfactory

STEP	ACTION	VERIFICATION
	to restore the operated key, or clear the trouble, then restore the operated key before proceeding with the test.	
2	Restore CKL key if operated.	At master timing frame— M_, DT_, DU_, HT_, HU_, H_, T_, ST_, U_ check lamps momentarily lighted once each minute.
3	◗At master timing frame— Momentarily operate STH relay of odd master timing circuit; ***start timing.***◖	◗Within 1 minute— SSF and check lamps lighted. Major alarm sounds.◖
4	Operate CKL key.	OSO lamp lighted. OSE lamp remains extinguished.
5	Momentarily operate ACO key. ***Note:*** If option VM is provided, the alarm will reinstate at 10 minute intervals. Reoperate the ACO key to silence the audible alarm.	Major alarm silenced.
6a	If ZD wiring option is provided without apparatus Fig. 31— Connect ground to 3T of TCE relay.	HE relay not operated.
7	Remove test connection from TCE relay.	
8	Operate CMBO key.	CMBO lamp lighted.
9	Momentarily operate S key.	SE lamp lighted while odd master timing circuit selectors are stepping to synchronized position. OSO lamp extinguished when selectors are synchronized.
10	Momentarily operate AR key.	SSF lamp extinguished.
11	Restore CMBO, CKL keys.	CMBO lamp extinguished.
12	◗Repeat Steps 3 through 5, 8 through 11 successively for each of TH, HH, HUH, HTH, DTH, DH, MON relays as applicable to office timing features.◖	
13	Operate TT key to O.	M_, DT_, DU_, HT_, HU_, H_, T_, ST_, U_ check lamps momentarily lighted once each minute.
14	◗Momentarily operate STH relay of even master timing circuit; ***start timing.***◖	◗Within 1 minute— SSF and check lamps lighted. Major alarm sounds.◖

STEP	ACTION	VERIFICATION
15	Operate CKL key.	OSE lamp lighted. OSO lamp remains extinguished.
16	Momentarily operate ACO key. ***Note:*** If option VM is provided, the alarm will reinstate at 10 minute interval. Reoperate the ACO key to silence the audible alarm.	Major alarm silenced.
17a	If ZD wiring option is provided without apparatus Fig. 31—	HO relay ***not*** operated.
18	Remove test connection from TCO relay.	
19	Operate CMBE key.	CMBE lamp lighted.
20	Momentarily operate S key.	SO lamp lighted while even master timing circuit selectors are stepping to synchronized position. OSE lamp extinguished when selectors are synchronized.
21	Momentarily operate AR key.	SSF lamp extinguished.
22	Restore CMBE, CKL keys.	CMBE lamp extinguished.
23	⏵Repeat Steps 14 through 16, 19 through 22 successively for each of TH, HH, HUH, HTH, DH, DTH, MOH relays, as applicable to office timing features.⏴	

K. Both Master Timing Circuits Make-Busy Alarm

1	At master timing frame— Operate CMBO key.	CMBO lamp lighted.
2	Operate CMBE key.	CMBO lamp remains lighted. CMBE lamp lighted. MBE relay ***not*** operated. Major alarm sounds.
3	Restore CMBO key.	CMBO lamp extinguished. Major alarm silenced.
4	Operate CMBO key.	CMBO lamp lighted. Major alarm sounds. MBO relay ***not*** operated.
5	Restore CMBE, CMBO keys.	CMBE, CMBO lamps extinguished. Major alarm silenced.

STEP	ACTION	VERIFICATION
L. Timer Start Control		
1	At master timing frame— Operate TT key to E.	
2	Operate MSO key to STP.	TSF lamp lighted. Major alarm sounds. TO timer stopped. Within 1 minute— SSF lamp lighted. 4E (odd) timer stops operating.
3	Momentarily operate ACO key.	Major alarm silenced.
4	Operate CMBO, CKL keys.	CMBO lamp lighted.
5a	If the 4B timer is in use— Grasp hub of TO timer; manually turn camshaft very slowly in direction in which it normally rotates until the CH timing mark, located on the CH cam, is centered under the CH cam follower.	
6b	If the 4E timer is in use— No action is required for this step.	
7	At any time except when ST0 or ST5 lamp is lighted— Operate MSO key to ST.	Within 1 minute— TO timer starts to run. 4E (odd) timer starts operating.
8	Operate MSO key to R.	
9	Momentarily operate S key.	SE lamp lighted while odd master timing circuit selectors are stepping to synchronized position. 4E (odd) timer in synchronized position when SE lamp is extinguished.
10	When SE lamp is extinguished— Momentarily operate AR key.	TSF, SSF lamps extinguished.
11	Restore CMBO key.	CMBO lamp extinguished.
12	Operate TT key to O.	
13	Proceed as in Steps 2 through 11 on TE or 4E (even) timer, using MSE, CMBE keys instead of MSO, CMBO keys and CMBE lamp instead of CMBO lamp.	SO lamp lighted while even master timing circuit selectors are stepping to synchronized position. 4E (even) timer in synchronized position when SO lamp is extinguished.
14	Restore CKL key.	CMBE lamp extinguished instead of CMBO.

STEP	ACTION	VERIFICATION
M. Time-Out Alarm Features		
	Caution: The charge records on recorder tapes for service calls made during the time this test is in progress cannot be properly processed by the accounting center. The tapes are marked for the accounting center to disregard the tape area covering both service call entries as well as improper test entries.	
1	Select an AMA recorder associated with master timer to be tested and mark tape as indicated in paragrah 1.12.	
2	At master timing circuit under test— Block nonoperated P3A relay.	
3	At trouble recorder frame— Insert make-busy plug into recorder MB jack associated with AMA recorder being used for testing; ***start timing.***	
4	At master timing circuit under test— When TIB relay operates— Remove blocking tool from P3A relay.	
5	At trouble recorder frame— Remove make-busy plug from MB jack.	
6	At master timing circuit under test— Block nonoperated P3A, TMR, TM5, TM6 relays.	
7	At trouble recorder frame— Insert make-busy plug into recorder MB jack associated with AMA recorder being used for testing.	At master timing circuit under test— TM2 relay operated.
8	When TM2 relay releases; ***start timing.***	
9	When TM2 relay reoperates; ***stop timing.***	Elapsed time on stopwatch is 2 to 4 seconds. TM6 relay ***not*** energized.
10	Remove blocking tool from TM5 relay.	
11	When TM2 relay releases; ***start timing.***	
12	When TM relay reoperates; ***stop timing.***	Elapsed time on stopwatch is 2 to 4 seconds. TM5, TIB relays operated. TM6 relay energized.

STEP	ACTION	VERIFICATION
13	Remove blocking tools from TMR, P3A relays.	
14	When TM1 relay releases— Remove blocking tool from TM6 relay.	
15	At trouble recorder frame— Remove make-busy plug from MB jack.	
16	At master timing circuit under test— Block nonoperated P3A relay.	
17	At trouble recorder frame— Insert make-busy plug into TRMB MB_ jack associated with master timing circuit under test.	TIB relay operated.
18	Insert make-busy plug into recorder MB jack associated with AMA recorder being used for testing.	After 16 to 20 seconds— At trouble recorder frame— CMB_, MT_ display lamps associated with master timer under test lighted. At master timing frame— CMB_, TA_ lamps associated with master timer under test lighted. Major alarm sounds. If option B provided— ETF_ lamp associated with master timer under test lighted. At AMA recorder frame— MTR lamp lighted.
19	At master timing circuit under test— Momentarily operate AR key.	CMB_, TA_ lamps associated with master timer under test extinguished. Major alarm silenced. If option B provided— ETF_ lamp extinguished.
20	At AMA recorder frame under test— Momentarily operate AR key.	MTR lamp extinguished.
21	Remove blocking tool from P3A relay.	
22	At trouble recorder frame— Remove make-busy plug from MB jack associated with AMA recorder frame being used for test.	
23	Momentarily operate alarm release key.	Display lost lamp extinguished.
24	Block nonoperated TM1, TM6 relays.	
25	Insulate 8-9T of ET1 relay, 1-2T of LTB relay.	

STEP	ACTION	VERIFICATION
26	At trouble recorder frame— Insert make-busy plug into recorder MB jack associated with AMA recorder being used for testing; ***start timing.***	At master timing circuit under test— In 19 to 29 seconds— TM6 relay operated. In 59 to 69 seconds— TSP relay operated. In 78 to 90 seconds— LT9 relay operated.
27	Connect 10B to 11B of ET1 relay.	TM1 relay energized.
28	Insulate 7-8B of LT9 relay.	TM1 relay ***not*** energized.
29a	If E wiring option is used— Remove insulator from LTB relay.	In 2 to 5 minutes— TM1 relay energized.
30b	If B wiring option is used— Remove insulator from LTB relay.	In 2 to 5 minutes— TM6 relay energized.
31	Remove test connection from ET1 relay.	
32	Remove insulators from LT9, ET1 relays.	
33	Remove blocking tool from TM1 relay.	TM1 relay momentarily operated.
34	After TM1 relay releases— Remove blocking tool from TM6 relay.	
35	At trouble recorder frame— Remove make-busy plug from MB jack.	
36	At master timing circuit under test— Momentarily operate LT4 relay.	At master timing frame— CMB_, TA_ lamps associated with master timer under test lighted. Major alarm sounds. If option B provided— ETF lamp associated with master timer under test lighted. At trouble recorder frame— CMB_, MT_ lamps associated with master timer under test lighted.
37	At master timing frame— Momentarily operate AR key.	CMB_, TA lamps lighted. Major alarm silenced. If option B provided— ETF lamp extinguished. At trouble recorder frame— CMB_, MT_ lamps extinguished.
38	At trouble recorder frame— Remove make-busy plug from TRMB MB_ jack.	TIB relay released.

STEP	ACTION	VERIFICATION
39	At master timing frame— Insert make-busy plugs into recorder MB and TST or T jacks associated with AMA recorder under test.	
40	Insert plug of 32A test set into R jack.	
41	Momentarily operate white (ST) button of 32A test set.	RUT lamp lighted while test entries are perforated.
42	When RUT lamp is extinguished— Momentarily operate white (ST) button of 32A test set.	RUT lamp lighted while test entries are perforated.
43	When RUT lamp is extinguished— Remove make-busy plugs from MB and TST or T jacks.	
44	Remove plug of 32A test set from R jack.	
45	At perforator associated with AMA recorder being used for testing— Mark tape and proceed as indicated in paragraph 1.12.	

N. Perforator Lead Cross-Detection Feature

1	At master timing frame— Momentarily connect ground to 02 of terminal strip A (located at top of frame).	CMBE lamp lighted. At trouble recorder frame— CMBE lamp lighted. Trouble record taken. XPL indication.
2	At master timing frame— Momentarily operate AR key.	CMBE lamp extinguished. At trouble recorder frame— CMBE lamp extinguished.
3	At master timing frame— Block nonoperated PLXE relay.	
4	Momentarily connect ground, in turn, to terminals of terminal strip A as follows: 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.	XPE relay operated in each case while ground is applied.
5	Momentarily connect battery to 02 of terminal strip A.	XPE relay operated while battery is applied.
6	Remove blocking tool from PLXE relay.	

STEP	ACTION	VERIFICATION
7	Momentarily connect ground to 02 of terminal strip C (located at top of frame).	CMBO lamp lighted. At trouble recorder frame— CMBO lamp lighted. Trouble record taken. XPL indication.
8	At master timing frame— Momentarily operate AR key.	CMBO lamp extinguished. At trouble recorder frame— CMBO lamp extinguished.
9	At master timing frame— Block nonoperated PLXO relay.	
10	Momentarily connect ground, in turn, to terminals of terminal strip C as follows: 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.	XPO relay operated in each case while ground is applied.
11	Momentarily connect battery to terminal 02 of terminal strip C.	XPO relay operated while battery is applied.
12	Remove blocking tool from PLXO relay.	
13	At RC terminal strip for even master timing circuit— Momentarily connect ground to terminal 02 (located adjacent to RCO, RCE relays).	CMBE lamp lighted. At trouble recorder frame— CMBE lamp lighted. Trouble record taken. XPL indication.
14	At master timing frame— Momentarily operate AR key.	CMBE lamp extinguished. At trouble recorder frame— CMBE lamp extinguished.
15	At master timing frame— Block nonoperated PLXE relay.	
16	Momentarily connect ground, in turn, to terminals of terminal strip RC for even master timing circuit as follows: 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.	XPE1 relay operated while ground is applied.
17	Remove blocking tool from PLXE relay.	
18	At RC terminal strip for odd master timing circuit— Momentarily connect ground to terminal 02.	CMBO lamp lighted. At trouble recorder frame— CMBO lamp lighted. Trouble record taken. XPL indication.

STEP	ACTION	VERIFICATION
19	At master timing frame— Momentarily operate AR key.	CMBO lamp extinguished. At trouble recorder frame— CMBO lamp extinguished.
20	At master timing frame— Block nonoperated PLXO relay.	
21	Momentarily connect ground, in turn, to terminals of terminal strip RC for odd master timing circuits as follows: 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.	XPO1 relay operated while ground is applied.
22	Remove blocking tool from PLXO relay.	

O. End-of-Tape Failure Alarm Test

1	At even master timing circuit— Momentarily connect ground to brush on arc 2 of ST selector when selector reaches terminal 3, 10, or 17.	At master timing frame— ETFO lamp lighted. Major alarm sounds.
2	Momentarily operate AR key.	ERFO lamp extinguished. Major alarm silenced.
3	At ST selector of odd master timing circuit— Momentarily connect ground to brush on arc 2 when selector reaches terminal 3, 10, or 17.	ETFE lamp lighted. Major alarm sounds.
4	Momentarily operate AR key.	ETFE lamp extinguished. Major alarm silenced.
5	Operate CMBO key.	CMBO lamp lighted.
6	At ST selector of even master timing circuit— Momentarily connect ground to brush on arc 2 when selector reaches terminal 3, 10, or 17.	ETFE lamp lighted. Major alarm sounds.
7	Momentarily operate AR key.	ETFE lamp extinguished. Major alarm silenced.
8	Restore CMBO key.	CMBO lamp extinguished.
9	Operate CMBE key.	CMBE lamp lighted.
10	At ST selector of odd master timing circuit— Momentarily connect ground to brush on arc 2 when selector reaches terminal 3, 10, or 17.	ETFO lamp lighted. Major alarm sounds.
11	Momentarily operate AR key.	ETFO lamp extinguished. Major alarm silenced.

STEP	ACTION	VERIFICATION
12	Restore CMBE key.	CMBE lamp extinguished.

P. FA, FA1 Fuse Alarm Relays and Make-Busy Feature

1	At even master timing circuit— Momentarily operate FA relay.	At master timing frame— FA1 relay operated. FGE, CMBE lamps lighted. At jack, lamp, and key circuit— MTFG lamp lighted.
2	At even master timing circuit— Momentarily operate AR key.	FGE, CMBE lamps extinguished. At jack, lamp, and key circuit— MTFG lamp extinguished.
3	At even master timing circuit— Block operated FA2 relay.	FA and FA1 relays operated. Major alarm sounds.
4	Release blocked FA2 relay.	FA relay released and same lamps lighted as in Step 1.
5	Momentarily operate AR key.	Major alarm silenced. FA1 relay released. Same lamps extinguished as Step 2.
6	Repeat Steps 1 through 5 for odd master timing circuit.	Observe FGO, CMBO lamps instead of FGE, CMBE lamps.

Q. LT1 Through LT9 Relays (Long Timer)

Caution: Do not perform the following steps during 1 minute before or after any 10 minute period. This is to prevent interference with the placing of the ten minute record on the recorders.

1	Operate CKL key.	
2a	If testing even master timing circuit— At master timing frame— Operate TT key to O.	Within 1 minute— OT lamp lighted.
3a	Operate CMBE key.	CMBE lamp lighted.
4a	At even master timing circuit— Block nonoperated ST_ relays.	
5b	If testing odd master timing circuit— Operate TT key to E.	Within 1 minute— ET lamp lighted.
6b	Operate CMBO key.	CMBO lamp lighted.

STEP	ACTION	VERIFICATION
7b	At odd master timing circuit— Block nonoperated ST_, EST relays.	
8	Block nonoperated ET1 relay.	
9	Using 893 cord, short 4, 5B of ET1 relay; ***start timing.***	LT1 relay operated. LT2 relay operated in 0 to 9 seconds. LT1 relay released 1 second after LT2 relay operated. LT3 relay operated 10 seconds after LT2 relay operated. Succeeding LT_ relays operated; preceding LT_ relays released at 10 second intervals. Approximately halfway through test— Major alarm sounds. TAO or TAE lamp lighted. ERFO or ERFE lamp lighted.
10	Remove connection from 4, 5B of ET1 relay.	
11	Momentarily operate AR key.	Major alarm silenced. TAO or TAE lamp extinguished. ETFO or ETFE lamp extinguished.
12c	If necessary to repeat test— Repeat Steps 9 through 11.	
13	Remove blocking tools from ST_, ET1 relays.	
14b	If testing odd master timing circuit— Remove blocking tool from EST relay.	CMBO lamp extinguished.
15b	Restore CMBO key.	
16a	If testing even master timing circuit— Restore CMBE key.	CMBE lamp extinguished.
17	Restore TT key to position E.	
18	Restore CKL key.	

R. Paper Take-Up and Jammed Paper Alarms

1	At perforator cabinet— Disconnect motor drive unit from power outlet.	
2	Remove take-up motor control arm from paper tape and let it drop to its lowest position; ***start timing.***	At master timing frame— PTU_ lamp lighted. Within 2 minutes— Major alarm sounds. Aisle pilot lamp lighted.

STEP	ACTION	VERIFICATION
3	At perforator cabinet— Replace control arm on tape.	
4	Reconnect motor drive unit to power outlet.	After tape has been taken up on storage reel— At master timing frame— PTU_ lamp extinguished. Major alarm silenced. Aisle pilot lamp extinguished.