

RECORDER AND RECORDER CONNECTOR CIRCUITS SD-25872-01

TESTS

NO. 1 CROSSBAR OFFICES

1. GENERAL

1.01 This section covers a method of testing regular and emergency recorder and recorder connector circuits in No. 1 crossbar offices arranged for AMA, using the recorder test portion of the master timing circuit SD-25630-01, the originating sender test frame SD-25221-01, and the district junctor test frame SD-25158-01.

1.02 This section is being reissued for the following reasons:

- (a) To add SD- reference to title
- (b) To add apparatus in Part 2 and Table A
- (c) To revise Test A to add steps when options are provided and to delete placing of test pattern on tape at completion of test
- (d) To change Table A to Table B
- (e) To add Figure 2
- (f) To revise Test K to include all leads to transverter and for checking at terminal strips instead of relay contacts
- (g) To revise Test N to add test steps when App. Fig. 27 is provided for improved preference operation
- (h) To add Test N.1 for in service test when App. Fig. 27 is provided for improved preference operation
- (i) To add Test N.2 for detection of falsely grounded DJ₋ lead when option WN is provided in the recorder and option T in the call identity indexer
- (j) To revise Test AB to include test when App. Fig. 27 is provided for improved preference operation in the emergency recorder

(k) To add Test AC for in service test when App. Fig. 27 is provided for improved preference operation in the emergency recorder

(l) To add Test AD for detection of falsely grounded DJ₋ lead when option WN is provided in the emergency recorder

(m) To add minor corrections and notes for clearer understanding throughout the section.

This issue affects the Equipment Test List.

1.03 The tests covered are:

REGULAR RECORDER

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A. Transfer Features: This test checks that the call identity indexer associated with the regular recorder can be transferred to the emergency recorder. It also checks that while the transfer is in effect, no other call identity indexer can be transferred to the emergency recorder.

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B. Make-busy Features: The following features are checked.

- (1) When the regular recorder is made busy, its associated call identity indexer can not be transferred to the emergency recorder.
- (2) When the regular recorder is made busy, the call identity indexer associated with any other recorder not made busy can be transferred to the emergency recorder.
- (3) The service busy, trouble busy, and extended timing leads from the regular recorder to each transverter.

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(4) The master timing release alarm feature in the regular recorder make-busy circuit.	10
C. Operation Test: The following features are checked:	
(1) The proper operation of the perforator magnets of the regular recorder by perforating the tape in a distinctive diamond-shaped pattern	
(2) Normal operation of the recorder on an initial entry and on answer and disconnect entries	
(3) Operation of the OTO and RCK relays	
(4) Operation of the 2-out-of-5 check relays	
(5) False battery on the OT lead	
(6) False ground on the XTC lead	
(7) Trouble grounds on the OT and TCO leads	12
D. Selector Synchronism Check and Synchronizing Feature: The following features are checked:	
(1) Detection of timing selectors in the regular recorder out of synchronism with the master timing circuit	
(2) Synchronization of the regular recorder selectors with the master timing circuit.	14
E. Recorder Number, Minutes Timing and Hour Alarm Features: The following features are checked:	
(1) The perforator magnet leads from the selector timing switches of the regular recorder	
(2) The perforator magnet leads from the RN (recorder number), HRT	

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(hour trouble), ADT (answer-disconnect trouble), TCT (talking charge trouble), and AT (advance tape) relays	
(3) The selector timing switch positions that bring in the hour entry, the hour trouble entry, and the hour alarm.	16
F. Splice and Break-in-Tape Feature: The following features are checked.	
(1) The regular recorder will perforate window pattern entries upon encountering a splice in the tape, a break in the tape, or the end-of-tape supply.	
(2) The no-paper alarm and the recorder make-busy features function when a break in the tape or the end of the tape supply is encountered.	25
G. Trouble Timing Feature: This test checks that the regular recorder will time out and bring in an alarm upon failure of entries originated by the recorder or associated call identity indexer.	28
H. AG Lead Alarm and Locking Features: The following features are checked.	
(1) Operation of TA_ or TB_ relay in the call identity indexer will start the timing feature in its associated regular recorder	
(2) Locking paths for RD and IPA relays.	29
I. Transient Operation of Perforator Magnets and Series Relay Locking Features: The following features are checked.	
(1) Momentary operation of a perforator magnet while the regular recorder is idle will cause a trouble display at the transverter trouble indicator frame and the perforation of the trouble entry 287100.	

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(2) The locking circuit for all perforator magnet series relays.	31	when the recorder preference improvement feature (App. 27) is provided.♦	45
<p><i>Note:</i> If the ground on the perforator magnet lead is permanent, the circuit will block until the trouble is cleared. If the ground is transient, relay CK will release when the ground is removed and cause the perforation of the trouble entry 287100.</p>			
J. Trouble Cross-detecting Features: The following features are checked:		N.1 ♦Dynamic Test of Preference Relays: This test checks that the preference relays operate in the proper sequence when the recorder preference improvement feature (App. 27) is provided.	50
(1) The operation of the alarm feature if a failure occurs in the preference relay chain circuit of the regular recorder or in the tens or units relay chain circuit in the associated call identity indexer		N.2 Detction of Falsely Grounded DJ Lead: This test checks that falsely grounded DJ_ lead in the call identity indexer on a timing entry will cause a trouble condition at the associated recorder, if option T is provided in the call identity indexer and option WN in the recorder.♦	51
(2) The operation of the alarm feature due to falsely grounded TC, RB, and EXT leads.	33	EMERGENCY RECORDER	
K. Test for False Continuity and Crosses of TC_ Relays: This test checks for false continuity and crosses on the contacts of the transverter-connector relays in the regular recorder.	37	O. Make-busy Feature: The following features are checked:	
L. Perforator Leads from Transverters: This test checks for transpositions of leads from the transverters to the perforator magnets at the regular recorders.	42	(1) When the emergency recorder is made busy, no call identity indexer can be transferred from its associated regular recorder to the emergency recoder.	
M. District Junctor Identifying Leads: This test checks for transpositions in the district junctor identifying leads from the call identity indexer to the perforator magnets of the associated regular recorder and that the district junctor test frame will block on answer or disconnect entry failures.	44	(2) While a call identity indexer is connected to the emergency recorder, the emergency recorder can be made busy.	
N. Preference Relays—Operating and Lockout Features: This test checks the order of preference of the IP, HP, TP_ and MTP relays and their locking features. ♦This test also checks the operation of the RIP and RTL relays		(3) The service busy feature.	52
		P. Operation Test: The following features are checked:	
		(1) The proper operation of the perforator magnets of the regular recorder by perforating the tape in a distinctive diamond-shaped pattern	
		(2) Normal operation of the emergency recorder on an initial entry and on answer and disconnect entries	
		(3) Operation of the OTO and RCK relays	

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(4) Operation of the 2-out-of-5 check relays		(2) The no-paper alarm and recorder make-busy features function when a break in the tape or the end of tape supply is encountered.	56
(5) False battery on the OT lead			
(6) False ground on the XTC lead		T. Trouble Timing Feature: This test checks that the regular recorder will time out and bring in an alarm upon failure of entries originated by the recorder or associated call identity indexer.	57
(7) Trouble grounds on the OT and TCO leads.	54		
Q. Selector Synchronism Check and Synchronizing Feature: The following features are checked:		U. AG Lead Alarm and Locking Features: The following features are checked.	
(1) Detection of timing selector switches in the emergency recorder out of synchronism with the master timing circuit		(1) Operation of TA ₋ or TB ₋ relay in the call identity indexer will start the timing feature in the emergency recorder.	
(2) Synchronization of these switches with the master timing circuit.	55	(2) Locking paths for RD and IPA relays.	57
R. Recorder Number, Minutes Timing and Hour Alarm Features: The following features are checked:		V. Transient Operation of Perforator Magnets and Series Relay Locking Features: The following features are checked.	
(1) The perforator magnet leads from the selector timing switches of the emergency recorder		(1) Momentary operation of a perforator magnet while the emergency recorder is idle will cause a trouble display at the transverter trouble indicator frame and the perforation of the trouble entry 287100.	
(2) The perforator magnet leads from the RN (recorder number), HRT (hour trouble), ADT (answer-disconnect trouble), TCT (talking charge trouble), and AT (advance tape) relays		(2) The locking circuit for all perforator magnet series relays.	58
(3) The selector timing switch positions that bring in the hour entry, the hour trouble entry and the hour alarm.	55	Note: If the ground on the perforator magnet lead is permanent, the circuit will block until the trouble is removed. If the ground is transient, relay CK will release when the ground is removed and cause the perforation of the trouble entry 287100.	
S. Splice and Break in Tape Feature: The following features are checked.		W. Trouble Cross-Detecting Features: The following features are checked:	
(1) The emergency recorder will perforate window pattern entries upon encountering a splice in the tape, a break in the tape or the end of tape supply		(1) The operation of the alarm feature if a failure occurs in the preference relay chain circuit of the emergency	

recorder or in the tens or units relay chain circuit in the associated call identity indexer

- (2) The operation of the alarm feature due to falsely grounded TC, RB and EXT leads.

X. Test for False Continuity and Crosses of TC Relays: This test checks for false continuity and crosses on the contacts of the transverter connector relays in the emergency recorder.

Y. Perforator leads from Transverters: This test checks for transpositions of leads from the transverters to the perforator magnets of the emergency recorder.

Z. District Junctor Identifying Leads: This test checks for transpositions in the district junctor identifying leads from the call identity indexer to the perforator magnets of the emergency recorder and that the district junctor test frame will block on answer or disconnect failures.

AA. Exercising Routine: This test checks the operation of the emergency recorder with each call identity indexer.

AB. Preference Relays—Operating and Lockout Features: This test checks the order of preference of the IP, HP, TP₋ and MTP relays and their locking features in the emergency recorder. This test also checks the operation of the RIP and RTL relays when the recorder preference improvement feature (App. 27) is provided.

AC. Dynamic Test of Preference Relays: This test checks that the preference relays operate in the proper sequence when the recorder preference feature (App. 27) is provided in the emergency recorder.

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AD. Detection of Falsely Grounded

DJ Lead: This test checks that a falsely grounded DJ₋ lead in the call identity indexer on a timing entry will cause a trouble condition at the emergency recorder, if option T is provided in the call identity indexer and option WN in the emergency recorder.

1.04 All tests covered in this section shall be made preferably during periods of light traffic but not during the interval of 2:55 A.M. to 3:30 A.M.

1.05 Information concerning precautions to limit stoppages at the accounting center caused by central office tape irregularities is covered in Section 216-800-302.

1.06 Avoid transferring a regular recorder to the emergency recorder more than once during the same hour entry (from 1 to 2, 2 to 3, etc) unless the associated district junctors are made busy and not in use.

1.07 A regular recorder should not be transferred to the emergency recorder during the interval from 5 minutes before to 5 minutes after any hour.

1.08 If Test (C), (G), (P), or (T) indicates trouble in a timing network, check the timing interval as covered in the circuit requirements table.

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

- (1) Raise the slack tape 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,

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that is, the diamond pattern farthest from the perforator drum.

(4) Find the red mark placed on the tape at the start of testing. Then 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 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.

1.10 Local instructions should be followed with reference to recording any register operation caused by these tests.

1.11 *Lettered Steps:* A letter a, b, c, etc, added to a step number in Part 4 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 a 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.

1.12 When a make-busy plug is inserted or removed from the RMB jack of a recorder at the transverter trouble indicator frame, a make-busy pattern is placed on the AMA tape. The R₋ lamp will light during recorder perforation and be extinguished when the perforation is complete.

1.13 When a make-busy plug is inserted into the TN jack of a recorder at the transverter trouble indicator frame, an end-of-tape pattern is placed on the regular recorder and then on the emergency recorder. The R₋ lamp will light for each recorder during perforation. When the make-busy plug is removed, the end-of-tape pattern is placed on the emergency recorder and then on the regular recorder. Again the R₋ lamp will light for each recorder during each perforation.

2. APPARATUS

2.01 The apparatus required for each test is listed in Table A. The details for each item are covered in the indicated paragraphs.

2.02 322A (make-busy) plugs.

2.03 32A test set.

2.04 349A (make-busy) plugs.

2.05 Test receiver, 716C or equivalent, attached to a W2AB cord equipped with two 360A tools (2W21A cord), a 411A tool and a KS-6278 tool.

2.06 Testing cord, 893 cord, 6 feet long, equipped with two 360A tools (1W13B cord), one KS-6278 tool and one 419A tool.

2.07 Testing cord, 893 cord, 6 feet long, equipped with two 360A tools (1W13B cord), one KS-6278 tool, and one 509A tool or 509B tool, as required.

2.08 Testing cord, 893 cord, 6 feet long, equipped with two 360A tools (1W13B cord), one KS-6278 tool, and one 411A tool.

2.09 KS-3008 stopwatch or equivalent.

2.10 Recorder test portion of the Master Timing Circuit J22451A (SD-25633-01).

2.11 District Junctor Test Circuit J27553 (SD-25158-01).

2.12 Originating Sender Test Circuit J27952 (SD-25221-01).

2.13 Red china marking pencil (obtained locally).

2.14 KS-14343 tape reader.

2.15 ♦Testing cord, 893 cord, 6 feet long, equipped with two 360A tools (1W13B cord), a KS-6278 connecting clip, and a 624A tool.

2.16 5-inch diagonal pliers.

2.17 Resistor 18AN or equivalent (350 ohms).

TABLE A

APPARATUS	TESTS																																
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	N.1	N.2	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	
322 A (make-busy) Plug (2.02)	2	2	2	2	2	2	2	2	2	2	2	1		2		2	2	2	2	2	2	2	3	2	3	2	1	1	1	2	1	3	
32A Test set (2.03)		1	1	1	1	1	1	1	1	1	1			1		1	1	1	1	1	1	1	1	1	1	1				1		1	
349A (make-busy) Plug (2.04)		✓		✓		✓		✓		✓				✓		✓	✓						✓		✓								
Test receiver (2.05)	1	1		1		1	1				1			1			1		1		1	1				1				1			
Testing cord (2.06)		1			2	1					1			1		2	1			2	1					1				1		2	
Testing cord (2.07)										1	1			2												1	1			2			
Testing cord (2.08)					1				1	1				1						1				1	1					1			
Stopwatch (2.09)								1															1										
Master Timing Circuit (2.10)		1	1	1	1	1	1	1	1	1	1			1		1	1	1	1	1	1	1	1	1	1	1	1			1		1	
Dist. Jct. Tst. Ckt. (2.11)													1																1				
Orig. Sdr. Test Ckt. (2.12)												1																1					
Red China Mkr. Pencil (2.13)	1	1	1	1	1	1	1	1	1	1	1			1		1	1	1	1	1	1	1	1	1	1	1	1			1		1	
Tape reader (2.14)			1																1														
Testing cord (2.15)														1																	1		
Diagonal Pliers (2.16)						1																1											
Resistor (350 ohms) (2.17)																1																	1
Event Recorder (2.18)																1																1	
Tools (Blocking and Insulating) (2.19)		✓			✓	✓	✓	✓	✓	✓	✓			✓		✓	✓			✓	✓	✓	✓	✓	✓	✓	✓			✓		✓	
Volt-ohmmeter (2.20)														1																1			
Testing cord (2.21)																1																1	
Testing cord (2.22)																2																	2
Testing cord (2.23)																1																	1
Testing cord (2.24)																1																	1

✓ As required.



2.18 Esterline Angus 20-pen Event Recorder or any 4-pen recorder with high impedance inputs.

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

2.20 KS-14510 volt-ohm meter or equivalent.

2.21 Testing cord, 893 cord, 6 feet long, equipped with two 360A tools (1W13B cord), a 364 tool, and a KS-6278 connecting clip.

2.22 Testing cord, W1AY cord, 8 feet 6 inches long, equipped with two 360A tools, a 364 tool, and a 624A tool. Should the W1AY cord be unavailable and a length of more than 6 feet be required, two 893 cords equipped with 360A tools

may be connected together by means of a 141 cord tip.

2.23 Testing cord, W1AY cord, 8 feet 6 inches long, equipped with two 360A tools, a 364 tool and a 509A tool. Should the W1AY cord be unavailable and a length of more than 6 feet be required, two 893 cords equipped with 360A tools may be connected together by means of a 141 cord tip.

2.24 Testing cord, W1AY cord, 8 feet 6 inches long, equipped with two 360A tools, a 364 tool, and a 419A tool. Should the W1AY cord be unavailable and a length of more than 6 feet be required, two 893 cords equipped with two 360A tools may be connected together by means of a 141 cord tip.♦

3. PREPARATION

STEP	ACTION	VERIFICATION
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All Tests

1	At transverter trouble indicator frame— Operate LP key.	
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4. METHOD

STEP	ACTION	VERIFICATION
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REGULAR RECORDERS

A. Transfer Features

Note: Before starting this test and on completion of testing, mark the associated perforator tape as indicated in 1.09.

1	At transverter trouble indicator frame— Check that the emergency recorder is not in service by observing that there is no plug in any of the TN jacks.	
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2	Insert make-busy plug into the TN_ jack for recorder under test.	
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At emergency recorder frame— EW lamp lighted. At recorder under test— NS, RNT, all TN_ relays operated. RT, RT1 relays released. Ground absent on 2B of MB relay.
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STEP	ACTION	VERIFICATION
3a	◆If option G and Fig. P are provided— Check for ground on 8B of TNS relay.	Ground present.
4b	If option G and Fig. R are provided— Check for ground on 12T of TNS relay.◆	Ground present.
5	At transverter trouble indicator frame— Insert make-busy plug into TN jack for any other recorder.	At corresponding recorder— TNS relay remains unoperated.
6	At transverter trouble indicator frame— Remove the plug from TN jack for recorder used in Step 5.	
7	Remove the plug from TN jack for recorder under test.	At emergency recorder frame— EW lamp extinguished. At recorder under test— NS, RNT, all TN_ relays released.
8	◆At perforator associated with recorder under test— Mark tape as indicated in 1.09.◆	

B. Make-busy Features

Note: Before starting this test and on completion of testing, mark the associated perforator tape as indicated in 1.09.

1	At sender link frame— Make busy all district junctors associated with recorder to be tested.	Associated primary hold magnets normal on district link frame.
2	◆At transverter trouble indicator frame—◆ Insert make-busy plug into RMB jack for recorder under test.	At transverter trouble indicator frame— Associated R_ lamp lighted. At recorder under test— NS relay operated. RT and RT1 relays released. At each transverter— Ground absent on 7B of ST_ relay for recorder under test. Ground present on 1B of ST_ relay for recorder under test.
3	At recorder under test— Block TA relay nonoperated.	
4	Block ON relay operated.	At each transverter— Ground present on 7B of ST_ relay for recorder under test.

STEP	ACTION	VERIFICATION
5	At recorder under test— Remove blocking tool from ON and TA relays in turn.	
6	At transverter trouble indicator frame— Check that the emergency recorder is not in service by observing that there is no plug in any of the TN jacks.	
7	Insert make-busy plug into TN jack for recorder under test.	At emergency recorder frame— EW lamp not lighted.
8	At recorder under test— Insulate 2T of RT relay.	
9	Connect ground to 2T of RT relay.	At each transverter— Ground present on 4B of ST ₁ relay for recorder under test.
10	At recorder under test— Remove ground from 2T of RT relay.	At each transverter— Ground absent on 4B of ST ₁ relay for recorder under test.
11	At recorder under test— Remove insulator from 2T of RT relay.	
12	At transverter trouble indicator frame— Remove plug from TN jack for recorder under test.	
13	Insert make-busy plug into TN jack for any other recorder.	At emergency recorder frame— EW lamp lighted.
14	At transverter trouble indicator frame— Remove plug from TN jack used in Step 13.	At emergency recorder frame— EW lamp extinguished.
15	At transverter trouble indicator frame— Remove plug from RMB jack for recorder under test.	At recorder under test— NS relay releases. Ground absent on 8B of TN ₁ and 2B of TN ₆ relays.
16	At recorder under test— Block the MBR relay nonoperated.	
17	At transverter trouble indicator frame— Insert make-busy plug into RMB jack for recorder under test.	At recorder frame— MTR lamp lighted. White aisle pilot lamp lighted. Major alarm sounds. RT, RT ₁ relays released.
18	At recorder under test— Remove blocking tool from MBR relay.	

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STEP	ACTION	VERIFICATION
19	Manually operate MBR relay.	MBR relay locked operated.
20	At recorder frame— Momentarily operate AR key.	MTR lamp extinguished. White aisle pilot lamp extinguished. Major alarm silenced.
21	At transverter trouble indicator frame— Insert make-busy plug into TST jack for recorder under test.	
22	Insert plug of 32A test set into R jack and momentarily depress white button of test set. ◆ <i>Note:</i> If a trouble is encountered while applying the test pattern, clear the trouble and apply a good test pattern before restoring the recorder to service.◆	Minor alarm sounds. At transverter trouble indicator frame— RUT lamp lighted. TI and DLR_ lamps lighted. When master timing circuit completes test of recorder— RUT lamp is extinguished.
23	At transverter trouble indicator frame— When RUT lamp is extinguished— Momentarily operate RL key.	Minor alarm silenced. At transverter trouble indicator frame— TI and DLR_ lamps extinguished.
24	Remove plugs from TST and RMB jacks for recorder under test.	
25	Remove plug of test set from R jack.	
26	◆At perforator associated with recorder under test— Mark tape as indicated in 1.09.◆	
27	At sender link frame— Restore to service district junctions associated with recorder under test.	

C. Operation Test

Note: Before starting this test and on completion of testing, mark the associated perforator tape as indicated in 1.09.

1	At transverter trouble indicator frame— Check that the emergency recorder is not in service by observing that there is no plug in any of the TN jacks.	
2	Insert make-busy plug into TN and TST jacks for recorder under test.	At emergency recorder frame— EW lamp lighted.
3	At perforator cabinets— Insert plug of 32A test set into RC jack and momentarily depress white button of test set.	Minor alarm sounds. At perforator cabinets— RUT lamp lighted.

STEP

ACTION

VERIFICATION

Note: If the RW lamp lights, indicating seizure of master timer by another recorder, wait for the RW lamp to be extinguished; then operate and release white button of 32A test set; wait several seconds to permit recorder test portion of master timing circuit to restore; and then restart test by the operation and release of white button of the 32A test set.

- 4 Again momentarily depress the white button of the 32A test set.
- 5 At transverter trouble indicator frame—
Momentarily operate RL key.
- 6 At perforator associated with recorder under test—
Find the diamond pattern perforated for the first test call group and compare with perforations shown in Fig. 1 using KS-14343 tape reader.

At transverter trouble indicator frame—
RUT lamp lighted.
TI and DLR_ lamps lighted.
When master timing circuit completes test of recorder—
RUT lamp extinguished at all locations.

Second test call group perforated on tape.

At transverter trouble indicator frame—
TI and DLR_ lamps extinguished.
Minor alarm silenced.

On embossed side of the tape—
No light or irregular perforations.
Locations of perforations in diamond pattern are exactly the same as shown in Fig. 1.

Caution: Do not cut the tape and be careful not to damage the tape in any other way.

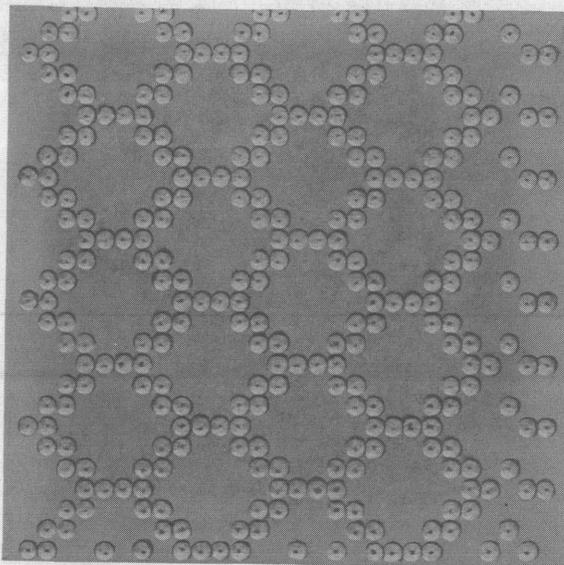


Fig. 1—Recorder Test Pattern (Embossed Side Up)

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STEP	ACTION	VERIFICATION
7	At perforator cabinets— Remove plug of 32A test set from RC jack.	
8	At transverter trouble indicator frame— Remove plugs from TST and then TN jacks for recorder under test.	At emergency recorder frame— EW lamp extinguished.
9	At perforator associated with recorder under test— Mark tape as indicated in 1.09.	
D. Selector Synchronism Check and Synchronizing Feature		
<i>Note:</i> Before starting this test and on completion of testing, mark the associated perforator tape as indicated in 1.09.		
1	At sender link frame— Make busy all district junctors associated with recorder to be tested.	Associated primary hold magnets normal on district link frame.
2	At recorder under test— Operate and release UH relay.	In one minute or less— Major alarm sounds. At master timing frame— SSF lamp lighted.
3	At master timing frame— Operate CKL key.	OS ₋ lamp lighted for recorder under test.
4	At transverter trouble indicator frame— Insert make-busy plug into RMB jack for recorder under test.	
5	At master timing frame— Momentarily operate AR key.	Major alarm silenced. At master timing frame— SSF lamp extinguished.
6	Momentarily operate S key.	OS ₋ lamp associated with recorder under test extinguished. At recorder under test— Ground absent on operating spring 15 of TIB relay and present on operating spring 9 of TIB relay when CA relay is released. Ground absent on operating spring 9 of TIB relay when CA relay is operated.
7	At master timing frame— Restore CKL key.	

STEP	ACTION	VERIFICATION
8	At transverter trouble indicator frame— Remove plug from RMB jack for recorder under test.	
9	At recorder under test— Operate and release TH relay.	In one minute or less— Major alarm sounds. At master timing frame— SSF lamp lighted.
10	Repeat Steps 3 through 8.	
11	At recorder under test— Operate and release HH relay.	In one minute or less— Major alarm sounds. At master timing frame— SSF lamp lighted.
12	Repeat Steps 3 through 7.	
13	At transverter trouble indicator frame— Insert make-busy plug into TST jack for recorder under test.	Minor alarm sounds. At transverter trouble indicator frame— RUT lamp lighted. TI and CLR_ lamps lighted.
14	Insert plug of 32A test set into R jack and momentarily depress white button of test set. ♦ <i>Note:</i> If a trouble is encountered while applying the test pattern, clear the trouble and apply a good test pattern before restoring the recorder to service.♦	When master timing circuit completes test of recorder— RUT lamp extinguished.
15	At transverter trouble indicator frame— When RUT lamp is extinguished, momentarily operate RL key.	Minor alarm silenced. At transverter trouble indicator frame— TI and DLR_ lamps extinguished.
16	Remove plugs from TST and RMB jacks for recorder under test.	
17	Remove plug of test set from R jack.	
18	♦At perforator associated with recorder under test— Mark tape as indicated in 1.09.♦	
19	At sender link frame— Restore to service district junctors associated with recorder under test.	

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STEP	ACTION	VERIFICATION
E. Recorder Number, Minutes Timing, and Hour Alarm Features		
<i>Note:</i> Before starting this test and on completion of testing, mark the associated perforator tape as indicated in 1.09.		
1	At transverter trouble indicator frame— Check that the emergency recorder is not in service by observing that there is no plug in any of the TN jacks.	
2	Insert make-busy plug into TN jack for recorder under test.	
3	Verify that LP key is operated.	
4	At the perforator cabinet for the recorder under test— Disconnect the perforator from its jack by raising the front of the perforator to clear the stop screws, and then pulling the perforator forward approximately one inch.	
5	At the recorder under test— Block HS, HRA, C and PTC relays nonoperated.	
6	Insulate 7T contact of RN relay.	
7	Insulate 5B contact HRA relay.	
8	Operate and release the UH relay as required to step U selector to position 1.	
9	Operate and release the TH relay as required to step T selector to position 1.	
10	Operate and release the HH relay as required to step H selector to position 1.	
11	◆Operate and hold◆ M and RN relays for several seconds.	Minor alarm sounds. At transverter trouble indicator frame— TI and DRR_ lamps lighted. MB_, MC_, MD_ lamps lighted as indicated in Table B on line corresponding to H, T, U selector positions. ME_ and MF_ lamps lighted to indicate recorder number tens and units digits, respectively.
12	Momentarily operate ACO key.	Minor alarm silenced.
13	Momentarily operate RL key.	Trouble indicator display cleared.

STEP

ACTION

VERIFICATION

TABLE B

MINUTES TIMING SELECTOR POSITIONS

SELECTOR POSITIONS			TROUBLE INDICATOR LAMPS LIGHTED		
H	T	U	MB	MC	MD
1	1	1	4,7	4,7	4,7
2	2	2	0,1	0,1	0,1
3	3	3	0,2	0,2	0,2
4	4	4	1,2	1,2	1,2
5	5	5	0,4	0,4	0,4
6	6	6	1,4	1,4	1,4
*8	7	7	4,7	2,4	2,4
8	8	8	4,7	0,7	0,7
9	9	9	0,1	1,7	1,7
10	10	10	0,2	2,7	2,7
11	11	11	1,2	4,7	4,7
12	12	12	0,4	0,1	0,1
13	13	13	1,4	0,2	0,2
*15	14	14	4,7	1,2	1,2
15	15	15	4,7	0,4	0,4
16	16	16	0,1	1,4	1,4
17	17	17	0,2	2,4	2,4
18	18	18	1,2	0,7	0,7
19	19	19	0,4	1,7	1,7
20	20	20	1,4	2,7	2,7
1	1	1	4,7	4,7	4,7

* H selector cannot stop on position 7 or 14. See note in Step 18.

- 14 At recorder under test—
Operate and release UH, TH, HH relays as needed to advance the U, T, H selectors to next position.
- 15 ♦Operate and hold♦ M relay for several seconds. Minor alarm sounds.
At transverter trouble indicator frame—
TI and DRR_ lamps lighted.
MB_, MC_, MD_ lamps lighted as indicated in Table B on line corresponding to H, T, U selector positions.
- 16 Momentarily operate ACO key. Minor alarm silenced.
- 17 Momentarily operate RL key. Trouble indicator display cleared.

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STEP	ACTION	VERIFICATION
18	Repeat Steps 15 through 17 for each of remaining H, T, U selector positions as indicated in Table B. <i>Note:</i> Since the H selector steps automatically from position 7 to 8 and from position 14 to 15, check the T and U selectors in positions 7 and 8 or 14 and 15 while the H selector is in position 8 or 15.	
19	At recorder under test— Operate and release UH, TH, HH relays as needed to advance U, T, H selectors to position 1.	
20	Remove insulators from 7T of RN and 5B of HRA relays.	
21	Block the TA, HRT and UH relays nonoperated.	
22	Block the IPA and CA relays operated.	
23	Remove blocking tool from the C relay.	Within 6 seconds— C relay operated and remains locked.
24	Remove blocking tool from IPA relay.	C relay released during time-pulse-open period. <i>Note:</i> The C relay is operated by a time pulse for 0.4 second every six seconds.
25	Block the C, PTS and TC1 relays nonoperated.	
26	Remove blocking tools from UH and CA relays.	
27	Block the HPA relay operated.	HR1 and HR2 relays operate.
28	Release the HR3 relay, if operated, by opening its 1B and 2B contacts.	
29	Operate and release UH relay to step U selector to position 2.	
30	Remove blocking tool from the HRA relay.	
31	Connect ground to 3T of NS relay.	◆At the recorder under test—◆ HRA relay operated. ◆At recorder frame—◆ HR lamp lighted. White aisle pilot lamp lighted. Major alarm sounds.

STEP	ACTION	VERIFICATION
32	◆At recorder under test—◆ Operate and release UH relay to step U selector to position 3.	
33	◆At recorder frame—◆ Momentarily operate AR key.	HR lamp extinguished. White aisle pilot lamp extinguished. Major alarm extinguished.
34	◆At recorder under test—◆ Momentarily operate CK relay.	HR3 relay operated.
35	Operate and release UH relay to step U selector to position 8.	
36	Operate and release TH relay to step T selector to position 10.	
37	Operate and release HH relay to step H selector to position 6.	
38	Connect ground to 4T of C relay.	HR3 relay released.
39	Operate and release UH relay to step U selector to position 9.	
40	Operate HR3 relay.	HR3 relay locks operated. ◆At recorder frame—◆ HR lamp lighted. Major alarm sounds.
41	◆At recorder under test—◆ Insulate 10T of PTS relay.	
42	Remove blocking tools from the HPA and HS relays.	HR1 and HR2 relays released.
43	Insulate 1T of HS relay.	
44	◆Block nonoperated HPA relay.	
45	Remove blocking tool from PTC relay.◆	
46	Operate and release UH relay to advance U selector to position 10.	HS relay operated.
47	◆At recorder frame—◆ Momentarily operate AR key.	HR lamp extinguished. Major alarm silenced.
48	At recorder under test— Operate and release HH relay to step H selector to position 8.	

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STEP	ACTION	VERIFICATION
49	Operate and release TH relay to step T selector to position 11.	
50	Operate and release UH relay to step U selector to position 12.	
51	Momentarily connect ground to 4B winding terminal of HR3 relay.	◆HR3 released. At recorder frame—◆ HR lamp lighted. Major alarm sounds.
52	◆At recorder under test—◆ Operate and release UH relay to advance U selector to position 13.	
53	◆At recorder frame—◆ Momentarily operate AR key.	HR lamp extinguished. Major alarm silenced.
54	At recorder under test— Operate and release HH relay to step H selector to position 13.	
55	Operate and release TH relay to step T selector to position 20.	
56	Operate and release UH relay to step U selector to position 19.	
57	Operate HR3 relay.	◆HR3 relay locks operated. At recorder frame—◆ HR lamp lighted. Major alarm sounds.
58	◆At recorder under test—◆ Operate and release UH relay to step U selector to position 20.	HS relay operated.
59	◆At recorder frame—◆ Momentarily operate AR key.	HR lamp extinguished. Major alarm silenced.
60	◆At recorder under test—◆ Operate and release HH relay to step H selector to position 15.	
61	Operate and release TH relay to step T selector to position 1.	
62	Operate and release UH relay to step U selector to position 12.	HS relay released.
63	Momentarily connect ground to 4B winding terminal of HR3 relay.	HR3 relay released. ◆At recorder frame—◆

STEP	ACTION	VERIFICATION
		HR lamp lighted. Major alarm sounds.
64	◆At recorder under test—◆ Operate and release UH relay to step U selector to position 13.	
65	◆At recorder frame—◆ Momentarily operate AR key.	HR lamp extinguished. Major alarm silenced.
66	◆At recorder under test—◆ Operate HR3 relay.	◆HR3 relay locks operated.◆
67	Operate and release HH relay to step H selector to position 20.	
68	Operate and release TH relay to step T selector to position 10.	
69	Operate and release UH relay to step U selector to position 18.	HR3 relay released.
70	Operate and release UH relay to step U selector to position 19.	
71	Momentarily operate HR3 relay.	◆HR3 relay locks operated. At recorder frame—◆ HR lamp lighted. Major alarm sounds.
72	Operate and release UH relay to step U selector to position 20.	
73	◆At recorder frame—◆ Momentarily operate AR key.	HR lamp extinguished. Major alarm silenced.
74	At recorder under test— Operate and release TH relay to step T selector to position 20.	HS relay operated.
75	Operate and release HH relay.	H, T, U selectors step to position 1. HS relay released.
76	Momentarily connect ground to 4B winding terminal of HR3 relay.	HR3 relay released.
77	Remove ground connections from 4T of C and 3T of NS relays.	
78	Remove insulator from 10T of PTS and 1T of HS relays.	

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STEP	ACTION	VERIFICATION
79	Remove blocking tools from C, PTS, HRT, and TA relays.	
80a	If HTA relay is not provided— Block operated HRT and ON relays.	Minor alarm sounds. At transverter trouble indicator frame— TI and DRR_ lamps lighted. MA TO MF lamp lighted to indicate numerical display 281899.
81a	At recorder under test— Remove blocking tools from HRT and ON relays.	
82a	Momentarily operate PR1 relay.	Recorder restores to normal.
83a	At transverter trouble indicator frame— Momentarily operate ACO key.	Minor alarm silenced.
84a	Momentarily operate RL key.	Trouble indicator display cleared.
85a	At recorder under test— Remove blocking tool from TC1 relay.	
86b	If HTA relay is provided— Block HRT, HTA, and ON relays operated.	Minor alarm sounds. At transverter trouble indicator frame— TI and DRR_ lamps lighted. MA to MF lamps lighted to indicate numerical display 281999.
87b	At recorder under test— Remove blocking tools from HRT, HTA and ON relays.	
88b	Momentarily operate PR1 relay.	Recorder restores to normal.
89b	At transverter trouble indicator frame— Momentarily operate ACO key.	Minor alarm silenced.
90b	Momentarily operate RL key.	Trouble indicator display cleared.
91b	At recorder under test— Block C and ON relays nonoperated.	
92b	Block HS relay operated.	
93b	Connect ground to 4T of C relay.	At recorder frame— HR lamp lighted. Major alarm sounds.
94b	At recorder under test— Remove ground from 4T of C relay.	

STEP	ACTION	VERIFICATION
95b	At recorder frame— Momentarily operate AR key.	HR lamp extinguished. Major alarm silenced.
96b	◆At recorder under test—◆ Operate and release HH relay to Step H selector to position 8.	
97b	Repeat Steps 93b through 95b.	
98b	◆At recorder under test—◆ Operate and release HH relay to step H selector to position 15.	
99b	Repeat Steps 93b through 95b.	
100b	At recorder under test— Remove blocking tool from ON relay.	
101b	Insulate 7B and 8B, 7T and 8T, 9T and 10T of TC1 relay.	
102b	Block operated TC1 relay.	
103b	Momentarily operate HRT and HTA relays.	On relay operated. Minor alarm sounds. At transverter trouble indicator frame— TI and DRR_ lamps lighted. MA to MF lamps lighted to indicate numerical display 281899.
104b	At recorder under test— Block nonoperated ON relay.	
105b	Momentarily operate PR1 relay.	Recorder restores to normal.
106b	At transverter trouble indicator frame— Momentarily operate ACO key.	Minor alarm silenced.
107b	Momentarily operate RL key.	Trouble indicator display cleared.
108b	◆At recorder under test—◆ Remove blocking tools from HS, C, ON and TC1 relays.	
109	Connect ground to 9B of ON relay.	
110	Block ADT on ON relays operated.	Minor alarm sounds. At transverter trouble indicator frame— TI and DRR_ lamps lighted. MA to MF lamps lighted to indicate numerical display 287100.

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STEP	ACTION	VERIFICATION
111	At recorder under test— Remove blocking tools from ADT and ON relays.	
112	At recorder under test— Momentarily operate PR1 relay.	Recorder restores to normal.
113	At transverter trouble indicator frame— Momentarily operate ACO key.	Minor alarm silenced.
114	Momentarily operate RL key.	Trouble indicator display cleared.
115	At recorder under test— Remove blocking tool from HPA relay.	
116	Block operated TCT and ON relays.	Minor alarm sounds. At transverter trouble indicator frame— TI and DRR_ lamps lighted. MA to MF lamps lighted to indicate numerical display 285400.
117	At recorder under test— Remove blocking tools from TCT and ON relays.	
118	Remove test connection from 9B of ON relay.	
119	Momentarily operate PR1 relay.	Recorder restores to normal.
120	At transverter trouble indicator frame— Momentarily operate ACO key.	Minor alarm silenced.
121	Momentarily operate RL key.	Trouble indicator display cleared.
122	Block AT and ON relays operated.	Minor alarm sounds. At transverter trouble indicator frame— TI and DRR_ lamps lighted. MA to MF lamps lighted to indicate numerical display 010101.
123	At recorder under test— Remove blocking tools from AT and ON relays.	
124	At recorder under test— Momentarily operate PR1 relay.	Recorder restores to normal.
125	At transverter trouble indicator frame— Momentarily operate ACO key.	Minor alarm silenced.
126	Momentarily operate RL key.	Trouble indicator display cleared.

STEP	ACTION	VERIFICATION
127	At the perforator cabinet for the recorder under test— Restore the perforator plug to its associated jack; then restore the perforator cover to its normal position.	
128	At master timing frame— Momentarily operate S key to synchronize the recorder selectors with the selectors of the master timing circuit.	SE or SO lamp extinguished when selectors are synchronized.
129	Momentarily operate AR key.	SSF lamp extinguished.
130	At transverter trouble indicator frame— Insert make-busy plug into TST jack for recorder under test.	
131	Insert plug of 32A test set into R jack and momentarily depress white button of test set. ♦ Note: If a trouble is encountered while applying the test pattern, clear the trouble and apply a good test pattern before restoring recorder to service.♦	Minor alarm sounds. At transverter trouble indicator frame— RUT, DLR_, TI lamps lighted. When master timing circuit completes test of recorder— RUT lamp extinguished.
132	At transverter trouble indicator frame— When RUT lamp is extinguished, momentarily operate RL key.	Minor alarm silenced. At transverter trouble indicator frame— TI and DLR_ lamps extinguished.
133	Remove plug from TST jack for the recorder under test.	
134	Remove plug of test set from R jack.	
135	Remove plug from TN jack for recorder under test.	At emergency recorder frame— EW lamp extinguished.
136	♦At perforator associated with recorder under test— Mark tape as indicated in 1.09.♦	

F. Splice and Break in Tape Feature

Note: Before starting this test and on completion of testing, mark the associated perforator tape as indicated in 1.09.

1	At sender link frame— Make busy all district junctors associated with recorder to be tested.	Associated primary hold magnets normal on district link frame.
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STEP	ACTION	VERIFICATION
2	At recorder under test— Connect ground to terminal 32 of terminal strip PRF.	Splice pattern perforated on tape. White aisle pilot lamps lighted. Major alarm sounds. At recorder under test— NP lamp lighted. MTR, MB, and MBR relays operate. Ground present on 8B of TN1 relay. ◆At transverter trouble indicator frame— R_ lamp lighted for recorder under test.◆
3a	If XN option is provided— At recorder frame— Momentarily operate AR key.	Major alarm silenced. White aisle pilot lamp extinguished. At recorder under test— NP lamp extinguished. MTR relay released.
4a	At recorder under test— Remove ground from terminal 32 of terminal strip PRF.	MBR and MB relays release. ◆Ground not present on 8B of TN1 relay.◆ At transverter trouble indicator frame— R_ lamp lighted for recorder under test.
5b	At recorder under test— If XO option is provided— Remove ground from terminal 32 of terminal strip PRF. <i>Note:</i> With XO option the AR key is ineffective.	Major alarm silenced. White aisle pilot lamp extinguished. At recorder under test— NP lamp extinguished. MBR, MB, and MTR relays released. ◆Ground not present on 8B of TN1 relay.◆ At transverter trouble indicator frame— R_ lamp extinguished for recorder under test.
6	At recorder under test— Block operated NS relay.	
7	At perforator associated with recorder under test— ◆Raise the clutch release arm and hook it over the catch.	
8	Pull back some slack in the tape and if necessary to obtain assess, disengage the tape from the tape guides.◆	
9	Fold tape in unperforated section of tape, as close to paper feed drum as possible; make two cuts beginning 1/4 inch on each side of center of fold at angle to intersect center line of tape, minimum 1/2 inch in from fold. ◆See Fig. 2.	
10	Replace tape in tape guides, wind tape back on the reel and lower the reel clutch release arm.◆	

STEP

ACTION

VERIFICATION

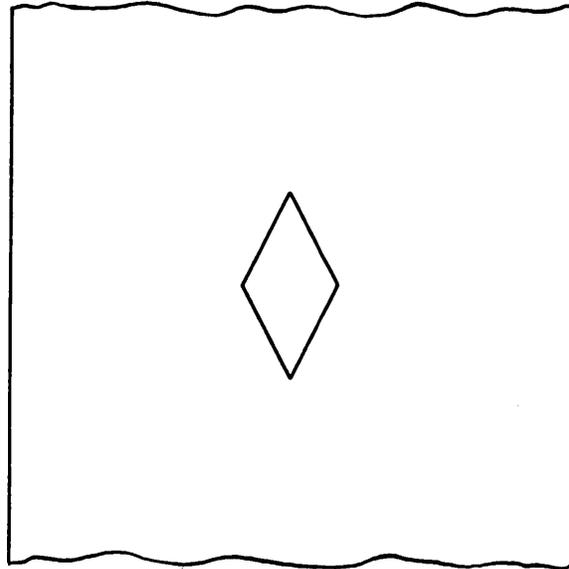


Fig. 2—Splice Window

- | | | |
|----|---|---|
| 11 | At perforator for recorder under test—
Operate and release AT switch until splice window is above splice indicator contact. | Perforator functions to perforate tape identity and approximately 40 lines of splice pattern to advance splice window beyond drum assembly. |
| 12 | At recorder under test—
Remove blocking tool from NS relay. | |
| 13 | At transverter trouble indicator frame—
Insert make-busy plug into RMB jack for recorder under test. | |
| 14 | Insert make-busy plug into TST jack for recorder under test. | |
| 15 | Insert plug of 32A test set into R jack and momentarily depress white button of test set.

◆ Note: If a trouble is encountered while applying the test pattern, clear the trouble and apply a good test pattern before restoring recorder to service.◆ | Minor alarm sounds.
At transverter trouble indicator frame—
RUT, DLR, TI lamps light.
When master timing circuit completes test of recorder—
RUT lamp extinguished. |

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STEP	ACTION	VERIFICATION
16	At transverter trouble indicator frame— When RUT lamp is extinguished, momentarily operate RL key.	Minor alarm silenced. At transverter trouble indicator frame— TI and DLR_ lamps extinguished.
17	Remove plug from TST and RMB jacks for recorder under test.	
18	Remove plug of test set from R jack.	
19	At perforator associated with perforator under test— Mark tape as indicated in 1.09.	
20	At sender link frame— Restore to service district junctors associated with recorder under test.	
G. Trouble Timing Feature		
<i>Note:</i> Before starting this test and on completion of testing, mark the associated perforator tape as indicated in 1.09.		
1	At transverter trouble indicator frame— Check that the emergency recorder is not in service by observing that there is no plug in any of the TN jacks.	
2	Insert make-busy plug into TN jack for recorder to be tested.	
3	At recorder under test— Block operated ON relay.	At recorder under test— TA and TF relays operate. Approximately 0.5 seconds later— TB relays operated. Minor alarm sounds. Approximately one second after TA relay operated TE relay operated. Approximately one second after TE relay operates RD relay operates. TTIB relay operates. Ground present on 5T of TBL and 8B of IPA relays.
4	Remove blocking tool from ON relay.	At recorder under test— TA, TB, TE, TTIB, and RD relays release.
5	At transverter trouble indicator frame— Momentarily operate ACO key.	Minor alarm silenced. DRR_ lamp associated with recorder under test and TI lamps lighted.
6	Momentarily operate RL key.	Trouble indicator restores to normal.

STEP	ACTION	VERIFICATION
7	At recorder under test— Block operated TTIB relay.	
8	Momentarily operate TB relay.	Minor alarm sounds.
9	At transverter trouble indicator frame— Momentarily operate ACO key.	Minor alarm silenced.
10	Momentarily operate RL key.	Trouble indicator restores to normal.
11	At recorder under test— Remove blocking tool from TTIB relay.	
12	At transverter trouble indicator frame— Insert make-busy plug into TST jack for recorder under test.	
13	Insert plug of 32A test set into R jack and momentarily depress white button of test set. ◆ <i>Note:</i> If a trouble is encountered while applying the test pattern, clear the trouble and apply a good test pattern before restoring recorder to service.◆	Minor alarm sounds. At transverter trouble indicator frame— RUT, DLR, TI lamps lighted. When master timing circuit completes test of recorder— RUT lamp extinguished.
14	At transverter trouble indicator frame— When RUT lamp is extinguished, momentarily operate RL key.	Minor alarm silenced. At transverter trouble indicator frame— TI and DLR_ lamps extinguished.
15	Remove plug from TST jack for recorder under test.	
16	Remove plug of test set from R jack.	
17	Remove plug from IN jack for recorder under test.	
18	◆At perforator associated with recorder under test— Mark tape as indicated in 1.09.◆	

H. AG Lead Alarm and Locking Features

Note: Before starting this test and on completion of testing, mark the associated perforator tape as indicated in 1.09.

1	At sender link frame— Make busy all district junctors associated with recorder to be tested.	Associated primary hold magnets normal on district link frame.
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STEP	ACTION	VERIFICATION
2	At transverter trouble indicator frame— Insert make-busy plug into RMB jack of recorder to be tested.	
3	Insert make-busy into TIB jack for the recorder under test.	
4	At recorder under test— Block nonoperated IP and TE relays.	
5	At call identity indexer associated with recorder under test— Block operated any TA_ or TB_ relay.	Minor alarm sounds.
6	At recorder under test— Manually operate IPA and RD relays in sequence.	IPA and RD relays lock.
7	At call identity indexer associated with recorder under test— Remove blocking tool from TA_ or TB_ relay.	RD and IPA relays release.
8	At transverter trouble indicator frame— Momentarily operate RL key.	Minor alarm retired.
9	At call identity indexer associated with recorder under test— Block operated any U_ relay.	
10	At recorder under test— Operate RD relay.	RD relay locks.
11	At call identity indexer associated with recorder under test— Remove blocking tool from U_ relay.	At recorder under test— RD relay releases.
12	At recorder under test— Block ON1 relay nonoperated.	
13	At call identity indexer associated with recorder under test— Block any TA_ or TB_ relay operated.	
14	At recorder under test— Operate RD relay.	RD relay locks.
15	At call identity indexer associated with recorder under test— Remove blocking tool from TA_ or TB_ relay.	At recorder under test— RD relay releases.

STEP	ACTION	VERIFICATION
16	At recorder under test— Remove blocking tool from TE, ON1 and IP relays.	
17	At transverter trouble indicator frame— Remove plug from TIB jack for recorder under test.	
18	At transverter trouble indicator frame— Insert make-busy plug into TST jack for recorder under test.	
19	Insert plug of 32A test set into R jack and momentarily depress white button of test set. ♦ Note: If a trouble is encountered while applying the test pattern, clear the trouble and apply a good test pattern before restoring recorder to service.♦	Minor alarm sounds. At transverter trouble indicator frame— RUT, DLR, TI lamps lighted. When master timing circuit completes test of recorder— RUT lamp extinguished.
20	At transverter trouble indicator frame— When RUT lamp is extinguished, momentarily operate RL key.	Minor alarm silenced. At transverter trouble indicator frame— TI and DLR_ lamps extinguished.
21	Remove plug from TST and RMB jack for recorder under test.	
22	Remove plug of test set from R jack.	
23	♦At perforator associated with recorder under test— Mark tape as indicated in 1.09.♦	
24	At sender link frame— Restore to service district junctions associated with recorder under test.	

I. Transient Operation of Perforator Magnets and Series Relay Locking Features

Note: Before starting this test and on completion of testing, mark the associated perforator tape as indicated in 1.09.

1	At transverter trouble indicator frame— Check that the emergency recorder is not in service by observing that there is no plug in any of the TN jacks.	
2	Insert make-busy plug into TN_ jack for recorder to be tested.	At emergency recorder— EW lamp lighted.

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STEP	ACTION	VERIFICATION
3	At recorder under test— Connect ground to T winding terminal of A0 relay.	Minor alarm sounds. A0 relay operates.
4	Remove ground from A0 relay.	Recorder restores to normal.
5	At transverter trouble indicator frame— Momentarily operate ACO key.	Minor alarm silenced. DRR_ lamp associated with recorder under test; TI and MA0 lamps lighted.
6	Momentarily operate RL key.	Trouble indicator restores to normal.
7	At recorder under test— Insulate 3B of TE relay, 8T of PTS relay, 9B of TEC relay.	
8	Block IP relay nonoperated.	
9	Momentarily connect ground to T winding terminal of A0 relay.	A0 relay operates and locks. PTS relay operates.
10	Momentarily connect ground to B winding terminal of A0 relay.	A0 and PTS relays release.
11	Repeat Steps 9 and 10 for each of relays A1, A2, B0 through B7, C0 through C7, D0 through D7, E0 through E7, and F0 through F7, inclusive.	
12	Remove insulators from 3B of TE relay, 8B of PTS relay and 9B of TEC relay.	
13	Remove blocking tool from IP relay.	
14	At transverter trouble indicator frame— Insert make-busy plug into TST jack for recorder under test.	
15	Insert plug of 32A test set into R jack and momentarily depress white button of test set.	Minor alarm sounds. At transverter trouble indicator frame— RUT, DLR_, TI lamps lighted. When master timing circuit completes test of recorder— RUT lamp extinguished.
	◆ Note: If a trouble is encountered while applying the test pattern, clear the trouble and apply a good test pattern before restoring recorder to service.◆	
16	At transverter trouble indicator frame— When RUT lamp is extinguished, momentarily operate RL key.	Minor alarm silenced. At transverter trouble indicator frame— TI and DLR_ lamps extinguished.
17	Remove plug from TST jack for recorder under test.	

STEP	ACTION	VERIFICATION
18	Remove plug of test set from R jack.	
19	▶At perforator associated with recorder under test— Mark tape as indicated in 1.09.▶	
20	At transverter trouble indicator frame— Remove plug from TN jack for recorder under test.	At emergency recorder frame— EW lamp extinguished.
J. Trouble Cross-detecting Features		
<i>Note:</i> Before starting this test and on completion of testing, mark the associated perforator tape as indicated in 1.09.		
1	At transverter trouble indicator frame— Check that the emergency recorder is not in service by observing that there is no plug in any of the TN jacks.	
2	At sender link frame— Make busy all district junctors associated with recorder to be tested.	Associated primary hold magnets normal on district link frame.
3	At transverter trouble indicator frame— Insert make-busy plug into RMB jack for recorder to be tested.	
4	▶At recorder under test— Insulate 3T and 4B of XPA relay.▶	
XP Relay		
5	Insulate 3B of IP relay.	Minor alarm sounds. ▶At recorder under test— XPA relay operated.▶
6	Remove insulator from 3B of IP relay.	
7	▶Open 6T of XPA relay.	XPA relay releases.▶
8	At transverter trouble indicator frame— Momentarily operate ACO key.	Minor alarm silenced. DRR_ lamp associated with recorder under test and XP1 lamp lighted.
9	Momentarily operate RL key.	Trouble indicator restores to normal.
10	At recorder under test— Block nonoperated XP1 relay.	
11	Insulate 3T of MTP relay.	XP relay not operated.

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STEP	ACTION	VERIFICATION
12	Insulate 6T of MTP relay.	XP relay operated.
13	Remove insulator from 3T of MTP relay.	XP relay releases.
14	Remove insulator from 6T of MTP relay.	
15	Remove blocking tool from XP1 relay.	
XU Relay		
16	At call identity indexer associated with recorder under test— Insulate 3T of any U_ relay.	Minor alarm sounds. At transverter trouble indicator frame— DRR_ and XU1 lamps light. ◆At recorder under test— XPA relay operated.◆
17	At call identity indexer associated with recorder under test— Remove insulator from 3T of U_ relay.	
18	At transverter trouble indicator frame— Momentarily operate ACO key.	Minor alarm silenced.
19	Momentarily operate RL key.	
20	At recorder under test— Block nonoperated XP1 relay.	
21	At call identity indexer associated with recorder under test— Insulate 3B of any U_ relay.	At recorder under test— XU relay operated.
22	At call identity indexer associated with recorder under test— Remove insulator from 3B of U_ relay.	
23	At recorder under test— Remove blocking tool from XP1 relay.	
XTC and XCO Relays		
24	◆Insulate 5T and 6T of TVM relay.◆	
25	At call identity indexer associated with recorder under test— Connect ground to 3T of any UA_ relay.	Minor alarm sounds. At transverter trouble indicator frame— DRR_, XTC and XTL lamps lighted. ◆At recorder under test— XTC and XCO relays operated.◆
26	At transverter trouble indicator frame— Momentarily operate ACO key.	Minor alarm silenced.

STEP	ACTION	VERIFICATION
27	Momentarily operate RL key.	Trouble indicator restores to normal.
28	At call identity indexer associated with recorder under test— Remove ground from 3T of UA ₁ relay.	
29	Block operated A1 relay.	Minor alarm sounds. At transverter trouble indicator frame— DRR ₁ , XTL and XTC lamps lighted. At recorder under test— XTC and XCO relays operated.
30	◆At recorder under test— Remove insulator from 5T and 6T of TVM relay.◆	
31	At transverter trouble identity frame— Momentarily operate ACO key.	Minor alarm silenced.
32	Momentarily operate RL key.	Trouble indicator restores to normal.
33	At call identity indexer associated with recorder under test— Remove blocking tool from A1 relay.	At recorder under test— XTC and XCO relays release.
XT Relay		
34	At recorder under test— Connect ground to 2B of MB relay.	
35	At call identity indexer associated with recorder under test— Insulate 1T of any T ₁ relay.	Minor alarm sounds. At transverter trouble indicator frame— DRR ₁ and XT1 lamps lighted. At recorder under test— XT relay operated.
36	At transverter trouble indicator frame— Momentarily operate ACO key.	Minor alarm silenced.
37	Momentarily operate RL key.	Trouble indicator restores to normal.
38	◆At recorder under test— Remove insulators from 3T and 4B of XPA relay.	Major alarm sounds. At recorder frame— XRB lamp associated with recorder under test lighted.
39	At recorder frame— Momentarily operate AR key.	Major alarm silenced. XRB lamp associated with recorder under test extinguished.◆
40	At recorder under test— Block XP1 relay nonoperated.	

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STEP	ACTION	VERIFICATION
41	Insulate 3B of RD relay.	XT relay operated.
42	Remove insulator from 3B of RD relay.	XT relay releases.
43	Remove blocking tool from XP1 relay.	
44	Remove ground from 2B of MB relay.	
XRB Relay		
45	Insulate 6B of MBR relay.	
46	Manually release MBR relay.	
47	Manually release and block nonoperated MBJ relay.	
48	Momentarily connect ground to 8B of TN1 relay.	Major alarm sounds. At recorder frame— XRB lamp associated with recorder under test lighted.
49	At recorder frame— Momentarily operate AR key.	Major alarm silenced. At recorder frame— XRB lamp associated with recorder under test extinguished.
50	◆At recorder under test—◆ Momentarily connect ground to 2T of RT relay.	Major alarm sounds. At recorder frame— XRB lamp associated with recorder under test lighted.
51	At recorder frame— Momentarily operate AR key.	Major alarm silenced. At recorder frame— XRB lamp associated with recorder under test extinguished.
52	◆At recorder under test—◆ Remove blocking tool from MBJ relay.	
53	Operate MBR relay.	MBR relay locks.
54	Remove insulator from 6B of MBR relay.	
54	At transverter trouble indicator frame— Insert make-busy plug into TST jack for recorder under test.	
55	Insert plug of 32A test set into R jack and momentarily depress white button.	Minor alarm sounds. At transverter trouble indicator frame— RUT, DLR., TI lamps lighted.

STEP	ACTION	VERIFICATION
	Note: If a trouble is encountered while applying the test pattern, clear the trouble and apply a good test pattern before restoring recorder to service.	When master timing circuit completes test of recorder— RUT lamp extinguished.
56	At transverter trouble indicator frame— When RUT lamp is extinguished, momentarily operate RL key.	Minor alarm silenced. At transverter trouble indicator frame— TI and DLR_ lamps extinguished.
57	Remove plug from TST and RMB jack for recorder under test.	
58	Remove plug of test set from R jack.	
59	At perforator associated with recorder under test— Mark tape as indicated in 1.09.	
60	At sender link frame— Restore to service all district junctors associated with recorder under test.	

K. Test for False Continuity and Crosses of TC_ Relgys

Note 1: Before starting this test and on completion of testing, mark the associated perforator tape as indicated in 1.09.

Note 2: In the following steps the action or verification specified for the operating and stationary springs applies to those circuits equipped with 263-type multicontact relay. When 287-type wire spring multicontact relay is provided, the action or verification specified for the operating springs should be made on the stationary springs, and that specified for the stationary springs should be made on the operating springs.

1	At transverter trouble indicator frame— Check that the emergency recorder is not in service by observing that there is no plug in any of the TN jacks.	
2	Insert make-busy plug into TN jack for recorder to be tested.	At emergency recorder— EW lamp lights.
3	Insert make-busy plug into TVB jack for lowest transverter.	At transverter made busy— RK relay released. At TC_ terminal strip on recorder frame for transverter made busy—

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STEP	ACTION	VERIFICATION
		Battery absent on terminal 48. Ground absent on terminals 29, 37, 45. At TC terminal strip on recorder under test— Battery absent on terminals 19, 36, 56. Ground absent on terminals 10 through 15, 18 through 25, 28, 30 through 38, 40 through 44, 58. At recorder under test— TVM and CH relays released.
4a	If CHLK relay is provided— At recorder under test— Connect ground to 9B and 10B of CH relay.	CHLK relay not operated.
5a	Remove ground from 9B and 10B of CH relay.	
6	Insulate 5T and 6T of TVM relay.	At TC terminal strip on recorder under test— Battery and ground absent on terminal 45.
7	Remove insulator from 5T and 6T of TVM relay.	
8	Insulate 5T and 6T of TVM1, 6T and 7T of RD relays.	At TC terminal strip on recorder under test— Battery and ground absent on terminal 48.
9	Remove insulators from 5T and 6T of TVM1; 6T and 7T of RD relays.	
10	Connect ground to top winding terminal of TC ₋ relay associated with transverter made busy.	
11	Block operated ON1 relay and, if provided, ON2 relay.	At TC terminal strip on recorder under test— Ground absent on terminal 00.
12	Remove ground from top winding terminal of TC ₋ relay placed in Step 10.	
13	Remove blocking tool from ON1 relay and if provided, ON2 relay.	
14	At transverter made busy— Insulate 3T and 4T, 5T and 6T, and 9T and 10T of COCL relay.	At TC ₋ terminal strip on recorder frame for transverter made busy— Battery and ground absent on terminal 26.
15	Remove insulator from 5T and 6T of COCL relay.	Battery and ground absent on terminal 36.
16	Remove insulator from 3T and 4T of COCL relay.	Battery and ground absent on terminal 46.

STEP	ACTION	VERIFICATION
17	Remove insulator from 9T and 10T of COCL relay.	Battery and ground absent on terminal 56. At TC terminal strip on recorder under test— Ground absent on terminal 16. Battery and ground absent on terminals 27 and 47. At recorder under test. TVM and PA relays released.
18	At transverter made busy— Insulate 1T and 2T of TOK relay.	At TC_ terminal strip on recorder frame for transverter made busy— Battery and ground absent on terminal 47.
19	Insulate 7T and 8T of COCL relay.	Battery and ground absent on terminal 57.
20	Remove insulator from 1T and 2T of TOK and 7T and 8T of COCL relays.	
21	At recorder under test— Connect 7B of HS relay to terminal 27 of TC_ terminal strip associated with transverter made busy on recorder frame.	At transverter made busy— IR relay operated.
22	At recorder under test— Remove connection from HS relay and TC_ terminal strip placed in Step 21.	At transverter made busy— IR relay released.
23	At transverter made busy— Insulate 1T and 2T of COCL relay.	At TC_ terminal strip on recorder frame for transverter made busy— Battery and ground absent on terminal 28.
24	Insulate 3B and 4B of CODA relay.	Battery and ground absent on terminal 38.
25	Insulate 7B and 8B of COCL relay.	Battery and ground absent on terminal 58.
26	Remove insulators from 3B and 4B of CODA and 7B and 8B of COCL relays.	
27	At TC terminal strip on recorder under test— Connect ground to terminal 29.	At TC terminal strip on recorder under test— Battery and ground absent on terminal 39.
28	Remove ground connection from terminal 29.	
29	Connect ground to terminal 49.	Battery and ground absent on terminals 39 and 59.
30	Remove ground connection from terminal 49.	
31	At transverter made-busy— Insulate 2B and 3B of LP relay.	At TC_ terminal strip on recorder frame for transverter made busy— Battery and ground absent on terminal 39.

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STEP	ACTION	VERIFICATION
32	Insulate 7B and 8B of CODA relay.	Battery and ground absent on terminals 59 and 39.
33	Remove insulators from 2B and 3B of LP, 7B and 8B of CODA relay.	
34	At recorder under test. Insulate 8B and 9B of PTS relay.	Battery and ground absent on terminal 06.
35	Remove insulator from 8B and 9B of PTS relay.	
36	◆At transverter made busy— Insulate 3B and 4B of COCL relay.	Battery and ground absent on terminal 16.
37	Insulate 1B and 2B of COCL relay.	Battery and ground absent on terminal 55.
38	Insulate 2B and 3B of TOK relay.	Battery and ground absent on terminal 49.
39a	If Figure C is provided— Insulate 2B and 3B of IR relay.	Battery and ground absent on terminal 18.
40b	If Figure D is provided— Insulate 7T and 8T of IR relay.	Battery and ground absent on terminal 18.
41	Insulate 5B and 6B of CODA relay.	Battery and ground absent on terminal 15.
42	Insulate 9B and 10B of CODA relay.	Battery and ground absent on terminal 35.
43	Insulate 1B and 2B of CODB relay.	Battery and ground absent on terminal 50.
44	Insulate 3B and 4B of CODB relay.	Battery and ground absent on terminal 51.
45	Insulate 5B and 6B of CODB relay.	Battery and ground absent on terminal 52.
46	Insulate 7B and 8B of CODB relay.	Battery and ground absent on terminal 53.
47	Insulate 9B and 10B of CODB relay.	Battery and ground absent on terminal 54.
48	Insulate 1T and 2T of CODB relay.	Battery and ground absent on terminal 40.
49	Insulate 3T and 4T of CODB relay.	Battery and ground absent on terminal 41.
50	Insulate 5T and 6T of CODB relay.	Battery and ground absent on terminal 42.
51	Insulate 7T and 8T of CODB relay.	Battery and ground absent on terminal 43.
52	Insulate 9T and 10T of CODB relay.	Battery and ground absent on terminal 44.
53	Insulate 1T and 2T of CODA relay.	Battery and ground absent on terminal 30.
54	Insulate 3T and 4T of CODA relay.	Battery and ground absent on terminal 31.

STEP	ACTION	VERIFICATION
55	Insulate 5T and 6T of CODA relay.	Battery and ground absent on terminal 32.
56	Insulate 7T and 8T of CODA relay.	Battery and ground absent on terminal 33.
57	Insulate 9T and 10T of CODA relay.	Battery and ground absent on terminal 34.
58	Insulate 1B and 2B of COFE relay.	Battery and ground absent on terminal 20.
59	Insulate 3B and 4B of COFE relay.	Battery and ground absent on terminal 21.
60	Insulate 5B and 6B of COFE relay.	Battery and ground absent on terminal 22.
61	Insulate 7B and 8B of COFE relay.	Battery and ground absent on terminal 23.
62	Insulate 9B and 10B of COFE relay.	Battery and ground absent on terminal 24.
63	Insulate 1T and 2T of COFE relay.	Battery and ground absent on terminal 10.
64	Insulate 3T and 4T of COFE relay.	Battery and ground absent on terminal 11.
65	Insulate 5T and 6T of COFE relay.	Battery and ground absent on terminal 12.
66	Insulate 7T and 8T of COFE relay.	Battery and ground absent on terminal 13.
67	Insulate 9T and 10T of COFE relay.	Battery and ground absent on terminal 14.
68	Remove insulators placed in Steps 41 through 67.♦	
69	At transverter trouble indicator frame— Remove plug from TVB jack for transverter made busy.	
70	Insert make-busy plug into TVB jack for next higher numbered transverter.	
71	Proceed as in Steps 3, 10 through 26, 31 through 68 for TC_ relay associated with transverter made busy.	
72	Repeat Steps 69 through 71 using next higher numbered TVB jack and associated TC_ relay until all TC_ relays of recorder under test have been tested.	
73	At transverter trouble indicator frame— Remove plug from TVB jack for transverter under test.	
74	Insert make-busy plug into TST jack for recorder under test.	

STEP	ACTION	VERIFICATION
75	Insert plug of 32A test set into R jack and momentarily depress white button of test set. <i>Note:</i> ♦If a trouble is encountered while applying the test pattern, clear the trouble and apply a good test pattern before restoring recorder to service.♦	Minor alarm sounds. At transverter trouble indicator frame— RUT, DLR, TI lamps lighted. When master timing circuit completes test of recorder— RUT lamp extinguished.
76	At transverter trouble indicator frame— When RUT lamp is extinguished, momentarily operate RL key.	Minor alarm silenced. At transverter trouble indicator frame— TI and DLR_ lamps extinguished.
77	Remove plug from TST jack for recorder under test.	
78	Remove plug of test set from R jack.	
79	♦At perforator associated with recorder under test— Mark tape as indicated in 1.09.♦	
80	At transverter trouble indicator frame— Remove plug from TN jack for recorder under test.	At emergency recorder— EW lamp extinguished.

L. Perforator Leads from Transverters

- 1 Determine from office records column switch and vertical file locations of four subscriber lines arranged for AMA which have 0, 1, 3, and 6, respectively, as last digit of directory numbers. If directory numbers having these units digits cannot be used for this test, select any other combination of directory numbers which will test all F (0-7) perforator leads, between transverters and recorder under test, for transpositions. Obtain from office records class of service of these lines and office codes which require AMA records for each calling line.
- 2 At originating sender test frame—
Operate AMA, RR, TE2 keys and TV_ key associated with transverter selected for test.
- 3 Insert plug into TVB jack associated with transverter selected for test.
- 4 At originating sender test frame—
Set up full selector test call for subscriber sender. Operate REP key and operate CH_, CT_, CU_, SW_ and VF_ keys for one of line

STEP	ACTION	VERIFICATION
	locations covered in Step 1. Operate A, B, C, and CS keys selected in Step 1 and F ₁ and FA keys for district frame associated with recorder under test, setting up any digits on each of the TH, H, T and U keys.	
5	Momentarily operate ST key.	Minor alarm sounds. At transverter trouble indicator frame— MAO lamp lighted and unit digit of directory number used for test indicated by the MF lamps.
6	At transverter trouble indicator frame— Operate ACO key.	Minor alarm retires.
7	Operate RL key.	Trouble indicator restores to normal.
8	Proceed as outlined in Steps 4 through 7 for each of the other directory numbers selected in Step 1.	
9	At originating sender test frame— Restore TE2 key.	
10	Operate TE4 and LO keys.	
11	Proceed as outlined in Step 4 except that on the TH, H, T and U keys, set up 0000.	
12	Momentarily operate ST key.	Minor alarm sounds. MB, MC, MD and ME lamps lighted indicate 0000.
13	At transverter trouble indicator frame— Operate ACO key.	Minor alarm retires.
14	Operate RL key.	Trouble indicator restores to normal.
15	Proceed as outlined in Step 4 and Steps 9 through 14 except that on successive calls, set up 1111, 3333 and 6666 on TH, H, T and U keys.	
16	At originating sender test frame— Restore TE4 and LO keys.	
17	Momentarily operate ST key.	Minor alarm sounds. At transverter trouble indicator frame— Number 2 indicated by MA lamp.
18	At transverter trouble indicator frame— Operate ACO key.	Minor alarm retires.

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STEP	ACTION	VERIFICATION
19	Operate RL key.	Trouble indicator restores to normal.
20	Remove plug from TVB jack for transverter under test.	
21	Proceed as outlined in Steps 2 through 20 until all transverters have been tested.	

M. District Junctor Identifying Leads

1	Select for test purposes district junctors associated with the following tens and units relays on call identity indexer associated with recorder under test: tens 0, units 0; tens 1, units 1; tens 3, units 3; and tens 6, units 6. If these district junctors can not be used for this test, select any other district junctors with combinations of tens and units relays on call identity indexer which will test for transpositions all T_ and U_ district junctor identification leads to recorder.	
2	At district junctor test frame— Set up local charge call selecting particular district junctor associated with call identity indexer tens and units relays as outlined in Step 1. Operate REP and TDN keys.	
3	Momentarily operate ST key.	Minor alarm sounds when transverter trouble indicator is brought in. At transverter trouble indicator frame— Numbers indicated on DNT and DNU lamps agree with number indicated on ME and MF lamps and number of district junctor under test.
4	At transverter trouble indicator frame— Operate ACO key.	Minor alarm retires.
5	Operate RL key.	Trouble indicator restores to normal.
6	At district junctor test frame— Operate CA key.	Test frame releases.
7	Repeat Steps 2 through 6 with each of district junctors selected in Step 1.	
8	Restore TDN key.	
9a	If district junctor test frame is arranged to block on failure to properly perforate an	

STEP	ACTION	VERIFICATION
	answer or disconnect entry (T0 lead)— Insulate 11T contact of TC relay of district junctor last tested.	
10a	At district junctor test frame— Momentarily operate ST key.	Minor alarm sounds when transverter trouble indicator is brought in. At district junctor test frame— TA and RA lamps lighted when test call blocks.
11a	At transverter trouble indicator frame— Operate RL key.	Trouble indicator restores to normal.
12a	Remove insulator from TC relay contact of district junctor under test.	
13	At district junctor test frame— Operate CA and RN keys and restore REP key to normal.	Test frame restores to normal.

N. Preference Relays—Operating and Lockout Features

Note: Before starting this test and on completion of testing, mark associated perforator tape as indicated in 1.09.

1	At sender link frame— Make busy all district juncctors associated with recorder to be tested.	
2	At recorder under test— Block nonoperated XP and ON relays.	
3	Insulate 5T and 6T of MTP relay.	
4	Connect battery to B winding terminal of IP relay.	IP relay operated.
5	Connect battery to B winding terminal of HP relay.	IP remains operated. HP relay not operated.
6	Disconnect battery from IP relay.	IP relay releases. HP relay operated.
7	Reconnect battery to B winding terminal of IP relay.	IP relay operated. HP relay remains operated.
8	Disconnect battery from IP relay.	IP relay releases.
9	Connect battery to B winding terminal of highest numbered TP_ relay.	TP_ relay not operated.

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STEP	ACTION	VERIFICATION
10	Disconnect battery from HP relay.	HP relay releases. TP_ relay operated.
11	Reconnect battery to B winding terminal of HP relay.	HP relay operated. TP_ relay remains operated.
12	Disconnect battery from TP_ relay.	TP_ relay releases.
13	In succession, connect battery to B winding terminals of remaining TP_ relays as outlined in Steps 9 through 12.	
14	Connect battery to B winding terminal of MTP relay.	MTP relay not operated.
15	Disconnect battery from HP relay.	HP relay released. MTP relay operated.
16	Reconnect battery to B winding terminal of HP relay.	HP relay operates. MTP relay remains operated.
17	Disconnect battery from HP and MTP relays.	HP relay releases. MTP relay releases.
18	Remove insulator from 5T and 6T of MTP relay.	
Figure 27 Provided for Improved Preference Operation		
19	At recorder under test— Check that XP and ON relays are blocked nonoperated as indicated in Step 2.	
20	At recorder unit TRF terminal strip— Momentarily apply ground to terminal 3.	At recorder under test— RIP relay operated. At call identity indexer associated with recorder under test— T0 relay operated.
21	At recorder unit TRF terminal strip— Momentarily apply ground to terminals 4 through 12 in sequence.	At recorder under test— RIP relay operated. At call identity indexer associated with recorder under test— T1 through T9 relays operate in accordance with terminal grounded. Terminal 4 = T1 relay Terminal 12 = T9 relay
22	At recorder under test— Insulate 8 break of RTL relay.	

STEP	ACTION	VERIFICATION
23	At recorder unit TRF terminal strip— Momentarily apply ground to terminal 3.	At recorder under test— RIP relay not operated. At call identity indexer associated with recorder under test— T0 relay operated.
24	At recorder under test— Remove insulator from 8 break of RTL relay.	
25	Connect ground to upper winding of RTL relay.	RTL relay operated. TIA or HS relays not operated. <i>Note:</i> Should the TIA or HS diode for a short.
26	Momentarily connect battery to bottom winding terminal of bottom winding coil of lowest TC ₋ relay.	TC ₋ relay not operated. <i>Note:</i> Should the TC ₋ relay operate, remove the battery and check the TC ₋ diode for a short.
27	Repeat Step 26 for all remaining TC ₋ relays.	
28	Remove ground from RTL relay.	RTL relay releases.
29	Connect ground to upper winding of RIP relay.	RIP relay operated. At call identity indexer associated with recorder under test— No T ₋ relay operated. <i>Note:</i> This tests the T0-9 diodes for shorts.
30	At recorder under test— Remove ground from RIP relay.	RIP relay releases.
31	Block operated lowest numbered TP ₋ relay.	RTL relay operated.
32	Insulate 6 make of RIP relay.	
33	Block operated RIP relay.	RTL relay released.
34	Remove blocking tool from RIP relay.	RTL relay operated.
35	Open contacts on ON1 and, if provided, ON2 relay in accordance with Table C.	RTL relay releases.
36	Remove blocking tools from TP ₋ relay.	TP ₋ and RTL relays release.
37	Repeat Steps 31 through 36 for other TP ₋ relays.	
38	Block operated MTP relay.	RTL and TIA relays operated.

STEP	ACTION	VERIFICATION
52	Remove blocking tool from RIP relay.	IPA relay releases. RTL relay operated.
53	Momentarily operate RIP relay.	IPA relay remains released. RTL relay remains operated.
54	Remove blocking tool from TP ₋ and IP relays.	
55	Connect battery to 8T of TN 8 relay.	
56	Block operated RIP relay.	UL relay operated. With KS-14563 volt-ohm meter or equivalent check for battery on 8B of IPA relay. (Reading should be approximately 24 volts.) Battery present on 1B of DS relay of approximately -48 volts.
57	Remove blocking tool from RIP relay.	UL relay releases. Battery not present on 1B of DS relay. Battery present on 8B of IPA relay of approximately -48 volts.
58	Remove battery connection from 8T of TN8 relay.	
59	Remove insulators from 1T and 2T, 1B and 2B of DS, 4B and 5B of IP, 5B and 6B of ON1, 5B and 6B of IPA relays.⚡	

All Equipment Arrangements With or Without Figure 27

60	Remove blocking tools from ON and XP relays in order.	
61	At transverter trouble indicator frame— Insert make-busy plug into RMB jack for recorder under test.	
62	Insert make-busy plug into TST jack for recorder under test.	
63	Insert plug of 32A test set into R jack and momentarily depress white button of test set. ⚡ Note: If a trouble is encountered while applying the test pattern, clear the trouble and apply a good test pattern before restoring the recorder to service.⚡	Minor alarm sounds. At transverter trouble indicator frame— RUT, DLR, TI lamps lighted. When master timing circuit completes test of recorder— RUT lamp extinguished.
64	At transverter trouble indicator frame— When RUT lamp is extinguished, momentarily operate RL key.	Minor alarm silenced. At transverter trouble indicator frame— TI and DLR ₋ lamps extinguished.

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STEP	ACTION	VERIFICATION
65	Remove plug from TST and RMB jack for recorder under test.	
66	Remove plug of test set from R jack.	
67	At perforator associated with recorder under test— Mark tape as indicated in 1.09.	
68	At sender link frame— Restore to service district junctors made busy for this test.	

N.1 Dynamic Test of Preference Relays

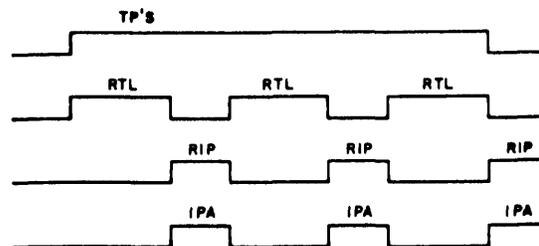
Note 1: This test is made only when the recorder preference improvement feature (App. Fig. 27) is provided.

Note 2: Refer to Section 100-133-100 before using Esterline Angus 20-pen event recorder.

Note 3: This test does not affect service and should be made during busy hours so that the recording will reflect conditions when two or more transverters have preference relays operated in order that a timing entry can be shown taking place between initial entries. In order to get a good reading this test should be made for approximately 1 hour or in accordance with local instructions.

Note 4: Connect battery first to prevent tying the leads together through the pen windings of the event recorder; disconnect battery last.

- | | | |
|---|---|--|
| 1 | At recorder under test—
Connect the recording device to upper windings | Satisfactory operation of preference relays will be indicated by a recording as follows: |
|---|---|--|



STEP	ACTION	VERIFICATION
	of RTL, RIP relay, 13T of IPA relay and 6B of CHLK relay.	
2	Remove connections from RTL, RIP, IPA and CHLK relays.	
N.2 Detection of Falsely Grounded DJ_ Lead		
	<i>Note 1:</i> This test is made only when T option is provided in the call identity indexer and option WN in the recorder.	
	<i>Note 2:</i> Before starting this test and on completion of testing, mark the associated perforator tape as indicated in 1.09.	
1	At sender link frame— Make busy all district junctors associated with recorder to be tested.	
2	At transverter trouble indicator frame— Insert make-busy plug into RMB jack for recorder under test.	
3	At recorder under test— Insulate 1T and 2T of DS, 4B and 5B of TBL, 6B and 7B of DTKA relays.	
4	Block ON relay nonoperated.	
5	At call identity indexer associated with recorder under test— Connect ground through 18AN resistor (350 ohms) or equivalent to 5T winding terminal of DJK relay.	DJK relay operated.
6	At recorder under test— Insulate 5T and 6T of LC relay.	
7	Block operated IPA, UL, and DTKA relays.	
8	Manually operate M relay.	M relay locks operated. DTN relay operated.
9	At call identity indexer associated with recorder under test— Remove ground from 5T winding terminal of DJK relay.	DJK relay released. At recorder under test— M and DTN relays release.
10	At recorder under test— Remove blocking tool from IPA, UL, and DTKA relays.	

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STEP	ACTION	VERIFICATION
11	Remove insulator from 5T and 6T of LC relay.	
12	Remove insulators from 1T and 2T of DS, 4B and 5B of TBL, 6B and 7B of DTKA relays.	
13	Remove blocking tool from ON relay.	
14	At transverter trouble indicator frame— Insert make-busy plug into TST jack for recorder under test.	
15	Insert plug of 32A test set into R jack and momentarily depress white button of test set. <i>Note:</i> If a trouble is encountered while applying the test pattern, clear the trouble and apply a good test pattern before restoring the recorder to service.	Minor alarm sounds. At transverter trouble indicator frame— RUT, DLR, TI lamps lighted. When master timing circuit completes test of recorder— RUT lamp extinguished.
16	At transverter trouble indicator frame— When RUT lamp is extinguished, momentarily operate RL key.	Minor alarm silenced. At transverter trouble indicator frame— TI and DLR_ lamps extinguished.
17	Remove plugs from TST and RMB jacks for recorder under test.	
18	Remove plug of test set from R jack.	
19	At perforator associated with recorder under test— Mark tape as indicated in 1.09.	
20	At sender link frame— Restore to service all trunks made busy for this test.◆	

Emergency Recorder

O. Make-busy Feature

Note: Before starting this test and on completion of testing, mark the associated perforator tape as indicated in 1.09.

1	At transverter trouble indicator frame— Observe that there is no plug in any TN jack.	
2	At sender link frame— Make busy all district junctors associated with any regular recorder.	Associated primary hold magnets normal on district link frame.

STEP	ACTION	VERIFICATION
3	At transverter trouble indicator frame— Insert make-busy plug into RMB jack for the emergency recorder.	At transverter trouble indicator frame— R lamp associated with emergency recorder lighted. At emergency recorder— NS relay operated. RT and RT1 relays released.
4	At transverter trouble indicator frame— Insert make-busy plug into TN jack of recorder associated with district junctors made busy in Step 2.	At emergency recorder frame— EW lamp extinguished.
5	At transverter trouble indicator frame— Remove plug from TN jack of regular recorder used in Step 4.	
6	Remove plug from RMB jack for emergency recorder.	At emergency recorder— NS, RT and RT1 relays released. At transverter trouble indicator frame— R lamp associated with emergency recorder extinguished.
7	At transverter trouble indicator frame— Insert make-busy plug into TN jack of recorder associated with district junctors made busy.	At emergency recorder frame— EW lamp lighted.
8	At transverter trouble indicator frame— Insert make-busy plug into RMB jack for the emergency recorder.	At emergency recorder— NS relay operated. RT and RT1 relays released. At transverter trouble indicator frame— R lamp associated with emergency recorder lighted. At transferred regular recorder— Ground present on 8B of TN1 relay. Ground absent on 2B of TN6 relay.
9	At emergency recorder— Block nonoperated TA relay and block operated ON relay.	At transferred regular recorder— Ground present on 2B of TN6 relay. At transverter trouble indicator frame— R lamp associated with emergency recorder lighted.
10	At emergency recorder— Remove blocking tools from ON and then TA relays.	At transverter trouble indicator frame— R lamp associated with emergency recorder extinguished.
11	At transverter trouble indicator frame— Remove plug from RMB jack for emergency recorder.	At emergency recorder— NS, RT, and RT1 relays released.

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STEP	ACTION	VERIFICATION
12	At emergency recorder— Insulate 4B and 5B, 10B and 11B of MBR relay.	
13	Block MBR relay operated.	At transferred regular recorder— Ground present on 8B of TN1 relay.
14	At emergency recorder— Remove blocking tool and insulators from 4B and 5B, 10B and 11B of MBR relay.	
15	At transverter trouble indicator frame— Remove plug from TN jack of recorder used for test.	At emergency recorder— EW lamp extinguished.
16	At sender link frame— Restore to service district junctors made busy in Step 2.	
17	At transverter trouble indicator frame— Insert make-busy plug into RMB jack for the emergency recorder.	
18	Insert make-busy plug into TST jack for emergency recorder.	
19	Insert plug of 32A test set into R jack and momentarily depress white button of test set. <i>Note:</i> If a trouble is encountered while applying the test pattern, clear the trouble and apply a good test pattern before restoring recorder to service.	Minor alarm sounds. At transverter trouble indicator frame— RUT lamp lighted. TI and DLR_ lamps lighted. When master timing circuit completes test of recorder— RUT lamp extinguished.
20	At transverter trouble indicator frame— When RUT lamp is extinguished, momentarily operate RL key.	Minor alarm silenced. At transverter trouble indicator frame— TI and DLR_ lamps extinguished.
21	Remove plugs from TST and RMB jacks for emergency recorder.	
22	Remove plug of test set from R jack.	
23	At perforator associated with emergency recorder— Mark tape as indicated in 1.09.	

P. Operation Test

Note: Before starting this test and on completion of testing, mark the associated perforator tape as indicated in 1.09.

STEP	ACTION	VERIFICATION
1	At transverter trouble indicator frame— Observe that there is no plug in any TN jack.	
2	Insert make-busy plug into RMB and TST jack for emergency recorder.	At emergency recorder— NS relay operated.
3	Proceed as outlined in Steps 3 through 7 of Test C.	
4	At transverter trouble indicator frame— Remove plugs from TST and RMB jacks for emergency recorder.	At emergency recorder— NS relay released.
5	At perforator associated with emergency recorder— Mark tape as indicated in 1.09.	

Q. Selector Synchronism Check and Synchronizing Feature

Note: Before starting this test and on completion of testing, mark the associated perforator tape as indicated in 1.09.

- 1 At transverter trouble indicator frame—
Observe that there is no plug in any TN jack.
- 2 Proceed as outlined in Steps 2 through 12 of Test D.
- 3 Proceed as outlined in Steps 17 through 23 of Test O.

R. Recorder Number, Minutes Timing and Hour Alarm Features

Note: Before starting this test and on completion of testing, mark the associated perforator tape as indicated in 1.09.

- 1 At transverter trouble indicator frame—
Observe that there is no plug in any TN jack.
- 2 Insert make-busy plug into RMB jack associated with emergency recorder.
- 3 Proceed as outlined in Steps 3 through 29 of Test E.

Note: ME₋ and MF₋ lamps referred to in Step 12 of Test E will indicate recorder

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STEP	ACTION	VERIFICATION
	number tens and units of 4 and 0 respectively, for emergency recorder.	
4	◆Block nonoperated RNT relay.◆	
5	Proceed as outlined in Steps 30 through 79 of Test E.	
6	◆Remove blocking tool from RNT relay.◆	
7	Proceed as outlined in Steps 80a through 129.	
8	Proceed as outlined in Steps 18 through 23 of Test O.	
S. Splice and Break in Tape Feature		
<i>Note:</i> Before starting this test and on completion of testing, mark the associated perforator tape as indicated in 1.09.		
1	At transverter trouble indicator frame— Observe that there is no plug in any TN jack.	
2	At emergency recorder— Connect ground to terminal 32 of terminal strip PRF.	Splice pattern perforated on tape. White aisle pilot lamp lighted. Major alarm sounds. At emergency recorder— NP lamp lighted. MTR, MB and MBR relays operated. At any regular recorder— Ground present on 7B of TN8 and 7B of TN1 relay. At transverter trouble indicator frame— R lamp associated with emergency recorder lighted.
3a	If XN option is provided— At recorder frame— Momentarily operate AR key.	Major alarm silenced. White aisle pilot lamp extinguished. At emergency recorder— NP lamp extinguished. MTR relay released.
4a	At emergency recorder— Remove ground from terminal 32 of terminal strip PRF.	MBR and MB relays release. At transverter trouble indicator frame— R lamp associated with emergency recorder extinguished.
5b	At emergency recorder— If XO option is provided— Remove ground from terminal 32 of terminal strip PRF.	Major alarm silenced. White aisle pilot lamp extinguished. At emergency recorder— NP lamp extinguished.

STEP	ACTION	VERIFICATION
	<i>Note:</i> With option XO the AR key is ineffective.	MBR, MB, and MTR relays released. At transverter trouble indicator frame— R lamp associated with emergency recorder extinguished.
6	At emergency recorder— Proceed as outlined in Steps 6 through 12 of Test F.	
7	Proceed as outlined in Steps 17 through 23 of Test O.	
T. Trouble Timing Feature		
	<i>Note:</i> Before starting this test and on completion of testing, mark the associated perforator tape as indicated in 1.09.	
1	At transverter trouble indicator frame— Observe that there is no plug in any TN jack.	
2	Insert make-busy plug into RMB jack for emergency recorder.	
3	At emergency recorder— Proceed as outlined in Steps 3 through 12 of Test G.	
4	Proceed as outlined in Steps 18 through 23 of Test O.	
U. AG Lead Alarm and Locking Features		
	<i>Note:</i> Before starting this test and on completion of testing, mark the associated perforator tape as indicated in 1.09.	
1	At transverter trouble indicator frame— Observe that there is no plug in any TN jack.	
2	At sender link frame— Make busy all district junctors associated with any regular recorder.	Associated primary hold magnets normal on district link frame.
3	At transverter trouble indicator frame— Insert make-busy plug into TN jack of recorder associated with district junctors made busy in Step 2.	At emergency recorder— EW lamp lighted.
4	Proceed as outlined in Steps 2 through 17 of Test H.	

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STEP	ACTION	VERIFICATION
5	Proceed as outlined in Steps 18 through 22 of Test O.	
6	At transverter trouble indicator frame— Remove plug from TN jack of recorder used in Step 3.	At emergency recorder— EW lamp extinguished.
7	Proceed as outlined in Step 23 of Test O.	
8	At sender link frame— Restore to service district junctors made busy in Step 2.	

V. Transient Operation of Perforator Magnets and Series Relay Locking Features

Note: Before starting this test and on completion of testing, mark the associated perforator tape as indicated in 1.09.

- 1 At transverter trouble indicator frame—
Observe that there is no plug in any TN jack.
- 2 Insert make-busy plug into RMB jack for emergency recorder.
- 3 Proceed as outlined in Steps 3 through 13 of Test I.
- 4 Proceed as outlined in Steps 18 through 23 of Test O.

W. Trouble Cross-detecting Features

Note: Before starting this test and on completion of testing, mark the associated perforator tape as indicated in 1.09.

- 1 At transverter trouble indicator frame—
Observe that there is no plug in any TN jack.

XP Relay

- 2 Proceed as outlined in Steps 4 through 15 of Test J.

XU Relay

- 3 At sender link frame—
Make busy all district junctors associated with any regular recorder.
- Associated primary hold magnets normal on district link frame.

STEP	ACTION	VERIFICATION
4	At transverter trouble indicator frame— Insert make-busy plug into TN jack of recorder with district junctors made busy in Step 3.	At emergency recorder— EW lamp lighted.
5	Insert make-busy plug into RMB jack for emergency recorder.	
6	Proceed as outlined in Steps 16 through 23 of Test J.	
XTC and XCO Relays		
7	Proceed as outlined in Steps 24 through 33 of Test J.	
XT Relay		
8	Proceed as outlined in Steps 34 through 44 of Test J.	
XRB Relay		
9	At emergency recorder— Insulate 6B of MBR relay.	
10	Manually release MBR relay.	
11	Manually release and block nonoperated MBJ relay.	
12	At transferred recorder— Momentarily connect ground to 8B of TN1 relay.	Major alarm sounds. At recorder frame— XRB lamp associated with emergency recorder lighted.
13	At recorder frame— Momentarily operate AR key.	Major alarm silenced. At recorder frame— XRB lamp associated with emergency recorder extinguished.
14	At transferred recorder— Momentarily connect ground to 2T of RT relay.	Major alarm sounds. At recorder frame— XRB lamp associated with emergency recorder lighted.
15	At recorder frame— Momentarily operate AR key.	Major alarm silenced. At recorder frame— XRB lamp associated with emergency recorder extinguished.
16	At emergency recorder— Remove blocking tool from MBJ relay.	

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STEP	ACTION	VERIFICATION
17	Operate MBR relay.	MBR relay locks.
18	Remove insulator from 6B of MBR relay.	
19	Proceed as outlined in Steps 18 through 22 of Test O.	
20	At transverter trouble indicator frame— Remove plug from TN jack of recorder used in Step 4.	
21	Proceed as outlined in Step 23 of Test O.	
22	At sender link frame— Restore to service district junctions made busy in Step 3.	

X. Test for False Continuity and Crosses of TC Relays

Note 1: Before starting this test and on completion of testing, mark the associated perforator tape as indicated in 1.09.

Note 2: In the following steps the action or verification specified for the operating and stationary springs applies to those circuits equipped with 263-type multicontact relay. When 287A-type wire spring multicontact relay is provided, the action or verification specified for the operating springs should be made on the stationary springs, and that specified for the stationary springs should be made on the operating springs.

- 1 At transverter trouble indicator frame—
Observe that there is no plug in any TN jack.
- 2 Insert make-busy plug into RMB jack for emergency recorder.
- 3 Proceed as outlined in Steps 3 through 73 of Test K.
- 4 Proceed as outlined in Steps 18 through 23 of Test O.

Y. Perforator Leads from Transverters

- 1 At transverter trouble indicator frame—
Observe that there is no plug in any TN jack.

STEP	ACTION	VERIFICATION
2	Insert make-busy plug into TN jack of any regular recorder.	At emergency recorder— EW lamp lighted.
3	Proceed as outlined in Step 1 of Test L.	
4	Proceed as outlined in Steps 2 through 21 of Test L, except operate F ₋ and FA ₋ keys corresponding to transferred regular recorder number.	
5	At transverter trouble indicator frame— Remove plug from TN jack of recorder used in Step 3.	At emergency recorder— EW lamp extinguished.

Z. District Junctor Identifying Leads

1	At transverter trouble indicator frame— Observe that there is no plug in any TN jack.	
2	Insert make-busy plug into TN jack of any regular recorder.	At emergency recorder— EW lamp lighted.
3	Proceed as outlined in Steps 1 through 13 of Test M.	
4	At transverter trouble indicator frame— Remove plug from TN jack of recorder used in Step 2.	At emergency recorder— EW lamp lighted.

AA. Exercising Routine

1	At transverter trouble indicator frame— Observe that there is no plug in any TN jack.	
2	Insert make-busy plug into TN jack of any regular recorder.	At emergency recorder— EW lamp lighted.
	<i>Note:</i> Service calls normally handled by transferred recorder are handled by the emergency recorder. Emergency recorder should be left in service for about one hour or as specified locally.	
3	At transverter trouble indicator frame— Remove plug from TN jack of recorder used in Step 2.	At emergency recorder— EW lamp extinguished.

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STEP	ACTION	VERIFICATION
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AB. Preference Relays—Operating and Lockout Features

Note: Before starting this test and on completion of testing, mark associated perforator tape as indicated in 1.09.

- | | | |
|---|--|--|
| 1 | At transverter trouble indicator frame—
Observe that there is no plug in any TN jack. | |
| 2 | Proceed as outlined in Steps 2 through 18 of Test N. | |

Figure 27 Provided for Improved Preference Operation

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|---|---|--|
| 3 | Proceed as outlined in Steps 19 and 25 through 54 of Test N. | |
| 4 | Connect battery to bottom winding terminal of UL relay. | |
| 5 | Proceed as outlined in Steps 56 and 57 of Test N. | |
| 6 | Remove battery connection from bottom winding terminal of UL relay. | |
| 7 | Proceed as outlined in Steps 59 and 60 of Test N. | |
| 8 | Proceed as outlined in Steps 17 through 23 of Test O. | |

AC. Dynamic Test of Preference Relays

- | | | |
|---|---|--|
| 1 | Refer to notes 1, 2, 3, and 4 of Test N.1 before starting this test. | |
| 2 | At transverter trouble indicator frame—
Observe that there is no plug in any TN jack. | |
| 3 | Insert make-busy plug into the TN jack of any regular recorder. | At emergency recorder—
EW lamp lighted. |
| 4 | Proceed as outlined in Steps 1 and 2 of Test N.1. | |
| 5 | At transverter trouble indicator frame—
Remove plug from TN jack of recorder used in Step 2. | |

STEP	ACTION	VERIFICATION
AD. Detection of Falsely Grounded DJ Lead		
1	Refer to notes 1 and 2 of Test N.2 before starting this test.	
2	At sender link frame— Make busy all district junctors associated with any regular recorder.	Associated primary hold magnets normal on district link frame.
3	At transverter trouble indicator frame— Insert make-busy plug into TN jack of recorder associated with district junctors made busy in Step 2.	At emergency recorder— EW lamp lighted.
4	Insert make-busy plug into RMB_ jack for emergency recorder.	
5	At emergency recorder— Insulate 1T and 2T of DS, 4B and 5B of TBL, 6B and 7B of DTKA relays.	
6	Block ON relay nonoperated.	
7	At call identity indexer associated with recorder transferred— Connect ground through 18AN resistor (350 ohms) or equivalent to 5T winding terminal of DJK relay.	DJK relay operates.
8	At emergency recorder— Proceed as outlined in Steps 6 through 8 of Test N.2.	
9	At call identity indexer associated with recorder transferred— Remove ground from 5T winding terminal of DJK relay.	DJK relay released. At emergency recorder— M and DTN relays release.
10	At emergency recorder— Proceed as outlined in Steps 10 through 13 of Test N.2.	
11	Proceed as outlined in Steps 18 through 22 of Test O.	
12	At transverter trouble indicator frame— Remove plug from TN jack of recorder used in Step 3.	At emergency recorder— EW lamp extinguished.
13	Proceed as outlined in Step 23 of Test O.	

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STEP	ACTION	VERIFICATION
14	At sender link frame— Restore to service district junctors made busy in Step 2.↓	