

SIZE	A	SHEET 1	TOTAL	4
			2	2
E- 85289		AUTOMATIC ELECTRIC CO. NORTHLAKE, ILLINOIS U.S.A.		
Designated Section A for NAFM Added Sections B & C 3/68:sah T.L. Snow <i>J. J. A.</i> <i>CSA-10-68</i> <i>W. J. A.</i> Issue 4				

CIRCUIT EXPLANATION

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LINEFINDER TEST CIRCUIT FOR SWITCH TEST STAND H-85289

(Written specifically for circuit issue 9 *
but may also apply to later issues. Refer
to H print for appropriate E issue number.)

* Not updated for NAFM figures.

FEATURES

- (a) Provides means for test of vertical or rotary stopping
- (b) Provides means for testing either loop or battery access
- (c) Provides means for testing 100 or 200 line Line Finders
- (d) Provides means for testing the numerous continuity checks via leads to the associated jacks in the Line Finder

Note: If no special line, bank or normal post spring is indicated after each Test No (X), than no limitations are applicable; however when so indicated, as Test No (X) [200 lines], then Test (X) is only applicable to 200 line Line Finders.

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APPROVED
ABN/DWM-4/1/60

ISSUE
4

DRAWING NO.
E- 85289

CIRCUIT OPERATION

The Switch Test Stand is prepared for testing by connecting exchange battery and ground to the external binding posts BAT. and GRD.

A. FIGS 1, 2, and 3 (NAFM)

TEST NO. 1: Jacking the finder into the switch test stand lights the ATB lamp, indicating circuit continuity within the finder from switch jack terminal 13 through contacts of the V.O.N. springs, BUSY KEY, relay B, and relay A.

TEST NO. 2: Operating the finder busy key momentarily transfers ground from switch jack terminal 13 to switch jack terminal 9, extinguishing the ATB lamp and lighting the GUARD lamp. This checks the break-make spring combination of the busy key.

TEST NO. 3: Raising the switch shaft opens the ground circuit to switch jack terminal 13 and places ground on switch jack terminal 9, extinguishing the ATB lamp and lighting the GUARD lamp. This checks break and make contacts of the V.O.N. springs.

TEST NO. 4: Operating the RELAY D key places ground on switch jack terminal 3. In linefinder 75311, or equivalent, ground at switch jack terminal 3 causes relay A to operate. Relay A in operating transfers ground from switch jack terminal 13 to switch jack terminal 9, extinguishing the ATB lamp and lighting the GUARD lamp. This checks the circuit continuity from switch jack terminal 3 through contacts of the V.O.N. springs, relay B, and relay D, and through the #1 winding of relay A.

In other linefinders such as H-35738, or equivalent, ground at switch jack terminal 3 is extended through the finder to switch jack terminal 9 without the intermediate operation of a relay. In these finders the GUARD lamp lights, but the ATB lamp will remain lit, in response to the operation of the RELAY D key. Contacts checked are similar to those described in the preceding paragraph.

TEST NO. 5: Operating the START key places ground on switch jack terminal 8, closing the circuit to relay B in the finder. Relay B operates, transfers ground from switch jack terminal 13 to switch jack terminal 3, extinguishing the ATB lamp and lighting the C GRD. lamp, and closes a high resistance circuit to the SEL. SEIZE lamp from switch jack terminal 2, through contacts of relay B, through the #2 non-inductive winding of relay D, to switch jack terminal 1.

TEST NO. 6: Touching the battery-connected test prod to the VERTICAL wiper and to each C wiper lights the test lamp, indicating continuity from each of these wipers through contacts of relay B to switch jack terminals 19, 5, and 15, respectively.

TEST NO. 7: Operating the VERT. INT. key closes the circuit to VS. Relay VS operates and closes circuits (after the release of the VERT. INT. key which should be held operated only momentarily) over switch jack terminals 4 and 14 (leads VERT. and INT.) to step the switch vertically under control of the VERT. magnet in the finder and INT. relay in the switch test stand. (Fig. 2 or Fig. 3 on H-85289 will be selected in accordance with the REMARKS in TABLE A on that circuit drawing.) The slow-to-release time of relay VS allows the switch to take five or more vertical steps before VS restores and opens the stepping circuits. In checking the vertical stepping speed, the repairman's judgment of smooth operation is relied upon. Contacts checked by this test are the interrupter springs on both the VERT. and ROT. magnets and two sets of make contacts on relay B.

TEST NO. 8: Operating the RELAY A key opens the circuit to the C GRD. lamp, extinguishing this lamp, and places ground on switch jack terminal 18, closing a circuit to the #1 winding of relay A. Relay A operates and places ground on switch jack terminal 9, lighting the GUARD lamp.

TEST NO. 9: Operating the RELAY D key places ground on switch jack terminal 17, but relay D in the finder does not operate because the circuit to its #1 winding has been opened by a set of break springs at relay A.

This test verifies that these break springs are open with relay A operated.

TEST NO. 10: Operating the ROT. INT. key extends ground from the interrupter springs in the finder, over switch jack terminal 14, to relay INT. (Fig. 2 on H-85289). Relay INT. (Fig. 2 only) operates, and the finder would step rotary, because of the presence of ground on switch jack terminal 10, (Fig. 2 or Fig. 3) except for the fact that the operated relay A in the finder has opened the circuit to the ROT. magnet. This test verifies that these break springs are open with relay A operated.

TEST NO. 11: Restoring the START key removes the ground from switch jack terminal 8 which operated relay B in the finder. Relay B restores and opens the circuit to the SEL. SEIZE lamp. Relay A remains operated, indicating that its locking circuit to switch jack terminal 3 is closed.

TEST NO. 12: Shorting the upper line wipers lights the SEL. SEIZE lamp, indicating continuity from switch jack terminals 1 and 2 through two sets of make contacts on relay A in the finder.

TEST NO. 13: Touching the battery-connected test lamp prod to the upper C wiper lights the test lamp. Ground placed on switch jack terminal 3 by the operated RELAY A key to hold relay A operated in the finder is extended through two sets of make contacts on relay A to the upper C wiper, thereby completing the circuit to the test lamp.

TEST NO. 14: Restoring the RELAY A key removes holding ground for relay A in the finder. Relay A restores and closes ground to the finder RLS. magnet. Magnet RLS. operates and releases the finder. When the V.O.N. springs restore, the RLS. magnet is opened, ground is removed from switch jack terminal 9, and ground is placed on switch jack terminal 13. The GUARD lamp goes dark, and the ATB lamp lights. This test assures the release of relay A in preparation for succeeding tests.

TEST NO. 15: This test is a repetition of tests 5 and 7; operations are as previously described.

TEST NO. 16: Operating the RELAY D key opens the circuit to the C GRD. lamp, extinguishing this lamp, and places ground on switch jack terminal 17, thereby closing a circuit to relay D in the finder. Relay D operates and places ground on switch jack terminal 9, lighting the GUARD lamp.

TEST NO. 17: Operating the RELAY A key places ground on switch jack terminal 18, but relay A in the finder does not operate because a set of break contacts on the operated relay D have opened the circuit to #1A.

TEST NO. 18: This test is the same as test 10 except that break springs on relay D instead of relay A now open the circuit to the ROT. magnet.

TEST NO. 19: This test is the same as test 11 except that relay D instead of relay A remains operated.

TEST NO. 20: Shorting the lower line wipers lights the SEL. SEIZE lamp, indicating continuity from switch jack terminals 1 and 2 through two sets of make contacts on relay D in the finder.

TEST NO. 21: Touching the battery-connected test lamp prod to the lower C wiper lights the test lamp. Ground placed on switch jack terminal 3 by the operated RELAY D key to hold relay D operated in the finder is extended through two sets of make contacts on relay D to the lower C wiper, thereby completing the circuit to the test lamp.

TEST NO. 22: Shorting the LOWER BANK TEST JACK on the finder lights the LBL lamp, indicating circuit continuity within the finder from switch jack terminal 16 through contacts of the lower bank test jack, relay D, the V.O.N. springs, busy key, relay B, and relay A.

TEST NO. 23: This test is the same as test 14 except that relay D now performs the functions described for relay A.

TEST NO. 24: This test is a repetition of tests 5 and 7; operations are as previously described.

TEST NO. 25: Operating the ROT. INT. key closes circuits over switch jack terminals 10 and 14 (leads ROT. and INT.) to step the switch rotary under control of the ROT. magnet in the finder and the INT. relay in the switch test stand. On the eleventh rotary step the cam springs in the finder operate and either place battery on the TEST 1 lead (Fig. 2 used), or place ground on the GUARD lead (Fig. 3 used). In either case, the STP relay operates and opens the stepping circuit to the ROT. magnet, stopping the switch at the eleventh step; and, in the latter case, lights the GUARD lamp.

TEST NO. 26: With the START and ROT. INT. keys restored, ground is removed from switch jack terminal 8, opening the circuit to relay B in the finder. Relay B restored, closes the circuit to the RLS. magnet, and closes ground through the V.O.N. springs to switch jack terminal 9. The switch releases and, after the V.O.N. springs restore, the GUARD lamp goes dark and the ATB lamp lights.

VERT. MAG. and ROT. MAG. keys are used to step the switch manually to any desired position. Each operation of these keys places ground on switch jack terminals 4 or 10 stepping the switch one step vertically or rotary.

Lamp EC is provided to check NORMAL POST spring operation on line finders arranged for discriminating service marking in accordance with NOTE 2 on H-85289.

Binding Posts are provided on leads extending to switch magnets and relays for convenient use of current flow test set or resistance box for adjustment purposes.

B. Test Procedure 1 - FIG 4A (see NOTES 2 & 4; H-85289)

1. Test No. 1

The Testman connects the jacks of the Line Finder into the Switch Test Stand Shelf Jacks, lighting

lamp ATB & LBL to indicate the Line Finder is in its normal state.

2. Test No. 2 (Operated: Lamp ATB & LBL)

The Testman operates the busy key in the Line Finder, extinguishing lamp ATB & LBL and lighting lamp GUARD via lead GUARD. This indicates the proper operation of the busy key.

3. Test No. 3 (Operated: Lamp GUARD)

The busy key of the Line Finder is restored, lighting lamp ATB & LBL and extinguishing lamp GUARD; the Testman raises the switch shaft to restore the VON springs, which upon restoring, extinguish lamp ATB & LBL and lights lamp GUARD. This is an indication of the proper operation of the VON springs. The switch shaft is returned to normal, operating the VON springs, which upon operating, extinguish lamp GUARD and lights lamp ATB & LBL.

4. Test No. 4 (Operated: Lamp ATB & LBL) (see NOTE 1; H-85289)

The Testman momentarily operates key RLY LB, transferring lead C from resistance (lamp C GRD) battery to ground, closing an associated relay in the Line Finder, which upon operating, lights lamp GUARD, and extinguishes lamp ATB & LBL. In addition, on certain Line Finders (see NOTE 1; H-85289), lamp EXT GUARD is lit via lead FBG when key RLY LB is operated.

When key RLY LB is restored, ground is removed from lead C, opening an associated relay, which upon restoring, extinguishes lamp GUARD (and lamp EXT GUARD if lit) and lights lamp ATB & LBL.

5. Test No. 5 (Operated: Lamp ATB & LBL)

The Testman operates key START to either the BAT SEIZE or LOOP SEIZE position (depending on seizure of succeeding equipment; see NOTE 5; H-85289).

When the Line Finder is wired for battery seizure, key START is operated to the BAT SEIZE position, grounding lead F ST to close an associated relay, which upon operating, lights lamps C GRD and EXT GUARD, extinguishes lamp ATB & LBL, closes #1TR via resistance battery on lead +L, and connects the upper C wiper and lower C wiper to leads TEST 1 and TEST 2, respectively. Relay TR operates to its "X" contacts, locks via its #2 winding, operates fully, and opens #1TR.

When the Line Finder is wired for loop seizure, key START is operated to the LOOP SEIZE position, and the remaining operations are similar to the preceding paragraph with the exception that lamp SEL SEIZE is dimly lit and relay TR does not operate.

6. Test No. 6 (Operated: Relay TR or lamp SEL SEIZE and lamps EXT GUARD and C GRD)

The Testman connects resistance (TEST LAMP IN TEST PROD) battery via NEG TEST PROD to the vertical wiper and each C wiper of the Line Finder; the lighting of lamp TEST LAMP IN TEST PROD indicates that each C wiper and vertical wiper is prepared for further testing of their respective levels.

7. Test No. 7 (Operated: Relay TR or lamp SEL SEIZE and lamps EXT GUARD and C GRD)

7.1 Vertical Interrupter Break Springs

The Testman momentarily operates key VERT INT to close relay VS. Relay VS operates. When key VERT INT is restored, relay VS is opened, #21N1 is closed via lead INT and the interrupter springs of the vertical magnet in the Line Finder. Relay VS remains operated due to its slow-to-release characteristics. Relay 1N1 operates and connects ground to lead VERT to close the vertical magnet. The operation of the vertical magnet steps the wipers and opens 1N1 via interrupter springs. Relay 1N1 restores and opens the vertical magnet. The vertical magnet restores and restores its interrupter springs, closing #21N1. Relay 1N1 operates and connects ground to lead VERT to close the vertical

magnet. This cyclic operation continues and the switch steps vertical to the 5th level or higher. After its slow-to-release interval, relay VS restores, removes ground from lead VERT to open the vertical magnet or opens #2IN1 (if operated). Relay IN1 restores. This checks the operation of the interrupter springs and vertical stepping.

7.2 Vertical Interrupter Make Springs

The Testman momentarily operates key VERT INT to close relay VS. Relay VS operates. When key VERT INT, is restored, ground is connected to lead VERT closing the vertical magnet and relay VS is opened. Relay VS remains operated due to its slow-to-release characteristics. The vertical magnet operates, operates its interrupter springs, closing relay IN2 via lead INT and steps the wipers to the next level. Relay IN2 operates and removes ground from lead VERT, opening the vertical magnet; the vertical magnet restores and restores its interrupter springs, opening relay IN2. Relay IN2 restores and connects ground to lead VERT to close the vertical magnet. The vertical magnet operates, steps its wipers to the next level and operates its interrupter springs, closing relay IN2. This cyclic operation continues and the switch steps vertical to the fifth level or higher. After its slow-to-release interval, relay VS restores, removes ground from lead VERT to open the vertical magnet or opens relay IN2 (if operated). Relay IN2 restores. This checks the operation of the interrupter springs and vertical stepping.

8. Test No. 8 (Operated: Relay TR or lamp SEL SEIZE, and lamps C GRD and EXT GRD)

The Testman operates key RLY UB, transferring lead C from resistance (lamp C GRD) battery to ground, extinguishing lamp C GRD (if lit), and connects ground to lead UB to close an associated relay, which upon operating, connects wipers "+" and "-" to leads +L and -L, respectively, and lights lamps EXT GUARD and GUARD (if not lit)

9. Test No. 9 (200 lines) (Operated: Relay TR or lamp SEL SEIZE, and lamps EXT GUARD and GUARD)

The Testman momentarily operates key RLY LB, connecting ground to lead LB. Note, at this time interval, the relay associated with lead LB should not operate.

10. Test 9 (100 lines) or Test 10 (200 lines)

(Operated: Relay TR or lamp SEL SEIZE and lamps EXT GUARD and GUARD)

The Testman momentarily operates key ROT INT, closing #1 and #21N1 in series via lead INT, and transferring leads TEST 1 and TEST 2 from ground to resistance (#1 and #2 STP) ground. Relay 1N1 operates and grounds lead ROT. When key INT TRANS is operated, the operation of key ROT INT connects ground to lead ROT. In either case, the wipers should not operate when key ROT INT is operated, indicating the proper operation of the associated relay closed in Section 8.

When the Testman restores key ROT INT, ground is removed from lead ROT (if key INT TRANS is operated) or TEST 2 and TEST 1 are transferred from resistance (#1 and #2 STP) ground to ground and #1 and #21N1 is opened. Relay 1N1 restores and removes ground from lead ROT.

11. Test 10 (100 lines) or Test 11 (200 lines)

(Operated: Relay TR or lamp SEL SEIZE, and lamps EXT GUARD and GUARD)

The Testman may now restore key START from either the BAT SEIZE position or LOOP SEIZE position (depending on seizure of succeeding equipment, see NOTE 5; H-85289). When key START is restored from the LOOP SEIZE position, ground is removed from lead RLY UB, and ground is removed from lead F ST, opening an associated relay, which upon restoring, removes resistance ground from lead +L, extinguishing lamp SEL SEIZE.

The Testman restores key START from the BAT SEIZE position, opening #2TR, removing ground from lead UB, and removing ground from lead F ST, opening an associated relay, which restores. Relay TR restores.

12. Test 11 (100 lines) or Test 12 (200 lines)
(Operated: Lamps EXT GUARD and GUARD)

The Testman short-circuits the line wipers (upper line wipers for 200 lines), lighting lamp SEL SEIZE to indicate the proper operation of the associated relay (closed in Section 8) in connecting leads +L and -L to the wipers "+" and "-", respectively.

13. Test No. 12 (100 lines) or Test No. 13 (200 lines)
(Operated: Lamps EXT GUARD and GUARD)

The Testman connects resistance (lamp TEST LAMP IN TEST PROD) battery to the C wiper of the Line Finder via the TEST PROD, lighting lamp TEST LAMP IN TEST PROD, indicating the operation of the associated relay (closed in Section 8) has connected ground to wiper C (upper line wiper C for 200 lines).

14. Test No. 13 (100 lines) or Test No. 14 (200 lines)
(Operated: Lamps EXT GUARD and GUARD)

The Testman restores key RLY UB, removing ground from lead C, opening the associated relay (closed in Section 8), which, upon restoring, extinguishes lamp EXT GUARD and closes the release magnet. The release magnet operates to restore the switch and the Line Finder to its normal condition, lights lamp ATB & LBL, and extinguishes lamp GUARD.

15. Test No. 15(200 lines)(Operated: Lamp ATB & LBL)

The Testman operates key START to either the BAT SEIZE or LOOP SEIZE position and further operations are the same as Section 5.

The Testman momentarily operates key VERT INT and further operation is as described in Section 7.

16. Test No. 16 (200 Lines)(Operated: Relay TR or lamp SEL SEIZE, and lamps C GRD and EXT GUARD)

The Testman operates key RLY LB, connecting ground to lead LB to close an associated relay, which, upon operating, lights lamp GUARD and connects the lower bank wipers "+" and "-" to leads +L and -L,

respectively, and transfers lead C from resistance (lamp C GRD) battery to ground, extinguishing lamp C GRD.

17. Test No. 17 (200 lines) (Operated: Relay TR
or lamp SEL SEIZE, and lamps EXT GUARD and GUARD)

The Testman momentarily operates key RLY UB, connecting ground to lead UB. Note, at this time, the associated relay with lead UB should not operate at this time.

18. Test No. 18 (200 lines) (Operated: Relay TR
or lamp SEL SEIZE, and lamps EXT GUARD and GUARD)

The Testman momentarily operates key ROT INT and further operations are the same as Section 10.

19. Test No. 19 (200 lines)

The operations are similar to Section 11 with the following exception when key START is restored, ground is removed from lead LB.

20. Test No. 20 (200 lines) (Operated: Lamps
EXT GUARD and GUARD)

The operations are similar to Section 12 with the exception that the Testman short-circuits the lower-line wipers to indicate the proper operation of the associated relay (closed in Section 16).

21. Test No. 21 (200 lines) (Operated: Lamps
EXT GUARD and GUARD)

The operations are similar to Section 13 with the exception that the associated operated relay in the Line Finder was closed in Section 16.

22. Test No. 22 (200 lines) (Operated: Lamps
EXT GUARD and GUARD)

The Testman momentarily inserts a shorting plug into the lower bank test jack of the associated Line

Finder, lighting lamp ATB & LBL.

23. Test No. 23 (200 lines) (Operated: Lamps
EXT GUARD and GUARD)

The Testman restores key RLY LB, removing ground from lead C to open the associated relay (closed in Section 16), which, upon restoring, closes the release magnet. The release magnet operates to restore the switch and the Line Finder to its normal condition, extinguishes lamps EXT GUARD and GUARD, and lights lamp ATB & LBL.

24. Test No. 14 (100 lines) or Test No. 24 (200 lines) (Operated: Lamp ATB & LBL)

The Testman operates key START and further operation is the same as Section 5.

The Testman momentarily operates key VERT INT and further operation is the same as Section 7.

25. Test No. 15 (100 lines) or Test No. 25 (200 lines) (Operated: Relay TR or lamp SEL
SEIZE and lamps C GRD and EXT GUARD)

25.1 Interrupter Break Springs

The Testman operates key ROT INT, closing #1 and #21N1 in series via lead INT and transferring leads TEST 1 and TEST 2 from ground to resistance (#1 and #2 STP) ground. Relay 1N1 operates and grounds lead ROT to close the rotary magnet. The rotary magnet operates, rotates its wipers and operates its interrupter springs, opening #1 and #21N1. Relay 1N1 restores and removes ground from lead ROT to open the rotary magnet. The rotary magnet restores and restores its interrupter springs, closing #1 and #21N1 in series via lead INT. Relay 1N1 operates and connects ground to lead ROT to close the rotary magnet. This cycle continues until the switch steps to the eleventh rotary step, where the cam springs operate, closing relay STP via lead TEST 1. Relay STP operates and removes

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ground from lead ROT, opening the rotary magnet. The rotary magnet restores, and restores its interrupter springs, closing #1 and #21N1 in series. Relay 1N1 operates.

25.2 Interrupter Make Springs

When key INT TRANS is operated, the operation of key ROT INT, connects ground to lead ROT to close the rotary magnet. The rotary magnet operates and rotates the wipers to the next step and operates its interrupter springs, closing relay 1N2 via lead INT. Relay 1N2 operates and removes ground from lead ROT, opening the rotary magnet. The rotary magnet restores and restores its interrupter springs, opening relay 1N2. Relay 1N2 restores and connects ground to lead ROT to close the rotary magnet. This cyclic operation continues until the switch steps to the eleventh rotary position, where the cam springs operate, closing relay STP via lead GUARD. Relay STP operates and removes ground from lead ROT, opening the rotary magnet. The rotary magnet restores and restores its interrupter springs, closing relay 1N2. Relay 1N2 operates.

26. Test No. 15 (100 lines) or Test No. 25 (200 lines) (Operated: Relays 1N1 or 1N2, STP and TR or lamp SEL SEIZE, lamp C GRD and EXT GUARD)

The Testman restores key ROT INT, opening relay STP and #1 and #21N1 (or relay 1N2 if key INT TRANS is operated) and transferring leads TEST 1 and TEST 2 from resistance (#1 and #2 STP) ground to ground. Relays 1N1 (or 1N2 if operated) and STP restore.

The Testman restores key START and further operations are the same as Section 11.

C. Test Procedure 2 - FIG 4A (see NOTES 2 & 4; H-85289)

1. Discriminating Markings With Normal Post Springs

1.1 Test No. 1 (Operated: Lamp ATB & LBL)

The Testman operates the busy key in the Line Finder, extinguishing lamp ATB & LBL and lighting lamp GUARD.

1.2 Test No. 2 (Operated: Lamp GUARD)

The Testman operates key START to either the BAT SEIZE or LOOP SEIZE position (depending on access of succeeding equipment, see NOTE 5; H-85289). When key START is operated to the BAT SEIZE position, ground via lead F ST closes an associated relay, which upon operating, closes #1TR via resistance battery on lead +L, extinguishes lamp GUARD, and lights lamp C GRD and EXT GUARD. Relay TR operates to its "X" contacts, locks via its #2 winding, operates fully.

When the Testman operates key START to the LOOP SEIZE position, ground is connected to lead F ST to operate an associated relay, which upon operating, dimly lights lamp SEL SEIZE, extinguishing lamp GUARD, and lights lamp C GRD and EXT GUARD. When the Testman is only interested in testing the left normal post springs, further operations are as described in Section 1.6.

1.3 Test No. 3 (Right Normal Post Springs) (Operated: Relay TR or lamp SEL SEIZE and lamps C GRD and EXT GUARD)

The Testman operates key RLY LB, extinguishing lamp C GRD, connects ground to lead LB to close an associated relay, which upon operating, lights lamp GUARD.

The Testman operates key EC CK, transfers lead MR from ground to resistance (#1TR) ground, connects lead EC with lead MR, connects resistance (#1TR) ground and resistance (#2TR) battery to lead EC, closing #1TR in magnetic opposition to #2TR, and extinguishes lamp SEL SEIZE. Relay TR restores.

1.4. Test No. 4 (Right Normal Post Springs) (Operated: Lamps GUARD and EXT GUARD)

The Testman operates key VERT MAG, connecting ground to lead VERT to close the vertical magnet. The vertical magnet operates and steps its wipers. Key VERT MAG is restored, removing ground from lead VERT to

open the vertical magnet. The Testman continues the operation of key VERT MAG until the level for the operation of the right normal post springs is reached, whereby resistance ground (discriminating mark) via lead EC closes #2TR and short-circuits #1TR. Relay TR operates to its "X" contacts, operates fully and lights lamp EC&EC1 to indicate the discriminating mark via the right normal post springs.

1.5 Test No. 5 (Right Normal Post Springs) (Operated: Relay TR and lamps GUARD, EXT GUARD and EC&EC1)

The Testman restores key START from either the LOOP SEIZE or BAT SEIZE position, ground is removed from lead LB, and ground is removed from lead F ST, opening an associated relay, which upon restoring, closes #1TR in magnetic opposition to #2TR. Relay TR restores and extinguishes lamp EC&EC1. When the Testman restores key RLY LB, ground is removed from lead C, extinguishing lamp EXT GUARD, and opens the associated relay, which restores. Key EC CK is restored, opening #1 and #2TR.

1.6 Test No. 3 (Left Normal Post Springs) (Operated: Relay TR or lamp SEL SEIZE, and lamps C GRD and EXT GUARD)

The Testman operates key RLY UB, transferring lead C from resistance (lamp C GRD) battery to ground, extinguishing lamp C GRD, and closes an associated relay, which upon operating, lights lamp GUARD SEIZE. The Testman operates key EC CK, connecting resistance (#1TR) ground and resistance (#2TR) battery to lead EC, closing #1 and #2TR in magnetic opposition and extinguishes lamp SEL SEIZE. Relay TR restores.

1.7 Test No. 4 (Left Normal Post Springs) (Operated: Lamps EXT GUARD and GUARD)

The Testman operates key VERT MAG and further operation is similar to Section 1.4 with the exception that the left normal post springs operate to connect the discriminating mark to lead EC.

1.8 Test No. 5 (Left Normal Post Springs) (Operated: Relay TR and lamps GUARD, EXT GUARD and EC&EC1)

When key START is restored, operations are similar to Section 1.5 with the exception that ground is removed from lead UB (rather than lead LB). When the Testman restores key RLY UB, ground is removed from lead C, extinguishing lamp EXT GUARD, and opens the associated relay, which restores.

1.9 Test No. 6 (Operated: Lamp GUARD)

When the Testman restores the busy key in the Line Finder, closing the release magnet to release the switch shaft. The release magnet operates to restore the switch shaft, extinguishes lamp GUARD and lights lamp ATB & LBL.

When the Testman restores key EC CK, #1 and #2TR are opened (which were closed in magnetic opposition).

2. Discriminating Markings Without Normal Post Springs

2.1 Test No. 1 (Operated: Lamp ATB & LBL)

The Testman operates key RLY UB, connecting ground to lead C to close an associated relay, which upon operating, extinguishes lamp ATB & LBL, and lights lamps GUARD and EXT GUARD. The Testman operates key EC CK, transferring lead MR from ground to resistance (#1TR) ground, connecting lead EC with lead MR, and connects resistance (#1TR) ground and resistance (#2TR) battery to lead EC to close #1TR in magnetic opposition to #2TR.

2.2 Test No. 2 (Operated: Lamps GUARD and EXT GUARD)

The Testman connects ground to the EC wiper via TEST PROD, closing #1TR and short-circuiting #2TR. Relay TR operates to its "X" contacts, operates fully and lights lamp EC&EC1.

2.3 Test No. 3 (Operated: Lamps GUARD and EXT GUARD)

The Testman restores key RLY UB, removing ground from lead C to open the associated relay, which upon restoring, extinguishes lamps GUARD and EXT GUARD, and lights lamp ATB & LBL. The Testman restores key EC CK, opening #1 and #2TR (which were closed in magnetic opposition).

3. Message Register Without Sensing Relays A & B

3.1 Test No. 1 (Lower Bank) (Operated: Lamp ATB & LBL)

The Testman operates key START and further operations are the same as that described in Section B-5. If the Testman is required to check the upper bank wipers only, further operation is as in Section C-3.5.

3.2 Test No. 2 (Lower Bank) (Operated: Relay TR or lamp SEL SEIZE, and lamps EXT GUARD and C GRD)

The Testman operates key RLY LB, extinguishing lamp C GRD, connects ground to lead LB to operate an associated relay, which upon operating, lights lamp GUARD.

3.3 Test No. 3 (Lower Bank) (Operated: Relay TR or lamp SEL SEIZE, and lamps GUARD and EXT GUARD)

The Testman touches resistance (TEST LAMP IN TEST PROD) battery to lower wiper MR, lighting the test lamp TEST LAMP IN TEST PROD.

3.4 Test No. 4 (Lower Bank) (Operated: Relay TR or lamp SEL SEIZE, and lamps GUARD and EXT GUARD)

The Testman restores key START from either the BAT SEIZE or LOOP SEIZE position. When the Testman restores key START from the BAT SEIZE position,

#2TR is opened, and ground is removed from lead F ST to open an associated relay, which restores. Relay TR restores. When the Testman restores key START from the LOOP SEIZE position, lamp SEL SEIZE is extinguished, and ground is removed from lead F ST to open an associated relay, which restores. The Testman restores key RLY LB, removing ground from lead C, extinguishing lamp EXT GUARD, and opens an associated relay, which upon restoring, extinguishes lamp GUARD and lights lamp ATB & LBL.

3.5 Test No. 1 (Upper Bank) (Operated: Lamp ATB & LBL)

When the Testman is ready to test the upper bank, key RLY UB is operated, connecting ground to lead C, lighting lamp EXT GUARD and closing an associated relay, which upon operating, extinguishes lamp ATB & LBL and lighting lamp GUARD.

3.6 Test No. 2 (Upper Bank) (Operated: Lamps GUARD and EXT GUARD)

The Testman touches resistance (TEST LAMP IN TEST PROD) battery via TEST PROD to the upper MR wipers, lighting lamp TEST LAMP IN TEST PROD.

3.7 Test No. 3 (Upper Bank) (Operated: Lamps GUARD, EXT GUARD and TEST LAMP IN TEST PROD)

The Testman removes the TEST PROD from the upper MR wiper, extinguishing lamp TEST LAMP IN TEST PROD. The Testman restores key RLY UB, removing ground from lead C, extinguishing lamp GUARD and opening an associated relay, which upon restoring, extinguishes lamp EXT GUARD and lights lamp ATB & LBL. This circuit is now at normal.

4. Message Register With Sensing Relays A & B

4.1 Test No. 1 (Upper Bank) (Operated: Lamp ATB & LBL)

The Testman operates key EC CK, transferring resistance (resistor R2) battery from lead INT to lead

+L, closing #1TR in magnetic opposition to #2TR. The Testman operates key RLY UB, connecting ground to lead C, lighting lamp EXT GUARD and closes an associated relay, which upon operating, lights lamp GUARD, extinguishes lamp ATB & LBL and connects leads +L and -L to upper line wipers "+" and "-", respectively.

4.2 Test No. 2 (Upper Bank) (Operated: Lamps EXT GUARD and GUARD)

The Testman short-circuits the upper line wipers to initiate the operation of two associated relays. Note, the Testman must make a physical observation check of the operation of the three associated relays.

4.3 Test No. 3 (Upper Bank) (Operated: Lamps EXT GUARD and GUARD)

The Testman removes the short-circuit from the wipers "+" and "-", the three associated relays should remain operated.

4.4 Test No. 4 (Upper Bank) (Operated: Lamps EXT GUARD and GUARD)

The Testman touches the POS TEST PROD to the upper MR wiper and touches resistance (TEST LAMP IN TEST PROD) lamp to the break cam spring via NEG TEST PROD, lighting lamp TEST LAMP IN TEST PROD.

4.5 Test No. 5 (Upper Bank) (Operated: Lamps EXT GUARD, GUARD and TEST LAMP IN TEST PROD)

The Testman removes POS TEST PROD from the upper MR wiper and resistance (TEST LAMP IN TEST PROD) battery from the break cam spring, extinguishing lamp TEST LAMP IN TEST PROD. The Testman restores key EC CK, transferring lead +L from resistance (resistor R2) battery to resistance (lamp SEL SEIZE) battery and connects resistance (resistor R2) battery to lead INT. The Testman restores key RLY UB, extinguishing lamp EXT GUARD and opening an associated relay, which upon restoring, opens two associated relays disconnects leads +L and -L from wipers "+"

and "-", respectively, extinguishes lamp GUARD and lights lamp ATB & LBL. This circuit is now at normal.

4.6 Test No. 6 (Upper Bank) (Operated: Lamp ATB & LBL)

The Testman operates key DET, transfers leads -L and +L from ground and resistance (lamp SEL SEIZE) battery to resistance (resistor R2) battery and ground, respectively, reversing battery polarity via leads +L and -L, and transfers lead FBG from resistance (lamp EXT GUARD) battery to resistance (resistor R3) battery. The Testman operates key RLY UB, connecting ground to lead C, which closes an associated relay, which upon operating, extinguishes lamp ATB & LBL, lights lamp GUARD, and connects leads +L and -L to the upper line wipers "+" and "-", respectively.

4.7 Test No. 7 (Upper Bank) (Operated: Lamp GUARD)

The Testman short circuits the upper line wipers "+" and "-" and observes to be sure that the two associated relays (which operated in Section 4.2) do not operate.

4.8 Test No. 8 (Upper Bank) (Operated: Lamp GUARD)

The Testman removes the short circuit from the upper line wipers "+" and "-". The Testman restores key RLY UB, removing ground from lead RLY UB, removing ground from lead C, opening an associated relay, which upon restoring, disconnects leads +L and -L from the upper line wipers "+" and "-", respectively, extinguishes lamp GUARD and lights lamp ATB & LBL. The Testman restores key DET, transferring lead -L from resistance (resistor R2) battery to ground, transferring lead FBG from resistance (resistor R3) battery to resistance (lamp EXT GUARD) battery, and transferring lead +L from ground to resistance (lamp SEL SEIZE) battery. This circuit is now at normal.

4.9 Test No. 1 (Lower Bank) (Operated: Lamp
ATB & LBL)

The Testman operates key START to the LOOP SEIZE position, connecting ground to lead F ST to close an associated relay, which upon operating, dimly lights lamp SEL SEIZE via resistance ground on lead +L, extinguishes lamp ATB & LBL, and lights lamp EXT GUARD and C GRD.

4.10 Test No. 2 (Lower Bank) (Operated: Lamps
SEL SEIZE, C GRD and EXT GUARD)

The Testman operates key EC CK, transferring resistance (resistor R2) battery from lead INT to lead +L, closing #1 and #2R in magnetic opposition. The Testman operates key RLY LB, connecting ground to lead C, connecting ground to lead RLY LB, extinguishes lamp C GRD closing an associated relay, which upon operating, connects leads +L and -L to the lower line wipers "+" and "-", respectively, and lights lamp GUARD.

4.11 Test No. 3 (Lower Bank) (Operated: Lamp
SEL SEIZE, EXT GUARD and GUARD)

The Testman short-circuits the lower line wipers "+" and "-" to initiate the operation of associated relays and increases the brilliance of lamp SEL SEIZE. Note, the Testman should make a physical observation check of the operation of the three associated relays.

4.12 Test No. 4 (Lower Bank) (Operated: Lamp
SEL SEIZE, EXT GUARD and GUARD)

The Testman removes the short circuit from the lower line wipers "+" and "-", decreasing the brilliance of lamp SEL SEIZE. The three associated relays should remain operated.

4.13 Test No. 5 (Lower Bank) (Operated: Lamp
SEL SEIZE, EXT GUARD and GUARD)

The Testman touches the POS TEST PROD to the lower MR wiper and touches resistance (TEST LAMP IN TEST

PROD) battery to the break cam spring via NEG TEST PROD, lighting lamp TEST LAMP IN TEST PROD.

4.14 Test No. 6 (Lower Bank) (Operated: Lamps SEL SEIZE, EXT GUARD, GUARD, and TEST LAMP IN TEST PROD)

The Testman removes the POS TEST PROD from the lower MR wiper, extinguishing lamp TEST LAMP IN TEST PROD, and removes resistance (TEST LAMP IN TEST PROD) battery from the break cam spring.

The Testman restores the START key from the LOOP SEIZE position, removing ground from lead F ST, opening an associated relay, which upon restoring, extinguishes lamp SEL SEIZE and lights lamp ATB & LBL.

4.15 Test No. 7 (Lower Bank) (Operated: Lamps ATB & LBL, EXT GUARD and GUARD)

The Testman restores key EC CK, transferring resistance (resistor R2) battery from lead +L to lead INT. The Testman restores key RLY LB, removing ground from lead LB, removing ground from lead C, extinguishing lamp EXT GUARD, opening an associated relay, which upon restoring, extinguishes lamp GUARD, and disconnects wipers "+" and "-" from leads +L and -L, respectively. This circuit is now at normal.

5. Satt Detector Battery

5.1 Test No. 1 (Operated: Lamp ATB & LBL)

The Testman operates the busy key in the Line Finder, extinguishing lamp ATB & LBL and lighting lamp GUARD. The Testman manually steps the switch shaft vertically to the first vertical level where the normal post springs do not operate.

5.2 Test No. 2 (Operated: Lamp GUARD)

The Testman operates key EC CK, closes #1 and #2TR in magnetic opposition. The Testman operates key DET, opening #2TR, transfers lead FBG from resistance (lamp EXT GUARD) battery to resistance (resistor R3) battery and connects ground to lead +L.

Relay TR operates to its "X" contacts, operates fully, locks via low resistance battery (3500 ohm detector battery) connected to lead C, lights lamp EC&EC1.

5.3 Test No. 3 (Operated: Relay TR and lamps GUARD and EC&EC1)

The Testman restores key EC CK, lamp EC&EC1 remains lit to indicate proper detection battery via lead C.

5.4 Test No. 4 (Operated: Relay TR and lamps GUARD and EC&EC1)

The Testman momentarily operates key ROT MAG, removing resistance (resistor R3) battery from lead FBG, changing lead C from low-resistance battery to high-resistance battery, opening #1TR. Relay TR restores and extinguishes lamp EC&EC1, indicating the low resistance battery (3500 ohm detector battery) is removed.

5.5 Test No. 5 (Operated: Lamp GUARD)

The Testman restores key ROT MAG, connecting resistance (resistor R3) battery to lead FBG. The Testman restores key DET, transferring lead FBG from resistance (resistor R3) battery to resistance (lamp EXT GUARD) battery, transfers lead +L from ground to resistance (lamp SEL SEIZE) battery, and connects ground to lead -L. The Testman restores the busy key in the Line Finder to initiate the operation of the VON springs, which upon operating, extinguish lamp GUARD and lights lamp ATB & LBL. The Line Finder is now at normal.

PM-1461 (Rev. 4/57)

TRACING
WORK
RETYPE

3-23-66
ISSUE: #3

4-AH-85289
MMC. ECO
1-5-68
ISSUE: #4

AH-85289

RELAYS		SPRING GAUGING		TEST FOR		RESIST. AT 50 V		CURRENT		TEST NOTE	TESTING INSTRUCTIONS
				READJ.	TEST	READJ.	TEST				
VS FIG.1	RT-16017-A12	310	310	0	2300	2000	.0161	.0179	POS. TO RH COIL TERM. AS VIEWED FROM REAR.		
D-282137-A	#1-800 Ω	310	310	NO	2800	3100	.0139	.0129			
SR											
INT, ETC.	RT-12074-F19	310	310						5 RESIDUAL TO BE MIN. .008", MAX. .011". INT: POS. TO SPG. 5 OF RLY. VS. IN1: POS. TO COIL TERM. AS VIEWED FROM REAR.		
D-283940-A	#1-32 Ω	310	310	0	580	550	.0460	.0475			
#2-500 Ω	CHROME CORE			NO	660	740	.0430	.0405	NEG. TO LH COIL TERM. AS VIEWED FROM REAR.		
STP FIG.2	RT-12056-B24	310	310	0	2400		.0139				
D-282232-A	#1-1200 Ω	310	310								
INT, ETC.	RT-12232-F11	310	310	0	240	220	.102	.106	TEST IN MULT. WITH 500 Ω. INT: POS. TO SPG. 5 OF RLY. VS. IN2: POS. TO UPPER COIL TERM.		
D-283458-A	#1-500 Ω	310	310	NO	340	370	.086	.090			
#2-500 Ω NI	CHROME CORE										
STP FIG.3	RT-12056-B24	310	310	0	2400		.0139		POS. TO RH COIL TERM. AS VIEWED FROM REAR.		
D-282232-A	#1-1200 Ω	310	310								
STP FIG.4	RT-12056-B24	310	310	0	5300	4800	.0090	.0099	GRD. TO UPPER COIL TERM. NEG. TO LOWER COIL TERM.		
D-281637-A	#1-250 Ω	310	310	NO	6800	7550	.0071	.0064			
#2-1000 Ω											

EXPLANATION OF TERMS

1-INSIDE OR ARMATURE END WINDING.
2-OUTSIDE OR HEEL END WINDING.
SA - SLOW TO OPERATE & SLOW TO RELEASE.
SR - SLOW TO RELEASE; SO - SLOW TO OPERATE.
AC - ALTERNATING CURRENT.
O - OPER.; NO - NON-OPER.; H - HOLD.; R - RELEASE.
RESID. - RESIDUAL ADJUSTMENT VALUE. TEST VALUES ARE FOR INSPECTION ONLY. READJ. VALUES ARE FOR ADJUSTING ONLY. CURRENT IS SHOWN IN AMPERES. POS. - TEST WITH POSITIVE BATTERY THRU RESISTANCE OF TEST SET. NEG. - TEST WITH NEGATIVE BATTERY THRU RESISTANCE OF TEST SET.

NOTES

1-TEST WITH BOTH WINDINGS IN SERIES.
2-TEST WITH VERTICAL MAGNET IN SERIES.
3-TEST WITH ROTARY MAGNET IN SERIES.
4-NO. 1 WINDING TO OPER. NO. 1 SPRING ONLY.
5-SPRINGS NEED ONLY MAKE CONTACT ON OPERATE TESTS.
6-BOTH TESTS MADE ON NO. 1 WINDING. NO. 1 TEST IS FOR NO. 1 SPRING ONLY.
7-CONNECT RESIST ACROSS TEST JACKS 1 & 2.
8-SHORT LEVER ARM. RESID MIN. .0015 MAX .004.

RELAY ADJUSTMENT SHEET

LINE FINDER TEST CIRCUIT

FOR

SWITCH TEST STAND

STANDARD ADJUSTMENTS 100 101 300

753

TYPE: DB ENG. JWL APP'D. RBK OK.

AUTOMATIC ELECTRIC COMPANY
NORTH LAKE, ILLINOIS, U.S.A.

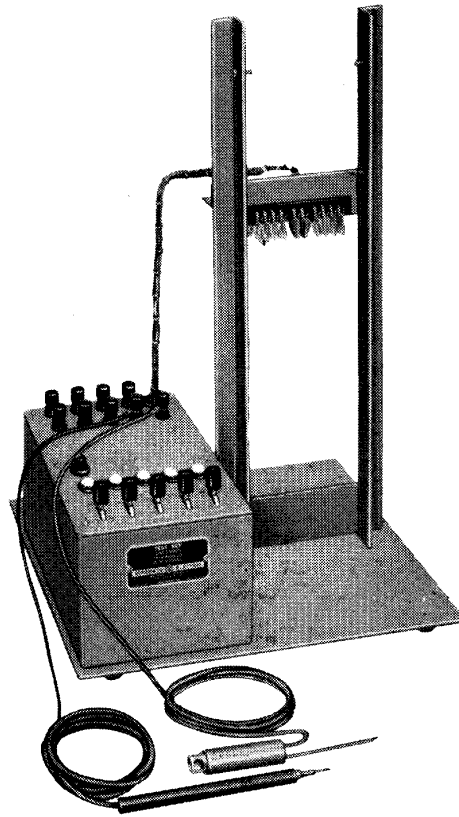
CKT. H-85289 2 SHEETS 1

AH-85289

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[illegible]

Linefinder Switch Test Stands



The Linefinder Switch Test Stand is designed to perform tests on linefinders which have been removed from the shelf for repair. It is not intended for a routine inspection of linefinders. All commonly used Automatic Electric Company, Strowger 2 motion linefinders can have their basic operations tested.

The Linefinder Switch Test Stand provides means for performing the following tests on linefinders: Vertical and rotary stepping. Continuity of all leads to the linefinder switch jack. Continuity of a closed circuit through all the relay break contacts with the relay normal, and for an open circuit with the relay operated. Continuity of a closed circuit through all the relay make contacts with the relay operated, and for an open circuit with the relay normal using the test prod with the lamp assembly. Continuity of all wiper circuits.

The Linefinder Switch Test Stand is mounted on a metal platform measuring $13\frac{25}{32}$ inches wide and $10\frac{1}{32}$ inches deep. On the left side of the platform is a metal box which contains the test equipment. On the right side of the platform a linefinder shelf jack is securely mounted in a mounting bracket.

Order No.	Description	Price Each
H-881444-1	Used when linefinders have magnet interrupter springs with break contacts, and cam springs place battery on test 1 lead.....	\$125.00
H-881444-2	Used when linefinders have magnet interrupter springs with make contacts, and cam springs ground the guard (G) lead.....	125.00

REFERENCE: Technical Bulletin 108-716.