

A.E.CO. TYPE 101 DIRECTOR SYSTEM
MAINTENANCE PROCEDURES

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1. GENERAL

1.01 This Section presents maintenance procedures to follow when routining the A.E.Co. Type 101 Director System. The procedures included in this Section are designed to detect malfunctions in system equipment before they result in customer complaints, and to localize a fault detected when routining the director system.

2. TEST EQUIPMENT

2.01 The following test equipment will be needed:

- (a) A.E.Co. Type 31 Routine Test Set;
- (b) A.E.Co. Type 32 MF Pulsing Test Set;
- (c) A.E.Co. Type 800 Hand Test Telephone, or equivalent;
- (d) W.E.Co. J-94713-A Timing Test Set;
- (e) W.E.Co. 32-A Remote Control Test Cord;
- (f) W.E.Co. J-34717-A Pulsing Test Set;
- (g) W.E.Co. 36-B Remote Control Test Cord;
- (h) Type 182A Touch Calling Telephone set;
- (i) 3P2A Cord Assy.;
- (j) 2W12A Cord Assy.

2.02 The test equipment listed will be used to test overall director system operation, and to test functional stages of major assemblies within the director system. This list covers an office where Type 101 Director equipment is equipped to provide Touch Calling service and has the capability for MF outpulsing. In an office

where the capability for MF outpulsing is not provided, the Type 32 MF Pulsing Test Set will not be required.

3. OVERALL SYSTEM TESTS

3.01 The purpose of performing overall system tests is to test the complete operation of the Type 101 director system. The overall system tests provided in this Part are divided into two categories: (1) register-sender access equipment tests, and (2) test calls through the director. Test calls are presented to the common equipment through the register-sender. The progress of these test calls is then observed on the Type 31 Routine Test Set.

Register-Sender Access Equipment
Tests

3.02 The objective of these tests is to test the overall operation of the register-sender access equipment. Tests are included covering both loop seizure and ground start from the linefinder. The only equipment required for the register-sender access equipment tests is a Type 800 hand test telephone.

3.03 A successful test of register-sender access from the linefinder shelf indicates that each linefinder calling for service will be connected through the register-sender access equipment to an idle register-sender. The access circuit calling for service will be identified by the proper tens and units marking, and dial tone will be received from the register-sender. Combine this routine with the usual linefinder operation routine. To perform this test, proceed as follows:

- (1) Operate the C-R switch of a Type 800 or similar hand test telephone to the C (monitor) position. Plug into test jacks 5 & 6 of the group relays associated with a local linefinder shelf.
- (2) Operate the C-R switch on the hand test telephone to the R (1500-ohm loop) position.
- (3) Observe which linefinder is activated to find the associated line. After the linefinder has found the line, listen for "precise" (musical) dial tone. Note any irregularities such as noise, delay in receiving dial tone, etc. There should be less than a five second wait for dial tone.
- (4) Restore the C-R switch on the hand test telephone to its C position.

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- (5) Repeat steps (2) through (4) until each linefinder on the shelf has been tested for access to the register-sender, then unplug the hand test telephone.
- (6) Repeat steps (1) through (5) for each linefinder shelf until all linefinders in the office have been tested for successful seizure of an idle register-sender.

3.04 A successful test of Group A crosspoint access switches associated with loop seizure access relay circuits indicates that each Group A crosspoint access switch identifies the test access relay circuit, and that dial tone is received from the register-sender. Proceed with this test in the following manner:

- (1) Using a Type 800 hand test telephone equipped with a D-542725-A cord assembly, with the C-R switch in the C position, plug into test jacks 1 and 2 on the register-sender access equipment shelf.
- (2) Operate the C-R switch on the hand test telephone to the R (1500-ohm loop) position.
- (3) Observe group A crosspoint access switches and note which tens coil of which crosspoint access switch is operated; it should correspond to the tens digit of the test access circuit.
- (4) Listen for precise dial tone. Note any irregularities such as noise, delay in receiving dial tone, etc. After receiving dial tone, restore the C-R switch on the hand test telephone to the C position.
- (5) Repeat steps (2) through (4) until each group A crosspoint access switch on the equipment shelf has been checked, then unplug the hand test telephone from the register-sender access equipment shelf test jack.

3.05 A successful test of Group B crosspoint access switches associated with loop seizure access relay circuits indicates that each Group B crosspoint access switch identifies the access relay circuit calling for service, and that dial tone is received from the register-sender. Proceed with this test in the following manner:

- (1) Using a Type 800 hand test telephone equipped with a D-542725-A cord assembly, with the C-R switch in the C position, connect to an access relay circuit's plus (+) L and minus (-) L terminals (punchings) on the terminal block (cable block) for the group B crosspoint access switches; connection is made to the +L and -L terminals of the access relay circuit used for this test (typically number 69, but may be selected between 61 and 00).
- (2) With the C-R switch of the hand test telephone in the C position, observe if

the access circuit is idle. If it is, operate the C-R switch to the R position (1500-ohm loop) and listen for precise dial tone. Note any irregularities in the dial tone returned, such as noise, delay in receiving dial tone, etc.

- (3) Observe the group B crosspoint access switches and note which tens coil of which crosspoint access switch is operated; it should correspond to the access relay circuit to which the connection was made.
- (4) Restore the C-R switch to the C position.
- (5) Repeat steps (2) through (4) until each group B crosspoint access switch on the equipment shelf has been tested, then disconnect the hand test telephone.

3.06 Proceed to test each shelf of register-sender access equipment as described in 3.04 and 3.05. These tests were based on loop seizure of the access circuit.

3.07 The procedures that follow test crosspoint access switches associated with ground start from the linefinder access relay circuits. These steps should be followed when single relay access circuits are used.

- (1) Using a Type 800 hand test telephone, with the C-R switch in the C position, connect to the +L and -L terminals of an access relay circuit in the A group (e.g. 29).
- (2) If the circuit is idle, operate the C-R switch on the hand test telephone to the R (1500-ohm loop) position.
- (3) Momentarily ground the FSA terminal.
- (4) Observe which tens coil of which crosspoint access switch is energized. It should correspond to the access relay circuit number.
- (5) Note any irregularities in dial tone, such as delay in receiving dial tone, noise, etc.
- (6) Restore the C-R switch to the C position.
- (7) Repeat steps (2) through (6) until each group A crosspoint access switch has been tested from the access relay circuit selected as a test circuit.
- (8) Disconnect the hand test telephone from the A group and connect it to an access relay circuit -L and -L terminals in the B group (e.g., 69). Repeat steps (2) through (6) until each crosspoint access switch in the B group has been tested, then disconnect the hand test telephone.

- (9) Repeat the above test for each register-sender access equipment shelf in the office.

3.08 The access relay circuit test is made from each access relay circuit to each crosspoint access switch to check all contactors of each switch for continuity. This test is performed in the following manner:

- (1) Using the Type 800 hand test telephone, with the C-R switch in the C position, connect to the access relay circuit +L and -L terminals on the group A terminal block at the end of the register-sender access equipment shelf; connect to the terminals of the access relay circuit to be tested.
- (2) With the C-R switch of the hand test telephone in the C position, observe if the circuit is idle, if it is, operate the C-R switch on the hand test telephone to the R position (1500-ohm loop) and listen for precise dial tone. Note any irregularities such as noise, delay in receiving dial tone, etc. Restore the C-R switch on the hand test telephone to the C position.
- (3) Disconnect from the +L and -L terminals of the access relay circuit tested and move to the next access relay circuit to be tested as in step (1).
- (4) Repeat steps (2) and (3) until all access relay circuits (A and B groups) on the register-sender access equipment shelf have been tested. (To test the B group, connections are made on the group B terminal block.) Each register-sender access equipment shelf of access relay circuits should be tested in the manner previously described.

3.09 To test single relay, ground start access circuits, follow the same basic procedure as described in paragraph 3.08, except momentarily ground the FSA terminal each time in order to seize the access circuit.

3.10 Visual and audible common alarm signals will be activated if any of the following conditions occur while performing the register-sender access equipment tests:

- (a) failure to find tens group,
- (b) failure to find units group,
- (c) failure to find register-sender, or
- (d) failure to release after finding a register-sender.

Test Calls Through the Director

3.11 The information contained in the paragraphs that follow, and the subsequent test procedures provided are intended as a guide to routining any office equipped with a Type 101 director system. The test procedures provided

have been selected as representative tests to check the features and functions of a local director system. If an office is arranged for features not covered by the test procedures provided in subsequent paragraphs, refer to the circuit drawing and explanation to determine the best approach to check those features.

3.12 Tables 1 through 3 present the various digit marking codes, routing instruction codes, and MF outpulsing frequencies used when MF is used in the office. These tables have been included for ready reference as an aid to the maintenance technician.

3.13 A typical test program form is shown in Table 4. A form of this type will prove helpful when testing. It presents a record of the proper readout indications that should be observed when predetermined digits are dialed into the register-sender. With the aid of the ETN drawing furnished with the 101 Director, a form similar to the one shown in Table 4 can be prepared. The information shown in Table 4 is provided as an example and is included only to show the type of information required to prepare an adequate test program form.

3.14 When placing test calls through the Director to routine the system, start with register-sender number 1. The office should be on the primary translator (translator 1) and primary time division power supply.

Alternating the Use of Equipment

3.15 After about one third of the register-senders in the office have been used for system testing, transfer the time division power supply to standby by operating the T DIV RST key on the translator monitor. Continue routining until another one third of the register-senders have been used, then transfer back to the primary time division power supply by again operating the T DIV RST key.

3.16 When testing the register-senders with the Type 31 test set, be sure the SHUNT/SPEED key is unoperated at the start. If the correct results are obtained, release the register-sender by operating the RLSE key. Reseize the register-sender by operating the SEIZE key. Operate the SHUNT/SPEED key to the SHUNT position. Dial into the register-sender again with the 31 test set. Follow this procedure on all register-senders.

3.17 When all register-senders have been routined as outlined in 3.15 and 3.16, this is considered a complete test cycle. The first test cycle should be performed with the primary translator. When the next test cycle is started, the translator should be transferred to the standby translator. This is done by operating the TRANSL TRANS key on the translator monitor. When routining is complete, return to the primary translator by operating the TRANSL RST key on the translator monitor.

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3.18 By alternating in the manner described in 3.14 through 3.17, both primary and stand-by equipment operation will receive a thorough check. Also, equipment will be checked for both 1200 ohm loop with no leak, and 0 ohm loop with leak 'A' to simulate a 'worst case' condition.

NOTE: The parity check key should be in the ON position during the time the office is attended, or during the time that tests are being performed in an unattended office, so that any fault condition detected will activate visual and audible alarms. When testing is completed in an unattended office, return parity check key to the OFF position.

3.19 The test equipment used to routine the Type 101 director will depend on the office equipment arrangement. The Type 31 Routine Test Set is used to routine the initial counting chain, codelreed storage, and register-sender outpulsing circuit. If the office is arranged for MF receiving and outpulsing, the Type 32 Multifrequency Pulsing Routine Test Set will also be used since it provides the facilities for pulsing multifrequency tones to the register-senders, and gives a visual display of multifrequency digits outpulsed from a register-sender. No other test equipment should be needed for this routine.

3.20 Before connecting the Type 31 test set to the Register-Sender to be tested, observe the SUPY lamp (white) associated with the Register-Sender. If it is dark, the Register-Sender is idle and the test set connection may be made. If the SUPY lamp is lit the Register-Sender is processing a call. Operate the BSY key on the Register-Sender. When the SUPY lamp extinguishes, connect the Type 31 test set to the test jack provided. Refer to the 108-251 series of GSP's for description and test connections for the Type 31 test set.

NOTE: Before beginning office routining, observe the register-sender monitor lamps and make a note of any that are illuminated steadily as they indicate register-senders that have been temporarily taken out of service. When the routining of the office has been completed, again observe the monitor lamps, noting which ones are illuminated steadily. In this manner, any register-sender taken out of service temporarily for testing will be detected if it was not returned to service.

3.21 For local director tests, the counting chain, codelreed storage, outpulsing, and T () relay circuits of the register-sender are tested by using the Type 31 Routine Test Set. All office codes which require different routing should be dialed into the system (including no code and codes for various time outs). Routining of the office should follow the pattern described in Paragraphs 3.14 through 3.18.

3.22 Select a group of office codes from the test program form prepared in accordance with the sample shown in Table 6 which will allow the register-sender to perform the functions of repeat, release; and absorb, in addition to the register-sender's normal functions. Connect the 10 conductor test cable, and the battery cable to the test set. Connect the battery cable to the central-office battery supply. Connect the 10-conductor test cable to test jack springs 1 and 2 of the register-sender to be tested. (Set the SX/LOOP/4W key on the test set to the pulse mode corresponding to the register-sender to be tested.)

3.23 Observe the test set BUSY lamp. If it is dark, the Register-Sender selected is idle. If it is lit, the Register-Sender is busy. Operate the BSY key on the Register-Sender. When the BUSY lamp extinguishes, operate the RLSE/SEIZE key to SEIZE. The test set BUSY lamp will begin to flash and the PAUSE lamp will light to indicate the Register-Sender was seized the test set registration circuit. Move the B/A/C key to the position determined by the ETN drawing.

3.24 Dial the first digit of the test number. If terminals DSA and DSB in the register-sender are strapped, the first digit will be repeated to the first selector. The lamp, on the test set, corresponding to the digit dialed should flash. If this digit is absorbed, the ABS lamp on the test set will flash momentarily. Dial the digits necessary to obtain a translation from the translator. Stop dialing and observe the digits outpulsed on the digit display lamps of the test set. During each interdigital pause, the PAUSE lamp will light. Continue dialing the necessary additional digits until the register-sender is no longer in the circuit and the RLSE lamp lights. These dialed digits will also be displayed on the digit display lamps.

3.25 Operate the RLSE/SEIZE key to RLSE. This will open the circuit to the register-sender, and the BUSY lamp will stop flashing. Operate the RLSE/SEIZE key to SEIZE until the BUSY lamp begins to flash, indicating seizure of the register-sender.

NOTE: Even though the circuit is opened, the test set continues to mark the register-sender busy to other calls by a ground appearing on lead H. This ground keeps the link finder associated with the register-sender marked busy, thereby marking the register-sender busy to other traffic. This ground is present after the RLSE/SEIZE key is operated to SEIZE the first time, and remains until the test plug is removed from the test jacks.

3.26 The time out interval for permanent lines should be approximately 20 seconds. No-code and slow-dialing time out intervals should be approximately 10 seconds under light loads and 5 seconds under heavy load conditions. For delayed CLR calls, the call should be routed to an oper-

ator within 4 seconds after the digit '0' is dialed if no other digits are dialed.

3.27 To check these timing intervals connect the Type 31 test set to the register-sender to be tested as described in 3.22 and 3.23. After operating the test set RLSE/SEIZE key to SEIZE, check the permanent line time out interval and observe the test set digit display lamps for proper outpulsing of intercept routing digits, or a release mark, depending on office arrangement.

3.28 When the test set RLSE lamp lights, operate the RLSE/SEIZE key to RLSE. Reseize the register-sender and check the no-code time out interval by dialing a non-translatable digit. Also observe the test set digit display lamps for proper intercept routing digits.

3.29 To check for delayed CLR timing, repeat the above procedure for checking no-code time out, except dial the digit 0.

3.30 The ability of the system to respond to fast dialing should also be checked. To make this check fast dial low number digits (e.g. 222-1111) and slightly force the dial back to normal each time. The call should terminate properly and not result in an alarm.

3.31 After call tests through register-sender number 1 have been completed, restore the register-sender BSY key to its normal nonoperated position, and disconnect the test set. Repeat the tests provided for in Paragraphs 3.21 through 3.30 each time connecting the test set to a different register-sender.

3.32 Calls may be placed through the Director system from Touch Calling telephones in the following manner:

- (1) Equip the line cord of a Type 182A Touch Calling telephone with alligator clips.
- (2) Connect the clips of the TC telephone to the +I and -I terminals on block A of the Register-Sender.
- (3) Connect the Type 31 test set to the Register-Sender test jack.
- (4) Seize the register-sender by operating the RLSE/SEIZE key to the SEIZE position.
- (5) Lift the handset of the Touch Calling receiver and key in the office code to be checked, then restore the handset.
- (6) Observe the routing instructions returned.
- (7) When outpulsing is completed and the register-sender releases, reoperate the register-sender RLSE/SEIZE key to the SEIZE position. The next office code may now be checked.

NOTE: After each office code is checked, the register-sender must be reseized by operating the RLSE/SEIZE key to the SEIZE position.

3.33 Register-senders used in local Directors which are equipped with the option to outpulse in a multifrequency mode should be tested with the Type 31 and Type 32 test sets. In order to test the multifrequency outpulsing circuits of such a register-sender, test numbers should be selected from the test program form which make the local register-sender perform the functions of repeat, release, and absorb, in addition to the function of outpulsing in the multifrequency mode. In order to accomplish this, more than one test number may be required.

3.34 Tests may be performed on a local register-sender that has multifrequency outpulsing capabilities, as follows:

- (1) Connect the 10-conductor test cable, and the battery cable to the Type 31 Test Set.
- (2) Connect the two six-conductor test cables and the battery cable, to Type 32 Test Set.
- (3) Connect the double plug-ended, six-conductor cable from the Type 32 Test Set to the Type 31 Test Set.
- (4) Connect the six-conductor cable with the Jones plug to the central-office multifrequency distribution circuit.
- (5) Connect the battery cables from both test sets to the central-office supply.
- (6) Operate the SX/LOOP/4W key to LOOP.
- (7) Connect the 10-conductor test cable from the Type 31 Test Set to test jack springs 1 and 2 on the register-sender to be tested.
- (8) Observe the BUSY lamp on the Type 31 Test Set; if it is dark, the register-sender selected for test is idle. If the BUSY lamp lights, no further steps should be taken until the lamp extinguishes.
- (9) Move the B/A/C key on the Type 31 Test Set to the position indicated in the ETN drawings.
- (10) Operate the RLSE/SEIZE key on the Type 31 Test Set to SEIZE; the BUSY lamp will begin to flash, and the PAUSE lamp will light to indicate the register-sender has seized the Type 31 Test Set registration circuit.

NOTE: The register-sender's BSY key should be operated to prevent additional seizures; the test set can seize the register-sender with the BSY key in the operated position.

- (11) Dial the first digit of the test number. If terminals DSA and DSB in the register-sender are strapped, the first digit

is repeated; therefore, the corresponding lamp on the Type 31 Test Set will flash momentarily. This digit will be absorbed; therefore, the ABS lamp on the test set will flash.

- (12) The register-sender BSY key, if operated during test, must be returned to its nonoperated position.

Table 1. Two-Out-of-Five Code Conversion.

Dialed Digit	Two-Out-of-Five Code
1	0-1
2	0-2
3	1-2
4	0-4
5	1-4
6	2-4
7	0-7
8	1-7
9	2-7
0	4-7

3.35 A local register-sender that will outpulse in the multifrequency mode will ordinarily not outpulse any digits until the last digit of the called number has been received and stored.

Table 2. Routing Instruction Codes.

Three-Out-of-Five Code	Routing Instruction
012	Release Register-Sender.
014	Repeat Next Dialed Digit.
017	Advance Sequence.
024	Absorb (Release the Switchtrain Forward Momentarily,
027	Delay Sending.
147	Send In MF Mode.

Therefore, dial all of the digits in the test number. The first digit, or digits, outpulsed by the register-sender will probably be dial pulsed. These digits position the selectors which access the MF (multifrequency) trunks. These digits may be observed as momentary flashes on the digit indicator lamps of the Type 31 Test Set. The STOP DIAL key may be operated during the interdigital pause. The register-sender should not outpulse again until the key is restored to normal.

3.36 All multifrequency digits outpulsed by the register-sender will be recorded in a two-out-of-five code on the lamp display of the Type 32 Test Set. In addition to the digits recorded, the KEY PULSE and STOP lamps should be illuminated.

3.37 When the analysis of the lamp display on the Type 32 Test Set is completed, operate the INTERNAL MF TEST/DISPLAY RELEASE key to DISPLAY RELEASE. (The key should be held operated for a few moments to allow all of the lamp circuits and associated equipment time to reset.) Operate the RLSE/SEIZE key on the Type 31 Test Set to RLSE; this restores the test set to the idle condition. If further testing of the register-sender is required, the RLSE/SEIZE key may be operated to SEIZE immediately following its operation to RLSE; this will re seize the register-sender. If further testing is not required, disconnect the test set from the register-sender and restore the register-sender BSY key to normal.

Table 3. Outpulsing in MF Mode.

Digit To Be Outpulsed	Relays Operated	Frequencies Applied To T & R Leads
1	M0, M1	700, 900
2	M0, M2	700, 1100
3	M1, M2	900, 1100
4	M0, M4	700, 1300
5	M1, M4	900, 1300
6	M2, M4	1100, 1300
7	M0, M7	700, 1500
8	M1, M7	900, 1500
9	M2, M7	1100, 1500
0	M4, M7	1300, 1500

Table 6. Sample Test Program Form.

TYPE OF CALL	DIGITS DIALED	TRANSLATION	RESULT
Local Call (Dial Pulsing)	485-1534	014 024 02 017 04(D3)	No. 4 lamp lights. ABS lamp flashes. No. 2 lamp lights No lamp indication. No. 1 lamp lights. No. 5 lamp lights. No. 3 lamp lights. No. 4 lamp lights. RLSE lamp flashes when register-sender releases.
Local Call (MF)	488-1534	014 027 147 01 017	No. 4 lamp lights. No lamp indication. No lamp indication. No lamp indication. Type 32 Test Set lamps; No. 0 and No. 1 in position 1 light. No. 1 and No. 4 in position 2 light. No. 1 and No. 2 in position 3 light. No. 0 and No. 4 in position 4 light. RLSE lamp flashes when register-sender releases.
SATT (Station-to-Station)	1 +7 or 10 Customer's Dialed Digits	01 014 017 01(D0)	No. 1 lamp lights. No lamp indication. No lamp indication. No. 1 lamp lights. Lamps corresponding to the 7 or 10 customer's dialed digits light. RLSE lamp will flash when register-sender releases.
Special Service	113	01 017 12(D2)	No. 1 lamp lights. No lamp indication. No. 3 lamp lights. RLSE lamp will flash when register-sender releases.
Dispatch	110	1(01) 9(27) 012	No. 1 lamp lights. No. 9 lamp lights. RLSE lamp will flash when register-sender releases.
Intercept	41	0(47) 012	No. 0 lamp lights. RLSE lamp will flash when register-sender releases.
Reverting Call	19	017 01(D0)	No lamp indication. No. 6 lamp lights. No. 1 lamp lights. No. 9 lamp lights. RLSE lamp will flash when register-sender releases.
SATT (PPCS)	1 +7 or 10 Customer's Dialed Digits	01 02 017 02(D1)	No. 1 lamp lights. No. 2 lamp lights. No lamp indication. No. 2 lamp lights. Lamps corresponding to the 7 or 10 Customer's dialed digits light. RLSE lamp will flash when register-sender releases.

4. MAJOR ASSEMBLY TESTS

4.01 This Part covers testing of major assemblies of the Type 101 director system. The tests included in this Part may be used to locate a fault detected during system operation checks, as well as to routine the register-sender, translator, or translator monitor. While performing tests on register-senders, observe for arcing contacts.

Register-Sender

4.02 The procedures in the paragraphs that follow check pulsing and pulse repeating, registration of dialed digits, outpulsing, and timing functions of the register-sender. The test equipment required is indicated for each test. Prior to testing of register-sender, check the register-sender supervisory lamps L1 and L2. They should glow dimly and be of equal brightness. No flickering or change of brightness should occur.

4.03 The pulsing and pulse repeating function of the A and PR relays, respectively, should be tested using the W.E.Co. Type J-34717-A test set equipped with the W.E.Co. Type 36-B test cord (Refer to the related Section in the 108-151 series of General System Practices.) Proceed as follows:

- (1) Make the necessary test set connections and calibrate the test set in accordance with the related Section in the 108-151 series of the General System Practices.
- (2) Observe the register-sender SUPY lamp to determine if the register-sender to be tested is idle. If the lamp is dark, the register-sender is idle.
- (3) If the register-sender is idle, operate the register-sender BSY key.
- (4) Using a W.E.Co. 3P2A cord assembly, connect from the SW jack on the W.E.Co. Type J-34717-A test set to register-sender test jacks 1 and 2. Operate the loop turnkeys to provide a 1400 ohm loop. Operate the LKA/LKC key to the LKA position to provide leak A.
- (5) Remove the equipment cover from the register-sender.
- (6) Using the W.E.Co. 36-B test cord (remote control) connected to the W.E.Co. J-34717-A test set, depress the LP button and release it. The digit 9 will be pulsed into the register-sender. Repeat three or more times.
- (7) Manually operate the AS (advance sequence) relay.
- (8) Manually operate to T0 and T1 relays simultaneously.
- (9) Observe the T2 and T7 relays. These relays should operate and restore simultaneously for each digit 9, indicating that the digit 9 was correctly received and stored.

(10) Repeat steps (6) through (10), using the LK button instead of the LP button on the W.E.Co. 36-B test cord. This provides a "worst case" check with leak A in the pulsing loop.

(11) Remove the test set connections, place the register-sender equipment cover in place, and restore the register-sender BSY key to its normal position to return the register-sender to service.

4.04 This test checks that the B relay holds during pulsing and releases within the time specified on the AH sheet. The W.E.Co. J-94713-A Timing Test Set will be used to perform this test.

NOTE: Specific timing values for the B and C relays will be stated on adjustment sheets issued after February 1, 1967.

Proceed as follows:

- (1) Make test set connections in accordance with the associated practice in the 108-204 series of General System Practices, then calibrate.
- (2) Observe the register-sender SUPY lamp. If the register-sender is idle as indicated by a dark lamp, operate the register-sender BSY key.
- (3) Connect from the timing test set V-BR jack to register-sender test jacks 1 and 2, using a 3P2A cord assembly.
- (4) Remove the register-sender equipment cover.
- (5) Position the A and B selector switches on the timing test set to the test limits specified on the relay adjustment sheet. The lever key associated with the B selector switch should be in the B position.
- (6) Operate the test set A/B lever key to the A (hold) position. Observe the B relay in the register-sender; it should not release.
- (7) Operate the test set A/B lever key to the B (release) position. Observe the B relay in the register-sender; it should be released.

NOTE: If necessary, use the 32A Remote Test Cord.

4.05 If the B relay does not hold during pulsing, or release is not within the specified limits, audible and visual alarm indications will be activated. After completing this test, proceed to check the timing of relay C as described in paragraph 4.06.

4.06 This test checks that the C relay releases within specified limits. (See 4.04 Note) The W.E.Co. J-94713-A timing test set is used to perform this test. Repeat the procedures provided in paragraph 4.04, except that the timing test set A and B selector switches should be set to the test limits for the C relay and connection is made

to the test set V-M jack. When the test is completed, remove all test set connections, place the register-sender equipment cover in place, and restore the register-sender BSY key to its normal position to return the register-sender to service.

4.07 This test checks that digits dialed into the register-sender are properly converted into two-out-of-five marks and stored in the codelreed cards (refer to Table 1). The A.E.Co. Type 31 Routine test set is required to read the digit stored on the codelreed card. To perform this test proceed as follows:

- (1) Observe the register-sender SUPY lamp. If the register-sender is idle, operate the register-sender BSY key, and connect the Type 31 test set to test jacks 1 and 2 of the register-sender.
- (2) Operate the B/A/C key on the Type 31 test set to the position indicated on the ETN drawings.
- (3) Operate the RLSE/SEIZE key on the Type 31 test set to SEIZE. The BUSY lamp will begin to flash; the PAUSE lamp will light to indicate the register-sender has seized the Type 31 test set registration circuit.

NOTE: The register-sender's BSY key should be operated to prevent additional seizures. The test set can seize the register-sender with the BSY key operated.

- (4) Remove the register-sender equipment cover.
- (5) Manually block the SC relay operated.
- (6) Using the Type 31 test set, dial in 13 digits, using all the digits 1 thru 0.
- (7) Manually operate the AS relay, then the T0 and T1 relays simultaneously.
- (8) Release relay SC. Observe for correct digit storage as indicated on the type 31 test set.
- (9) Repeat steps (5), (7) and (8) for each dialed digit until all codelreed storage units have been checked.
- (10) Remove all test set connections and replace the register-sender equipment cover. Restore the register-sender BSY key to normal.

4.08 The percent break and speed test of the pulse generator should be performed using the A.E.Co. Type 31 test set. (The test set meter should be calibrated before starting tests.) Proceed as follows:

- (1) Observe if the register-sender SUPY-lamp is dark; if it is, operate the register-sender BSY key.

- (2) Connect the Type 31 test set to register-sender test jacks 1 and 2.
- (3) Operate the PULSE key of the Type 31 test set.
- (4) Operate the RLSE/SEIZE key of the Type 31 test set to SEIZE.
- (5) Operate the pulse test PT key on the register-sender.
- (6) Read the pulse ratio as percent break on the meter of the Type 31 test set (should be $61 \pm 1\%$).
- (7) Operate the SHUNT/SPEED key to the SPEED position and read the pulse speed in pulses per second. If speed does not read $10 \pm .5\text{PPS}$, adjust R27 to obtain the desired speed.
- (8) Restore the SHUNT/SPEED key to normal and read the percent break ($61 \pm 1\%$). Readjust R20 as necessary to obtain the correct percent break. (If R20 must be adjusted, repeat step 7).
- (9) Restore the pulse test PT key on the register-sender to normal.
- (10) Restore the PULSE key on the test set to normal.
- (11) Operate the RLSE/SEIZE key to RLSE.
- (12) Remove all test set connections, and return the register-sender to service.

4.09 The Parity check tests the ability of the register-sender to identify an undermark or overmark condition. To make this test, proceed as follows:

- (1) Be sure the Parity Check switch is in the ON position.
- (2) If the register-sender is idle, operate the BSY key.
- (3) Remove the register-sender equipment cover.
- (4) Connect the Type 31 test set to test jacks 1 & 2.
- (5) Undermarking:
 - (a) Using a good office code plus the 4 digits 2211, dial into the register-sender.
 - (b) When any of the last four digits is ready to outpulse, block the T0 relay from operating. This should bring in a Parity check alarm after about five seconds since only one other T() relay is operated.
 - (c) Release the T0 relay and clear the alarm by operating the ALM RLS button on the translator panel.

(6) Overmarking:

- (a) Again dial XXX-2211 into the register-sender.
- (b) When any of the last four digits is ready to outpulse, manually operate the T4 relay. This should bring in a Parity check alarm after about five seconds since more than two T relays were operated.
- (c) Clear the Parity Check alarm by operating the ALM RLS button on the translator panel.

- (7) Disconnect the test equipment; replace the register-sender equipment cover; and return the register-sender to service.

4.10 To test the register-sender permanent line time out, plug into test jacks 1 and 2 with a hand test telephone and operate the C-R switch to seize the register-sender. The TM1 and NC relays should operate after about 50 seconds and the register-sender should release. Time out for no-code and slow dialing should also be checked. These calls should time out about 15 seconds after a digit is dialed. The TM1 and NC relays should operate. Relay BB should already be operated before the end of the time out interval.

4.11 Alternate routing may be checked by blocking the normally operated AR relay in the translator for a particular trunk group. With the AR relay blocked from operating, dial a call to the trunk group which is associated with the blocked AR relay. Using the Type 31 test set, the call may be dialed in from register-sender test jack springs 1 and 2. Observe the routing instructions received for proper alternate routing in accordance with the test program developed from the ETN drawing furnished with the equipment.

Translator

4.12 The primary translator is being continuously routined during normal operation by the translator monitor. The translator (both primary and standby) is being further routined in the process of making system call through tests. Therefore, it should not be necessary to perform any additional maintenance routining on this major assembly.

Translator Monitor

4.13 At the time of initial installation, the translator monitor is tested for normal operation, including a check of the programming of the monitor to routine the primary (on line) translator translation field. During the normal maintenance routines, the translator monitor manual transfer functions and reset functions are checked. Therefore, very little additional maintenance routining of the translator monitor should be necessary.

4.14 Occasionally the translator monitor should be tested to verify that it will detect a non-standard condition. If the monitor is re-programmed at any time, it should be tested again and in the same manner as for initial installation. Refer to the related Section in the 240-202 series of General System Practices for information on testing of the translator monitor.

5. LUBRICATION AND CLEANING OF SWITCHES

5.01 Automatic switching equipment and rotary stepping switches should be lubricated and cleaned in accordance with standard practices. Refer to the associated practice in the 230-005 series of General System Practices for information on lubricating and cleaning of Strowger switches. Refer to the related Section in the 230-007 series of General System Practices for information on lubrication and cleaning of rotary stepping switches.