# DECODER TROUBLE INDICATOR
# TESTS
# PANEL OFFICES

## 1. GENERAL

**1.01** This section describes the methods of testing the decoder trouble indicator used with decoders in panel offices. The tests are intended to detect trouble not readily evident in the normal use of the decoder trouble indicator.

**1.02** This section is reissued to revise Tests A and D to include tests for compressed code digit and 3-digit common translator lamp indications, and to include a cross ground test of register relays. This test is designated Test E.

**1.03** The tests covered and features tested are:

*A. Test for Seizure and for General Indications:* The following features are checked: (1) Seizure of trouble indicator by each decoder after timing out on trouble. (2) Audible and visual alarms. (3) Display of identity of equipment involved in a failure. (4) Receiving lead lamps.

*B. Test of DL Lamps:* The following features are checked: (1) DL lamp indications for each decoder. (2) Functioning of audible alarm to indicate an attempt to seize the trouble indicator while engaged.

*C. Test of Code and Class-of-Service Lamps:* The following features are checked: (1) Lighting of code lamps A-, B- and C- to indicate recording relays operated. (2) Direct translation of code into lighted H-, T- and U-lamps. (3) Class-of-service indications. (4) Indication of permanent signal and zero operator routings.

*D. Test of Transmitting Chain Circuit Lamps and Miscellaneous Lamps:* This test checks the ability of the trouble indicator to display a record of an open at any point in the decoder transmitting lead chain and checks the continuity of some of the miscellaneous display lamps.

*E. Cross Ground Test — Register Relays:* This test checks that with a false ground on the locking contact of any register relay a trouble lamp indication will be given and the trouble indicator circuit will be held busy.

**1.04** In making the tests in this section, a considerable amount of common equipment will not be available for service calls.

**1.05** An assistant is required for Tests B and D. Test A requires an assistant unless the alternate method, covered by steps lettered b, is used.

**1.06** *Lettered Steps:* A letter a, b, c, etc., added to a step number in Part 3 of this section, indicates an action which may or may not be required depending on local conditions. The condition under which a lettered step or 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.

**1.07** Local instructions should be followed for recording and reporting any register operations caused by performing these tests.

## 2. APPARATUS

### All Tests

**2.01** 184B (make-busy) plugs, as required.

→**Tests A and E**

**2.02** Sender test frame.

**Test A Without Assistant**

**2.03** 32A test set.

**2.04** Testing cord, 893 cord, 6 feet long, equipped with two 360A tools (1W13B cord), one 419A (test connector) tool, and one 361B (relay winding connector) tool.

**2.05** Patching cord, P3E cord, 6 feet long, equipped with two 310 plugs (3P6C cord).

**Test D**

**2.06** Test receiver, 716C receiver (or replaced 528 receiver) attached to a W2AB cord equipped with two 360A tools (2W21A cord), one 411A (test pick) tool and one 365 (connecting clip) tool.

**Test E**

**2.07** Testing cord, 893 cord, 6 feet long, equipped with two 360A tools (1W13B cord), one KS-6278 connecting clip and 419A (test connector) tool.

## 3. METHOD

### A. Test for Seizure and for General Indications

| STEP | ACTION | VERIFICATION |
|---|---|---|
| 1 | At sender make-busy frame —<br>Make senders associated with first decoder connector busy. | |
| 2 | At trouble indicator —<br>Make decoder to be tested busy to all decoder connectors except the first. | |
| 3 | Make all other decoders busy to first decoder connector. | |
| 4 | Make trouble indicator busy to all decoders except the one to be tested. | |
| 5 | At decoder under test —<br>Block nonoperated CK1 and CK2 relays. | |
| 6a | If test is made with an assistant, he should be stationed at sender test frame so that, on advice of craftsman, he can:<br>(a) Start test of a particular sender by momentary removal of sender make-busy plug when senders are not arranged to be tested over a made-busy condition.<br>(b) Advance test frame to successive senders by operation and release of CA key. | |
| 7b | If test is made without an assistant and senders are not arranged to be tested over a made-busy condition —<br>Blocking and strapping operations in sender test frame shall be performed according to Table 1. | |

TABLE 1

| SENDER TEST CIRCUIT | TYPE OF SENDERS TESTED | BLOCK RELAYS NONOPERATED | STRAP (USING 893 CORD) | |
|---|---|---|---|---|
| | | | FROM RELAY SPRING | TO RU WINDING TERMINAL OF |
| ES-239493 | Sender Selector | REP, TA, SS | 1T of T2 relay | SS relay |
| ES-20013-01 | Panel Link | REP, TA, SS | 1T of T1 relay | SS relay |
| ES-20013-01 | Rotary Link | REP, TA, SS | 1B of T2 relay | SS relay |
| SD-21026-01 | Panel Link or Both Panel Link and Rotary Link | REP, TA, SA2 | 1B of T2 relay | SA2 relay |
| SD-21026-01 | Rotary Link | REP, TA, SA2 | 1B of T4 relay | SA2 relay |
| SD-21026-02 | Sender Selector or Rotary Link | REP, TA, SA2 | 1T of T2 relay | SA2 relay |
| SD-21186-01 | Panel Link, Rotary Link or KPA | CA2, ALM, SA2 | 1B of TL2 relay | SA2 relay |

| STEP | ACTION | VERIFICATION |
|---|---|---|
| 8b | Connect 32A test set to sender test frame remote control jack nearest trouble indicator or to a spare jack at trouble indicator which has been multipled to a spare jack on sender frames and patched to remote control jack. By means of 32A test set:<br>(a) Sender test frame can be advanced to successive senders by momentarily depressing RED button.<br>(b) Test of a particular sender can be started by momentarily depressing WH button when senders are not arranged to be tested over a made-busy condition.<br>*Note:* When the statement "advance sender test frame" or "start the test" of a particular sender appears in the ACTION column, the assistant or the craftsman should take the appropriate action as outlined in Step 6a or Step 8b. | |
| 9b | Operate REP key. | |
| 10c | If recycle feature is not provided —<br>At sender test frame —<br>Set up 3-digit operator class call. | |
| 11d | If recycle feature is provided —<br>At sender test frame —<br>Set up 10-digit codes which require foreign area code to be compressed. | |
| 12 | Advance connector switches to first sender in first decoder connector. | |

| STEP | ACTION | VERIFICATION |
|---|---|---|
| 13 | At sender test frame —<br>Operate ST key. | |
| 14 | Start test of sender.<br>See Step 6a or 8b. | At trouble indicator —<br>TI lamp lights.<br>Audible alarm sounds.<br>At floor alarm board —<br>TI lamp lights.<br>***Note:*** The floor alarm board TI lamp need only be checked once during this test. |
| 15 | At trouble indicator —<br>Operate LP key. | Lamps light to identify equipment under test —<br>DR GR-, if provided.<br>DR-<br>CONN FR-<br>CONN-<br>SENDER-<br>LS FR or HS FR, if provided.<br>Receiving lead lamps light —<br>A1, 2, 4, and 5<br>B1, 2, 4, and 5<br>C1, 2, 4, and 5<br>D1, 2, and 3 as provided.<br>PS1<br>KS, if provided.<br>If test of foreign area compressed code digit using common translator is being made —<br>CC- lamp lights.<br>3DT- lamp lights.<br>***Note:*** If individual 3-digit translators are provided, 3-digit translator number will not be indicated. |
| 16 | Restore LP key. | Equipment identification lamps and receiving lead lamps extinguished. |
| 17 | Momentarily operate RL key. | Alarm lamps extinguished.<br>Audible alarm silenced. |
| 18 | Advance sender test frame to next sender in decoder connector.<br>(See Step 6a or 8b.) | |
| 19 | Repeat Steps 13 through 18 until all senders in decoder connector have been tested. | |
| 20 | At sender test frame —<br>Restore ST key. | |
| 21 | Advance sender test frame connectors to first sender in next decoder connector. | |

| STEP | ACTION | VERIFICATION |
|---|---|---|
| 22 | At trouble indicator —<br>For decoder connector just tested, make decoder under test busy and remove make-busy plugs from remaining decoders. | |
| 23 | At sender make-busy frame —<br>Remove make-busy plugs from senders just tested. | |
| 24 | Make senders in next decoder connector to be tested busy. | |
| 25 | At trouble indicator —<br>Make all decoders except the one under test busy to decoder connector to be tested. | |
| 26 | Repeat Steps 13 through 25 and continue in this manner until all senders in all decoder connectors have been tested with decoder under test. | |
| 27 | Remove blocking tools from CK1 and CK2 relays of decoder under test. | |
| 28 | Repeat Steps 1 through 27 for remaining decoders. | |
| 29 | Remove make-busy plugs from equipment tested. | |
| 30b | Remove blocking tools and strap from sender test frame relays. | |
| 31 | Restore sender test frame connector switches and keys. | |

**B. Test of DL Lamps**

| | | |
|---|---|---|
| 1 | At trouble indicator —<br>Make first decoder busy.<br>*Note:* If there are two decoder groups, begin the test on the first decoder in the first group. | |
| 2 | Operate LP key. | |
| 3 | At first decoder —<br>Momentarily operate TR1 relay. | At trouble indicator —<br>TI lamp lights.<br>DR GR- lamp lights, if provided.<br>DR1 lamp lights.<br>Alarm bell taps. |
| 4 | At trouble indicator —<br>Remove make-busy plug from first decoder. | |
| 5 | Make second decoder busy. | |
| 6 | Block operated LK relay. | |
| 7 | At second decoder —<br>Momentarily operate TR1 relay. | At trouble indicator —<br>DL2 lamp lights.<br>Audible alarm changes from tapping to vibrating bell. |

| STEP | ACTION | VERIFICATION |
|---|---|---|
| 8 | At trouble indicator —<br>Remove make-busy plug from second decoder. | |
| 9 | Make third decoder busy. | |
| 10 | At third decoder —<br>Momentarily operate TR1 relay. | At trouble indicator —<br>DL3 lamp lights. |
| 11 | Proceed as in Steps 8, 9, and 10 for the remaining decoders in the group. | Respective DL- lamps light. |
| 12 | If there are two groups of decoders —<br>Proceed as in Steps 8, 9, and 10 for second group of decoders. | Respective DL- lamps for second group light. |
| 13 | At trouble indicator —<br>Manually release DR relay associated with first decoder tested. | DR1 lamp extinguished.<br>DR GR- lamp extinguished, if provided.<br>DL1 lamp lights. |
| 14 | Restore LP key. | DL- lamps extinguished. |
| 15 | Remove blocking tool from LK relay. | |
| 16 | Momentarily operate RL key. | TI lamp extinguished.<br>Audible alarm silenced. |
| 17 | Remove make-busy plug from last decoder. | |

### C. Test of Code and Class-of-Service Lamps

| | | |
|---|---|---|
| 1 | At trouble indicator —<br>Make trouble indicator busy to all decoders. | |
| 2 | Operate LP key. | |
| 3 | At trouble indicator —<br>Block operated CK2 relay. | HO, TO, UO, and CRC lamps light.<br>Lowest numbered equipped S- lamp lights. |
| 4 | Block operated PS relay. | PS and PS1 lamps light.<br>HO lamp extinguished. |
| 5 | Remove blocking tool from PS relay. | PS and PS1 lamps extinguished.<br>HO lamp lights. |
| ~~6a~~ | If trouble indicator is used with decoders which serve modified translator senders —<br>Block operated PS1 relay. | PS and PS2 lamps light.<br>HO lamp extinguished. |
| ~~7a~~ | Remove blocking tool from PS1 relay. | PS and PS2 lamps extinguished.<br>HO lamp lights. |
| ~~8a~~ | Block operated ZO relay. | ZO1 lamp lights. |
| ~~9a~~ | Remove blocking tool from ZO relay. | ZO1 lamp extinguished. |
| 10 | Momentarily operate each relay or combination of relays listed in "Relays Blocked Operated" columns of Table 2.<br><br>*Note:* The combinations of D- and S- lamps to be tested will depend on the D- relays with which the trouble indicator is equipped. | Lamps light as indicated in "Lamps Lighted" columns of Table 2.<br>Lighted HO, TO, UO, or S- lamp extinguished while another lamp in same group is lighted. |

TABLE 2

| RELAYS BLOCKED OPERATED | LAMPS LIGHTED | RELAYS BLOCKED OPERATED | LAMPS LIGHTED |
|---|---|---|---|
| A1 | H1, A1 | B4, B5 | T9, B4, B5 |
| A2 | H2, A2 | C1 | U1, C1 |
| A1, A2 | H3, A1, A2 | C2 | U2, C2 |
| A4 | H4, A4 | C1, C2 | U3, C1, C2 |
| A5 | H5, A5 | C4 | U4, C4 |
| A1, A5 | H6, A1, A5 | C5 | U5, C5 |
| A2, A5 | H7, A2, A5 | C1, C5 | U6, C1, C5 |
| A1, A2, A5 | H8, A1, A2, A5 | C2, C5 | U7, C2, C5 |
| A4, A5 | H9, A4, A5 | C1, C2, C5 | U8, C1, C2, C5 |
| B1 | T1, B1 | C4, C5 | U9, C4, C5 |
| B2 | T2, B2 | D1 | S2, D1 |
| B1, B2 | T3, B1, B2 | D2 | S3, D2 |
| B4 | T4, B4 | D1, D2 | S4, D1, D2 |
| B5 | T5, B5 | D3 | S5, D3 |
| B1, B5 | T6, B1, B5 | D1, D3 | S6, D1, D3 |
| B2, B5 | T7, B2, B5 | D2, D3 | S7, D2, D3 |
| B1, B2, B5 | T8, B1, B2, B5 | D1, D2, D3 | S8, D1, D2, D3 |

| STEP | ACTION | VERIFICATION |
|---|---|---|
| 11 | Remove blocking tool from CK2 relay. | HO, TO, UO, CRC, and S- lamps extinguished. |
| 12 | Remove make-busy plug from trouble indicator. | |

### D. Test of Transmitting Chain Circuit Lamps and Miscellaneous Lamps

| | |
|---|---|
| 1 | At trouble indicator —<br>Make trouble indicator busy to all decoders. |
| 2 | Make decoder to be tested busy. |
| 3 | Operate LP key. |
| 4 | At decoder —<br>Block nonoperated RL and X relays. |
| 5a | If decoders are equipped with TSA relays —<br>At decoder —<br>Insulate 1T, 2T, and 3T contacts of TSA relay. |
| 6 | At trouble indicator —<br>Block nonoperated DR relay associated with decoder to be tested. |

| STEP | ACTION | VERIFICATION |
|---|---|---|
| 7 | Block operated DS relay associated with decoder to be tested. | At decoder —<br>TI relay operates.<br>TI1 relay operates, if provided. |
| 8 | Block operated LK relay. | |
| 9 | At decoder —<br>Using test receiver, momentarily connect ground to TI relay spring corresponding to leads as shown in Table 3, beginning with CK2 lead and continuing in the order listed. | At trouble indicator —<br>Lamp lights as shown in Table 3 and remains lighted until succeeding lead is grounded.<br>*Note:* Disregard the lighted code and class-of-service lamps at this time; the test of these lamps is covered in Test C. |

**TABLE 3**

| LEAD TO BE GROUNDED ON 229-TYPE TI RELAYS | SPRING NUMBER TO BE GROUNDED ON 264-TYPE TI RELAYS | LAMP LIGHTED |
|---|---|---|
| CK2 | 1 | CRC |
| CRB | 56 | CRB |
| CRA | 55 | CRA |
| ZCB (see Note) | 4 | ZCB |
| CLC | 12 | CLC |
| CLB | 11 | CLB |
| CLA | 10 | CLA |
| ZCB (see Note) | 4 | ZCB |
| ZCA<br>or (if provided)<br>TSB | 3 | ZCA<br>or<br>TSB |
| DBC | 47 | DBC |
| DBB | 46 | DBB |
| DBA | 45 | DBA |
| DGD | 38 | DGD |
| DGC | 37 | DGC |
| DGB | 36 | DGB |
| DGA | 35 | DGA |
| OBD | 28 | OBD |
| OBC | 27 | OBC |
| OBB | 26 | OBB |
| OBA | 25 | OBA |
| OGD (if provided) | 18 | OGD |
| OGC | 17 | OGC |
| OGB | 16 | OGB |
| OGA | 15 | OGA |
| RL | 44 | RL |

*Note:* If the ZCB lamp is provided and is wired per "X" wiring, test the ZCB lamp after the CRA lamp. If the ZCB lamp is provided and is wired per "Y" wiring, test the ZCB lamp after the CLA lamp.

| STEP | ACTION | VERIFICATION |
|---|---|---|
| 10 | Momentarily ground X lead (No. 19 spring on 264-type TI relays). | X lamp lights.<br>RL lamp remains lighted. |
| 11 | At trouble indicator —<br>Remove blocking tool from LK relay. | X and RL lamps extinguished. |
| 12 | At decoder —<br>Momentarily connect ground to TI (or TI1) relay contact corresponding to leads, as provided, shown in Table 4. | At trouble indicator —<br>Lamp lights, if provided, as shown in Table 4 while ground is connected to associated lead. |

**TABLE 4**

| LEAD TO BE GROUNDED ON 229-TYPE TI (OR TI1) RELAYS | SPRING NUMBER TO BE GROUNDED ON 264-TYPE TI RELAYS | LAMP LIGHTED |
|---|---|---|
| LA | 58 | LA |
| EA | 57 | EA |
| TDK | 54 | TDK |
| XTD | 48 | XTD |
| PS1 | 49 | PS2 |
| ZO | 29 | ZO1 |

| STEP | ACTION | VERIFICATION |
|---|---|---|
| 13b | If recycle feature is provided —<br>At decoder —<br>Momentarily connect ground to contacts of TIA relay as shown in Table 5. | |

**TABLE 5**

| CONTACT | LAMP LIGHTED |
|---|---|
| 1B | CC0 |
| 3B | CC1 |
| 5B | CC2 |
| 7B | CC4 |
| 9B | CC7 |

| | | |
|---|---|---|
| 14b | At 3-digit translator connector —<br>Momentarily connect ground to 01 contact of each — A relay for each 3-digit common translator associated with decoder made busy. | 3DT lamps corresponding to 3-digit common translators light. |
| 15 | At trouble indicator —<br>Remove blocking tool from DS relay. | At decoder —<br>Relay TI releases.<br>Relay TI1 releases, if provided. |
| 16 | Remove blocking tool from DR relay. | |
| 17 | Restore LP key. | |

| STEP | ACTION | VERIFICATION |
|---|---|---|
| 18 | Momentarily operate RL key. | |
| 19 | At decoder —<br>Remove blocking tool from RL and X relays. | |
| 20a | If decoders are equipped with TSA relay —<br>At decoder tested —<br>Remove insulators from IT, 2T, and 3T contacts of TSA relay. | |
| 21 | Remove make-busy plug from decoder. | |
| 22 | Repeat Steps 2 through 21 for each decoder. | |

**E. Cross Ground Test — Register Relays**

| | | |
|---|---|---|
| 1 | At sender make-busy frame —<br>Make all senders associated with first decoder connector busy. | |
| 2 | At trouble indicator —<br>Make decoder selected for test busy to all decoder connectors except the first. | |
| 3 | Make all other decoders busy to first decoder connector. | |
| 4 | Make trouble indicator busy to all decoders except the one used to make test. | |
| 5 | Using an 893 cord equipped with KS-6278 connecting clip and 419A test connector, apply ground to 2B contact of CLA relay in trouble indicator. | |
| 6 | At decoder used to make test —<br>Block operated CK1 and CK2 relays. | |
| 7 | At sender test frame —<br>Connect sender test circuit to one of senders made busy in Step 1. | |
| 8 | Set up any call on sender test circuit. | |
| 9 | Operate REP key. | |
| 10 | Operate ST key. | |
| 11 | At sender make-busy frame —<br>Remove plug from sender being used for test. | Test circuit proceeds with test.<br>At trouble indicator —<br>TI lamp lights.<br>Audible alarm sounds.<br>***Note:*** If LP key is operated, other display lamps. |
| 12 | At trouble indicator —<br>Momentarily operate RL key. | XGT lamp lights.<br>TI lamp remains lighted. |

| STEP | ACTION | VERIFICATION |
|---|---|---|
| 13 | Remove ground connected to 2B contact of CLA relay. | All lamps extinguished.<br>Audible alarm silenced. |
| 14 | At decoder used for test —<br>Remove blocking tools from CK1 and CK2 relays. | |
| 15 | At trouble indicator —<br>Release equipment made busy in Steps 2, 3, and 4. | |
| 16 | At sender make-busy frame —<br>Release senders made busy in Step 1. | |
| 17 | At sender test frame —<br>Restore ST key. | |
| 18 | Operate CA key. | Sender test circuit restores to normal. |