# LOOP SIGNALING CONVERTER ORIGINATING LINE, SD-98130-01 TESTS WIDE AREA DATA SERVICE (WADS) USING STATION ARRANGEMENT A

## 1. GENERAL

1.01 This section is reissued to revise the instruction for equipment made compatible with the B1 Data Trunking System. The title of the section has been revised to indicate a reference to the use of this equipment for Wide Area Data Service (WADS) using Station Arrangement A. The initial application of this equipment was in association with Developmental Line Switched Teletypewriter Service (DLSTTS). Since this reissue covers a general revision, the arrows ordinarily used to indicate changes have been omitted.

1.02 The tests covered are:

*A. In-Service Test of Logic:* This test checks the relay logic of the signaling converter by setting up a call through the switching office.

*B. 43A1 Channel Terminal Line-Up:* This test checks the alignment and operation of the 43A1 channel terminal in the signaling converter.

*C. Test of Transmission Path:* This test checks the transmission path during the dialing interval, including the adjustment of the V3 amplifier gain, and also checks the transmission path during the transmission mode.

*D. Test of Timers:* This test checks the timing interval of the timers in the signaling converter.

*E. Out-of-Service Test of Logic:* This test checks the relay logic of a signaling converter which is out of service.

1.03 *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.

## 2. APPARATUS

### Test A

2.01 305A plug (tip-tip with common sleeve and monitoring pins).

2.02 1011G hand test set equipped with a 2W41A cord assembly consisting of a W2GY cord, 471A (polarized) jack, 360A and 360B tools (spring chucks).

### Tests A Through E

2.03 165C dummy plug.

2.04 328D plug (termination type tip-tip with 600 ohms).

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

### Test B

2.06 5A attenuator.

2.07 AC voltmeter, Hewlett-Packard 400 type or KS-16979 L1 (Triplett 310W).

2.08 Testing cord, W1N cord, 10 feet long, equipped with one 278A plug (pin type) and one test clip.

**Tests B and C**

2.09 21A transmission measuring set (TMS).

**Tests B Through D**

2.10 2AB auxiliary transmission test set.

2.11 166A1 station test set.

2.12 72A frequency meter. (If 21A TMS is used as a tone source, its frequency must be adjusted using a frequency counter.)

2.13 Patching cord, P3J cord, 6 feet long, equipped with 241 plug (tip-tip) (3P14A cord).

2.14 Testing cord, S3F cord, 6 feet long, equipped with 241 plug (tip-tip) and spade tips (3W2A cord).

**Tests B Through E**

2.15 DC voltmeter, KS-16979 L1 (Triplett 310W), or equivalent.

**Test D**

2.16 J24753A timing test set.

2.17 Testing cord, W3M cord, 6 feet long, equipped with one 310 plug (tip-ring-sleeve) and three 360 tools (spring chucks) (3W4A cord).

**Tests D and E**

2.18 365 tool (spring clip).

2.19 419A tool (clip for test connection to springs of relays).

2.20 Testing cord, 893 cord, 6 feet long, equipped with two 360A tools (spring chucks) (1W13A cord).

**Test E**

2.21 Volt-ohmmeter, KS-16979 L1 (Triplett 310W), or equivalent.

## 3. METHOD

| STEP | ACTION | VERIFICATION |
|---|---|---|
| | **A. In-Service Test of Logic** | |
| 1 | At signaling converter—<br>Insert 328D (termination) plug into T-R SUB jacks. | |
| 2 | Insert 305A (tip-tip with common sleeve and monitoring pins) plug into LINE T, CONV T′ jacks. | |
| 3 | Connect 1011G hand test set to 305A plug, operate to TALK position. | |
| 4 | Block nonoperated ABA relay. | |
| 5 | Operate manually RS relay momentarily. | |
| 6 | Block nonoperated RS relay. | S, SR, CT relays operate.<br>All other wire-spring relays released. |
| 7 | Dial master test frame, WADS 2-way subscriber transmission test (STT) line. | |
| 8 | Remove blocking tool from ABA relay. | Within about 8 seconds after dialing, ABA, TS, TSA relays operate. |

| STEP | ACTION | VERIFICATION |
|---|---|---|
| 9a | If requirement of Step 8 is not met — Listen with handset to nature of difficulty (that is, reorder, busy, etc). | |
| 10 | Repeat Steps 4 through 8. | |
| 11 | Block operated RS relay. | CT, S, TS, TSA, SR relays release. |
| 12 | Remove blocking tool from RS relay. | |
| 13 | Repeat Steps 4 through 8. | |
| 14 | Insert 165C dummy plug into LINE R jack. | AB, S, CT, TS, SR, ABA relays release. |
| 15 | Block operated RS relay. | TSA relay releases. |
| 16 | At signaling converter — Remove all plugs, blocking tools, disconnect 1011G hand test set. | |

### B. 43A1 Channel Terminal Line-Up

| | | |
|---|---|---|
| 1 | At 2AB auxiliary transmission test set — Operate DIAL SLV key to normal, TEST switch to REC 900, 2DB PAD to OUT. | |
| 2a | If 72A frequency meter is provided — Calibrate in accordance with standard procedures. (Recalibrate every 30 minutes while in use.) | |
| 3 | At DC voltmeter — Operate switch to lowest dc scale including 20 volts. | |
| 4 | At signaling converter — Insert positive cord of voltmeter into F+ terminal, negative cord into F− terminal, adjust F1L ADJ potentiometer for 20-volt reading. | Voltmeter reads between 19.5 and 20.0 volts. |
| 5 | Insert 165C (dummy) plugs into T-R LINE jacks. | |
| 6 | Insert 328D (termination) plug into T-R SUB jacks. | |
| 7 | Operate SEND to LM, REC to H+, OSC to ON on 43A1 channel terminal. | |
| 8 | Block nonoperated RS, ABA, TS, TSA, S relays. | |
| 9 | Block operated CT relay. | CT, SR relays operated. All other wire-spring relays released. |
| 10 | At signaling converter — Connect MEAS jacks of 2AB test set to T-R CONV jacks, using 3P14A cord. | |

| STEP | ACTION | VERIFICATION |
|---|---|---|
| 11a | If 72A frequency meter is provided — Operate CAL-MEAS-SEARCH switch to MEAS. | |
| 12a | Connect 600-ohm IN jacks to TMS terminals of 2AB test set, using 3W2A cord. | |
| 13a | Adjust OSC potentiometer of 43A1 channel terminal to obtain 2090 cps. | 72A frequency meter reads 2090 cps. |
| 14a | At signaling converter — Block nonoperated CT relay. | 72A frequency meter reads 2160 ±1 cps. |
| 15 | Block operated CT relay. | |
| 16b | If 166A1 station test set is provided — Connect GRD jack of 166A1 station test set to ground terminal on bay, using W1N cord. | |
| 17b | Connect originating 48-volt jack of 166A1 station test set to 48-volt terminal on bay, using second W1N cord. | |
| 18 | At 21A TMS — Operate DET INPUT switch to 0 db on *white* scale. | |
| 19 | Connect DET IN jacks to TMS terminals of 2AB test set, using 3W2A cord. | |
| 20 | At signaling converter — Connect MEAS jacks of 2AB test set to T-R CONV jacks, using 3P14A cord. | |
| 21 | Adjust SEND LEV potentiometer on 43A1 channel terminal to obtain reading of −8 db on 21A TMS. | |
| 22 | At 21A TMS — Remove plug from DET IN jacks, insert into OUT jacks of 5A attenuator. | |
| 23 | At 5A attenuator — Operate 5-, 3-db keys. | |
| 24 | At 166A1 station test set — Connect FREQ STD OUT jacks to IN jacks of 5A attenuator. | |
| 25 | Operate FREQ STD switch to 2090 cps, 40DB PAD to OUT. | |
| 26 | At AC voltmeter — Operate switch to 1-volt AC scale. | |
| 27 | Connect voltmeter test leads to OUT T-R terminals of 5A attenuator. | Meter needle swings slowly. |

| STEP | ACTION | VERIFICATION |
|---|---|---|
| 28 | Adjust OSC potentiometer on 43A1 channel terminal to obtain desired reading. | Meter needle swings back and forth less than once per second. |
| 29 | Remove patch cord from 2AB test set TMS jacks. | |
| 30 | Patch 2AB test set to 21A TMS. | |
| 31 | Operate DET INPUT switch to −10 db. | |
| 32 | Adjust SEND LEV potentiometer of 43A1 channel terminal to obtain reading of −17.5 db. | 21A TMS reads −17.5 db. |
| 33 | At signaling converter —<br>Remove blocking tools from relays. | |
| 34 | Operate OSC switch of 43A1 channel terminal to OFF. | |
| 35 | Remove voltmeter test leads. | |
| 36b | If 166A1 station test set is provided —<br>Operate FREQ STD switch to 1140 cps. | |
| 37a | If 72A frequency meter is provided —<br>Patch OSC OUT to DET IN of 21A TMS. Adjust OSC OUT potentiometer to obtain reading of +0.2 db on 21A TMS, at frequency of 1140 cps. | |
| 38 | Patch either FREQ STD jacks of 166A1 test set or 72A frequency meter OSC OUT to 5A attenuator input. | |
| 39 | At 5A attenuator —<br>Operate 10-db key. | |
| 40 | Patch output of 5A attenuator to TMS jacks of 2AB test set (MEAS jacks patched to T-R CONV jacks). | |
| 41 | At AC voltmeter —<br>Operate switch to smallest ac voltage scale including 7 volts. | |
| 42 | At signaling converter —<br>Connect negative test lead to G jack of 43A1 channel terminal, positive test lead to 43A1 channel terminal A2 jack. | |
| 43 | Adjust REC GAIN potentiometer on 43A1 channel terminal to obtain correct reading. | ***If using KS-16979, L1*** —<br>Meter reads 5.6 volts.<br>***If using Hewlett-Packard 400 Type*** —<br>Meter reads 5.9 volts. |
| 44 | Remove voltmeter test leads. | |

| STEP | ACTION | VERIFICATION |
|---|---|---|
| 45 | At DC voltmeter —<br>Operate switch to lowest range including 80 volts dc. | |
| 46 | Connect positive lead to LP jack of 43A1 channel terminal, negative lead to ground. | |
| 47 | Adjust LP CUR potentiometer on 43A1 channel terminal to give 80-volt reading. | Voltmeter reads 80 volts. |
| 48 | Remove voltmeter test leads. | |
| 49 | At signaling converter —<br>Remove all connections to 2AB test set, 72A frequency meter, or 166A1 station test set, blocking tools, plugs. | |
| 50 | Adjut REC BIAS screw of 43A1 channel terminal to midrange position. | |
| | **C. Test of Transmission Path** | |
| 1 | Insert 165C (dummy) plugs into T-R LINE jacks. | |
| 2 | Insert 328D (termination) plug into T-R SUB jacks. | |
| 3 | At signaling converter —<br>Operate OSC switch of 43A1 channel terminal to OFF. | |
| 4 | Block nonoperated RS, TS, ABA relays. | S, SR relays operate. |
| 5a | If 72A frequency meter is provided —<br>Patch OSC OUT to DET IN of 21A TMS. Adjust frequency to 852 cps, and OSC OUT to give a reading of +0.2 db on 21A TMS. | |
| 6b | If 166A1 test set is provided —<br>Operate FREQ STD switch to 852. | |
| 7 | Connect OSC OUT of 72A frequency meter or FREQ STD jacks of 166A1 test set to TMS terminals of 2AB test set, using 3W2A cord. | |
| 8 | At signaling converter —<br>Block operated CT relay. | CT, S, SR relays only wire-spring relays operated. |
| 9 | Connect T'-R' CONV jacks to DET IN jacks of 21A TMS, using 3P14A cord. | |
| 10 | Connect T-R CONV jacks to MEAS jack of 2AB test set, using 3P14A cord. | |
| 11 | Adjust V3 amplifier in signaling converter to obtain reading of +0.7 db. | 21A TMS reads 0.7 db. |

| STEP | ACTION | VERIFICATION |
|---|---|---|
| 12 | At 72A frequency meter or 166A1 test set —<br>Operate FREQ dial to 1140 cps. | |
| 13 | Operate 21A TMS DET INPUT switch until reading is obtained. | Reading less than −30 dbm. |
| 14 | Operate 21A TMS DET INPUT switch to 0 db on ***white*** scale. | |
| 15 | At signaling converter —<br>Block operated ABA, TS relays. | At 21A TMS —<br>Meter reads between −0.5 and −1.0 db. |
| 16 | At signaling converter —<br>Remove all connections to 21A TMS, 72A frequency meter, or 166A1 test set, 2AB test set, blocking tools, plugs. | |
| 17 | At signaling converter —<br>Operate OSC switch of 43A1 channel terminal to ON. | |
| | **D. Test of Timers** | |
| 1 | At 2AB auxiliary transmission test set —<br>Operate DIAL-SLV key to normal, TEST switch to REC 900, 2DB PAD to OUT. | |
| 2a | If 72A frequency meter is provided —<br>Calibrate in accordance with standard procedures. (Recalibrate every 30 minutes while in use.) | |
| 3 | Insert 165C (dummy) plugs into T-R LINE jacks. | |
| 4 | Insert 328D (termination) plug into T-R SUB jacks. | |
| 5 | At timing test set —<br>Connect 48-volt jack to 48-volt jack on bay. | |
| 6 | Operate BAT ON key to ON, SEND MK key to BK, REC switch to OC GRD, MCF key to NORM, MIL SEC switch to 0-100. | BAT lamp lights. |
| 7 | Calibrate timing test set for half scale according to standard procedures. | |
| 8 | Insert 419A (clip for test connection to springs of relays) tools into white, black, red leads of 3W4A cord. | |
| 9 | Insert (tip-ring-sleeve) plug end of 3W4A cord into TST1 jack.<br>***Caution: In Steps 10 through 13, care must be taken in making the connections to avoid shorting.*** | |

| STEP | ACTION | VERIFICATION |
|---|---|---|
| 10 | At signaling converter —<br>Connect red lead of 3W4A cord to sleeve terminal of REC jack. | |
| 11 | Connect black lead of 3W4A cord to tip terminal of REC jack. | |
| 12 | Connect white lead of 3W4A cord to 12 fixed contact of RS relay. | |
| 13 | Insert 365 tool (spring clip) into one end, 419A tool into other end of 1W13A testing cord. | |
| 14 | Connect 12 make contact of RS relay to ground terminal on bay, using 1W13A testing cord. | |
| 15 | Insert 165C dummy plug into REC jack. | |
| 16a | If 72A frequency meter is provided —<br>Operate frequency dial of 72A frequency meter to 1140 cps. | |
| 17a | Adjust OSC OUT to approximately mid-range. | |
| 18a | Operate CAL-MEAS-SEARCH switch to MEAS. | |
| 19a | Connect OSC OUT jacks to TMS terminals of 2AB test set, using 3W2A cord. | |
| 20a | At signaling converter —<br>Connect MEAS jacks of 2AB test set to T-R CONV jacks, using 3P14A cord. | |
| 21b | If 166A1 station test set is provided —<br>Connect ground jack of station test set to ground, and originating −48 volt jack on station test set to −48 volt terminal on bay, using W1N cord. | |
| 22b | Operate 40 DB PAD to OUT, FREQ STD switch to 1140 cps. | |
| 23b | Connect FREQ STD OUT jacks to T-R CONV jacks of signaling converter, using 3P14A cord. | |
| 24 | At timing test set —<br>Operate TST key to OPR, hold until meter is read. | Meter reads between 60 and 65, that is, 120 and 130 ms. |
| 25c | If requirement of Step 24 is not met —<br>Restrap C1 capacitor in signaling converter to obtain desired reading.<br>*Note:* Increasing the capacity increases the time, while descreasing the capacity decreases the time. | |

| STEP | ACTION | VERIFICATION |
|---|---|---|
| 26 | Operate MIL SEC switch to 0-500. Recalibrate timing test set for half scale according to standard procedures. | |
| 27 | Block operated S relay. | |
| 28 | Block nonoperated TS relay. | |
| 29 | Operate CT relay manually. | CT, S, SR relays are only wire-spring relays operated. |
| 30 | At timing test set —<br>Operate TST key to OPR, hold until meter is read. | Meter reads between 45 and 55, that is, 450 and 550 ms. |
| 31d | If requirement of Step 30 is not met —<br>Restrap C1A capacitor in signaling converter to obtain desired reading.<br>***Note:*** Increasing the capacity increases the time, while decreasing the capacity decreases the time. | |
| 32 | Disconnect 2AB test set from T-R CONV jacks. | |
| 33 | At signaling converter —<br>Remove dummy plug, tools from REC jack, 12 make and fixed contacts of RS relay, and all relay blocking tools. | |
| 34 | At timing test set —<br>Operate REC switch to 48-volt GRD, MIL SEC switch to 0-500. | |
| 35 | Calibrate for full scale according to standard procedures.<br>***Caution: Care must be taken in connecting tool end of W3M cord to avoid shorting.*** | |
| 36 | At signaling converter —<br>Connect read lead of W3M cord to 1 fixed contact of ABA relay. | |
| 37 | Connect black lead of W3M cord to 1 break contact of ABA relay. | |
| 38 | Connect white lead of W3M cord to upper coil winding of TSA relay. | |
| 39 | Block operated RS relay. | |
| 40 | Block operated ABA relay. | RS, ABA relays only wire-spring relays operated. |
| 41 | At timing test set —<br>Operate TST key to OPR, hold until meter is read. | Meter reads between 38 and 42, that is, 190 and 210 ms. |

| STEP | ACTION | VERIFICATION |
|---|---|---|
| 42e | If requirement of Step 41 is not met — Restrap C2 capacitor in signaling converter to obtain desired reading.<br>*Note:* Increasing the capacity increases the time, while decreasing the capacity decreases the time. After each reading, it will be necessary to release the TS relay by hand. | |
| 43 | At signaling converter — Remove all tool connections, blocking tools, plugs. | |
| 44 | At timing test set — Remove all cords from timing test set. | |
| 45 | Operate BAT to OFF position. | |

### E. Out-of-Service Test of Logic

| | | |
|---|---|---|
| 1 | Insert 165C (dummy) plug into T-R LINE jacks. | |
| 2 | Insert 328D (termination) plug into T-R SUB jacks. | |
| 3 | At volt-ohmmeter — Operate switch to 150 volts on dc scale. | |
| 4 | At signaling converter — Connect volt-ohmmeter test leads to 10 fixed contact of CT relay and ground. | Meter reads 0 volts. |
| 5 | Block operated S, RS relays. | Meter reads 0 volts. |
| 6 | At volt-ohmmeter — Operate switch to X1 on ohm scale. | Meter reads 0 ohms. |
| 7 | At signaling converter — Block operated CT relay. | Meter reads ∞ ohms. |
| 8 | Remove blocking tool from CT relay. | Meter reads 0 ohms. |
| 9 | Remove blocking tool from S and RS relays. | Meter reads ∞ ohms. |
| 10 | Remove volt-ohmmeter test leads. | |
| 11 | Operate manually RS relay momentarily. | CT, S, SR relays release. |
| 12 | Block nonoperated RS relay. | S, SR relays operate.<br>All other wire-spring relays release. |
| 13 | Insert 365 tool into one end, 419A tool into other end of 1W13A testing cord. | |
| 14 | Connect 8 fixed contact of RS relay to ground terminal on bay, using 1W13A testing cord. | CT relay operates. |

| STEP | ACTION | VERIFICATION |
|---|---|---|
| 15 | Remove test cord from 8 fixed contact of SR relay, connect to 10 fixed contact of CT relay. | |
| 16 | Insert 365 tool into one end, 419A tool into other end of second 1W13A testing cord. | |
| 17 | Connect 8 fixed contact of SR relay to −48V terminal on bay, using second 1W13A testing cord. | AB, ABA, TS, TSA relays operate. |
| 18 | Block operated RS relay. | AB, ABA, S, CT, TS, TSA, SR relays release. |
| 19 | Remove test cord from 10 fixed contact of CT relay to ground. | |
| 20 | Remove second test cord from 8 fixed contact of SR relay to −48 volts. | |
| 21 | Repeat Steps 11 through 17. | |
| 22 | Remove test leads from 8 fixed contact of SR relay to −48 volts, and from 10 fixed contact of CT relay to ground. | AB, ABA, S, CT, TS, SR relays release. |
| 23 | Block operated RS relay. | TSA relay releases. |
| 24 | Remove all plugs, blocking tools. | |