

AUTOMATIC DATA TEST LINE NO. 5A (SD-71076-01) TRANSMISSION AND OPERATION TESTS

1. GENERAL

1.01 This section describes a method of making transmission and operating tests on the automatic data test line No. 5A (ADTL).

1.02 The ADTL frame consists of the following circuits:

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| Test Sentence Generator Circuit | SD-71052-01 |
| Instruction Word Generator Circuit | SD-71060-01 |
| Distortion Generator Circuit | SD-71063-01 |
| Automatic Data Test Line No. 5A | SD-71076-01 |
| Data Signal Distortion Measuring Circuit | SD-71078-01 |

1.03 The tests covered are:

A. Automatic Connect, Sending Level Control, and Frequency Check — Programed Trunk:

The following features of the programed trunk are checked. (1) The ability to automatically answer and connect when called by a WADS station or a 10B testboard. (2) The ability to reduce sending levels under control of the trunk logic circuitry. (3) Sending frequencies of the trunk in answer and originate modes. (4) Restraint signal.

B. Test Sentence Generator, Instruction Word Generator, Distortion Measurement and FLIP Failure Time-Out Disconnect Tests — Programed Trunk:

The following features are checked: (1) Coding and text of test sentence. (2) Coding and text of instruction word generator. (3) Accuracy of the data signal distortion measuring circuit. (4) The ability of the trunk to detect and act upon a failure by the station to invert modes (flip) when instructed to do so.

C. Distortion Generator Calibration and GA SEND Time-Out Disconnect Tests — Programed Trunk:

This test checks the calibration of the distortion generator circuit. It also checks the ability of the trunk to disconnect

if the station fails to send when instructed to do so.

D. FLIP, Answer-Back Delay Timing, and End-of-Program Disconnect Tests — Programed Trunk:

The following features are checked: (1) The ability of the trunk to follow the station through the mode-inverting sequence. (2) The anticontention time allowed for the station to send an answer-back after the flip sequence. (3) The ability of the trunk to initiate a disconnect at the end of the test program.

E. Automatic Connect, Frequency Check, Test Sentence Coding, and Distortion Control — Break-Controlled Trunk:

The following features are checked: (1) The ability of the trunk to automatically answer and connect when called by a WADS station or a 10B testboard. (2) The sending frequency of the trunk in the answer mode. (3) The text of the test sentence. (4) The ability of the trunk to change the type of distortion in the test signals under control of break signals sent from the test position.

1.04 All tests require action and verification at a 10B telegraph testboard.

1.05 The test sentence sent by the programed trunk is as follows:

THE QUICK BROWN FOX JUMPED OVER
A LAZY DOG'S BACK 1234567890 ## (See Note.)

Note: Six characters in this space denote type of signals.

- (a) UNDIST = Undistorted signals.
- (b) SW-DIS = Switched combination distortion in signals.
- (c) DISPAD = Switched combination distortion in signals sent at a reduced level (10 db pad).

SECTION 205-102-501

1.06 The test sentence sent by the break-controlled trunk is as follows:

**THE QUICK BROWN FOX JUMPED OVER
A LAZY DOG'S BACK 1234567890 ## (&\$,.)**

1.07 In this section the 10B telegraph testboard is referred to as the test position. The

automatic data test line No. 5A is referred to as the ADTL.

2. APPARATUS

Tests B, C, and D

2.01 KS-3008 stopwatch, or equivalent.

3. PREPARATION

| STEP | ACTION | VERIFICATION |
|-------------|---------------|---------------------|
|-------------|---------------|---------------------|

Tests A and E

- | | | |
|---|---|--|
| 1 | Establish talking circuit between test position and ADTL. | |
| 2 | At ADTL — Block released CY relay (programed trunk) or CYA relay (break-controlled trunk). | |
| 3 | At test position — Originate call to trunk under test. | |

Tests B and D

- | | | |
|---|---|--|
| 4 | At test position — Originate call to trunk under test. | |
|---|---|--|

Test C

- | | | |
|---|---|--|
| 5 | Establish talking circuit between test position and ADTL. | |
| 6 | At ADTL — Block released STP relay. | |
| 7 | At test position — Originate call to trunk. | |

4. METHOD

| STEP | ACTION | VERIFICATION |
|-------------|---------------|---------------------|
|-------------|---------------|---------------------|

**A. Automatic Connect, Sending Level Control, and Frequency Check —
Programed Trunk**

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|---|--|--|
| 4 | At test position — Monitor progress of call. | Audible ringing stops. F2 mark tone received. |
| 5 | At ADTL — Check for proper selection of trunk. | CON relay operated. |
| 6 | At ADTL — After CON relay operates — Remove unit comprising data timer and instruction timer cards from trunk. | |

| STEP | ACTION | VERIFICATION |
|------|--|---|
| 7 | At test position — Connect frequency measuring set to trunk to measure F2 mark frequency. | Frequency meter indicates 2225 ± 3 cps. |
| 8 | At ADTL — Block operated SRS relay. | |
| 9 | At test position — Measure average restraint frequency. | Frequency meter indicates 2200 ± 3 cps. <i>Note:</i> This reading can be obtained only with an electronic counter type of frequency meter. |
| 10 | At ADTL — Remove blocking tools from SRS relay. | |
| 11 | Operate S relay. | S relay locks operated. |
| 12 | At test position — Measure F2 space frequency. | Frequency meter indicates 2025 ± 3 cps. |
| 13 | At ADTL — Release AN relay, then immediately operate OR, CON relays. | Busy lamp remains lighted. OR, CON relays lock operated. |
| 14 | At test position — Measure F1 mark frequency. | Frequency meter indicates 1270 ± 4 cps. |
| 15 | At ADTL — Block operated SRS relay. | |
| 16 | At test position — Measure average restraint frequency. | Frequency meter indicates 1245 ± 4 cps. <i>Note:</i> This reading can be obtained only with an electronic counter type of frequency meter. |
| 17 | At ADTL — Remove blocking tool from SRS relay. | |
| 18 | Operate S relay. | S relay locks operated. |
| 19 | At test position — Measure F1 space frequency. | Frequency meter indicates 1070 ± 4 cps. |
| 20 | At ADTL — Release OR relay, then immediately operate AN, M, CON relays. | AN, M, CON relays lock operated. |
| 21 | At test position — Disconnect frequency meter from trunk. | |
| 22 | Connect transmission level measuring set to trunk. | |
| 23 | Measure and record level of F2 mark frequency. | F_{2M} should be X db below (-8 dbm) where X represents the loss in the test trunk facilities. |
| 24 | At ADTL — Operate P3 relay. | P3 relay locks operated. |

SECTION 205-102-501

| STEP | ACTION | VERIFICATION |
|------|---|---|
| 25 | At test position — Measure level of F2 mark frequency. | Level meter indicates 10 ± 2 db below reading recorded in Step 23. |
| 26 | At ADTL — Release P3, AN relays; immediately operate OR, CON relays. | OR, CON relays lock operated. |
| 27 | At test position — Measure and record level of F1 mark frequency. | F_{1M} should be X db below (-8 dbm) where X represents the loss in the test trunk facilities. |
| 28 | At ADTL — Operate P3 relay. | P3 relay locks operated. |
| 29 | At test position — Measure level of F1 mark frequency. | Level meter indicates 10 ± 2 db below reading recorded in Step 27. |
| 30 | Disconnect transmission level measuring set from trunk. | CLR lamp lights. |
| 31 | At ADTL — Replace data timer and instruction timer cards in trunk. | CON relay releases. BY lamp goes out. |
| 32 | Remove blocking tool from CY relay. | |

B. Test Sentence Generator, Instruction Word Generator, Distortion Measurement and FLIP Failure Time-Out Disconnect Tests — Programed Trunk

| | | |
|----|--|--|
| 5 | At test position — Monitor progress of call. | Audible ringing stops. F2 mark tone received. |
| 6 | At ADTL — Check for proper selection of trunk. | BY lamp lights. CON relay operated. |
| 7 | At test position — Monitor text of test sentence sent by trunk. | Receive two lines of test sentence ending with UNDIST. Receive two lines of test sentence ending with SW-DIS. Receive two lines of test sentence ending with DISPAD. Receive GA SEND. |
| 8 | At ADTL — Block released TO relay. | |
| 9 | At test position — Send undistorted signals to trunk. | |
| 10 | At ADTL — Operate RLS key momentarily, then remove blocking tool from TO relay. | Note: This clears any extraneous distortion indication resulting from insertion of the DIST SIGS plug at the test position. |
| 11 | At test position — Check for proper verification. | Break signal received. Transmission stops. Receive 5%. Receive FLIP instruction. |
| 12 | Disregard FLIP instruction. | CLR lamp lights after 10 ± 2 seconds. |
| 13 | Repeat Steps 5 through 8. | Same as Steps 5 through 8. |

| STEP | ACTION | VERIFICATION |
|--|---|--|
| 14 | At test position — Send test sentence signals containing 7 per cent switched bias to trunk. | |
| 15 | Repeat Step 10. | |
| 16 | At test position — Check for proper verification. | Break signal received. Transmission stops. Receive 10%. Receive FLIP instruction. |
| 17 | Repeat Step 12. | Same as Step 12. |
| 18 | Repeat Steps 5 through 8. | Same as Steps 5 through 8. |
| 19 | At test position — Send test sentence signals containing 12 per cent switched bias to trunk. | |
| 20 | Repeat Step 10. | |
| 21 | At test position — Check for proper verification. | Break signal received. Transmission stops. Receive 15%. Receive FLIP instruction. |
| 22 | Repeat Step 12. | Same as Step 12. |
| 23 | Repeat Steps 5 through 8. | Same as Steps 5 through 8. |
| 24 | At test position — Send test sentence signals containing 17 per cent switched bias to trunk. | |
| 25 | Repeat Step 10. | |
| 26 | At test position — Check for proper verification. | Break signal received. Transmission stops. Receive 20%. Receive FLIP instruction. |
| 27 | Repeat Step 12. | Same as Step 12. |
| 28 | Repeat Steps 5 through 8. | Same as Steps 5 through 8. |
| 29 | At test position — Send test sentence signals containing 22 per cent switched bias to trunk. | |
| 30 | Repeat Step 10. | |
| 31 | At test position — Check for proper verification. | Break signal received. Transmission stops. Receive 20% +. Receive FLIP instruction. |
| 32 | Repeat Step 12. | Same as Step 12. |
| C. Distortion Generator Calibration and GA SEND Time-Out Disconnect Tests — Programed Trunk | | |
| 8 | At test position — Monitor progress of call. | Audible ringing stops. F2 mark tone received. |
| 9 | At ADTL — Check for proper selection of trunk. | BY lamp lighted. CON relay operated. |

| STEP | ACTION | VERIFICATION |
|---|---|--|
| 10 | At test position — Monitor text of test sentence sent by trunk. | Receive repeated lines of test sentence ending with UNDIST. |
| 11 | Connect TMS (164C4) set to measure signals. | TMS indicates less than 5 per cent peak distortion. <i>Note:</i> This distortion reading assumes that there is negligible distortion in the test trunk facilities. |
| 12 | At ADTL — Operate P2 relay. | P2 relay locks operated. |
| 13 | At test position — Measure signals on TMS. | TMS indicates 28 \pm 2 per cent switched combination distortion. |
| 14 | At ADTL — Remove blocking tool from STP relay. | |
| 15 | At test position — Disconnect TMS. | Receive test sentence signals. Receive GA SEND instruction. |
| 16 | Disregard GA SEND instruction. | CLR lamp lights after 10 \pm 2 seconds. |
| D. FLIP, Answer-Back Delay Timing, and End-of-Program Disconnect Tests — Programed Trunk | | |
| 5 | At test position — Monitor progress of call. | Audible ringing stops. F2 mark tone received. |
| 6 | At ADTL — Check for proper selection of trunk. | BY lamp lighted. CON relay operated. |
| 7 | At test position — Monitor text of test sentence sent by trunk. | Receive two lines of test sentence ending with UNDIST. Receive two lines of test sentence ending with SW-DIS. Receive two lines of test sentence ending with DISPAD. Receive GA SEND instruction. |
| 8 | Send undistorted test sentence signals to trunk. | Break signal received 5 \pm 1 seconds after transmission starts. Transmission stops. Receive indication of measured distortion. <i>Note:</i> Hits or extraneous peak distortion due to insertion of the UNDIST SIGS plug into the SEND SIGS jack may cause a high distortion indication. Receive FLIP instruction. |
| 9 | Perform FLIP operation by momentarily operating FLIP key, then CLR key in sequence. | At ADTL — AN, M, CON relays release. OR, CON relays operate. At test position — FLIP indication received. Test sentence signals received 8 \pm 1 seconds after start of FLIP operation. |

| STEP | ACTION | VERIFICATION |
|------|--|---|
| 10 | Repeat Step 7. | Same as Step 7. |
| 11 | Send undistorted test sentence signals to trunk. | Receive break signal within 5 ± 2 seconds after transmission starts. Transmission stops. Receive indication of measured distortion. <i>Note:</i> Hits or extraneous peak distortion due to insertion of the UNDIST SIGS plug into the SEND SIGS jack may cause a high distortion indication. Receive END. CLR lamp lights. |

E. Automatic Connect, Frequency Check, Test Sentence Coding, and Distortion Control — Break-Controlled Trunk

| | | |
|----|---|--|
| 4 | At test position — Monitor progress of call. | Audible ringing stops. F2 mark tone received. |
| 5 | At ADTL — Check for proper selection of trunk. | BYA lamp lights. CONA relay operated. |
| 6 | Remove unit comprising two data timer cards, one of which serves trunk under test. <i>Note:</i> Since this action will disable the other Break-Controlled Trunk, it should be made busy by operation of the appropriate TST key. | |
| 7 | At test position — Connect frequency measuring set to trunk to measure F2 mark frequency. | Frequency meter indicates 2225 ± 3 cps. |
| 8 | At ADTL — Operate S relay. | S relay locks operated. |
| 9 | At test position — Measure F2 space frequency. | Frequency meter indicates 2025 ± 3 cps. |
| 10 | At ADTL — Release S relay. | S relay releases. |
| 11 | At test position — Disconnect frequency meter from trunk. | |
| 12 | At ADTL — Replace data timer cards. | CONA relay remains operated. |
| 13 | Release TST key operated in Step 6. (See note.) | |
| 14 | Remove blocking tool from CYA relay. | At test position — Receive repeated lines of test sentence ending with (&\$,.). |

| STEP | ACTION | VERIFICATION |
|------|--|---|
| 15 | At test position — Connect TMS (164C4) to trunk. | TMS indicates less than 5 per cent peak distortion. <i>Note:</i> This distortion reading assumes negligible distortion in the test trunk facilities. |
| 16 | Send break signal to trunk, reset TMS. | TMS indicates 28 ± 2 per cent switched bias distortion. |
| 17 | Send break signal to trunk, reset TMS. | TMS indicates 28 ± 2 per cent switched combination distortion. |
| 18 | At test position — Send break signal to trunk, reset TMS. | TMS indicates no transmission. At ADTL — All relays release. BYA lamp extinguishes. |