FLUKE networks

DTX-PCU6S

Patch Cord Adapters

Users Manual

November 2004

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Introduction

The DTX-PCU6S Patch Cord Adapters let you use a DTX CableAnalyzer™ Series tester to test patch cords in accordance with the TIA/EIA-568-B.2-1 Category 6 and IEC 61935-2 standards. These adapters, which meet backwards-compatibility requirements, also test Category 5e patch cords (see "Testing Cat 5e Patch Cords" on page 4).

Notes

Test standards are subject to amendments. Contact the appropriate standards organization for details. Contact Fluke Networks for general information on standards and for DTX software or database updates that may result from changes to standards.

The patch cord adapters feature special test jacks selected specifically for testing Cat 6 patch cords as specified in TIA/EIA-568-B.2-1.

Unpacking

The DTX-PCU6S Patch Cord Adapter Set comes with the following:

- One DTX-PCU6/MN patch cord test adapter for the main DTX tester
- One DTX-PCU6/SR patch cord test adapter for the remote DTX tester
- DTX-PCU6S Product CD-ROM

If something is missing or damaged, contact the place of purchase immediately.

Contacting Fluke Networks

Note

If you contact Fluke Networks about your tester, have the tester's software and hardware version numbers available if possible.

www.flukenetworks.com

support@flukenetworks.com

+1-425-446-4519

- Australia: 61 (2) 8850-3333 or 61 3 9329 0244
- Beijing: 86 (10) 6512-3435
- Brazil: 11 3044 1277
- Canada: 1-800-363-5853
- Europe: +44 1923 281 300
- Hong Kong: 852 2721-3228
- Japan: +81-3-3434-0181
- Korea: 82 2 539-6311
- Singapore: +65-6738-5655
- Taiwan: (886) 2-227-83199
- USA: 1-800-283-5853
- Anywhere in the world: +1-425-446-4519

Visit our website for a complete list of phone numbers.

Additional Resources for Cable Testing Information

The Fluke Networks Knowledge Base answers common questions about Fluke Networks products and provides articles on cable testing techniques and technology.

To access the Knowledge Base, log on to **www.flukenetworks.com**, then click **knowledge base** at the top of the page.

The website **cabletesting.com** answers common questions about cable testing and provides articles on testing, documentation, and standards, and other reference information.

DTX Software Requirements

The DTX main and remote testers need software version 1.1 or later to work with the DTX-PCU6S adapters

To determine the software versions in your main and remote testers, do the following:

1. Connect the main and remote testers together with permanent link and channel adapters or two channel adapters and a patch cord.
2. Turn on both testers.
3. Turn the rotary switch to **SPECIAL FUNCTIONS**; then select **Version Information**.

The latest software version is available at no charge on the Fluke Networks web site. Download the update file from the website; then use LinkWare software to install new software into the DTX testers. See the *DTX CableAnalyzer Users Manual*, the *DTX CableAnalyzer Technical Reference Handbook*, or the online help in LinkWare for instructions.

Note

Patch cord performance requirements may change as standards are amended. If requirements change, Fluke Networks will post an updated test specification database for the DTX tester on the Fluke Networks DTX software download page. To install a new database, use the ***Modify DTX Test Limits*** *utility in LinkWare.*

Characterizing the Adapters' Performance

When you receive the patch cord adapters, you should characterize their performance. Later, the test results can help you determine when the adapters' jacks need replacing or verify that the adapters are working properly. See Appendix A: "Characterizing and Testing the Adapters' Performance".

Testing Patch Cords

⚠Caution

Testing patch cords that have poorly crimped plugs may reduce the life of the patch cord adapter's jacks.

Note

If you want to verify the performance of RJ45 plugs before using them to make patch cords, see Appendix B.

Testing Cat 5e Patch Cords

While the DTX-PCU6 patch cords adapters are optimized for testing Cat 6 patch cords, they may also be used to test Cat 5e patch cords. To test Cat 5e patch cords without modifying the adapters, select a Cat 5e cable type and a Cat 6 limit in SETUP.

To optimize the adapters for testing Cat 5e patch cords, replace the RJ45 jacks in the adapters with Cat 5e jacks specially selected for testing patch cords. See "Replacement Parts" on page 9 for a source for these jacks. See "Replacing the Adapter's Jacks" on page 8 for installation instructions.

Setting Up the Tester

1. Attach the DTX-PCU6/MN adapter to the main DTX tester. Attach the DTX-PCU6/SR adapter to the remote DTX tester.
2. Turn the rotary switch to SETUP; then select **Twisted Pair**.
3. On the **Twisted Pair** menu, select **Cable Type**.
4. Select the category of twisted pair cable used for the patch cords, then select the appropriate cable type.
5. On the **Twisted Pair** menu, select **Test Limit**.
6. Select the patch cord limit with the appropriate category and length.

   If the appropriate limit is not shown on the **Last Used** menu, press F1 **More**; then select **Patch Cords** to see more patch cord limits.

Notes

If the patch cord's length is not listed in the limits database, select a limit with the next longest length. For example, if the patch cord is 2.2 m long, select a limit for a 2.5 m patch cord.

If you are testing Cat 5e patch cords and have not replaced the adapter jacks with Cat 5e jacks, select a Cat 6 limit.

CENELEC limits are preceded by "CLC" in the patch cord limits list.

Running the Patch Cord Test

1. Connect the patch cord to be tested to the main and remote testers, as shown in Figure 1.
2. Turn the rotary switch to Autotest; then press TEST.
3. To save the results, press SAVE, enter or select a cable ID; then press SAVE again.

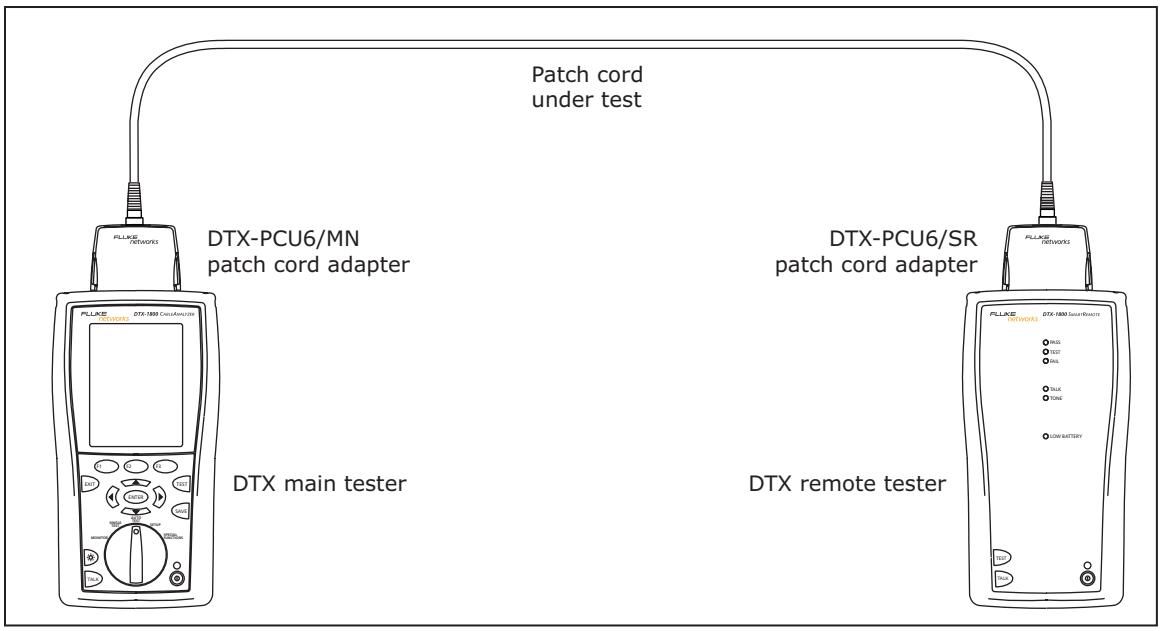


Figure 1. Patch Cord Test Connections

Patch Cord Test Results

Patch cord tests evaluate the following:

- Wire map
- Return loss
- NEXT

The patch cord test specifications assume that dc resistance, length, propagation delay, and delay skew requirements are met by the patch cord's design; therefore, test limits for these measurements are not required.

Note

NEXT loss and return loss are measured in one direction only, as required by the patch cord test standard. For standard patch cords up to 5 m this method is adequate and can detect performance problems at the remote connection. For longer patch cords, Fluke Networks recommends repeating the test with the patch cord reversed.

Why Patch Cords Fail

Patch cords may fail because of faulty wiring, poor workmanship , poor quality materials, or damage to the cable or plug.

Failures may also occur when the patch cord adapter jacks need replacing or a patch cord adapter is defective. If the adapters' performance was characterized when the adapters were new, use the results and the reference patch cord to check the adapters' performance. See Appendix A.

The following sections give typical causes for wire map, return loss, and NEXT failures.

Wire Map Failures

Wire map failures are typically caused by the following:

- Wires connected to wrong pins at plug
- Faulty connections
- Damaged plug
- Damaged cable
- Wrong **Outlet Configuration** selected in setup
- Mix of 568A and 568B wiring standards (12 and 36 crossed)
- Conductive material stuck between pins at plug

Return Loss Failures

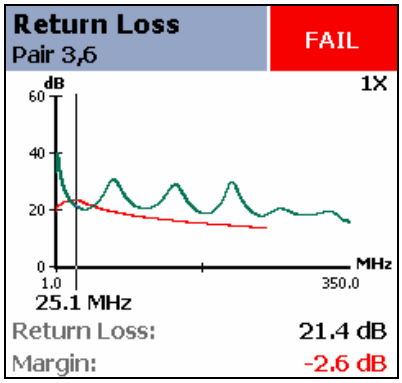
Return loss failures are typically caused by the following:

- Cable impedance not 100 Ω
- Patch cord handling causing changes in impedance
- Excessive untwisting of pairs at plug
- Poor quality plug
- Cable impedance not uniform (poor quality cable)
- Cable compression (pinches, kinks, etc.)
- Poorly matched plug and jack (most often affects Cat 6/Class E applications)
- Wrong test limit selected

The return loss plot can often tell you if a patch cord failed because of bad cable or a bad plug:

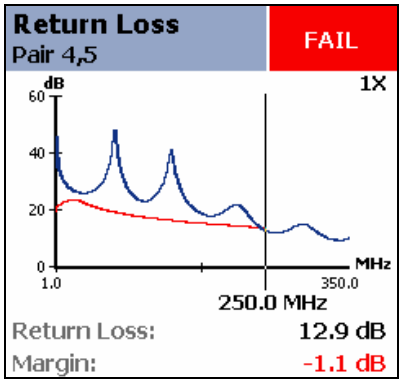
- Return loss failures at low frequencies (below 50 MHz) tend to be caused by the cable.
- Return loss failures at high frequencies tend to be caused by plugs.

Figure 2 shows examples of these failures. The plot on the left shows results from a patch cord made with bad cable. The plot on the right shows results from a cord with a bad plug.



bal25.bmp

Low-frequency return loss failure caused by bad cable



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High frequency return loss failure caused by a bad plug

Figure 2. Return Loss Failures at Low and High Frequencies

NEXT Failures

NEXT failures are typically caused by the following:

- Excessive untwisting of pairs at plug. Most NEXT failures occur at plugs, where the twist in the wire pairs is interrupted.
- Poor quality plug
- Poor quality cable
- Poorly matched plug and jack (Cat 6/Class E applications)
- Cable compression (pinches, kinks, etc.)
- Excessive noise source near cabling under test. Use the impulse noise test to check for noise.
- Wrong test limit selected

Fault Information for Long Patch Cords

For 20 m patch cord limits, the tester's automatic diagnostics may help you determine why a patch cord failed. After an Autotest that failed, press F1 **Fault Info** to see information about the failure.

Note

The tester's automatic diagnostics do not usually give complete fault information for patch cords shorter than 20 m.

Mechanical Stress Tests for Patch Cords

Every patch cord design should be evaluated for changes in performance–particularly return loss performance–under mechanical stress. Refer to the TIA/EIA or ISO/IEC standards for details on stress tests.

Since it is not practical to perform the stress tests on every patch cord produced, you can test samples of production patch cords to ensure quality. The sample size depends on the desired quality level. Alternately, you can use the stress tests to determine the possible shift in performance, then apply the shift to worst-case margins to ensure that patch cords meet specifications under worst-case conditions. You can apply the shift as you test, or you can use LinkWare software to upload test results to a PC for evaluation.

Replacing the Adapter's Jacks

The RJ45 jacks in the DTX-PCU6S adapters are typically good for 5000 insertions when used continuously.

When used non-continuously, the lifetime may be reduced to 750 insertions. After 750 insertions, the gold plating that prevents oxidation on the contacts may be worn away; however, continuous use wipes off the oxidation and extends the life of the contacts.

⚠Caution

Testing patch cords that have poorly crimped plugs may reduce the life of the patch cord adapter's jacks.

When to Replace Jacks

You should replace the jacks when any of the following occur:

- Margins for patch cord tests begin to shrink.
- Patch cord tests, particularly wire map or return loss tests, begin to produce intermittent and/or inconsistent results.
- The jacks have been used for more than 5000 insertions.
- The test described in Appendix A: "Characterizing and Testing the Adapters' Performance" fail or the results are noticeably different from those observed when the adapters were new.

You may also want to replace the jacks with Cat 5e jacks to optimize the adapters for testing Cat 5e patch cords.

Replacing the Jacks

Caution

The DTX-PCU6S adapters contain static-sensitive devices. When replacing the RJ45 jack, follow guidelines for preventing electrostatic discharge (ESD).

Note

To ensure reliable operation, replace the entire DTX-PCU6S patch cord adapter after the RJ45 jack has been replaced 10 times.

1. Use a TORX PLUS® driver, size T-7, to remove the three screws from the backs of the patch cord adapters.
2. Take the adapter cases apart and remove the circuit boards from the cases.

3 Pull the RJ45 jacks off the circuit boards (Figure 3), being careful not to stress the boards.

4 Align the new RJ45 jacks on the connectors on the circuit boards. Note in Figure 3 how the insulation displacement connectors in the jacks slide into the connectors on the circuit boards.

5 Place the boards on a hard, flat surface; then push the RJ45 jacks onto the connectors on the boards. If firm pressure does not push the jack onto the connectors, realign the jack on the connectors before trying again.

6 Reassemble the cases.

7 If the adapters' performance was characterized when the adapters were new, use the results and the reference patch cord to check the adapters' performance. See Appendix A.

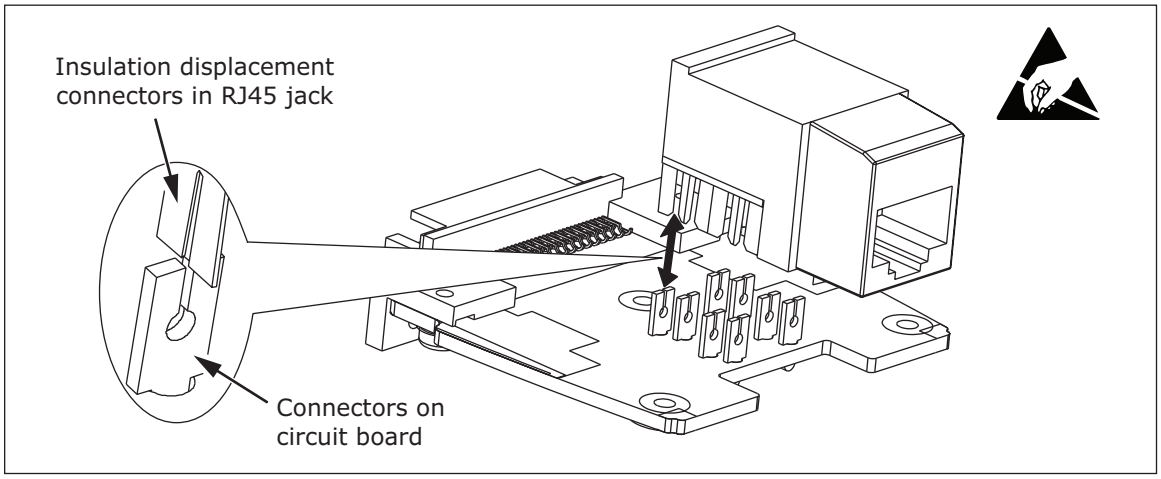

Figure 3. Replacing the RJ45 Jack

Replacement Parts

Table 1 shows the replacement parts available for the DTX-PCU6S Patch Cord Adapters. The parts are available from Fluke Networks, unless otherwise specified.

Table 1. Replacement Parts

Description	Fluke Networks Model Number
Kit of 10 RJ45 test jacks for DTX-PCU6 adapters	DSP-PCI-C6JACK
DTX-PCU6 Cat 6 patch cord adapter for main tester	DTX-PCU6/MN
DTX-PCU6 Cat 6 patch cord adapter for remote tester	DTX-PCU6/SR
	Superior Modular Part Number*
Set of two RJ45 Cat 6 test jacks for DTX-PCU6 adapters	PCTAC6K
Set of two RJ45 Cat 5e test jacks for DTX-PCU6 adapters	PCTAC5e

* Superior Modular Products
33 Superior Way
Swannanoa, NC 28778, USA
Telephone: 1-828-298-2260 or 1-800-880-7674
World Wide Web: www.superiormod.com

Specifications

DTX CableAnalyzer Measurement Accuracy

The DTX CableAnalyzer testers are guaranteed to meet the Level III accuracy requirements at Cat 6 permanent link and channel pass/fail limits. Refer to the *DTX CableAnalyzer Series Technical Reference Handbook* for details.

Patch Cord Test Configuration Measurement Accuracy

The charts in Figure 4 show NEXT and return loss measurement accuracies for the patch cord test configuration. The results were computed using the methods defined in standards applicable to field tester requirements. The accuracies shown reflect the accuracy of the measurement circuitry, excluding variability caused by the adapters' connectors.

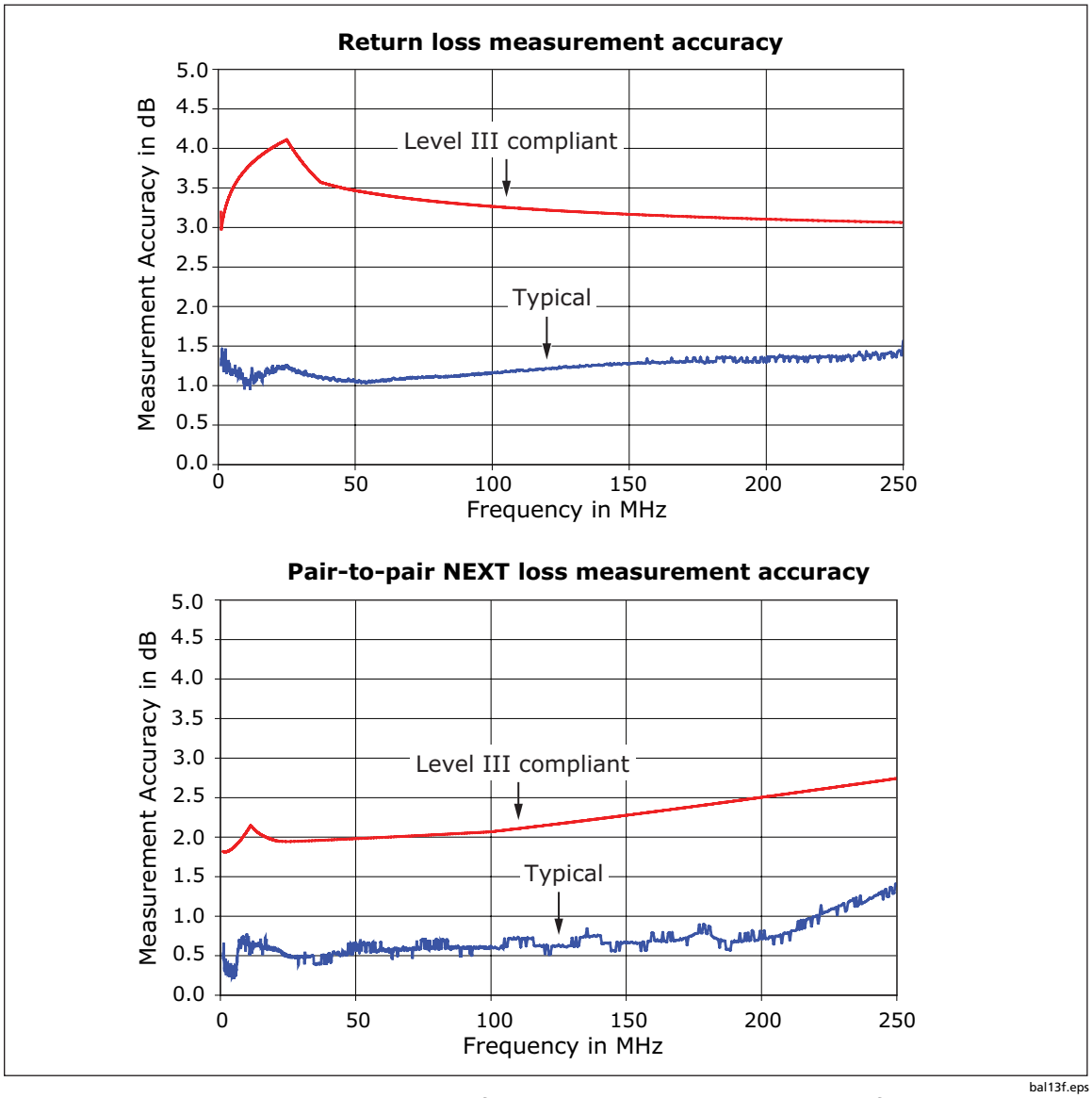

Figure 4. Measurement Accuracy of the DTX-PCU6S Patch Cord Test Configuration

Appendix A
Characterizing and Testing the Adapters' Performance

Introduction

This appendix describes how to characterize the performance of the DTX-PCU6S adapters. You can use the results from this test for the following:

- **Determining when the RJ45 jacks need replacing, or the adapters are otherwise damaged**

  Category 6 patch cord test limits are very tight. You may see many failures and, consequently, may wonder if the test adapters are working properly. The RJ45 jacks in the adapters wear out with use. Worn jacks or other damage to the adapters can cause tests to fail. The performance test helps you determine when the jacks need replacing or the adapters need service center repair.

- **Verifying the adapters' performance**

  The performance test lets you verify the adapters' performance after you replace the RJ45 jacks in the adapters, purchase replacement or additional adapters, or anytime the adapters' performance seems questionable.

  While it is not possible to fully evaluate the adapters' performance in the field, the test described in this section help you characterize the adapters and determine if they are working properly.

DTX-PCU6S Performance Test Using a Reference Patch Cord

When you first receive your adapters, you should test a patch cord and save the cord and test results for future reference. You may use the patch cord and its results later to determine if the adapters' RJ45 jacks need replacing or to verify the adapters' performance.

To test the adapters when you first receive them, do the following:

1. Attach the DTX-PCU6/MN adapter to the main DTX tester. Attach the DTX-PCU6/SR adapter to the remote DTX tester.
2. Select an appropriate patch cord test limit in SETUP.
3. Run an Autotest on some patch cords to find one that passes. A PASS* result is adequate.
4. Save the test results from a compliant patch cord and mark the patch cord ends with "main" and "remote" as it was connected during the test. Store the reference patch cord for later use.

Notes

To help ensure consistent return loss measurements from the reference patch cord, do not mechanically stress the cord. Patch cord properties can change when the cord is bent or twisted.

When you test the reference patch cord later, use the same main and remote DTX testers as were used for the initial test. The serial numbers of the testers are saved with the test results.

To test the same adapters later, do the following:

1. Connect the reference patch cord between the same main and remote testers used for the original test. Be sure the marked ends of the patch cord go to the correct testers.
2. Run an Autotest; then save the results.
3. Compare the results with the reference patch cord's previous results. The difference between the old and new NEXT and RL results should be less than 0.5 dB near the PASS/FAIL limits.

If the old and new results are more than 0.5 dB apart near the PASS/FAIL limits, the RJ45 jacks may need replacing. See "Replacing the Adapter's Jacks" on page 8 for details.

Appendix B
Pre-Qualifying Patch Cord Plugs

You may use the DTX-PCU6 patch cord adapters to test a sample of the patch cord plugs before using them to build patch cords.

To get a general idea of how plugs will affect patch cord performance, test a sample of the plugs terminated with 100 Ω resistors. Figure B-1 shows this configuration. This test is strongly recommended for Cat 6 plugs, as the Cat 6 NEXT pass/fail limits have little margin for poor performance.

To test the plugs, select a cable type that matches the plug type, and select the Cat 6 patch cord test limit with the shortest length. If you are testing Cat 5e plugs and have replaced the adapters' jacks with Cat 5e jacks, select the Cat 5e limit with the shortest length. Run the **NEXT** and **Return Loss** tests in SINGLE TEST mode.

Refer to the TIA/EIA-568-B.2-1 or IEC 60603-7 standard for additional information on test plug requirements.

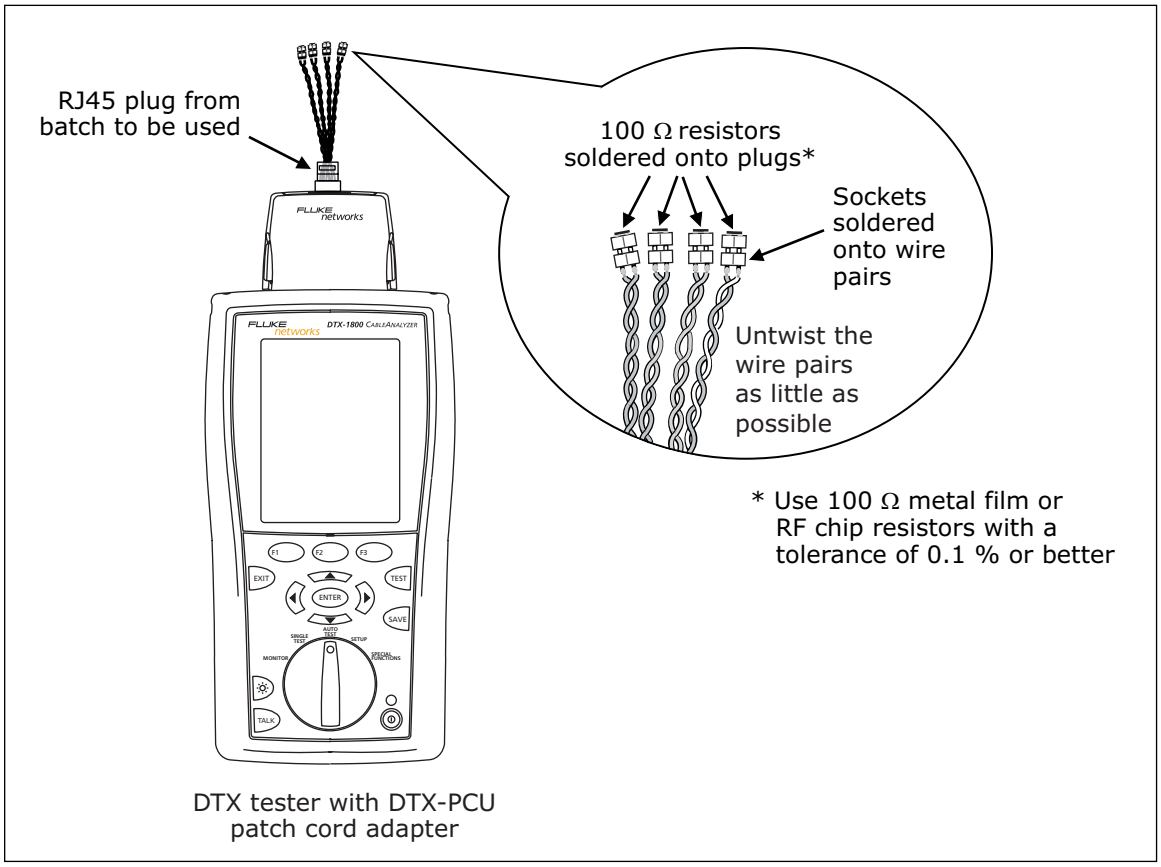

Figure B-1. Pre-qualifying RJ45 Plugs

Appendix C
Patch Cord Performance Requirements

The tables in this appendix show TIA/EIA and ISO/IEC performance requirements at selected frequencies for Cat 5e and Cat 6 patch cords. These numbers are used in the DTX test specification database.

Notes

Patch cord performance requirements may change as standards are amended. If requirements change, Fluke Networks will post an updated test specification database for the DTX tester on the Fluke Networks DTX software download page. To install a new database, use the ***Modify DTX Test Limits*** *utility in LinkWare.*

The DTX-PCU6 patch cords adapters are optimized for testing Cat 6 patch cords, but may be used with a Cat 6 limit to test Cat 5e patch cords. To optimize the adapters for testing Cat 5e patch cords, replace the RJ45 jacks in the adapters with Cat 5e jacks specially selected for testing patch cords. See "Replacement Parts" on page 9 for a source for these jacks. See "Replacing the Adapter's Jacks" on page 8 for installation instructions.

Table C-1. Cat 5e Patch Cord Limits per TIA/EIA-568-B

Freq. (MHz)	Patch Cord Length and NEXT (dB)													RL (dB)
	0.5m	1m	1.5m	2m	2.5m	3m	3.5m	4m	5m	7.5m	10m	15m	20m	
1	65	65	65	65.0	65.0	65	65	65	65	65	65	65	65	19.8
4	65	65	65	65.0	65.0	65	65	65	64.4	63.3	62.4	61.2	60.3	21.6
8	62.3	61.6	61.1	60.6	60.2	59.8	59.4	59.1	58.6	57.5	56.7	55.5	54.7	22.5
10	60.3	59.7	59.2	58.7	58.3	57.9	57.5	57.2	56.7	55.6	54.8	53.7	53	22.8
16	56.3	55.7	55.1	54.7	54.3	53.9	53.6	53.3	52.7	51.7	51	49.9	49.3	23.4
20	54.4	53.8	53.2	52.8	52.4	52	51.7	51.4	50.9	49.9	49.1	48.2	47.6	23.7
25	52.5	51.9	51.3	50.9	50.5	50.1	49.8	49.5	49	48	47.4	46.4	45.9	24.0
31.25	50.6	50	49.4	49.0	48.6	48.2	47.9	47.7	47.2	46.2	45.6	44.7	44.2	23.1
62.5	44.7	44.1	43.6	43.2	42.8	42.5	42.2	41.9	41.5	40.7	40.2	39.5	39.2	20.0
100	40.7	40.1	39.7	39.3	38.9	38.6	38.4	38.1	37.8	37.1	36.6	36.1	35.9	18.0
125	38.8	38.3	37.8	37.4	37.1	36.8	36.6	36.4	36	35.4	35	34.6	34.4	17.0
200	34.9	34.4	34	33.6	33.3	33.1	32.9	32.7	32.4	31.9	31.7	31.4	31.4	15.0
250	33	32.5	32.2	31.8	31.6	31.4	31.2	31	30.7	30.3	30.1	30	30	14.0

Table C-2. Cat 6 Patch Cord Limits per TIA/EIA-568-B

Freq. (MHz)	Patch Cord Length and NEXT (dB)													RL (dB)
	0.5m	1m	1.5m	2m	2.5m	3m	3.5m	4m	5m	7.5m	10m	15m	20m	
1	65	65	65	65	65	65	65	65	65	65	65	65	65	19.8
4	65	65	65	65	65	65	65	65	65	65	65	65	65	21.6
8	65	65	65	65	65	65	65	65	65	65	64.79	63.77	63.06	22.5
10	65	65	65	65	65	65	65	64.91	64.48	63.6	62.93	61.95	61.26	22.8
16	63.03	62.64	62.28	61.96	61.66	61.4	61.15	60.92	60.5	59.67	59.04	58.14	57.53	23.4
20	61.11	60.72	60.37	60.05	59.76	59.5	59.25	59.03	58.63	57.82	57.21	56.35	55.78	23.7
25	59.19	58.8	58.46	58.14	57.86	57.6	57.37	57.15	56.75	55.97	55.39	54.58	54.06	24.0
31.25	57.26	56.89	56.55	56.24	55.97	55.71	55.48	55.27	54.89	54.14	53.58	52.83	52.35	23.1
62.5	51.31	50.96	50.64	50.36	50.11	49.88	49.67	49.49	49.15	48.52	48.07	47.5	47.18	20.0
100	47.29	46.96	46.67	46.41	46.18	45.97	45.79	45.62	45.33	44.79	44.43	44.02	43.82	18.0
125	45.39	45.07	44.79	44.54	44.33	44.13	43.96	43.8	43.53	43.05	42.74	42.4	42.26	17.0
200	41.4	41.11	40.86	40.65	40.46	40.3	40.15	40.03	39.81	39.46	39.26	39.08	39.05	15.0
250	39.51	39.24	39.01	38.82	38.65	38.5	38.37	38.26	38.08	37.79	37.64	37.55	37.55	14.0

Note

Patch cord performance requirements for CENELEC standards (CLC limits) are equivalent to those for ISO/IEC standards, except that CENELEC standards have no requirement for return loss below 4 MHz.

Table C-3. Cat 5e Patch Cord Limits per ISO/IEC-11801-2002

Freq. (MHz)	Patch Cord Length and NEXT (dB)													RL (dB)
	0.5m	1m	1.5m	2m	2.5m	3m	3.5m	4m	5m	7.5m	10m	15m	20m	
1	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	19.8
4	65.0	65.0	65.0	65.0	65.0	65.0	64.6	64.3	63.7	62.4	61.6	60.3	59.5	21.6
8	62.1	61.3	60.7	60.2	59.7	59.3	58.9	58.5	58.0	56.8	56.0	54.9	54.1	22.5
10	60.2	59.4	58.8	58.3	57.8	57.4	57.0	56.7	56.1	55.0	54.2	53.1	52.4	22.8
16	56.2	55.4	54.8	54.3	53.8	53.4	53.1	52.8	52.2	51.2	50.4	49.5	48.8	23.4
20	54.2	53.5	52.9	52.4	52.0	51.6	51.2	50.9	50.4	49.4	48.7	47.7	47.2	23.7
25	52.3	51.6	51.0	50.5	50.1	49.7	49.4	49.1	48.5	47.6	46.9	46.0	45.5	24.0
31.25	50.4	49.7	49.1	48.6	48.2	47.8	47.5	47.2	46.7	45.8	45.1	44.3	43.9	23.1
62.5	44.5	43.9	43.3	42.9	42.5	42.1	41.8	41.6	41.1	40.3	39.8	39.3	39.0	20.0
100	40.6	39.9	39.4	39.0	38.6	38.3	38.0	37.8	37.4	36.8	36.4	36.0	35.8	18.0
125	38.7	38.1	37.6	37.2	36.8	36.5	36.3	36.1	35.7	35.1	34.8	34.5	34.4	17.0
200	34.8	34.2	33.7	33.4	33.1	32.8	32.6	32.4	32.2	31.7	31.5	31.4	31.4	15.0
250	32.9	32.4	32.0	31.6	31.3	31.1	30.9	30.8	30.5	30.2	30.0	30.0	30.0	14.0

Table C-4. Cat 6 Patch Cord Limits per ISO/IEC-11801-2002

Freq. (MHz)	Patch Cord Length and NEXT (dB)													RL (dB)
	0.5m	1m	1.5m	2m	2.5m	3m	3.5m	4m	5m	7.5m	10m	15m	20m	
1	65	65	65	65	65	65	65	65	65	65	65	65	65	19.8
4	65	65	65	65	65	65	65	65	65	65	65	65	65	21.6
8	65	65	65	65	65	65	65	65	65	64.85	64.13	63.1	62.41	22.5
10	65	65	65	65	65	64.98	64.69	64.42	63.95	63.01	62.32	61.34	60.68	22.8
16	62.92	62.44	62.02	61.65	61.31	61.01	60.73	60.48	60.03	59.15	58.51	57.63	57.06	23.4
20	61	60.53	60.11	59.75	59.42	59.12	58.85	58.6	58.17	57.32	56.71	55.88	55.36	23.7
25	59.08	58.62	58.21	57.85	57.53	57.24	56.98	56.74	56.32	55.5	54.92	54.15	53.68	24.0
31.25	57.16	56.71	56.31	55.96	55.64	55.36	55.11	54.87	54.47	53.69	53.15	52.44	52.01	23.1
62.5	51.22	50.79	50.42	50.1	49.82	49.57	49.34	49.14	48.79	48.16	47.73	47.24	46.99	20.0
100	47.2	46.81	46.47	46.17	45.92	45.69	45.49	45.32	45.02	44.5	44.18	43.85	43.72	18.0
125	45.3	44.92	44.6	44.32	44.08	43.87	43.69	43.53	43.26	42.8	42.53	42.28	42.2	17.0
200	41.32	40.98	40.69	40.46	40.25	40.08	39.94	39.81	39.61	39.29	39.14	39.05	39.06	15.0
250	39.44	39.12	38.86	38.64	38.46	38.31	38.18	38.08	37.91	37.67	37.57	37.55	37.58	14.0