



## **GT-15-121**

### **10G BASE-T/Cat 6a Compliance Testing of Glenair Ochito Contacts and 26AWG Aerospace Grade S/FTP CAT 6a Cable**





**Revision History**

<b>Rev</b>	<b>Date</b>	<b>Approved</b>	<b>Description</b>
1	9/3/2015	K. Williams	First Draft
2	10/06/2015	K. Williams	Edit
3	10/08/2015	K. Williams	Initial Release

## 1.0 Abstract

The purpose of this test is to characterize the electrical performance of the Ochito Ethernet Contacts in accordance with the Category 6a cabling standard as per TIA/ETA Cat 6a STP. The parameters of interest are as follows: Near-End Crosstalk (NEXT), Power Sum NEXT, Equal Level Far-End Crosstalk (ELFEXT), Power Sum ELFEXT, Return Loss, and Insertion Loss.

## 2.0 Test Samples

A full testing sample is called a link. A link is composed of a series of cordsets. A cordset is composed of some known length of Ethernet cable (Glenair PN: 963-033-26) terminated on each end with opposite gendered Ochito Ethernet contacts (Glenair PIN: 858-016 and 858-017). Each cordset was tested alone as a link. Shown below is a schematic of a test link consisting of 4 cordsets.

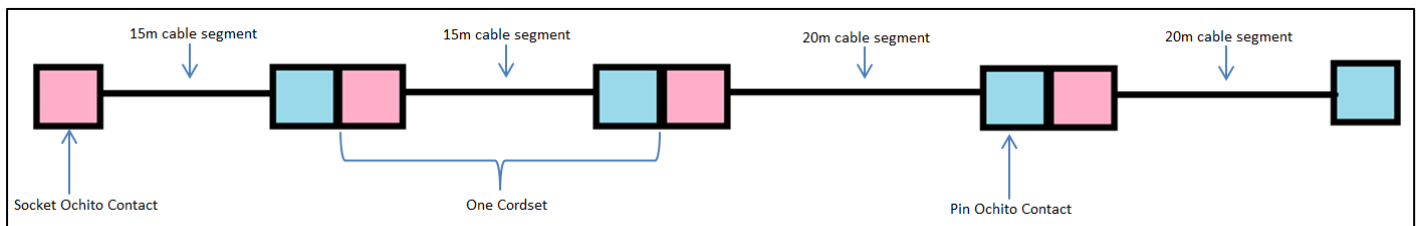


Figure 1: Sample Link Diagram

Here is the wiring configuration of the Ochito contacts.

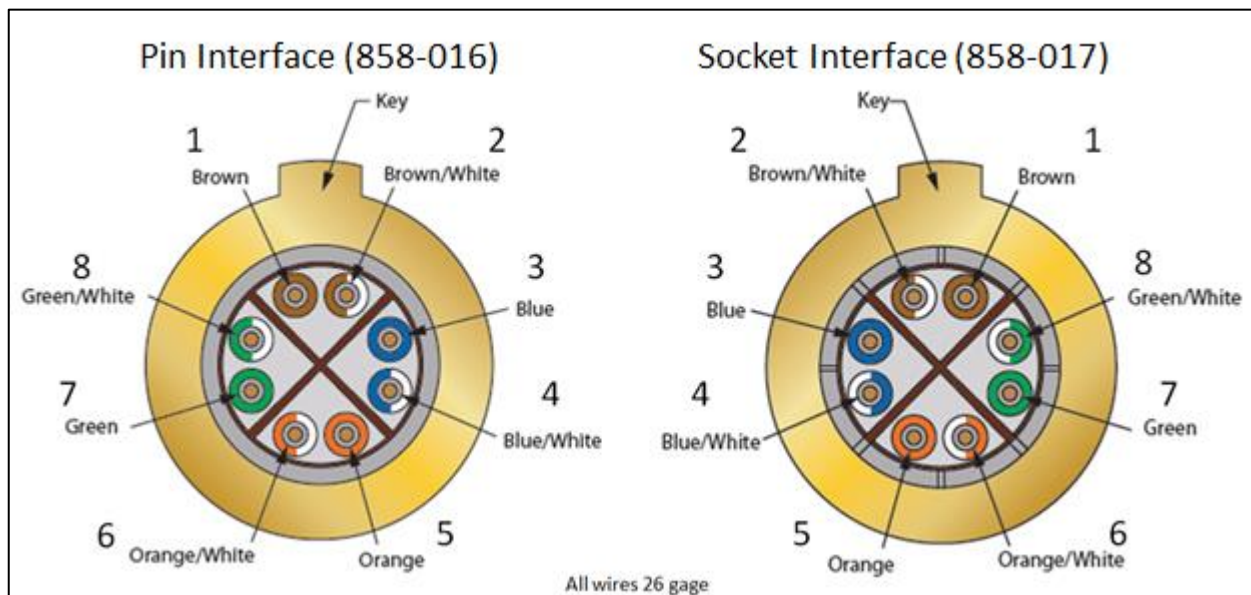


Figure 2: Ochito Contacts Wiring

### 3.0 Test Equipment

The testing equipment is tabulated below.

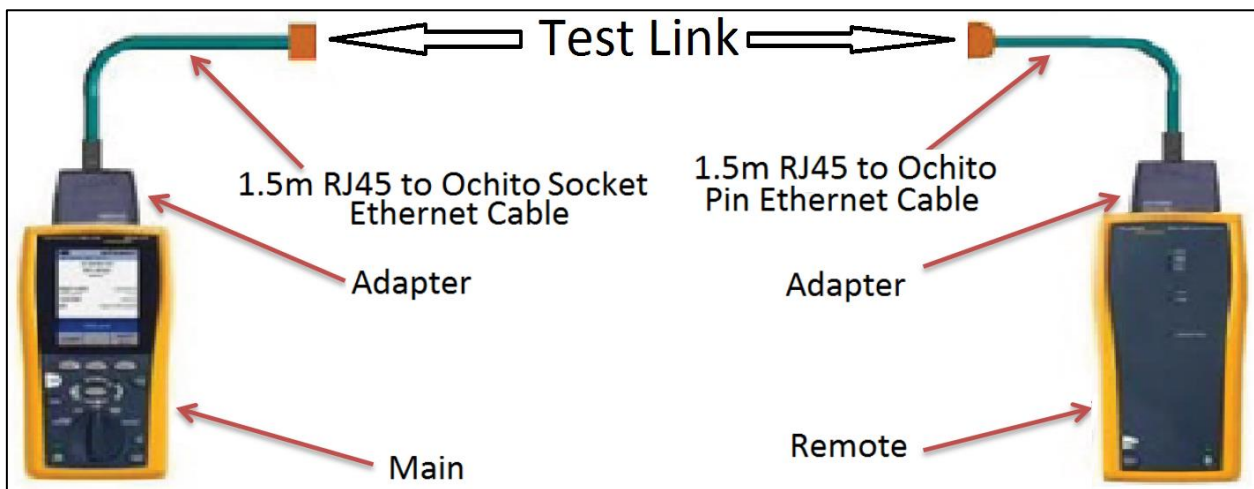
**Table 1: Test Equipment Information**

Make	Model	Component	S/N	Calibration Date	Calibration Expiration
FlukeNetworks	DSX-5000	Main	2766352	12/11/2014	12/11/2015
FlukeNetworks	DSX-5000	Remote	2766289	12/11/2014	12/11/2015
FlukeNetworks	DSX-CHA004	Main Adapter	N/A	N/A	N/A
FlukeNetworks	DSX-CHA004	Remote Adapter	N/A	N/A	N/A

An image including this test equipment is found in Section 4.0 of this report.

### 4.0 Setup and Test Procedure

Below is a diagram of the test setup.



**Figure 3: Test Setup**

An adapter was attached to the units. At each end of the links, a 1.5m segment of cable acted as an adaptor between the Ochito contact and the RJ45 terminal of the adapter. After selecting CAT6A as the testing standard, the tests were run and the data stored.



## 5.0 Results

Many links were tested, including individual cordsets. Included below are seven sets of data that are adequate to establish some important trends. For reference within this document, they are named with letters in order of appearance. Cordset sequence is listed left to right as Main to Remote. The highlighted field is the lowest clearance parameter for that test configuration.

**Table 2: Worst Case Margin Summary Link A**

<b>Link ID:</b>	A				
<b>Number of Cordsets:</b>	1				
<b>Link Length:</b>	10m				
<b>Cordset Sequence:</b>	10m				
Worst Case Margin Summary					
Parameter	Pair	Frequency [MHz]	Value [dB]	Limit [dB]	Clearance [dB]
Insertion Loss	78	487.0	7.9	48.6	40.7
NEXT	12-36	61.8	45.3	43.5	1.8
PS NEXT	36	111.5	39.0	36.3	2.7
ARC-F (ELFEXT)	45-36	487.0	26.1	9.5	16.6
PS ARC-F (ELFEXT)	36	1.0	70.2	60.3	9.9
ARC-N	36-45	1.0	70.6	62.0	8.6
PS ARC-N	36	2.6	66.9	58.6	8.3
Return Loss	78	321.0	15.7	6.9	8.8

**Table 3: Worst Case Margin Summary Link B**

<b>Link ID:</b>	B				
<b>Number of Cordsets:</b>	1				
<b>Link Length:</b>	20m				
<b>Cordset Sequence:</b>	20m				
Worst Case Margin Summary					
Parameter	Pair	Frequency [MHz]	Value [dB]	Limit [dB]	Clearance [dB]
Insertion Loss	45	500.0	13.4	49.3	35.9
NEXT	45-78	84.3	45.3	41.2	4.1
PS NEXT	45	90.0	42.4	37.9	4.5
ARC-F (ELFEXT)	12-36	460.0	28.1	10.0	18.1
PS ARC-F (ELFEXT)	45	1.0	71.5	60.3	11.2
ARC-N	12-36	5.5	65.1	56.0	9.1
PS ARC-N	36	4.6	63.8	55.1	8.7
Return Loss	12	26.9	21.0	16.9	4.1



**Table 4: Worst Case Margin Summary Link C**

<b>Link ID:</b>	C				
<b>Number of Cordsets:</b>	3				
<b>Link Length:</b>	55m				
<b>Cordset Sequence:</b>	15m-20m-20m				
Worst Case Margin Summary					
Parameter	Pair	Frequency [MHz]	Value [dB]	Limit [dB]	Clearance [dB]
Insertion Loss	45	500.0	34.8	49.3	14.5
NEXT	12-78	2.3	67.7	65.0	2.7
PS NEXT	78	2.0	65.6	62.0	3.6
ARC-F (ELFEXT)	36-45	403.0	15.5	11.2	4.3
PS ARC-F (ELFEXT)	12	1.0	66.8	60.3	6.5
ARC-N	12-78	2.3	65.2	61.8	3.4
PS ARC-N	45	3.9	62.0	56.7	5.3
Return Loss	12	3.4	22.0	19.0	3.0

**Table 5: Worst Case Margin Summary Link D**

<b>Link ID:</b>	D				
<b>Number of Cordsets:</b>	4				
<b>Link Length:</b>	60m				
<b>Cordset Sequence:</b>	10m-10m-20m-20m				
Worst Case Margin Summary					
Parameter	Pair	Frequency [MHz]	Value [dB]	Limit [dB]	Clearance [dB]
Insertion Loss	45	500.0	36.9	49.3	12.4
NEXT	36-45	1.4	65.3	65.0	0.3
PS NEXT	36	11.9	54.9	52.8	2.1
ARC-F (ELFEXT)	36-45	1.0	65.5	63.3	2.2
PS ARC-F (ELFEXT)	45	1.0	64.8	60.3	4.5
ARC-N	36-45	1.5	63.2	62.0	1.2
PS ARC-N	36	1.9	61.9	59.0	2.9
Return Loss	12	2.9	20.8	19.0	1.8

**Table 6: Worst Case Margin Summary Link E**

<b>Link ID:</b>	E				
<b>Number of Cordsets:</b>	4				
<b>Link Length:</b>	60m				
<b>Cordset Sequence:</b>	20m-20m-10m-10m				
Worst Case Margin Summary					
Parameter	Pair	Frequency [MHz]	Value [dB]	Limit [dB]	Clearance [dB]
Insertion Loss	45	500.0	36.7	49.3	12.6
NEXT	36-45	2.6	65.6	65.0	0.6
PS NEXT	36	23.9	49.3	47.7	1.6
ARC-F (ELFEXT)	45-36	1.0	65.2	63.3	1.9
PS ARC-F (ELFEXT)	45	1.0	64.3	60.3	4.0
ARC-N	36-45	2.6	62.7	61.6	1.1
PS ARC-N	36	12.0	48.6	45.6	3.0
Return Loss	78	2.8	20.1	19.0	1.1

**Table 7: Worst Case Margin Summary Link F**

<b>Link ID:</b>	F				
<b>Number of Cordsets:</b>	4				
<b>Link Length:</b>	65m				
<b>Cordset Sequence:</b>	15m-10m-20m-20m				
Worst Case Margin Summary					
Parameter	Pair	Frequency [MHz]	Value [dB]	Limit [dB]	Clearance [dB]
Insertion Loss	45	500.0	40.2	49.3	9.1
NEXT	12-36	23.9	66.0	65.0	1.0
PS NEXT	36	23.9	60.0	58.3	1.7
ARC-F (ELFEXT)	12-78	1.0	66.2	63.3	2.9
PS ARC-F (ELFEXT)	12	1.0	65.0	60.3	4.7
ARC-N	12-78	1.9	42.8	40.3	2.5
PS ARC-N	36	23.9	40.9	37.7	3.2
Return Loss	78	2.4	19.9	19.0	0.9



Table 8: Worst Case Margin Summary Link G

<b>Link ID:</b>	G				
<b>Number of Cordsets:</b>	4				
<b>Link Length:</b>	70m				
<b>Cordset Sequence:</b>	15m-15m-20m-20m				
Worst Case Margin Summary					
Parameter	Pair	Frequency [MHz]	Value [dB]	Limit [dB]	Clearance [dB]
Insertion Loss	45	500	42.9	49.3	6.4
NEXT	36-45	4.9	63.6	61.7	1.9
PS NEXT	45	5	61.6	59	2.6
ARC-F (ELFEXT)	12-78	1	65.6	63.3	2.3
PS ARC-F (ELFEXT)	12	1	63.8	60.3	3.5
ARC-N	36-45	4.9	59.1	57.1	2
PS ARC-N	45	4.9	57.2	54.6	2.6
Return Loss	78	2.3	19.6	19	0.6

The data summaries here make it clear that NEXT and Return Loss are often the limiting factors. Shorter cordsets closer to the source side of the link worsen NEXT, and to a lesser extent so does increasing total link length. Return Loss gets worse with increasing link length and with more cordsets.

Detailed test data sheets are shown in Appendix 1 herein.

### 6.0 Test Location, Date, and Personnel

Test Location: Glenair, Inc. 1131 Air Way, Glendale, CA.

Test Dates: 8/20/2015 and 9/14/2015

Engineer: Kyle Williams





## **Appendix 1: Test Results**



**Cable ID: 394A**

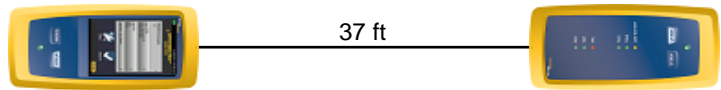
Date / Time: 09/14/2015 09:19:35 AM  
**Headroom 1.8 dB (NEXT 12-36)**  
**Test Limit: TIA Cat 6A Channel**  
 Cable Type: Cat 6A U/UTP  
 Calibration Date: 08/14/2014

Operator: KLW  
 Software Version: V3.0 Build 6  
 Limits Version: V3.0  
 NVP: 68.2%

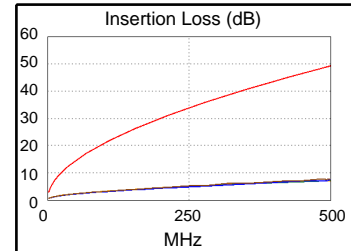
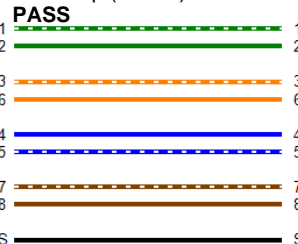
**Test Summary: PASS**

Model: DSX-5000  
 Main S/N: 2766352  
 Remote S/N: 2766289  
 Main Adapter: DSX-CHA004  
 Remote Adapter: DSX-CHA004

Length (ft), Limit 328	[Pair 36]	37
Prop. Delay (ns), Limit 555	[Pair 12]	57
Delay Skew (ns), Limit 50	[Pair 12]	1
Resistance (ohms)	[Pair 12]	3.4
Insertion Loss Margin (dB)	[Pair 78]	40.7
Frequency (MHz)	[Pair 78]	487.0
Limit (dB)	[Pair 78]	48.6

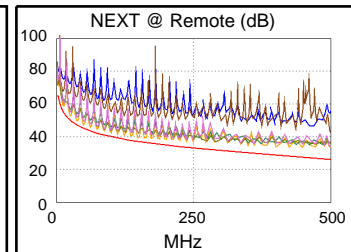
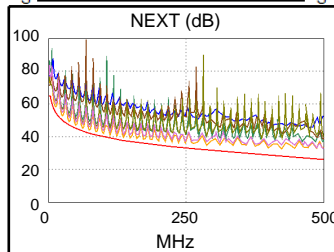


Wire Map (T568A)

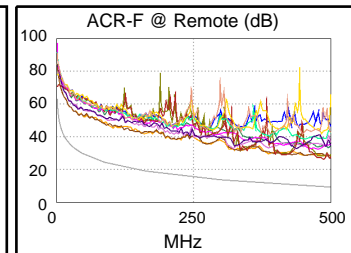
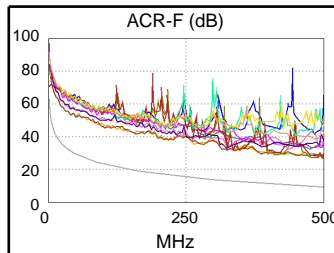


Worst Case Margin Worst Case Value

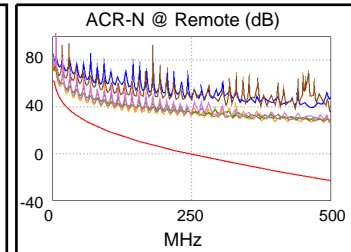
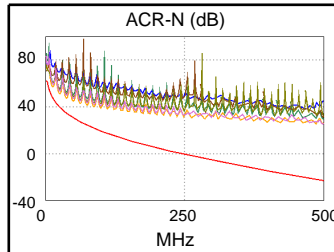
<b>PASS</b>	MAIN	SR	MAIN	SR
Worst Pair	12-36	12-36	12-36	12-36
<b>NEXT (dB)</b>	1.8	1.9	5.7	6.2
Freq. (MHz)	61.8	149.0	474.0	462.0
Limit (dB)	43.5	37.0	26.7	27.0
Worst Pair	36	36	45	12
<b>PS NEXT (dB)</b>	2.9	2.7	7.4	7.6
Freq. (MHz)	74.5	111.5	499.0	498.0
Limit (dB)	39.3	36.3	23.3	23.3



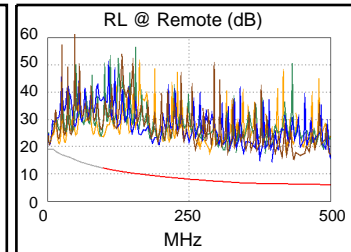
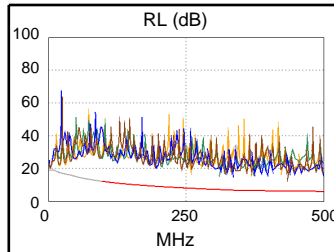
<b>PASS</b>	MAIN	SR	MAIN	SR
Worst Pair	45-36	45-36	45-36	45-36
<b>ACR-F (dB)</b>	16.6	16.6	16.6	16.6
Freq. (MHz)	487.0	487.0	487.0	487.0
Limit (dB)	9.5	9.5	9.5	9.5
Worst Pair	36	36	36	36
<b>PS ACR-F (dB)</b>	9.9	9.8	17.6	17.4
Freq. (MHz)	1.0	1.0	489.0	489.0
Limit (dB)	60.3	60.3	6.5	6.5



<b>N/A</b>	MAIN	SR	MAIN	SR
Worst Pair	36-45	36-45	45-78	12-36
<b>ACR-N (dB)</b>	8.6	8.8	48.3	48.4
Freq. (MHz)	1.0	1.1	498.0	486.0
Limit (dB)	62.0	62.0	-23.1	-22.1
Worst Pair	36	36	45	45
<b>PS ACR-N (dB)</b>	8.3	9.1	49.2	49.4
Freq. (MHz)	2.6	2.4	499.0	499.0
Limit (dB)	58.6	58.7	-26.0	-26.0



<b>PASS</b>	MAIN	SR	MAIN	SR
Worst Pair	45	78	45	78
<b>RL (dB)</b>	9.2	8.8	9.2	9.3
Freq. (MHz)	500.0	321.0	500.0	435.0
Limit (dB)	6.0	6.9	6.0	6.0



Compliant Network Standards:

10BASE-T	100BASE-TX	100BASE-T4
1000BASE-T	10GBASE-T	ATM-25
ATM-51	ATM-155	100VG-AnyLan
TR-4	TR-16 Active	TR-16 Passive



**Cable ID: 788A**

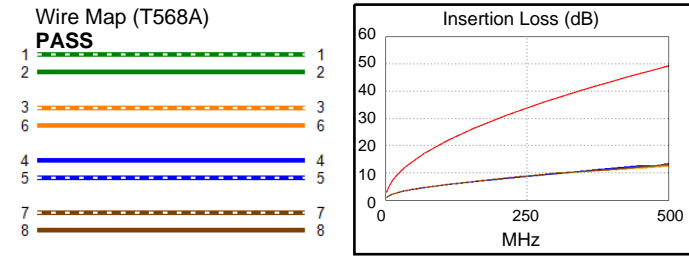
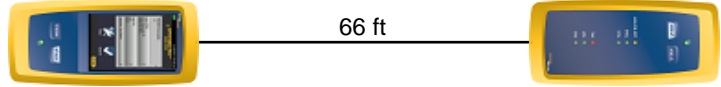
Date / Time: 09/14/2015 02:17:13 PM  
**Headroom 4.1 dB (NEXT 45-78)**  
**Test Limit: TIA Cat 6A Channel**  
 Cable Type: Cat 6A U/UTP  
 Calibration Date: 08/14/2014

Operator: KLVW  
 Software Version: V3.0 Build 6  
 Limits Version: V3.0  
 NVP: 68.2%

**Test Summary: PASS**

Model: DSX-5000  
 Main S/N: 2766352  
 Remote S/N: 2766289  
 Main Adapter: DSX-CHA004  
 Remote Adapter: DSX-CHA004

Length (ft), Limit 328	[Pair 36]	66
Prop. Delay (ns), Limit 555	[Pair 12]	100
Delay Skew (ns), Limit 50	[Pair 12]	1
Resistance (ohms)	[Pair 12]	6.1
Insertion Loss Margin (dB)	[Pair 45]	35.9
Frequency (MHz)	[Pair 45]	500.0
Limit (dB)	[Pair 45]	49.3



Worst Case Margin Worst Case Value

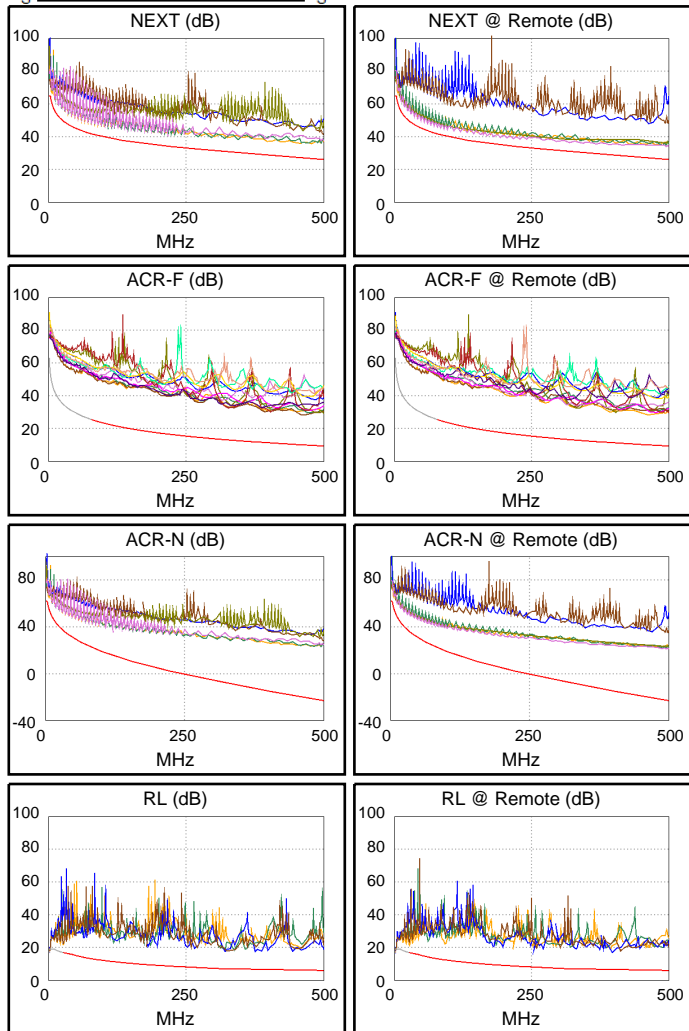
PASS	MAIN	SR	MAIN	SR
Worst Pair	12-36	45-78	12-45	45-78
<b>NEXT (dB)</b>	5.8	4.1	8.9	7.8
Freq. (MHz)	5.5	84.3	477.0	495.0
Limit (dB)	60.8	41.2	26.7	26.2
Worst Pair	36	45	12	45
<b>PS NEXT (dB)</b>	5.6	4.5	8.6	8.0
Freq. (MHz)	5.1	90.0	477.0	495.0
Limit (dB)	58.8	37.9	23.8	23.3

PASS	MAIN	SR	MAIN	SR
Worst Pair	36-12	12-36	36-12	12-36
<b>ACR-F (dB)</b>	18.2	18.1	18.3	18.1
Freq. (MHz)	460.0	460.0	466.0	460.0
Limit (dB)	10.0	10.0	9.9	10.0
Worst Pair	45	45	12	36
<b>PS ACR-F (dB)</b>	11.6	11.2	19.3	19.7
Freq. (MHz)	1.0	1.0	466.0	480.0
Limit (dB)	60.3	60.3	6.9	6.6

N/A	MAIN	SR	MAIN	SR
Worst Pair	12-36	12-36	12-45	45-78
<b>ACR-N (dB)</b>	9.1	9.3	45.9	43.8
Freq. (MHz)	5.5	5.4	495.0	495.0
Limit (dB)	56.0	56.2	-22.8	-22.8
Worst Pair	36	12	12	45
<b>PS ACR-N (dB)</b>	8.7	9.7	44.4	43.9
Freq. (MHz)	4.6	5.4	477.0	495.0
Limit (dB)	55.1	53.7	-24.3	-25.7

PASS	MAIN	SR	MAIN	SR
Worst Pair	12	12	78	45
<b>RL (dB)</b>	4.6	4.1	9.5	10.6
Freq. (MHz)	26.9	26.9	325.0	398.0
Limit (dB)	16.9	16.9	6.9	6.0

Compliant Network Standards:  
 10BASE-T      100BASE-TX      100BASE-T4  
 1000BASE-T      10GBASE-T      ATM-25  
 ATM-51      ATM-155      100VG-AnyLan  
 TR-4      TR-16 Active      TR-16 Passive





**Cable ID: 591A\_788A\_788B**

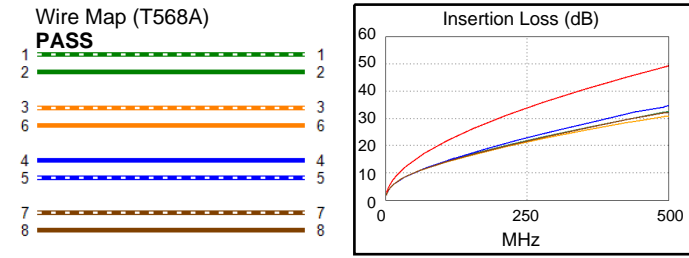
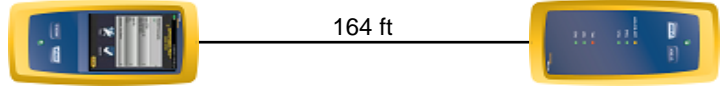
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**Headroom 2.7 dB (NEXT 12-78)**  
**Test Limit: TIA Cat 6A Channel**  
 Cable Type: Cat 6A U/UTP  
 Calibration Date: 08/14/2014

Operator: KLW  
 Software Version: V3.0 Build 6  
 Limits Version: V3.0  
 NVP: 68.2%

**Test Summary: PASS**

Model: DSX-5000  
 Main S/N: 2766352  
 Remote S/N: 2766289  
 Main Adapter: DSX-CHA004  
 Remote Adapter: DSX-CHA004

Length (ft), Limit 328	[Pair 36]	164
Prop. Delay (ns), Limit 555	[Pair 12]	247
Delay Skew (ns), Limit 50	[Pair 12]	2
Resistance (ohms)	[Pair 12]	15.2
Insertion Loss Margin (dB)	[Pair 45]	14.5
Frequency (MHz)	[Pair 45]	500.0
Limit (dB)	[Pair 45]	49.3



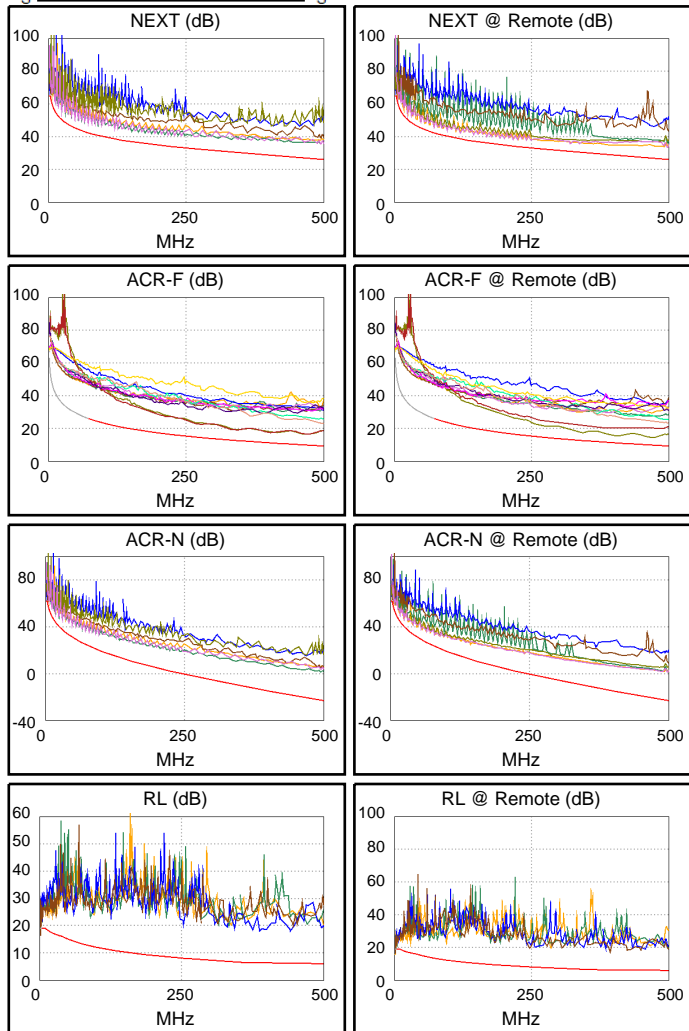
	Worst Case Margin		Worst Case Value	
<b>PASS</b>	MAIN	SR	MAIN	SR
Worst Pair	12-78	12-36	45-78	45-78
<b>NEXT (dB)</b>	2.7	2.8	9.4	7.3
Freq. (MHz)	2.3	48.0	495.0	497.0
Limit (dB)	65.0	45.3	26.2	26.2
Worst Pair	45	78	45	45
<b>PS NEXT (dB)</b>	4.4	3.6	8.5	8.2
Freq. (MHz)	3.9	2.0	495.0	498.0
Limit (dB)	60.8	62.0	23.3	23.3

<b>PASS</b>	MAIN	SR	MAIN	SR
Worst Pair	36-45	36-45	36-45	36-45
<b>ACR-F (dB)</b>	5.8	4.3	6.2	4.8
Freq. (MHz)	400.0	403.0	466.0	474.0
Limit (dB)	11.2	11.2	9.9	9.7
Worst Pair	12	12	45	45
<b>PS ACR-F (dB)</b>	6.5	6.3	8.7	7.2
Freq. (MHz)	1.0	1.0	466.0	474.0
Limit (dB)	60.3	60.3	6.9	6.7

<b>N/A</b>	MAIN	SR	MAIN	SR
Worst Pair	12-78	12-78	12-45	45-78
<b>ACR-N (dB)</b>	3.4	3.6	24.1	24.4
Freq. (MHz)	2.3	2.0	495.0	497.0
Limit (dB)	61.8	62.0	-22.8	-23.0
Worst Pair	45	78	45	45
<b>PS ACR-N (dB)</b>	5.3	4.2	23.5	22.7
Freq. (MHz)	3.9	2.0	500.0	498.0
Limit (dB)	56.7	59.0	-26.1	-25.9

<b>PASS</b>	MAIN	SR	MAIN	SR
Worst Pair	12	12	45	78
<b>RL (dB)</b>	3.4	3.0	12.0	11.1
Freq. (MHz)	3.4	3.4	442.0	434.0
Limit (dB)	19.0	19.0	6.0	6.0

Compliant Network Standards:  
 10BASE-T      100BASE-TX      100BASE-T4  
 1000BASE-T    10GBASE-T      ATM-25  
 ATM-51        ATM-155        100VG-AnyLan  
 TR-4           TR-16 Active    TR-16 Passive





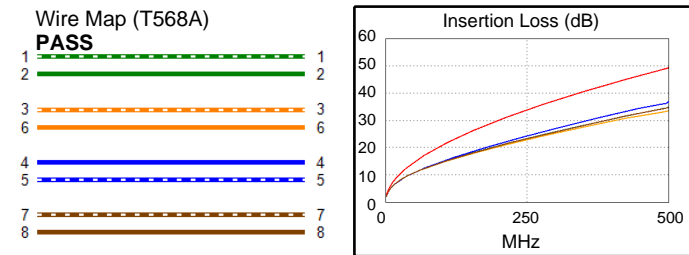
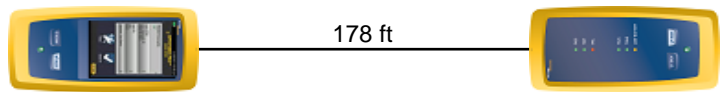
**Cable ID: 394A 394B 788A 788B**

Date / Time: 09/15/2015 10:46:54 AM  
**Headroom 0.3 dB (NEXT 36-45)**  
**Test Limit: TIA Cat 6A Channel**  
 Cable Type: Cat 6A U/UTP  
 Calibration Date: 08/14/2014

Operator: KLW  
 Software Version: V3.0 Build 6  
 Limits Version: V3.0  
 NVP: 68.2%

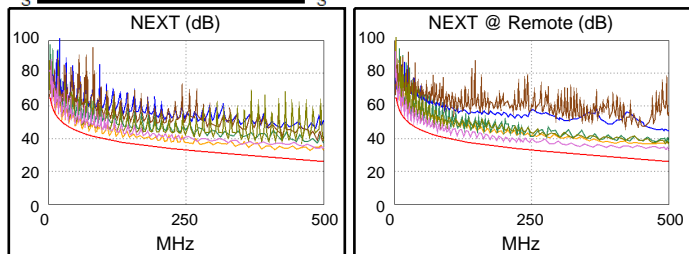
**Test Summary: PASS**  
 Model: DSX-5000  
 Main S/N: 2766352  
 Remote S/N: 2766289  
 Main Adapter: DSX-CHA004  
 Remote Adapter: DSX-CHA004

Length (ft), Limit 328	[Pair 36]	178
Prop. Delay (ns), Limit 555	[Pair 12]	266
Delay Skew (ns), Limit 50	[Pair 12]	1
Resistance (ohms)	[Pair 12]	16.1
Insertion Loss Margin (dB)	[Pair 45]	12.4
Frequency (MHz)	[Pair 45]	500.0
Limit (dB)	[Pair 45]	49.3

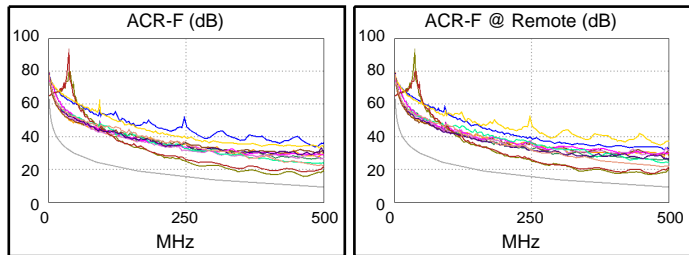


Worst Case Margin Worst Case Value

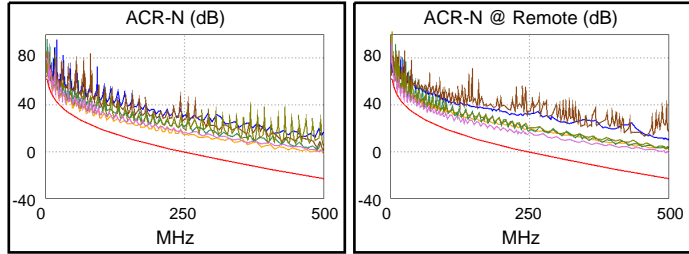
<b>PASS</b>	MAIN	SR	MAIN	SR
Worst Pair	36-45	36-45	12-36	45-78
<b>NEXT (dB)</b>	0.3*	1.7	5.9	6.9
Freq. (MHz)	1.4	1.0	474.0	500.0
Limit (dB)	65.0	65.0	26.7	26.1
Worst Pair	36	78	12	78
<b>PS NEXT (dB)</b>	2.1	2.9	7.4	8.1
Freq. (MHz)	11.9	11.9	474.0	500.0
Limit (dB)	52.8	52.8	23.8	23.2



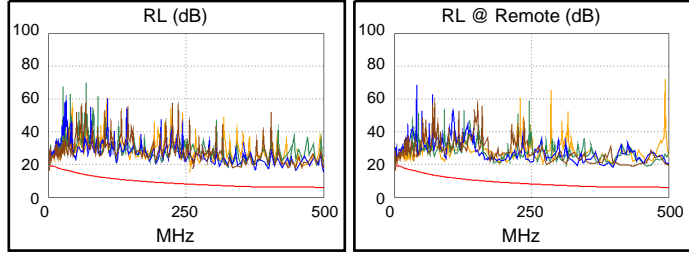
<b>PASS</b>	MAIN	SR	MAIN	SR
Worst Pair	36-45	36-45	36-45	36-45
<b>ACR-F (dB)</b>	2.2	2.2	5.8	6.8
Freq. (MHz)	1.0	1.0	463.0	462.0
Limit (dB)	63.3	63.3	9.9	10.0
Worst Pair	45	45	45	45
<b>PS ACR-F (dB)</b>	4.5	4.5	7.9	8.7
Freq. (MHz)	1.0	1.0	463.0	478.0
Limit (dB)	60.3	60.3	6.9	6.7



<b>N/A</b>	MAIN	SR	MAIN	SR
Worst Pair	36-45	36-45	12-36	45-78
<b>ACR-N (dB)</b>	1.2	2.8	21.6	21.6
Freq. (MHz)	1.5	1.0	499.0	500.0
Limit (dB)	62.0	62.0	-23.1	-23.2
Worst Pair	36	78	45	45
<b>PS ACR-N (dB)</b>	2.9	4.3	21.0	21.0
Freq. (MHz)	1.9	11.9	499.0	500.0
Limit (dB)	59.0	45.7	-26.0	-26.1



<b>PASS</b>	MAIN	SR	MAIN	SR
Worst Pair	12	12	45	78
<b>RL (dB)</b>	1.9*	1.8*	9.4	11.8
Freq. (MHz)	2.9	2.9	500.0	446.0
Limit (dB)	19.0	19.0	6.0	6.0



Compliant Network Standards:  
 10BASE-T 100BASE-TX 100BASE-T4  
 1000BASE-T 10GBASE-T ATM-25  
 ATM-51 ATM-155 100VG-AnyLan  
 TR-4 TR-16 Active TR-16 Passive

\* Measurement is within the accuracy limits of the instrument.



**Cable ID: 788A 788B 394A 394B**

Date / Time: 09/15/2015 10:52:15 AM

Headroom 0.6 dB (NEXT 36-45)

Test Limit: TIA Cat 6A Channel

Cable Type: Cat 6A U/UTP

Calibration Date: 08/14/2014

Operator: KLVW

Software Version: V3.0 Build 6

Limits Version: V3.0

NVP: 68.2%

**Test Summary: PASS**

Model: DSX-5000

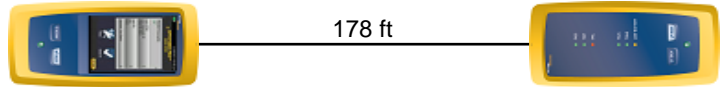
Main S/N: 2766352

Remote S/N: 2766289

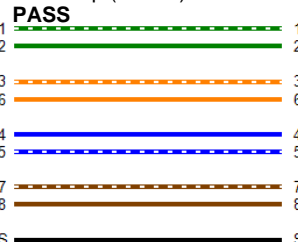
Main Adapter: DSX-CHA004

Remote Adapter: DSX-CHA004

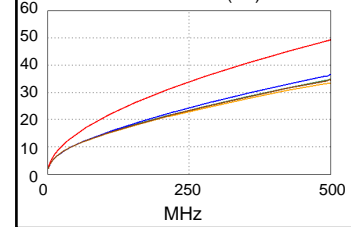
Length (ft), Limit 328	[Pair 36]	178
Prop. Delay (ns), Limit 555	[Pair 12]	266
Delay Skew (ns), Limit 50	[Pair 12]	1
Resistance (ohms)	[Pair 78]	16.2
Insertion Loss Margin (dB)	[Pair 45]	12.6
Frequency (MHz)	[Pair 45]	500.0
Limit (dB)	[Pair 45]	49.3



Wire Map (T568A)

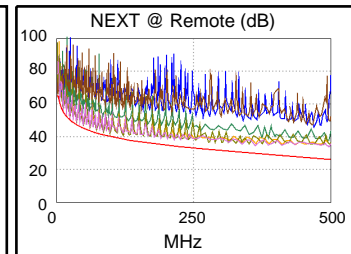
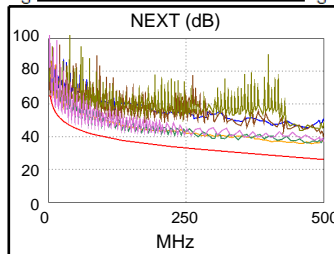


Insertion Loss (dB)

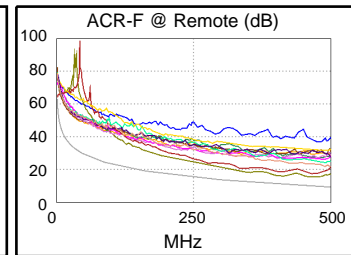
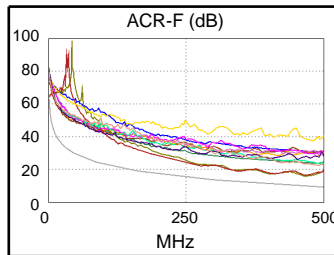


Worst Case Margin Worst Case Value

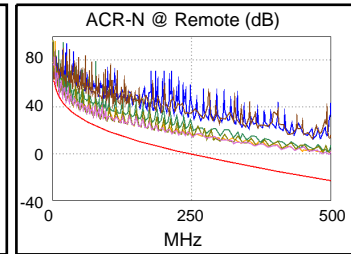
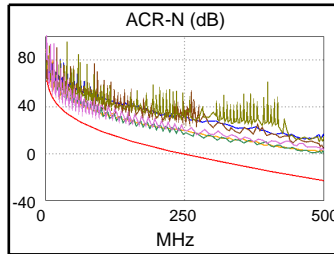
PASS	MAIN	SR	MAIN	SR
Worst Pair	36-45	36-45	12-45	45-78
<b>NEXT (dB)</b>	0.6*	0.8	8.9	7.4
Freq. (MHz)	2.6	2.4	477.0	484.0
Limit (dB)	65.0	65.0	26.7	26.5
Worst Pair	36	36	12	36
<b>PS NEXT (dB)</b>	3.5	1.6	8.6	7.6
Freq. (MHz)	2.9	23.9	477.0	473.0
Limit (dB)	62.0	47.7	23.8	23.9



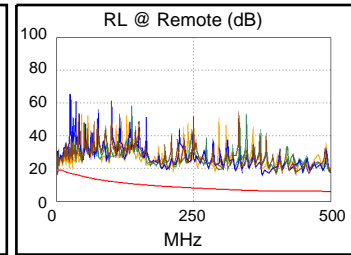
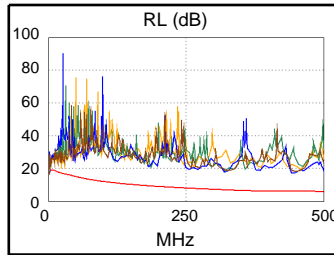
PASS	MAIN	SR	MAIN	SR
Worst Pair	45-36	36-45	36-45	36-45
<b>ACR-F (dB)</b>	1.9	1.9	6.0	5.1
Freq. (MHz)	1.0	1.0	471.0	464.0
Limit (dB)	63.3	63.3	9.8	9.9
Worst Pair	45	45	45	45
<b>PS ACR-F (dB)</b>	4.3	4.0	7.8	7.3
Freq. (MHz)	1.0	1.0	472.0	464.0
Limit (dB)	60.3	60.3	6.8	6.9



N/A	MAIN	SR	MAIN	SR
Worst Pair	36-45	36-45	12-45	45-78
<b>ACR-N (dB)</b>	1.1	1.3	23.0	22.4
Freq. (MHz)	2.6	2.4	495.0	497.0
Limit (dB)	61.6	61.7	-22.8	-23.0
Worst Pair	36	36	45	45
<b>PS ACR-N (dB)</b>	4.0	3.0	22.6	22.0
Freq. (MHz)	2.6	12.0	500.0	496.0
Limit (dB)	58.6	45.6	-26.1	-25.8



PASS	MAIN	SR	MAIN	SR
Worst Pair	78	12	45	45
<b>RL (dB)</b>	1.1*	1.4*	10.5	9.7
Freq. (MHz)	2.8	2.8	446.0	375.0
Limit (dB)	19.0	19.0	6.0	6.3



Compliant Network Standards:

10BASE-T	100BASE-TX	100BASE-T4
1000BASE-T	10GBASE-T	ATM-25
ATM-51	ATM-155	100VG-AnyLan
TR-4	TR-16 Active	TR-16 Passive

\* Measurement is within the accuracy limits of the instrument.



**Cable ID: 591A\_394A\_788A\_788B**

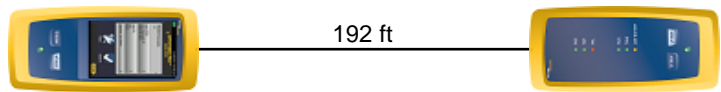
Date / Time: 08/20/2015 11:45:41 AM  
**Headroom 1.0 dB (NEXT 12-36)**  
**Test Limit: TIA Cat 6A Channel**  
 Cable Type: Cat 6A U/UTP  
 Calibration Date: 08/14/2014

Operator: KLVW  
 Software Version: V3.0 Build 6  
 Limits Version: V3.0  
 NVP: 68.2%

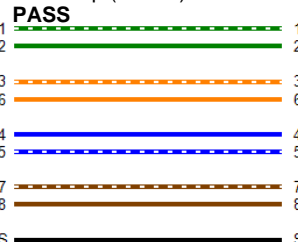
**Test Summary: PASS**

Model: DSX-5000  
 Main S/N: 2766352  
 Remote S/N: 2766289  
 Main Adapter: DSX-CHA004  
 Remote Adapter: DSX-CHA004

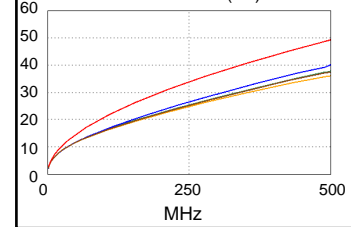
Length (ft), Limit 328	[Pair 36]	192
Prop. Delay (ns), Limit 555	[Pair 12]	287
Delay Skew (ns), Limit 50	[Pair 12]	1
Resistance (ohms)	[Pair 78]	17.6
Insertion Loss Margin (dB)	[Pair 45]	9.1
Frequency (MHz)	[Pair 45]	500.0
Limit (dB)	[Pair 45]	49.3



Wire Map (T568A)

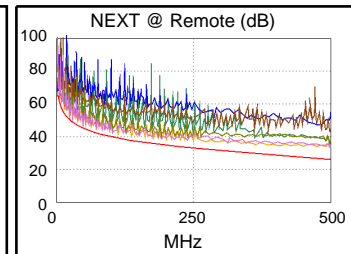
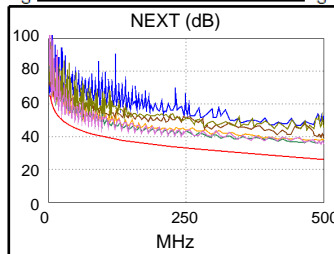


Insertion Loss (dB)

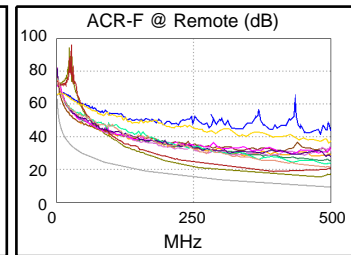
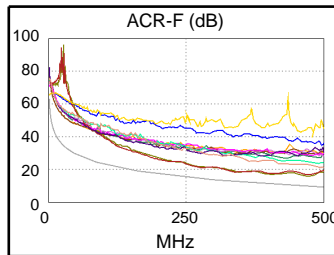


Worst Case Margin Worst Case Value

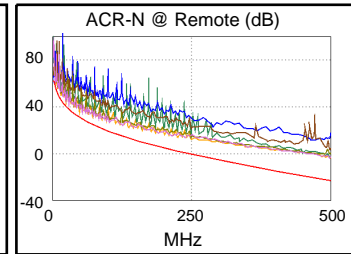
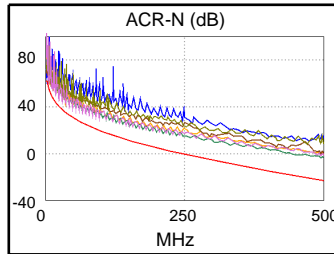
PASS	MAIN	SR	MAIN	SR
Worst Pair	12-78	12-36	45-78	45-78
<b>NEXT (dB)</b>	2.2	1.0	9.3	7.5
Freq. (MHz)	1.9	23.9	495.0	498.0
Limit (dB)	65.0	50.4	26.2	26.1
Worst Pair	45	36	45	45
<b>PS NEXT (dB)</b>	3.0	1.7	8.6	8.1
Freq. (MHz)	5.5	23.9	495.0	498.0
Limit (dB)	58.3	47.7	23.3	23.3



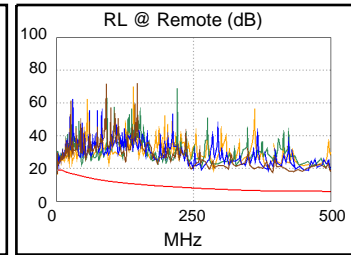
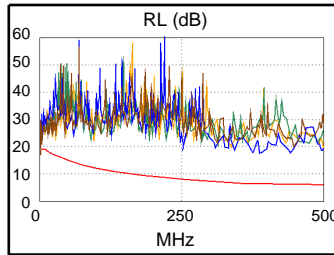
PASS	MAIN	SR	MAIN	SR
Worst Pair	12-78	78-12	36-45	36-45
<b>ACR-F (dB)</b>	2.9	2.9	6.2	5.2
Freq. (MHz)	1.0	1.0	474.0	476.0
Limit (dB)	63.3	63.3	9.7	9.7
Worst Pair	12	12	45	45
<b>PS ACR-F (dB)</b>	4.9	4.7	8.2	7.2
Freq. (MHz)	1.0	1.0	476.0	476.0
Limit (dB)	60.3	60.3	6.7	6.7



N/A	MAIN	SR	MAIN	SR
Worst Pair	12-78	12-36	12-45	12-36
<b>ACR-N (dB)</b>	2.5	2.6	19.1	19.1
Freq. (MHz)	1.9	23.9	495.0	499.0
Limit (dB)	62.0	40.3	-22.8	-23.1
Worst Pair	45	36	45	45
<b>PS ACR-N (dB)</b>	3.4	3.2	18.2	17.3
Freq. (MHz)	5.4	23.9	500.0	498.0
Limit (dB)	53.7	37.7	-26.1	-25.9



PASS	MAIN	SR	MAIN	SR
Worst Pair	78	12	45	78
<b>RL (dB)</b>	0.9*	0.9*	11.4	10.8
Freq. (MHz)	2.4	2.5	387.0	434.0
Limit (dB)	19.0	19.0	6.1	6.0



Compliant Network Standards:

10BASE-T	100BASE-TX	100BASE-T4
1000BASE-T	10GBASE-T	ATM-25
ATM-51	ATM-155	100VG-AnyLan
TR-4	TR-16 Active	TR-16 Passive

\* Measurement is within the accuracy limits of the instrument.



**Cable ID: 591A\_591B\_788A\_788B**

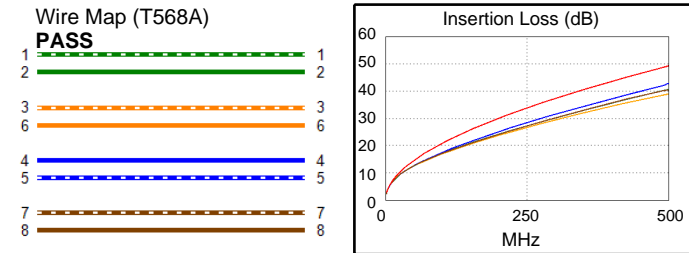
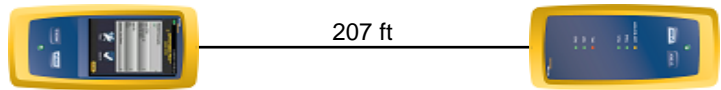
Date / Time: 08/20/2015 11:44:01 AM  
**Headroom 1.9 dB (NEXT 36-45)**  
**Test Limit: TIA Cat 6A Channel**  
 Cable Type: Cat 6A U/UTP  
 Calibration Date: 08/14/2014

Operator: KLW  
 Software Version: V3.0 Build 6  
 Limits Version: V3.0  
 NVP: 68.2%

**Test Summary: PASS**

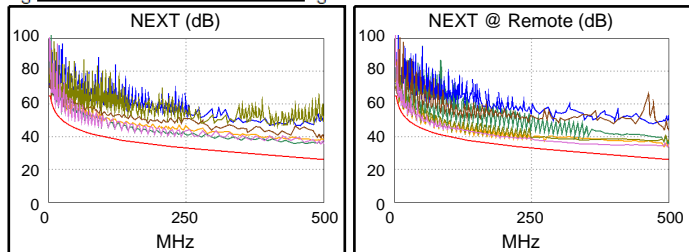
Model: DSX-5000  
 Main S/N: 2766352  
 Remote S/N: 2766289  
 Main Adapter: DSX-CHA004  
 Remote Adapter: DSX-CHA004

Length (ft), Limit 328	[Pair 36]	207
Prop. Delay (ns), Limit 555	[Pair 12]	310
Delay Skew (ns), Limit 50	[Pair 12]	2
Resistance (ohms)	[Pair 78]	19.1
Insertion Loss Margin (dB)	[Pair 45]	6.4
Frequency (MHz)	[Pair 45]	500.0
Limit (dB)	[Pair 45]	49.3

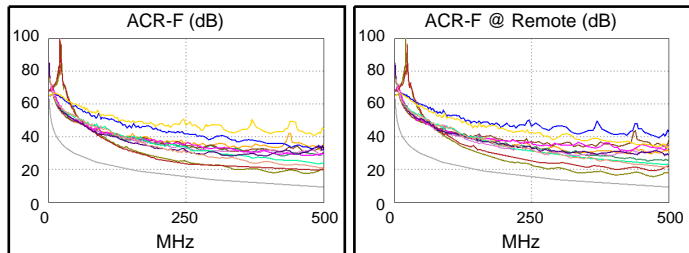


Worst Case Margin Worst Case Value

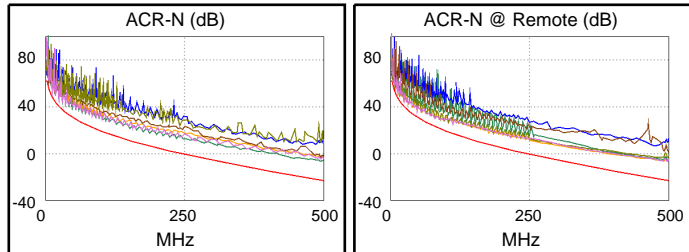
PASS	MAIN	SR	MAIN	SR
Worst Pair	36-45	12-36	45-78	45-78
<b>NEXT (dB)</b>	1.9	2.6	9.3	7.6
Freq. (MHz)	4.9	23.9	494.0	498.0
Limit (dB)	61.7	50.4	26.2	26.1
Worst Pair	45	36	45	45
<b>PS NEXT (dB)</b>	2.6	2.7	8.3	8.2
Freq. (MHz)	5.0	23.6	494.0	498.0
Limit (dB)	59.0	47.8	23.4	23.3



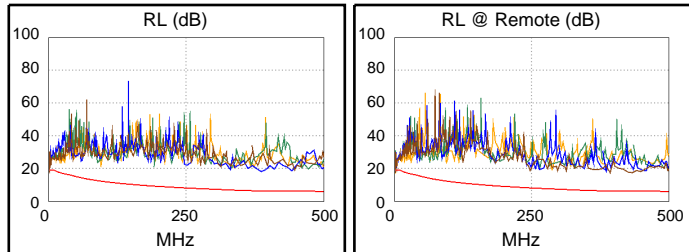
PASS	MAIN	SR	MAIN	SR
Worst Pair	12-78	78-12	36-45	36-45
<b>ACR-F (dB)</b>	2.3	2.3	7.1	5.8
Freq. (MHz)	1.0	1.0	466.0	473.0
Limit (dB)	63.3	63.3	9.9	9.8
Worst Pair	12	12	45	45
<b>PS ACR-F (dB)</b>	3.6	3.5	8.9	7.8
Freq. (MHz)	1.0	1.0	466.0	476.0
Limit (dB)	60.3	60.3	6.9	6.7



N/A	MAIN	SR	MAIN	SR
Worst Pair	36-45	12-36	12-45	45-78
<b>ACR-N (dB)</b>	2.0	3.4	16.0	16.3
Freq. (MHz)	4.9	23.6	495.0	498.0
Limit (dB)	57.1	40.5	-22.8	-23.1
Worst Pair	45	36	45	45
<b>PS ACR-N (dB)</b>	2.6	3.2	15.3	14.7
Freq. (MHz)	4.9	8.0	500.0	498.0
Limit (dB)	54.6	49.8	-26.1	-25.9



PASS	MAIN	SR	MAIN	SR
Worst Pair	78	12	45	78
<b>RL (dB)</b>	0.6*	1.0*	11.5	11.0
Freq. (MHz)	2.3	2.4	387.0	434.0
Limit (dB)	19.0	19.0	6.1	6.0



Compliant Network Standards:  
 10BASE-T      100BASE-TX      100BASE-T4  
 1000BASE-T    10GBASE-T      ATM-25  
 ATM-51        ATM-155        100VG-AnyLan  
 TR-4           TR-16 Active    TR-16 Passive

\* Measurement is within the accuracy limits of the instrument.