

Title: Telecommunications Zone Distribution System CAT5e Performance

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Introduction

The Siemon Company, the manufacturer of telecommunications connectors used in the America Cable Systems (ACS) telecommunications zone distribution system recently performed CAT5e validation testing of the system. The zone distribution system includes the armored home run cable comprising an 18-count bundle of Hitachi CAT5e 4-pair cables that are terminated at the ACS zone distribution box (ZDB). This testing revealed that the zone distribution system meets the CAT5e standard with positive performance margin in all of the performance parameters. This application note describes the test procedure and results of the CAT5e testing.

Standards

The CAT5e performance standard is detailed in ANSI/TIA/EIA-568-A-5, *Transmission Performance Specifications for 4-Pair 100 Ohm Category 5e Cabling*. The performance of hybrid cable, such as the ACS home run cable, is detailed in ANSI/TIA/EIA-568-A-3, *Hybrid Cable*.

Summary of Test Results

Individual cables in the home run cable assembly, which consists of a 260-foot long armored 18-count bundle of Hitachi 4-pair CAT5e cables, were tested alone and found to comply with the performance requirements of the CAT5e specification up to 100 MHz. Figure 1 summarizes the results of this testing.

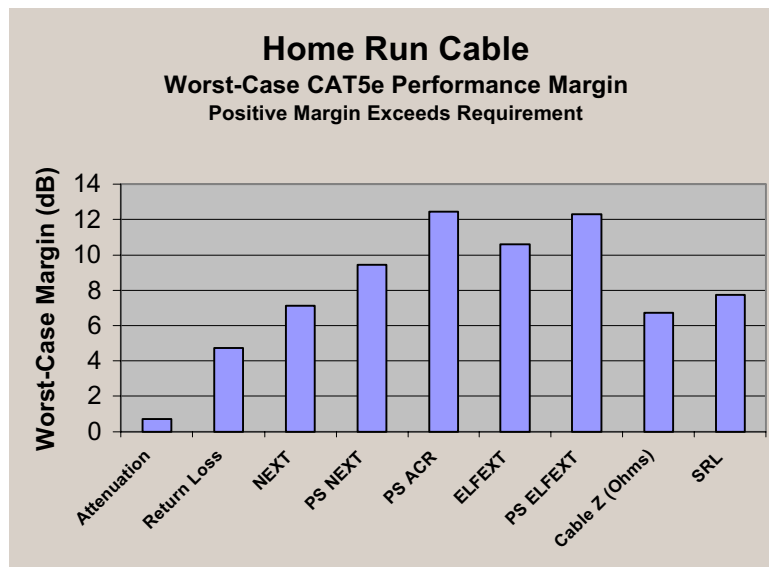


Figure 1. CAT5e Performance Margin of Home Run Cable

Earlier testing of the ACS armored home run cable showed that the home run cable complies with the PSNEXT requirements of the hybrid cable standard. These data are presented in a separate application note.

The ACS zone distribution system using Siemon CAT5e connectors and Hitachi Hi-Net Plus CAT5e cable in the home run cable assembly was tested in both a link configuration and in a channel configuration and found to comply with the performance requirements of the CAT5e specification. Please note that the test data for both the link configuration and the channel configuration are evaluated against the CAT5e link performance specification. The test equipment available for this testing did not evaluate the data against the CAT5e channel performance requirements.

In interpreting the results, we can see that the connectors and the system configuration do not appreciably degrade the performance of the home run cable, including the worst-case margin in attenuation. In the other parameters, the ACS zone distribution system offers substantial (+3dB or greater) worst-case performance margin in both the link and channel configurations. Figures 2 and 3 summarize the results of this testing.

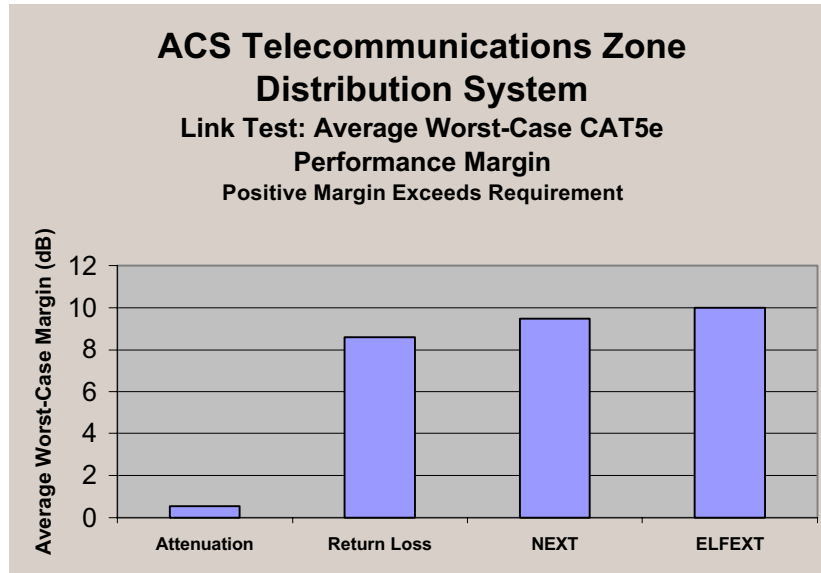


Figure 2. Link Configuration CAT5e Performance Margin - ACS Telecommunications Zone Distribution System.

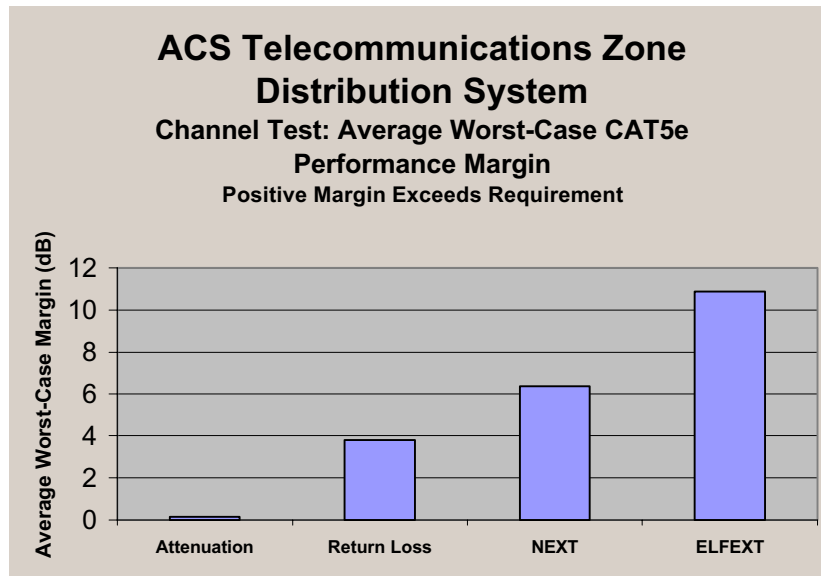


Figure 3. Channel Configuration CAT5e Performance Margin - ACS Telecommunications Zone Distribution System.

Test Equipment

1. Hewlett Packard Model 8753D Network Analyzer (calibration due: 03/30/01)
2. BH Electronics Baluns (P/N: 040-0055)
3. MicroTest Omni Scanner (P/N: 2950-4000-04)

Test Procedure

The home run cable was evaluated using a network analyzer as shown in Figure 4 below.

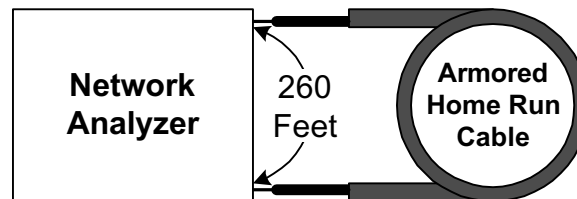


Figure 4. Test Setup for Home Run Cable Testing.

The link configuration of the ACS telecommunications zone distribution system was evaluated as shown in Figure 5 below.

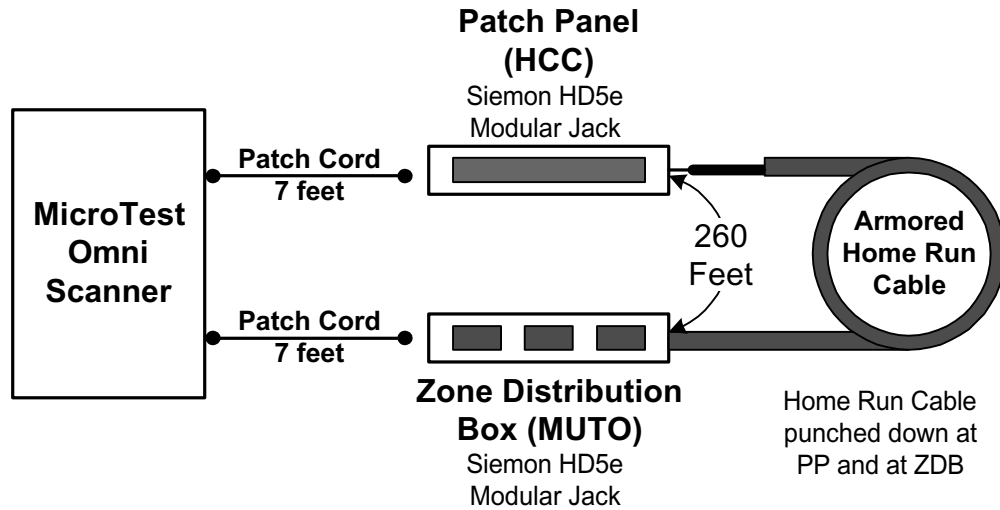


Figure 5. Link Configuration for CAT5e Testing.

The channel configuration of the ACS telecommunications zone distribution system was evaluated as shown in Figure 5 below. Please note again that the test data for the channel configuration are evaluated against the CAT5e link performance specification. The Omni Scanner test equipment currently available does not evaluate the data against the CAT5e channel performance requirements.

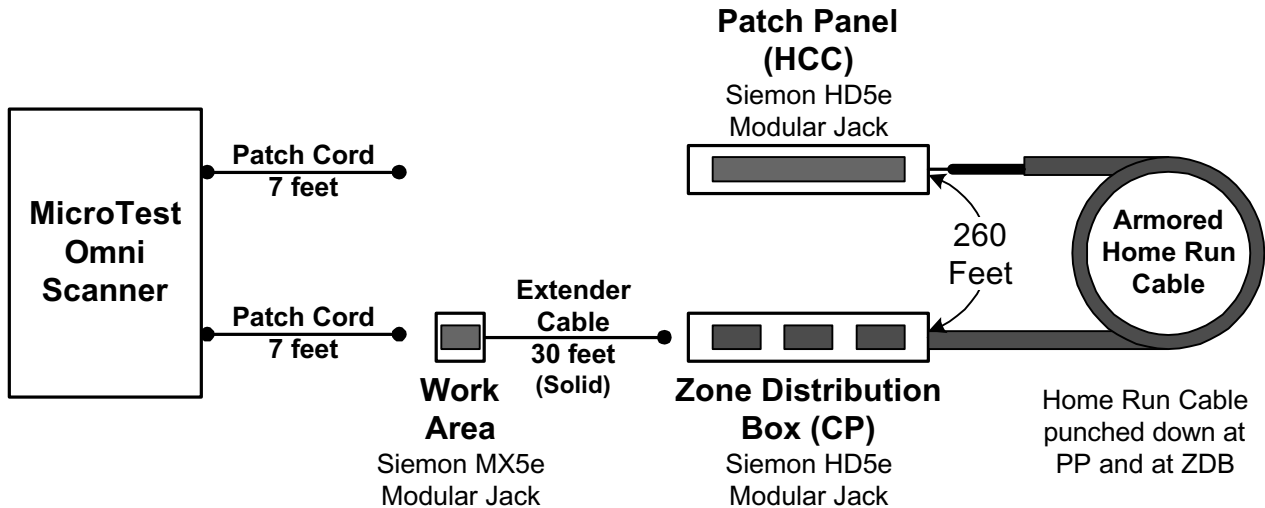


Figure 6. Channel Configuration for CAT5e Testing.

Test Results

The detailed results of the home run cable consisting testing is shown in the table below.

Home Run Cable	Pass/ Fail	Worst Case Value (dB)	Frequency (MHz)	Margin* (dB)
Attenuation	✓	1.83	1.4	0.69
Return Loss	✓	-26.04	1.84	4.72
NEXT	✓	-51.21	26.01	7.13
PS NEXT	✓	-50.51	26.01	9.43
PS ACR	✓	42.92	26.01	12.43
ELFEXT	✓	-30.28	159.67	10.59
PS ELFEXT	✓	-31.05	125.8	12.29
Cable Impedance	✓	108.26 (Ohms)	91.87	6.74 (Ohms)
SRL	✓	28.42	34.26	7.75

* A negative margin fails to meet '568-A CAT 5e cabling requirements while a positive margin exceeds '568-A CAT5e cabling requirements.

The detailed test results of the link configuration testing are shown in the table below.

Test Sequence	Pass/ Fail	Attenuation (dB)	Return Loss (dB)	NEXT (dB)	ELFEXT (dB)
1-1	✓	0.6	8.7	8.2	13.7
1-2	✓	0.6	8.8	8.1	13.6
1-3	✓	0.5	8.6	9.9	7.4
1-4	✓	0.5	8.3	10.0	7.6
1-5	✓	0.5	8.4	10.2	9.1
1-6	✓	0.5	8.7	10.4	8.7

The detailed test results of the channel configuration testing are shown in the table below.

Test Sequence	Pass/ Fail	Attenuation (dB)	Return Loss (dB)	NEXT (dB)	ELFEXT (dB)
3-1	✓	0.1	3.7	6.2	11.9
3-2	✓	0.1	3.9	5.9	11.7
3-3	✓	0.2	3.6	7.2	10.9
3-4	✓	0.2	4.2	6.8	10.7
3-5	✓	0.1	3.5	6.0	10.1
3-6	✓	0.1	3.9	6.1	9.9