

TEST REPORT No. 16015-1-CT6E

January 22, 2001

Transmission Performance Testing

according to: ISO/IEC JTC 1/SC 25 N 655 (2000)
Limits relating to Connecting Hardware Cat.6

- Maximum Attenuation
- Minimum Next Loss
- Minimum PowerSum NEXT Loss
- Return Loss
- Input to output Resistance
- Transfer Impedance

Prepared for: Telegärtner Karl Gärtner GmbH
Lerchenstraße 35
D-71144 Steinenbronn/Germany

Equipment under Test:

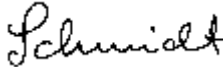
Part number : J02023F0019 electrically identical to
J02023F0020, J02023B0019, J02023C0019, J02023E0019, J02022F0024,
J02022B0024, J02022F0025, J02022A0036, J02022A0037, J02022A0038,
J02022A0039, J02022A0028, J02022A0035, J02022A0031, J02022A0032,
J02021A0015, J02021A0016, J02021A0017, J02021A0018, J02021A0019,
J02021A0020.

Type : Mod. Patch Panel Cat.6 MPP24 screened / unscreened RAL 7035
Mod. Patch Panel Cat.6 MPP16 screened / unscreened RAL 7035
½ 19" Mod. Patch Panel Cat.6 MPP12 screened / unscreened RAL 7035
10" Mod. Patch Panel Cat.6 MPP12 screened / unscreened RAL 7035
Mini Distributor Cat.6 MPD12 screened / unscreened
Mini Distributor Cat.6 Typ II MPD6 screened / unscreened
Mini Distributor Cat.6 3HE / 8TE MPD6 screened / unscreened
Mini Distributor Cat.6 3HE / 10TE MPD12 screened / unscreened

Date tested: January 18, 2001

Test passed: YES

Testing Location: ELMAC GmbH, Boschstrasse 2
D-71149 Bondorf/Germany
Tel: ++49(0)7457/9441-0 eMail: info@elmac.de
Fax: ++49(0)7457/9441-99 WWW: <http://www.elmac.de>

Tested by: 
U. Schmidt 2001-09-24
Date

Engineer in charge: 
J. Bühne 2001-09-24
Date

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2. Test Specifications and Equipment under Test
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Notes:

ELMAC GmbH represents to the client that testing is done in accordance with the standard procedures stated under 2.1. All deviations will be listed separately.

The test results of this report are exclusively referring to the specific sample tested under stated test conditions. ELMAC GmbH shall have no liability for any deductions, inferences or generalizations drawn from the test results.

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2. Test Specifications and Equipment under Test

2.1. Test Specifications:

ISO/IEC JTC 1/SC 25 N 655 (2000)

Limits relating to Connecting Hardware Cat.6

Following tests had to be performed:

- Maximum Attenuation
- Minimum Next Loss
- Minimum PowerSum NEXT Loss
- Return Loss
- Input to output Resistance
- Transfer Impedance

2.2. Specification of the Equipment under Test (EUT)

Part number : J02023F0019 electrically identical to
J02023F0020, J02023B0019, J02023C0019, J02023E0019, J02022F0024,
J02022B0024, J02022F0025, J02022A0036, J02022A0037, J02022A0038,
J02022A0039, J02022A0028, J02022A0035, J02022A0031, J02022A0032,
J02021A0015, J02021A0016, J02021A0017, J02021A0018, J02021A0019,
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Mini Distributor Cat.6 Typ II MPD6 screened / unscreened
Mini Distributor Cat.6 3HE / 8TE MPD6 screened / unscreened
Mini Distributor Cat.6 3HE / 10TE MPD12 screened / unscreened

3. Summary of the Test Results

3.1. Overview

Test	Test report See Paragraph	Test passed	Remarks
Maximum Attenuation	4.1.	YES	
Minimum Next Loss	4.2.	YES	
Minimum PowerSum NEXT Loss	4.3.	YES	
Minimum Return Loss	4.4.	YES	
Maximum input to output Resistance	4.5	YES	
Maximum Transfer Impedance	4.6	YES	

3.2. Verification and Certification Status

The EUT - specified in paragraph 2.2. - has been verified as being compliant with the standard

ISO/IEC JTC 1/SC 25 N 655 (2000)

Requirements for Attenuation, Next Loss, PowerSum NEXT Loss, Return Loss,
Input to output Resistance, Transfer Impedance.

4. Test Results

4.1. Attenuation

The attenuation was measured as the signal power loss due to the connecting hardware and was derived from swept frequency voltage measured as on short lengths of coaxial test leads before and after splicing in the connecting hardware. (See picture 2.)

The summarized test results see table 1.

The required limits were met: **YES**

4.2. Next Loss

The Next loss was measured as the signal coupling from one cable pair to another. A balanced input signal was applied to a disturbing pair of the connector while the induced signal on the disturbed pair was measured. Each pair was terminated by a 100 Ohm one percent resistor on both sides. The connection to the DUT was made by a short twisted pair cable, which was correct impedance-matched to the coaxial test leads. (See picture 3.)

The summarized test results see table 1.

The required limits were met: **YES**

4.3. Power Sum Next Loss

Power Sum Near End Crosstalk takes into account the combined crosstalk on a receive pair from all near end disturbers operating simultaneously. The power sum crosstalk (Psum NEXT)is calculated in accordance to ASTM D4566 as a power sum on a selected pair from all other pairs as shown in equation for the case of 4-pair connecting hardware.

The summarized test results see table 2.

The required limits were met: **YES**

4.4. Return Loss

Each pair was terminated by a 100 Ohm one percent resistor on both sides. The connection to the DUT was made by short lengths of coaxial test leads. (See picture 4.)

The summarized test results see table 2.

The required limits were met: **YES**

4.5. Input to Output Resistance

The input to output resistance was measured by using a 4-wire resistance test probe. The far-end of the test setup corresponded to the 8-pin connector was terminated by a 8 pin plug with the wires of each pair soldered together.

The summarized test results see table 3.

The required limits were met: **YES**

4.6. Maximum Transfer Impedance

The Maximum Transfer Impedance was measured by using the test setup and test procedure according to IEC 96.1, clause 1.8.

The summarized test results see table 3..

The required limits were met: **YES**

4.7. Remarks about test setup

Measuring is accomplished by connecting 2 pairs of the tested device to the 8-port S-parameter test set and changing the combination of pairs until all combinations had been tested.

The connections between the S-parameter test set and the ports of the tested device were made by using SMA plugs and 25 cm coaxial cables RG 178.

The S-parameter test set, the HP 4380S RF Balanced Cable Test System, is a balanced measuring system consisting of the HP 4396B network analyzer, the HP 4380A 8-port test set with option 001 (RF Balanced Cable Test) and the Pentium II PC with HP-BASIC.

The HP 4380S has the following features:

- Frequency range from 10 kHz to 1000 MHz
- No baluns needed for measuring
- Obtains balanced parameters and unbalanced parameters without replacing cables
- Corresponds to any impedance by using parameter conversion
- Calibrates up to higher frequency with existing unbalance standard device.

Graphs of the measurements were taken and plotted with the continuous limits. For a simple presentation of test results in tables the frequency range 1 MHz to 600 MHz was splitted into some frequency bands. In the tables the worst case limit of each band and the worst case reading of each band is given.

Normally the margin between the readings and the continuous limits is at least equal but normally better than resulting from the tables.

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 J02021A0015, J02021A0016, J02021A0017, J02021A0018, J02021A0019,
 J02021A0020.

Table 1: Summarized Test Results – Max. Attenuation, Min. Next Loss

Max. Attenuation [dB]		ISO/IEC JTC 1/SC 25 N 655 (2000)			
Frequency [MHz]	Cat.6 Limit	EUT Results			
		1-2	3-6	4-5	7-8
1.0	-0.1	-0.02	-0.02	-0.02	-0.04
4.0	-0.1	-0.02	-0.02	-0.02	-0.04
10.0	-0.1	-0.02	-0.02	-0.02	-0.04
16.0	-0.1	-0.04	-0.04	-0.04	-0.08
20.0	-0.1	-0.04	-0.04	-0.04	-0.08
25.0	-0.1	-0.04	-0.04	-0.04	-0.08
31.3	-0.1	-0.08	-0.08	-0.08	-0.1
62.5	-0.2	-0.1	-0.1	-0.1	-0.1
100.0	-0.2	-0.1	0.1	-0.1	-0.1
125.0	-0.2	-0.1	-0.1	0.1	-0.1
155.5	-0.2	-0.1	-0.1	-0.1	-0.1
175.0	-0.3	-0.1	-0.1	-0.1	-0.1
200.0	-0.3	-0.2	-0.2	-0.2	-0.2
250.0	-0.3	-0.2	-0.25	-0.2	-0.3
300.0	n.a.	-0.3	-0.3	-0.3	-0.4
600.0	n.a.	-1.2	-2.0	-2.1	-1.0

Min. NEXT [dB]		ISO/IEC JTC 1/SC 25 N 655 (2000)					
Frequency [MHz]	Cat.6 Limit	EUT Results					
		1-2/7-8	1-2/3-6	1-2/4-5	4-5/3-6	4-5/7-8	3-6/7-8
1.0	-80.0	-89.0	-89.7	-92.8	-91.4	-98.4	-94.2
4.0	-80.0	-90.6	-85.4	-95.6	-83.3	-88.6	-84.5
10.0	-74.0	-88.8	-83.7	-88.8	-75.0	-79.9	-82.8
16.0	-69.9	-86.1	-77.1	-90.0	-71.2	-75.5	-76.0
20.0	-68.0	-83.5	-75.1	-90.9	-69.4	-74.3	-73.8
25.0	-66.0	-81.9	-74.6	-86.0	-67.5	-72.5	-72.7
31.3	-64.1	-79.2	-71.7	-81.8	-65.4	-69.9	-70.5
62.5	-58.1	-75.2	-67.0	-72.3	-60.1	-64.2	-65.9
100.0	-54.0	-68.7	-62.1	-64.0	-56.6	-60.7	-64.6
125.0	-52.1	-66.1	-60.2	-60.7	-55.3	-58.9	-66.4
155.5	-50.2	-63.1	-58.7	-57.2	-53.9	-55.8	-73.0
175.0	-49.1	-62.6	-58.5	-55.2	-53.4	-53.9	-69.2
200.0	-48.0	-61.3	-57.8	-52.0	-51.2	-51.4	-60.0
250.0	-46.0	-60.7	-59.1	-47.9	-46.1	-48.4	-52.0
300.0	n.a.	-58.6	-50.7	-44.5	-39.3	-46.0	-45.9
600.0	n.a.	-40.0	-31.1	-29.8	-23.8	-29.4	-37.4

Equipment under Test:

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 J02021A0015, J02021A0016, J02021A0017, J02021A0018, J02021A0019,
 J02021A0020.

Table 2: Summarized Test Results – Min. PowerSum NEXT Loss, Min. Return Loss

Min. PsumNEXT [dB]		ISO/IEC JTC 1/SC 25 N 655 (2000)			
Frequency [MHz]	Cat.6 Limit	EUT Results			
		1-2	3-6	4-5	7-8
1.0	-77.0	-87.0	-86.8	-90.7	-89.5
4.0	-77.0	-93.7	-80.1	-84.8	-83.4
10.0	-70.0	-88.7	-74.5	-74.1	-78.6
16.0	-65.9	-96.5	-69.8	-70.5	-72.5
20.0	-64.0	-86.1	-67.9	-68.7	-71.0
25.0	-62.0	-86.2	-66.1	-66.9	-69.7
31.3	-60.1	-94.7	-64.0	-64.7	-66.9
62.5	-54.1	-89.0	-58.8	-59.0	-61.8
100.0	-50.0	-86.4	-55.6	-55.1	-59.0
125.0	-48.1	-89.8	-54.3	-53.3	-57.5
155.5	-46.2	-89.6	-53.0	-51.1	-55.1
175.0	-45.1	-86.9	-52.7	-49.6	-53.6
200.0	-44.0	-90.2	-50.5	-47.1	-50.7
250.0	-42.0	-90.8	-44.1	-42.0	-46.3
300.0	n.a.	-90.2	-37.9	-37.3	-43.0
600.0	n.a.	-94.2	-22.5	-21.6	-28.5

Min. Return Loss [dB]		ISO/IEC JTC 1/SC 25 N 655 (2000)			
Frequency [MHz]	Cat.6 Limit	EUT Results			
		1-2	3-6	4-5	7-8
1.0	-30.0	-38.3	-37.4	-35.0	-39.7
4.0	-30.0	-39.6	-38.8	-37.0	-40.3
10.0	-30.0	-40.0	-39.3	-37.8	-41.0
16.0	-30.0	-39.8	-40.1	-37.7	-41.1
20.0	-30.0	-39.6	-40.1	-37.7	-40.2
25.0	-30.0	-40.2	-41.7	-37.7	-40.5
31.3	-30.0	-39.9	-41.2	-36.7	-39.7
62.5	-28.1	-36.7	-45.1	-33.6	-35.5
100.0	-24.0	-32.8	-47.1	-30.4	-31.3
125.0	-22.1	-31.6	-41.4	-28.0	-30.4
155.5	-20.2	-31.3	-34.0	-25.0	-30.8
175.0	-19.1	-32.1	-30.4	-23.2	-32.2
200.0	-18.0	-70.0	-52.1	-41.5	-70.9
250.0	-16.0	-39.4	-20.6	-17.4	-27.9
300.0	n.a.	-27.9	-17.7	-15.6	-21.2
600.0	n.a.	-15.8	-9.7	-8.7	-11.7

Equipment under Test:

Part number : J02023F0019 electrically identical to
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 J02021A0015, J02021A0016, J02021A0017, J02021A0018, J02021A0019,
 J02021A0020.

Table 3: Summarized Test Results – Input to output Resistance, Transfer Impedance

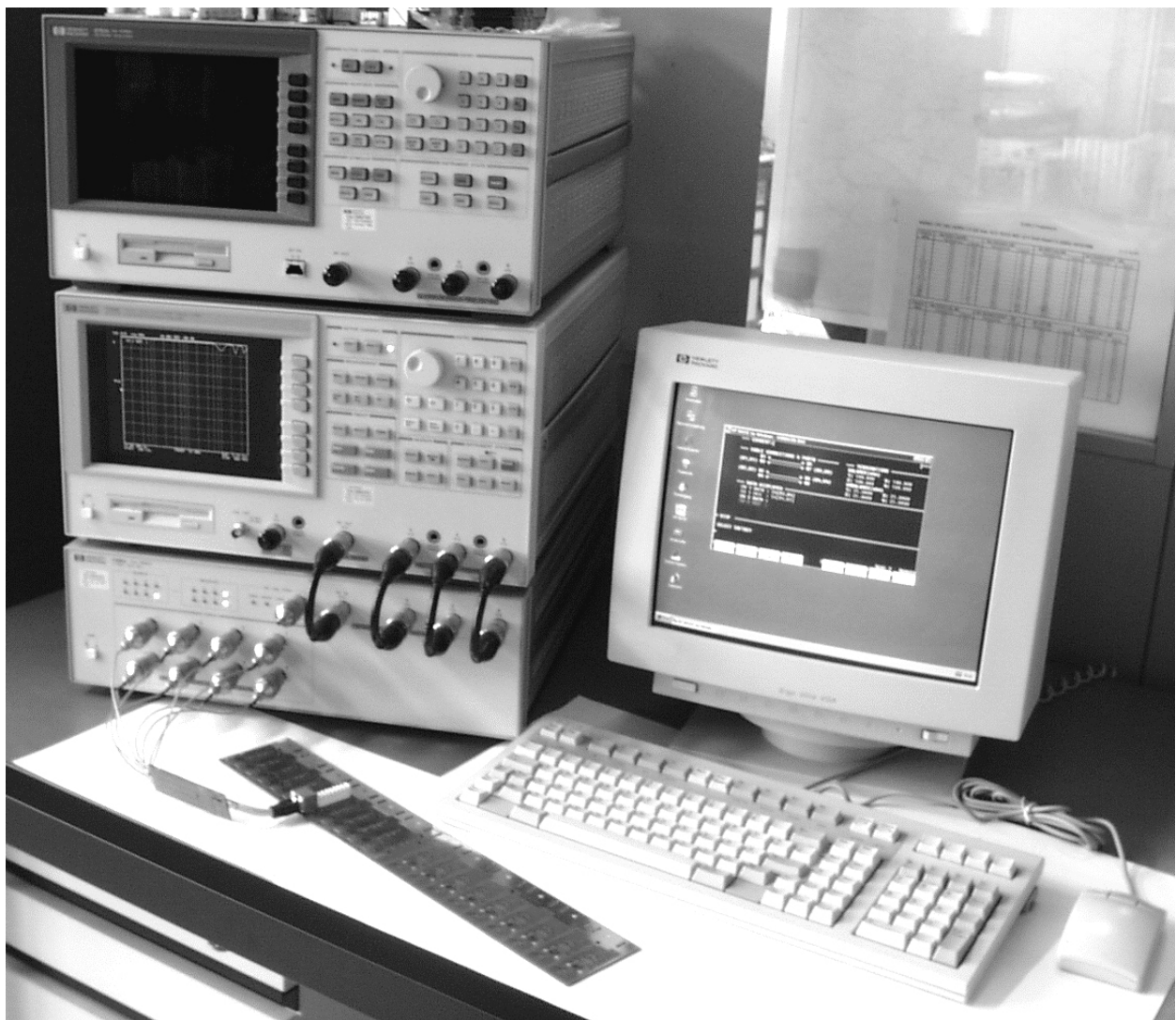
Max. DC Resistance [mOhm]		ISO/IEC JTC 1/SC 25 N 655 (2000)			
Frequency [MHz]	Cat.6 Limit	EUT Results			
		1 – 2	3 - 6	4 - 5	7 – 8
DC/1 kHz	200	20	23	28	34

Max. Transfer Impedance [mOhm]		ISO/IEC JTC 1/SC 25 N 655 (2000)
Frequency [MHz]	Cat.6 Limit	EUT Results
1.0	100	20
10.0	200	170
80.0	1600	982
100.0	2000	1107
250.0	2500	1460

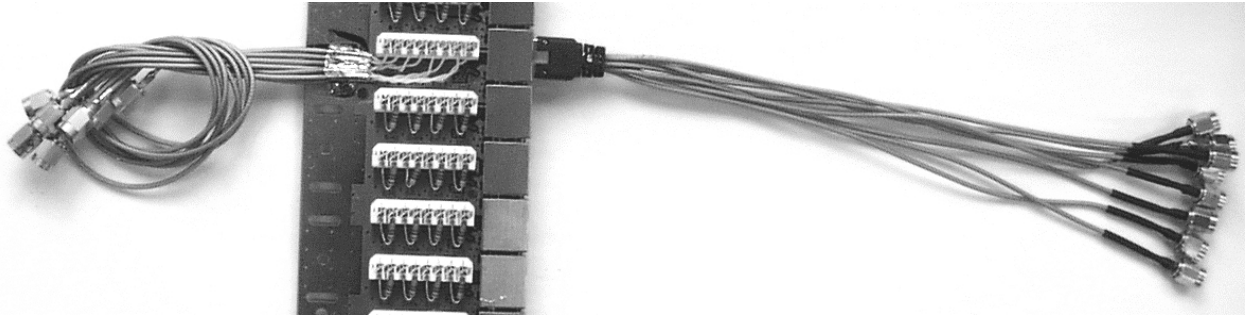
5. List of Test Equipment

Name	Model	Manufacturer	Serial Number	Last calibration
Network Analyzer	HP4396B	Hewlett-Packard	JP1KE00665	05.00
S-Parameter Test Set	HP4380A	Hewlett-Packard	JP1KB00105	05.00
Calibration set 3,5 mm	HP85033D	Hewlett-Packard	3423A00274	01.01
Network analyzer	HP8753B	Hewlett-Packard	2849U04342	06.00
S-Parameter Test Set	HP85047A	Hewlett-Packard	2904A00464	06.00
Precision LCR Meter	HP4284A	Hewlett-Packard	2940J05218	04.00

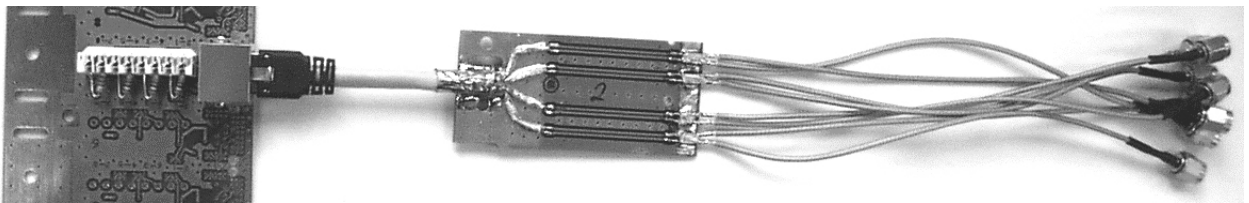
Picture 1: Configuration of the test setup



Picture 2: Configuration of measurement 4.1 Attenuation



Picture 3: Configuration of measurement 4.2 NEXT Loss



Picture 4: Configuration of measurement 4.4 Return Loss

