

Qualified Partner Programme QPP

Warranty

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Convincing cabling solutions

Overview

- Why a warranty?
- R&M warranties at a glance
- Prerequisites
- Product warranty
- System warranty
- Application warranty
- Procedure
- Summary

Warranty - why?

- Protect a long-term investment
- Customer peace of mind
- End user assurance of his requirements fulfilment
- Planner gets supplier support for his planning performance
- Installer gets supplier support for his installing performance

- Suppliers image of quality product and service
- Products and service better than market offering

Warranties overview

- 3-level warranty programme
- 2 types of warranties

1. Product Warranty

- 5 years general product warranty
- 20 years system warranty*

2. Lifetime Application Warranty

- Lifelong warranty on the system operations*

*provided installed and/or planned by certified partner



General 5 year product warranty

R&M warrants for a period of 5 years that all R&Mfreenet products

- are free of defects
- fulfil or exceed their respective Industry standards
- fulfil their respective performance when used in R&Mfreenet systems.

The product warranty applies to

- all R&Mfreenet products
- all products manufactured by R&M HQ or by R&M HQ accredited production plants

20 year system warranty

R&M warrants for a period of 20 years that the R&Mfreenet cabling system (consisting of sole R&Mfreenet components)

- is free of defects
- fulfils the requirements (mechanical and transmission properties) of the warranted standards
- supports applications in effect at the date of installation

The R&Mfreenet system warranty solely applies to

- R&Mfreenet components of the system (from one single source)
- installations by R&M certified installers
- all products manufactured by R&M or its accredited production plants

Lifetime application warranty

The R&Mfreenet warrants a lifetime application warranty on

- all applications that were operational and supported by the industry standard on the respective system at the date of certification
- all future applications that will be operational in accordance with the industry standard for that class of system

The R&Mfreenet lifetime application warranty solely applies to

- R&Mfreenet components
- planning by R&M certified planners
- installations by R&M certified installers



Prerequisites

Product Warranty: none necessary

System/Application Warranty:

- The installer/planner is certified by R&M and holder of a valid badge.
- He/she carried out the planning or installation performance in accordance with the actual technical state of the art and the local standards and regulations.
- He/she tested and documented the cabling system with appropriate test equipment for the compliance with the required specific standards.
- He/she sent all necessary requests according to the procedure valid at the time of installation to R&M inclusive of all requested documentation.

System warranty general terms

- The requirements of the standards valid at the date of installation.
- The installation was carried out in conformance with application, design, and the R&M installation guidelines.
- Products/system components are original, new and not used.
- Product or protocol updates require a warranty upgrade.

System warranty FO products

Warranty terms for FO products

- Installation was carried out in accordance with the application, design and the R&M installation guidelines.
- Warranty covers only the tested operations wavelengths (850nm, 1300nm, 1550nm)
- Requirements of the optical transmission links
 - optical attenuation (insertion loss) acc. to standard
 - optical bandwidth within the defined limits
 - optical insertion loss of the interface acc. to standard
- The system performance of fiber optic connection hardware, plug connectors or patch cords is warranted if the max. attenuation and min. insertions loss are according to Standard.

System warranty test equipment

The following test equipment is apt to field certification:

Class D

Wavetek Pro XL

Fluke DSP 100

Fluke DSP 2000

Microtest Penta

LAN Cat. system 6

Agilent 155

Class D, De

Wavetek LT 8155

Class D, De, E

Wavetek LT 8600

Fluke DSP 4000

Microtest Omni

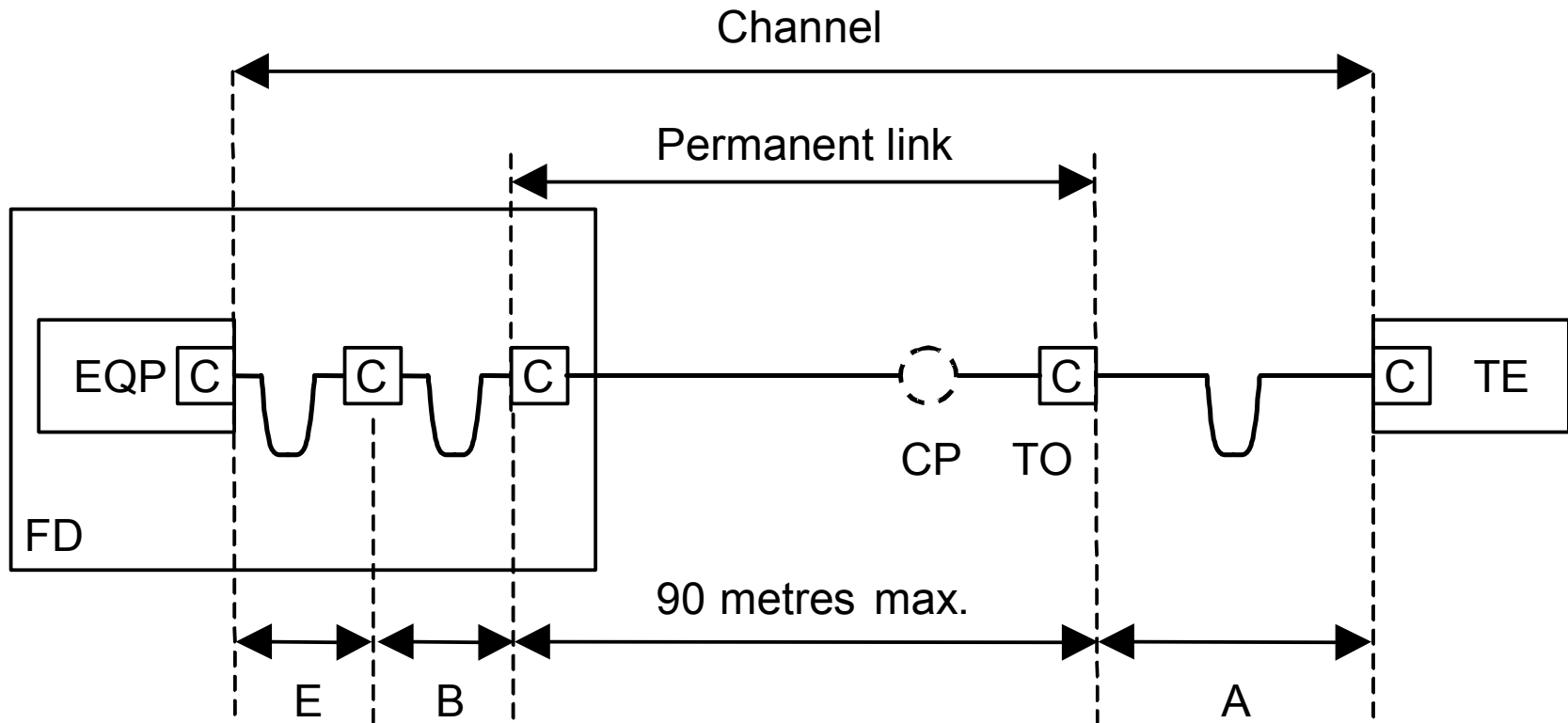
Agilent

Test equipment

- R&Mfreenet do not require special/proprietary test heads
- Test head plugs, like any RJ45 plug, have limited number of insertion cycles
- After 500 measurements the plugs should to be replaced.

- Errors in acceptance measurements do not enter the warranty programme. Debugging support provided by R&M are voluntary.
- R&M does not assume liability for problems determination.

Warranted values class D



Warranted values class D

Class D EN 50173: 1995 +Amendment (ditto ISO/IEC 11801 and EIA/TIA 568A)

Permanent Link:

Frequency [MHz]	Return-Loss [dB]	Attenuation [dB]	NEXT [dB]	PS-NEXT [dB]	EL-FEXT [dB]	PS-EL-FEXT [dB]	ACR [dB]	PS-ACR [dB]
1.0	17.0	2.1	61.2	58.2	59.6	57.0	59.1	56.1
4.0		4.1	51.8	48.8	47.6	45.0	47.7	44.7
10.0		6.1	45.5	42.5	39.6	37.0	39.4	36.4
16.0		7.8	42.3	39.3	35.5	32.9	35.4	31.5
20.0		8.7	40.7	37.7	33.6	31.0	32.0	29.0
31.25	17- 7*LOG(f/20)	11.0	37.6	34.6	29.7	27.1	26.6	23.6
62.5		16.0	32.7	29.7	23.7	21.1	16.7	13.7
100.0		20.6	29.3	26.3	19.6	17.0	8.7	5.7

DC Loop Resistance [Ohm]: <40

Propagation Delay: Frequency [MHz]: $1 \leq f \leq 100$ Value [μ s]: $< 0.486 + 0.036/\sqrt{f}$

Delay Skew: Frequency [MHz]: $1 \leq f \leq 100$ Value [μ s]: < 0.043



Warranted values class D

Channel:

Frequency	Return-Loss	Attenuation	NEXT	PS-NEXT	EL-FEXT	PS-EL-FEXT	ACR	PS-ACR
[MHz]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1.0	17.0	2.5	60.3	57.3	57.0	54.4	57.8	54.8
4.0		4.5	50.6	47.6	45.0	42.2	46.1	43.1
10.0		7.0	44.0	41.0	37.0	34.4	37.0	34.0
16.0		9.2	40.6	37.6	32.9	30.3	31.4	28.4
20.0		10.3	39.0	36.0	31.0	28.4	28.7	25.7
31.25	17- 10*LOG(f/2 0)	12.8	35.7	32.7	27.1	24.5	22.9	19.9
62.5		18.5	30.6	27.6	21.1	18.5	12.1	9.1
100.0		24.0	27.1	24.1	17.0	14.4	3.1	0.1

DC Loop Resistance [Ohm]:<40

Propagation Delay: Frequency [MHz]: $1 \leq f \leq 100$ Value [μ s]: $< 0.544 + 0.036/\sqrt{f}$

Delay Skew: Frequency [MHz]: $1 \leq f \leq 100$ Value [μ s]: < 0.05



Warranted values class De

CAT. 5e (Class De) of EIA/TIA 568-A-5

Channel:

Frequency	Return-Loss	Attenuation	NEXT	PS-NEXT	EL-FEXT	PS-EL-FEXT	ACR	PS-ACR
[MHz]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1.0	17.0	2.5	60.0	57.0	57.4	54.4	57.8	54.8
4.0		4.5	53.6	50.9	45.3	42.4	49.1	46.4
10.0		7.0	48.6	44.1	37.4	34.4	39.9	37.0
16.0		9.2	43.6	40.6	33.3	30.3	34.6	31.6
20.0		10.3	42.0	39.0	31.4	28.4	31.8	28.8
31.25	17- 10*LOG(f/20)	12.8	38.7	35.7	27.5	24.5	25.9	22.8
62.5		18.5	33.6	30.6	21.5	18.5	15.0	12.0
100.0		24.0	30.1	27.1	17.4	14.4	6.1	3.1

DC Loop Resistance [Ohm]: <40

Propagation Delay: Frequency [MHz]: 10

Value [μ s]: < 0.555

Delay Skew: Frequency [MHz]: $1 \leq f \leq 100$

Value [μ s]: < 0.05

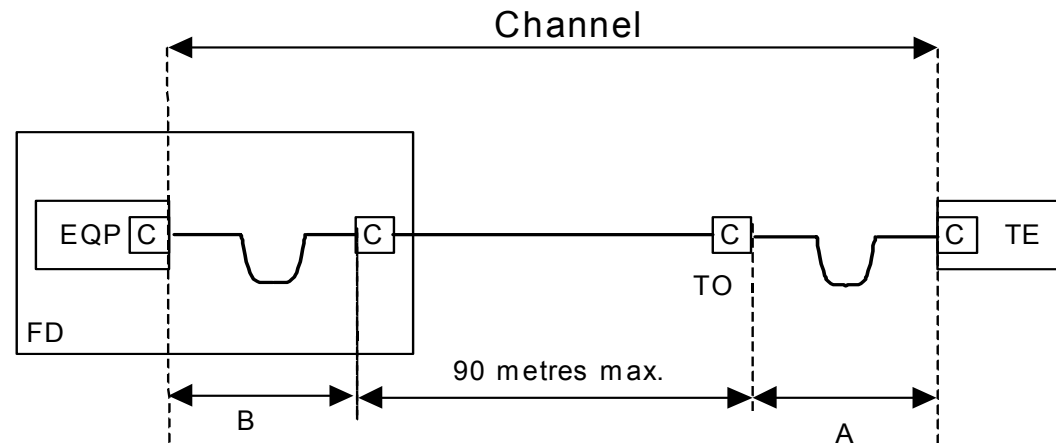
There are no Permanent Link values with EIA/TIA. If necessary the Basic Link values can be used instead.

(Careful: the test patch cord affects the test results)



Warranted values class E

Class E Channel of the ISO/IEC Draft N552



Warranted values class E

Frequency	Return-Loss	Attenuation	NEXT	PS-NEXT	EL-FEXT	PS-EL-FEXT	ACR	PS-ACR
[MHz]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1,0	19.0	2.2	72.7	70.3	63.2	60.2	70.4	68.1
4.0		4.2	63.0	60.5	51.2	48.2	58.9	56.4
10,0		6.5	56.6	54.0	43.2	40.2	50.0	47.5
16,0		8.3	53.2	50.6	39.1	36.1	44.9	42.3
20,0		9.3	51.6	49.0	37.2	34.2	42.3	39.7
31,25	19- 10*LOG(f/20)	11.7	48.4	45.7	33.3	30.3	36.7	34.0
62,5		16.9	43.4	40.6	27.3	24.3	26.5	23.7
100,0		21.7	39.9	37.1	23.2	20.2	18.2	15.4
155.52		27.6	36.7	33.8	19.4	16.4	9.0	6.1
200,0		31.7	34.8	31.9	17.2	14.2	3.0	0.1
250,0		36.0	33.1	30.2	15.3	12.3	-2.8	-5.8

DC Loop Resistance [Ohm]:<40

Propagation Delay: Frequency [MHz]: $1 \leq f \leq 100$

Value [μ s]: $< 0.544 + 0.036/\sqrt{f}$

Delay Skew: Frequency [MHz]: $1 \leq f \leq 100$

Value [μ s]: < 0.05



Application warranty copper

The following applications are supported by standards:

Application	Pins 1 & 2	Pins 3 & 6	Pins 4 & 5	Pins 7 & 8
Supported Applications				
PBX	Class A ¹	Class A ¹	Class A	Class A ¹
X.21		Class A	Class A	
V.11		Class A	Class A	
S ₀ -Bus (extended)	²	Class B	Class B	²
S ₀ Point-to-Point	²	Class B	Class B	²
S ₁ /S ₂	Class B	³	Class B	²
CSMA/CD 1BASE5	Class B	Class B		
CSMA/CD 10BASE-T	Class C	Class C		
Token Ring 4 Mbit/s		Class C	Class C	
ISLAN	Class C	Class C		²
Demand Priority	Class C	Class C	Class C	Class C

Foot Notes:

1. Option dependent on supplier.
2. Optional power sources.
3. Option for continuity of cable screen.



Application warranty copper

ATM-25 Category 3	Class C			Class C
ATM-51 Category 3	Class C			Class C
ATM -155 Category 3	Class C			Class C
Token Ring 16 Mbit/s		Class D	Class D	
TP-PMD	Class D			Class D
ATM-155 Category 5	Class D			Class D
Emerging Applications				
CSMA/CD 100BASE-T4	Class C	Class C	Class C	Class C
CSMA/CD 100BASE-T2	Class C	Class C		
ISLAN16-T	Class C	Class C		
CSMA/CD 100BASE-TX	Class D	Class D		
Token Ring 100 Mbit/s	Class D	Class D		
CSMA/CD 1000BASE-T	Class D	Class D	Class D	Class D

Application warranty fiber optics

The following applications are supported by standards:

Applications based on 10/125um SMF	? (um)	Maximum channel length L _{max} (metres)	Maximum channel attenuation (dB)
Attenuation (1310nm/1550nm): 0.5/1.0dB/km max.			
DIS 9314-4: FDDI SMF-PMD	1310	2000	10.0 ¹
ATM @ 52 Mb/s	1310	2000	7.0 ¹
ATM @ 155 Mb/s	1310	2000	7.0 ¹
ATM @ 622 Mb/s	1310	2000	7.0 ¹
CD 14165-1: Fiber Channel (FC-PH) @ 266 Mb/s	1310	2000	6.0 ¹
CD 14165-1: Fiber Channel (FC-PH) @ 531 Mb/s	1310	2000	14.0 ¹
CD 14165-1: Fibre Channel (FC-PH) @ 1062 Mb/s	1310	2000	6.0 ¹
IEEE 802.3: 1000BASE-LX	1310	2000	4.57
1. This is the minimum optical loss budget for cabling supported by the applications. Much higher values are also supported in the application standards but lie outside the scope of this standard.			

Table C5.1: Application specifications using singlemode optical fiber cabling

Application warranty fiber optics

The following applications are supported by standards:

Applications based on 50/125um MMF	? (nm)	Maximum channel length L _{max} (metres)	Maximum channel attenuation (dB)
Attenuation (850nm/1300nm): 3.5/1.5dB/km max. Modal bandwidth (850nm/1300nm): 500/500MHzkm min.			
ISO/IEC 8802-3: FOIRL	850	514	3.3
ISO/IEC 8802-3:10BASE-FL & FB	850	1514	6.8
ISO/IEC TR 11802-4: 4 & 16 Mb/s Token Ring	850	1571	8.0
IEEE 802.12: Demand Priority	850	371	2.8
ATM @ 155 Mb/s	850	1000 ¹	7.2 ¹
ATM @ 622 Mb/s	850	300 ¹	4.0 ¹
CD 14165-1: Fiber Channel (FC-PH) @ 266 Mb/s	850	2000	12.0
CD 14165-1: Fiber Channel (FC-PH) @ 531 Mb/s	850	1000	8.0
CD 14165-1: Fiber Channel (FC-PH) @ 1062 Mb/s	850	500 ¹	4.0 ¹

Foot Note:

1. This is the minimum optical loss budget for cabling supported by the applications. Much higher values are also supported in the application standards but lie outside the scope of this standard.

Application warranty fiber optics

IEEE 802.3: 1000BASE-SX	850	550 ¹	3.56 ^{1,2}
CD 9314-9: FDDI LCF-PMD	1300	330	2.0
ISO/IEC 9314-3: FDDI PMD	1300	2000	6.0
ISO/IEC 8802-3: 100BASE-FX	1300	2000	6.0
IEEE 802.12: Demand Priority	1300	533	2.3
ATM @ 52 Mb/s	1300	2000	5.3
ATM @ 155 Mb/s	1300	2000	5.3
ATM @ 622 Mb/s	1300	330	2.0
CD 14165-1: Fiber Channel (FC-PH) @ 133 Mb/s	1300	Not supported	1.3
CD 14165-1: Fiber Channel (FC-PH) @ 266 Mb/s	1300	2000	5.5
IEEE 802.3: 1000BASE-LX	1300	550 ¹	2.35 ^{1,2}

Warranty programme - claims

Claims procedure:

- **5 Year product warranty**
 - Visual product check 10 working days after receipt
 - Attach proof of purchase
- **20 Year system and lifetime application warranty**
 - System check 20 working days after receipt of certificate
 - Detailed description of the problem, proof of purchase, operating environment according to the standards/installation guidelines etc. forwarded to R&M (Claims Form)
 - R&M or R&M business partner will inspect cabling system at site
 - R&M will proof and decide if the warranty claim will be legitimate or not

Warranty programme - coverage and liability

Coverage

- Defective components will be replaced or repaired
- There will be no compensation claims at any time
- Expenses for fault tracking will be charged if claim is not legitimate
- The Warranty will not be transferable to third parties

Liability

- No liability for consequential damages like revenue or profit losses, data losses or recovery/machine down time
- No liability for consequential damages caused by force major.