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Specification of the BT Metallic Path Facility

Issue 4

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Normative Information

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CONTENTS

NOTICE OF COPYRIGHT AND LIABILITY	2
CONTENTS	3
1 FOREWORD	4
2 SCOPE	4
3 MPF TYPES	4
4 METALLIC PATH FACILITY SPECIFICATION	5
5 MPF ELECTRICAL TERMINATION	6
5.1 NTP TERMINATION.....	6
5.1.1 <i>Connections Used in BT Master Sockets</i>	6
5.1.2 <i>Insulation Displacement Connectors</i>	7
5.2 MDF AND SDF TERMINATION	7
6 METALLIC PATH FACILITY OPERATION	7
6.1 POWER FEEDING: MAXIMUM VOLTAGE AND CURRENT ON A METALLIC PATH FACILITY.....	7
6.2 INPUT SIGNALS ON A METALLIC PATH FACILITY.....	8
7 REFERENCES	8
8 ABBREVIATIONS	8
9 HISTORY	8

1 Foreword

This specification has been produced by the NICC Task Group on Digital Subscriber Line (DSL) – Spectrum Management Plan. Representatives from network operators, switch and terminal equipment manufacturers, test laboratories, DTI, and Ofcom participated in the Task Group.

2 Scope

This specification defines the electrical parameters of the Metallic Path Facility (MPF) provided by BT. There are potentially 4 types of MPF:

- Full-loop MPF
- Full-loop, shared MPF
- Sub-loop MPF
- Sub-loop, shared MPF

This specification defines the electrical parameters for all 4 types, excluding any aspects of splitter specification [4].

The specification applies to the MPF when it is isolation from customer premises wiring and equipment and from LLU (Local Loop Unbundling) operator wiring and equipment.

3 MPF Types

Figure 1 describes the 4 types of MPF covered in this document.

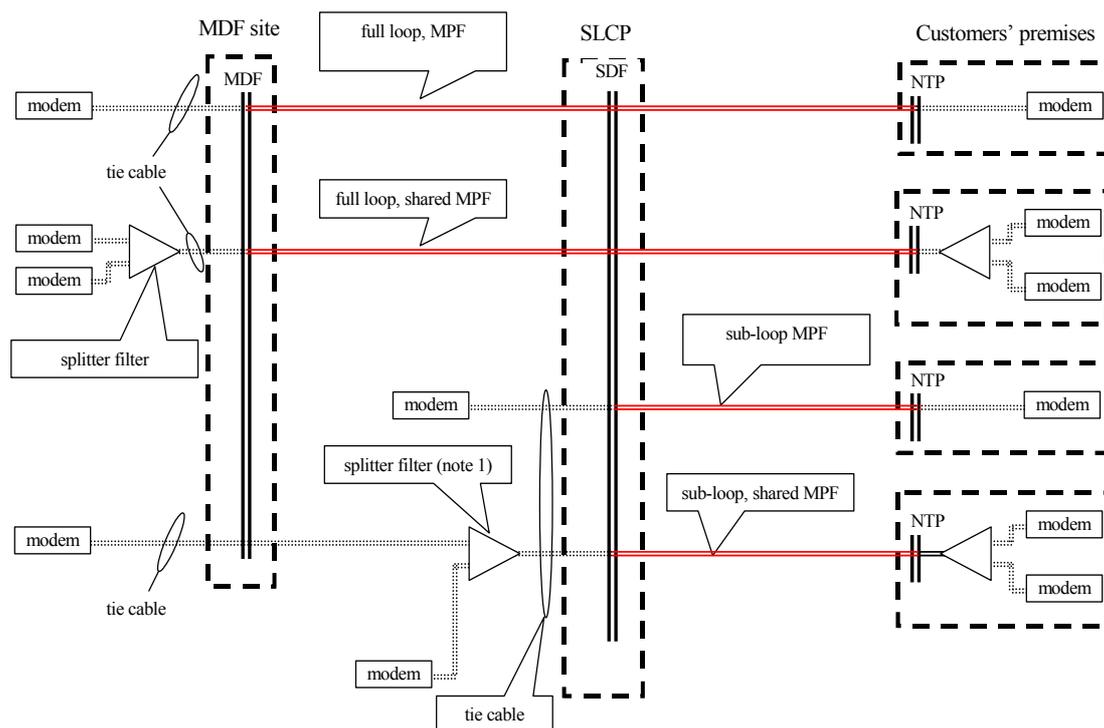


Figure 1 – MPF Types

Key

MDF	Main Distribution Frame
NTP	Network Termination Point
SDF	Sub-loop Distribution Frame
SLCP	Sub-loop Connection Point
====	(in red) metallic path facility (MPF)
.....	(in black) other metallic pair cabling

As illustrated in Figure 1, both the full loop and full-loop shared MPF consist of a metallic pair from the Main Distribution Frame (MDF) to the Network Termination Point* (NTP) and both the sub-loop and shared, sub-loop MPF consist of a metallic pair from the Sub-loop Distribution Frame (SDF) to the NTP.

4 Metallic Path Facility Specification

The parameters of the MPF are defined for the pair from the MDF or SDF to the NTP depending on the MPF type. When testing these parameters of the MPF, the MPF must be tested in isolation from customer premises wiring and equipment and from LLU operator wiring and equipment. The parameter values listed in Table 1 apply to all types of MPF.

Parameter (note 6)	Value (taking account of notes 1 to 6)
Electrical continuity	The MPF will be a continuous metallic connection between MDF in BT premises and a network termination point at the end customer premises.
Insulation Resistance (note 1) A-B or B-A	Greater than 100 kOhm
Insulation Resistance (note 1) Wire – Earth	Greater than 100 kOhm
Insulation Resistance (note 1) Wire - Battery	Greater than 100 kOhm
Voltage between the wires (note 2)	$-55 < V_{DC} < +55$ Volts DC (note 7) $V_{AC} < 15$ Volts
Voltage between either wire and earth. (note 2)	$-55 < V_{DC} < +3$ Volts (note 7) $V_{AC} < 15$ Volts
Loop Resistance (note 3)	Less than 1800 Ohm
Difference in measured earth capacitance between A leg and B leg using line test system	$C_{A-E} > 0.85 \times C_{B-E}$ AND $C_{B-E} > 0.85 \times C_{A-E}$
Maximum Insertion Loss (note 4)	50dB at 100kHz
Insertion loss variation over time (notes 4,5)	Less than 6 dB

Table 1 - MPF Parameters

Note 1: Measurement of Insulation Resistance

Insulation resistance is measured using a voltage of $30V_{DC}$. Resistance is measured between the wires using each polarity in order to detect rectified faults. Resistance between wire and earth or battery is measured to detect contact faults between adjacent wire pairs.

The MPF will be categorised faulty if any measured resistance is below the threshold values.

Note 2: Measurement of Voltage

The presence of voltages on the pair will be measured using a voltmeter with internal impedance of nominally 100 kOhm. The AC voltage measurement will only include frequencies up to 100 Hz (such that the second harmonic of the AC mains supply is included). Voltage spikes i.e. peaks of voltage occurring less frequently than 1 per second and with a duration of less than 1 ms will be ignored in this measurement.

* The NTP is the legal demarcation between the network provider's cabling and the customer's in-house wiring. On a telephone line this point resides on the master socket or NTE ("Network Termination Equipment").

Note 3: Resistance is measured using a voltage of 30V_{DC}. The MPF will be categorised faulty if the measured resistance exceeds the threshold value.

Note 4: Insertion Loss is to be measured at 100 kHz between 140 Ohm resistive (non-reactive) terminations when using a nominal transmit power of anywhere between -10dBm and 0 dBm.

Note 5: This parameter is associated with the optional service where the LLU operator can order from BT an insertion loss measurement at MPF provision time. BT would guarantee that the insertion loss of a MPF that is not otherwise faulty would not deviate over time from the initial value by more than 6 dB.

Note 6: Any measurement made with respect to earth will be made using the earth at the BT MDF site for full loops and the earth at the SCLP for sub-loops. Any measurement made with respect to battery will be made using the BT exchange battery.

Note 7: D.C voltages of the magnitude specified should only occur as a result of a network fault condition. The MPF user should ensure that equipment utilising the MPF is capable of withstanding D.C voltages of the magnitude specified.

5 MPF Electrical Termination

The MPF consists of two metallic conductors designated as the 'A' and 'B' wires.

5.1 NTP Termination

The connection to the MPF at the NTP end can be either a BT Master socket or in the form of an Insulation Displacement Connection (IDC) cable termination. (Note: The front plate on the NTE may not be provided, in which case only the socket (and not the IDC termination) will be available).

5.1.1 Connections Used in BT Master Sockets

When the MPF is terminated on a BT Master socket, connection to the MPF is provided by the socket or the Insulation Displacement Connector (IDC) on the Customer Connection Unit (i.e. front plate) of the network terminating equipment. The IDC will accept the connection of solid copper conductors between 0.4 mm and 0.63 mm diameter. The connections for the socket and the IDC are as shown in the Table 1.

Socket Contacts		IDC Contacts	
1	Not To Be Used	6	Not To Be Used
2	'A' wire or 'B' wire	5	'A' wire or 'B' wire
3	Not To Be Used	4	Not To Be Used
4	Shunt connection	3	Shunt connection
5	'B' wire or 'A' wire	2	'B' wire or 'A' wire
6	Not To Be Used	1	Not To Be Used

Table 1: BT Master Socket and IDC Contacts

Note 1: The contact assignment for the socket and IDC is the same contact assignment as used for the BT single line analogue PSTN interface. A different contact assignment is used for BT 2-wire analogue private circuits

Note 2: The shunt connection is derived from the centre point between a 470 kOhm resistor and a 1.8 µF capacitor connected in series across the 'A' and 'B' wires. Additionally there is an overvoltage protection device connected across the 'A' and 'B' wires.

Note 3: Contact 6 is adjacent to the latch.

Note 4: Plugs that meet the requirements of BS 6312:Part 1:1994 ^[2] and wired to correspond with Figure 2 will be compatible with the BT provided socket.

Note 5: The different types of NTE currently deployed within the BT network present from 3 to 6 IDCs for the termination of extension wiring, however, the essential connections, IDC '2', '3', & '5', will always be present and the numbering kept consistent.

Note 6: The numbering of IDC and Master Socket contacts are reversed; for example the 'shunt connection' is presented on IDC '3' and at Master Socket contact '4'.

5.1.2 *Insulation Displacement Connectors*

When the BT network interface is terminated with insulation displacement connectors they will accept the connection of solid copper conductors between 0.4 mm and 0.63 mm diameter.

5.2 MDF and SDF Termination

Direct connection to the network end of the MPF (i.e. at the MDF) or SDF is not provided. Indirect connection to the MPF is provided via an Internal Tie Cable at the MDF and an External Tie Cable at SDF.

The interface to the network end of the MPF will be at the Handover Distribution Frame (HDF) within the LLU Operator's collocation space or in the building used by the LLU Operator for distant location. Indirect connection to the SLCP is provided via External Tie cables.

6 Metallic Path Facility Operation

In order to maintain network integrity and for health and safety reasons, equipment to be connected to and used on a MPF needs to fulfil certain technical requirements. These requirements are given below.

6.1 Power Feeding: Maximum Voltage and Current on a Metallic Path Facility

The voltage and current applied by an LLU operator to a Metallic Path Facility (MPF) in the BT network must be limited for several reasons:

- To ensure the safety of BT personnel working on the network.
- To protect the network from damage.
- To ensure that the overvoltage protection devices built into BT's metallic network are not inadvertently triggered.

Voltages and currents (including the telecommunications signal) applied to the MPF must not:

- Apply an open circuit voltage greater than 120V peak of either polarity with respect to earth to either leg of the MPF (note 7).
- Apply an open circuit voltage greater than 200V peak between the two legs of the MPF (note 7).
- Cause greater current to flow than 60mA peak in either leg of the line (note 7).

Voltage measurements will be made using a high internal impedance (nominally 10 MOhm) voltmeter.

Additionally if it is intended to apply line voltages greater than 120V peak between legs of the MPF, the equipment must conform to IEC 60950-1 and IEC 60950-21. See note 8

Note 7: The voltages and currents are absolute limits including AC signals at any frequency together with any DC power supplied to customer sited equipment. They apply at all times including when LLU operators are carrying out tests on MPFs.

Note 8: IEC 60950-1 [1] covers all the safety aspects of all information technology equipment. This document defines the safe voltage (120V between conductors) above which the operating characteristics of the equipment feeding power to lines must be governed for safety reasons. The required characteristics of the power feeding system are further defined in IEC 60950-21 [2].

IEC 60950-21 allows a range of operating voltages above 120V, but for a given voltage they define:

- The maximum current which can be fed to earth (e.g. in the event of human contact).
- The maximum current which can be passed from one 'leg' of the metallic pair to the other 'leg' via an inadvertent contact.
- The time taken to shut down the power supply in the event of an inadvertent contact.

- The maximum effective capacitance (to earth and between line 'legs') of the terminating equipment (this defines the maximum fault current through a human contact **after** the power supply has been tripped).

6.2 Input signals on a Metallic Path Facility

Any signal applied to the MPF must conform to the BT Access Network Frequency Plan [3].

7 References

- [1] IEC 60950-1 Edition 1.0 (Safety of Information Technology Equipment)
- [2] IEC 60950-21 Edition 1.0 (Safety of Information Technology Equipment - Remote Power Feeding)
- [3] Specification of the Access Network Frequency Plan applicable to transmission systems used on the BT Access Network – ND1602:2005/05 (*available on NICC website at <http://www.nicc.org.uk/nicc-public/publication.htm>*)
- [4] Exchange Based Splitter Specification for Use with Local Loop Unbundling Line Sharing Service – ND1606:2005/01 (*available on NICC website at <http://www.nicc.org.uk/nicc-public/publication.htm>*)

8 Abbreviations

BT	British Telecommunications plc <i>(bridged taps are not discussed in this document)</i>
DSL	Digital Subscriber Line - any of the modem technologies which send high speed data over metallic telephone pairs. A DSL line has a dedicated modem at each end of the physical wire pair; typically one of these is in the exchange
DSL TG	Digital Subscriber Line Task Group A Task Group under NICC
LLU	Local Loop Unbundling
MDF	Main Distribution Frame
MPF	Metallic Path Facility
NICC	Network Interoperability Consultative Committee - a committee of UK industry; homepage: http://www.nicc.org.uk
NTE	Network Termination Equipment
NTP	Network Termination Point
SDF	Sub-loop Distribution Frame
SLCP	Sub-loop Connection Point

9 History

Issue No.	Date	Comments
1	19/7/00	First Issue
2	7/11/01	Addition of Note 7 in section 3 in alignment with the KCH MPF specification.
3	4/4/03	Updating references to take account of the publication of IEC 60950-1 and Recommendation K.50
4	4/5/05	Updated to include shared and sub-loop MPF.

- END -