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Flexi Multiradio 10 Base Station Transmission Description

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Summary of changes

Changes between document issues are cumulative. Therefore, the latest document issue contains all changes made to previous issues.

This document is published with the product releases listed in the following table.

Radio Access Technology (RAT)	Product release
GSM	RG20, RG30
LTE	RL25TD, RL35TD RL40, RL50
WCDMA	RU40

Table 1 RAT releases covered by the document

Changes between issues 07 and 08

- Section FTCY has been updated.
- Section Environment related markings has been added.
- Information on FSMG and FSML has been removed.

Changes between issues 06 and 07

- Section Transmission interface specifications has been updated.

Changes between issues 05 and 06

- Section Ethernet Small Form-factor Pluggable (SFP) transceivers has been updated.

1 Overview of Flexi Multiradio 10 Base Station transmission

The document includes sections that are relevant to one technology only. For the sake of clarity, they are highlighted with special icons, as presented in the following table.

	GSM-specific content
	WCDMA-specific content
	LTE-specific content

Table 2 Technology-specific content

Flexi Multiradio 10 Base Station System Module FSMF is equipped with two integrated transport interfaces: electrical Gigabit Ethernet (GE) interface (EIF1) and optical interface (EIF2/RF/6).

The latter is SW configurable for transport purposes or for RP3-01 interface. To operate in either (transport or RP3-01), it requires a small form-factor pluggable (SFP). Both Ethernet interfaces provide a physical interface to the backhaul network.

In WCDMA and LTE the optical interface (EIF2/RF/6) is available as transport interface EIF2 if not used for RP3-01 connection.

In GSM the optical interface (EIF2/RF/6) is available as transport interface EIF2 if the optional transmission sub-module (FTIF) is not deployed.

Flexi Multiradio 10 System Module FSMF is optimized for Ethernet Transport, and the HW supports the following integrated transport functions (without the optional transmission sub-module):

- 1 x 100/1000Base-T Ethernet port
- 1 x optional optical SFP (depends on configuration)
- Ethernet based chaining and switching across up to two interfaces
- IEEE1588-2008, Synchronous Ethernet, 1PPS and 2.048MHz
- LTE S1/X2, or WCDMA Iub/IP, or GSM Packet Abis over Ethernet backhaul interfaces

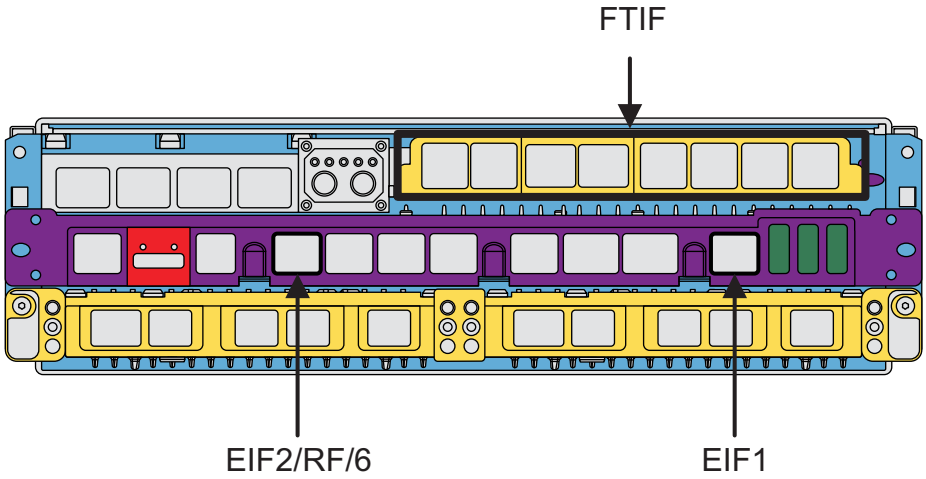


Figure 1 Flexi Multiradio 10 Base Station System Module and transport interfaces

Note that for all the technologies (GSM, WCDMA, FD-LTE and TD-LTE) there is a possibility to install an optional transmission sub-module (FTIF) to extend Flexi Multiradio 10 Base Station transport capabilities.

The FTIF transmission sub-module is needed, for example: for GSM legacy Abis support and for WCDMA the support of ML-PPP or IMA over multiple TDM ports. For more information, see section FTIF.

2 Transmission sub-modules

2.1 Transmission interface specifications

Interface	Capacity	Connector	Notes
TRS Interface (electrical)	1 x 100/1000 Mbit/s	RJ45	None
TRS/RP3-01 Interface EIF2/RF/6 (optical, requires SFP)	1 x 1000 Mbit/s	SFP (LC)	• Interface available if not used for RP3-01 connection. • Only 1 GE optical is supported. • For transport SFP requirements see chapter Ethernet Small Form-factor pluggable (SFP) transceivers

Table 3 Flexi Multiradio 10 Base Station System Module transmission interfaces

2.2 FTIF

2.2.1 Overview

FTIF transmission sub-module enhances the connectivity and transport capabilities of Flexi Multiradio 10 Base Station. The sub-module has eight PDH ports (E1/T1/JT1) with RJ48C pin-out on four physical connectors.

Flexi Multiradio 10 System Module with FTIF supports Ethernet Switching across up to three interfaces and 8x E1/T1/JT1 (twisted pair); coaxial connectivity can be provided via baluns.

The sub-module is required:

- for ATM Iub, Dual Iub, and IP Iub over ML-PPP
- for Dynamic Abis over TDM, Dynamic Abis over IP/Ethernet (TDM pseudowire), and Packet Abis over TDM
- if collocation (CESoPSN) or synchronization includesTDM
- if more/other Ethernet interfaces are required than available on Flexi Multiradio 10 System Module
- if Synchronization Hub function based on Synchronous Ethernet input or output is to be used

Flexi Multiradio 10 System Module integrated Transport and FTIF build a single logical Transport node.

FTIF meets the following standards:

- IEEE 802.3
- ITU-T G.703
- ITU-T G.8262
- ANSI T1.403

2.2.2 Interfaces

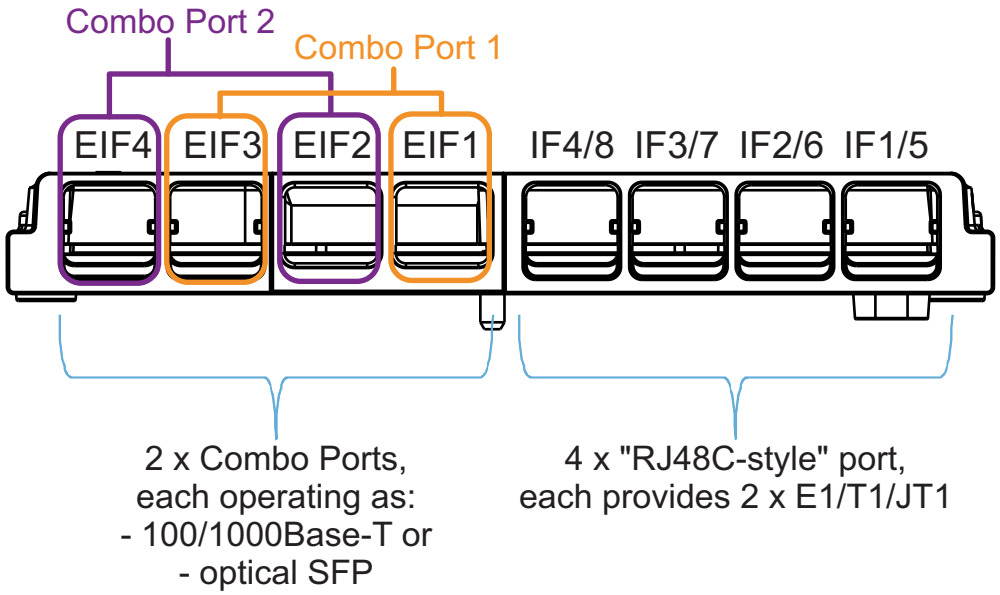


Figure 2 FTIF sub-module front panel - physical layer view

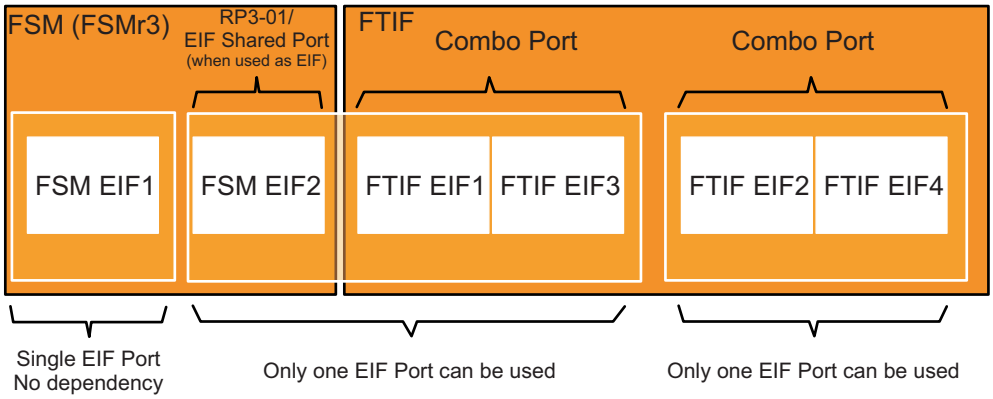


Figure 3 FTIF interfaces - logical layer view

EIF1/EIF3 and EIF2/EIF4 are paired as one combo port.

- The usage of EIF1 and EIF3 as well as EIF2 and EIF4 is mutually exclusive.
- The usage of EIF1/EIF3 on this FTIF and EIF2 on FSMF is mutually exclusive.
- The supported optical SFP's 1000Base-BX/LX/SX/ZX are not part of the FTIF delivery.

When using the optional transmission sub-module (FTIF), the following number of interfaces (provided by both the System Module and FTIF) is possible:

- 3 x GE electrical
- 2 x GE electrical + 1 x GE optical
- 1 x GE electrical + 2 x GE optical
- 2 x GE optical

Interfaces	Capacity	Tolerance	Connector
2 x Combo Ports; can work as: • 2 x 100/1000Base-T electrical GE, or • 2 x 1000Base-BX/LX/SX/ZX optical GE, or • 1 x 100/1000Base-T electrical GE + 1 x 1000Base-BX/LX/SX/ZX optical GE.	• 2 x 100/1000 Mbit/s • 2 x 1000 Mbit/s • 1 x 100/1000 Mbit/s 1 x 1000 Mbit/s	not relevant	• 2 x RJ45 • 2 x SFP[1)] • RJ45 + SFP
8 x E1/T1/JT1 (100/110/120 ohm, twisted pair)	8 x 2 Mbit/s (E1) 8 x 1.5 Mbit/s (T1)	± 50 ppm (E1) ± 32 ppm (T1/JT1)	4 x RJ48C

Table 4 FTIF interfaces

[1)] See section Ethernet Small Form-factor Pluggable (SFP) transcievers.

2.2.3 Physical and electrical properties

Property	Value
Power consumption (calculated maximum)	10 W
Height	37.5 mm
Width	244.55 mm
Depth	196.73 mm
Weight	1693 g

Table 5 FTIF physical and electrical properties

2.2.4 Contents of delivery

The delivery comprises the following items:

- FTIF transmission sub-module with eight rubber plugs
- 4 x M5 screw
- 1 x FCM-FTM connector card
- leaflet with SFP-related information

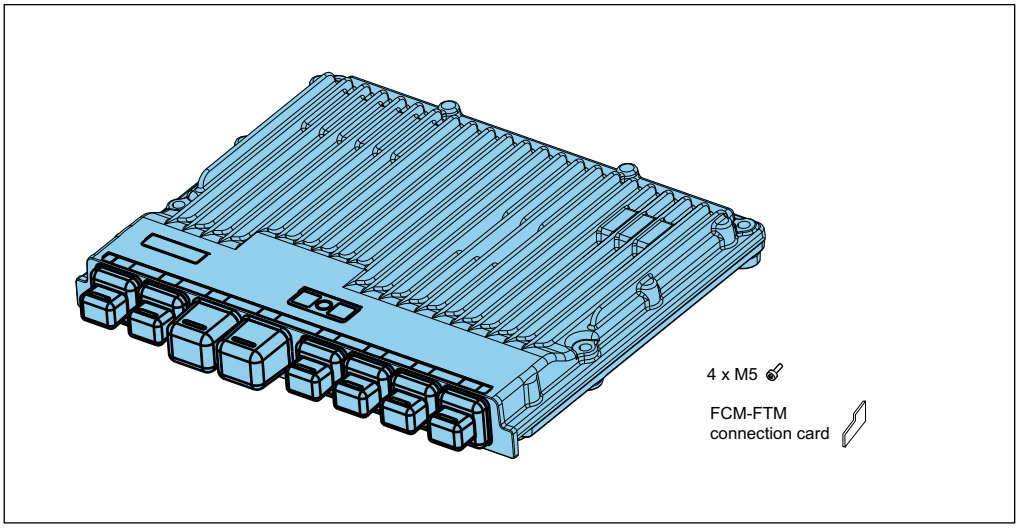


Figure 4 FTIF delivery contents

3 Ethernet Small Form-factor Pluggable (SFP) transceivers

The Flexi Multiradio 10 Base Station System Module FSMF is shipped with one electrical 100/1000 Base-T Gigabit Ethernet interface. The unit has also an optical 1000 Base-X Gigabit Ethernet interface, which may be equipped with an optical Small Form-factor Pluggable (SFP) transceiver. This interface is shared with RP3-01 interface. Only optical GE SFP transceivers can be used in FSMF.

SFP is also needed for FTIF combo ports.

The following SFPs can be ordered from Nokia Siemens Networks:

- FOSC Optical SFP 1000Base-LX 1310nm SM (471880A). It supports fiber length up to 10 km on 9/125 μm single mode fiber (All FlexiBTS long-haul Gigabit Ethernet outdoor transmission cables are 9/125 μm single mode fibers)
- FOSD Optical SFP 1000Base-SX 850nm MM (471881A). It supports fiber length up to:
  - 550 m on 50/125 μm multimode fiber
  - 300 m on 62.5/125 μm multimode fiber
    (All FlexiBTS short-haul Gigabit Ethernet outdoor transmission cables are 50/125 μm multimode fibers)
- Optical SFP 1000Base-ZX 1550 nm SM (V50017-U469-K500). It supports fiber lengths up to 80 km on 9/125 μm single mode fiber.
- Optical SFP 1000Base-BX10 1310TX, 1490RX (V50017-U406-K500). It supports fiber lengths up to 10 km on 9/125 μm single mode fiber.
- Optical SFP 1000Base-BX10 1490TX, 1310RX (V50017-U416-K500). It supports fiber lengths up to 10 km on 9/125 μm single mode fiber.

Note that FOSC and FOSD are for transport only. RP3-01 connection requires different SFP types.

If the SFP is not purchased from Nokia Siemens Networks, the used SFP must fulfill the following requirements:

- SFP Multi-Sourcing Agreement (MSA) compliant
- Laser Class 1 compliant
- 1000Base-BX10, 1000Base-LX, 1000Base-SX, or 1000Base-ZX
  The only devices supported are those identified as LX type (SFP E²PROM Address A0h byte 6 = “02h”), SX type (“01h”), or BX type (“40h”).
- Industrial temperature range -40°C...+85°C
- LOS detection pin supported
- Extraction Bail Latch Actuator

Do not use SFPs with MSA direct/standard push pull, dog leg latch actuator, with plastic pull tab, or without any extraction handle.

If the inserted SFP does not comply with the requirements listed above, an alarm (ID 61050) is raised and the laser is not switched on.

Figure 5 Supported actuator types

Note that:

- Only laser class 1 SFPs are allowed for safety reasons.
- Flexi Multiradio 10 Base Station does not support half-duplex mode.
- For the connection to be successful, the remote peers need to have a matching configuration. For example, Auto Negotiation needs to be configured in both the BTS and the remote peer.
- The same SFPs and transport cables can be used with both Flexi Multiradio Base Station and Flexi Multiradio 10 Base Station.

4 FlexiPacket FirstMile 200i (FPFM200i) unit

4.1 Overview of FPFM200i

FPFM200i is a Nokia Siemens Networks FlexiPacket Microwave Radio indoor unit that is designed to fit the transport slot of Flexi Multiradio 10 Base Station System Module. The mechanical integration includes powering of the FPFM200i. The FPFM200i provides support in the Ethernet uplink and downlink traffic. It provides advanced Ethernet processing features, as well as maximum flexibility to support TDM traffic via circuit emulation.

The FPFM200i can be connected to outdoor units via a single Ethernet cable, using a copper Ethernet port with power feeding support. Alternatively, two cables can be used, in which case one of them is a separate power supply cable.

The FPFM200i can be configured, monitored, and administered by a web-based Local Craft Terminal (WebLCT) or Nokia Siemens Networks NetViewer management tool. That can be done locally or remotely, via Data Communication Network (DCN).

For more information, see *FlexiPacket FirstMile 200* documentation.

4.2 Front panel I/O interfaces

The FPFM200i supports the following interfaces:

- five electrical Ethernet Ports
  - 10/100/1000Base-TX full duplex
  - 10/100/1000Base-TX auto-negotiation
  - MDIX (10/100Base-TX)
  - 5 x RJ45 connector (EIF1 ~ EIF5)
  - 2 x P+E ports (EIF4 / EIF5)
- four PDH ports on two RJ48C connectors - one RJ48C supports two E1/T1 ports (IF1/3 & IF2/4)
- one LMP port on RJ45 connector, 10/100/1000Base-T

Figure 6 FPFM200i front panel view

5 Transmission cables

This section describes layouts and pin-maps of cables used for transmission purposes in Flexi Multiradio 10 Base Station. The cable code is imprinted on each cable.

NOTICE: Outdoor cables provided by Nokia Siemens Networks are equipped with special rubber gaskets, which ensure that no water or dust gets in and damages the Flexi Multiradio 10 Base Station. Do not remove the rubber gaskets. Do not use other cables than those provided by Nokia Siemens Networks. Improper use can lead to serious malfunctions of the system and it is not covered by the product warranty.

To connect twisted pair cables to 75 ohm equipment or interfaces, baluns can be used. For details on the purchase procedure, contact Nokia Siemens Networks sales representative.

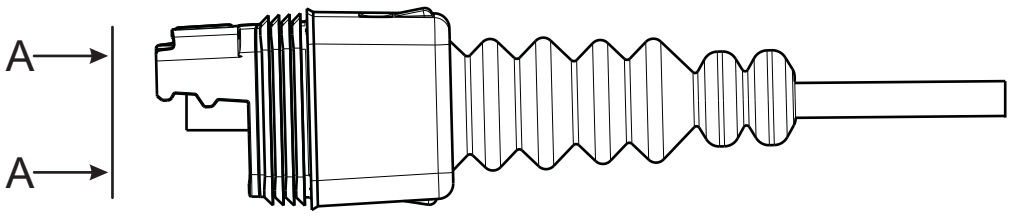
Cable name	Interface	Length [m]	Impedance [ohm]	Cable code	Sales item code
FTCB	E1/T1/JT1	15	120	994970	470309A
FTCV	E1/T1/JT1	30	120	995144	471713A
FTCX	E1/T1/JT1	50	120	995145	471714A
FTCL	E1/T1/JT1	4	120	995340	472348A
FTCY	E1	15	120	995342	472427A
FTCR	Ethernet	15	100	995094	471408A
FTCS	Ethernet	30	100	995148	471717A
FTCT	Ethernet	50	100	995149	471718A
FTCW	Ethernet	4	100	995339	472347A
FTCH	Ethernet optical	15	not relevant	994972	470311A
FTSF	Synchronization	2	not relevant	995304	472509A
FTSG	Synchronization	2	not relevant	995430	472576A
FTSK	Synchronization	2	not relevant	995530	472808A

Table 6 General information on transmission cables

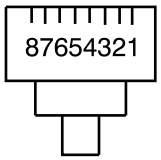
5.1 E1/T1/JT1 Cables

5.1.1 FTCB, FTCV, FTCX

Twisted pair cable for 1 x E1. One end is equipped with an RJ48C connector and a rubber gasket.



View A-A



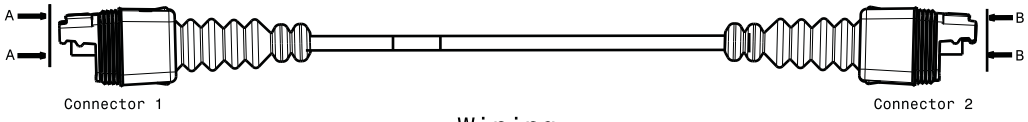
Wiring

Conn.1 Pin no.	Wire color
1	brown
2	yellow
3	
4	white
5	green
6	
7	
8	

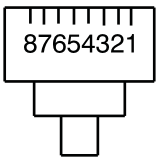
Figure 7 View of FTCB, FTCV, or FTCX cable

5.1.2 FTCL

Flexi Multiradio BTS collocation cable. Twisted pair cable for 1 x E1. Both ends are equipped with RJ48C connectors and rubber gaskets.



View A-A



Wiring

Conn.1 Pin no.	Wire color	Conn. 2 Pin no.
1	brown	4
2	yellow	5
3		
4	white	1
5	green	2
6		
7		
8		

View B-B

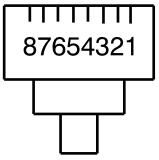
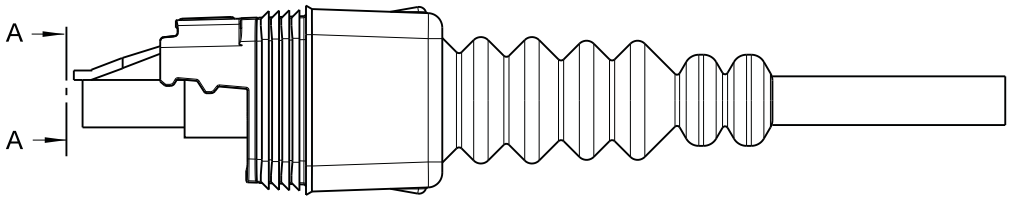
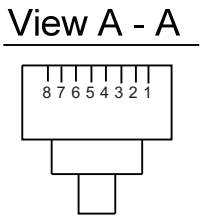


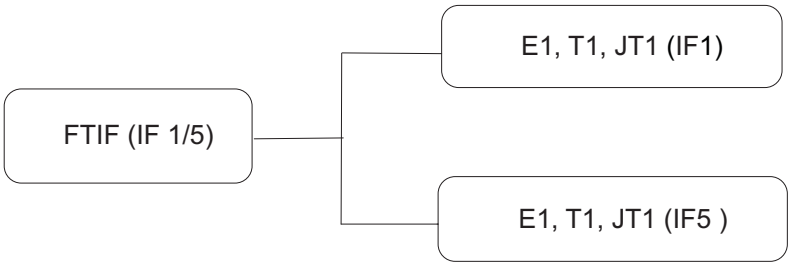
Figure 8 View of FTCL cable

5.1.3 FTCY

Dual twisted pair cable for 2 x E1. One end is equipped with RJ48C and a rubber gasket. The cable is required to connect two E1 ports to one physical E1 port on FTIF.







Wiring

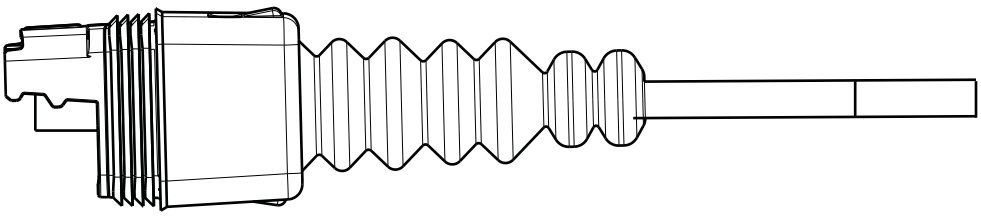
Pin No.	Connector 1(IF1)	Connector 2(IF5)	Pair no: color
1	RX1_Tip		2: white/orange
2	RX1_Ring		2: orange
3		TX2_Tip	3: white/green
4	TX1_Tip		1: blue
5	TX1_Ring		1: white/blue
6		TX2_Ring	3: green
7		RX2_Tip	4: white/brown
8		RX2_Ring	4: brown

Figure 9 View of FTCY cable

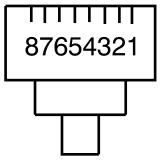
5.2 Ethernet electrical cables

5.2.1 FTCR, FTCS, FTCT

Twisted pair cable for GE. One end is equipped with an RJ45 connector and a rubber gasket.



View A-A



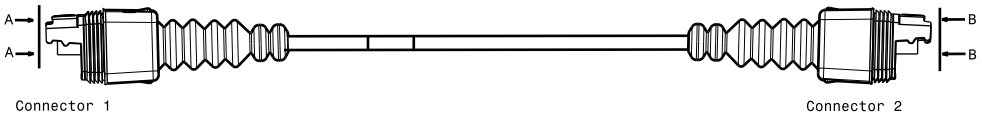
Wiring

Conn.1 Pin no.	Pair no: Color
1	2: white/orange
2	2: orange
3	3: white/green
4	1: blue
5	1: white/blue
6	3: green
7	4: white/brown
8	4: brown

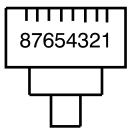
Figure 10 View of FTCR, FTCS, or FTCT cable

5.2.2 FTCW

Flexi Multiradio/Flexi Multiradio 10 collocation cable. Twisted pair cable for electrical Ethernet. Both ends are equipped with RJ45 connectors and rubber gaskets.



View A-A



Wiring

Conn.1 Pin no.	Pair no: Color	Conn. 2 Pin no.
1	2: white/orange	3
2	2: orange	6
3	3: white/green	1
4	1: blue	7
5	1: white/blue	8
6	3: green	2
7	4: white/brown	4
8	4: brown	5

View B-B

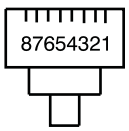
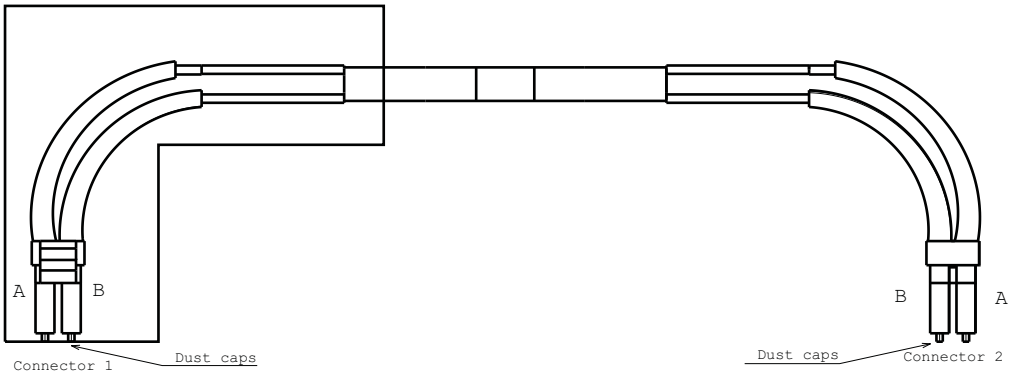


Figure 11 View of FTCW cable

5.3 Ethernet optical cable FTCH

Single mode optical fiber with 2 x LC connectors and one rubber gasket. A suitable SFP for this cable is, for example, FOSC (471880A).



Wiring

Conn.1	Conn.2
A	B
B	A

Figure 12 View of FTCH cable

In principle, all prefabricated Nokia Siemens Networks system fibers can be used for the backhaul connection. There are many variants of fibers that can be used to connect System Modules with RF Modules or Remote Radio Heads. Table 7 Multimode Flexi System Fibers presents a selection of multimode system fibers, for which the FOSD (471881A) SFP is required.

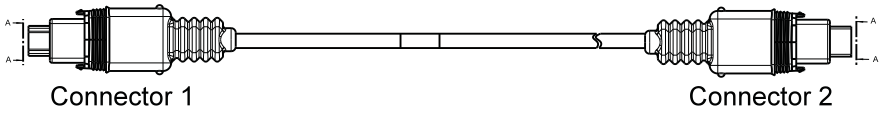
Name	Length [m]	Cable code	Sales item code
FSFB	50	995092	471395A
FSFC	100	995093	471396A
FSFD	4	995109	471743A
FSFF	10	995138	471707A
FSFG	20	995139	471708A
FSFH	30	995140	471709A
FSFI	40	995141	471710A
FSFK	75	995142	471711A
FSFP	200	995143	471712A

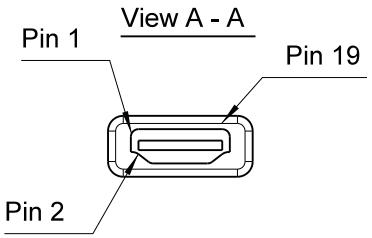
Table 7 Multimode Flexi System Fibers

5.4 Synchronization cables

5.4.1 FTSF Sync Cable F

2xHDMI connectors with rubber gaskets. The cable is used for connecting Sync In and Sync Out ports of collocated Flexi Multiradio 10 System Modules.





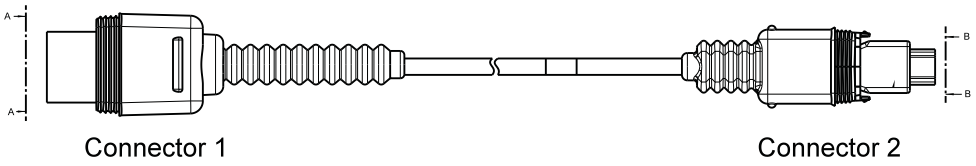
Wiring

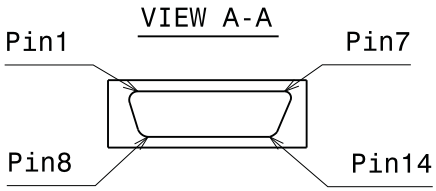
Conn.1 pin nr	Conn.2 pin nr	Pair: wire color
1: GPS_TIME_GSM_FC_OUT _H	1: GPS_TIME_GSM_FC_IN_H	TP-1: White/Blue
3: GPS_TIME_GSM_FC_OUT_L	3: GPS_TIME_GSM_FC_IN_L	TP-1: Blue/White
		TP-1G
7: PPS_OUT_H	7: GPS_PPS_GSM_FN_IN_H	TP-2: White/Orange
9: PPS_OUT_L	9: GPS_PPS_GSM_FN_IN_L	TP-2: Orange/White
11: GND	11: GND	TP-2G
2: SINGLE_ENDED_CLOCK_OUT1	2: SINGLE_ENDED_CLOCK_IN	TP-3: White/Green
4: GND	4: GND	TP-3: Green/White
6: GND	6: GND	TP-3G

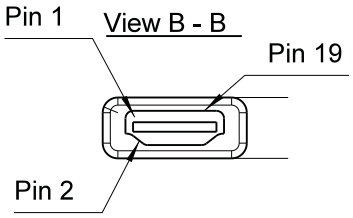
Figure 13 View of FTSF cable

5.4.2 FTSG Sync Cable G

One HDMI and one MDR14 connector with rubber gaskets. The cable is used for connecting Sync In of Flexi Multiradio 10 system module to Sync Out of Flexi Multiradio System Module.







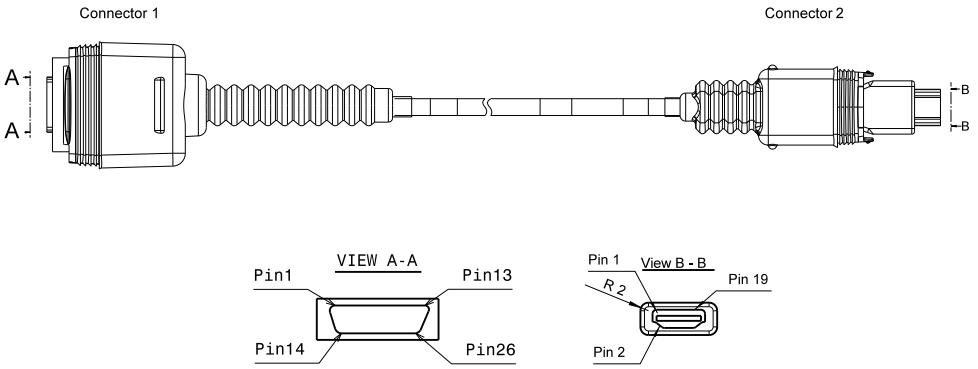
Wiring

Conn.1 MDR14 Pin no.:Signal	Conn.2 HDMI Pin no.:Signal	Pair: wire color
1: PPS_out+	7: GPS_PPS_IN_H	TP-1: White/Blue
2: PPS_out-	9: GPS_PPS_IN_L	TP-1: Blue/White
8: GND	11: GND	TP-1G
3: GPStime_out+	1: GPS_TIME_IN_H	TP-2: White/Orange
4: GPStime_out-	3: GPS_TIME_IN_L	TP-2: Orange/White
10: GND	13:GND	TP-2G
7: 2M_out	2: SingleEndedIn	TP-3: White/Green
14: GND	4: GND	TP-3: Green/White
12: GND	6: GND	TP-3G

Figure 14 View of FTSG cable

5.4.3 FTSK Sync Cable FSMF to FSMD/E

One HDMI and one MDR14 connector with rubber gaskets. The cable is used for connecting Sync Out of Flexi Multiradio 10 System Module to Sync In of Flexi Multiradio System Module.



Conn.1 MDR 26 Pin no.:Signal	Conn.2 HDMI Pin no.:Signal	Pair: wire color
1: PPS_in +	7: PPS_OUT_H	TP-1: Black
2: PPS_in-	9:PPS_OUT_L	TP-1: Yellow
8: GND	11: GND	TP-1G
3: GPStime_in+	1: GPS_TIME_OUT_H	TP-2: Black
4: GPStime_in-	3: GPS_TIME_OUT_L	TP-2: Green
10: GND	13:GND	TP-2G
7: REF2M_in	8: SingleEnded_clock_out_1	TP-3:White
14: GND	4: GND	TP-3: Blue
16: GND	6: GND	TP-3G

Figure 15 View of FTSK cable

6 Environment related markings

6.1 RSS-310 compliance

This equipment complies with RSS-310 of Industry Canada. Operation is subject to the condition that this device does not cause harmful interference.

6.2 EU RoHS statement

This equipment complies with the European Union RoHS Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment. The directive applies to the use of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE) in electrical and electronic equipment.

6.3 CE marking

Declaration of Conformity with Regard to the EU Directive 1999/5/EC (R&TTE Directive)

Hereby, Nokia Siemens Networks declares that this equipment is in compliance with the essential requirements and other relevant provisions of Directive: 1999/5/EC.

CE ! R&TTE Directive 1995/5/EC							
AT	✓	FR	✓	LV	✓	LI	✓
BE	✓	DE	✓	LT	✓	RO	✓
BG	✓	GB	✓	LU	✓	SK	✓
CY	✓	GR	✓	MT	✓	SI	✓
CZ	✓	HU	✓	NL	✓	ES	✓
DK	✓	IS	✓	NO	✓	SE	✓
EE	✓	IE	✓	PL	✓	CH	✓
FI	✓	IT	✓	PT	✓	TR	✓

Figure 16 List of countries respecting EU Directive 1999/5/EC

This declaration is only valid for configurations (combinations of software, firmware, and hardware) provided and/or supported by Nokia Siemens Networks.

6.4 FCC Part 15 compliance

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manuals, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Changes or modifications not expressly approved by the party responsible for compliance could void the user´s authority to operate the equipment.