LTE Radio Access, Rel. FDD-LTE 16A, Operating Documentation, Issue 02

Flexi Multiradio 10 Base Station System Module Description

DN09123366
Issue 04
Approval Date 2016-06-22

⚠ Important Notice on Product Safety

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Table of Contents

This document has 51 pages

List of Figures

List of Tables

Summary of changes

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

This document is common for all Radio Access Technologies (RAT). You may find here information about solutions that are not available or supported in a specific SW release or RAT. Table *RAT releases covered by the document* lists all SW releases covered by the content of this document. For features supported in your SW release, see respective feature documentation chapter in the system library.

Table 1   Releases covered by the document

Product	Release
GSM/EDGE (BSS)	RG40 (BSS), GSM 16
WCDMA RAN	RU50, RU50 EP1, WCDMA 16
Long Term Evolution	RL70, FDD-LTE 15A, FDD-LTE 16, FDD-LTE 16A
TD LTE	RL55TD, TDD-LTE 15A, TDD-LTE 16, TDD-LTE 16A

Changes between issues 03 (2015-10-01) and 04 (2016-06-21)

Flexi Multiradio 10 System Module operation and main blocks

• A note related to the FSMFA, FBBAA and FBBCA has been added.
• Information on plug-and-play functionality has been added.

Synchronization

• Information on GPS modules has been added.

LMP connector pin map

• The section has been updated.

Interfaces of the Flexi Multiradio 10 System Module (FSMF)

• Information on reset button has been added.

Interfaces of the Flexi Multiradio 10 System Module (FSIH)

• Information on reset button has been added.

Changes between issues 02 (2015-09-08) and 03 (2015-10-01)

Dimensions and weights of the Flexi Multiradio 10 System Modules

• FSIH weight has been changed.

Dimensions and weights of the capacity extension sub-modules

• FBIH weight has been changed.

Changes between issues 01l (2015-01-09) and 02 (2015-09-08)

Power requirements of the capacity extension sub-modules

• Typical power consumption of FBBC has been changed.

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.

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.

3 CE marking

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

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

Figure 1   List of countries respecting EU Directive 1999/5/EC

CE ① 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	✓

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

4 FCC Part 15 compliance

This equipment has been tested and found to comply with the limits for a Class B 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.

5 Flexi Multiradio 10 System Module operation and main blocks

Flexi Multiradio System Module is an integral part of Flexi Multiradio 10 BTS. It supports the following software operating modes:

- GSM/EDGE
- WCDMA
- HSPA, HSPA Evolution
- LTE in FDD and TDD

They are supported either in a dedicated or a concurrent mode of operation. The concurrent mode functionality can include several radio access technologies and their combinations, for example: GSM-LTE, GSM-WCDMA, WCDMA-LTE, GSM-WCDMA-LTE. Flexi Multiradio 10 BTS also supports multi-operator cases (MORAN) where several operators can share resources of one BTS.

With Flexi Multiradio 10 BTS the user can build a site in a flexible way, that is adjusted to needs:

- System Module can act as a System Extension Module operating in a baseband extension mode. Flexi Multiradio 10 BTS architecture supports chaining of up to nine System Modules. It thus enables building of very high capacity sites and different redundancy solutions.
- Multiband support - RF Modules for different frequency bands can be connected to the same System Module.
- Cooperation with the existing Flexi Multiradio BTS and sharing the same network interface, synchronization, and power distribution units.

Note: RFM modules can be connected as plug-and-play unit in the fast delivery mode to Multiradio 10 System Module-based configurations only. Plug-and-play RFM modules should not be deployed to base stations with Flexi Multimode (Release 2) System module.

The tasks of the System Module are:

- telecom control
- system operation and maintenance
- baseband processing
- transmission
- synchronization
- power distribution via optional sub-module

The following versions of Flexi Multiradio 10 Base Station System Modules are available:

- Flexi Multiradio System Module Outdoor/Indoor FSMF (472181A)
- Flexi Multiradio System Module Indoor FSIH (472567A)

Note: The document covers also the Flexi Multiradio 10 System Module FSMFA and capacity extension sub-modules: FBBAA and FBBCA. All information related to the FSMF, FBBA and FBBC is valid also for FSMFA, FBBAA and FBBCA.

5.1 Flexi Multiradio 10 System Module Outdoor

The outdoor Flexi Multiradio 10 System Module FSMF consists of:

• casing of the height of three standard rack units
• weatherproof core module
• fans

The fan assembly is connected with a cable to the core module. All these items form a single sales item. The core module has the control and baseband processing functionality of the BTS. It contains also up to two integrated Gigabit Ethernet transport interfaces for the backhaul.

Additional optional equipment that can be installed in the System Module casing is:

• up to two capacity extension sub-modules
• one transport sub-module
• one power distribution sub-module

The capacity extension sub-modules are connected with cables to the core module. Other two sub-modules are connected through internal connectors. The System Module has no backplane. All modules are outdoor-capable, IP65-sealed modules.

 shows the total air interface throughput of a Flexi Multiradio 10 System Module, which can vary depending on the combination of the modules used. Note that MIMO is supported for both HSPA and LTE.

Table 2   Flexi Multiradio 10 System Module outdoor air interface peak throughput

Capacity	FSMF
GSM/EDGE [transceivers]	36
WCDMA [channel elements]	528
HSDPA [Mbps]	756
HSUPA [Mbps]	115
LTE DL [Mbps]	450
LTE UL [Mbps]	150

Table 2   Flexi Multiradio 10 System Module outdoor air interface peak throughput
(Cont.)

Capacity	FSMF
LTE BW/cell [MHz]	20
LTE cells [cell count]	3
MIMO (HSPA/LTE)	yes

The GSM/EDGE capacity is measured as the number of transceivers. The WCDMA capacity is measured as the number of Channel Elements (CEs), while the HSPA capacity is measured as megabits per second. WCDMA traffic dimensioning principles are described in other documents (see *Plan and Dimension* category in the library). HSPA users and data might have an impact on the number of AMR calls.

Additionally, LTE has a bandwidth and cell count limitation. For more information, see *Feature Descriptions and Instructions* in LTE Operating Documentation library.

Functional blocks

See the following figure for the functional blocks of the System Module.

Figure 2   Functional blocks of the System Module (FSMF) with FTIF, FBBA/FBBC, and FPFD
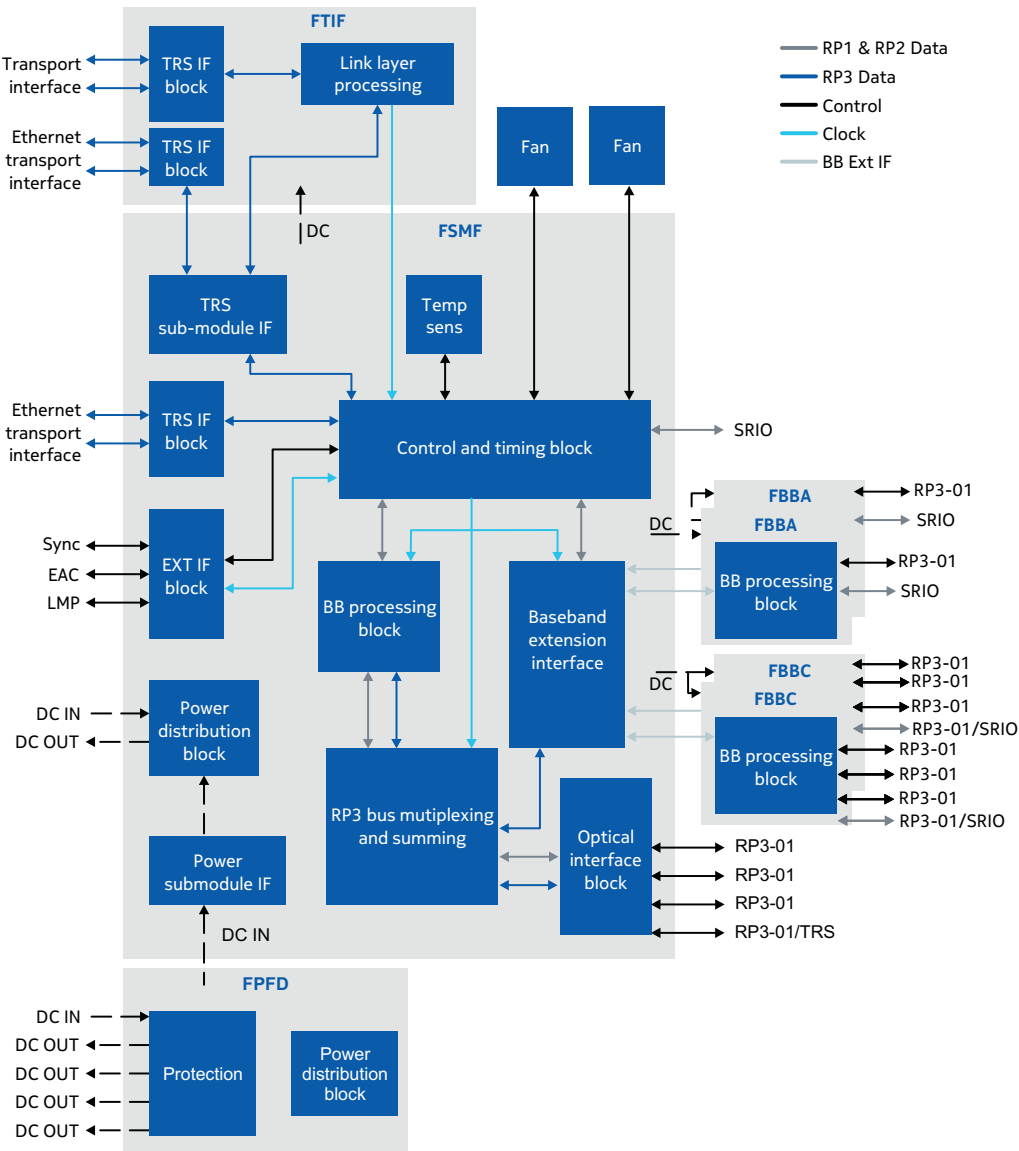
shows the location of the product code and serial number on Flexi Multiradio 10 System Module (FSMF).

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Figure 3   Location of the product code and serial number

Product code and
serial number of the FSM

Product code and
serial number of the core
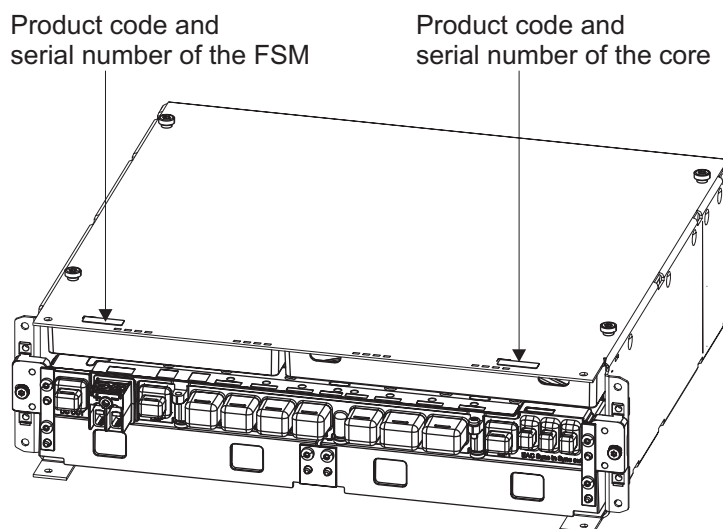
5.2   Flexi Multiradio 10 System Module Indoor

The Flexi Multiradio 10 System Module Indoor (FSIH) consists of:

- casing of the height of 2.5 standard rack units
- core module
- fans
- backplane

The fan assembly is connected with a cable to the backplane and controlled by the core module. All these items form a single sales item. The core module has the control and baseband processing functionality of the BTS. It contains also up to three integrated Gigabit Ethernet transport interfaces for the backhaul.

Additional optional equipment that can be installed in the System Module casing is:

- up to two capacity extension sub-modules

The capacity extension sub-modules are connected via backplane to the core module. All modules are rated at IP20.

Table 3: Flexi Multiradio 10 System Module Indoor air interface peak throughput shows the total air interface throughput of a Flexi Multiradio System Module, which can vary depending on the combination of the modules used.

Table 3   Flexi Multiradio 10 System Module Indoor air interface peak throughput

Capacity	FSIH
GSM/EDGE [transceivers]	N/A
WCDMA [channel elements]	N/A

Table 3   Flexi Multiradio 10 System Module Indoor air interface peak throughput (Cont.)

Capacity	FSIH
HSDPA [Mbps]	N/A
HSUPA [Mbps]	N/A
LTE DL [Mbps]	440
LTE UL [Mbps]	108
LTE BW/cell [MHz]	20
LTE cells [cell count]	4
MIMO	yes

Single FSIH or FBIH module supports the following configurations:

- 3 cells @ 20 MHz 8TX and 8RX, or
- 3 cells @ 20 MHz 4TX and 4RX, or
- 4 cells @ 20 MHz 2TX and 2RX

Functional blocks

See the following figure for the functional blocks of the System Module.

Figure 4   Functional blocks of the System Module (FSIH) with two FBIHs
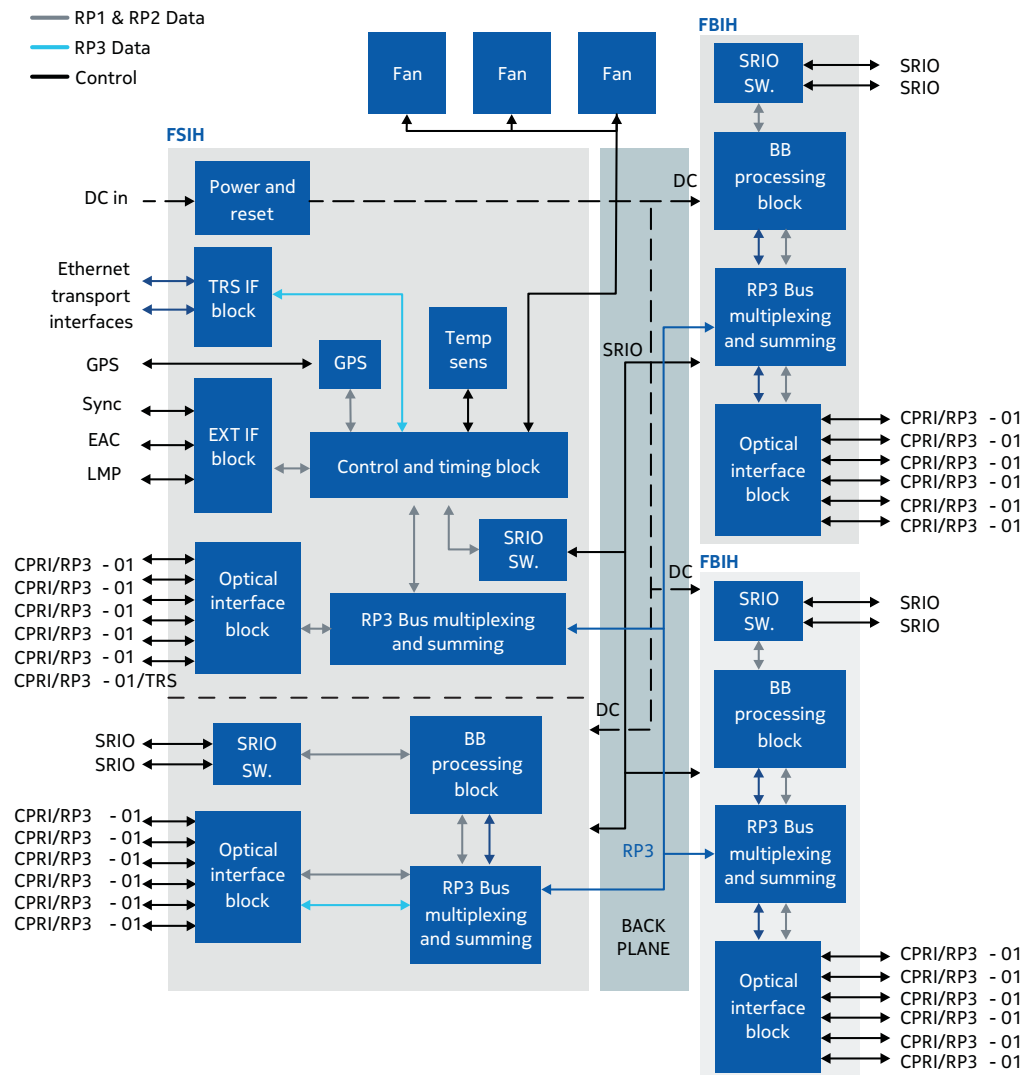
5.3 Capacity Extension Sub-Module

Capacity extension sub-module allows increasing of the BTS capacity. It can be inserted into the casing, providing additional signal processing power to the system. Adding the capacity sub-modules in the field does not affect the ongoing traffic. The following capacity extension sub-modules are available:

- FBBA for FSMF (472182A)
- FBBC for FSMF (472797A)
- FBIH for FSIH (472568A)

FBBA is powered by the core module. The second sub-module is powered by the first one. Every extension sub-module is connected to the core module through QSFP connector.

In case of FBBC both sub-modules are powered directly by the core module via Y-cable. Similarly to FBBA, every extension sub-module is connected to the core module through QSFP connector.

FBIH connection to the core module is done entirely through the backplane.

For more information on cabling, see *Cabling Flexi Multiradio 10 Base Station*.

Table 4: Capacity extension sub-module air interface peak throughput shows the total air interface throughput of capacity extension sub-modules.

Table 4   Capacity extension sub-module air interface peak throughput

Capacity	FBBA	FBBC	FBIH
GSM/EDGE [transceivers]	N/A	N/A	N/A
WCDMA [channel elements]	576	N/A	N/A
HSDPA [Mbps]	756	N/A	N/A
HSUPA [Mbps]	157	N/A	N/A
LTE DL [Mbps]	450	450	440
LTE UL [Mbps]	150	150	108
LTE BW/cell [MHz]	20	20	20
LTE cells [cell count]	3	3	4
MIMO (HSPA/LTE)	yes	yes	yes

The GSM/EDGE capacity is measured as the number of transceivers. The WCDMA capacity is measured as the number of Channel Elements, while the HSPA capacity is measured as megabits per second. WCDMA traffic dimensioning principles are described in other documents (see *Plan and Dimension* category in the library). HSPA users and data might have an impact on the number of AMR calls.

Additionally, LTE has a bandwidth and cell count limitation. For more information, see *Feature Descriptions and Instructions* in LTE Operating Documentation library.

For more information, see *Flexi Multiradio Base Station and Flexi Multiradio 10 Base Station Optional Items Description*.

5.4 Transport options

5.4.1 Flexi Multiradio 10 System Module (FSMF)

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.

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

ℹ️ **Note:** 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[1]
- LTE S1/X2, or WCDMA Iub/IP, or GSM Packet Abis over Ethernet backhaul interfaces

Figure 5 Flexi Multiradio 10 Base Station System Module and transport interfaces

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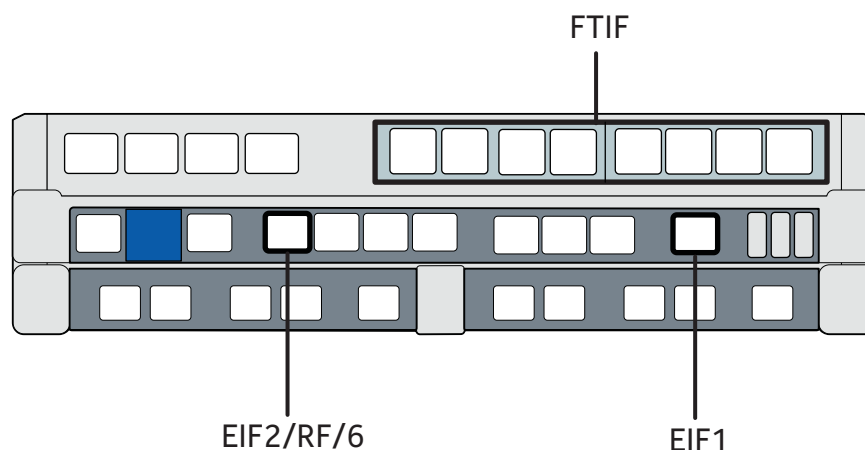
[1] This function is supported from release RL35TD onwards.

Table 5   Flexi Multiradio 10 Base Station System Module transmission interfaces

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

Note: 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.

5.4.2 Flexi Multiradio 10 System Module (FSIH)

Note: Indoor System Module FSIH is supported from RL45TD release onwards.

Core module offers up to three integrated Ethernet interfaces that can be used simultaneously:

- One optical shared port
- Two Combo ports in the following combinations:
    - 2 x 100/1000Base-T, or
    - 2 x optional optical SFP, or
    - 1 x 100/1000Base-T and 1 x optional optical SFP

The optical shared port is available for transport only if it is not used for RF Module connectivity. FSIH supports Synchronous Ethernet Generation over all the integrated Ethernet interfaces.

More detailed information can be found in *Flexi Multiradio 10 Base Station Transmission Description*.

5.5 Power distribution options

Power distribution module provides 48 V DC power output connectors for power distribution to RF Modules, Remote Radio Heads, capacity extension System Modules, or any standard 48 V DC device at the site.

The following optional power distribution modules are available:

- power distribution sub-module (FPFD) for near-by-located devices.
  Note that FPFD is installed in the System Module casing (see Front panel of the
  System Module). When it is installed, it also powers the core module via an internal
  connector (MEC8). Hence, the FSMF DC IN interface must not be used.
  Note that FPFD is not applicable to FSIH.
- stand-alone power distribution module (FPFC) for feederless sites mainly.

For more information, see *Flexi Multiradio Base Station and Flexi Multiradio 10 Base
Station Optional Items Description*.

5.6 Optional items

Optional items are the elements that do not belong to the above-mentioned categories.
Optional items are, for example:

- Flexi Mounting Kit for Floor, Wall, and Pole (FMFA)
- Flexi Cabinet for Outdoor (FCOA)

For the complete list of the available optional items, see *Flexi Multiradio Base Station
and Flexi Multiradio 10 Base Station Optional Items Description*.

6 Synchronization

The Flexi Multiradio 10 BTS requires accurate timing information. It can be extracted from:

- the TDM-based network interface
- the packet network via:

    – Timing over Packet
    – Synchronous Ethernet

- the 2.048 MHz signal
- another Flexi BTS or a legacy BTS
- the Global Positioning System (GPS)
- the BeiDou Navigation Satellite System
- the Global Navigation Satellite System (GLONASS)
- the GPS GLONASS Receiver Antenna (FYGB)
- the Flexi GPS Box (FYGD)
- the Flexi Enhanced External GPS Box (FYGE)
- the Outdoor External GNSS Enhanced Holdover (FYGG)
- the Outdoor GNSS receiver (FYGM)

FSIH contains an integrated GNSS (GPS and GLONASS) receiver. FSMF requires an additional unit. The full list of available units can be found in *Flexi Multiradio Base Station and Flexi Multiradio 10 Base Station Optional Items Description*.

FYGM is compatible with existing legact Sync-In port and plug-and-play to existing synchronization features in FSIH and FSMF.

i   **Note:** The BTS-internal clock source can also be used for a limited period if the external timing reference is lost.

In the Ethernet transport case, the timing information can be carried over the Ethernet-based network using the Timing over Packet functionality, where specific timing packets are sent over the network from a master clock to the BTS.

If Synchronous Ethernet generation is required, FSMF must contain FTIF.

FSIH contains the synchronization hub feature by default. There is no need for additional HW.

7 Module chaining

Flexi Multiradio 10 BTS architecture supports System Module chaining. It thus enables building of very high capacity sites and different redundancy solutions. One of the System Modules has to be selected, with BTS SW, as the master unit.

The encrypted connection between System Modules is done via SRIO interface.

By default, the first System Module is the master but its role can be taken over by the slave unit, for example, during a recovery action.

8 Power requirements

8.1 Power requirements of the Flexi Multiradio 10 System Modules

The power supply of the System Module is described in the tables below.

Table 6   Input voltage of the System Module

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to - 57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
The minimum startup voltage is 40.5 V DC.	

If input voltage is below/beyond extended limits, the unit may shut down.

Table 7   Power consumption of the System Modules

Module	Typical power consumption [W]	Maximum power consumption [W]
FSMF	125	180
FSIH	250	290

All above with nominal 48 V voltage input.

8.2 Power requirements of the capacity extension sub-modules

The typical power consumption of the capacity extension sub-modules is described in the table below.

Table 8   Power consumption of the capacity extension sub-modules

Module	Typical power consumption [W]	Maximum power consumption [W]
FBBA	85	136

Table 8   Power consumption of the capacity extension sub-modules (Cont.)

Module	Typical power consumption [W]	Maximum power consumption [W]
FBBC	91	147
FBIH	150	190

8.3 Power requirements of the transmission sub-modules

The typical power consumption of the transmission sub-modules is described in the table below.

Table 9   Power consumption of the transmission sub-modules

Module	Typical power consumption [W]
FTIF	10

Power consumption depends on the equipment connected to the transmission sub-module.

9 Dimensions and weights

9.1 Dimensions and weights of the Flexi Multiradio 10 System Modules

System Module is installed inside a casing. Dimensions and weights of the casings are in Dimensions and weights of the casings. Note that dimensions of the optional covers are not included.

Table 10   Dimensions and weights of the casings

Property	FSMF casing	FSIH casing
Height	133 mm/3U (5.2 in.)	110.3 mm/2.5U (4.3 in.)
Width	447 mm (17.6 in.)	448 mm (17.6 in.)
Depth	420 mm (16.5 in.)	375 mm (14.8 in.)
Weight with core module	11.5 kg (25.3 lb)	11.5 kg (23.4 lb)

⚠ **CAUTION! Risk of personal injury.**
The equipment is heavy. Take care when lifting the module.

9.2 Dimensions and weights of the capacity extension sub-modules

Table 11   Dimensions and weights of the capacity extension sub-modules

Property	FBBA	FBBC	FBIH
Height	42 mm (1.6 in.)	42 mm (1.6 in.)	25.8 mm (1 in.)
Width	220 mm (8.7 in.)	220 mm (8.7 in.)	442 mm (17.4)
Depth	363 mm	363 mm	277 mm

Table 11   Dimensions and weights of the capacity extension sub-modules (Cont.)

Property	FBBA	FBBC	FBIH
	(14.3 in.)	(14.3 in.)	(10.9 in.)
Weight	3.35 kg (7.38 lb)	3.35 kg (7.38 lb)	3.72 kg (8.20 lb)

10 Interfaces

All interfaces of the System Modules, capacity extension sub-modules, and transport sub-modules are located on the front panel.

OBSAI RP3-01 line can handle up to 6.144 Gbps, that is, it can transfer up to 32 WCDMA carriers via one link. Hence, it allows creating very large RF configurations. For CPRI the following line rates are supported: 1.228, 2.45761, 4.9152, and 6.144 Gbps. FSIH supports also 9.8 Gbps CPRI throughput.

BTS internal communications between sub-assemblies is done with SRIO (6.25 Gbps line rate) which provides very fast and low latency interface and allows the operator to utilize advanced receiver algorithms.

SRIO and OBSAI RP3-01 interfaces are used also as communication channels between the first System Module and the expansion System Modules. The SRIO switch supports Link Layer Encryption scheme on 4 of its 16 ports. Encryption is used for external interfaces to protect them against possible intruders.

Descriptions of the transport sub-modules interfaces can be found in *Flexi Multiradio 10 Base Station Transmission Description*.

Descriptions of the radio module interfaces can be found in *Flexi Multiradio BTS Radio Module and Remote Radio Head Description*, *Flexi Multiradio 10 Base Station TD-LTE RF Module and Remote Radio Head Description*.

10.1 Interfaces of the Flexi Multiradio 10 System Module (FSMF)

Table 12 Flexi Multiradio 10 System Module (FSMF) connectors

Connector	Type	Description
DC Out	PwrProfile	Power output for power chaining to one optional baseband capacity extension sub-module.
DC In	DC Terminal 2P	Power input connector for power distribution to the System Module.
LMP Site Support Interface	RJ45	Ethernet interface for Element Manager or Site Support equipment (battery backup module, for example).
EIF2/RF/EXT6	SFP	Ethernet interface for external transport. Note that this is the default configuration. Alternatively, it can be SW configured as additional optical interface that provides RP3-01 (OBSAI) or CPRI interfacing to RF Module or RRH.
RF/EXT1	SFP	Optical interfaces provide RP3-01 (OBSAI) or CPRI interfacing to RF Modules or RRHs.

Table 12   Flexi Multiradio 10 System Module (FSMF) connectors (Cont.)

Connector	Type	Description
RF/EXT2	SFP	
RF/EXT3	SFP	
SRIO	SFP	Interface in the core module (and one similar interface in each optional extension sub-modules) used for System Module chaining. System Module chaining is not supported in all RATs. For details, see *Feature List*.
BB EXT1	SFP	Interfaces for broadband interconnecting between the core module and the optional extension sub-modules.
BB EXT2	SFP	All necessary signals are carried over a single copper cable between the core module and the sub-module.
EIF1	RJ45	100/1000 Base-T Gigabit Ethernet interface for external transport, that is, interfacing towards the RAN, or directly towards the CN (LTE).
EAC	HDMI	External Alarms and Controls (EAC) interface provides six alarm signals and six SW controllable interfaces that can be assigned to support either control or alarm signals.
SYNC IN	HDMI	HDMI-based input and output external synchronization interfaces enable, for example, interfacing to GPS equipment.
SYNC OUT	HDMI	

The Flexi Multiradio 10 System Module (FSMF) front panel is illustrated in the following figure.

Figure 6   Front panel of the FSMF with optional sub-modules FPFD, FTIF, and two
FBBAs

Optional power distribution
sub-module

Optional capacity extension
sub-module

Optional transport
sub-module

Reset

DC Output

DC Input

LMP

EIF2/RF/EXT6

BB EX1-2

SRIO

RF/EXT1-3

Sync Out

Sync In

EAC

EIF1

The reset button is located under the EIF1 interface. Press the reset button for 5
seconds to clear configuration data. Manual reset is required afterwards for changes to
take effect.

10.2 Interfaces of the Flexi Multiradio 10 System Module (FSIH)

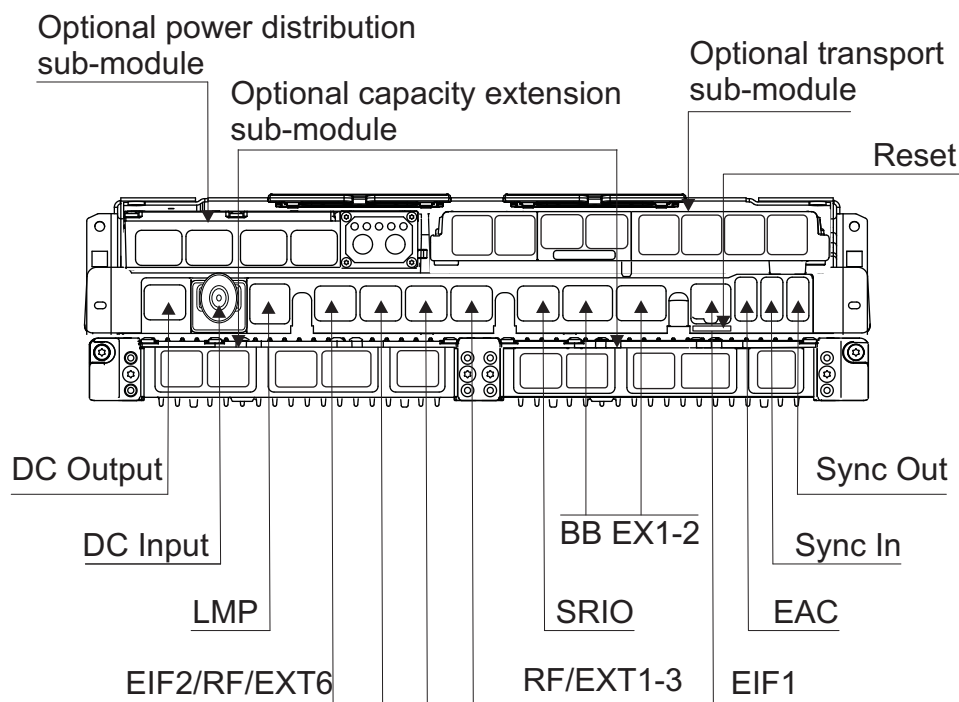*Table 13*   Flexi Multiradio 10 System Module (FSIH) connectors

Connector	Type	Description
DC In		Power input connector for power distribution to the System Module.
LMP Site Support Interface	RJ45	Ethernet interface for Element Manager or Site Support equipment (battery backup module, for example).
RF6/EIF5	SFP	An additional optical interface that provides RP3-01/CPRI 6.144G interfacing to RF Module or RRH. Alternatively, it can be SW configured as a Ethernet interface (1000Base-X) for external transport.
RF1	SFP	Optical interfaces provide RP3-01/CPRI 6.144G interfacing to RF Modules or RRHs.

Table 13   Flexi Multiradio 10 System Module (FSIH) connectors (Cont.)

Connector	Type	Description
RF2	SFP	
RF3	SFP	
RF4	SFP	
RF5	SFP	
RFEXT1/10G	SFP	Optical interfaces provide RP3-01/CPRI 6.144G and CPRI 9.8G interfacing to RF Modules or RRHs.
RFEXT3/10G	SFP	
RFEXT5/10G	SFP	
RFEXT2	SFP	Optical interfaces provide RP3-01/CPRI 6.144G interfacing to RF Modules or RRHs.
RFEXT4	SFP	
RFEXT6	SFP	
SRIO1	SFP	Interfaces in the core module support high-speed chaining several System Modules per BTS.
SRIO2	SFP	
EIF1	SFP (1000Base-X)	Interfaces for external transport, that is, interfacing towards directly towards the CN or for transport chaining. EIF1 and EIF3 form a combo port. EIF2 and EIF4 form another combo port.
EIF2	SFP (1000Base-X)	
EIF3	RJ45 (1000Base-T)	
EIF4	RJ45 (1000Base-T)	
EAC	HDMI	External Alarms and Controls (EAC) interface provides: • 12 alarm signals (6 control outputs and 6 alarm inputs), or • 12 alarm inputs and serial bus interface for FSEB
SYNC IN	HDMI	HDMI-based input and output external synchronization interfaces.
SYNC OUT	HDMI	
GPS RF	GPS	Interface to an external GPS antenna.

The Flexi Multiradio 10 System Module (FSIH) front panel is illustrated in the following figure.

Figure 7   Front panel of the FSIH
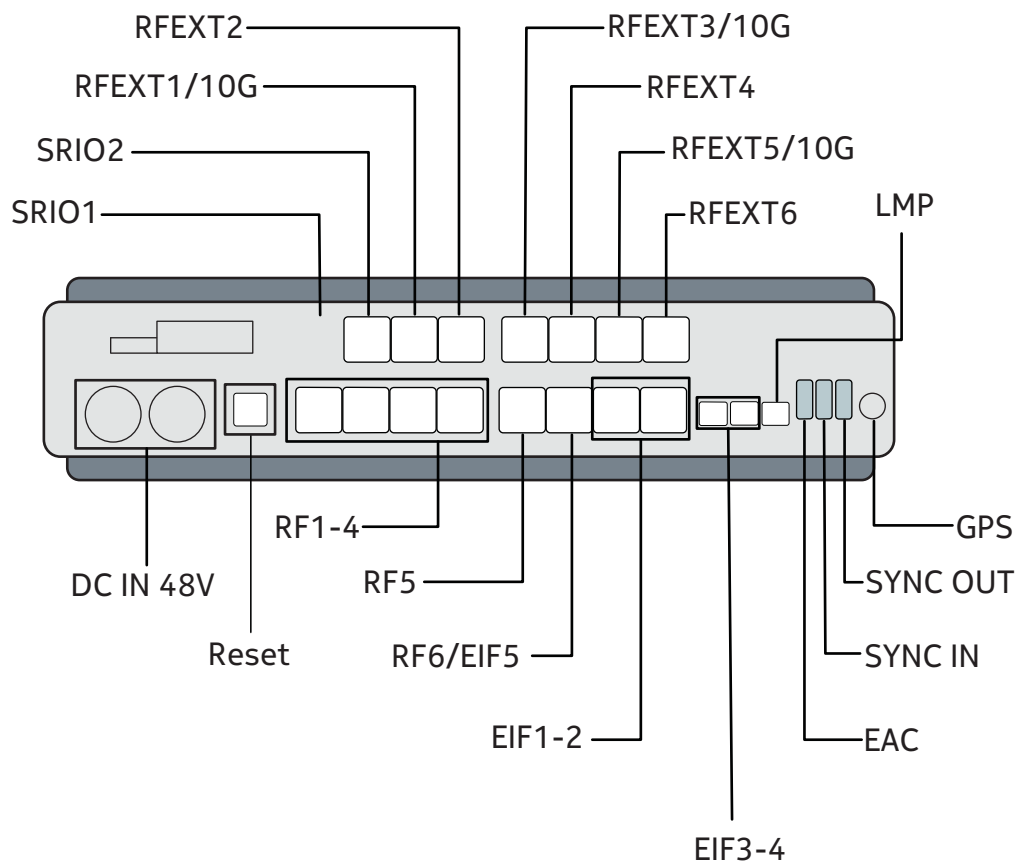
The reset button is located next to the power input connector. Press the reset button for 5 seconds to clear configuration data. Manual reset is required afterwards for changes to take effect.

10.3   Interfaces of the capacity extension sub-module (FBBA)

Table 14   Interfaces of the capacity extension sub-module (FBBA)

Connector	Type	Description
DC In	PwrProfile	Power input connector.
DC Out	PwrProfile	Power output connector towards another baseband capacity extension sub-module.
SRIO	SFP	Interface for an external baseband extension, for example additional System Module.
BB EXT	QSFP	Interface for interconnecting capacity extension sub-module and System Module.

Table 14   Interfaces of the capacity extension sub-module (FBBA) (Cont.)

Connector	Type	Description
RF/EXT	SFP	Optical OBSAI RP3-01 (up to 6 Gbit/s) interface towards RF unit.

The capacity extension sub-module (FBBA) front panel is illustrated in the following figure.

Figure 8   Interfaces of the capacity extension sub-module (FBBA)
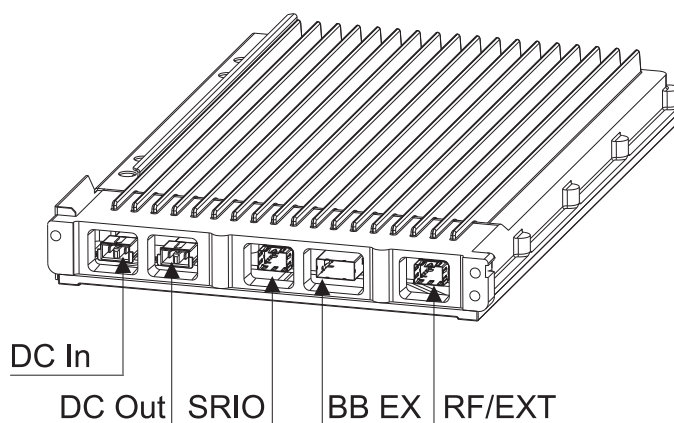
10.4 Interfaces of the capacity extension sub-module (FBBC)

Table 15   Interfaces of the capacity extension sub-module (FBBC)

Connector	Type	Description
DC In	PwrProfile	Power input connector.
RF1 RF2 RF3	SFP	Optical OBSAI RP3-01 (up to 6 Gbit/s) interfaces towards RF units.
SRIO/RF4	SFP	Dual mode combo port which can be configured either as SRIO or as RP3 interface.
BB EXT	QSFP	Interface for interconnecting capacity extension sub-module and System Module.

The capacity extension sub-module (FBBC) front panel is illustrated in the following figure.

Figure 9   Interfaces of the capacity extension sub-module (FBBC)

DC IN   RF1   RF2   BB EXT   RF3   SRIO/RF4

10.5 Interfaces of the capacity extension sub-module (FBIH)

Table 16   Interfaces of the capacity extension sub-module (FBIH)

Connector	Type	Description
SRIO1 SRIO2	SFP	Interface for an external baseband extension, for example additional System Module.
RFEXT2 RFEXT4 RFEXT6	SFP	Optical interfaces provide RP3-01/CPRI 6.144G interfacing towards RF units.
RFEXT1/10G RFEXT3/10G RFEXT5/10G	QSFP	Optical interfaces provide RP3-01/CPRI 6.144G and CPRI 9.8G interfacing towards RF units.

The capacity extension sub-module (FBIH) front panel is illustrated in the following figure.

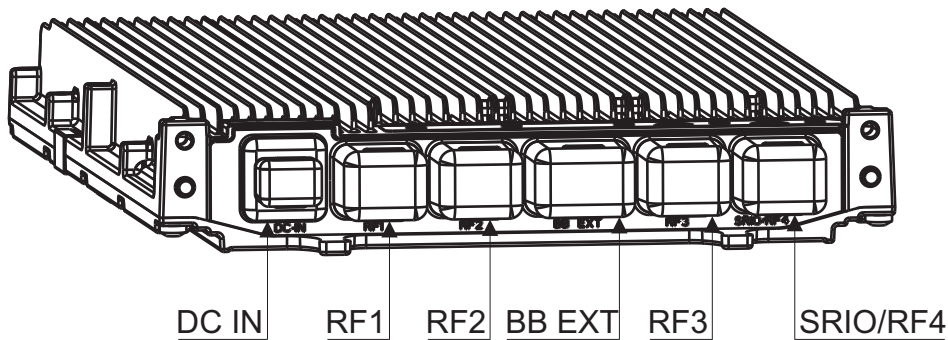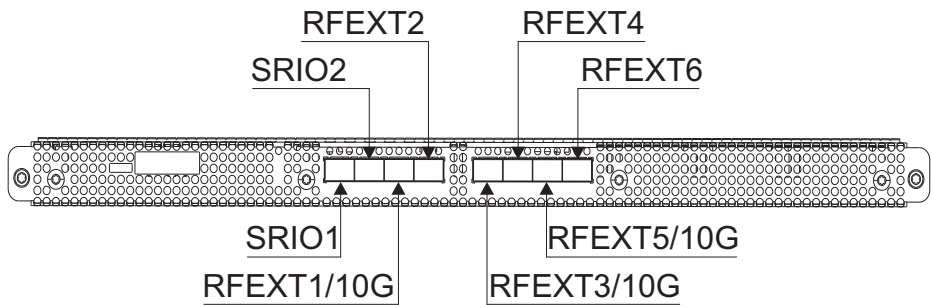*Figure 10*   Interfaces of the capacity extension sub-module (FBIH)

RFEXT2   RFEXT4
SRIO2   RFEXT6

SRIO1   RFEXT5/10G
RFEXT1/10G   RFEXT3/10G

11 LEDs

System Module and capacity extension sub-module have tricolor LEDs on the front panel to indicate the operational status of the module and all fault conditions during operation. It is recommended that you read the information on the LED indications carefully. A blinking red LED does not always require removing of the module.

For more information on radio module-related LEDs, see *Flexi Multiradio BTS Radio Module and Remote Radio Head Description*, *Flexi Multiradio 10 Base Station TD-LTE RF Module and Remote Radio Head Description*, *Flexi Multiradio 10 Base Station TD-LTE Remote Radio Head Description*.

For more information on optional items-related LEDs, see *Flexi Multiradio Base Station and Flexi Multiradio 10 Base Station Optional Items Description*.

11.1 LEDs of the Flexi Multiradio 10 System Module (FSMF)

The figure and table below explain LED indications on the FSMF module.

Figure 11   LEDs of the Flexi Multiradio 10 System Module (FSMF)

Table 17   LEDs of the Flexi Multiradio 10 System Module (FSMF)

LED name	LED description	Color
EIF2/RF/6	RF/EXT link 6 status or transport interface 2 status	• Red: no connection • Green: connection OK • Yellow: not in use
RF/EXT1	RF link 1 status	• Red: no connection • Green: connection OK • Yellow: not in use
RF/EXT2	RF link 2 status	• Red: no connection • Green: connection OK • Yellow: not in use
RF/EXT3	RF link 3 status	• Red: no connection

Table 17   LEDs of the Flexi Multiradio 10 System Module (FSMF) (Cont.)

LED name	LED description	Color
		• Green: connection OK • Yellow: not in use
SRIO	SRIO connection status	• Red: connection is faulty/ no link detected • Red, blinking: connection is degraded • Green: connection OK/ link detected • no color: port is not in use
EIF1/TRS	transport interface 1 status	• Red: no connection • Green: connection OK • Yellow: not in use
FAN	fan status	• Red: fan fault • Green: fan OK
STATUS	system module status	• Red: module self-test or reset (LED red for < 5 seconds) or major alarm or critical alarm • Red, blinking: minor alarm • Yellow: stand-by or blocked • Yellow, blinking: SW download or configuration ongoing, module non-operational • Green: module operational (the cell can be locked in the RNC) • Green, blinking: module is loading software or parameters or local maintenance access when modules are operational

11.2 LEDs of the Flexi Multiradio 10 System Module (FSIH)

The figure and table below explain LED indications on the FSIH module.

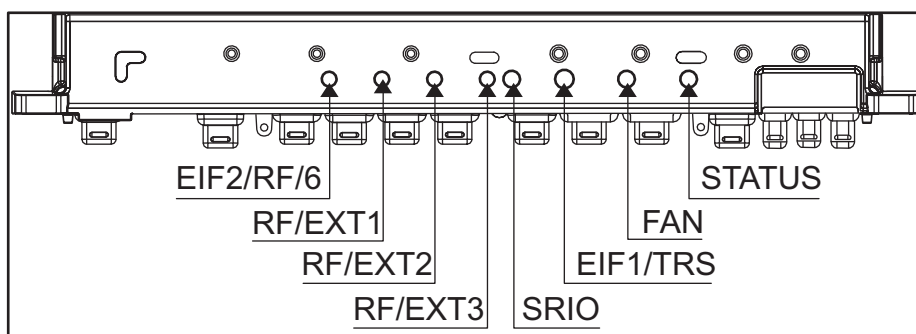*Figure 12*   LEDs of the Flexi Multiradio 10 System Module (FSIH)
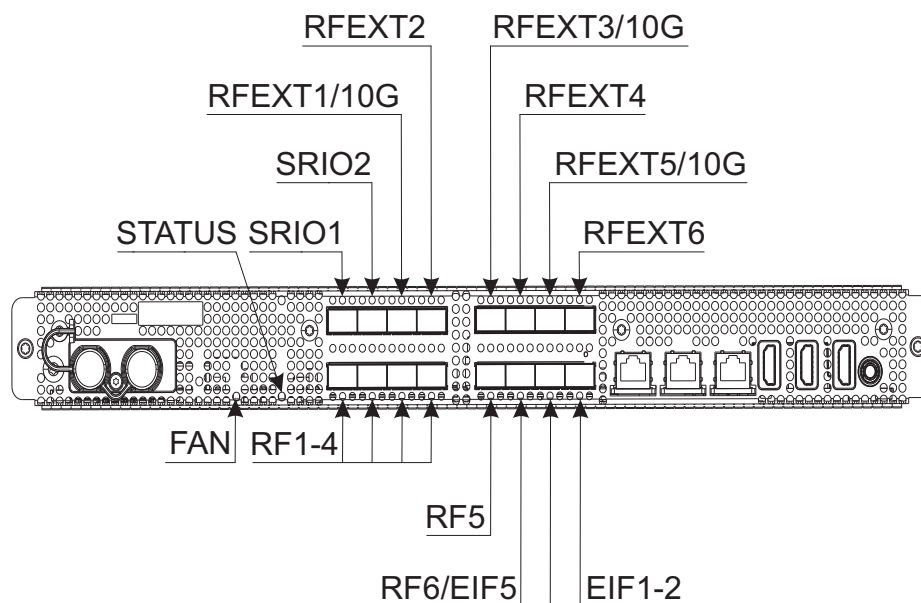
Table 18   LEDs of the Flexi Multiradio 10 System Module (FSIH)

LED name	LED description	Color
FAN	fan status	• Red: fan fault • Green: fan OK
STATUS	system module status	• Red: module self-test or reset (LED red for < 5 seconds) or major alarm or critical alarm • Red, blinking: minor alarm • Yellow: stand-by or blocked • Yellow, blinking: SW download or configuration ongoing, module non-operational • Green: module operational • Green, blinking: module is loading software or parameters or local maintenance access when modules are operational
RF1 RF2 RF3 RF4 RF5 RF6 RF/EXT1 RF/EXT2 RF/EXT3 RF/EXT4 RF/EXT5 RF/EXT6	RF link status	• Red: no connection • Green: connection OK • Yellow: not in use
SRIO1 SRIO2	SRIO1-2 connection status	• Red: no connection • Green: connection OK • Yellow: not in use

Table 18   LEDs of the Flexi Multiradio 10 System Module (FSIH) (Cont.)

LED name	LED description	Color
EIF1 EIF2	transport interface status	• Red: no connection • Green: connection OK • Yellow: not in use

11.3   LEDs of the capacity extension sub-module (FBBA)

The figure and table below explain LED indications on the FBBA module.

Figure 13   LEDs of the capacity extension sub-module (FBBA)
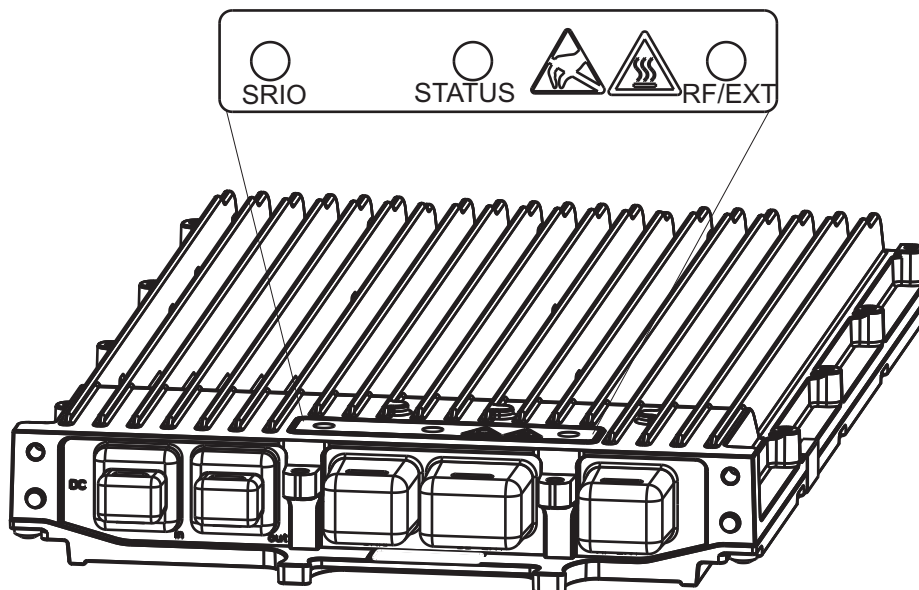
Table 19   LEDs of the capacity extension sub-module (FBBA)

LED name	LED description	Color
SRIO	SRIO1 connection status	• Red: no connection • Green: connection OK • Yellow: not in use
STATUS	operational status	• Red: module self-test or reset (LED red for < 5 seconds) or major alarm or critical alarm • Red, blinking: minor alarm • Yellow: stand-by or blocked • Yellow, blinking: SW download or configuration ongoing, module non-operational

Table 19   LEDs of the capacity extension sub-module (FBBA) (Cont.)

	LED description	
LED name		**Color**
		• Green: module operational • Green, blinking: module is loading software or parameters or local maintenance access when modules are operational
RF/EXT	RF link status	• Red: no connection • Green: connection OK • Yellow: not in use

11.4 LEDs of the capacity extension sub-module (FBBC)

The figure and table below explain LED indications on the FBBC module.

Figure 14   LEDs of the capacity extension sub-module (FBBC)

Table 20   LEDs of the capacity extension sub-module (FBBC)

	LED description	
LED name		**Color**
RF1/ RF2/ RF3	RF link status	• Red: no connection • Green: connection OK • Yellow: not in use
SRIO/RF4	RF4 link status or SRIO interface status	• Red: no connection • Green: connection OK • Yellow: not in use
STATUS	operational status	• Red: module self-test or reset (LED red for < 5 seconds) or major alarm or critical alarm • Red, blinking: minor alarm • Yellow: stand-by or blocked • Yellow, blinking: SW download or configuration ongoing, module non-operational

Table 20   LEDs of the capacity extension sub-module (FBBC) (Cont.)

LED name	LED description	Color
		• Green: module operational • Green, blinking: module is loading software or parameters or local maintenance access when modules are operational

11.5 LEDs of the capacity extension sub-module (FBIH)

The figure and table below explain LED indications on the FBIH module.

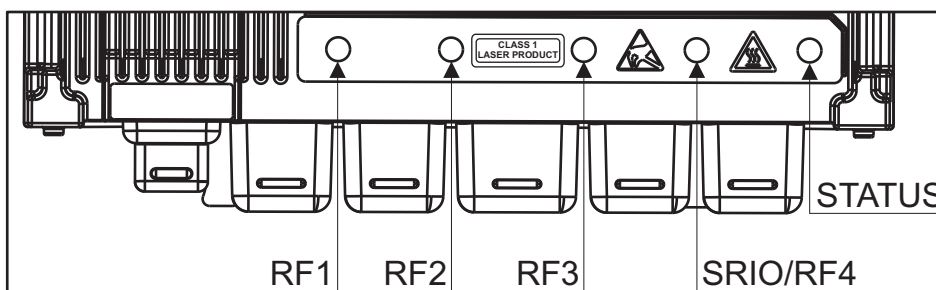*Figure 15*   LEDs of the capacity extension sub-module (FBIH)
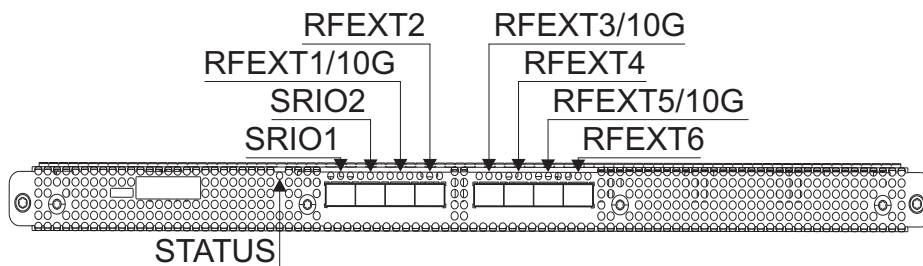
Table 21   LEDs of the capacity extension sub-module (FBIH)

LED name	LED description	Color
STATUS	operational status	• Red: module self-test or reset (LED red for < 5 seconds) or major alarm or critical alarm • Red, blinking: minor alarm • Yellow: stand-by or blocked • Yellow, blinking: SW download or configuration ongoing, module non-operational • Green: module operational • Green, blinking: module is loading software or parameters or local maintenance access when modules are operational
RF/EXT1 RF/EXT2 RF/EXT3 RF/EXT4 RF/EXT5 RF/EXT6	RF1-6 link status	• Red: no connection • Green: connection OK • Yellow: not in use
SRIO1 SRIO2	SRIO1-2 connection status	• Red: no connection • Green: connection OK • Yellow: not in use

12 Appendix System Module connector pin maps

12.1 DC output connector pin map

Figure 16   PwrProfile
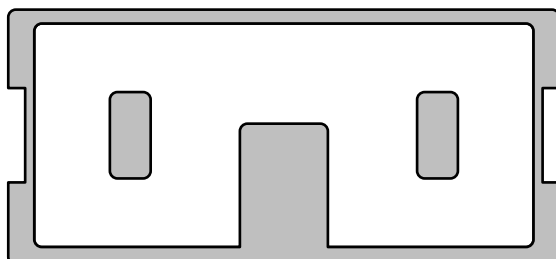
Power chaining output connectors' pin map is presented in Table 22: DC output connector pin map. It is used to provide power to a baseband capacity extension sub-module.

Table 22   DC output connector pin map

Pin	Signal
1	P48V
2	N48V_OUT

12.2 DC input connector pin map (FSMF)

Figure 17   DC terminal 2P
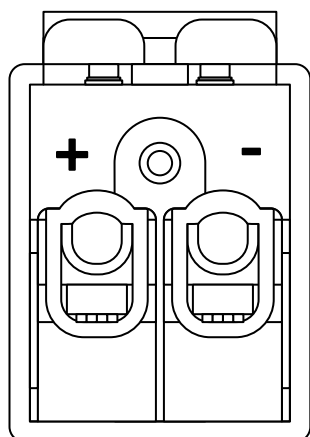
The FSMF DC input connector pin map is presented in Table 23: DC input connector (terminal block).

Table 23   DC input connector (terminal block)

Pin	Signal
Left	V48RTN (+)
Right	V48N (-)

Signal description:

- V48#: -48VDC power supply

12.3   DC input connector pin map (FSIH)

Figure 18   DC terminal 2P

The FSIH DC input connector pin map is presented in Table 24: DC input connector (terminal block).

Table 24   DC input connector (terminal block)

Pin	Signal
Left	V48RTN (+)
Right	V48N (-)

Signal description:

- V48#: -48VDC power supply

12.4 LMP connector pin map
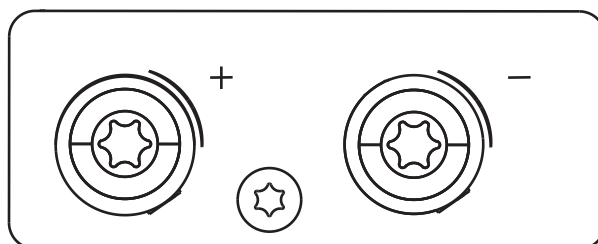
Figure 19   RJ45
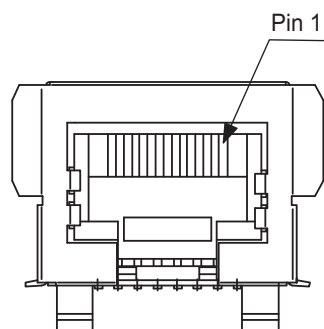
The Ethernet connector pin map is presented in Eth LMP connector (RJ45).

Table 25   Eth LMP connector (RJ45)

Pin	Signal
1	TX+ (Ethernet 100 Mbit/s)
2	TX- (Ethernet 100 Mbit/s)
3	RX+ (Ethernet 100 Mbit/s)
4	signal (FPMA alarm, from site support cabinet or power system)
5	signal (FPMA alarm, from site support cabinet or power system)
6	RX- (Ethernet 100 Mbit/s)
7	GND
8	GND

12.5 SFP connector pin map

SFP connector is used in the following Flexi Multiradio 10 System Module interfaces:

- EIF/RF
- RF
- SRIO

The list of compliant SFP transceivers and cables can be found in *Flexi Multiradio Base Station and Flexi Multiradio 10 Base Station Optional Items Description*.

12.6 Broadband extension connector pin map

Figure 20   QSFP
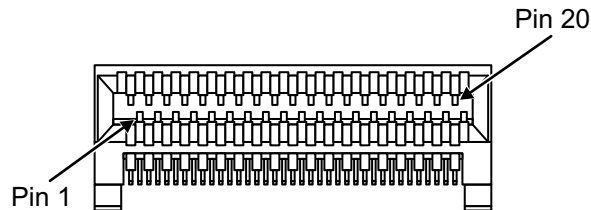
The broadband extension connector pin map is presented in Table 26: Broadband extension connector pin map (QSFP connector).

Table 26   Broadband extension connector pin map (QSFP connector)

	Pin	Signal		Pin	Signal
B	1	SDA1_FSP1_H	A	1	SCL1_FSP1_H
	2	GND		2	GND
	3	FSP1_MURKKU_RP3_H(0)		3	MURKKU_FSP1_RP3_H(0)
	4	FSP1_MURKKU_RP3_L(0)		4	MURKKU_FSP1_RP3_L(0)
	5	GND		5	GND
	6	FSP1_MURKKU_RP3_H(1)		6	MURKKU_FSP1_RP3_H(1)
	7	FSP1_MURKKU_RP3_L(1)		7	MURKKU_FSP1_RP3_L(1)
	8	GND		8	GND
	9	FSP1_MURKKU_RP3_H(2)		9	MURKKU_FSP1_RP3_H(2)
	10	FSP1_MURKKU_RP3_L(2)		10	MURKKU_FSP1_RP3_L(2)
	11	GND		11	GND
	12	FSP1_MURKKU_RP301_H		12	MURKKU_FSP1_RP301_H
	13	FSP1_MURKKU_RP301_L		13	MURKKU_FSP1_RP301_L
	14	GND		14	GND
	15	QSFP1_FCT_SRIO_H		15	FCT_QSFP1_SRIO_H
	16	QSFP1_FCT_SRIO_L		16	FCT_QSFP1_SRIO_L
	17	GND		17	GND

Table 26　　Broadband extension connector pin map (QSFP connector) (Cont.)

	Pin	Signal		Pin	Signal
	18	RP1_BURST_FSP1_H		18	RP1_CLK_FSP1_H
	19	RP1_BURST_FSP1_L		19	RP1_CLK_FSP1_L

12.7　External Ethernet transport connector pin map

Figure 21　　RJ45
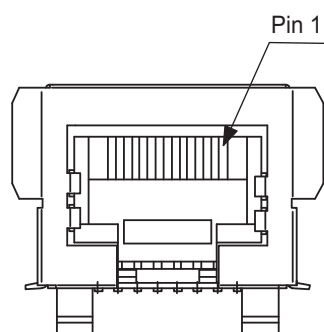
The ETP connector pin map is presented in Table 27: ETP connector (RJ45).

Table 27　　ETP connector (RJ45)

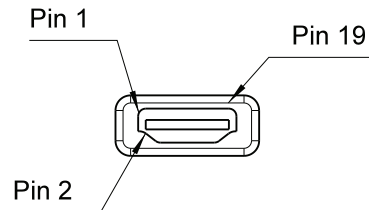| Pin	Signal
1	BI_D2+
2	BI_D2-
3	BI_D1+
4	BI_D4+
5	BI_D4-
6	BI_D1-
7	BI_D3+
8	BI_D3-

Signal description:

• The signals of this connector are according to standard 1000Base-T (IEEE 802.3).

12.8   EAC connector pin map

Figure 22   HDMI

The EAC connector pin map is presented in .

Table 28   EAC connector (HDMI)

Pin	Signal	Pin	Signal
1	EXT_AL0_H	2	EXT_AL1_H
3	EXT_AL2_H	4	EXT_AL3_H
5	EXT_AL4_H	6	EXT_AL5_H
7	EXT_CTRL0_EXT_AL6_H	8	EXT_CTRL1_EXT_AL7_H
9	EXT_CTRL2_EXT_AL8_H	10	EXT_CTRL3_EXT_AL9_H
11	EXT_CTRL4_EXT_AL10_H	12	EXT_CTRL5_EXT_AL11_H
13	P5V_EAC	14	P5V_EAC
15	PROT_CAN_H_P5V_EAC	16	GND
17	PROT_CAN_L_P5V_EAC	18	GND
19	GND	-	-

Signal description:

- EXT_AL#_H: External Alarm 0-5
- EXT_CTRL0_EXT_AL#_H: Shared Control line 0-5 / Alarm 6-11
- P5V_EAC: CAN 5V Supply or Supply for Controls
- PROT_CAN_H_P5V_EAC: serial line positive
- PROT_CAN_L_P5V_EAC: serial line negative

12.9 External synchronization input connector pin map

Figure 23   HDMI
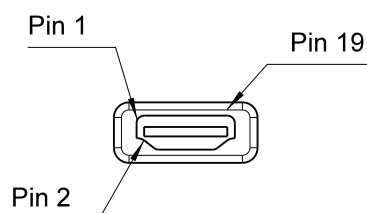
The Sync in connector pin map is presented in External synchronization input interface connector (HDMI).

Table 29   External synchronization input interface connector (HDMI)

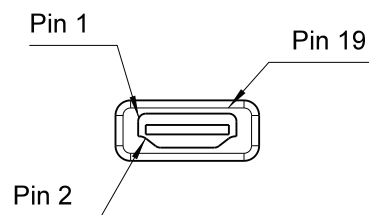| Pin	Signal	Pin	Signal
1	GPS_TIME_IN_H GSM_FC_IN_H	2	SingleEndedIn
3	GPS_TIME_IN_L GSM_FC_IN_L	4	GND
5	NC	6	GND
7	GPS_PPS_IN_H GSM_FN_IN_H	8	NC
9	GPS_PPS_IN_L GSM_FN_IN_L	10	GPS_CONTROL_H
11	GND	12	GPS_CONTROL_L
13	GND	14	NC
15	GPS_PWR_RET	16	GND
17	GND	18	GPS_PWR
19	NC	-	-

Signal descriptions:

- GPS_TIME_IN_H, GSM_FC_IN_H, GPS_TIME_IN_L, GSM_FC_IN_L: serial data from GPS to CPU or GSM Frame Clock input; RS422/485 differential
- SingleEndedIn: REF2M_IN REF10M_IN Accepts TTL/CMOS and SINE from -6 to +13 dBm. Input impedance is approximately 75 Ohm, Reduced swing TTL resulting from TTL-Gate plus 75 Ohm source termination is OK, too.

- NC: No Connection
- GPS_PPS_IN_H, GSM_FN_IN_H, GPS_PPS_IN_L, GSM_FN_IN_L: PPS pulse from GPS or GSM Frame Number input; RS422/485 differential
- GPS_CONTROL_H, GPS_CONTROL_L: Serial data form CPU to GPS; RS422/485 differential.
- GPS_PWR, GPS_PWR_RET: GPS power supply: 50 mA at 15 to >35 V GPS_PWR_N might not be isolated from GND but cannot be relied upon to be the same.

12.10 External synchronization output connector pin map

Figure 24   HDMI

The Sync out connector pin map is presented in External synchronization output interface connector (HDMI).

Table 30   External synchronization output interface connector (HDMI)

Pin	Signal	Pin	Signal
1	GPS_TIME_OUT_H GSM_FC_OUT_H	2	SingleEndedClockOut 1
3	GPS_TIME_OUT_L GSM_FC_OUT_L	4	GND
5	NC	6	GND
7	PPS_OUT_H	8	SingleEndedClockOut 2
9	PPS_OUT_L	10	DiffClockOut_H or GSM_FN_OUT_H
11	GND	12	DiffClockOut_L or GSM_FN_OUT_L
13	GND	14	NC
15	-	16	GND
17	GND	18	NC

Table 30   External synchronization output interface connector (HDMI) (Cont.)

Pin	Signal	Pin	Signal
19	TESTCLK_GSM_FN_OUT_H	-	-

Signal descriptions:

- GPS_TIME_OUT_H, GSM_FC_OUT_H, GPS_TIME_OUT_L, GSM_FC_OUT_L: Copy of the serial data from GPS to CPU. The collocated BTS is only interested in the NMEA contents of this data stream or GSM Frame Clock output; RS422/485 differential or Frame clock out
- SingleEndedClockOut1: LVTTL. Can have 11 sources: 2.048 MHz (from SingleEndedIn), 10 MHz (from SingleEndedIn), 10 MHz (FPGA internally generated), FCLK_IN 250 Hz, SYNC_WFCLK 30.72 MHz, SYNC_SFCLK 100 Hz, SYNC_SFCLK/2 50 Hz, SYNC_SFCLK/4 25 Hz, SYNC_SFCLK/8 12.5 Hz, SFNO 30.72 MHz pulse per 10 ms, Internal PPS_int 1 Hz
- PPS_OUT_H, PPS_OUT_L: PPS_OUT RS422/485 differential
- SingleEndedClockOut2: LVTTL. Can have two sources: 2.048 MHz (from SingleEndedIn), 10 MHz (from SingleEndedIn)
- DiffClockOut_H or GSM_FN_OUT_H, DiffClockOut_L or GSM_FN_OUT_L: Has 12 potential clock sources: 2.048 MHz (from SingleEndedIn), 10 MHz (from SingleEndedIn), 10 MHz (FPGA internally generated), FCLK_IN 250 Hz, SYNC_WFCLK 30.72 MHz, SYNC_SFCLK 100 Hz, SYNC_SFCLK/2 50 Hz, SYNC_SFCLK/4 25 Hz, SYNC_SFCLK/8 12.5 Hz, SFNO 30.72 MHz pulse per 10 ms, Internal PPS_int 1 Hz, GSM FRAME number
- TESTCLK_GSM_FN_OUT_H: Single ended copy of pins 10/12