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**Nokia Flexi EDGE Base Station, Rel. EP1,
Product Documentation, v.1**

Nokia Flexi EDGE System Module (ESMA) Description

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1

Nokia Flexi EDGE System Module (ESMA)

The System Module is a unit providing BTS common functionalities and external and internal connections for the whole BTS. The BTS software is stored in the System Module.

The System Module also receives and stores the unit identification information of all other units of the BTS. The System Module supports configurations of up to 12 TRXs. For larger configurations, the System Extension Module is used.

The main functions of the System Module are:

- BTS O&M
- BTS integrated transport
- Module bus control and BTS synchronisation
- Power distribution (48 VDC) to other modules

See the following figure for an isometric view of the System Module.

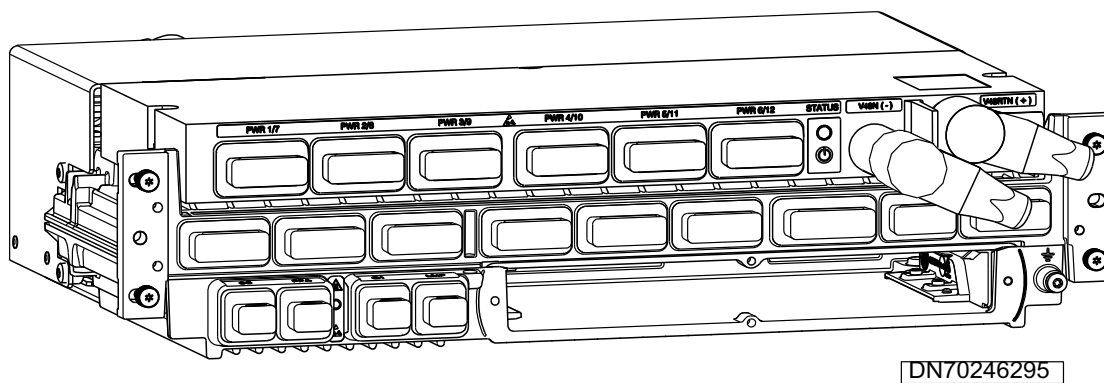


Figure 1. Isometric view of the System Module (ESMA)

Following figures show the transmission sub-modules.

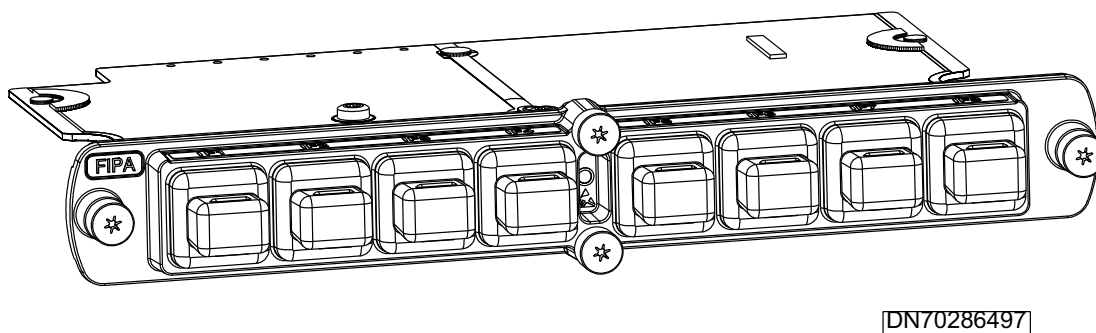
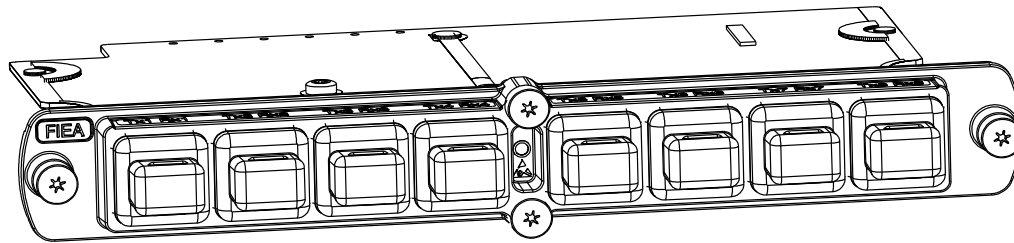
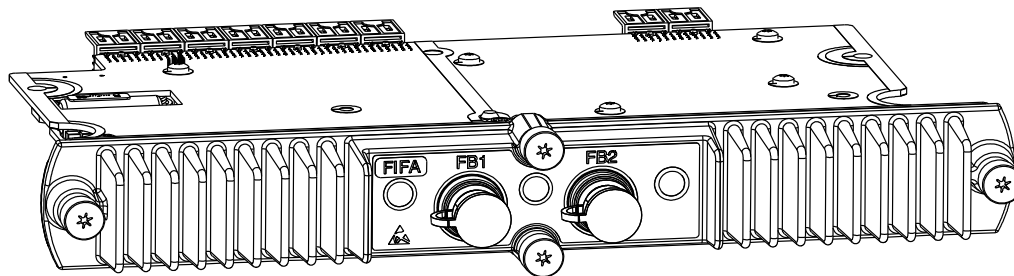


Figure 2. Isometric view of the transmission sub-module FIPA



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Figure 3. Isometric view of the transmission sub-module FIEA



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Figure 4. Isometric view of the transmission sub-module FIFA

BTS O&M

Main BTS O&M functions are:

- Software downloading (There can be simultaneously two software versions in a System Module)
- Configuration management (BTS configuration autodetection)
- Alarm handling and recovery
- BTS reference clock management
- External alarms and controls (EAC). The System Module provides 12 alarm input and six control output connections. When more than 12 alarm inputs are needed, a System External Alarm Module (FSEB) can be used

BTS integrated transport

The System Module handles external and internal transmission of the BTS. It has the physical transmission interfaces from the BTS to the BSC, and it terminates the Abis interface.

There are four different network interface alternatives:

- E1 symmetric 120 ohms, RJ48
- T1 symmetric 100 ohms, RJ48
- E1 asymmetric 75 ohms, SMB
- Nokia FlexBus for Nokia microwave radios, TNC

These come as three separate plug-in sub-module variants which are inserted into the System Module. There is space for one transmission sub-module in the System Module. Table *Alternative transport sub-modules and supported interfaces* summarises the physical interfaces that the System Module integrated transport supports.

Table 1. Alternative transport sub-modules and supported interfaces

Sub-module type	Interface	Number of interfaces per System Module
E1/T1 transmission sub-module (FIPA)	E1/T1 (symmetric)	8
E1 transmission sub-module (FIEA)	E1 (asymmetric)	8
FlexBus transmission sub-module (FIFA)	FlexBus (integrated coaxial copper interfaces for Nokia microwave radios)	2

An optional FlexiHub module is available for transmission enhancements.

Module bus control and BTS synchronisation

The System Module has an integrated BTS internal and external synchronisation functionality. It can be synchronised to the incoming Abis line or to an external synchronisation source (other BTS or Location Measurement Unit, LMU). It distributes the synchronisation within the BTS and maintains it if the synchronisation source is cut.

The System Module also acts as a main communication link within the BTS and the connected modules (Dual TRX module, Remote Tune Combiner module) via the Module Bus.

Power distribution

The operating power is supplied to Nokia Flexi EDGE BTS from a single point in the System Module. The System Module distributes the 48 VDC power further to up to six other modules of the BTS. The power distribution capability can be increased with an additional Nokia Flexi EDGE System Extension Module. The main function of the Nokia Flexi EDGE System Extension Module is to increase the number of Dual TRX Module connections.

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System Module (ESMA) main blocks

System Module (ESMA) includes the following functional blocks:

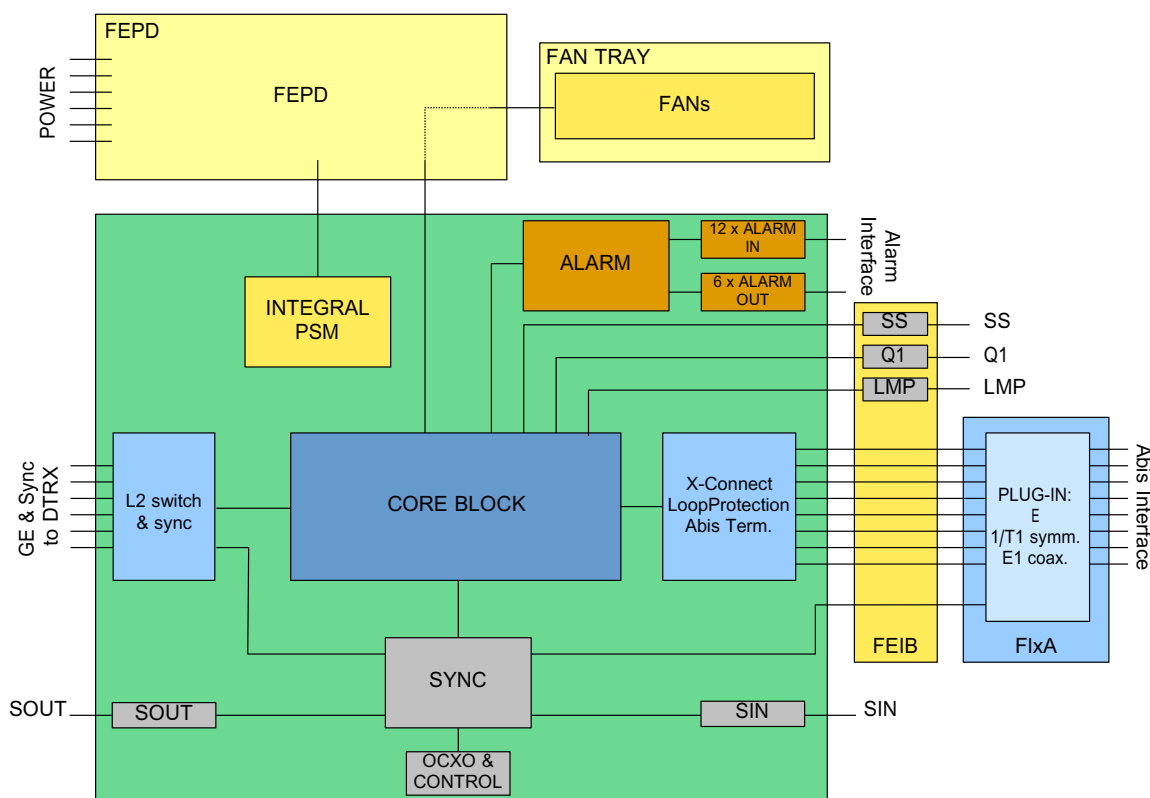
- System control block
 - BTS O&M
 - TRS O&M
 - Transport network layer procedures
 - System Module control
- System timing block
 - Common system reference frequency and air interface timing generation
 - BTS frame clock and frame number generation
 - Interface to Location Measurement Unit (LMU)
 - External synchronization I/O
- System interfaces block
 - Ethernet switching of Gigabit/Fast Ethernet data
 - Interface to TRX and RTC Modules via Gigabit/Fast Ethernet (autonegotiation)
 - Local Management Port (LMP) interface
 - Fan control
- Transport interfaces block

This block is the transmission sub-module.

 - Interface to physical (electrical/RF) transport media
 - Timing reference extraction for BTS centralized timing
 - Controlled by transport block controller (concerns only the Flexbus interface sub-module)
- External interfaces block
 - External Alarms and Controls (EAC) interfaces
 - Visual indicators (LEDs)

- Management interfaces to external units and site support system
- FPA (Flexi Power Alarm) interfaces
- Power supply block
 - Module internal power supply
- Power distribution unit
 - Power distribution to TRX Modules and RTC Modules
 - Power distribution to System Module internal sub-modules or units
 - Fuse protection of separate power supply interfaces
 - Module grounding interface

Following figure presents the functional blocks of the System Module.



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Figure 5. System Module main blocks

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System Module (ESMA) power requirements

Table 2. System Module (ESMA) power requirements

Property	Value
Nominal system voltage	48 V DC
Input voltage range	40.5 - 57 V DC

Table 3. System Module (ESMA) maximum power consumption

Module	Maximum power consumption
ESMA E1/T1	55 W
ESMA E1/T1 with LMU and FSEB	68 W
ESMA Flexbus	135 W
ESMA Flexbus with LMU and FSEB	148 W

4 System Module (ESMA) interfaces

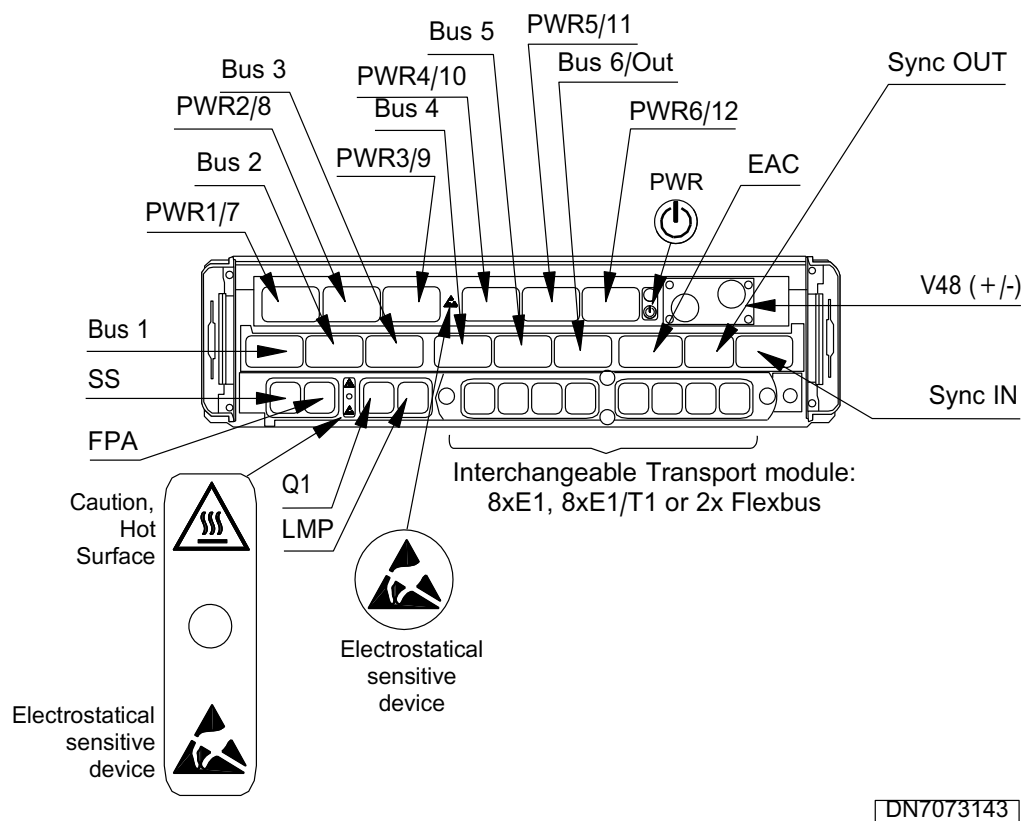


Figure 6. Nokia Flexi EDGE System Module (ESMA) front panel connectors and labels

Table 4. Nokia Flexi EDGE System Module (ESMA)
front panel connectors and interfaces

Label name on module	Function	Connector type	Interface(s)
V48N (+/-)	-48 V DC input power for the base station.	M10 terminal bolts	FPMA, FPDA, site support, or other external power supply
PWR 1/7...PWR 6/12	-48 V DC output power with fuse protection to six other modules.	Multi-Beam XL	EXxA, ECxA, FCFA
BUS 1...BUS 6/OUT	6 x Ethernet (1000 Base-T)	MDR 26 F RA	EXxA, ECxA, ESEA
EAC	External alarm and control interface	MDR 36 F RA	FSEB, FSAA, customer alarm inputs or control outputs
Sync OUT	Base station synchronisation chaining out	MDR 26 F RA	External BTS
Sync IN	Base station synchronisation chaining in	MDR 14 F RA	External BTS, LMUB
SS	Site Support alarm	RJ45	-
FPA	Flexi power alarm	RJ45 shielded	FPAA, FPBA, FPDA
Q1	Q1 management interface	RJ45 shielded	Nokia Q1 managed network elements
LMP	Local management port	RJ45 shielded	Laptop or other computer

Transmission interface E1 sub-module (FIEA) interfaces

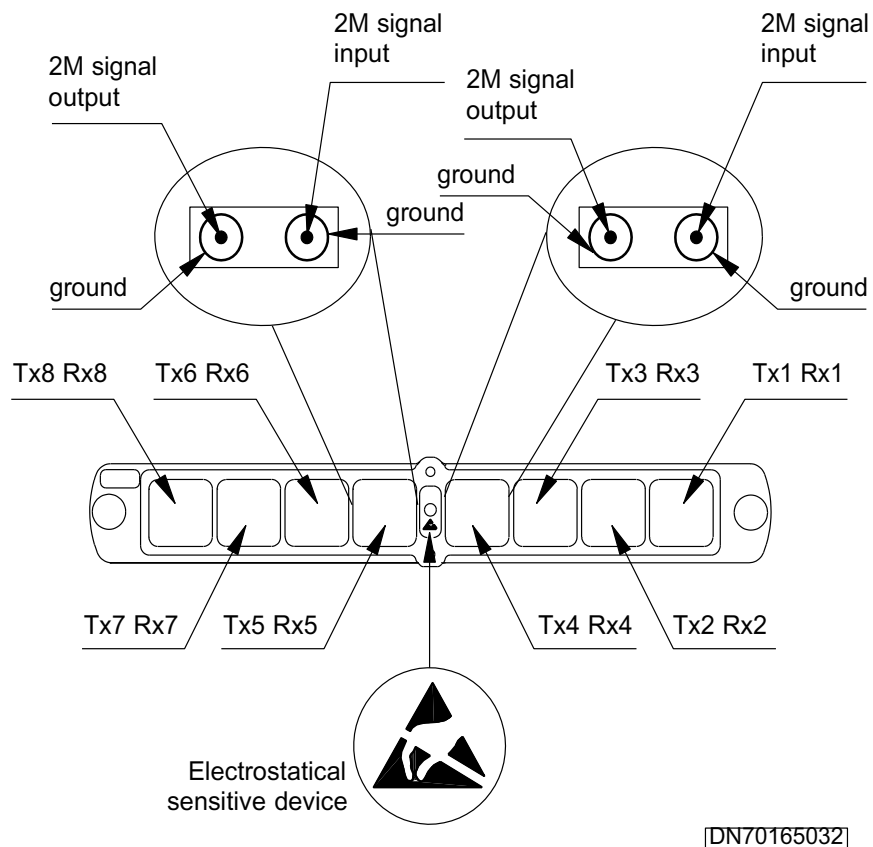


Figure 7. FIEA transmission sub-module front panel connectors and labels

Table 5. FIEA transmission sub-module front panel connectors and interfaces

Label name on module	Description	Connector type	Interface(s)
Tx1 Rx1...Tx8 Rx8	Eight Transmission (Abis) interfaces - unbalanced (coaxial) E1	SMB	External transmission equipment

Transmission interface Flexbus sub-module (FIFA) interfaces

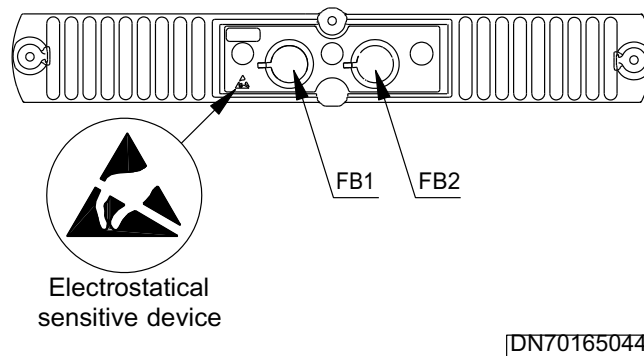


Figure 8. FIFA transmission sub-module front panel connectors and labels

Table 6. FIFA transmission sub-module front panel connectors and interfaces

Label name on module	Description	Connector type	Interface(s)
FB1, FB2	Transmission (Abis) interface - Flexbus (Nokia proprietary PDH radio)	TNC	Nokia FlexiHopper microwave radios

Transmission interface E1/T1 sub-module (FIPA) interfaces

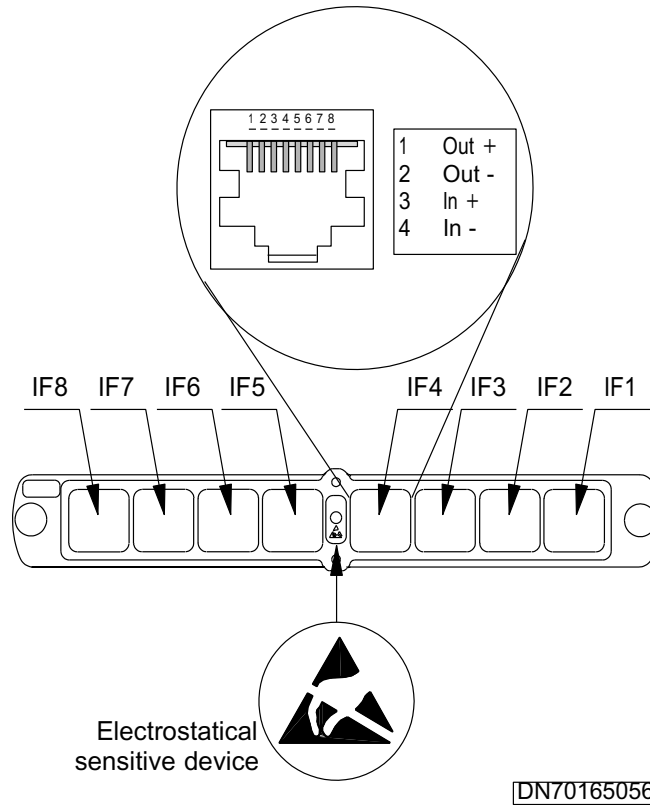


Figure 9. FIPA transmission sub-module front panel connectors and labels

Table 7. FIPA transmission sub-module front panel connectors and interfaces

Label name on module	Description	Connector type	Interface(s)
IF1 ... IF8	Eight transmission (Abis) interfaces - balanced E1/T1	RJ45 shielded	External transmission equipment

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System Module (ESMA) dimensions and weight

The dimensions of the Flexi EDGE System Module are presented in the table below.

Table 8. ESMA dimensions and weight

Property	Value
Width ¹⁾	447/492 mm (17.6/19.4 in.)
Height	133 mm (5.2 in.)
Depth ²⁾	422/560 mm (16.6/22.1 in.)
Weight without transmission sub-modules	8.6 kg (19 lbs)

¹⁾ Width of the casing without front covers/with front covers

²⁾ Depth of the casing without front covers/with front covers

Maximum dimensions of the module without a casing or cover are: Front panel width 483 mm (19 in.), module width less than 447 mm (17.6 in.) and depth less than 432 mm (17 in.)

5.1 Transmission sub-module dimensions and weight

The dimensions of the transmission sub-modules (FIEA, FIFA, FIPA) are presented in the table below.

Table 9. Transmission sub-module dimensions and weight

Property	Value
Width	262 mm (10.3 in.)
Height	40 mm (1.6 in.)
Depth	165 mm (6.5 in.)
Weight	0.7 kg (1.5 lbs)

6 System Module (ESMA) LED indications

System Module (ESMA) has one tri-colour LED on the front panel to indicate the operational status of the module and all fault conditions during operation.

Table 10. System Module LED indications

Colour	Explanation
Stable red	BTS_OM SW is not running , or Alarm is active with class critical and system module is disabled
Red, blinking	Alarm is active with class major but system module is still enabled
Stable yellow	BTS_OM SW state is configuring and the sub-state is Wait for LAPD (Link Access Protocol on the D-channel) establishment but LAPD on OMUSIG (Operation and Maintenance Unit Signalling) is not established and alarm is active due to problems with the transmission connection to the System Module, or System Module is blocked from Element Manager
Yellow, blinking	BTS_OM SW state is initialization or configuring including the sub-states: Auto detection, Commissioning, Wait for LAPD establishment and LAPD on OMUSIG is established, or Alarm is active with class minor but system module is still enabled
Stable green	BTS_OM SW state is supervisory and no minor, major or critical alarms are active
Green, blinking	BTS_OM SW state is configuring and the sub-state is Software loading, or BTS_OM SW state is supervisory and SW is downloading in the background

Tables below describe the transmission sub-module LED indications:

Table 11. FIPA/FIEA LED indications

Colour	Explanation
Dark	Power off
Stable red	Interface card has power but it is not detected
Stable green	Interface card is detected by the System Module

Table 12. FIFA main status LED indications

Colour	Explanation
Stable red	One or more data lines are not operating correctly, or The fault is in the indoor unit, outdoor units, or far-end units.
Stable yellow	The indoor unit, outdoor units, or far-end units have active alarm(s). (LED will be stabilized for alarm status in about 30s after power on) The data is transmitted in this configuration, but may not be transmitted in other configurations or if another failure occurs. The overall performance capability is reduced., or SW boot (LED is yellow only during the first second after power on. Afterwards LED blinks all colours during application SW startup).
Stable green	Both terminals over this hop are operating normally and no alarms are active A blinking green LED indicates that there is a connection to the node manager
All colours blinking	Application SW startup

Table 13. FIFA Flexbus status LED indications

Colour	Status
Dark	No power feed or Tx signal (IU-IU connection can be active, however)
Blinking green	DC power feed to the outdoor unit active, Tx signal not active
Stable green	DC power feed to the outdoor unit and Tx signal active

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Contents of the System Module (ESMA) delivery

Table 14. Nokia Flexi EDGE System Module (ESMA) delivery contents

Description	Product code	Quantity
EDGE System Module (ESMA):	470246A	1
• M5 screws		4
• AWG 4 (25 mm ²) connector rubber boots		2

Appendix A System Module connector pin assignments

A.1 System Module (ESMA) connector pin assignments

The pin assignments for the connectors on the System Module front panel are described in the tables below.

Table 15. EAC connector pin assignments

Signal	Pin	Pin	Signal
EXT_CO0	1	19	+5V/150mA
EXT_CO1	2	20	+5V/150mA
EXT_CO2	3	21	+5V/150mA
EXT_CO3	4	22	+5V/150mA
EXT_CO4	5	23	+5V/CAN_L
EXT_CO5	6	24	+5V/CAN_H
EXT_AL0	7	25	GND
EXT_AL1	8	26	GND
EXT_AL2	9	27	GND
EXT_AL3	10	28	GND
EXT_AL4	11	29	GND
EXT_AL5	12	30	GND
EXT_AL6	13	31	GND
EXT_AL7	14	32	GND
EXT_AL8	15	33	GND
EXT_AL9	16	34	GND
EXT_AL10	17	35	GND
EXT_AL11	18	36	GND

Table 16. TRX connector pin assignments

Signal	PIN	PIN	Signal	Signal Groups
TRXMD	1	14	GND	TRX Module Detection / GND

Table 16. TRX connector pin assignments (cont.)

Signal	PIN	PIN	Signal	Signal Groups
GND_SFCRT	2	15	SFCRTN+	System frame return reserv.
SF Bn+	3	16	SFCRTn-	
SF Bn-	4	17	GND_SFB	System Frame Burst
GND_D	5	18	TPn_BI_DD+	Gigabit Ethernet (1000Base-T)
TPn_BI_DC+	6	19	TPn_BI_DD-	
TPn_BI_DC-	7	20	GND_C	
GND_B	8	21	TPn_BI_DB+	
TPn_BI_DA+	9	22	TPn_BI_DB-	
TPn_BI_DA-	10	23	GND_A	
GND	11	24	NC	Ground for TRX detect
SCLKn+	12	25	GND_TRXMD	
SCLKn-	13	26	GND_SCLK	System Clock (6.5 MHz)

Table 17. SIN connector pin assignments

Signal	PIN	PIN	Signal
PPS_INP	1	14	GND
PPS_INN	2	15	LMUD
FN_INP	3	16	GND
FN_INN	4	17	SCD
FCK_INP	5	18	GND
FCK_INN	6	19	REF2M_OUT
REF2M_IN	7	20	GND
Creepage	8	21	Creepage
LMU48V	9	22	LMU48VRTN
LMU48V	10	23	LMU48VRTN
Creepage	11	24	Creepage

Table 17. SIN connector pin assignments (cont.)

Signal	PIN	PIN	Signal
TSTCLK	12	25	TSTFCLK
(REF10M_IN)	13	26	GND

Table 18. Sync OUT connector pin assignments

Signal	PIN	PIN	Signal
PPS_OUTP	1	8	GND
PPS_OUTP	2	9	SCD
FN_OUTP	3	10	GND
FN_OUTN	4	11	TSTCLK
FCK_OUTP	5	12	GND
FCK_OUTN	6	13	TSTFCLK
REF2M_OUT	7	14	GND

Table 19. Q1 connector pin assignments

PIN	Signal	Function	Technology	Direction
1	NC	Not connected	-	-
2	NC	Not connected	-	-
3	Q1_OUT_P	Q1 out plus	RS-485	Output
4	Q1_IN_P	Q1 in plus	RS-485	Input
5	Q1_IN_N	Q1 in negative	RS-485	Input
6	Q1_OUT_N	Q1 out negative	RS-485	Output
7	NC	Not connected	-	-
8	NC	Not connected	-	-

Table 20. LMP connector pin assignments

Pin	Signal	Function	Technology	Direction
1	LMP_RX+	Receive positive	10/100 base-TX	In
2	LMP_RX-	Receive negative	10/100 base-TX	In
3	LMP_TX+	Transmit positive	10/100 base-TX	Out
4	NC	-	-	-
5	NC	-	-	-
6	LMP_TX-	Transmit negative	10/100 base-TX	Out
7	NC	-	-	-
8	NC	-	-	-

Table 21. SS connector pin assignments

PIN	Signal	Function	Technology	Direction
1	LMP_BI_DA+	GE TP A positive	10/100 base-TX	Bidirectional
2	LMP_BI_DA-	GE TP A negative	10/100 base-TX	Bidirectional
3	LMP_BI_DB+	GE TP B positive	10/100 base-TX	Bidirectional
4	LMP_BI_DC+	GE TP C positive	10/100 base-TX	Bidirectional
5	LMP_BI_DC-	GE TP C negative	10/100 base-TX	Bidirectional
6	LMP_BI_DB-	GE TP B negative	10/100 base-TX	Bidirectional
7	LMP_BI_DD+	GE TP D positive	10/100 base-TX	Bidirectional
8	LMP_BI_DD-	GE TP D negative	10/100 base-TX	Bidirectional

Table 22. FPA connector pin assignments

PIN	Signal
1	FPA4
2	FPA5
3	FPA6
4	FPA1
5	FPA2
6	FPA3

Table 22. FPA connector pin assignments (cont.)

PIN	Signal
7	GND
8	FPADET