Alcatel-Lucent 9500

MICROWAVE PACKET RADIO for ANSI and ETSI | RELEASE 5.2.0

MPR-e and MSS-1c User Manual
3DB19901EFAA Edition 01

Alcatel·Lucent

Disclaimers

THIS PRODUCT COMPLIES WITH D.H.H.S. RADIATION PERFORMANCE STANDARDS 21 CFR, 1040.10, FOR A CLASS 1 LASER PRODUCT.

DANGER

Invisible laser radiation is present when the optic connector is open. AVOID DIRECT EXPOSURE TO BEAM.

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 when the equipment is operated 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 manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case users will be required to correct the interference at their own expense.

Release notes describing revisions to this software may impact operations described in this manual.

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Table of Contents

List of Tables

List of Figures

Preface

Preliminary Information

WARRANTY

Any warranty must be referred exclusively to the terms of the contract of sale of the equipment to which this manual refers.

Alcatel-Lucent makes no warranty of any kind with regards to this manual, and specifically disclaims the implied warranties of merchantability and fitness for a particular purpose. Alcatel–Lucent will not be liable for errors contained herein or for damages, whether direct, indirect, consequential, incidental, or special, in connection with the furnishing, performance, or use of this material.

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SAFETY RECOMMENDATIONS

The safety recommendations below must be considered to avoid injuries to persons and/or damage to the equipment:

- **Service Personnel**

  Installation and service must be carried out by authorized persons having appropriate technical training and experience necessary to be aware of hazardous operations during installation and service, so as to prevent any personal injury or danger to other persons, as well as to prevent damage to equipment.
- **Access to the Equipment**

  Access to the equipment in use must be restricted to Service Personnel only.
- **Safety Rules**

  Recommended safety rules are listed in Safety, EMC, EMF, ESD norms, equipment labeling, standards and compliance.

  Local safety regulations must be used if mandatory. Safety instructions in this manual should be used in addition to the local safety regulations. In case of conflict between safety instructions stated in this manual and those indicated in local regulations, mandatory local norms will prevail. Should local regulations not be mandatory, then safety rules stated in this manual will prevail.

SERVICE PERSONNEL SKILL

Service Personnel must have an adequate technical background in telecommunications and in particular in the equipment that is the subject of this manual.

An adequate background is required to properly install, operate and maintain equipment. Merely reading this manual is not considered sufficient.

Applicability

This manual applies to the following product release:

Table 1 — Product and Release

PRODUCT	RELEASE
9500 MPR-A and 9500 MPR-E	

Table 1 — Product and Release

PRODUCT	RELEASE
• MSS-1c • MPT-HC/MPT-HC-HQAM/MPT-MC/MPT-XP/MPT-XP-HQAM/9558HC • MPR-e	5.2.0

Scope

This document describes the hardware and software functionalities for the MSS-1c and MPR-e solutions for the 9500 MPR.

This document is intended for the technicians involved in Planning, in Operation and Maintenance and in Commissioning.

The 9500 MPR product supports both the ANSI standard, for the North American market, and the ETSI standard, for other markets. When referring to information that applies only to ANSI, this document uses the term MPR-A. When referring to information that applies only to ETSI, this document uses the term MPR-E.

The MSS-1c system is made up of an Indoor section (MSS-1c) and an Outdoor section (MPT-HC/HC-HQAM/MC/XP/XP-HQAM/9558HC). The 9500 MPR supports both ANSI and ETSI standards and is the term used when referring to information that is common to both standards.

The MPR-e system is made up of an MPT-HC/HC-HQAM/MC/XP/XP-HQAM/9558HC in standalone mode. MPR-e supports both ANSI and ETSI standards and is the term used when referring to information that is common to both standards.

References to MPT-HC in this document refer to the MPT-HC V2.

History

Table 2 — Change history

ISSUE	DATE	DESCRIPTIONS
01	October 2014	Initial Release

Table 2 — Change history

ISSUE	DATE	DESCRIPTIONS

Change notes

Manual Structure

This manual is divided into the main topics described in Table 3.

Table 3 — Manual structure

PREFACE	This section contains general information such as preliminary information, manual scope, and history. As well, it describes the manual structure and the customer documentation.
SAFETY	This section includes all the safety instructions.
PRODUCT INFORMATION AND PLANNING	This section provides the equipment description (at system, MSS-1c and Outdoor levels), introduces the basic information regarding the 9500 MPR hardware architecture, and gives its technical characteristics.
NE MANAGEMENT BY SOFTWARE APPLICATIONS	This section provides the description and use of the SW tools available for the NE management.
INSTALLATION	This section provides information regarding equipment hardware installation. Moreover, it contains operative information on: • provisioning of equipment items (P/Ns, equipping rules) • their physical position in the system • unit assembly and front panel drawings, with the description on the access point usage (connectors, visual indicators, buttons). This also provides operative instructions for the preparation of the Craft Terminal for the Line-Up and Commissioning of the two NEs making up the radio link.
PROVISIONING	This section provides all the instructions to provision (configure) the NE.

Table 3 — Manual structure

MAINTENANCE AND TROUBLE-CLEARING	This section contains the logical and operative information for the equipment maintenance and system upgrade.
LINE-UP AND COMMISSIONING	This section provides all the instructions for the line-up and commissioning of the NE.
ABBREVIATIONS	This section lists the abbreviations used in this manual.
CUSTOMER DOCUMENTATION FEEDBACK	This section provides information about contacting Alcatel-Lucent for technical support or to provide feedback about documentation.

1 — FCC Part 15 Subpart B

1.1 — 9558HC UNLICENSED RADIO

The JF6-9558HC/6933B-9558HC (9558HC) unlicensed radio provides fast deployment of service with microwave radio. No license and small antennas (no FCC and Industry Canada requirements) allow immediate turn-up. The 9558HC unlicensed radio can not be upgraded to licensed operation.

The JF6-9558HC/6933B-9558HC unlicensed radio operates in the 5725-5850 Information, Scientific, and Medical (ISM) band in accordance with FCC Part 15.247 and IC RSS-210. This unlicensed radio, although operating in the same band as a spread spectrum radio, operates using narrower bandwidths than spread spectrum.

Note: The 9558HC 5.8 Unlicensed band JF6-9558HC/6933B-9558HC has been certified by the FCC and Industry Canada as of August 7, 2012.

1.2 — FCC Class B Compliance Statement

The JF6-9558HC/6933B-9558HC unlicensed radio has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules and IC RSS-210. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated 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 manual, 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.

1.3 — FCC Class B Requirements

This device complies with part 15 of the FCC Rules and IC RSS-210. Operation is subject to the following three conditions: (1) this device may not cause harmful interference. (2) This device must accept any interference received, including interference that may cause undesired operation. (3) This device must be professionally installed.

Cet appareil radio est conforme à IC RSS-210. Son fonctionnement respecte les trois conditions suivantes: 1) cette radio ne cause pas d'interférences néfastes, 2) cette radio peut recevoir des interférences, ainsi que des interférences qui peuvent causer des opérations non désirées, et 3) cette radio doit être installée par des Professionnels.

Note: Changes or modifications not expressly approved by Alcatel-Lucent could void the authority to operate the JF6-9558HC/6933B-9558HC unlicensed radio.

Note: Installation, Turn-Up, Maintenance, and Operation Instruction supplied with the JF6-9558HC/6933B-9558HC unlicensed radio require strict adherence for continued part 15 of the FCC Rules and IC RSS-210 compliance.

Note: Regulatory compliance warning: Physical changes or modifications to the JF6-9558H/6933B-9500MPT and JF6-9558HC/6933B-9558HC (unlicensed) radio are strictly prohibited.

2 — Safety, EMC, EMF, ESD norms, equipment labeling, standards and compliance

This chapter describes the equipment labeling and the mandatory and suggested norms that must be considered to avoid injuries to persons and/or damage to the equipment.

This chapter is organized as follows:

2.1 — MPR-E: declaration of conformity to CE marking and countries list

Figure 2.1 shows the declaration of conformity.

Figure 2.1 — Declaration of Conformity

We, **Alcatel-Lucent Italia S.p.A.**
Piazzale Biancamano, 8
20121 Milano
Italy

declare, under our sole responsibility, that the product **ALCATEL 9500 MPR R.5.X**

Outdoor unit frequency ranges	5.925 - 6.425 GHz (**) 6.425 - 7.11 GHz (**) 7.125 - 7.9 GHz (**) 7.725 - 8.5 GHz (**) 10.0 - 10.68 GHz (**) 10.7 - 11.7 GHz (*) (**) 12.75 - 13.25 GHz (**) 14.4 - 15.35 GHz (**)	17.7 - 19.7 GHz (**) 21.2 - 23.632 GHz (**) 24.52 - 26.483 GHz (**) 27.5 - 29.520 GHz 31.8 - 33.4 GHz 37.0 - 39.46 GHz (**)
Power supply	-40.5 to -58 VDC	
Modulation	4 - 8 - 16 - 32 - 64 - 128 - 256 QAM	

to which this declaration relates is in conformity, provided that it is installed and maintained in accordance with the "state of the art", manufacturer's instructions and provided that it is used under normal conditions, with the requirements of the following European Directives :

A / R&TTE 1999/5/EEC (Annex III / Annex IV) : Directive on radio equipment and telecommunications terminal equipment.

Applicable standards and recommendations under the scope of this Directive

- Safety & health requirements: EN 60950-1: 2006 + A11:2009 + A1:2010 + A12: 2011
  EN 60950-22: 2006
  EN 60825-1:2007
  EN 60825-2:2004 + A1 :2007
  EN 50385 : 2002
- EMC requirements: EN 301 489-1 V1.8.1 (04/2008)
  EN 301 489-4 V1.3.1 (08/2002) V1.4.1 (05/2009)
- Spectrum requirements: EN 302 217-2-2 V1.3.1 (04/2009)
  EN 302 217-2-1 V1.2.1 (06-2007)
  EN 301 390 V1.2.1 (11-2003)

*Notified Body CETECOM (Identification Number **0682**) has issued Expert Opinions for ODU MPT (Registration N° E816316Y, E816317Y, E816318Y, E816319Y, E816320Y, E816321Y, E816322Y, E816332Y, E816314Y, E816315Y, E816330Y, E816310Y, E816313Y, E816969A, E816970A, E816971A, E816972A, E816973A).*

(*) In case of ODU300 in such frequency range, available modulations: 64 / 128 / 256 QAM.
(**) Annex IV / Expert Opinion available for MPT.
Additional EO : E816587Z.

B / RoHS 2011/65/EU: Directive on Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment.

• Standard: EN 50581: 2012

P.O. R. BARON

Vimercate, 09 April 2014

F. Allain
Vice President WIRELESS TRANSMISSION

Indication of the countries where the equipment is intended to be used: Austria (AT) - Belgium (BE) - Bulgaria (BG) - Switzerland/Liechtenstein (CH) - Cyprus (CY) - Czech Republic (CZ) - Germany (DE) - Denmark (DK) - Estonia (EE) - Finland (FI) - France (FR) - Greece (GR) - Hungary (HU) – Italy (IT) - Ireland (IE) - Iceland (IS) - Lithuania (LT) – Luxembourg (LU) - Latvia (LV) - Malta (MT) - Netherlands (NL) - Norway (NO) –Poland (PL) – Portugal (PT) - Romania (RO) – Spain (SP) - Sweden (SE) - Slovenia (SI) - Slovak Republic (SK) -United Kingdom (UK)

Indication of the intended use of the equipment: Point to Point PDH/Ethernet Transport radio Link

2.2 — Specific label for MPR equipment

The label is attached to the MPT-MC/MPT-HC V2/MPT-XP/9558HC.

Figure 2.2 — MPT-MC/MPT-HC V2/MPT-XP/9558HC label

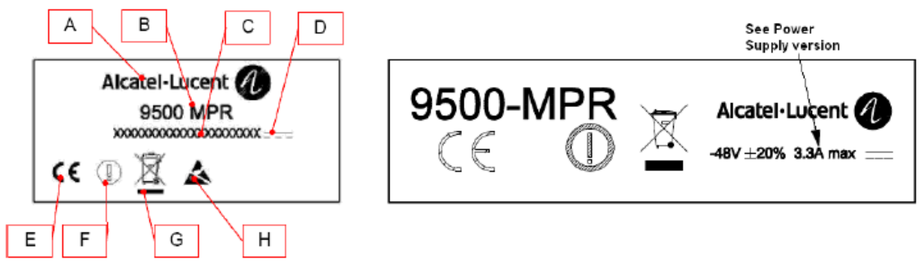


Figure 2.3 — MPT-MC/MPT-HC V2/MPT-XP/9558HC label (close-up)

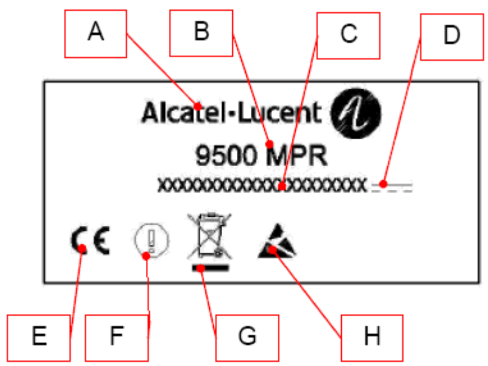


Table 2.1 — Labels for MPR equipment

Label	Label Name	Note
A	Alcatel-Lucent logo	—
B	Equipment acronym	—
C	Power Supply range	MSS-1c: -38.4 V / -57.6 V; 3.3 A max. MPT-MC, MPT-HC/9558HC: -28 V / -58 V, + 28 V/+58 V MPT-XP: -38 to -58 ,V, +38 to +58 V

Table 2.1 — Labels for MPR equipment

Label	Label Name	Note
D	Current range	MPR-E: 1.6 A / 0.8 A for MPT-MC 1.5 A / 0.7 A for MPT-HC V2
		MPR-A: 1.6 A / 0.8 A for MPT-HC V2
E	European Community logo	—
F	Not harmonized frequency logo	—
G	WEEE logo	—
H	Electrostatic Device logo	—

2.3 — Applicable standards and recommendations

1999/5/CE of 09 March 1999

Safety: EN 60950, EN 60825-1, EN 60825-2, EN 50385

EMC: EN 301 489-1, EN 301 489-4

Spectrum: EN 302 217-2-2

2.4 — Safety rules

Warning: Equipment is intended for installation in Restricted Access Location.

Warning: Equipment is only to be accessed by trained service personnel

2.4.1 — General rules

Before carrying out any installation, turn-up, tests, or operation and maintenance operations, carefully read the related sections of this Manual, in particular:

- Hardware Installation
- Commissioning
- Maintenance and Trouble-clearing

Observe the following safety rules:

- While the equipment is operating, no access is allowed to the equipment parts which are protected with Cover Plate Shields that are removable with tools.
- If there is a need for access to the equipment parts while the equipment is operating, this access is restricted to service personnel. Service personnel provide technical assistance and are:
  - "personnel who have adequate technical knowledge and experience to be aware of the potential dangers in carrying out an operation and the necessary steps to take in order to minimize these dangers for themselves and others".
  - Service Personnel can only replace the faulty units with spare parts.
  - Service Personnel are not allowed to repair equipment; therefore, they are not allowed access to any parts not specified above.
  - The keys and/or tools used to open doors or hinged covers to gain access to compartments in which dangerous high voltages are present, must only be held by the service personnel.
- When cleaning the external parts of the equipment, never use any inflammable substances that could alter the markings or inscriptions.
- When cleaning the external parts of the equipment, use a slightly wet cleaning cloth.

The safety rules stated in the manual describe the operations and/or precautions that must be observed to safeguard service personnel during the working phases and to guarantee equipment safety; that is, avoiding exposing persons, animals, or things to the risk of being injured or damaged.

If the safety protection features have been impaired, REMOVE POWER.

To cut off power, switch off the power supply units and cut off the power station upstream (rack or station distribution frame).

The safety rules described in this manual are distinguished by the following symbol:

2.4.2 — Labels indicating danger, forbidding, command

It is of utmost importance to follow the instructions printed on the labels affixed to the units and assemblies:

- dangerous electrical voltages
- risk of explosion
- moving mechanical parts
- heat-radiating mechanical parts
- harmful optical signals
- microwave radiations

Pay attention to the information stated in the following sections, and proceed as instructed.

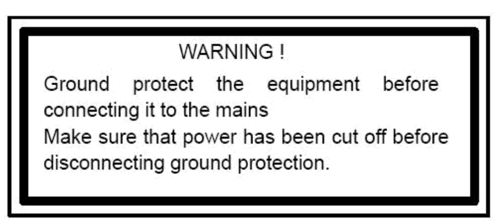
Note: The symbols presented in the following sections are all the possible symbols that could be on Alcatel-Lucent equipment, but are not necessarily on the equipment this manual refers to.

2.4.2.1 — Dangerous electrical voltages:

Labeling

The following warning label is affixed next to dangerous voltages (>42.4 Vp; >60 VDC).

If the product is a Class 1 equipment connected to mains, then the label associated with it states that the equipment must be grounded before connecting it to the power supply voltage, For example,



Safety instructions

Danger: Carefully observe the specific procedures for installation, turn-up and commissioning and maintenance of equipment parts where DC power is present, described in the relevant installation, turn-up and commissioning and maintenance documents and the following general rules:

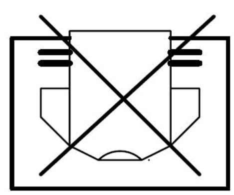
Personal injury can be caused by -48 VDC. Avoid touching powered terminals with any exposed part of your body.

Short-circuiting, low-voltage, low-impedance DC circuits can cause severe arcing that can result in burns and/or eye damage. Remove rings, watches, and other metal jewelry before working with primary circuits. Use caution to avoid shorting power input terminals.

2.4.2.2 — Risks of explosions: labeling and safety instructions

This risk is present when batteries are used, and it is signaled by the following label:

Therefore, slits or apertures are made to let air circulate freely and allow dangerous gases to down-flow (battery-emitted hydrogen). A 417-IEC-5641 Norm. compliant label is affixed next to the slits indicating that the openings must not be covered up.



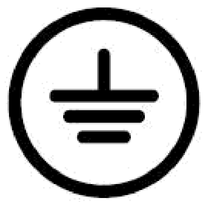
2.4.2.3 — Moving mechanical parts: labeling and safety instructions

The following warning label is affixed next to fans or other moving mechanical parts:

Before carrying out any maintenance operation, ensure that all the moving mechanical parts have been stopped.

2.4.2.4 — Equipment connection to earth: labeling and safety instructions

Terminals for equipment connection to earth, to be done according to international safety standards, are indicated by the following symbol:



The position of earth connection terminals is specified in the Hardware Installation section.

2.4.2.5 — Heat-radiating mechanical parts: labeling and safety instructions

The presence of heat-radiating mechanical parts is indicated by the following warning label in compliance with IEC 417 Norm, Fig.5041:

Danger: Carefully observe the specific procedures for installation, turn-up, and commissioning and maintenance of equipment parts where heat-radiating mechanical parts are present, described in the relevant installation, turn-up, and commissioning and maintenance documents and the following general rule:

Personal injury can be caused by heat. Avoid touching powered terminals with any exposed part of your body.

2.4.2.6 — Harmful optical signals: labeling and safety instructions

The equipment contains Class 1 laser components according to IEC 60825-1 (paragraph 5).

The laser source is placed in the left side of the optional SFP plug-in, which must be installed in the Core-E unit.

According to IEC 60825-1, the explanatory label is not applied to the equipment due to lack of space.

2.4.2.7 — Microwave radiations electromagnetic field (EMF) norms: labeling and safety instructions

Equipment emitting RF power:

The site must be compliant with ICNIRP guidelines or local regulations if more restrictive.

The following rules must be strictly followed by the customer:

- Non authorized persons must not enter the compliance boundaries, if any.
- Compliance RF boundaries, if any, related to EMF exposure, must be marked.
- Workers must be allowed to switch off the power if they must operate inside compliance boundaries.
- Ensure good cable connection.
- Install the antenna as high as possible from the floor or area with public access (if possible, the cylinder delimiting the compliance boundaries, if any, or the cylinder corresponding to the transmission area directly in front of the antenna with the same diameter as the antenna, should be more than 2 m high).
- Install the antenna as far as possible from other equipment emitting RF power.

Someone standing in front of the 9500 MPR antenna may cause traffic shutdown.

Place the relevant stickers as listed below:

EMF emission warning sign

- On the site when applicable (if people can cross the compliance boundaries and/or the transmission area of the antenna; for example, roof-top installation)
  - Warning label "Do not stand on the antenna axis"
- On the mast (front side)

    - EMF emission warning sign (yellow and black) to be placed at the bottom of the antenna, so that it is visible to someone moving in front of the antenna (roof-top installation)
- On the antenna (rear side)
    - EMF emission warning sign.

2.5 — Electromagnetic compatibility (EMC norms)

The equipment's EMC norms depend on the type of installation being carried out (such as cable termination and grounding) and on the operating conditions (such as equipment, setting options for the electrical/electronic units, and presence of dummy covers).

Before carrying out any installation, turn-up, tests, and operation and maintenance operations, carefully read the related sections of this Manual, in particular:

- Hardware Installation
- Maintenance and Trouble-clearing

The norms set down to guarantee EMC compatibility are indicated in this manual by the symbol and term:

ATTENTION **EMC Norms**

EMC General Norms - Installation

- All connections towards the external source of the equipment made with shielded cables use only cables and connectors recommended in this manual or in the relevant Plant Documentation, or those specified in the Customer's "Installation Norms" (or similar documents).
- Shielded cables must be properly terminated.
- Install filters outside the equipment as required.
- Ground connect the equipment using a conductor with proper diameter and impedance.
- Mount shields (if used), previously positioned during the installation phase, but not before having cleaned and degreased them.
- Before inserting the shielded unit, clean and degrease all peripheral surfaces (contact springs and connection points, etc.)
- Fasten the units to the subrack with screws.
- To correctly install EMC-compatible equipment, follow the instructions provided.

EMC General Norms - Turn-up, Tests and Operation

- Preset the electrical units as required to guarantee EMC compatibility
- Check that the equipment is operating with all the shields properly positioned (dummy covers, ESD connector protection)
- To properly use EMC-compatible equipment, follow the instructions provided.

EMC General Norms - Maintenance

- Before inserting the shielded unit, which will replace the faulty or modified unit, clean and degrease all peripheral surfaces (contact springs, connection points, and so on).
- Clean the dummy covers of the spare units as well.
- Fasten the units to the subrack with screws.

2.6 — Equipment protection against electrostatic discharges

Before removing ESD protection from the monitors, connectors and so on, follow the precautionary measures stated above. Ensure that ESD protection is not removed until maintenance and monitoring operations are terminated.

Most electronic devices are sensitive to electrostatic discharges; therefore the following warning label has been affixed to the equipment:

Follow the precautionary measures stated previously when touching the electronic parts during the installation and maintenance phases.

Workers are supplied with anti-static protection devices consisting of:

- an elasticized band worn around the wrist
- a coiled cord connected to the elasticized band and to the stud on the subrack

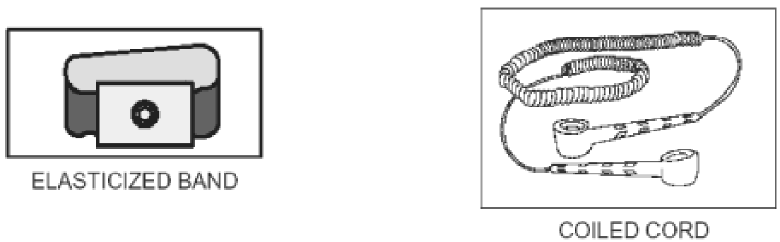
2.7 — Cautions to avoid equipment damage

The following sections describe necessary information to avoid equipment damage.

2.7.1 — Anti-static protection device kit

Whenever it is necessary to handle spare parts and cards out of the box, an anti-static protection device kit (Figure 2.4) must always be worn and terminated at a grounded structure, to avoid possible damage to the electronic devices by electrostatic discharges.

Figure 2.4 — Anti-static protection device kit



2.7.2 — Screw fixing

Under normal operating conditions, all screws (such as for unit box closing and cable fixing) must always be tightened to avoid item detachment and to ensure equipment EMI-EMC performance.

The screw tightening torque must be:

- 2.8 kg x cm (0.28 Newton x m) ±10%
- 2.4317 in lb (0.2026 ft lb) ±10%

Exceeding these values may result in the screw breaking.

2.7.3 — Cable disconnection / connection

Before disconnecting or connecting the cable (at the indoor or ODU side), switch off the corresponding MSS-1c or MPR-e unit.

2.8 — MPR-E: waste from electrical and electronic equipment (WEEE)

This product must be selectively collected and treated. Treatment applied at end of life of the product shall comply with the applicable national laws implementing directive on waste electrical and electronic equipment (WEEE).

The use of the crossed-out wheeled bin symbol indicates that the product is subject to separate collection and is not to be treated as general household waste (only for B2C equipment).

Separate collection and recycling of waste equipment at the time of disposal contribute to avoid possible negative effects on the environment and on human health.

2.9 — Standards and compliance

Table 2.2 — Standards and compliance

CISPR 22	EMI Radiated and Conducted Emissions
IEEE 1613	ESD, emissions, immunity
SR-332	Reliability
GR-63	Climatic Tests for storage and transportation
GR-3108	Environmental Climatic Criteria Requirement
GR-78	Equipment Sub-Assembly and Assembly Requirements
ATIS 0600315	Criteria for DC Power Port of Telecommunications Load Equipment
ANSI Z136.2	Optical Safety
NAR EIA-310	Spatial Requirements
ETSI ITU.T K20	Lightening and Power Faults
ETSI EN 55022	EMI Radiated and Conducted Immunity

Table 2.2 — Standards and compliance

ETSI EN 300 386	Fast Transients, Conducted Immunity, surges, Performance
ETSI EN 300 253	Bounding and Grounding
ETSI EN 300 119	Spatial Requirements
ETSI EN 300 753	Acoustic noise emitted by telecommunications equipment

3 — Product information and planning

3.1 — 9500 family overview

The 9500 Microwave Packet Radio (MPR) is a microwave digital radio family that supports both PDH and packet data (Ethernet) for migrating from TDM to IP. The 9500 MPR provides a generic, modular IP platform for multiple network applications (including 2G/3G/HSDPA/WiMAX backhauling to Metro Ethernet areas) to accommodate broadband services. The 9500 MPR radio family supports low-, medium-, and high-capacity applications using European or North American data rates, frequencies, channel plans, and tributary interfaces:

MPR-E (ETSI market)

- TDM/PDH Data Rate: E1
- TDM/SDH Data Rate: STM-1
- ATM Data Rate: E1
- Ethernet Data Speed: 10, 100, 1000 Mb/s
- RF Frequency Range: 6 to 38 GHz

MPR-A (ANSI market)

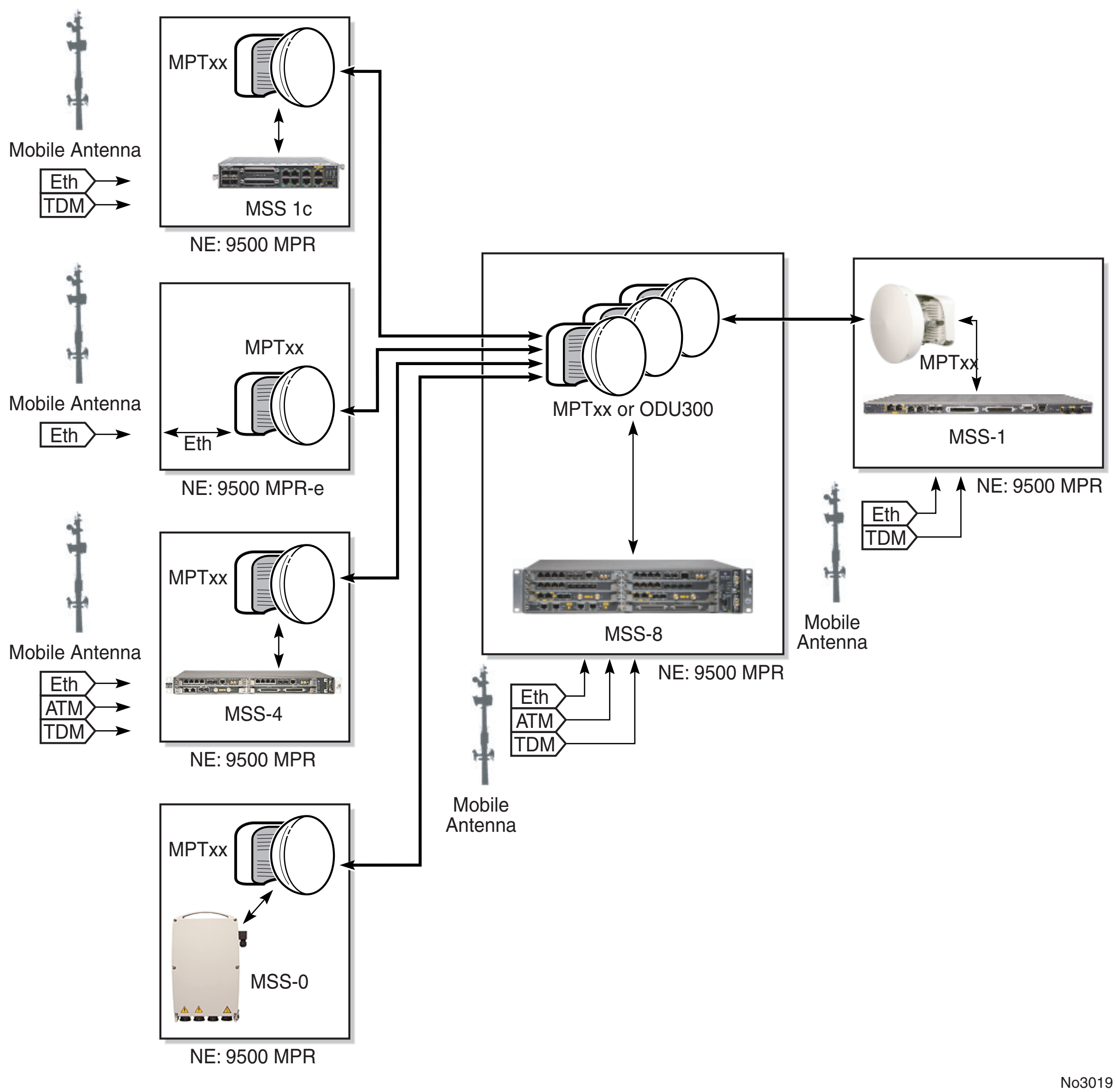
- TDM/PDH Data Rates: DS1, DS3
- TDM/SDH Data Rate: OC-3
- Ethernet Data Speed: 10, 100, 1000 Mb/s
- RF Frequency Range: 5.8 to 38 GHz

The 9500 MPR introduces several elements to the microwave packet family:

- the most compact IDU solutions (MSS-1c) for E1 or E1/T1 and Ethernet hybrid connectivity as well as a zero footprint solution (no IDU), addressing full outdoor applications
- a new set of multipurpose ODUs, with the MPT addressing any application in the microwave domain
- standalone as well as split-mount solutions applications depending on the network requirement and layout

The MPT is available in a variety of configurations to address, in the most cost-effective way, each part of the network; this also includes millimeter wavelength.

Figure 3.1 — 9500 MPR configurations



The following types of Indoor Units are available:

- MSS-8: a 2U shelf, connected to an outdoor RF unit (split-mount system)

  Supported ODUs:

  - ODU300
  - MPT-HC/HC-HQAM/XP/XP-HQAM

    - MPT-MC (MPR-E)
    - 9558HC (MPR-A)
- MSS-4: a 1U shelf, connected to an outdoor RF unit (split-mount system)

  Supported ODUs:
    - ODU300
    - MPT-HC/HC-HQAM/XP/XP-HQAM
    - MPT-MC (MPR-E)
    - 9558HC (MPR-A)
- MSS-1: a 1U shelf, connected to an outdoor RF unit (split-mount system)

  Supported ODUs:
    - MPT-HC/HC-HQAM/XP/XP-HQAM
    - MPT-MC (MPR-E)
- MSS-1c: a compact IDU that complements the existing portfolio, addressing the last mile, the far-end application in a nodal solution, and cost-optimized point-to-point applications.

  Its small size of 1U height and half-rack width drastically reduces the space consumption in busy sites.

  Supported ODUs:
    - MPT-HC/HC-HQAM/XP/XP-HQAM
    - MPT-MC (MPR-E)
    - 9558HC (MPR-A)

The MPT is a multipurpose ODU that address any microwave application, is extremely compact in size and provides:

- MPT-MC: 155 Mbps max. (MPR-E)
- MPT-HC V2/ MPT-XP: 340 Mbps max.
- MPT-HC-HQAM/MPT-XP-HQAM: 425 Mbps max.

The MPT-xx can be deployed in a standalone configuration (9500 MPR-e standalone), or it can be deployed in a split-mount solution connected to any MSS-x IDU.

- Up to 18 MPT units can be connected to an MSS-8; providing the highest density
- Up to 14 MPT units can be connected to an MSS-4; providing the highest density
- Up to 6 MPT units can be connected to an MSS-1; providing the highest density
- 1 MPT can be connected to an MSS-1c

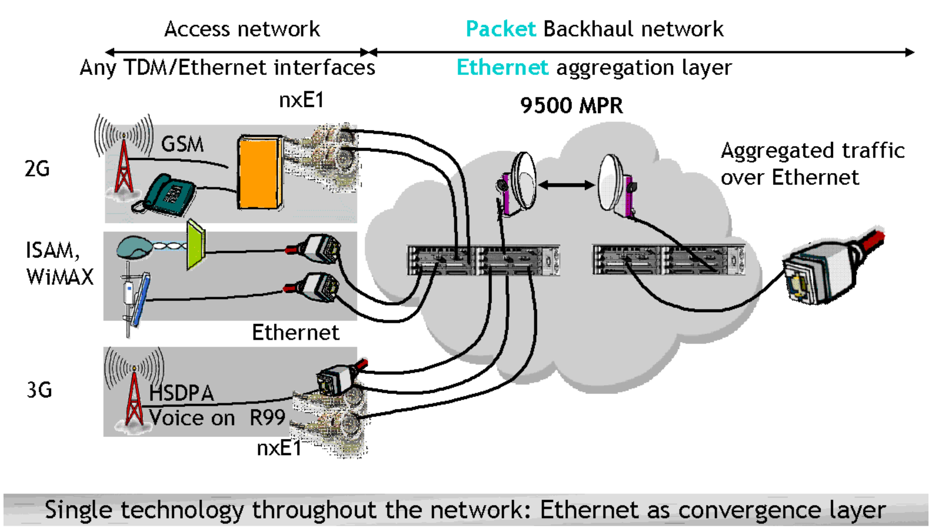
The 9500 MPR-e standalone is the full outdoor application of the MPR-e xx to address full Ethernet site backhauling (fixed or mobile) and to address converged MPLS metro networks reducing the number of deployed equipment.

The 9500 MPR innovative solutions include:

- **Multiservice aggregation layer**: the capacity to use Ethernet as a common transmission layer to transport any kind of traffic, independent of the type of interface. Ethernet becomes the convergence layer.
- **Service awareness**: traffic handling and quality management, queuing traffic according to the type of service assigned, independent of the type of interface
- **Packet node**: no service aggregation limits with all traffic aggregated in packets according to: capacity, type of service requirements and type of interface
- **Service-driven adaptive modulation**: fully exploits the air bandwidth in its entirety by changing the modulation scheme according to the propagation availability and allocates transport capacity, discriminating traffic by different services, which is only possible in a packet-based environment.

Multiservice aggregation layer

Figure 3.2 — Multiservice aggregation layer



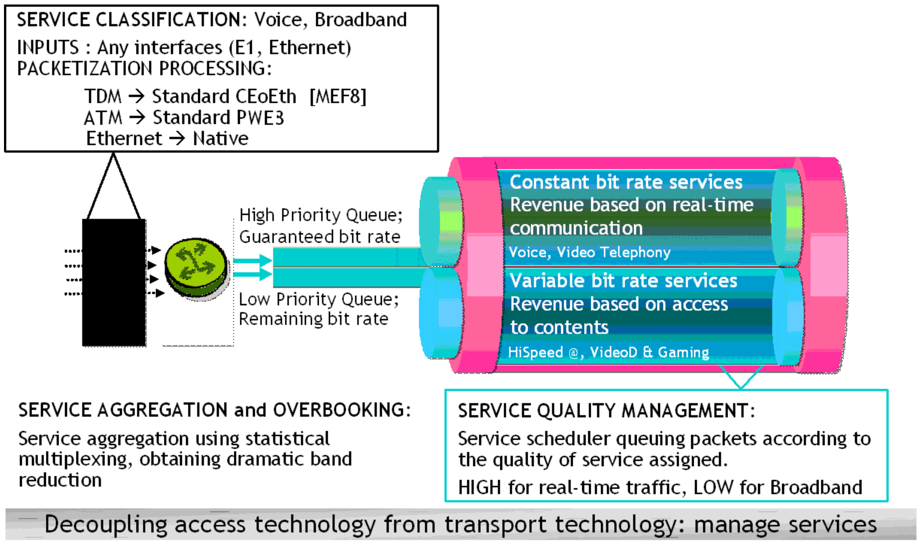
The 9500 MPR aggregates and carries over a **COMMON PACKET LAYER**: TDM 2G, 3G, LTE and IP/Ethernet. This allows sharing of common packet transmission infrastructures, regardless of the nature of the traffic being carried.

Due to the nature of Ethernet, each service can be discriminated based on several parameters like quality of service.

Mapping different access technologies over Ethernet is achieved by standardized protocols like circuit emulation and pseudowire.

Service awareness

Figure 3.3 — Service awareness

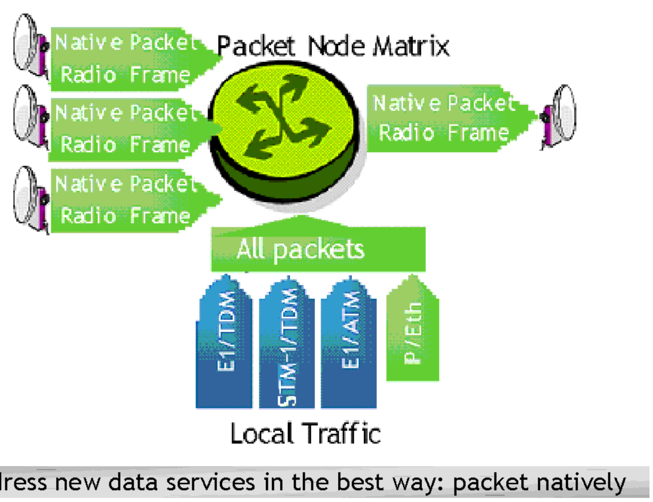


Service awareness is the ability to discriminate the different traffic types carried over the converged Ethernet stream. The traffic flow can be composed of E1/DS1, E3/DS3 and/or IP/Ethernet (as applicable for the area), coming from different sources, and therefore having different requirements.

Service awareness is what allows identification of the traffic types, and in case of the non-real-time variable bit rate service, always optimization of the band with overbooking of the radio scarce resource.

Packet node

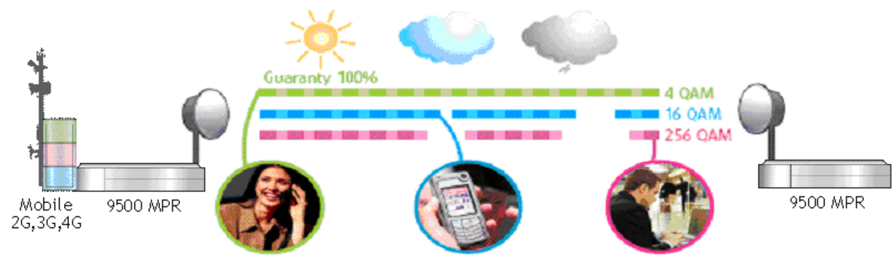
Figure 3.4 — Packet node



The 9500 MPR offers a **SINGLE PACKET MATRIX** that is able to switch, aggregate and handle any of the possible incoming traffic types with virtually no capacity limits (up to 10 GBps).

Service-driven adaptive modulation

Figure 3.5 — Service-driven packet adaptive modulation

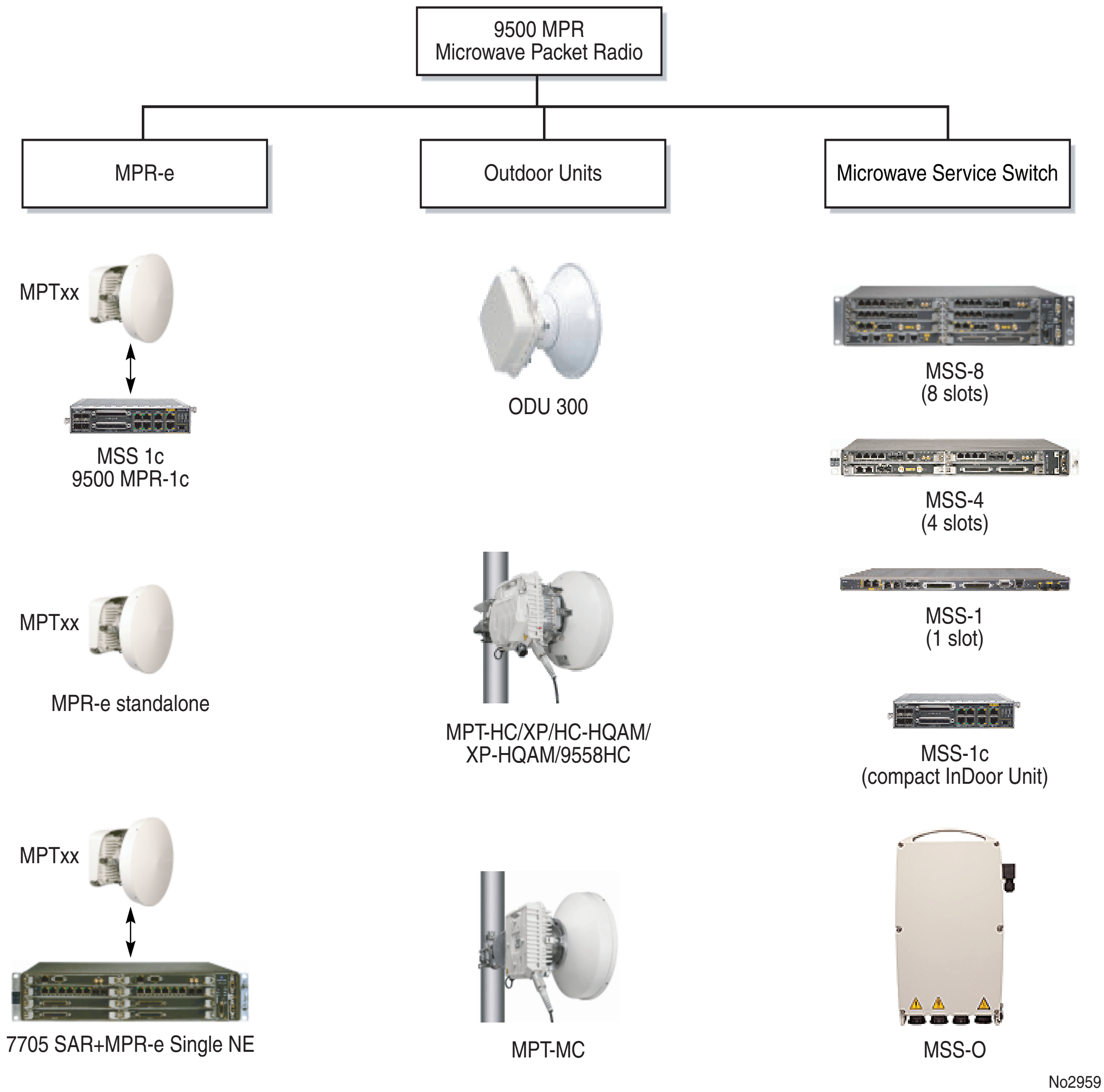


Traffic with high priority, such as voice, will always have bandwidth available (deterministic approach).

Broadband traffic is discriminated by QoS dynamically, with modulation scheme changes driven by propagation conditions.

3.1.1 — 9500 MPR system family

Figure 3.6 — 9500 MPR system family



The 9500 MPR in the standalone (zero-footprint) architecture is built by only one unit for Ethernet applications:

- Outdoor Unit
- The Outdoor Unit is connected to the MPLS metro networks equipment with one electrical Ethernet cable for data and power supply, or with one coaxial cable for the power supply and one optical Ethernet cable for the data (with MPT).

The 9500 MPR in the split-mount architecture is built by two separate units:

- MSS (Microwave Service Switch): indoor unit for split-mount and standalone configurations (Ethernet uplink)
- Radio: Outdoor Unit or Indoor Unit (MPT-HLS, not pictured)
- The MSS and Radio are connected with a single standard coaxial cable (with ODU300) or with one coaxial cable for the power supply and one Ethernet optical or electrical cable (with MPT).

3.1.2 — Family elements described in this User Manual

In this User Manual the following solutions are described:

- MPR-1c access solution with the MSS-1c and MPT-HC/MPT-HC/MPT-HC-HQAM/MPT-XP/MPT-XP-HQAM/MPT-MC (MPR-E) /9558HC (MPR-A)
- MPR-e

3.1.2.1 — The MSS-1c solution

The MSS-1c uses its Ethernet interface to connect to the following Outdoor Units:

- for MPR-E—MPT-HC, MPT-HC, MPT-HC-HQAM, or MPT-MC
- for MPR-—MPT-XP, MPT-XP-HQAM, or 9558HC

The MSS-1c can collect up to 10 or 16 TDM flows and Ethernet flows. The implemented radio configuration is 1+0.

For MPR-E and MPR-A, the ODUs are in a charge of transporting the flows in an efficient way to ensure bandwidth optimization, Quality of service, and TDM constraints.

3.1.2.2 — The MPR-e solution

The MPR-e product embodies three different modes of operation:

- a standalone full outdoor Network Element connected to a Ethernet generic device
- in conjunction with an MSS-1c indoor unit, making an MPR-1c
- in conjunction with a 7705 SAR, making an integrated single Network Element solution

The MPR-E system consists of the following ODUs:

- MPT-HC V2
- MPT-HC-HQAM
- MPT-XP
- MPT-XP-HQAM
- MPT-MC (MPR-E)

The ODUs are connected to an Ethernet generic device, and the ways to connect it to the Ethernet generic Device. The Ethernet generic device implements L2/L3 functionalities.

The Ethernet generic Device is a device with the prerequisites listed in Ethernet generic device prerequisites.

Several portions of this document focus on 7705 SAR family because additional features are supported when the MPR-e is connected to a 7705 SAR device. Paragraph 7705 SAR platform prerequisites illustrates the prerequisites of the 7705 platform to make use of these features.

3.1.3 — MSS-1c

The MSS-1c provides user port interface, cross-connection and switching management.

The cross-connection matrix implements all the cross-connections between the User ports (4 Ethernet ports and E1/T1 streams) and the Radio port. The matrix is a standard Ethernet switch, based on VLAN, assigned by the MCT.

The E1/T1 enter the LIU and then the IWF, which manages the encapsulation and reconstruction of PDH data to and from standard Ethernet packets and sends and receives standard Ethernet packets to and from the Ethernet switch.

Two variants of MSS-1c are available:

- MSS-1c providing 10E1 and 4 User Ethernet ports
- MSS-1c 16PDH providing 16E1 or 16T1 and 4 User Ethernet ports. This version is HW ready to manage up to 2 STM-1 frames (instead of 2 Ethernet ports) not supported by the current SW Release

The Radio Interface interfaces the MPT-HC or MPT-HC or MPT-HC-HQAM, or the MPT-MC (MPR-E) or MPT-XP, MPT-XP-HQAM or 9558HC (MPR-A).

The radio interface is a standard GbEth interface: electrical only for MPT-MC (MPR-E) and electrical or optical for MPT-HC, MPT-HC, MPT-HC-HQAM, MPT-XP, MPT-XP-HQAM, and 9558HC (MPR-A). It sends/receives standard Ethernet packets to/from the Ethernet switch.

In case of electrical radio interface, on the same cable is also sent the power supply for the MPT by using the Power Feed over Ethernet (PFoE) function.

Note: The MPT-HCMPT-HC/HC-HQAM/MC/XP/XP-HQAM/9558HC (MPR-A) can be connected also by using an optical cable for the Ethernet traffic and a coaxial cable for the power supply.

For the different connection solutions with the MPTs, see MSS-1c to MPT-HC/HC-HQAM/9558HC interconnection, and MSS-1c to MPT-MC interconnection.

3.1.4 — MPR-e

3.1.4.1 — Ethernet generic device prerequisites

One Ethernet traffic port:

- electrical to be used with MPT-HC V2/HC-HQAM/MC/XP/XP-HQAM or
- optical only with MPT-HC V2/HC-HQAM/XP/XP-HQAM
- An FE (minimum) port

For local management (provisioning phase only):

- VLAN management capability to create a tagged service between the local management port and MPT Ethernet port

  One service open with VLAN ID on GE Port. Default VLAN ID: 4080

If local management is not required, the NE could be supervised through TMN RF.

One Gigabit Ethernet (GE) traffic port:

- electrical to be used with MPT-HC V2/HC-HQAM/MC/XP/XP-HQAM or
- optical only with MPT-HC V2/HC-HQAM/XP/XP-HQAM

For local management (provisioning phase only):

- An FE (minimum) port
- VLAN management capability to create a tagged service between the local management port and MPT Ethernet port

  One service open with VLAN ID on GE Port. Default VLAN ID: 4080

  If local management is not required, the NE could be supervised through TMN RF.

3.1.4.2 — 7705 SAR platform prerequisites

Any 7705 SAR chassis can be connected to an MPR-e in the same way as any other Ethernet generic device. In addition, connecting a SAR-8 or SAR-18 chassis with a Packet Microwave Adapter card (3HE02782AA) provides key additional features depending on the 7705 SAR software release.

The following levels of integration are available:

- 7705 SAR and MPR-e standalone mode
- 7705 SAR and MPR-e in Single NE mode
- 1+1 HSB in Single NE mode with 7705 SAR only

3.1.4.2.1 — 7705 SAR and MPR-e standalone mode

The standalone option is available with all 7705 SAR versions. In addition, starting from 7705 SAR OS 5.0.R5, with the introduction of the Packet Microwave Adapter card (PMC), supported on the SAR-8 and SAR-18, was the first step towards microwave integration. The following key features are supported in this release of the 7705 SAR:

- Proprietary Clock Recovery (PCR)
- up to 4 MPR-e radios in unmanaged mode per PMC

The main radio configurations and topologies available are:

- 1+0 hop, with one MPR-e and one 7705 SAR per site
- 2x(1+0) XPIC hop, with two MPR-e (MPT-HC/HC-HQAM/XP/XP-HQAM) and one 7705 SAR per site
- N+0 hop, with *N* MPR-e and one 7705 SAR per site; 7705 SAR IP/MPLS networking and protection switching apply
- Ring/mesh topologies, with *N* MPR-e and one 7705 SAR per site; 7705 SAR IP/MPLS networking and protection switching apply

For detailed information, see the 7705 SAR OS 5.0 or later Software Release Notice (3HE06942000xTQZZA) and the related user guides.

3.1.4.2.2 — 7705 SAR and MPR-e in Single NE mode

With 7705 SAR OS 6.0.R1 combined with 9500 MPR Release 4.1.0, the MPR-e and the 7705 SAR can operate as a single NE. The following new features are introduced in addition to those in paragraph 7705 SAR and MPR-e standalone mode:

- up to 4 MPR-e per PMC managed as a single NE

- Fast Fault Detection (FFD)
- 1+1 HSB with the MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC by means of a coupling link
- TDM2ETH (MEF 8) over an Epipe

In single NE mode, the MPR-e behaves differently from the MPR-e in standalone mode: the MPR-e is part of the 7705 SAR as one Network Element. The MPR-e does not have a dedicated IP address; however, all MPR-e radios connected to 7705 SAR units are reachable using the 7705 SAR IP address using the MCT Launcher.

See the 7705 SAR OS 6.0 Software Release Notice (3HE07992000xTQZZA, available in early 2013) and related user guides for information about the 7705 SAR.

In addition to the configurations and topologies described in section 2.1.4.1, the following radio configuration is available in single NE mode:

- 1+1 HSB SD with the MPT-HC/HC-HQAM/XP/XP-HQAM (RPS module and coupling link) and two PMCs on the 7705 SAR

Note: This working mode applies to Release 4.1.0.

3.1.4.2.3 — 1+1 HSB in Single NE mode with 7705 SAR only

Two types of couplers are available for the MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC:

- 3 dB/3 dB balanced coupler
- 1 dB/10 dB unbalanced coupler

Note: The 1+1 configuration with the MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC can be implemented only with an interconnection cable between the two ODUs.

Note: An MPT-HC/HC-HQAM and an MPT-XP/XP-HQAM can form a 1+1 configuration with the use of an RPS cord.

Note: This working mode applies to Release 4.1.0.

3.1.5 — MPT-HC V2/HC-HQAM/9558HC

The high-capacity (HC) MPT ODUs are available in the following models. The models share the same characteristics except where indicated below:

- MPT-HC—supports QPSK, and 8, 16, 32, 64, 128,and 265 QAM
- MPT-HC-HQAM—supports the same QAM range as the MPT-HC, but adds support for 512 QAM and 1024 QAM
- 9558HC—supports the same QAM range as the MPT-HC, but operates only at 5.8 GHz

MPT-HC V2/HC-HQAM/9558HC is microwave equipment capable of transporting the Ethernet traffic over an RF radio channel.

MPT-HC/HC-HQAM is microprocessor-controlled equipment that interfaces the MSS with the antenna.

The input interface is a standard Giga Ethernet interface (electrical or optical).

The Ethernet traffic is transmitted over the radio channel according to the configured QoS and to the scheduler algorithms.

Transmitter circuits in the MPT-HC V2/HC-HQAM/9558HC consist of Ethernet input interface, modulator, local oscillator, upconverter/mixer, power amplifier, and diplexer.

Receiver circuits consist of diplexer, low-noise amplifier, local oscillator, downconverter/ mixer, automatic gain control, demodulator and Ethernet output interface.

The microprocessor manages the frequency, transmit power alarming, and performance monitoring.

The power supply is provided through PFoE (electrical Ethernet cable) or a dedicated power supply cable.

MPT-HC V2 is XPIC-ready, and requires the installation of a dedicated module.

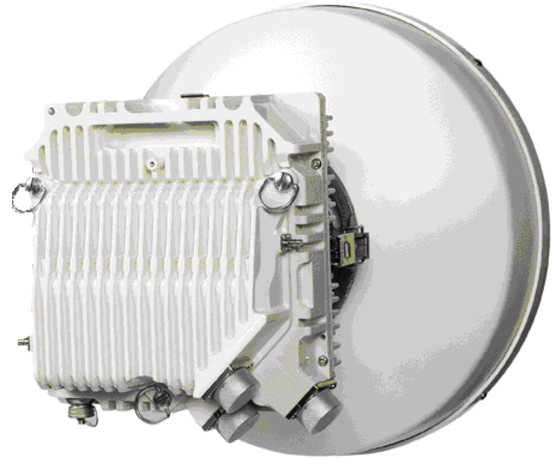
The MPT-HC-HQAM has an integrated, on-board XPIC function which can be enabled by software upgrade using a dedicated XPIC RTU license. No additional hardware module is required.

The MPT-HC V2/HC-HQAM/9558H is frequency dependent.

The MPT-HC-HQAM does not require a solar shield.

See Sparing strategy: MPT-HC/XP replacement with MPT-HC-HQAM/XP-HQAM for information about HQAM spares.

Figure 3.7 — 11 GHz MPT-HC V2



The following configurations are available for MPR-e:

- 1+0 (see MPT-HC/HC-HQAM/9558HC connectivity for MPR-e (1+0 configuration))
- co-channel XPIC (see MPT-HC/HC-HQAM/9558HC connectivity for MPR-e (co-channel XPIC configuration))
- 1+1 HSB in Single NE mode with 7705 SAR (see MPT-HC/HC-HQAM/9558HC connectivity for MPR-e (1+1 HSB in Single NE mode with 7705 SAR))

3.1.5.1 — MSS-1c to MPT-HC/HC-HQAM/9558HC interconnection

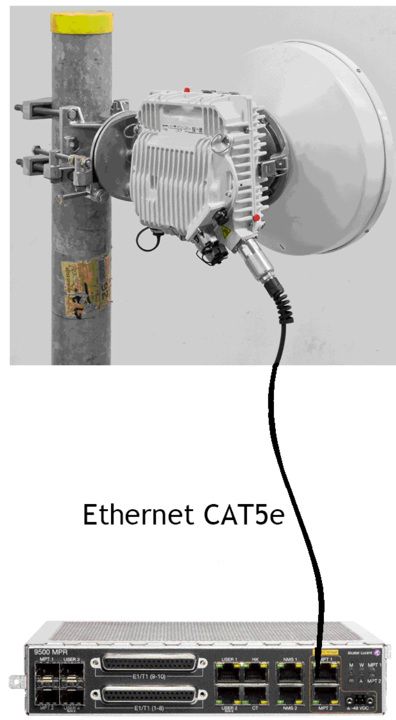
3.1.5.1.1 — MSS-1c to MPT-HC/HC-HQAM/9558HC interconnection (one cable)

One electrical Ethernet cable connects the MSS-1c to its MPT-HC/HC-HQAM/9558HC.

The max cable length is 100 m.

The Ethernet electrical cable is provided with connectors to be mounted on site with the specific RJ45 tool (1AD160490001).

Figure 3.8 — MPT-HC/HC-HQAM/9558HC connection



3.1.5.1.2 — Optical cable

Two cables connect the MSS-1c to its MPT-HC/HC-HQAM/9558HC:

- One cable is a 50 ohm cable to send the power supply to the MPT-HC/HC-HQAM/9558HC:
    - for length lower or equal to 100 m the power cable can be CAT5E cable to send the power supply to the MPT-HC/HC-HQAM/9558HC. The Ethernet electrical cable is provided with connectors to be mounted on site with the specific RJ45 tool (1AD160490001);
    - for length higher than 100m, the cable is a 50 ohm coaxial cable to send the power supply to the MPT-HC/HC-HQAM/9558HC.

Note: In case of length lower than 100m and presence in the field of 1 coaxial already installed and free it is recommended to use the coax cable to minimize the installation effort.

- The second cable is an Ethernet optical cable.The Ethernet optical cable is preassembled and available in different lengths (up to 350 m).

Note: A special adapter cord must be connected to the coaxial cable on the MPT-HC/HC-HQAM/9558HC.

Figure 3.9 — MPT-HC/HC-HQAM/9558HC connection (optical cable + power supply cable from MSS-1c)

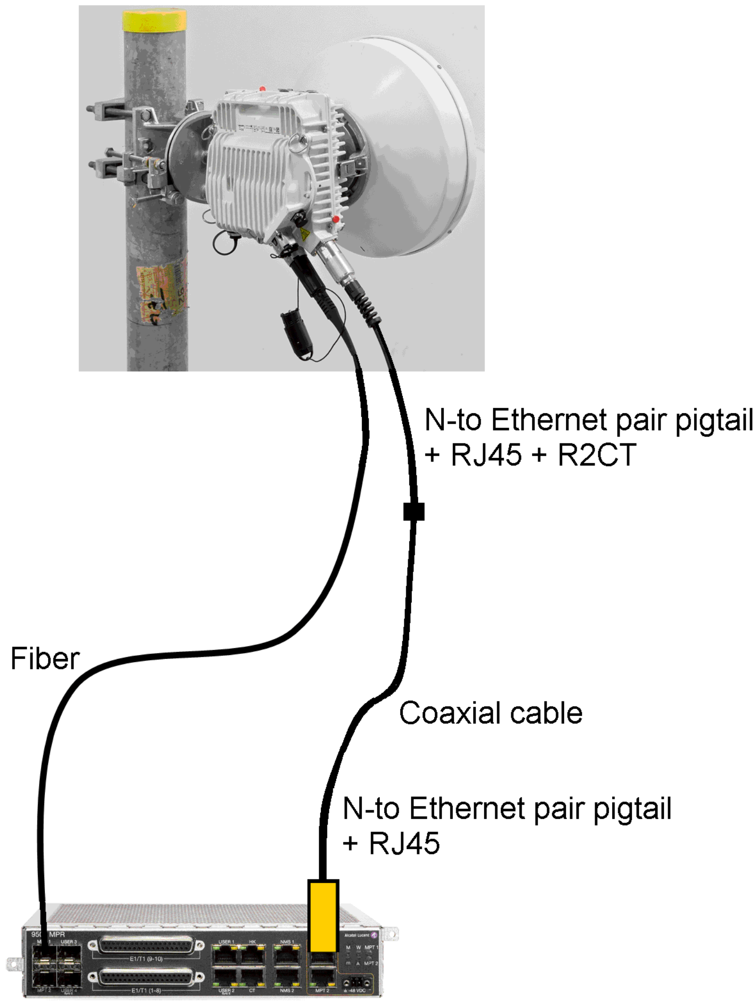
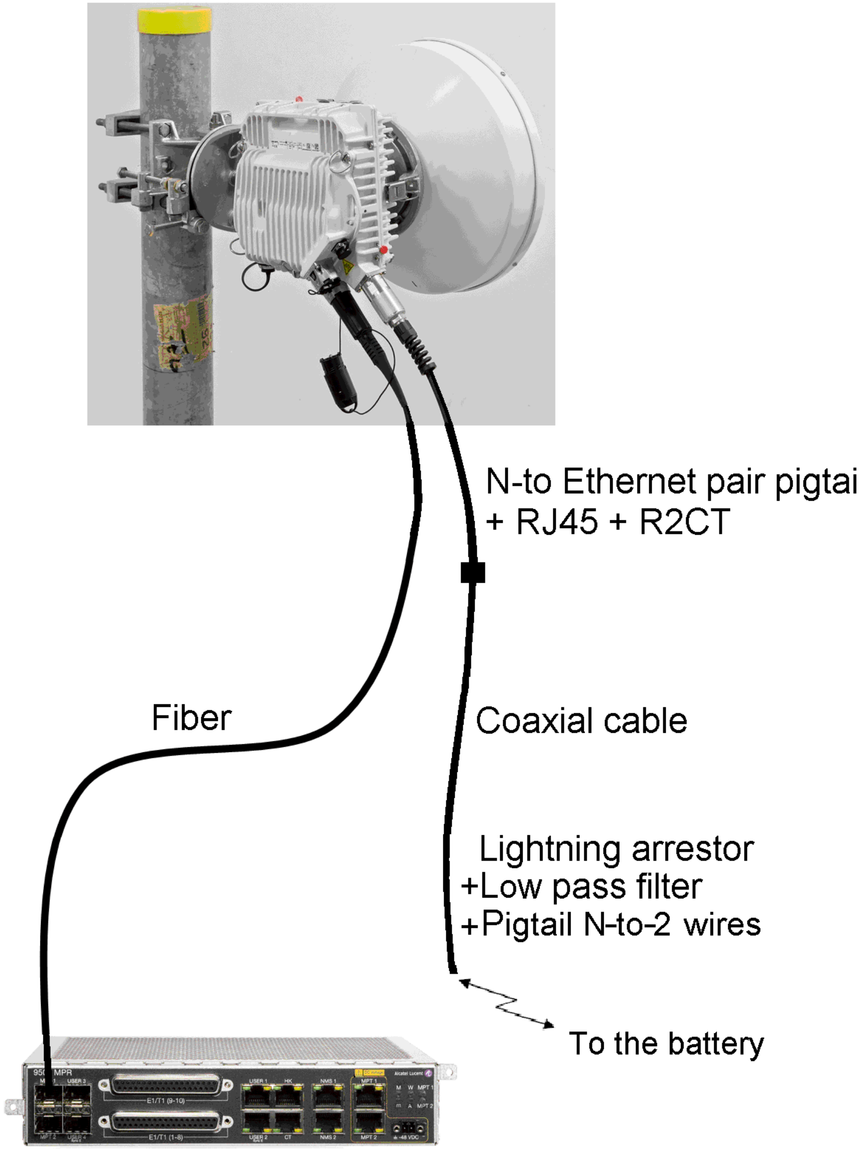


Figure 3.10 — MPT-HC/HC-HQAM/9558HC connection (optical cable + power supply cable from station battery)



Note: MPT-HC/HC-HQAM/9558HC must be connected to a fuse or a breaker on a customer power distribution box. The recommended value is 3 Amps.

3.1.5.2 — MPT-HC/HC-HQAM/9558HC connectivity for MPR-e (1+0 configuration)

The MPT-HC/HC-HQAM/9558HC can be connected to the Ethernet generic Device through:

- Electrical interface

or

- Optical interface (an optional SFP must be installed in the MPT-HC/HC-HQAM/ 9558HC).

3.1.5.2.1 — Electrical interface

The MPT-HC/HC-HQAM/9558HC is connected to a Power Injector or MPT Extended Power unit through one electrical Ethernet cable.

The maximum cable length is 100 m.

Figure 3.11 and Figure 3.12 show the connections used with the Power Injector.

Figure 3.13 shows the connections used with the MPT Extended Power Unit.

The Power Injector box is an indoor device that is installed in a 19-inch or 21-inch rack.

The Power Injector card is a unit that is installed in a 7705 SAR.

The MPT Extended Power unit is an indoor device that is installed in a 19-inch or 21-inch rack.

Figure 3.11 — MPT-HC/HC-HQAM/9558HC connection through the Power Injector Box

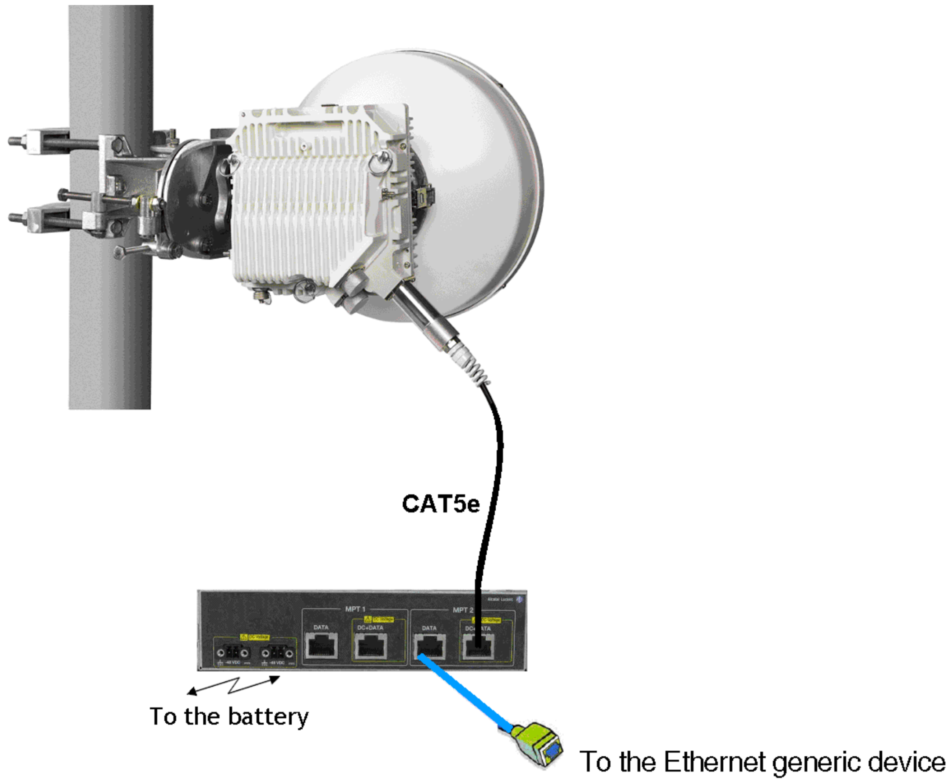


Figure 3.12 — MPT-HC/HC-HQAM/9558HC connection through the Power Injector card installed in the 7705 SAR

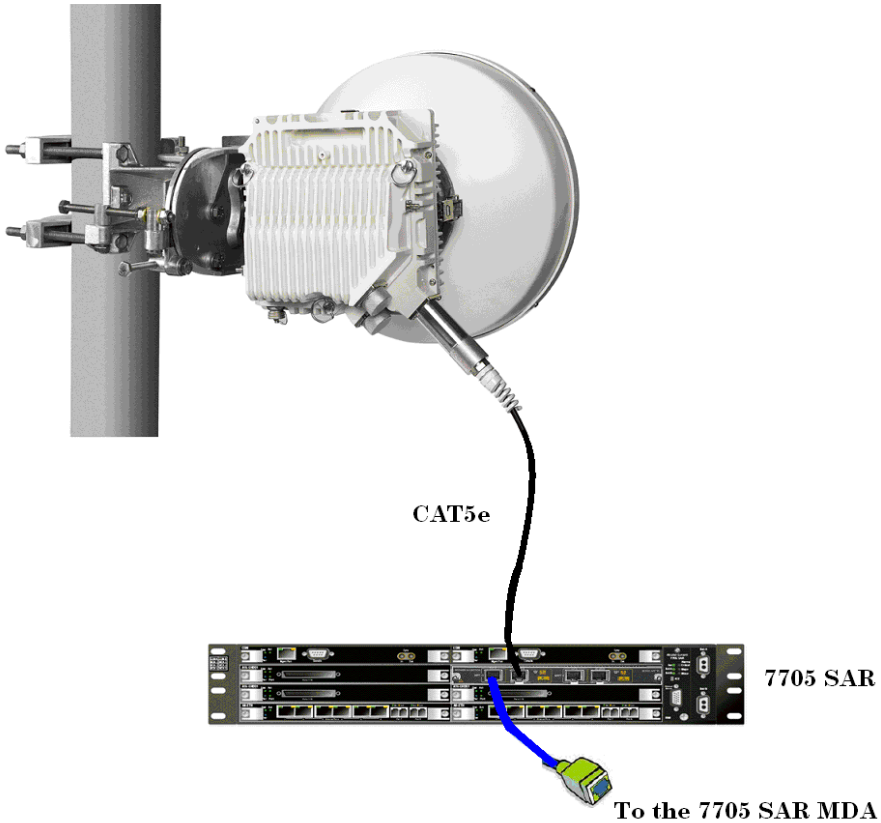
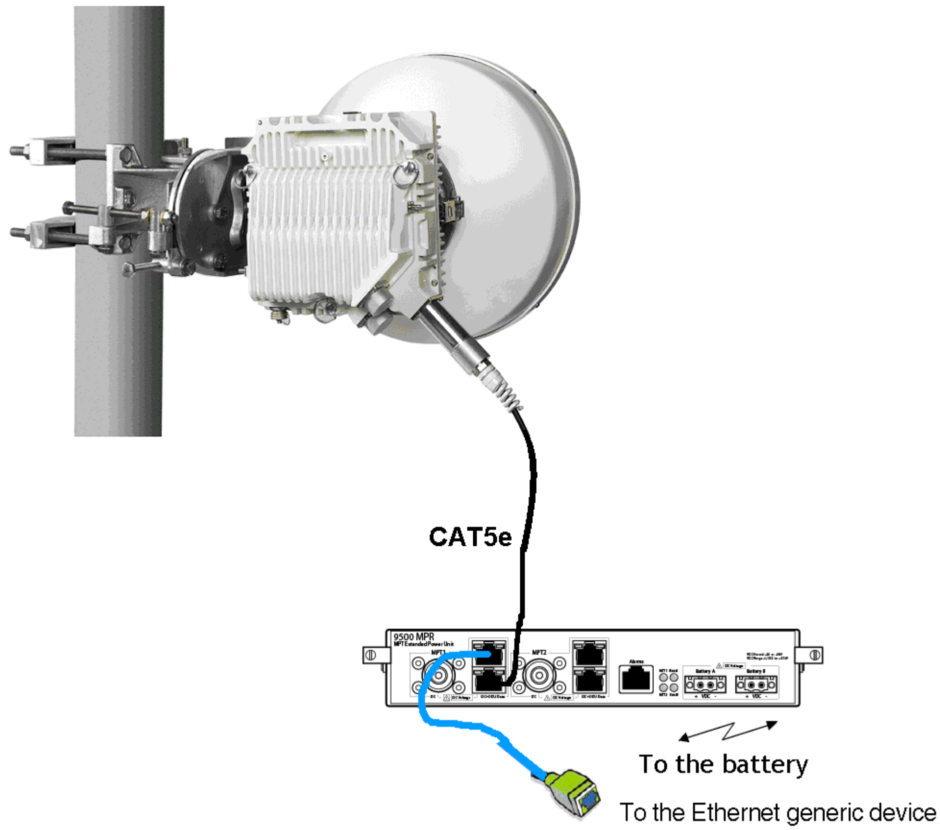


Figure 3.13 — MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC connection through the MPT Extended Power Unit



3.1.5.2.1.1 — Connecting an AC Power Converter to a Power Injector Box (MPR-E)

This section provides information on how to connect an external AC power converter to a Power Injector Box (PIB) when an AC power source is required. The procedure involves modifying the open end of a pigtail O-ring cable so that the wires can be connected to the DC power terminal block on the PIB, and then connecting the other end of the cable to the AC power converter.

The following hardware and tools are required:

- AC power supply (250W 120/240V AC power converter) – part number 3HE05838AA; see Figure 3.14.
- 7705 AC power converter pigtail - O-ring – part number 3HE05837BA; see Figure 3.15.
- wire stripper
- wire cutter

Figure 3.14 — AC Power Converter

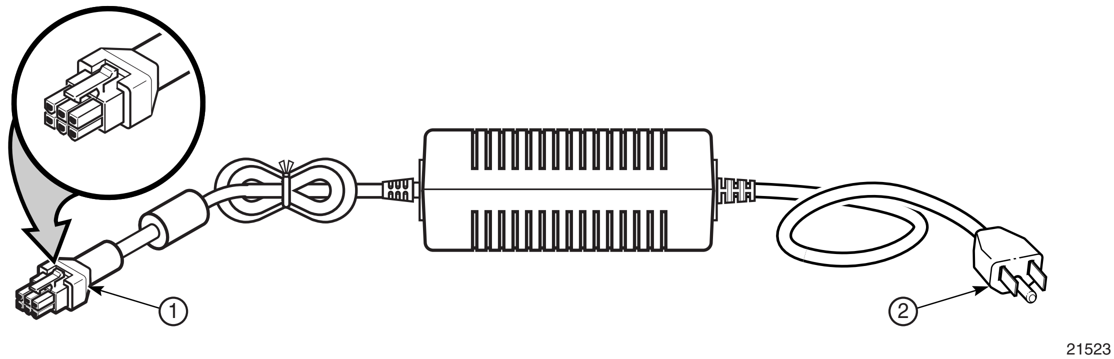


Table 3.1 — AC Power Converter features

Key	Description
1	Male 6-pin connector
2	AC cord set1

1: Two AC cord sets are supplied with the AC power converter to match North American and European style AC outlets.

Figure 3.15 — AC Power O-Ring Pigtail Cable Assembly

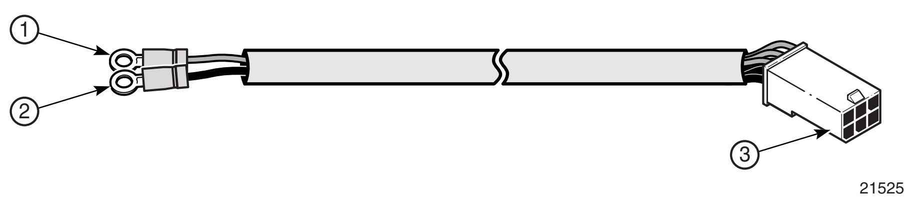


Table 3.2 — AC Power Converter O-Ring Pigtail Cable features

Key	Description
1	Ring lug connector (–VDC, black wire)
2	Ring lug connector (+VDC, red wire)
3	Female 6-pin connector

Preparing the O-Ring Cable

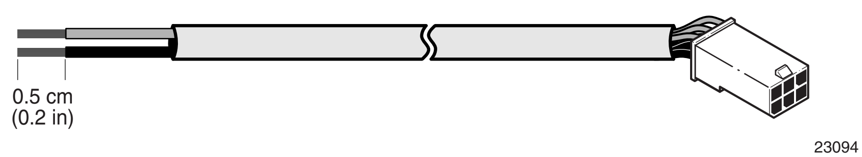
Modify the pigtail O-ring cable by cutting off the output terminals (the O-ring lug connectors) on the O-ring cable and splicing the open-ended wires to interface with the DC power terminal block on the PIB.

Danger: Ensure that the power supply is disconnected from the AC main power feed before preparing and cutting the DC wires.

To modify the pigtail O-ring cable:

- Cut off the O-ring lugs (items 1 and 2 on the cable in Figure 3.15) and strip approximately 0.5 cm of shield from each wire to expose the conductors. See Figure 3.16.

Figure 3.16 — Modified AC Power O-Ring Pigtail Cable



Connecting the AC Power Converter to the DC inputs on the PIB

To connect the AC power converter to the DC inputs on the PIB:

- Connect the modified end of the pigtail O-ring cable to the DC inputs on the PIB.

  Connect the -VDC (black wire) to the -Batt terminal on the PIB terminal block; connect the +VDC (red wire) to the +Batt terminal on the PIB terminal block.
- Connect the male 6-pin connector on the AC Power Converter (item 1 in Figure 3.14) to the female 6-pin connector on the pigtail cable (item 3 in Figure 3.15).
- Plug the AC power converter cord (item 2 in Figure 3.14) into an AC power outlet.

3.1.5.2.2 — Optical interface

One Optical Ethernet cable connects the MPT-HC/HC-HQAM/9558HC to the Ethernet generic Device and one coaxial cable connects the MPT-HC/HC-HQAM/9558HC to MPT Power Unit or MPT Extended Power Unit.

The maximum cable length is up to 350 m. For longer distances, please contact Product Management.

Figure 3.17 shows the connections used with the MPT Power Unit.

Figure 3.18 shows the connections used with the MPT Extended Power Unit.

Figure 3.19 shows the connections used with direct connection to office power.

The MPT Power unit is an indoor device that is installed in a 19-inch or 21-inch rack.

Figure 3.17 — MPT-HC/HC-HQAM/9558HC connection (optical cable for traffic and coaxial cable to MPT Power Unit)

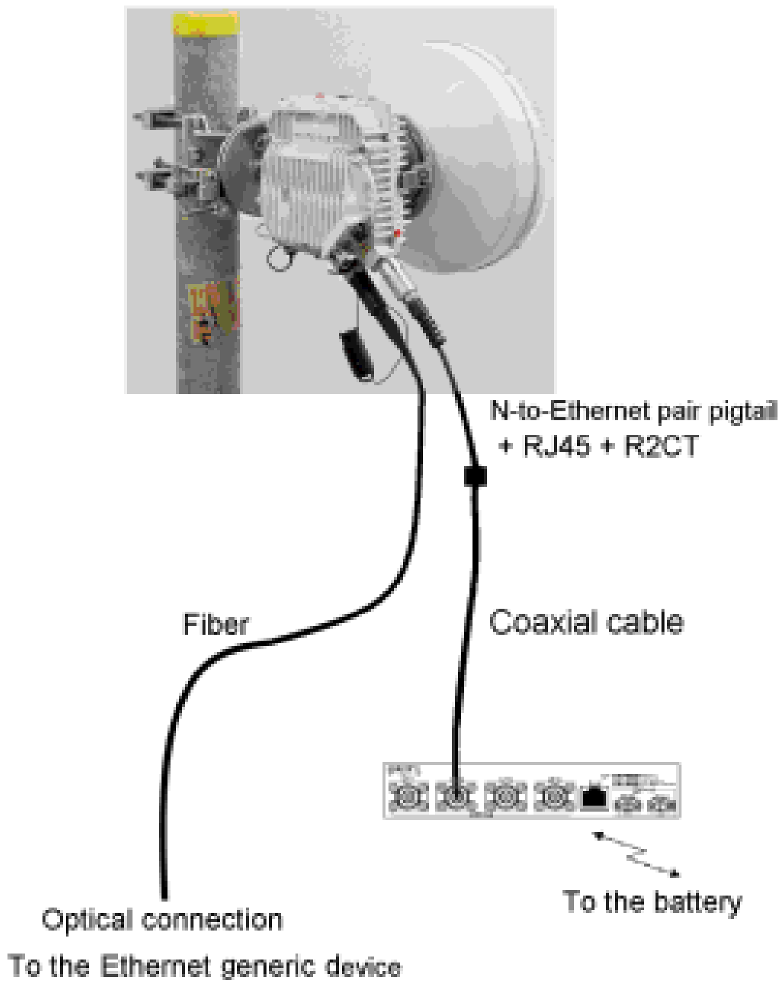


Figure 3.18 — MPT-HC/HC-HQAM/9558HC connection (optical cable for traffic and coaxial cable to MPT Extended Power Unit)

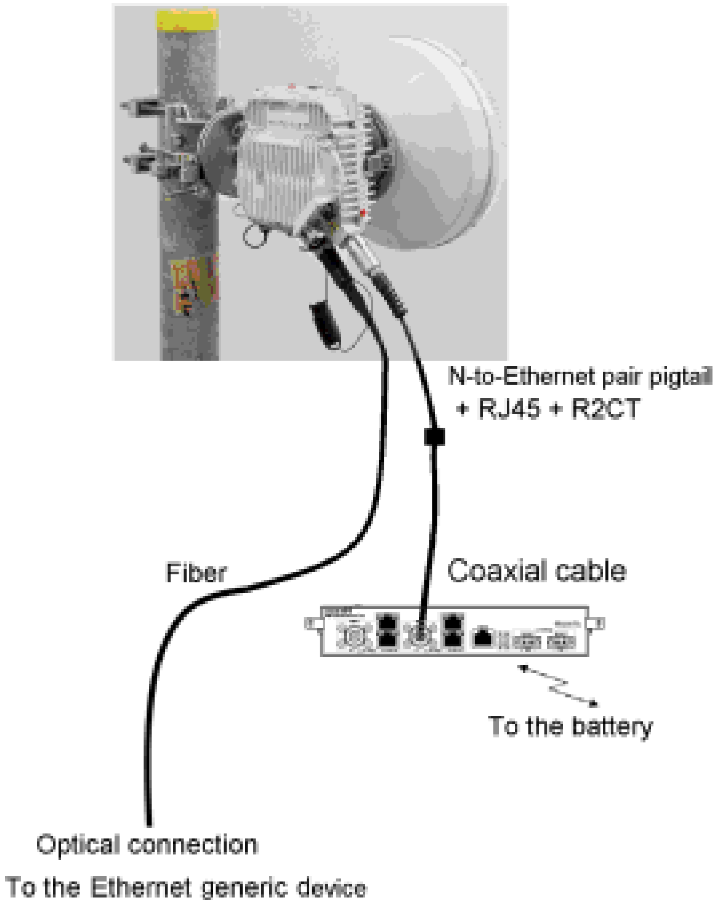
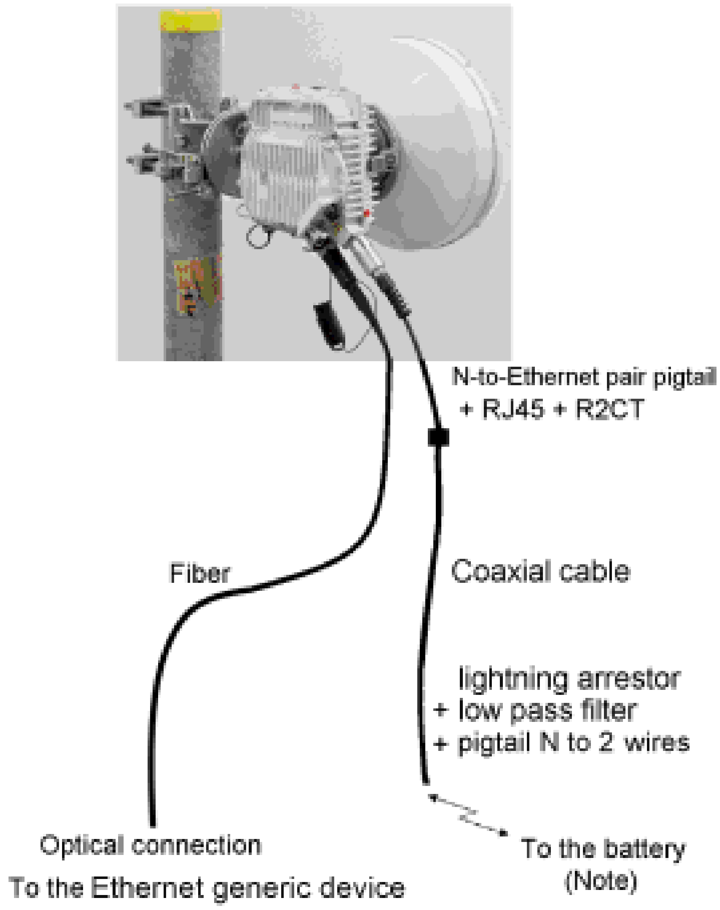


Figure 3.19 — MPT-HC/HC-HQAM/9558HC connection (optical cable for traffic and coaxial cable for power supply)



Note: The MPT-HC/HC-HQAM/9558HC must be connected to a fuse or a breaker on a customer power distribution box.

The recommended value is 3 Amps.

3.1.5.3 — MPT-HC/HC-HQAM/9558HC connectivity for MPR-e (co-channel XPIC configuration)

In this configuration, the MPT-HC/HC-HQAM/9558HC units must be installed on the OMT that is directly connected to the antenna. The two MPT-HC/HC-HQAM/9558HC units must be connected to the Indoor Section as explained in MPT-HC/HC-HQAM/9558HC connectivity for MPR-e (1+0 configuration).

The two MPT-HC/HC-HQAM/9558HC units must **also** be interconnected through two terminated cables (XPIC and RPS cables) as shown in Figure 3.20, Figure 3.21, and Figure 3.22.

Note: The extra length of the RPS and XPIC cables must be bound by using tie-wraps, either on the pole or on the other cables coming from the ODUs.

Figure 3.20 — MPT-HC/HC-HQAM/9558HC connection through the Power Injector Box (co-channel XPIC)

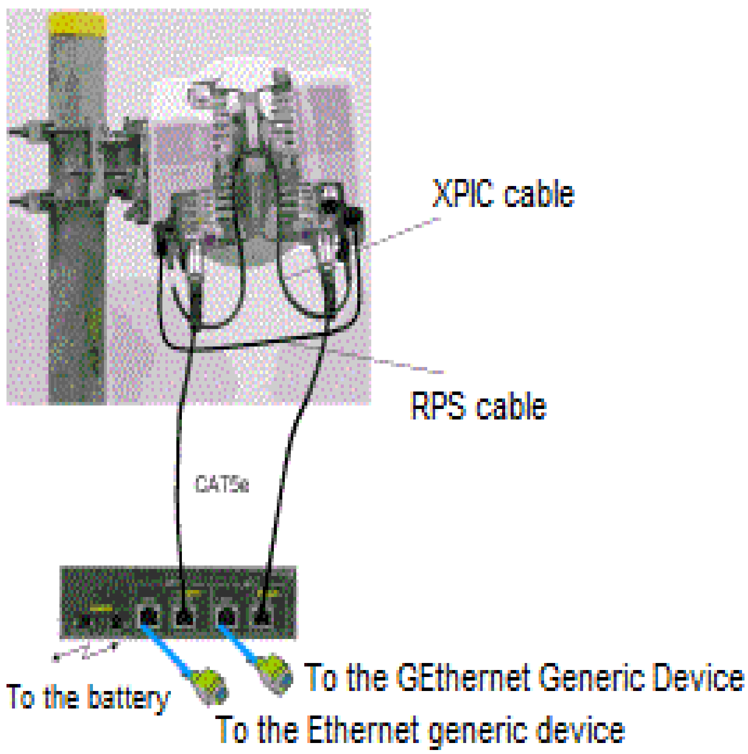


Figure 3.21 — MPT-HC/HC-HQAM/9558HC connection through the MPT extended power unit (co-channel XPIC)

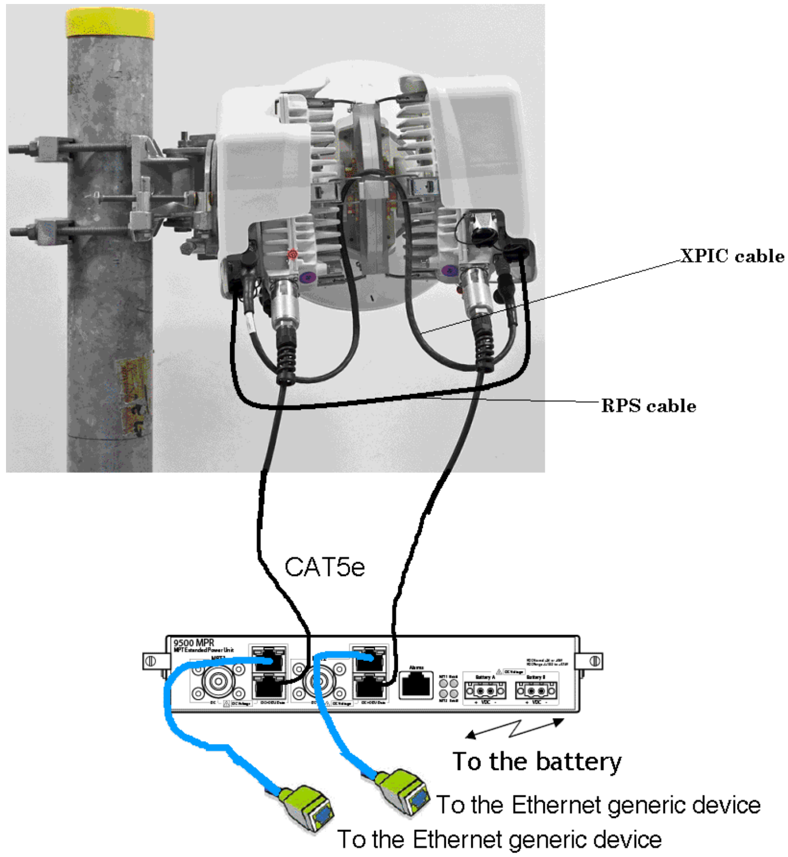
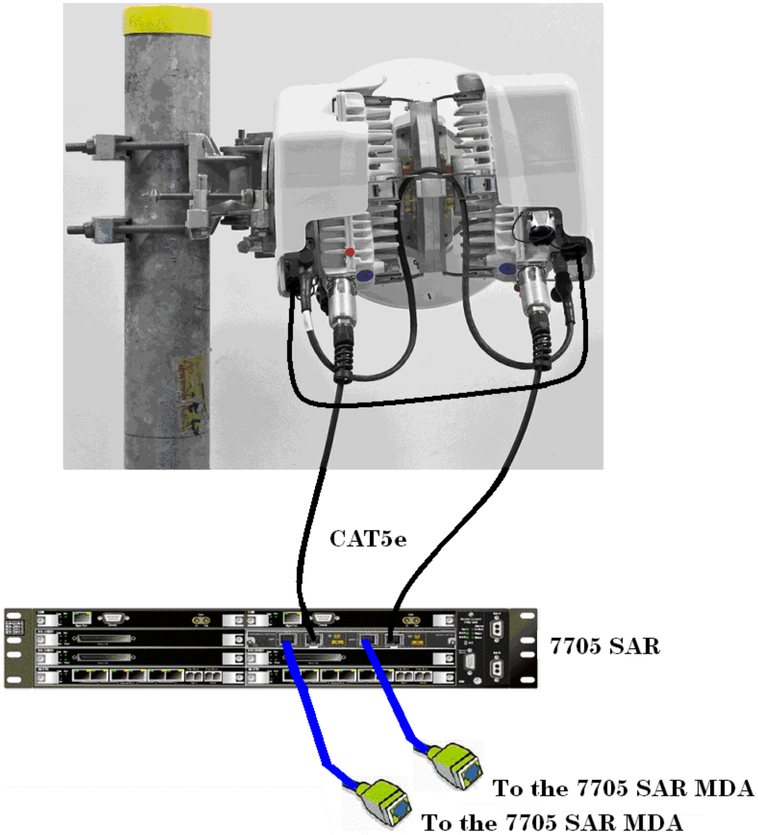


Figure 3.22 — MPT-HC/HC-HQAM/9558HC connection through the Power Injector card installed in the 7705 SAR (co-channel XPIC)



3.1.5.4 — MPT-HC/HC-HQAM/9558HC connectivity for MPR-e (1+1 HSB in Single NE mode with 7705 SAR)

In this configuration, the MPT-HC V2/9558HC units can be installed on the same antenna or different antennas (SD). The two MPT-HC/HC-HQAM/9558HC units must be connected to the 7705 SAR, and if they are on the same antenna, connected to each other using a coupler. See Figure 3.23 for an example.

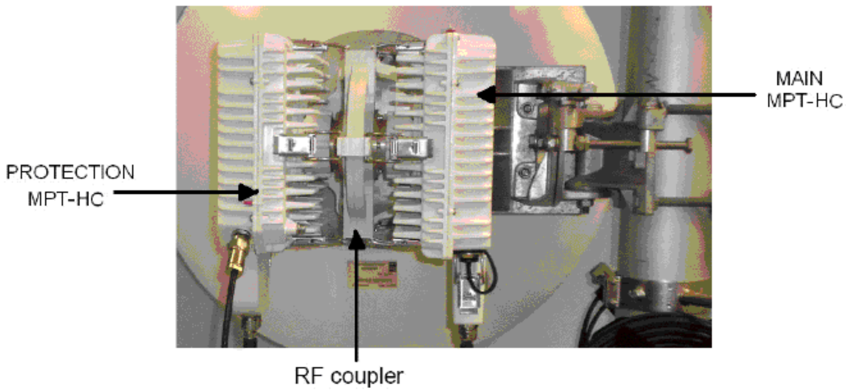
Two types of coupler are available for the MPT-HC/HC-HQAM/9558HC:

- 3 dB/3 dB balanced coupler or 1 dB/10 dB unbalanced coupler

Note: The 1+1 configuration with MPT-HC/HC-HQAM/9558HC can be implemented only with an interconnection cable between the two ODUs.

Note: An MPT-HC/HC-HQAM/9558HC and an MPT-XP/XP-HQAM can form a 1+1 configuration with the use of a specific cord.

Figure 3.23 — 1+1 HSB for MPT-HC (11-38 GHz)



3.1.6 — MPT-XP/XP-HQAM

The extended power (XP) MPT ODUs are available in two model. Both models share the same characteristics except where indicated below:

- MPT-XP—supports QPSK, and 8, 16, 32, 64, 128,and 265 QAM
- MPT-XP-HQAM— supports the same range as the MPT-XP, but adds support for 512 QAM and 1024 QAM

MPT-XP is a very high power version of the MPT-HC.

The MPT-XP provides an additional 5 to 9 dB of transmit power as compared to equivalent MPT-HC.

MPT-XP is XPIC-ready, and requires the installation of a dedicated module.

The MPT-XP-HQAM has an integrated, on-board XPIC function which can be enabled by software upgrade using a dedicated XPIC RTU license. No additional hardware module is required.

The power MUST be provided from the MPT Extended Power Unit to the MPT-XP/XP-HQAM Data+-DC connector.

The MPT-XP-HQAM does not require a solar shield.

The MPT-XP/XP-HQAM is frequency dependent.

Figure 3.24 — MPT-XP

See Sparing strategy: MPT-HC/XP replacement with MPT-HC-HQAM/XP-HQAM for information about HQAM spares.

3.1.6.1 — Sparing strategy: MPT-HC/XP replacement with MPT-HC-HQAM/XP-HQAM

The MPT-HC-HQAM/XP-HQAM can be used as a spare for the MPT-HC V2/XP in specified configurations. The replacement MPT-HC-HQAM or MPT-XP-HQAM must be provisioned in compatibility mode. The main and spare MPT-HC/XPs in 1+1 HSB/SD or 1+1 FD configuration must be replaced with MPT-HC-HQAM/XP-HQAMs.

Air compatibility is supported between:

- an MPT-HC-HQAM/XP-HQAM and an MPT-HC/XP only when the MPT-HC-HQAM/XP-HQAM is configured in compatibility mode
- an MPT-HC-HQAM/XP-HQAM and an MPT-HC-HQAM/XP-HQAM only when the both ODUs are configured in the same mode; that is, both must be in standard mode or both must be configured in compatibility mode.

3.1.6.2 — MSS-1c to MPT-XP/XP-HQAM interconnection

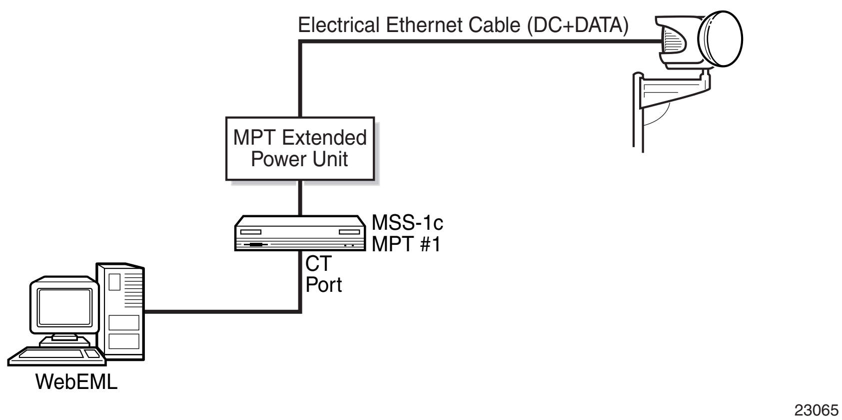
3.1.6.2.1 — MSS-1c to MPT-XP/XP-HQAM interconnection (PFoE)

One electrical Ethernet cable connects the MSS-1c to MPT Extended Power Unit and a second Ethernet cable connects the MPT Extended Power Unit to its MPT-XP/XP-HQAM.

The max cable length is 100 m.

The Ethernet electrical cable is provided with connectors to be mounted on site with the specific RJ45 tool (1AD160490001).

Figure 3.25 — MPT-XP/XP-HQAM connection



3.1.6.2.2 — Optical cable

Two cables connect the MSS-1c to its MPT-XP/XP-HQAM:

- One cable is a 50 ohm cable to send the power supply from the MPT Extended Power Unit to the MPT-XP/XP-HQAM:
    - for length less than or equal to 100 m, the power cable can be CAT5E cable to send the power supply to the MPT-XP/XP-HQAM. The Ethernet electrical cable is provided with connectors to be mounted on site with the specific RJ45 tool (1AD160490001);
    - for length greater than 100m, the cable is a 50 ohm coaxial cable to send the power supply to the MPT-XP/XP-HQAM.

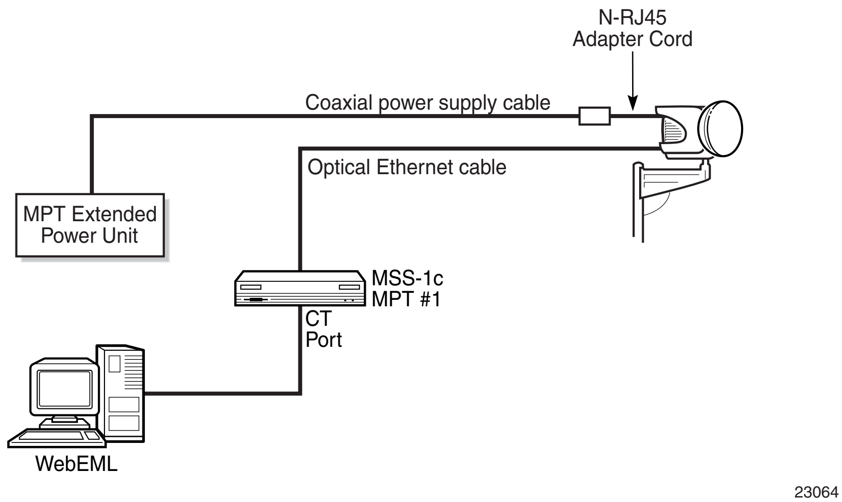
Note: In case of length less than 100m and presence in the field of 1 coaxial already installed and free it is recommended to use the coax cable to minimize the installation effort.

- The second cable is an Ethernet optical cable.

  The Ethernet optical cable is preassembled and available in different lengths (up to 300 m).

Note: A special adapter cord must be connected to the coaxial cable on the MPT-XP/XP-HQAM.

Figure 3.26 — MPT-XP/XP-HQAM connection (optical cable from MSS-1c + (power supply cable from Extended Power Unit)



3.1.6.3 — MPT-XP/XP-HQAM connectivity for MPR-e (1+0 configuration)

The MPT-XP/XP-HQAM can be connected to the Ethernet generic Device through:

- Electrical interface

or

- Optical interface (an optional SFP must be installed in the MPT-XP/XP-HQAM).

3.1.6.3.1 — Electrical interface

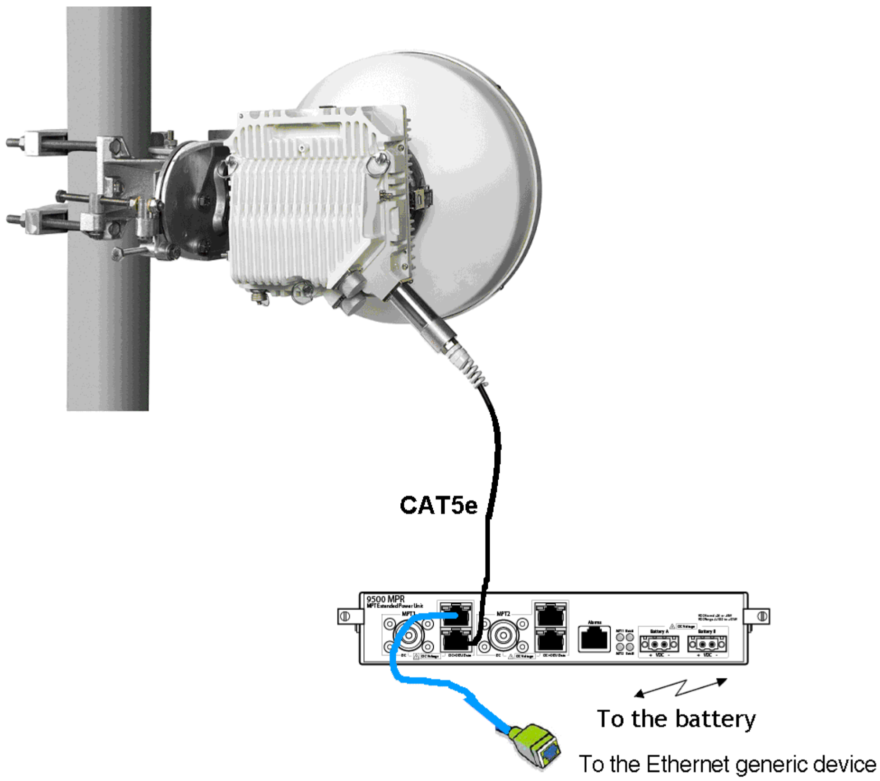
The MPT-XP/XP-HQAM MUST be connected to a MPT Extended Power unit through one electrical Ethernet cable.

The maximum cable length is 100 m.

Figure 3.27 shows the connections used with the MPT Extended Power Unit.

The MPT Extended Power unit is an indoor device that is installed in a 19-inch or 21-inch rack.

Figure 3.27 — MPT-XP/XP-HQAM connection through the MPT Extended Power Unit



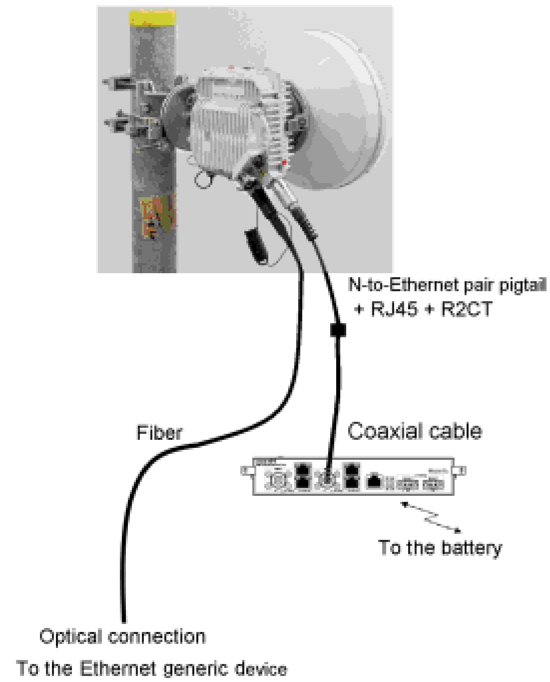
3.1.6.3.2 — Optical interface

One Optical Ethernet cable connects the MPT-XP/XP-HQAM to the Ethernet generic Device and one coaxial cable MUST connect the MPT-XP/XP-HQAM to MPT Extended Power Unit, or office power.

The maximum cable length is up to 300 m. For longer distances, please contact Product Management.

Figure 3.28 shows the connections used with the MPT Extended Power Unit.

Figure 3.28 — MPT-XP/XP-HQAM connection (optical cable for traffic and coaxial cable to MPT Extended Power Unit)



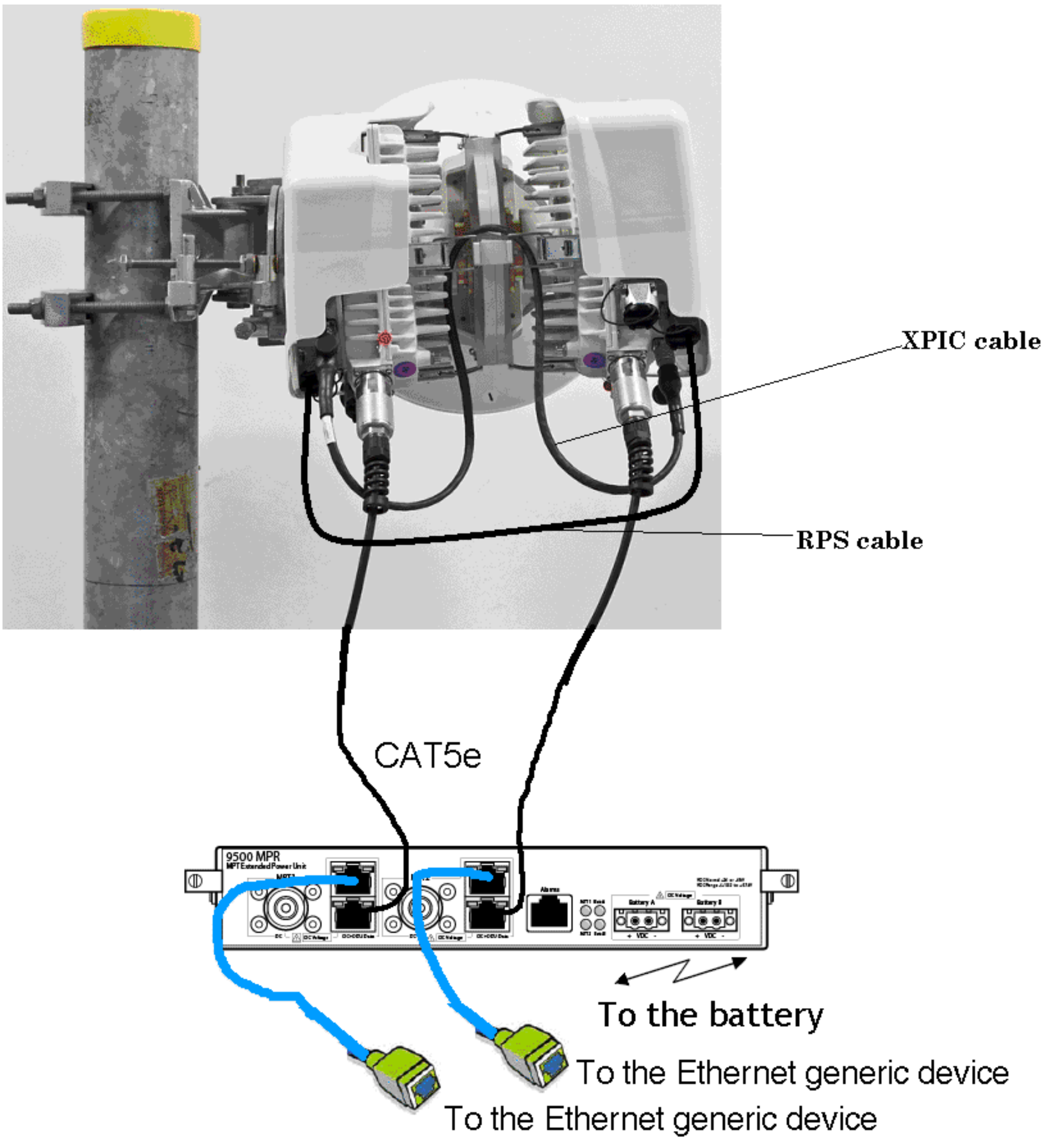
3.1.6.4 — MPT-XP/XP-HQAM connectivity for MPR-e (co-channel XPIC configuration)

In this configuration, the MPT-XP/XP-HQAM units must be installed on the OMT that is directly connected to the antenna. The two MPT-XP/XP-HQAM units must be connected to the Indoor Section as explained in MPT-XP/XP-HQAM connectivity for MPR-e (1+0 configuration).

The two MPT-XP/XP-HQAM units must **also** be interconnected through two terminated cables (XPIC and RPS cables) as shown in Figure 3.29.

Note: The extra length of the RPS and XPIC cables must be bound by using tie-wraps, either on the pole or on the other cables coming from the ODUs.

Figure 3.29 — MPT-XP/XP-HQAM connection through the MPT Extended Power Unit (co-channel XPIC)



3.1.6.5 — MPT-XP/XP-HQAM connectivity for MPR-e (1+1 HSB in Single NE mode with 7705 SAR)

In this configuration, the MPT-XP/XP-HQAM units can be installed on the same antenna or different antennas (SD). The two MPT-XP/XP-HQAM units must be connected to the 7705 SAR, and if they are on the same antenna, connected to each other using a coupler. See Figure 3.30 for an example.

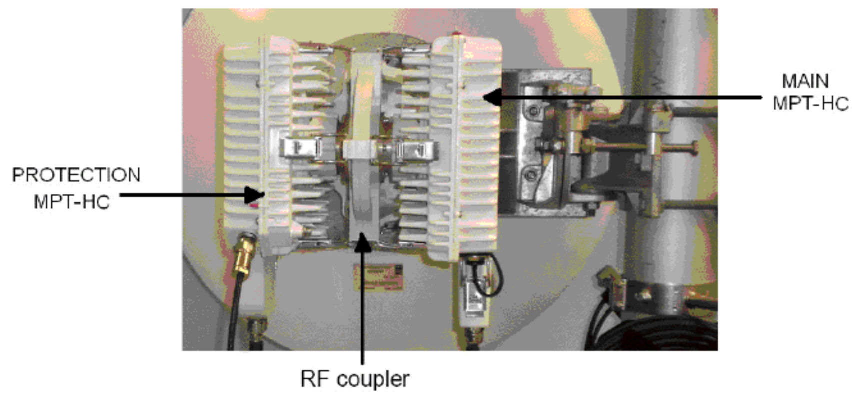
Two types of coupler are available for the MPT-XP/XP-HQAM:

- 3 dB/3 dB balanced coupler or 1 dB/10 dB unbalanced coupler

Note: The 1+1 configuration with MPT-XP/XP-HQAM can be implemented only with an interconnection cable between the two ODUs.

Note: An MPT-HC/HC-HQAM and an MPT-XP/XP-HQAM can form a 1+1 configuration with the use of a specific cord.

Figure 3.30 — 1+1 HSB for MPT-XP (11-38 GHz)

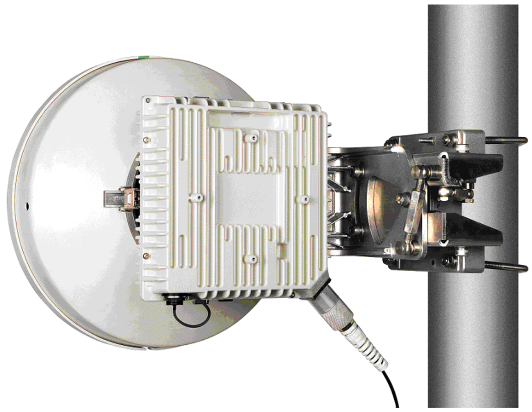


3.1.7 — MPR-E: MPT-MC

MPT-MC is similar to MPT-HC V2 from an architectural standpoint. The only differences are:

- MPT-MC cannot be connected in optical -> 100m length cable limitation.
- MPT-MC does not support the XPIC configuration.

Figure 3.31 — MPT-MC



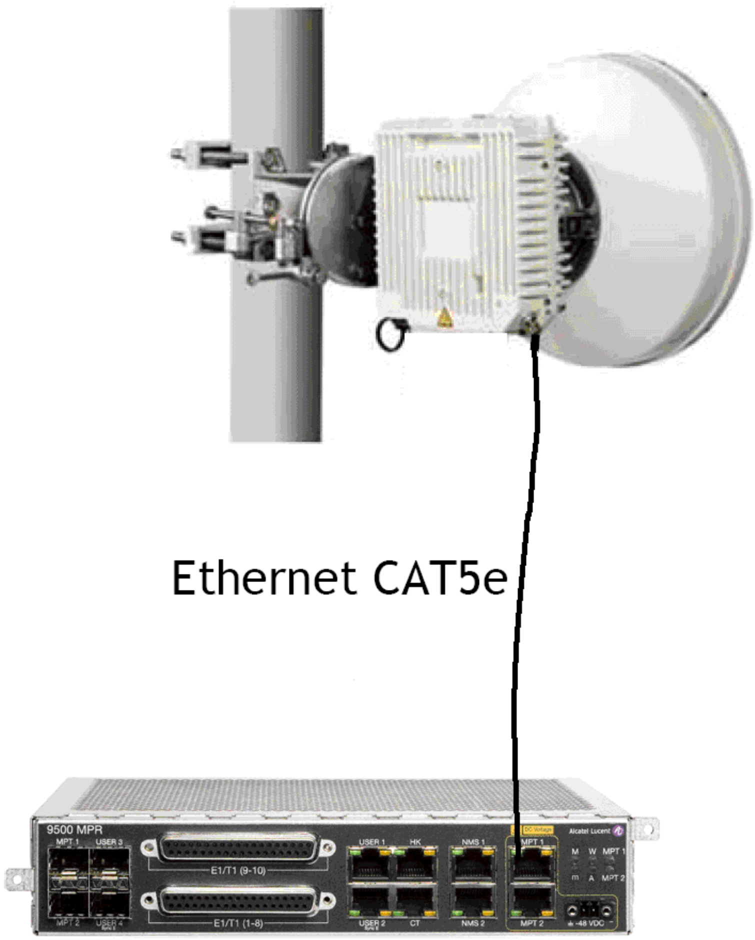
3.1.7.1 — MSS-1c to MPT-MC interconnection

One electrical Ethernet cable connects the MSS-1c to its MPT-MC.

The max cable length is 100 m.

The Ethernet electrical cable is provided with connectors to be mounted on site with the specific RJ45 tool (1AD160490001).

Figure 3.32 — MPT-MC connection



3.1.7.2 — MPT-MC connectivity for MPR-e

The MPT-MC is connected to a Power Injector through one electrical Ethernet cable.

The max cable length is 100 m.

In Figure 3.33 and Figure 3.34 are shown the connections implemented with the two available Power Injectors.

The Power Injector box is an indoor device to be installed in a 19-inch 21-inch rack.

The Power Injector card is a unit to be installed in a 7705 SAR.

Figure 3.33 — MPT-MC connection through the Power Injector Box

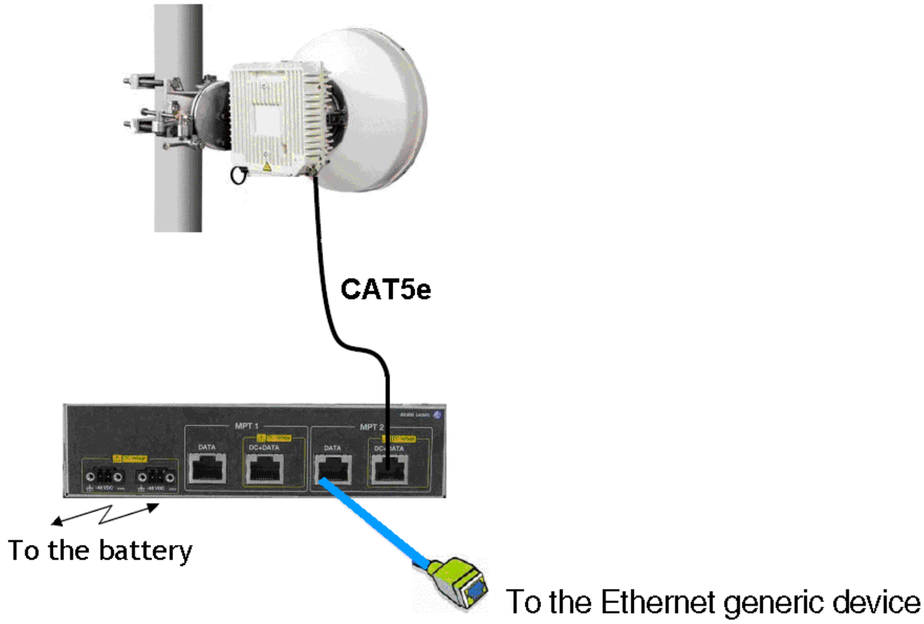
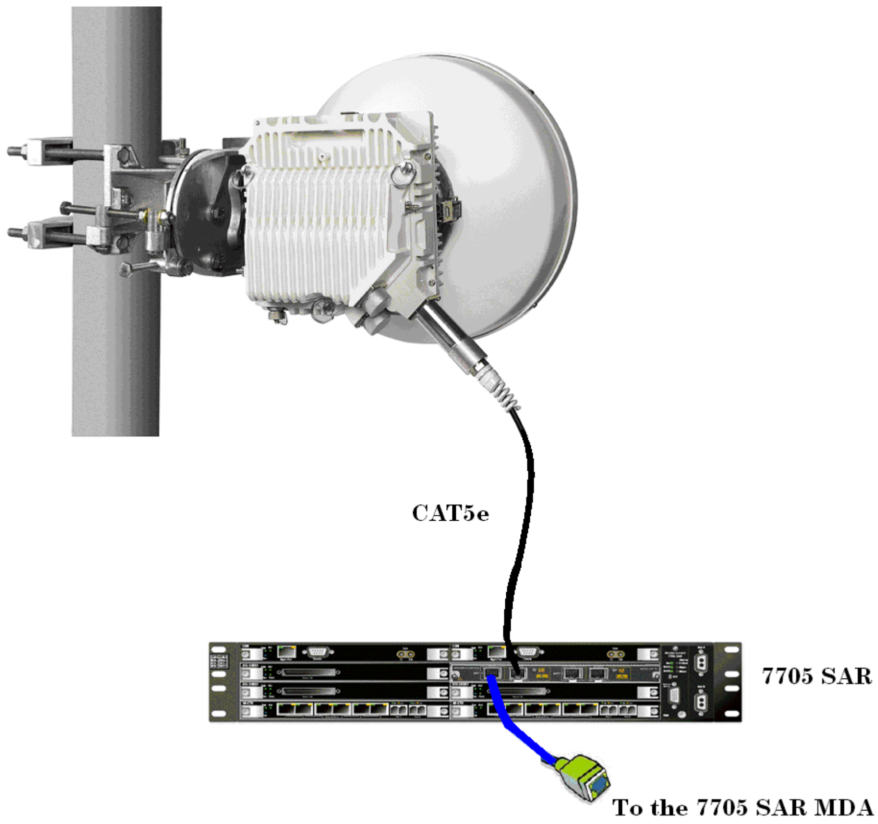


Figure 3.34 — MPT-MC connection through the Power Injector card installed in the 7705 SAR



3.1.8 — Antennas

Antennas for direct-mounting an MPT are available in diameters from 0.3 m to 1.8 m, depending on the frequency band.

A polarization rotator is included within the antenna collar, and direct-mounting equal or unequal loss couplers are available for single-antenna protected operation.

Antenna mounts are designed for use on industry-standard 114 mm OD pipe-mounts.

An MPT can also be used with standard antennas via a remote-mount kit and flexible waveguide.

Note: An MPR-e can also be mounted on most existing Melodie or AWY integrated antennas. Contact Alcatel-Lucent technical support for details.

3.2 — MPR-E: radio capacity, channeling and modulation

For MPR-E modem profile information, see the *Alcatel-Lucent 9500 MPR-E MSS-1/4/8 User Manual*.

3.3 — MPR-A: Radio capacity, channeling and modulation (MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC)

For MPR-A modem profile information, see the MPR-A MPT ODU/MPR-e Radio Specification document (PN 3EM23959AAAATQZZA).

3.4 — Standard features

Standard features include more radio and site scalability and flexibility for installation teams.

The following features are available with both MSS-1c and MPR-e:

- Limited need for factory presetting of channel frequency or bandwidth
- Supports cellular mobile networks, and microcellular network back and common carrier, private carrier and data networks, and utility haul applications
- 2G, 2.5G, 3G and LTE network compatible
- Outdoor Unit capacity- and modulation-independent
- Outdoor Unit can support either split-mount or full-outdoor architecture with the same hardware
- Adaptive packet transport improves performance for priority services
- Output power agility
- ATPC
- Adaptive Modulation
- Packet-based internal cross-connect
- Electrical/Optical Ethernet interfaces
- Software-based configuration
- Packet throughput booster for enhanced bandwidth
- AES-256 radio encryption

The following features are available with MSS-1c only:

- Flexible aggregate capacity sharing between E1/T1/DS1 and Ethernet
- TDM MEF8 encapsulation
- High Switching Capacity

The following features are available with MPR-e only:

- XPIC
- QoS on the Ethernet traffic

3.5 — Radio configurations

The following radio configurations are available with MSS-1c:

- 1+0 in split-mount
- 2x(1+0) repeater

The following radio configurations are available with MPR-e:

- 1+0 full outdoor
- 1+0 repeater (with MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC only)
- co-channel XPIC full outdoor (with MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC only) used to establish a 2 x (1+0) radio link.
- 1+1 HSB (with MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC only) when in Single NE mode with 7705 SAR configuration (with MPR-e 4.1.0)

3.5.1 — 1+0 in split-mount configuration for MSS-1c

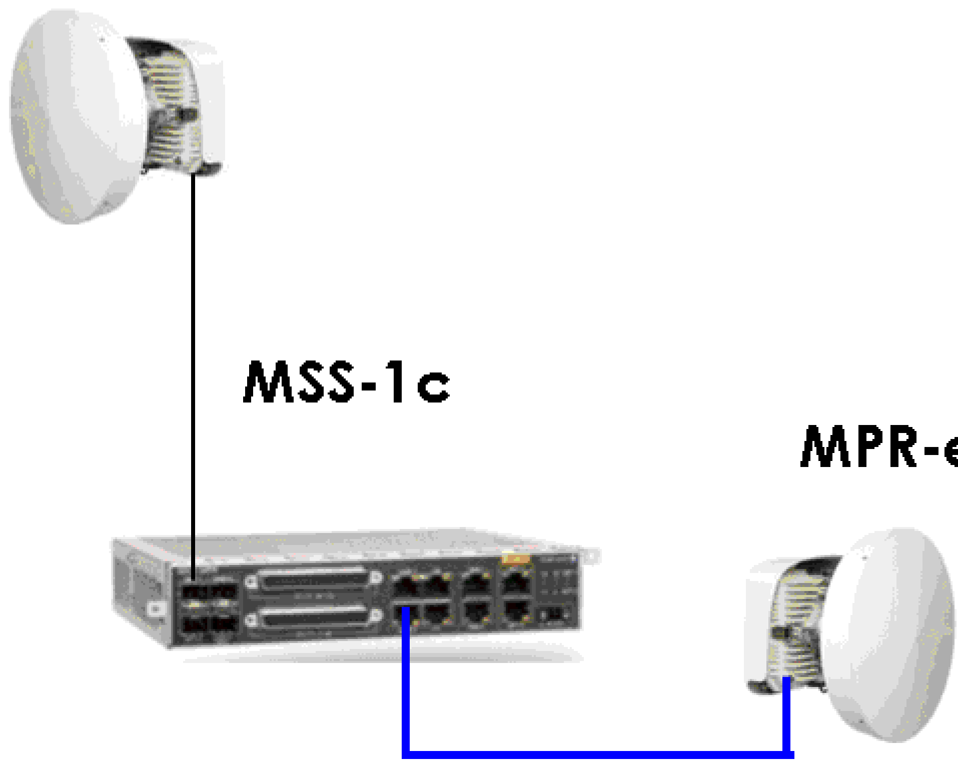
A 1+0 configuration is setup with one MSS-1c and one MPT. See Figure 3.35.

Figure 3.35 — 1+0 in split-mount configuration

3.5.2 — 2x(1+0) repeater configuration for MSS-1c

A 1+0 repeater configuration can be easily setup by adding a second radio direction to the MSS-1c. This second MPT will be connected to a User Port and will run as a MPR-e. It can be a MPT-MC or MPT-HC/HC V2/HC-HQAM/XP/XP-HQAM/9558HC. See Figure 3.36.

Figure 3.36 — 2x(1+0) repeater configuration



The MPR-e can be connected to the MSS-1c using electrical connectivity through the User Port 2 (SynchE capability) or using optical connectivity through an optical SFP plugged on User Port 4 or User Port 3 (not available on MSS-1c variant) (both SynchE capability).

A DC Power Injector box or MPT Extended Power Unit should be used to power the MPR-e (refer to the User Manual of MPR-e for detailed information).

The speed of the MSS-1c User Port, on which the MPR-e is connected, must be set to 1000 Mb/s with SynchE enabled.

3.6 — Typical system configurations for MSS-1c

TDM over Ethernet packet node - mapping of E1/T1/DS1 TDM on Ethernet (Figure 3.37).

Note: In this case a connected MPT is needed in order to configure the cross-connections.

TDM and Ethernet terminal packet transport E1/T1/DS1 TDM and 1 radio direction (Figure 3.38).

TDM and Ethernet terminal packet transport E1/T1/DS1 TDM and 2 radio directions - 2x(1+0) repeater (Figure 3.39).

Figure 3.37 — TDM over Ethernet packet node - mapping of E1/T1/DS1 TDM on Ethernet

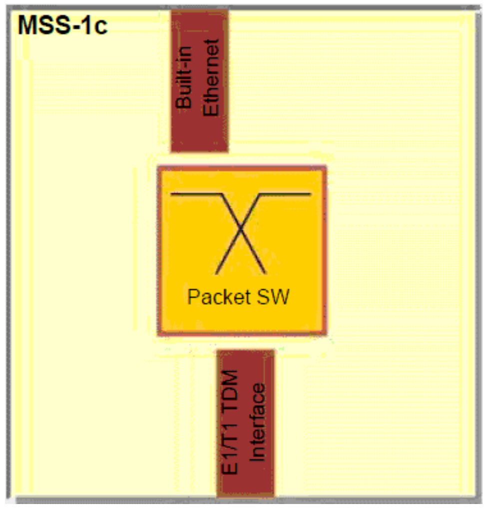


Figure 3.38 — TDM and Ethernet terminal packet transport E1/T1/DS1 TDM and 1 radio direction

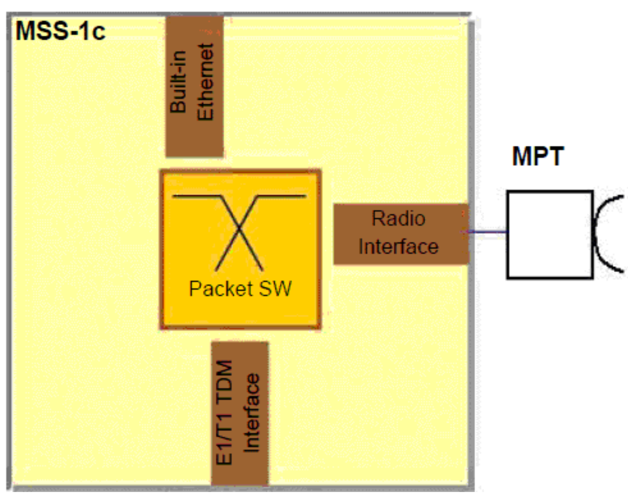
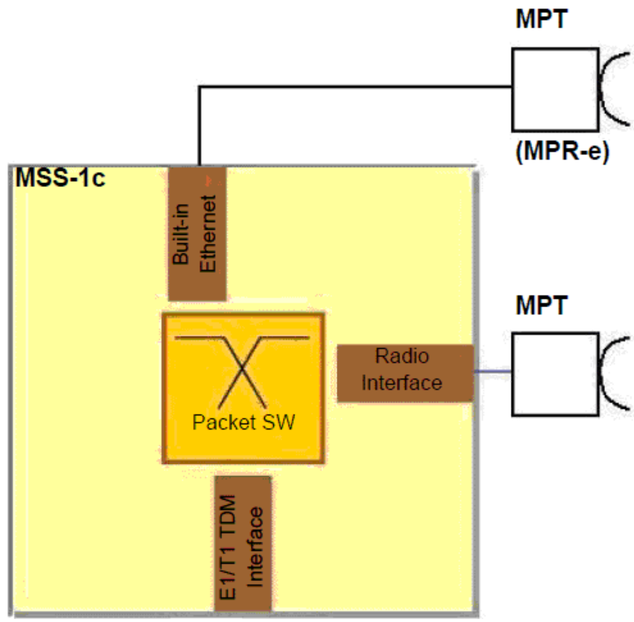


Figure 3.39 — TDM and Ethernet terminal packet transport E1/T1/DS1 TDM and 2 radio directions -2x(1+0) repeater



3.7 — Environmental and electrical characteristics

3.7.1 — General characteristics (MSS-1c)

Table 3.3 — General characteristics (MSS-1c)

Power Injector	
Input Voltage range	-38.4 to -57.6 Vdc
Standards Compliance (Power Injector)	
EMC	EN 301 489-1, EN 301 489-4, EN 55022 Class B
Stationary use	ETS 300 019 1-3, Class 3.2
Storage	ETS 300 019 2-1, Class 1.2
Transportation	ETS 300 019 2-2, Class 2.3
Safety	EN 60950
Environmental	
Operating Temperature	-20° to +50° C (without FAN unit for MSS-1c) -20° to +55° C (without FAN unit for MSS-1c 16PDH) -20° to +65° C (with FAN unit)
Cold start-up	-40° C
Humidity	0 to 95%, non condensing
Management	
Protocol	SNMP, OSPF
Interface, electrical	Ethernet 10/100/1000 Base-T
Interface, electrical physical	RJ-45
Routing Protocols supported	Static routing, OSPF
Network Management	Alcatel-Lucent 1350 OMS Alcatel-Lucent 1352 Compact Alcatel-Lucent 5620 SAM
Power consumption for MSS-1c	
Typical	13 W
Guaranteed	18 W
Power consumption for MSS-1c 16PDH	
Typical	15 W
Guaranteed	20 W

3.7.2 — General characteristics (MPT-HC/HC-HQAM/MC/XP/XP-HQAM/9558HC)

Table 3.4 — General characteristics (MPT-HC/HC-HQAM/MC/XP/XP-HQAM/9558HC)

General with MPT-HC V2/HC-HQAM/9558HC	
Operating Frequency Range	5.8 - 38 GHz
Max. Ethernet throughput	MPR-E: 339.834 Mb/s MPR-A: 314.46 Mb/s
Bandwidth	MPR-E: up to 56 MHz MPR-A: up to 50 MHz
Modulation Options in FCM	QPSK, 8PSK, 16 QAM, 32 QAM, 64 QAM, 128 QAM, 256 QAM
Adaptive Modulation	QPSK, 8PSK, 16 QAM, 32 QAM, 64 QAM, 128 QAM, 256 QAM
General with MPT-XP/XP-HQAM	
Operating Frequency Range	6 - 8 GHz
Max. Ethernet throughput	349 Mb/s
Bandwidth	MPR-E: up to 56 MHz MPR-A: up to 50 MHz
Modulation Options in FCM	QPSK, 8PSK, 16 QAM, 32 QAM, 64 QAM, 128 QAM, 256 QAM
Adaptive Modulation	QPSK, 8PSK, 16 QAM, 32 QAM, 64 QAM, 128 QAM, 256 QAM
General with MPT-MC (MPR-E)	
Operating Frequency Range	6 - 38 GHz
Max. Ethernet throughput	349 Mbps
Bandwidth	up to 56 MHz
Modulation Options in FCM	QPSK, 8PSK, 16 QAM, 32 QAM, 64 QAM, 128 QAM, 256 QAM
Adaptive Modulation	QPSK, 8PSK, 16 QAM, 32 QAM, 64 QAM, 128 QAM, 256 QAM
Radio Path Protection Options	
Non Protected, 1+0	
Standards Compliance	
EMC	EN 301 489-1, EN 301 489-4, EN 55022 Class B
Stationary use	ETS 300 019, Class 4.1
Storage	ETS 300 019, Class 1.2

Table 3.4 — General characteristics (MPT-HC/HC-HQAM/MC/XP/XP-HQAM/9558HC)

Transportation	ETS 300 019, Class 2.3
Safety	IEC 60950-1/EN 60950-1
Radio Frequency	EN 302 217 Classes 2, 4 & E5
Water Ingress	IEC 60529 (IPX6)

Table 3.5 — Environmental characteristics (MPT-HC/HC-HQAM/MC/XP/XP-HQAM/9558HC)

Environmental	
Operating Temperature (Guaranteed)	-33° to +55°C
Startup temperature from low temperature	-40°C
Humidity (Guaranteed)	0 to 100%
MPR-e Management	
TMN In-band	Extension of the DCN over the Ethernet traffic interfaces

3.7.3 — MPR-E: MPT-HC/HC-HQAM/XP/XP-HQAM characteristics

3.7.3.1 — 5.8 to 11 GHz

Table 3.6 — MPT-HC/HC-HQAM characteristics, 5.8 to 11 GHz (MPR-E)

	5.8 GHz	**L6 GHz**	**U6 GHz**	**7 GHz**	**8 GHz**	**10.5 GHz**	**11 GHz**
System							
Frequency Range, GHz	5.725.5-5.849.5	5.930 - 6.420	6.425 - 7.11	7.125 - 7.9	7.725 - 8.5	10.000-10.684	10.7 - 11.7

Table 3.6 — MPT-HC/HC-HQAM characteristics, 5.8 to 11 GHz (MPR-E)

	5.8 GHz	**L6 GHz**	**U6 GHz**	**7 GHz**	**8 GHz**	**10.5 GHz**	**11 GHz**
T-R Spacings supported, MHz	64	252.04	340	154 160 161 168 196 245	119; 126; 151.614 208; 213.5; 266; 294.44 310 305.56 311.32	91 350	490 530
Antenna Interface							
Waveguide Type	WR137	WR137	WR137	WR112	WR112	WR75	WR75
Input voltage range	-28 Vdc to -57.6 Vdc +28 Vdc to +57.6 Vdc						
Typical power consumption (MPT-HC V2)	5.8 to 10.5, 38 GHz: 38.5 W 11 to 25 GHz: 37 W						
Guaranteed power consumption (MPT-HC V2)	40 W						
MPR-e only configurations							
Typical power consumption (MPT-HC V2 with RPS module)	5.8 to 10.5, 38 GHz: 38.5 W 11 to 25 GHz: 37 W						
Guaranteed power consumption (MPT-HC V2 with RPS module)	40 W						
Typical power consumption (MPT-HC V2 with XPIC-RPS module)	5.8 to 10.5, 38 GHz: 45.5 W 11 to 25 GHz: 44 W						
Guaranteed power consumption (MPT-HC V2 with XPIC-RPS module)	48 W						

3.7.3.2 — 13 to 38 GHz

Table 3.7 — MPT-HC/HC-HQAM characteristics, 13 to 38 GHz (MPR-E)

	13 GHz	15 GHz	18 GHz	23 GHz	25 GHz	38 GHz
System						
Frequency Range, GHz	12.75 - 13.25	14.4 - 15.35	17.7 - 19.7	21.2 - 23.632	24.52 - 26.483	37.0 - 39.46
T-R Spacings supported, MHz	266	308; 315; 322; 420; 490; 640; 644; 728	1008; 1010; 1560; 340	1008; 1050; 1200; 1232	1008	1260
Antenna Interface						
Waveguide Type	WR62	WR62	WR42	WR42	WR42	WR28
Input voltage range	-28 Vdc to -57.6 Vdc +28 Vdc to +57.6 Vdc					
Typical power consumption (MPT-HC V2)	5.8 to 10.5, 38 GHz: 38.5 W 11 to 25 GHz: 37 W					
Guaranteed power consumption (MPT-HC V2)	40 W					
MPR-e only configurations						
Typical power consumption (MPT-HC V2 with RPS module)	5.8 to 10.5, 38 GHz: 38.5 W 11 to 25 GHz: 37 W					
Guaranteed power consumption (MPT-HC V2 with RPS module)	40 W					
Typical power consumption (MPT-HC V2 with XPIC-RPS module)	5.8 to 10.5, 38 GHz: 45.5 W 11 to 25 GHz: 44 W					
Guaranteed power consumption (MPT-HC V2 with XPIC-RPS module)	48 W					

3.7.3.3 — MPT-XP/XP-HQAM characteristics

Table 3.8 — MPT-XP/XP-HQAM characteristics, 6 to 8 GHz (MPR-E)

	L6 GHz	U6 GHz	7 GHz	8 GHz
System				
Frequency Range, GHz	5.930 - 6.420	6.425 - 7.11	7.125 - 7.9	7.725 - 8.5
T-R Spacings supported, MHz	252.04	340	154 160 161 168 196 245	119; 126; 151.614 208; 213.5; 266; 294.44 305.56 310 311.32
Antenna Interface				
Waveguide Type	WR137	WR137	WR112	WR112
Input voltage range	-38 Vdc to -57.6 Vdc +38 Vdc to +57.6 Vdc			
Typical power consumption (MPT-XP)	73 W			
Guaranteed power consumption (MPT-XP)	75 W			
MPR-e only configurations				
Typical power consumption (MPT-XP with RPS module)	73 W			
Guaranteed power consumption (MPT-XP with RPS module)	75 W			
Typical power consumption (MPT-XP with XPIC-RPS module)	81 W			
Guaranteed power consumption (MPT-XP with XPIC-RPS module)	83 W			

3.7.4 — MPR-E: MPT-MC characteristics

3.7.4.1 — 6 to 13 GHz

Table 3.9 — MPT-MC characteristics, 6 to 13 GHz (MPR-E)

	L6 GHz	U6 GHz	7 GHz	8 GHz	11 GHz	13 GHz
System						
Frequency Range, GHz	5.930 - 6.420	6.420- 7.115	7.125 - 7.9	7.725 - 8.5	10.7 - 11.7	12.75 - 13.25
T-R Spacings supported, MHz	252.04	340	154; 160; 161; 168; 196; 245	119; 126; 151.614; 208; 213,5; 266; 294.44; 305.56; 311.32	490; 530	266
Antenna Interface						
Waveguide Type	WR137	WR137	WR112	WR112	WR75	WR62
Input voltage range	-28 Vdc to -57.6 Vdc +28 Vdc to +57.6 Vdc					
Typical power consumption	6 to 10.5, 38 GHz: 37.5 W 11 to 25 GHz: 36 W					
Guaranteed power consumption	38 W					

3.7.4.2 — 15 to 38 GHz

Table 3.10 — MPT-MC characteristics, 15 to 38 GHz (MPR-E)

	15 GHz	18 GHz	23 GHz	25 GHz	38 GHz
System					
Frequency Range, GHz	14.4 - 15.35	17.7 - 19.7	21.2 - 23.632	24.52 - 26.483	37.0 - 39.46

Table 3.10 — MPT-MC characteristics, 15 to 38 GHz (MPR-E)

	15 GHz	18 GHz	23 GHz	25 GHz	38 GHz
T-R Spacings supported, MHz	420; 475; 490; 640; 644; 728	1008; 1010; 1560	1008; 1050; 1200; 1232	1008	1260
Antenna Interface					
Waveguide Type	WR62	WR42	WR42	WR42	WR28
Input voltage range	-28 Vdc to -57.6 Vdc +28 Vdc to +57.6 Vdc				
Typical power consumption	6 to 10.5, 38 GHz: 37.5 W 11 to 25 GHz: 36 W				
Guaranteed power consumption	38 W				

3.7.5 — MPR-A: MPT-HC/HC-HQAM/9558HC characteristics

3.7.5.1 — 5.8 to 11 GHz

Table 3.11 — MPT-HC/HC-HQAM/9558HC general characteristics (MPR-A)

	5.8 GHz	L6 GHz	U6 GHz	7 GHz	8 GHz	11 GHz
System						
Frequency Range, GHz	5.725 - 5.850	5.930 - 6.420	6.420 - 7.115	7.125 - 7.9	7.725 - 8.5	10.7 - 11.7
T-R Spacings supported MHz	64	252.04	160 340	150 175	300	490/500
Antenna Interface						
Waveguide Type	WR137	WR137	WR137	WR112	WR112	WR75
Input voltage range	-28 Vdc to -57.6 Vdc +28 Vdc to +57.6 Vdc					

Table 3.11 — MPT-HC/HC-HQAM/9558HC general characteristics (MPR-A)

Typical power consumption (MPT-HC V2/9558HC)	5.8 to 10.5, 38 GHz: 38.5 W 11 to 25 GHz: 37 W
Guaranteed power consumption (MPT-HC V2/ 9558HC)	40 W
MPR-e only configurations	
Typical power consumption (MPT-HC V2 with RPS module)	5.8 to 10.5, 38 GHz: 38.5 W 11 to 25 GHz: 37 W
Guaranteed power consumption (MPT-HC V2 with RPS module)	40 W
Typical power consumption (MPT-HC V2 with XPIC-RPS module)	5.8 to 10.5, 38 GHz: 45.5 W 11 to 25 GHz: 44 W
Guaranteed power consumption (MPT-HC V2 with XPIC-RPS module)	48 W

3.7.5.2 — 15 to 38 GHz

Table 3.12 — MPT-HC/HC-HQAM/9558HC characteristics, 15 to 38 GHz (MPR-A)

	15 GHz	**18 GHz**	**23 GHz**	**38 GHz**
System				
Frequency Range, GHz	14.5 - 15.144	17.7 - 19.7	21.2 - 23.6	38.6 - 40.0
T-R Spacings supported MHz	475	1560	1200	700
Antenna Interface				
Waveguide Type	WR62	WR42	WR42	WR28
Input voltage range	-28 Vdc to -57.6 Vdc +28 Vdc to +57.6 Vdc			
Typical power consumption (MPT-HC V2)	5.8 to 10.5, 38 GHz: 38.5 W 11 to 25 GHz: 37 W			
Guaranteed power consumption (MP--HC V2)	40 W			
MPR-e only configurations				

Table 3.12 — MPT-HC/HC-HQAM/9558HC characteristics, 15 to 38 GHz (MPR-A)

Typical power consumption (MPT-HC V2 with RPS module)	5.8 to 10.5, 38 GHz: 38.5 W 11 to 25 GHz: 37 W
Guaranteed power consumption (MP--HC V2 with RPS module)	40 W
Typical power consumption (MPT-HC V2 with XPIC-RPS module)	5.8 to 10.5, 38 GHz: 45.5 W 11 to 25 GHz: 44 W
Guaranteed power consumption (MP--HC V2 with XPIC-RPS module)	48 W

3.7.6 — MPR-A: MPT-XP/XP-HQAM characteristics

3.7.6.1 — 6 to 8 GHz

Table 3.13 — MPT-XP/XP-HQAM characteristics, 6 to 8 GHz (MPR-A)

	L6 GHz	U6 GHz	7 GHz	8 GHz
System				
Frequency Range, GHz	5.930 - 6420	6.420 - 7.115	7.125 - 7.9	7.725 - 8.5
T-R Spacings supported, MHz	252.04	160, 340	150, 175	300
Antenna Interface				
Waveguide Type	WR137	WR137	WR112	WR112
Input voltage range	-38 Vdc to -57.6 Vdc +38 Vdc to +57.6 Vdc			
Typical power consumption (MPT-XP)	73 W			
Guaranteed power consumption (MPT-XP)	75 W			
MPR-e only configurations				
Typical power consumption (MPT-XP with RPS module)	73 W			

Table 3.13 — MPT-XP/XP-HQAM characteristics, 6 to 8 GHz (MPR-A)

Guaranteed power consumption (MPT-XP with RPS module)	75 W
Typical power consumption (MPT-XP with XPIC-RPS module)	81 W
Guaranteed power consumption (MPT-XP with XPIC-RPS module)	83 W

3.7.6.2 — MPT power system: power requirements

For MPT-XP power system power requirements with the MPT Extended Power Unit, refer to Table 3.14.

For MPT-HC power system power requirements with the MPT Power Unit, refer to Table 3.15.

Table 3.14 — MPT-XP power system: power requirements

	Cable type	Cable Length							
	Ethernet UTP 5E 1AC016760006	0 m		≤ 20 m		20 - 40m		—	
	Coaxial Cable 1AC001100022	0 m		≤ 56 m		56 - 168 m		168 - 280 m	
	Coaxial Cable 1AC041350001	0 m		≤ 25 m		25 - 75 m		75 - 125 m	
Number of MPT ODU	**Input Voltage for Extended Power Unit**	**+24 (Vdc)**	**-48 (Vdc)**	**+24 (Vdc)**	**-48 (Vdc)**	**+24 (Vdc)**	**-48 (Vdc)**	**+24 (Vdc)**	**-48 (Vdc)**
1 MPT	MPT-XP + XPIC (MPR-e only)	81.0W	81.0W	81.0W	81.0W	81.0W	81.0W	81.0W	81.0W
	Cable Losses	0.0W	0.0W	2.0W	2.0W	6.6W	6.6W	12.7W	12.7W
	Extended Power Unit	11.0W	15.4W	11.3W	15.8W	12.0W	16.7W	12.8W	17.8W
	Total power consumption	92.0W	96.4W	94.3W	98.8W	99.6W	104.3W	106.5W	111.5W

Table 3.14 — MPT-XP power system: power requirements

	Cable type	Cable Length							
	Ethernet UTP 5E 1AC016760006	**0 m**		**≤ 20 m**		**20 - 40m**		**—**	
	Coaxial Cable 1AC001100022	**0 m**		**≤ 56 m**		**56 - 168 m**		**168 - 280 m**	
	Coaxial Cable 1AC041350001	**0 m**		**≤ 25 m**		**25 - 75 m**		**75 - 125 m**	
Number of MPT ODU	**Input Voltage for Extended Power Unit**	**+24 (Vdc)**	**-48 (Vdc)**	**+24 (Vdc)**	**-48 (Vdc)**	**+24 (Vdc)**	**-48 (Vdc)**	**+24 (Vdc)**	**-48 (Vdc)**
	MPT-XP-HQAM + XPIC (MPR-e only)	74.0W	74.0W	74.0W	74.0W	74.0W	74.0W	74.0W	74.0W
	Cable Losses	0.0W	0.0W	2.0W	2.0W	6.6W	6.6W	12.7W	12.7W
	Extended Power Unit	11.0W	15.4W	11.3W	15.8W	12.0W	16.7W	12.8W	17.8W
	Total power consumption	85.0W	89.4W	87.3W	91.8W	92.6W	97.3W	99.5W	104.5W
2 MPT	MPT-XP + XPIC (MPR-e only)	162W	162W	162W	162W	162W	162W	162W	162W
	Cable Losses	0.0W	0.0W	4.0W	4.0W	13.2W	13.2W	25.4W	25.4W
	Extended Power Unit	22.0W	30.8W	22.6W	31.6W	24W	33.4W	25.6W	35.6W
	Total power consumption	184.0W	192.8W	188.6W	197.6W	199.2W	208.6W	213.0W	223.0W
	MPT-XP-HQAM + XPIC (MPR-e only)	148W	148W	148W	148W	148W	148W	148W	148W
	Cable Losses	0.0W	0.0W	4.0W	4.0W	13.2W	13.2W	25.4W	25.4W
	Extended Power Unit	22.0W	30.8W	22.6W	31.6W	24W	33.4W	25.6W	35.6W
	Total power consumption	170.0W	178.8W	174.6W	183.6W	185.2W	194.6W	199.0W	209.0W

Table 3.15 — MPT-HC power system: power requirements

	Cable type P/N	Coaxial Cable 1AC001100022				Coaxial Cable 1AC041350001	
	Cable Length	**0 - 100 m**	**100 - 200 m**	**200 - 300 m**	**300 - 440 m**	**0 - 100 m**	**100 - 190 m**
Number of MPT ODU	**Input Voltage for Power Unit**	**-38.4 (Vdc)**	**38.4 (Vdc)**	**38.4 (Vdc)**	**38.4 (Vdc)**	**38.4 (Vdc)**	**38.4 (Vdc)**
1 MPT	MPT-HC + XPIC (MPR-e only)	47.0 W	47.0 W	47.0 W	47.0 W	47.0 W	47.0 W
	Cable Losses	1.9 W	4.3 W	7.2 W	13.1 W	4.7 W	11.5 W
	Power Unit	2.0 W	2.0 W	2.0 W	2.0 W	2.0 W	2.0 W
	Total power consumption	50.9 W	53.3 W	56.2 W	62.1 W	53.7 W	60.5 W
	MPT-HC-HQAM + XPIC (MPR-e only)	40.5 W	40.5 W	40.5 W	40.5 W	40.5 W	40.5 W
	Cable Losses	1.9 W	4.3 W	7.2 W	13.1 W	4.7 W	11.5 W
	Power Unit	2.0 W	2.0 W	2.0 W	2.0 W	2.0 W	2.0 W
	Total power consumption	44.4 W	46.8 W	49.7 W	55.6 W	47.2 W	54.0 W
2 MPT	MPT-HC + XPIC (MPR-e only)	94.0 W	94.0 W	94.0 W	94.0 W	94.0 W	94.0 W
	Cable Losses	3.8 W	8.6 W	14.4 W	26.2 W	9.4 W	23.0 W
	Power Unit	4.0 W	4.0 W	4.0 W	4.0 W	4.0 W	4.0 W
	Total power consumption	101.8 W	106.6 W	112.4 W	124.2 W	107.4 W	121.0 W
	MPT-HC-HQAM + XPIC (MPR-e only)	81.0 W	81.0 W	81.0 W	81.0 W	81.0 W	81.0 W
	Cable Losses	3.8 W	8.6 W	14.4 W	26.2 W	9.4 W	23.0 W
	Power Unit	4.0 W	4.0 W	4.0 W	4.0 W	4.0 W	4.0 W
	Total power consumption	88.8 W	93.6 W	99.4 W	111.2 W	94.4 W	108.0 W

Table 3.15 — MPT-HC power system: power requirements

	Cable type P/N	**Coaxial Cable 1AC001100022**				**Coaxial Cable 1AC041350001**	
	Cable Length	**0 - 100 m**	**100 - 200 m**	**200 - 300 m**	**300 - 440 m**	**0 - 100 m**	**100 - 190 m**
Number of MPT ODU	**Input Voltage for Power Unit**	**-38.4 (Vdc)**	**38.4 (Vdc)**	**38.4 (Vdc)**	**38.4 (Vdc)**	**38.4 (Vdc)**	**38.4 (Vdc)**
3 MPT	MPT-HC + XPIC (MPR-e only)	141.0 W	141.0 W	141.0 W	141.0 W	141.0 W	141.0 W
	Cable Losses	5.7 W	12.9 W	21.6 W	39.3 W	14.1 W	34.5 W
	Power Unit	6.0 W	6.0 W	6.0 W	6.0 W	6.0 W	6.0 W
	Total power consumption	152.7 W	159.9 W	168.6 W	186.3 W	161.1 W	181.5 W
	MPT-HC-HQAM + XPIC (MPR-e only)	121.5 W	121.5 W	121.5 W	121.5 W	121.5 W	121.5 W
	Cable Losses	5.7 W	12.9 W	21.6 W	39.3 W	14.1 W	34.5 W
	Power Unit	6.0 W	6.0 W	6.0 W	6.0 W	6.0 W	6.0 W
	Total power consumption	133.2 W	140.4 W	149.1 W	166.8 W	141.6 W	162.0 W
4 MPT	MPT-HC + XPIC (MPR-e only)	188.0 W	188.0 W	188.0 W	188.0 W	188.0 W	188.0 W
	Cable Losses	7.6 W	17.2 W	28.8 W	52.4 W	18.8 W	46.0 W
	Power Unit	8.0 W	8.0 W	8.0 W	8.0 W	8.0 W	8.0 W
	Total power consumption	203.6 W	213.2 W	224.8 W	248.4 W	214.8 W	242.0 W
	MPT-HC-HQAM + XPIC (MPR-e only)	162.0 W	162.0 W	162.0 W	162.0 W	162.0 W	162.0 W
	Cable Losses	7.6 W	17.2 W	28.8 W	52.4 W	18.8 W	46.0 W
	Power Unit	8.0 W	8.0 W	8.0 W	8.0 W	8.0 W	8.0 W
	Total power consumption	177.6 W	187.2 W	198.8 W	222.4 W	188.8 W	216.0 W

3.7.7 — Radio performances

The radio performance specifications are provided in the “Technical Description” document.

3.7.8 — General characteristics (Power Injector)

Table 3.16 — Power injector general characteristics

Power Injector	
Input Voltage range	-38.4 to -57.6 Vdc
Standards Compliance (Power Injector)	
EMC	EN 301 489-1, EN 301 489-4, EN 55022 Class B
Stationary use	ETS 300 019 1-3, Class 3.2
Storage	ETS 300 019 2-1, Class 1.2
Transportation	ETS 300 019 2-2, Class 2.3
Safety	EN 60950
Environmental	
Operating Temperature (Guaranteed)	-40° to +65°C
Humidity (Guaranteed)	0 to 95%, non-condensing

3.7.9 — General characteristics (MPT Power Unit)

Table 3.17 — MPT Power Unit general characteristics

Standards Compliance (MPT Power Unit)	
EMC	EN 301 489-1, GR-1089 Class A
Storage	ETS 300 019, Class 1.2, GR-3108
Transportation	ETS 300 019 1-2, Class 2.3, GR-3108-CORE
Safety	EN 60950, UL-60950
Environmental	

Table 3.17 — MPT Power Unit general characteristics

Operating Temperature (Guaranteed)	-40° to +65° C
Start up temperature from low temperature	-40° C
Humidity (Guaranteed)	0 to 95%

3.7.10 — MPR-E: Maximum allowed cable lengths for MPT Power Unit

Table 3.18 — Maximum allowed cable lengths for MPT Power Unit (MPR-E)

Cable type		**Coaxial cable 1AC001100022 Power only, Data optical cable**	**Coaxial cable 1AC041350001 Power only, data optical cable**
Configuration	**Required power**	**Maximum length**	**Maximum length**
MPT-HC	40 W	510 m	230 m
MPT-HC with XPIC[1]	48 W	435 m	200 m
MPT-HC-HQAM[1]	39.5 W	550 m	255 m
MTP-HC-HQAM with XPIC[1]	40.5 W	535 m	245 m
Constraint 1	Maximum current in the Ethernet transformer < 1.8 A Maximum current limit for the Power Unit: 1.8 A		
Constraint 2	Minimum MPT-HC/HC-HQAM PSU input voltage > 28 V		
Constraint 3	Data traffic only with optical cable		

1. Equipped with SFP

3.7.11 — MPR-A: Maximum allowed cable lengths for MPT Power Unit

Table 3.19 — Maximum allowed cable lengths for MPT Power Unit (MPR-A)

Cable type		**Coaxial cable 1AB350440001** **Power only, data on optical cable**
Configuration	**Required power**	**Maximum length**
MPT-HC	40 W	300 m
MPT-HC with XPIC[1]	48 W	300 m
MPT-HC-HQAM[1]	39.5 W	300 m
MPT-HC-HQAM with XPIC[1]	40.5 W	300 m
Constraint 1	Maximum current in the Ethernet transformer < 1.8 A Maximum current limit for the Power Unit: 1.8 A	
Constraint 2	Minimum MPT-HC/HC-HQAM PSU input voltage > -28 V	
Constraint 3	Data traffic only with optical cable	

1. Equipped with SFP

3.7.12 — General characteristics (MPT Extended Power Unit)

Table 3.20 — MPT Extended Power Unit general characteristics

Standards Compliance (Power Extractor)	
EMC	EN 301 489-1, GR-1089 Class A
Storage	ETS 300 019, Class 1.2, GR-3108
Transportation	ETS 300 019 1-2, Class 2.3, GR-3108-CORE
Safety	EN 60950, UL-60950
Environmental	
Operating Temperature (Guaranteed)	-40° to +65° C
Start up temperature from low temperature	-40° C
Humidity (Guaranteed)	0 to 95%

3.7.13 — MPR-E: Maximum allowed cable length for MPT Extended Power Unit

Table 3.21 provides the maximum cable lengths for use with an MPT Extended Power Unit. Use of an external lightning arrestor will reduce the cable length by 10 m.

Table 3.21 — Maximum allowed cable lengths for MPT Extended Power Unit (MPR-E)

Cable type		Ethernet UTP 5E with outer screen and braid. Power and Data on Ethernet cable	Ethernet UTP 5E with outer screen and braid. Power only, Data optical cable	Coaxial cable 1AC0011000 22 Power only, Data optical cable	Coaxial cable 1AC0413500 01 Power only, Data optical cable
Configuration	**Power requirement**	**Maximum length**	**Maximum length**	**Maximum length**	**Maximum length**
MPT-HC [1]	42.0 W	100 m	400 m	1100 m	500 m
MPT-HC with XPIC [1]	48.0 W	100 m	350 m	1000 m	440 m
MPT-XP [1]	77.0 W	40 m	155 m	480 m	280 m
MPT-XP with XPIC [1]	83.0 W	40 m	115 m	360 m	200 m
MPT-HC-HQAM [1]	39.5 W	100 m	440 m	1700 m	790 m
MPT-HC-HQAM with XPIC [1]	40.5 W	100 m	430 m	1600 m	770 m
MPT-XP-HQAM [1]	75.0 W	40 m	170 m	650 m	300 m
MPT-XP-HQAM with XPIC [1]	76.0 W	40 m	165 m	620 m	290 m

1.Equipped with SFP

3.7.14 — MPR-A: Maximum allowed cable length for MPT Extended Power Unit

Table 3.22 provides the maximum cable lengths for use with an MPT Extended Power Unit. Use of an external lightning arrestor will reduce the cable length by 10 m.

Table 3.22 — Maximum allowed cable lengths for MPT Extended Power Unit (MPR-A)

Cable type		Cat5E, 1AC016760006: Power and data on Ethernet cable	Cat5E, 1AC016760006: Power only, data on optical cable	Coaxial cable 1AB350440001: Power only, data on optical cable
Configuration	**Power Requirement**	**Maximum length**	**Maximum length**	**Maximum length**
MPT-MC/HC [1]	42 W	100 m	100 m	300 m
MPT-HC with XPIC [1]	48 W	100 m	100 m	300 m
MPT-HC-HQAM [1]	39.5 W	100 m	100 m	300 m
MPT-HC-HQAM with XPIC [1]	40.5 W	100 m	100 m	300 m
MPT-XP [1]	77 W	40 m	100 m	300 m
MPT-XP with XPIC [1]	83 W	40 m	100 m	300 m
MPT-XP-HQAM [1]	75 W	40 m	100 m	300 m
MPT-XP-HQAM with XPIC [1]	76 W	40 m	100 m	300 m
Constraint 1		Maximum current in Ethernet transformer < 1.8 A Maximum current limit for Power Unit: 1.8 A		Maximum current limit for Power Unit: 1.8 A
Constraint 2		Minimum MPT-HC/HC-HQAM PSU input voltage > -28 V, Minimum MPT-XP/XP-HQAM PSU input voltage > -41 V		
Constraint 3		Data traffic only with Ethernet cable	Data traffic only with optical cable	Data traffic only with optical cable

1.Equipped with SFP

3.8 — MPR-E parts lists

3.8.1 — MSS-1c item codes

Table 3.23 provides item codes for MSS-1c in MPR-E.

Table 3.23 — MPR-E MSS-1c item codes

Name	Code	Remarks
MSS-1c	3DB18613AAXX	Up to 10E1s supported
MSS-1c 16PDH	3DB18613BAXX	Up to 16E1/T1s supported
Fan unit	3DB77002AAXX	To be installed if the ambient temperature is higher than 55°C (for MSS-1c 16PDH) and 50°C (for MSS-1c)
MPT Power Unit	3CC50173AAXX	To be installed in a 19-inch/21-inch rack to provide the office power to the MPT-HC V2/MPT-XP. Includes rack mounting bracket.
MPT Extended Power Unit	3CC50174AAXX	To be installed in a 19-inch/21-inch rack to provide the PFoE or office power to the MPT-HC V2/ MPT-MC/MPT-XP. Includes rack mounting bracket.
SFP 1000Base-Lx	1AB383760002/ 3CC50168AAAA	To be installed in the Ethernet user port 3 or 4 (optional)
SFP 1000Base-Sx	1AB383760001/ 3CC50167AAAA	To be installed in the Ethernet user port 3 or 4 (optional)
SFP 1000base-T	1AB359780002/ 3CC50169AAAA	To be installed in the Ethernet user port 3 or 4 (optional)

3.8.2 — MPR-E indoor items for MPR-e solution

Table 3.24 provides codes for MPR-e indoor items.

Table 3.24 — MPR-E: Indoor items for MPR-e solution

Name	Part number	Remarks

Table 3.24 — MPR-E: Indoor items for MPR-e solution

[A]	Power Injector box	3CC50129AAXX	To be installed in a 19-inch/21-inch rack to provide the PFoE to the MPT-MC
[B]	Power Injector card	3HE07152AAXX	To be installed in a 7705 SAR shelf to provide the PFoE to the MPT-MC or to the MPT-HC V2/ HC-HQAM
[B]	Power Injector card	3CC50120AAXX	To be installed in a 9500 MPR shelf to provide the PFoE to the MPT-MC or to the MPT-HC V2/ HC-HQAM
[C]	Bracket	3DB77008ACXX	Bracket to be used to install the Power Injector box in a 19-inch rack
[D]	21-inch Adapter kit	3CC50065AAAA	Kit to be used with item [C, E, and F] to install the Power Injector box, MPT Power Unit, and MPT Extended Power Unit in a 21-inch rack
[E]	MPT Power Unit	3CC50173AAXX	To be installed in a 19-inch/21-inch rack to provide the office power to the MPT-HC V2/ HC-HQAM. Includes rack mounting bracket.
[F]	MPT Extended Power Unit	3CC50174AAXX	To be installed in a 19-inch/21-inch rack to provide the PFoE or office power to the MPT-HC V2/HC-HQAM/MC/XP/XP-HQAM. Includes rack mounting bracket.
[G]	250W 120/240V AC Power Converter	3HE05838AA	To be connected to a Power Injector Box (PIB) when an AC power source is required.
[H]	7705 SAR AC Power Converter Pigtail O-Ring	3HE05837BA	To connect the DC power terminal block on the PIB to the AC power converter.

3.8.3 — CD-ROM software

Table 3.25 provides codes for the CD-ROM software.

Table 3.25 — MPR-E: CD-ROM software

Name	Part number
TCO Software Suite R5.2 DVD-ROM	3DB18971AGAA
SWP 9500 MPR HYBRID CD-ROM	3DB18969AGAA
SWP 9500 MPR PACKET CD-ROM	3DB18970AGAA
9500 MPR Rel 5.2.0 User Manual CD-ROM EN	3DB19902BFAA

3.8.4 — MPT-HC V2/MPT-XP optical interface option

Table 3.26 — MPR-E: MPT-HC V2/MPT-XP option

Name	Part number	Remarks
SFP 1000Base-Sx	1AB383760001/ 3CC50167AAAA	Optical SFP module to be installed optionally in the MPT to provide the optical Gigabit Ethernet interface
SFP 1000Base-Lx	1AB383760002/ 3CC50168AAAA	

3.8.5 — MPT-HC V2/MPT-XP external modules (option for MPR-e)

For MPT-HC V2 external module options, see the *9500 MPR Frequency Plan for MPT Outdoor Transceivers*.

3.8.6 — MPT-HC V2/HC-HQAM with internal diplexer

For MPT-HC V2 with internal diplexer options, see the *9500 MPR Frequency Plan for MPT Outdoor Transceivers*.

3.8.7 — MPT-MC with internal diplexer

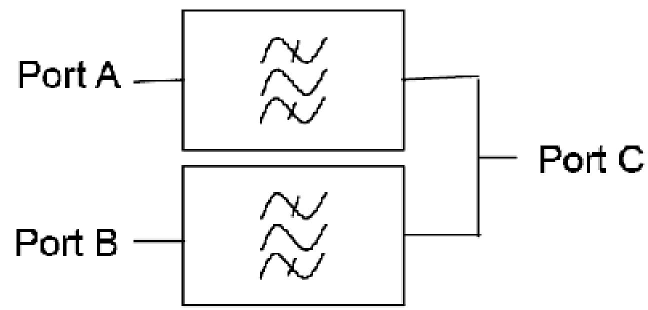
For MPT-MC with internal diplexer options, see the *9500 MPR Frequency Plan for MPT Outdoor Transceivers*.

3.8.8 — MPT-HC/HC-HQAM/MC/XP/XP-HQAM/ with external diplexer

The diplexer included in the available external diplexer assemblies refers to ITU–R F.385, 386 and RF special customers channeling with Tx/Rx separation specified in the *9500 MPR Frequency Plan for MPT Outdoor Transceivers*.

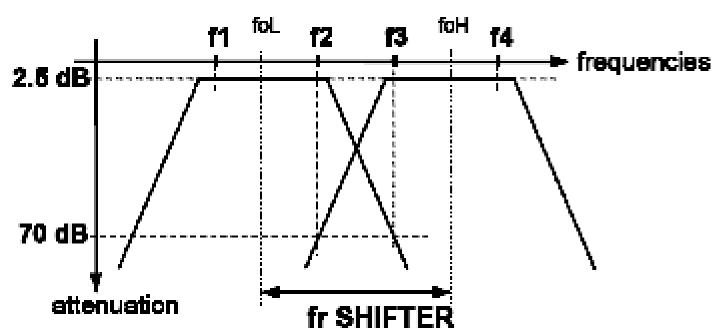
Each diplexer is a 3-port passive device with two band–pass filters as shown in Figure 3.40.

Figure 3.40 — MPT-HC/HC-HQAM/MC/XP/XP-HQAM/with external diplexer - diplexer as a 3-port passive device with two band-pass filters



The arrangement between each filter on the same external diplexer device is shown in Figure 3.41.

Figure 3.41 — MPT-HC/HC-HQAM/MC/XP/XP-HQAM/ with external diplexer - arrangement between each filter on the same external diplexer device



Warning: f1, f2, f3 and f4 frequencies of the external diplexer filters refer to the extreme channel frequencies and not to the cut-off frequencies of the filters.

3.8.8.1 — External diplexer MPT-HC/HC-HQAM/MC/XP/XP-HQAM/

For MPT-HC/HC-HQAM/MC/XP/XP-HQAM/ with external diplexer options, see the *9500 MPR Frequency Plan for MPT Outdoor Transceivers*.

3.8.8.2 — MPT-HC/HC-HQAM/MC/XP/XP-HQAM couplers for MPR-e

Table 3.27 — MPT-HC/HC-HQAM/XP/XP-HQAM 1+1 couplers for MPR-e

Description	Codes
6 GHz 1 dB/10 dB coupler	3CC58056ABXX
6 GHz 3 dB coupler	3CC58056AAXX
7.1-8.5 GHz 1 dB/10 dB coupler	3CC14536AAXX
7.1-8.5 GHz 3 dB coupler	3CC14536ABAA
10-11.7GHz 3dB coupler	3CC58224AAXX
10.7-11.7 GHz 3 dB coupler	3CC14140AAXX
13-15 GHz 1 dB/10 dB coupler	3CC13472ABXX
13-15 GHz 3 dB coupler	3CC13472AAXX
18-23-25 GHz 1 dB/10 dB coupler	3CC13473ABXX
18-23-25 GHz 3 dB coupler	3CC13473AAXX
28-32-38 GHz 1 dB/10 dB coupler	3CC13474ABXX
28-32-38 GHz 3 dB coupler	3CC13474AAXX

Table 3.28 — MPT-HC/HC-HQAM/XP/XP-HQAM OMT couplers for MPR-e

Description	Codes
OMT 6 GHz L	3CC58134AAXX
OMT 6 GHz U	3CC58186AAXX
OMT 7 GHz	3CC58124AAXX
OMT 8 GHz	3CC58133AAXX
OMT 11 GHz	3CC58161AAXX
OMT 13 GHz	3CC58162AAXX
OMT 15 GHz	3CC58163AAXX
OMT 18 GHz	3CC58164AAXX
OMT 23 GHz	3CC58165AAXX

3.8.8.3 — MPT-HC/HC-HQAM/XP/XP-HQAM optical interface

Table 3.29 — MPT-HC/MPT-XP optical interface

Description	Codes	Remarks
SFP 1000Base-Sx Transceiver	1AB383760001/ 3CC50167AAAA	Optical SFP module to be installed optionally in the MPT to provide the optical interface
SFP 1000Base-Lx Transceiver	1AB383760002/ 3CC50168AAAA	

3.9 — MPR-A parts lists

3.9.1 — MSS-1c items

Table 3.30 — MPR-A: MSS-1c items

Name	Part number	Remarks
MSS-1c 16T1	3DB18613BAXX	Up to 16 T1s supported
Fan unit	3DB77002AAXX	To be installed if the ambient temperature is higher than 50°C (for MSS-1c)
MPT Power Unit	3CC50173AAXX	To be installed in a 19-inch/21-inch rack to provide the office power to the MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC. Includes rack mounting bracket.
MPT Extended Power Unit	3CC50174AAXX	To be installed in a 19-inch/21-inch rack to provide the PFoE or office power to the MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC. Includes rack mounting bracket.
SFP 1000Base-Lx	1AB187280040	To be installed in the Ethernet user port 3 or 4 (option)
SFP 1000Base-Sx	1AB383760001	To be installed in the Ethernet user port 3 or 4 (option)
SFP 1000base-T	1AB359780001	To be installed in the Ethernet user port 3 or 4 (option)

3.9.2 — Indoor items for MPR-e solution

Table 3.31 — MPR-A: Indoor items for MPR-e solution

Name		Part number	Remarks
[A]	Power Injector box	3CC50129AAXX	To be installed in a 19-inch to 21-inch rack to provide the PFoE to the MPR-e
[B]	Power Injector card	3HE07152AAXX	To be installed in a 7705 SAR shelf to provide the PFoE to the MPT-HC V2/HC-HQAM
[B]	Power Injector card	3CC50120AAXX	To be installed in a 9500 MPR shelf to provide the PFoE to the MPT-MC or to the MPT-HC V2/HC-HQAM
[C]	Bracket	3DB77008ACXX	Bracket to be used to install the Power Injector box in a 19-inch rack.
[D]	21-inch Adapter kit	3CC50065AAAA	Kit to be used with item [C, E, F] to install the Power Injector box/MPT Power Unit in a 21-inch rack
[E]	MPT Power Unit	3CC50173AAXX	To be installed in a 19-inch/21-inch rack to provide the office power to the MPT-HC V2. Includes rack mounting bracket.
[F]	MPT Extended Power Unit	3CC50174AAXX	To be installed in a 19-inch/21-inch rack to provide the PFoE or office power to the MPT-HC/HC-HQAM/MC/XP/XP-HQAM. Includes rack mounting bracket.

3.9.3 — CD-ROM software

Table 3.32 provides codes for the CD-ROM software.

Table 3.32 — MPR-A: CD-ROM software

Name	Part number
9500 MPR for ANSI R5.2.0 SW CD kit	3DB18970BGAA
9500 MPR for ANSI R5.2.0 Customer Documentation Library	3EM23951APAA

3.9.4 — MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC optical

interface option

Table 3.33 — MPR-A: MPT-HC V2/MPT-XP/9558HC option

Name	Part number	Remarks
SFP 1000Base-SX	1AB 38376 0001/3CC 50167 AAAA	Optical SFP module to be installed optionally in the MPT-HC/HC-HQAM/XP/XP-HQAM/ 9558HC to provide the optical Gigabit Ethernet interface

3.9.5 — MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC external modules (option for MPR-e)

Table 3.34 — MPR-A:MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC external modules

Description	Part number	Remarks
RPS MODULE	3DB20117BAXX	All frequency band for 1+1 configuration. The 1+1 configuration is not available for MPR-e.
XPIC-RPS MODULE	3DB20116BBXX 3DB20116BCXX	All frequency bands. This module is used for the XPIC configuration.

3.9.6 — MPT-HC V2/HC-HQAM with internal diplexer

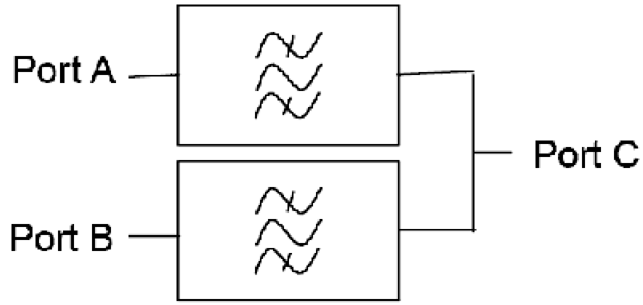
For transceivers with internal diplexer options, see the *9500 MPR Frequency Plan for MPT Outdoor Transceivers*.

3.9.7 — MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC with external diplexer

The diplexer included in the available external diplexer assemblies refers to ITU–R F.385, 386 and RF special customers channeling with Tx/Rx separation specified in the *9500 MPR Frequency Plan for MPT Outdoor Transceivers*.

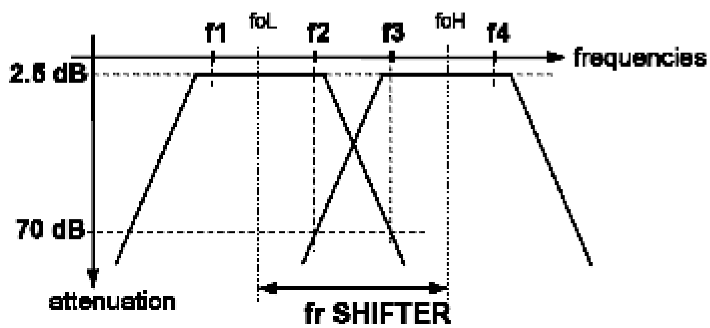
Each diplexer is a 3-port passive device with two band–pass filters as shown in Figure 3.42.

Figure 3.42 — MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC with external diplexer - diplexer is a 3-port passive device with two band-pass filters



The arrangement between each filter on the same external diplexer device is shown in Figure 3.43.

Figure 3.43 — MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC with external diplexer - arrangement between each filter on the same external diplexer device



Warning: f1, f2, f3 and f4 frequencies of the external diplexer filters refer to the extreme channel frequencies and not to the cut-off frequencies of the filters.

3.9.7.1 — MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC without external diplexer

For transceivers without external diplexer options, see the *9500 MPR Frequency Plan for MPT Outdoor Transceivers*.

3.9.7.2 — External diplexers for MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC

For transceivers with external diplexer options, see the *9500 MPR Frequency Plan for MPT Outdoor Transceivers*.

3.9.7.3 — MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC couplers for MPR-e

Table 3.35 — MPT-HC/HC-HQAM/XP/XP-HQAM 1+1 couplers for MPR-e

Description	Codes
6 GHz 1 dB/10 dB coupler	3CC58056ABXX
6 GHz 3 dB coupler	3CC58056AAXX
7.1-8.5 GHz 1 dB/10 dB coupler	3CC14536AAXX
7.1-8.5 GHz 3 dB coupler	3CC14536ABAA
10-11.7GHz 3dB coupler	3CC58224AAXX
10.7-11.7 GHz 3 dB coupler	3CC14140AAXX
13-15 GHz 1 dB/10 dB coupler	3CC13472ABXX
13-15 GHz 3 dB coupler	3CC13472AAXX
18-23-25 GHz 1 dB/10 dB coupler	3CC13473ABXX
18-23-25 GHz 3 dB coupler	3CC13473AAXX
28-32-38 GHz 1 dB/10 dB coupler	3CC13474ABXX
28-32-38 GHz 3 dB coupler	3CC13474AAXX

Table 3.36 — MPT-HC/HC-HQAM/XP/XP-HQAM OMT couplers for MPR-e

Description	Codes
OMT 6 GHz L	3CC58134AAXX
OMT 6 GHz U	3CC58186AAXX
OMT 7 GHz	3CC58124AAXX
OMT 8 GHz	3CC58133AAXX
OMT 11 GHz	3CC58161AAXX
OMT 13 GHz	3CC58162AAXX
OMT 15 GHz	3CC58163AAXX
OMT 18 GHz	3CC58164AAXX

Table 3.36 — MPT-HC/HC-HQAM/XP/XP-HQAM OMT couplers for MPR-e

Description	Codes
OMT 23 GHz	3CC58165AAXX

3.9.7.3.1 — MPT-HC/MPT-XP optical interface

Table 3.37 — MPT-HC/HC-HQAM/XP/XP-HQAM optical interface

<table>
<tr><th>Description</th><th>Codes</th><th>Remarks</th></tr>
<tr><td>SFP 1000Base-Sx Transceiver</td><td>1AB383760001/
3CC50167AAAA</td><td rowspan="2">Optical SFP module to be installed optionally in the MPT to provide the optical interface</td></tr>
<tr><td>SFP 1000Base-Lx Transceiver</td><td>1AB383760002/
3CC50168AAAA</td></tr>
</table>

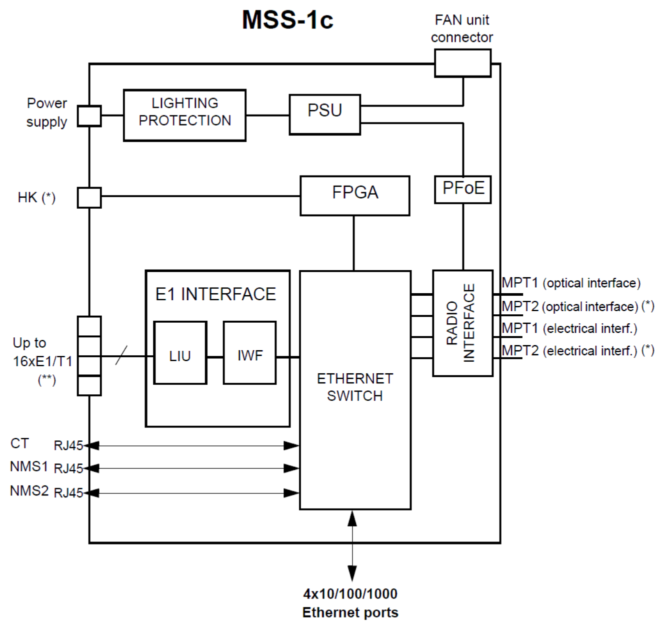
3.10 — Functional description

3.10.1 — MSS-1c (indoor unit)

The MSS-1c incorporates the base–band processing and also radio interface functionalities only when the MPT-HC/HC V2/HC-HQAM/MC/XP/XP-HQAM/9558HC is connected. MSS-1c offers tributaries interfaces as well as supervision.

The MSS-1c is frequency–independent.

Figure 3.44 — MSS-1c block diagram



(*)Not supported in the current release.

(**)Depending on the MSS-1c variant.

Figure 3.45 — MSS-1c front view

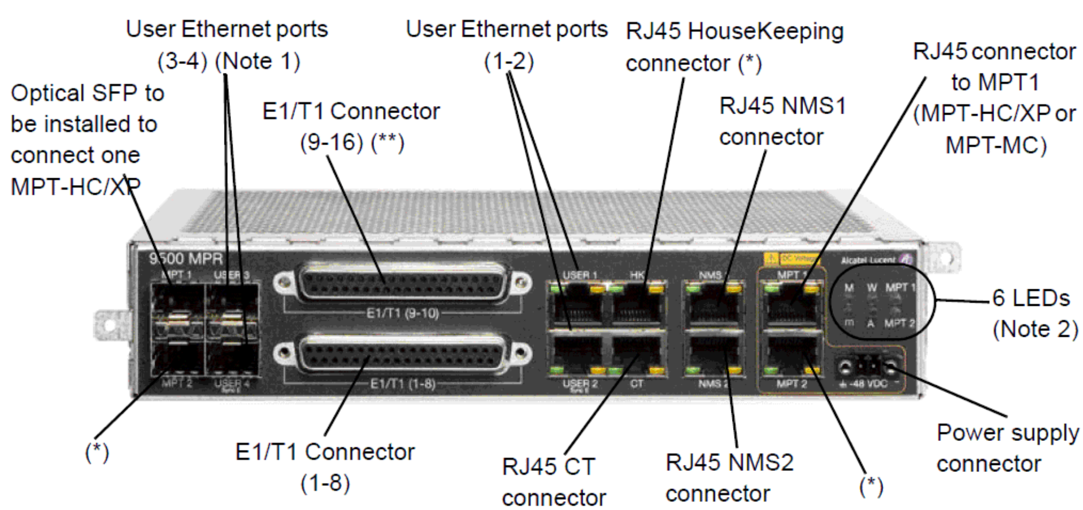


Figure 3.46 — MSS-1c rear view

Note: To use the User Ethernet Ports 3 and 4 an SFP plug-in (electrical or optical) must be installed

Note: The meanings of the six LEDs are:

- LED M: Major Alarm (red)
- LED m: Minor Alarm (red) (not supported in the current release: permanently OFF)
- LED W: Warning (yellow) (not supported in the current release: permanently OFF)
- LED A: Abnormal condition (yellow)
- LED MPT1: MPT Status (green/red/yellow)
- LED MPT2: not supported

LED A is ON in the following conditions:

- Tx Power muted by operator
- ACM frozen by operator
- MPT loopback active

LED MPT1 can be:

- GREEN: MPT is emitting power as expected according the known configuration
- YELLOW: MPT is not emitting power due to a forced Squelch condition
- RED: MPT is ABNORMALLY emitting power
- SWITCHED OFF: MPT is not emitting power according with the known configuration

At start-up the MSS-1c:

- lights on all the alarm LEDs (Major, Minor, Warning and Abnormal)
- lights on the MPT LED as yellow, then this LED will be GREEN, RED or YELLOW, as explained above.

3.10.1.1 — External user interface

- 2 traffic 10/100/1000 Base-T Ethernet interfaces for data and service traffic via RJ45 connector

Note: For 100 Ethernet interface the standard is 100Base-Tx.

- 2 SFP ready to accept optical 1000Base-LX/SX SFP or Electrical 1000Base-T SFP
- 2x 10/100 Ethernet NMS interfaces for connection of TMN on RJ45 connector
- 1 Local Craft terminal interface 10/100 Ethernet allows the straight connection to MPT remote Controller via RJ45 connector
- 10E1 or 16E1/T1 bi-directional interfaces on 2 subD connectors
- 4 In housekeeping for external alarms collections, RJ45 connector + 2 IN/OUT (not supported)
- 9 poles SubD Connector in the rear side for FAN unit feed/control.

3.10.1.2 — 2 traffic 10/100/1000 Base-T Ethernet interfaces for data and service traffic via RJ45 connector

3.10.1.3 — Power supply

The MSS-1c receives the Battery input through 1 power connector mounted on the front panel.

The input voltage range is from -38.4 V to -57.6 Vdc.

3.10.1.4 — Ethernet switch

The switch provides the following features:

- Address learning up to 8K Mac address and static entries,
- Standard 802.1Q management (VLAN),
- Layer2 switching (MAC Address),
- 2 QoS per port (802.1P and DiffServ)
- Flexible output scheduler: SP (strict priority), DWRR (deficit weighted round robin).

3.10.1.5 — E1/T1 interface

The E1/T1 Interface performs the following macro functions:

- MPR-E: Termination of 10E1 or 16E1 signals (E1 bi-directional interfaces according ITU-T G.703 on the front panel)
- MPR-A: Termination of 16T1 signal with MSS-1c 16PDH variant (T1 bi-directional interfaces according to ANSI T1.403/TR 62411 on the front panel)
- Encapsulation/Extraction of those PDH data flows into/from standard Ethernet packets Inter Working Function
- Reconstruction of the original PDH Timing
- Sending/getting those std Ethernet packets to the Ethernet switch
- Communication with the Controller for provisioning and status report.

3.10.1.6 — MPT interface

The MPT Interface is the interface for one MPT: MPT-HC/HC V2/HC-HQAM/MC/XP/XP-HQAM/9558HC.

For interconnections with MSS-1c, see MSS-1c to MPT-HC/HC-HQAM/9558HC interconnection, MSS-1c to MPT-XP/XP-HQAM interconnection, and MSS-1c to MPT-MC interconnection.

3.10.1.6.1 — Main functions

- Provide the power supply interface and the Ethernet interface
- Provide the Power Feed over Ethernet function
- Lightning and surge protection
- Ethernet and power interface supervision
- Clock distribution function
- Ethernet link quality monitor function
- Communication with Controller for provisioning and status report.

3.10.1.7 — Ethernet user interface

The following 4 Ethernet User Interfaces are available:

- 2 traffic 10/100/1000 Base-T Ethernet interfaces for data and service traffic via RJ45 connector.

  N.B. For 100 Ethernet interface the standard is 100Base-Tx.
- 2 SFP ready to accept optical 1000Base-LX/SX SFP or Electrical 1000Base-T SFP.

The User port 2 can be used as SynchE synchronization.

The User port 3 and port 4 can be used as SynchE synchronization in optical mode.

Note: MPR-E: User port 3 is not available as a synchronization source on the MSS-1c variant.

3.10.2 — MSS-1c Fan unit

An optional Fan unit must be used to dissipate the MSS-1c in the special case when the ambient temperature is > +50°C (MSS-1c) or >+55°C (MSS-1c 16PDH).

Figure 3.47 shows the installation position: the MSS-1c on the right and the Fan unit on the left.

The MSS-1c and the Fan unit are mounted on a bracket compatible with 19" rack. Height is 1.3U.

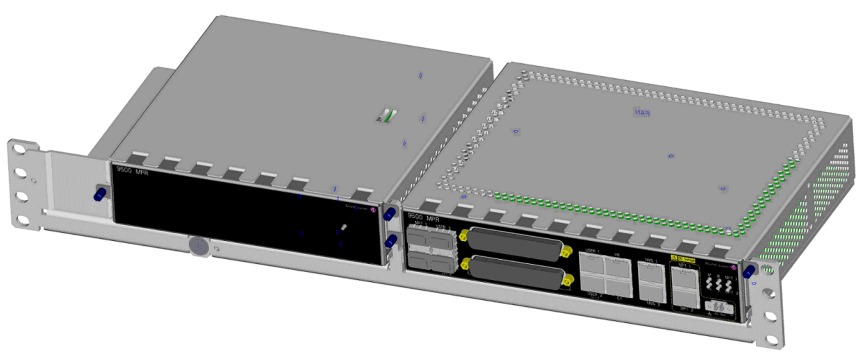
The Fan unit is powered by the MSS-1c with a cable placed on the rear side. The cable is provided with the Fan unit.

The Fan unit includes two fans.

One bi-color LED on the front panel gives the status of the Fan unit:

- Fans alarm = OFF <-> LED = green
- Fans alarm = ON <-> LED = red

Figure 3.47 — MSS-1c and Fan unit



3.10.3 — MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC

The MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC (Microwave Packet Transport) is Microwave Equipment capable of transporting Ethernet traffic over an RF radio channel.

For MPR-A, the MPT-HC using the 5.8 GHz channel is referred to as the 9558HC.

The MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC includes a waveguide antenna port, one electrical GE interface for data and power, one SFP port for optical Ethernet data, a maintenance connector (with captive protection cap) for RSSI access, and a grounding stud.The 1 GE interface for RPS is not used.

The MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC can be natively Ethernet powered through a proprietary PFoE.

The MPT-HC V2/MPT-XP/9558HC can host an external module (RPS module for 1+1 configurations or XPIC_RPS module for XPIC and/or 1+1 configurations. MPT-HC-HQAM/XP-HQAM transceivers include integrated XPIC and RPS functions. No hardware modules are required. An RTU software upgrade is required to enable XPIC functions. The 1+1 for MPR-e standalone configuration is not supported in the current release). RPS and XPIC are not supported with MSS-1c.

The MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC can be rapidly installed on an integrated antenna or on standard poles, wall or pedestal mount, with an appropriate fastening system. The pole mounting is the same from 6 to 38 GHz.

The MPT-HC V2/MPT-XP/9558HC (with a solar shield) or MPT-HC-HQAM/XP-HQAM (solar shield is not required) incorporates the complete RF transceiver and can be associated with an integrated or separate antenna.

The cabinet is a very compact and robust weatherproof (IP 67) container, designed to be compatible with hot and very sunny climatic zones.

The MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC is fixed by means of quick-fastening latches. This system allows the MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC to be changed without altering the antenna position.

Two mechanical solutions are adopted:

1. with embedded diplexer for cost optimisation (**6 and 11 to 38 GHz**), shown in Figure 3.48, where the diplexer is internal to the MPT ODU cabinet; this type of MPT ODU is identified by one **Logistical Item** only.

   Table 3.38 lists the MPT ODUs that can support an embedded diplexer.

Table 3.38 — MPT ODUs that support an embedded diplexer

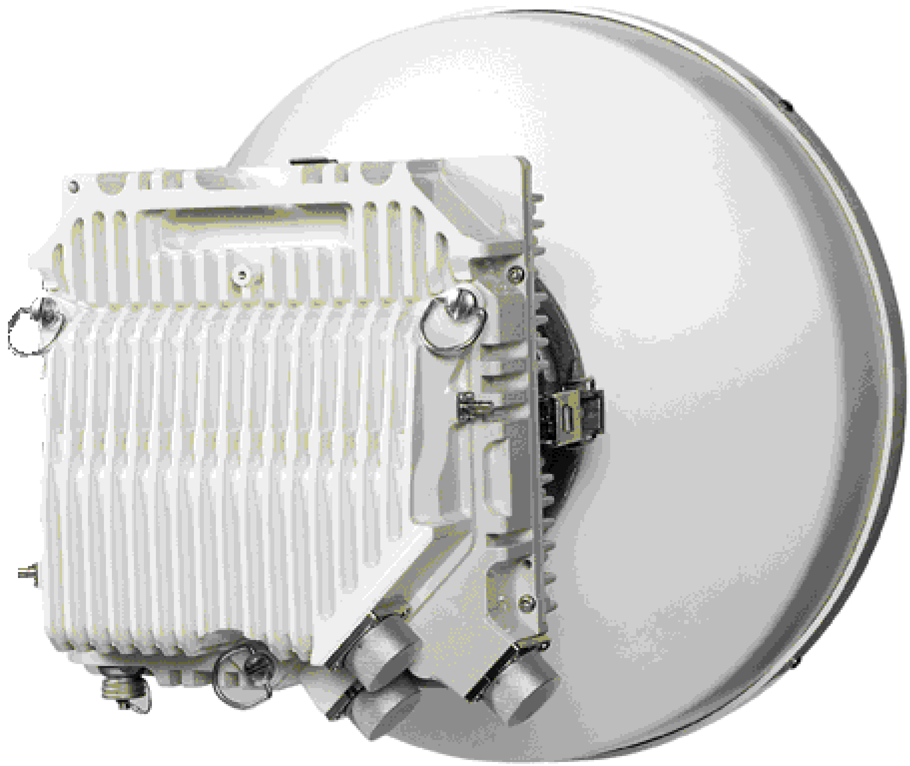
Radio	Frequency range
MPT-HC	L6, 11-38 GHz
MPT-HC-HQAM	13-38 GHz

Table 3.38 — (Continued)MPT ODUs that support an embedded diplexer

Radio	Frequency range
MPT-XP	Not supported
MPT-XP-HQAM	Not supported

Figure 3.48 shows an MPT-HC with an embedded diplexer.

Figure 3.48 — MPT-HC housing (embedded diplexer)



Warning: To mount a 6 GHz MPT-HC with internal diplexer in a 1+1 configuration with a MPT-HC with external diplexer, the MPT with internal diplexer must be the Main unit and the MPT with external diplexer must be the Spare unit, see Figure 3.49. If the units are mounted the other way, the cabling will cause interference; see Figure 3.50.

Figure 3.49 — Correct protected mounting of 6 GHz MPT-xC with internal and external diplexers

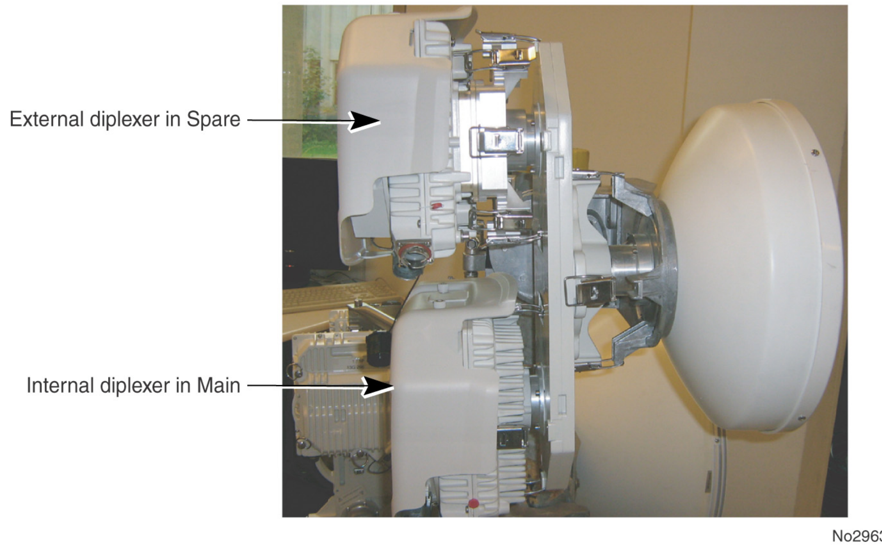
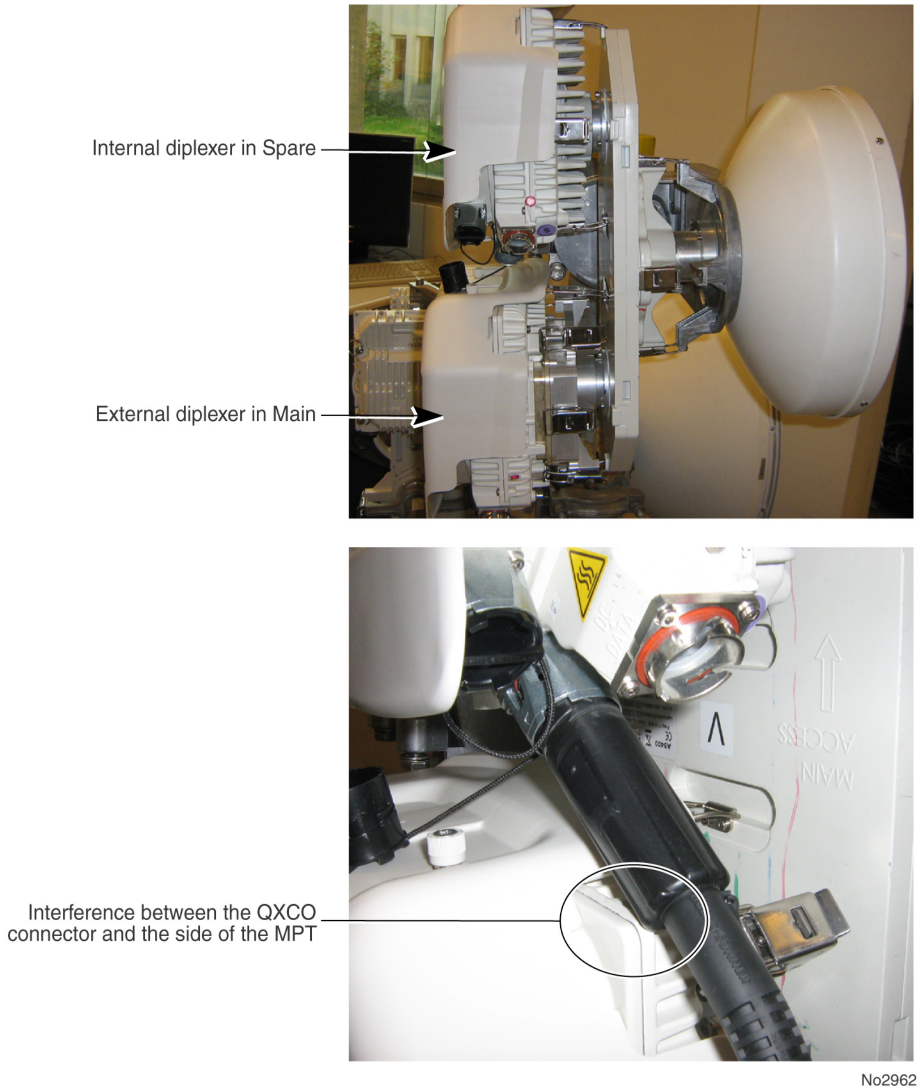


Figure 3.50 — Incorrect protected mounting of 6 GHz MPT-xC with internal and external diplexers



2. with external diplexer: due to a high number of shifters, the diplexer is external for the flexibility of the shifter customization (**5.8, 6, 7, 8, and 10.5 GHz** for MPR-E, **5.8, 6, 7, and 8 GHz** for MPR-A) where the MPT ODU is composed of two independent units: the external diplexer assembly (containing the diplexer) and the RF transceiver assembly (containing the RF section); each of this type of MPT ODU is identified by two **Logistical Items**, one for the external diplexer assembly and another for the RF transceiver assembly. To read the external diplexer assembly identification label, it is necessary to separate the external diplexer assembly from the RF transceiver assembly.

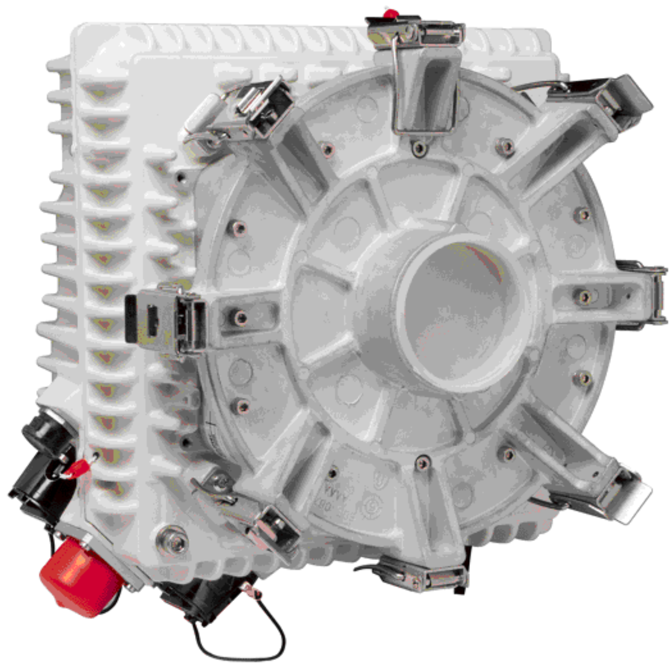
   Table 3.39 lists the MPT ODUs that can support an external diplexer.

Table 3.39 — MPT ODUs that support an external diplexer

Radio	Frequency range
MPT-HC	5.8-10.5 GHz
MPT-HC-HQAM	L6-11 GHz
MPT-XP	L6-8 GHz
MPT-XP-HQAM	L6-11GHz

Figure 3.51 shows an example of an MPT-HC-HQAM with an external diplexer.

Figure 3.51 — View of MPT-HC-HQAM with external diplexer (13-38 GHz)



For 5.8 GHz (external diplexer) in MPR-A, the 9558HC polarization is determined by the rotation of the 9558HC (1+0 configuration).

For 6, 7, and 8 GHz (external diplexer), the MPT-HC/HC-HQAM/XP/XP-HQAM polarization is determined by the rotation of the MPT-ODU (1+0 configuration).

For 6, and 11 to 38 GHz (embedded diplexer), the MPT-HC V2/HC-HQAM polarization is determined by the rotation of the polarization rotator fitted in the antenna port of the MPT ODU (1+0 configuration).

The MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC interface is based on Gigabit Ethernet, that can be either optical or electrical depending on the needs and the cable length. If the optical port must be used (data and/or RPS port), the corresponding SFP plug-in must be installed.

Figure 3.52 — MPT-HC V2/MPT-XP/9558HC housing

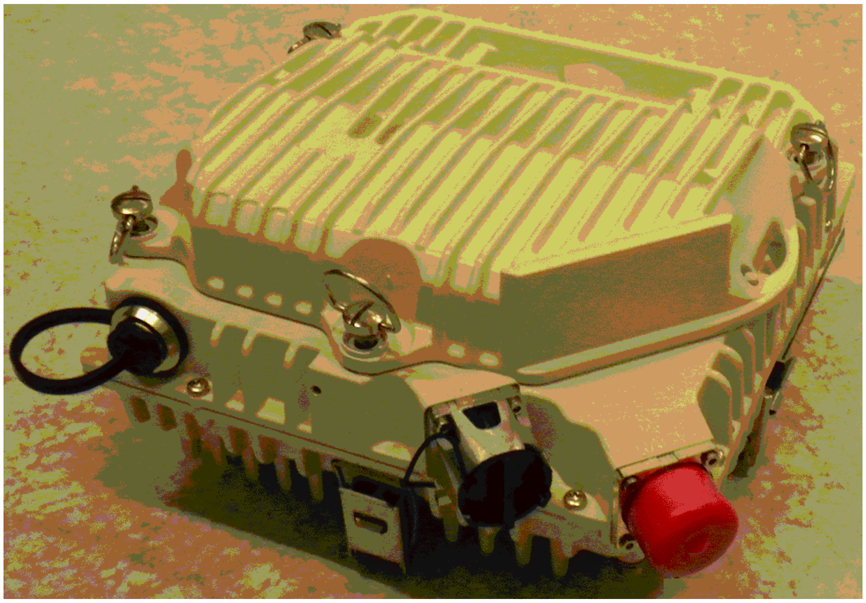


Figure 3.53 — MPT-HC V2 housing (internal diplexer)

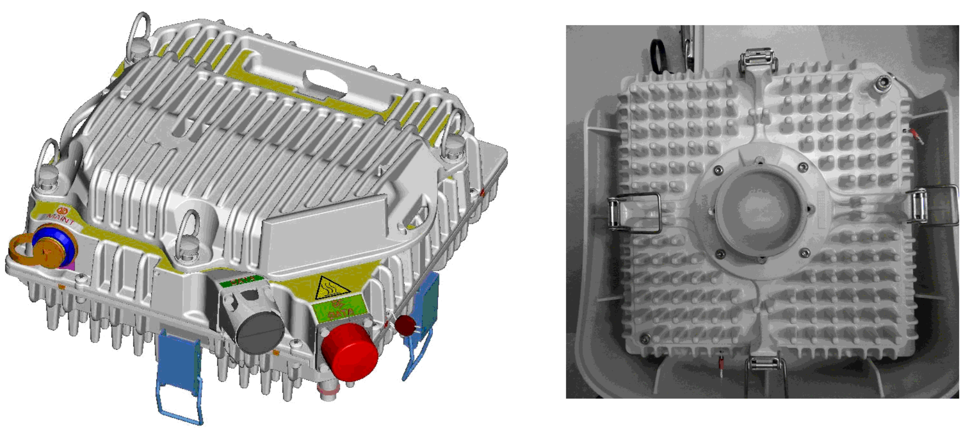
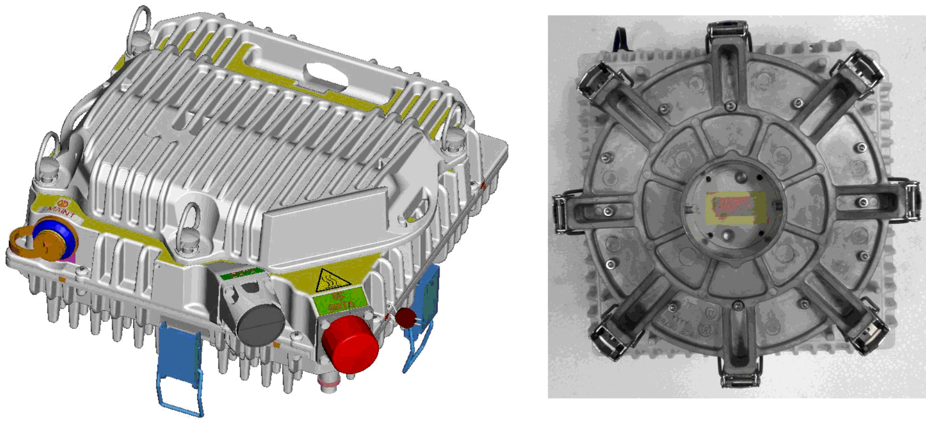


Figure 3.54 — MPT-HC V2/MPT-XP/9558HC housing (external diplexer)



3.10.3.1 — RSSI monitoring point

The RSSI is available on a connector used to manually point the antenna on the field.

The higher the voltage, the higher the RSSI and the better aligned the antenna is. The RSL is measured using a is used a voltmeter connected to the MPT with a service kit cable.

Table 3.40 — RSSI

Units	Measurement (with MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC)									
Service kit cable (Vdc)	5	4.71	4.12	3.5	2.9	2.3	1.71	1.11	0.59	0.14
RSL (dBm)	-10	-20	-30	-40	-50	-60	-70	-80	-90	-100

1. Without any received signal (Tx mute on the remote MPT for example), the RSL value displayed may be more than -100 dBm. This depends on the channelization/modulation settings.

3.10.3.2 — Waveguide flange data

Table 3.41 — MPR-E waveguide flange data

Waveguide Type	5.8 GHz	L6 GHz	U6 GHz	7 GHz	8 GHz	10.5 GHz	11 GHz	13 GHz	15 GHz	18 GHz	23 GHz	25 GHz	38 GHz
	WR137	WR137	WR137	WR112	WR112	WR75	WR 75	WR 62	WR 62	WR 42	WR 42	WR 42	WR 28

Table 3.42 — MPR-A waveguide flange data

Waveguide Type	5.8 GHz	L6 GHz	U6 GHz	7 GHz	8 GHz	11 GHz	15 GHz	18 GHz	23 GHz	38 GHz
	WR137	WR137	WR137	WR113	WR113	WR75	WR62	WR42	WR42	WR28

3.10.4 — MPT-MC (MPR-E)

MPT-MC is similar to MPT-HC V2 from architecture standpoint.

The only differences are:

- MPT-MC cannot be connected in optical -> 100m length cable limitation.
- MPT-MC does not support the XPIC configuration.

Two mechanical solutions are adopted:

- with embedded diplexer for cost optimisation (**6 GHz and from 11 GHz to 38 GHz**), where the diplexer is internal to the MPT-MC cabinet; this type of MPT-MC is identified by one **Logistical Item** only;
- with external diplexer: due to a vary high number of shifters, the diplexer is external for the flexibility of the shifter customization (**L6, U6, 7 GHz and 8 GHz**), where MPT-MC is composed by two independent units: the EXTERNAL DIPLEXER assembly (containing the diplexer) and the RF TRANSCEIVER assembly (containing the RF section); each of this type of MPT-MC is identified by two **Logistical Items**, one for the EXTERNAL DIPLEXER assembly and another for the RF TRANSCEIVER assembly. To read the EXTERNAL DIPLEXER assembly identification label it is necessary to separate the EXTERNAL DIPLEXER assembly from the RF TRANSCEIVER assembly.

Figure 3.55 — MPT-MC housing (internal diplexer)

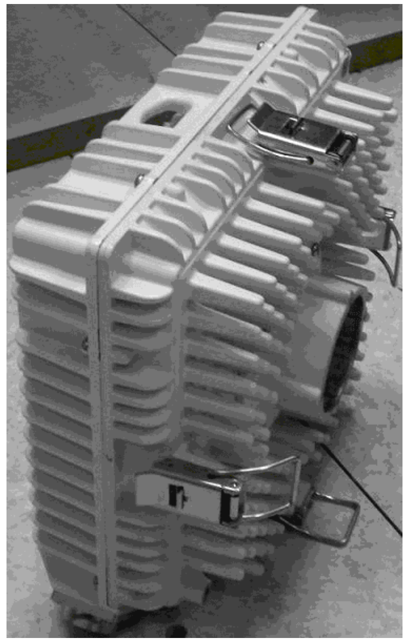
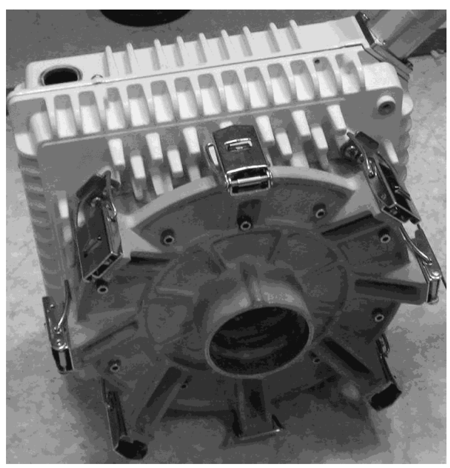


Figure 3.56 — MPT-MC housing (external diplexer)



3.10.5 — Power injector

3.10.5.1 — General

The MPT-HC V2/HC-HQAM/MC is powered through an electrical Ethernet cable from the Power Injector.

The Power Injector is an indoor device designed to deliver the DC power supply to the MPT-HC/HC-HQAM/MC by using the cable that carries the Ethernet traffic.

At the input, the Power Injector receives the Ethernet traffic and the power supply on two dedicated connectors. The Power Injector outputs the power supply and Ethernet traffic on one connector. This solution, called PFoE (Power Feed over Ethernet), is proprietary.

The Power Injector can power up to two MPTs.

The two power supply sources provide power supply redundancy.

3.10.5.2 — Main functions of the Power Injector

- Securization of two DC power inputs from -48 VDC office power
- Low pass filtering
- Insertion of the DC voltage on two Ethernet streams to power two MPTs
- Surge protection on both Ethernet output ports (K44 & K45)

3.10.5.3 — Power Injector versions

Two versions are available:

- **Power Injector card**: installed in the 7705 SAR shelf and powered through the backplane.

Figure 3.57 — Power Injector card

- **Power Injector box**: standalone box, powered through two connectors on the front providing power supply redundancy. The box can be mounted in a rack by means of a separate bracket. The bracket can support two boxes side by side. Height: 1,3 U.

Figure 3.58 — Power Injector box

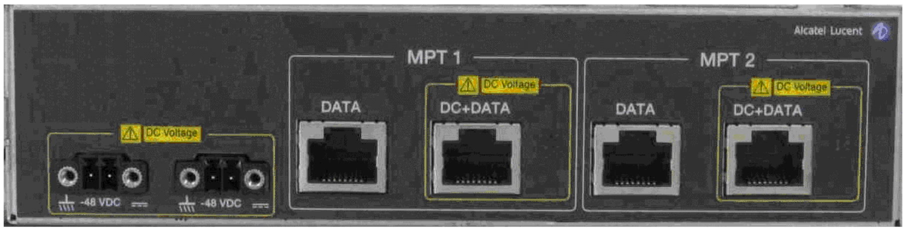
3.10.5.4 — Connectors

- Two DC connectors in the front (for box version), or power from the back panel (for plug-in version)
- Two RJ45 connectors for the data in (DATA)
- Two RJ45 connectors for the data + DC out (DC+DATA)

3.10.5.5 — LEDs

- Two LEDs indicate the presence of DC voltage on each Ethernet output.

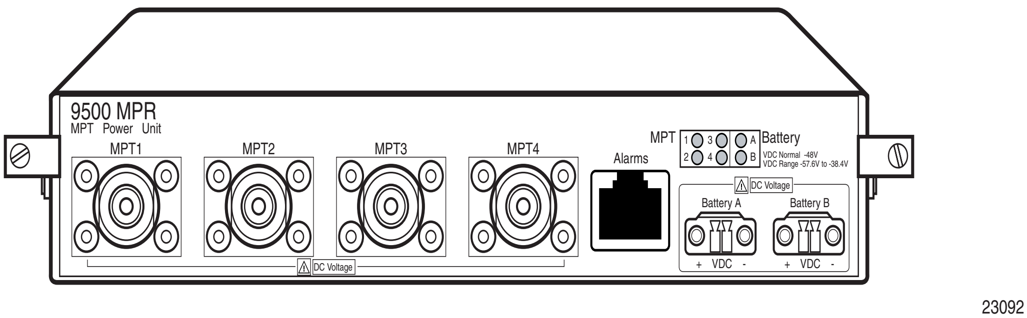
Figure 3.59 — Power Injector front panel



3.10.6 — MPT Power Unit

The MPT Power Unit is an indoor device, which provides power to up to four MPT using coax cable and Type-N connectors.

Figure 3.60 — MPT Power Unit



The MPT Power Unit has 7 connectors:

- Battery A/B (A & B power from office power)
- MPT 1/4 (DC Power to MPT)
- Alarms (Alarm status)

3.10.6.1 — LEDs

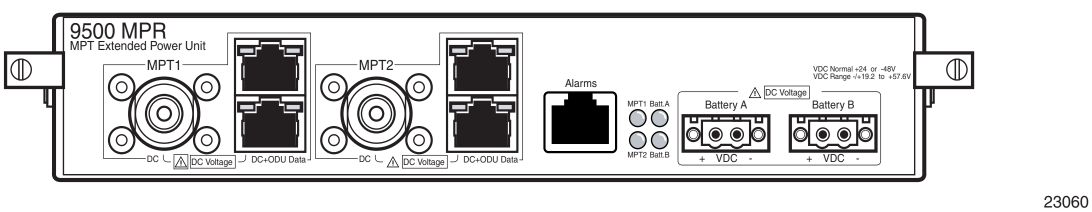
- Two LEDs indicate the presence of DC voltage on each power input.
- Four LEDs indicate the presence of DC voltage on each MPT power output.

3.10.7 — MPT Extended Power Unit

The MPT Extended Power Unit is an indoor device that provides power to up to two MPT using coax cable and Type-N connectors. The unit can also provide PFoE using RJ45 connectors. If an MSS-1c is in use, the MPT Extended Power Unit should be installed close to the MSS-1c.

An MPT Extended Power Unit is required to power an MPT-XP or MPT-XP-HQAM.

Figure 3.61 — MPT extended power unit



The MPT Power Unit has 9 connectors:

- Battery A/B (A & B power from office power)
- MPT1/2 IDU Data (Data from MSS-1c or Ethernet generic device)
- MPT1/2 DC + ODU Data (PFoE to MPT)
- MPT1/2 DC (Power Supply to MPT)
- Alarms (Alarm status)

3.10.7.1 — LEDs

- Two LEDs indicate the presence of DC voltage on each power input.

- Two LEDs indicate the presence of DC voltage on each MPT power output.

3.10.8 — Radio transmission features with MPT-HC/HC-HQAM/MC/XP/XP-HQAM/9558HC

3.10.8.1 — Frequency agility

The Frequency Agility feature gives the operator the ability to set the frequency of a single Transceiver within a chosen sub-band to select the RF working channel via MCT. This provides benefits for spare parts, order processing and frequency co-ordination.

3.10.8.2 — Automatic transmit power control (ATPC)

The Automatic Transmit Power Control (ATPC) function automatically increases or decreases the transmit output power upon request from the opposite terminal. The opposite terminal constantly monitors the Receive Signal Level (RSL), receive signal quality, and aggregate Bit Error Rate (BER) of the receive signal.

When ATPC is enabled, the transmit output will remain at its lowest level until a fade occurs (or a receive circuit alarm is detected). When the change in RSL is detected at the receive end, a command is sent to the transmit end to increase power in 1-dB steps to it's highest level. After the fade is over, the receive end commands the transmit power to decrease in 1-dB steps to the lowest level.

The ATPC range (high and low limits) is variable, determined by link distance, link location, and link frequency. When ATPC Enabled is checked, the range values are shown in parentheses (minimum - maximum) in the ATPC Range field.

When ATPC is disabled the transmit output will always operate at the power value set by the MCT.

The set point of the ATPC regulation (ATPC RSL threshold) must be chosen considering the link budget. For example if the set point is too high, the remote transmitter will permanently remain at maximum power. It is recommended to choose a value at least 15 dB above the 10-6 BER threshold.

3.10.8.3 — Transmitted power control: RTPC function

The capability to adjust the transmitted power in a static and fixed way (RTPC = Remote Transmit Power Control) has been introduced for those countries where, due to internal rules, the ATPC function is not accepted or for those hops in which due to the short length and interface problems, a fixed reduced transmitted power is preferred. The range of the possible attenuation depends on the frequency band involved. The setting of the transmitted power can be done locally through MCT.

The Output power is band- and modulation-dependent.

3.10.8.4 — Power monitoring

The MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC incorporates a detector for Tx power measurement. It is used to provide measurement of forward power as a performance parameter and to provide a calibration input for transmitter operation over temperature and output range.

Viewed Tx power ranges always match the capabilities of the MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC for a given modulation. When modulation is changed, the CT automatically adjusts/restricts Tx power to be within the valid range.

3.10.8.5 — Adaptive equalization

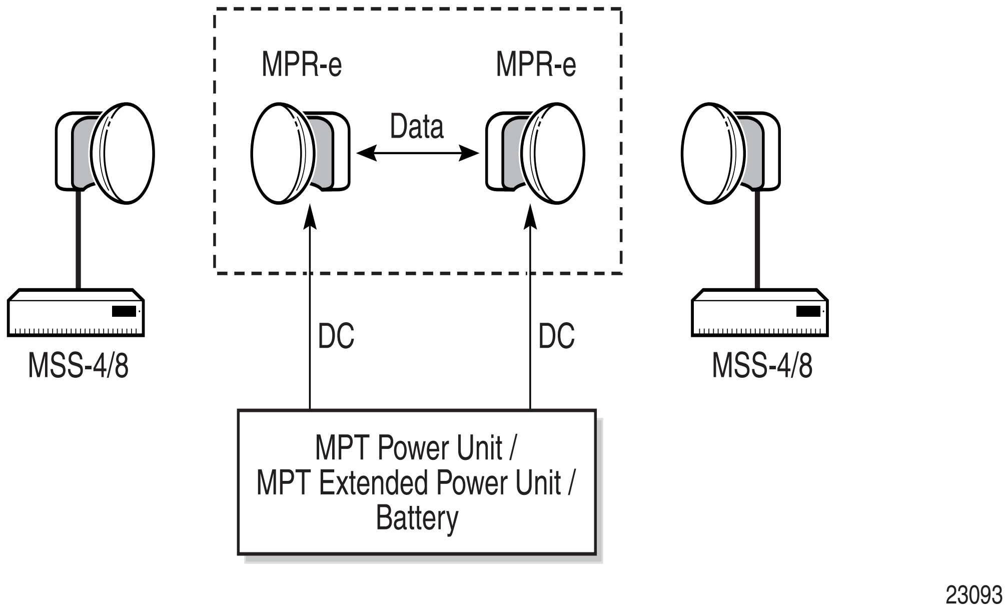
Adaptive equalization (AE) is employed to improve reliability of operation under dispersive fade conditions, typically encountered over long and difficult paths.

This is achieved through a multi-tap equalizer consisting of two registers, one with feed-forward taps, the other with feed-back taps. Each of these registers multiply successive delayed samples of the received signal by weighting coefficients to remove propagation-induced inter-symbol interference.

3.10.8.6 — 1+0 Repeater (with MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC only, for MPR-e)

The 1+0 repeater configuration can be setup with two MPR-e placed back-to-back as shown in Figure 3.62.

Figure 3.62 — 1+0 Repeater configuration



This solution is available with MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC with the following conditions:

- Repeater(s) inserted between two terminal MSS-4/8
- DATA exchange between the two MPR-e through an optical link only
- Synchronization configured in SyncE
- No XPIC configuration
- QoS policy aligned on the 4 stations
- Service: TDM2ETH, Ethernet traffic

3.10.8.7 — XPIC (with MPT-HC/HC-HQAM/XP/XP-HQAM only, for MPR-e)

The MPT-HC/HC-HQAM/XP/XP-HQAM supports Co-channel Dual Polarized (CCDP) operation using a built-in Cross-polarized Interference Cancellation (XPIC) function. This function is implemented as follows:

- for MPT-HC/XP transceivers, by installing the RPS+XPIC external module
- for MPT-HC-HQAM/XP-HQAM transceivers, which include integrated XPIC and RPS functions, no hardware modules are required. An RTU software upgrade is required to enable XPIC functions

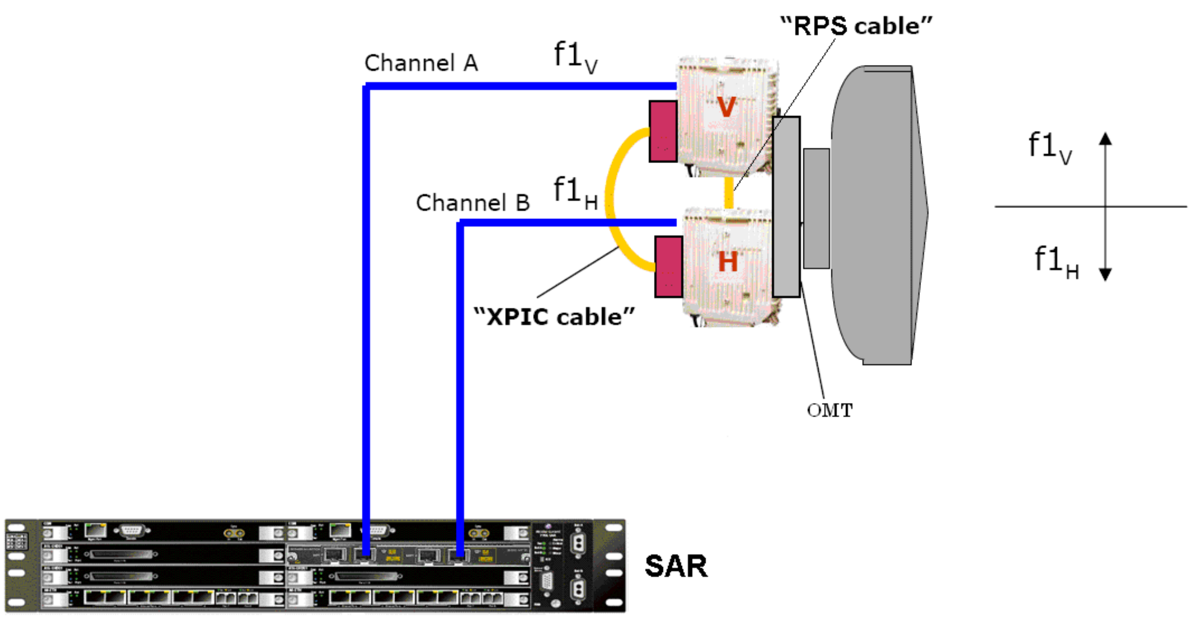
; ..

Two links are operated on the same radio channel, with one using the vertical polarization and the other using the horizontal polarization. XPIC typically provides a 20-dB improvement in polarization discrimination. The actual improvement will depend on the native discrimination provided at antenna alignment and any reduction of this discrimination caused by atmospheric effects (fading).

The XPIC can be implemented with or without the adaptive modulation.

The Radio configuration supported is co-channel XPIC.

Figure 3.63 — Co-channel XPIC



The XPIC configuration is available when MPR-e is standalone and in Single NE mode with 7705 SAR configuration.

3.10.8.7.1 — MPT-HC/HC-HQAM/XP/XP-HQAM in XPIC with a generic indoor unit

XPIC configuration allows a generic indoor unit (e.g. 7705 SAR) to take advantage of both double capacity and hardware redundancy. In fact, the indoor unit can exploit two times the same radio channel doubling the total amount of traffic transported. Moreover, whenever one of the two MPR-e fails, the indoor unit can collapse all its traffic on a single MPT. In case remaining working MPR-e is under congestion, MPR-e QoS function will handle the situation and high priority traffic will be served as first in accordance to the selected scheduling policy.

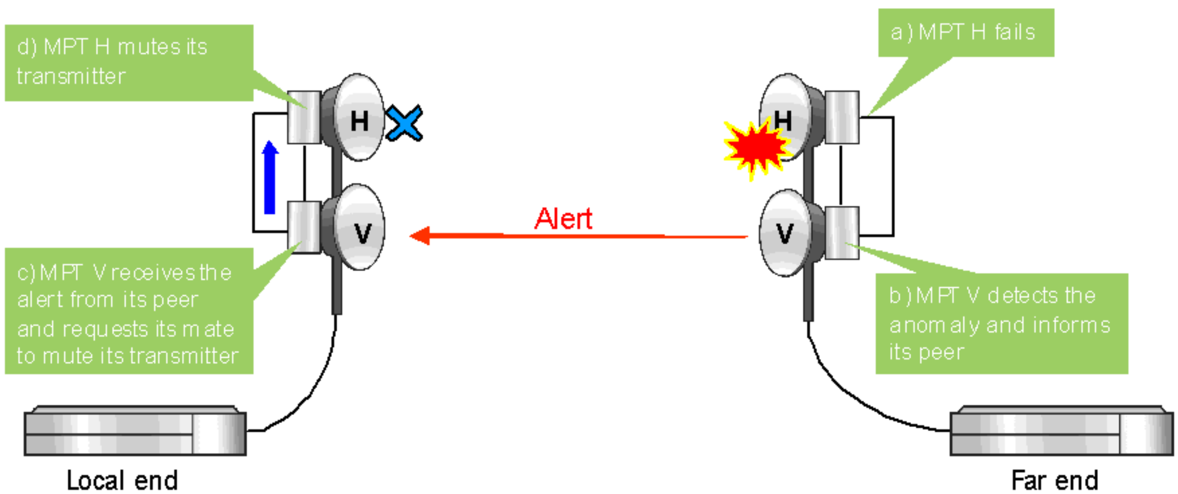
It has to be noticed that this configuration offers two parallel links, but it is left to the indoor unit the detection of radio problem/failure by the means of any kind of OAM protocol at layer 2 or 3 which will transparently pass through the radio link and are received at the other end.

3.10.8.7.2 — Auto Tx mute of MPT-HC/HC-HQAM/XP/XP-HQAM in XPIC

When XPIC is configured, a self protection mechanism is in place over the entire radio link which automatically reacts in case of either local or remote failure. Each MPR-e is capable to mute its transmitter whenever its peer at the other end (MPR-e H or MPR-e V) fails (under certain conditions). Such mute is necessary to continue ensuring the working condition of the link. In fact, signal cancellation cannot be accomplished anymore if an MPR-e fails. So its corresponding peer at the other end shall be muted.

To make this happen, each pair MPR-e H and V has a real-time communication always running which makes each MPR-e aware of its mate status. As an example, when remote MPR-e H fails, remote MPR-e V detects the anomaly and advertises through the radio link the counterpart MPR-e V. Then, local MPR-e V alerts its mate (local MPR-e H) requesting to mute its transmitter.

Figure 3.64 — Auto TX mute in XPIC configuration



3.10.8.8 — 1+1 Hot StandBy for MPR-e

When protection is switched in 1+1 HSB configuration, the spare ODU module is squelched.

3.10.8.8.1 — HSB Switching Criteria

The switching criteria are:

- MPT Access Card Fail status
- IDU-ODU Connection Failure
- ICP alarm
- Incompatible Shifter alarm
- Incompatible Frequency alarm
- Incompatible Power alarm
- Incompatible Modulation Parameters alarm
- Mated MPT Access card Failure
- Inter-MPT coupling link failure. Where there is a cross configuration (EPS on Spare & TPS on main), HSB (TPS) will switch and align with EPS position, if there is an inter-MPT coupling link failure.

3.10.8.9 — Link identifier

The number of microwave links, especially in urban areas, might cause interference during installation and the turn-up phase.

The digital frame incorporates link identity coding capabilities to prevent the capture of an unwanted signal.

If a “Link Identifier Mismatch” occurs all traffic is dropped.

The Link identifier management function can be enabled or disabled by the management system.

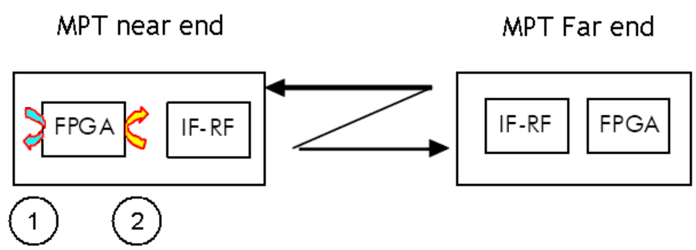
3.10.8.10 — Loopbacks

To facilitate installation/commissioning and remote maintenance, two loopbacks are available.

As the activation of a loopback affects traffic, the presence of a loopback is indicated to the management systems as an abnormal condition.

The supported loopbacks are shown in Figure 3.65.

Figure 3.65 — Available loopbacks



The following loopbacks are provided by the MPT-HC/HC-HQAM/MC/XP/XP-HQAM:

- Line Side loopback: this loopback routes data from the output of the Tx Data Awareness block (after compression) to the input of the Rx data awareness block (decompression). This is an internal loopback.
- It is a Loop and Continue loopback. It is possible to enable this loopback only at aggregate level.

  When this loopback is activated, the behavior is as follows:

    - TDM2TDM and TDM2ETH flows are forwarded back to the MSS-1c or Ethernet generic Device with the source and destination MAC addresses swapped. For TDM2ETH flows, the loopback works only if the ECID Tx and ECID Rx are the same. If the ECID Tx is different from the ECID Rx, the loopback does not work.
    - Generic Ethernet flows are dropped. (This includes the ETH2ETH flows).
- Radio facing loopback: this remote loopback allows an over-the-air loopback test to be performed when the modem is operating in a continuous mode.

  The loopback connects the Receive data interface to the Transmit data interface.

  This loopback is a Loop and Continue loopback. It is possible to enable this loopback only at aggregate level.

  When this loopback is enabled, the behavior is as follows:
    - TDM2TDM and TDM2ETH flows are looped back with the source and destination MAC addresses swapped. For TDM2ETH flows, the loopback works only if the ECID Tx and ECID Rx are the same. If the ECID Tx is different from the ECID Rx, the loopback does not work.
    - Generic Ethernet flows are dropped.

3.10.8.11 — Loopback activation

The loopback can be activated by locally or remotely. The activation command also defines the duration of the loopback (time-out).

The time-out period starts at the activation time and automatically expires in the NE at the end of the period, unless another reconfiguration of the time-out period is requested at the operator interface during the activation time. If the loopback is still active because the activation time-out is not expired yet, the time-out period is reconfigurable and the specified time range starts again from the new updated activation date, overwriting the previous activation date and time-out values.

After the NE reset, the activation of each loopback is disabled and must be recreated again if needed, starting with a new time-out period.

3.10.8.12 — Loopback life time

In order to avoid the risk of a permanent disconnection from MCT/NMS of a remote NE after the execution of a loopback, a time-out mechanism is supported.

The management system's operator has to provide the time range of the loopback time-out period expressed in hours/minutes starting from the time of the loopback activation.

A default time-out period may be suggested at the operator interface, even if it could be modified on user-needs basis.

After the NE reset, the activation of each loopback point is lost and must be recreated again if needed, starting with a new time-out period.

3.10.8.13 — MPR-A: Unlicensed radio for 9558HC

The JF6-9558HC/6933B-9558HC (9558HC) unlicensed radio provide fast deployment of service with microwave radio. No license and small antennas (no FCC and Industry Canada (IC) requirements) allow immediate Turn-Up. The 9558HC unlicensed radio can not be upgraded to licensed.

Note: Changes or modifications not expressly approved by Alcatel-Lucent could void the authority to operate the JF6-9558HC/6933B-9558HC unlicensed radio.

Note: Installation, Turn-Up, Maintenance, and Operation Instruction supplied with the JF6-9558HC/6933B-9558HC unlicensed radio require strict adherence for continued part 15 of the FCC Rules and IC RSS-210 compliance.

Table 3.43 — Unlicensed radio

Transceiver	FCC ID	Industry Canada ID
9558HC	JF6-9558HC	6933B-9558HC

See the Equipping Options Drawing for unlicensed radio configurations and equipping options, found in the *Alcatel-Lucent 9500 MPR-A Engineering Support Documentation*.

The 9558HC unlicensed radio operate in the 5725-5850 Information, Scientific, and Medical (ISM) band in accordance with FCC Part 15.247 and IC RSS-210. This unlicensed radio, although operating in the same band as a spread spectrum radio, operates using narrower bandwidths than spread spectrum. Advantages, disadvantages, and antenna recommendations for the unlicensed radio follow:

Advantages:

- Fast installation and Turn-Up
- Between 6.6 — 185 Mb/s user configurable data payload capacity consisting of a combination of DS1, DS3, and/or Ethernet traffic
- Field expandable to higher capacities.
- Common network management with licensed radios.
- Common spares and training with licensed radios

- Adaptive Modulation - automatic interference countermeasures

Disadvantages:

- Interference from other 5725-5850 ISM band transmissions are possible
- Operating restrictions
- 5.725 to 5.850 GHz band
- Performance could deteriorate due to interference as the frequency band becomes congested.

Antenna recommendations:

- Frequency – 5.8 GHz
- Size and Type – 2, 4, 6, 8, or 10 foot parabolic; 1 or 2 foot flat panel.
    - Parabolic antennas, See 5.8 GHz unlicensed antenna options.
    - Flat antennas, See 5.8 GHz unlicensed antenna options.
- Gain and 3 dB Beamwidth

This device has been designed to operate with the antennas listed below, and having a maximum gain of 42.5 dB. Antennas not included in this list or having a gain greater than 42.5 dB are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

Table 3.44 — 5.8 GHz unlicensed antenna options

PARABOLIC	FLAT
9558HC	**9558HC**
2 ft parabolic - 29 dB/6°	1 ft flat panel - 23 dB/9°
4 ft parabolic - 35 dB/3°	2 ft flat panel - 28 dB/3.5°
6 ft parabolic - 38 dB/2°	—

These antennas can only be used in a fixed point-to-point configuration.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p) is not more than that permitted for successful communication.

The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 12 meters from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

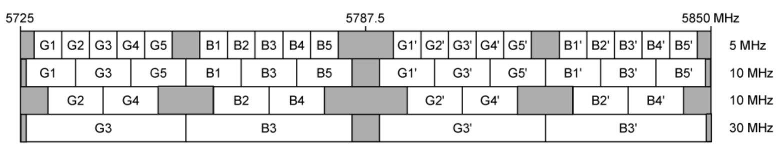
Danger: Danger of public exposure to long term RF radiated energy. When using a 1 ft flat panel antenna with a 1 watt (+30 dBm) output power, the antenna must be located in an area that does not allow the general population access to within 12 meters (5.8 GHz) of the antenna.

Frequency Plan: For 9558HC frequency plan for the 5.725 and 5.850 GHz unlicensed band, refer to Figure 3.66.

Output Power: A requirement of operating in the unlicensed band is to limit transmit output power to not more than +30.0 dBm at the antenna port. It is the responsibility of the user to transmit not more than +30.0 dBm.

Note: To meet FCC part 15 requirements, output power for 30 MHz 4QAM and 8QAM channels must not be provisioned greater than 24 dBm. This is not enforced by the user interface and is the responsibility of the operator to guarantee provisioning of the radio transmit power. For transmit power specification, refer to the System Application Rules document, found in the *Alcatel-Lucent 9500 MPR-A Engineering Support Documentation*.

Figure 3.66 — Frequency plan 9558HC: 5.725 to 5.850 GHz unlicensed band (FCC Part 15 and IC RSS-210)



Transmit Channel	Frequency MHz	Receive Channel	Frequency MHz
G1	5730.5	G1'	5794.5
G2	5735.5	G2'	5799.5
G3	5740.5	G3'	5804.5
G4	5745.5	G4'	5809.5
G5	5750.5	G5'	5814.5
B1	5760.5	B1'	5824.5
B2	5765.5	B2'	5829.5
B3	5770.5	B3'	5834.5
B4	5775.5	B4'	5839.5
B5	5780.5	B5'	5844.5

Notes:

1. The drawing above shows the 5 MHz bandwidth channels used by the JF6-9558HC/6933B-9558HC radio. Gray channels are designated "G". Blue channels are designated "B". Transmit and receive channels have a 64 MHz frequency separation.
2. RF filters are centered on channels G3, B3, G3', and B3'.
3. The flexability of the JF6-9558HC/6933B-9558HC allows any radio to grow to 185 Mb/s without a hardware upgrade.

950-0254-1
041612

3.10.9 — MPR-e standalone IP addresses

3.10.9.1 — NE IP addresses

The NE IP address is a network IP address used to access the MPR-e through the radio and traffic Ethernet traffic port.

This address is configured statically by the operator through the management system.

The default IPv4 address is 10.0.1.2.

The subnet mask is 255.255.255.255 (/32). This mask is fixed and not configurable by the operator.

3.10.9.2 — TMN communication channels

On 9500 MPR Network Element the following types of TMN communication channels are present:

- In-band TMN through the use of any USER port requiring the activation of a user defined VLAN
- TMN-RF allowing the management of a remote NE through radio.
- MSS-1c only: 2 NMS interfaces through the use of VLANs 4085 and 4086 and 2 dedicated RJ45 ports.

3.10.9.3 — TMN-RF

The TMN-RF interface is associated with the radio port and is used to connect the MPR-e to the NE on the other side of the radio link. There are two different selectable modes for this interface: PPP or In-Band.

When an MPR-e is interfacing with any NE belonging to the MPR family at the other end of a radio link, TMN-RF PPP is required. TMN-RF PPP doesn't have an explicit IP address configuration because it automatically inherits the NE IP address.

When the NE at the other end is a 7705 SAR in Single NE with MPR-e, TMN-RF In-Band is required. As TMN In-Band, this interface requires a unique IP address, a subnet mask and a unique VLAN ID (it cannot be the same as the TMN In-Band VLAN ID). The 7705 SAR must have a similar valid interface within the same subnet with the same VLAN ID as the MPR-e to establish IP connectivity over the radio link.

3.10.9.4 — TMN In-Band

The TMN In-Band interface dedicated to TMN is used to connect the MPR-e NE to the LAN exchanging TMN information through a VLAN mixed with the user Ethernet traffic.

This interface has a local default IP address, and the operator can reconfigure this IP address as a public address.

The IP address of the TMN In-Band interface can be equal to the local IP address (NE IP address).

If the IP address is different from the NE IP address, the TMN In-Band subnet is different from the NE logical subnet calculated by masking the NE IP address with the TMN In-Band subnet mask.

The default address is 192.168.100.1.

The default subnet mask is 255.255.255.0 (/24).

The default TMN In-Band VLAN ID is 4080.

3.10.10 — SAR and MPR-e Single NE IP addresses

When MPR-e is used in Single NE mode with 7705 SAR, MPR-e does not have its own IP address. Conversely, all MPR-e to 7705 SARs are reachable with any SAR IP addresses (IPv4 only).

MPR-e management traffic is handled by SAR routing function like any other IP stream. As a direct consequence, there is no longer a special channel carrying TMN that the MPR-e can explicitly recognize by use of a VLAN ID. Management traffic back and forth from the MPR-e follows the 7705 SAR QoS policy and profile.

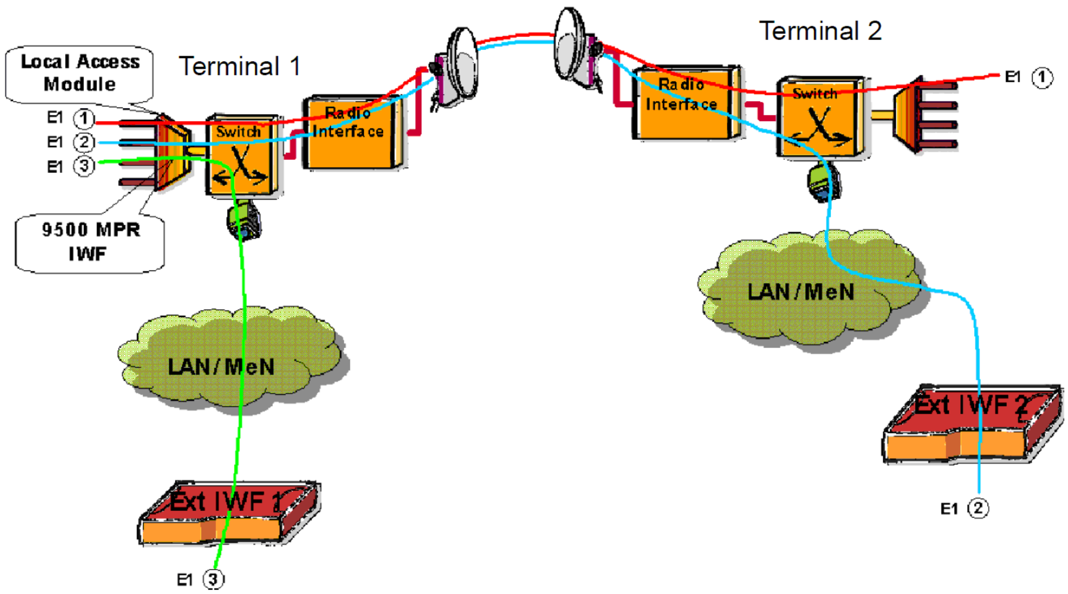
3.10.11 — MSS-1c traffic profiles

Three kinds of traffic profiles have been identified:

- TDM2TDM (9500 MPR → 9500 MPR, internal to an MPR network)
- TDM2Eth (9500 MPR→ TDM to Ethernet)
- MPR-E: ETH2ETH (Ethernet to Ethernet)
- MPR-A: DATA (Ethernet to Ethernet)

The second profile meets MEF8 standard.

Figure 3.67 — Traffic profiles



- **Case 1** In MSS-1c these "Case X" is shown in a graphic.

  The E1 or T1 stream is inserted in Terminal 1 and extracted in Terminal 2. In this case the two IWFs used to packetize the traffic for the Ethernet switch in the MSS-1c are both internal to the 9500 MPR network. The Circuit Emulation Service is TDM2TDM in Terminal 1 and Terminal 2. The Cross connections to be implemented are PDH-Radio type.

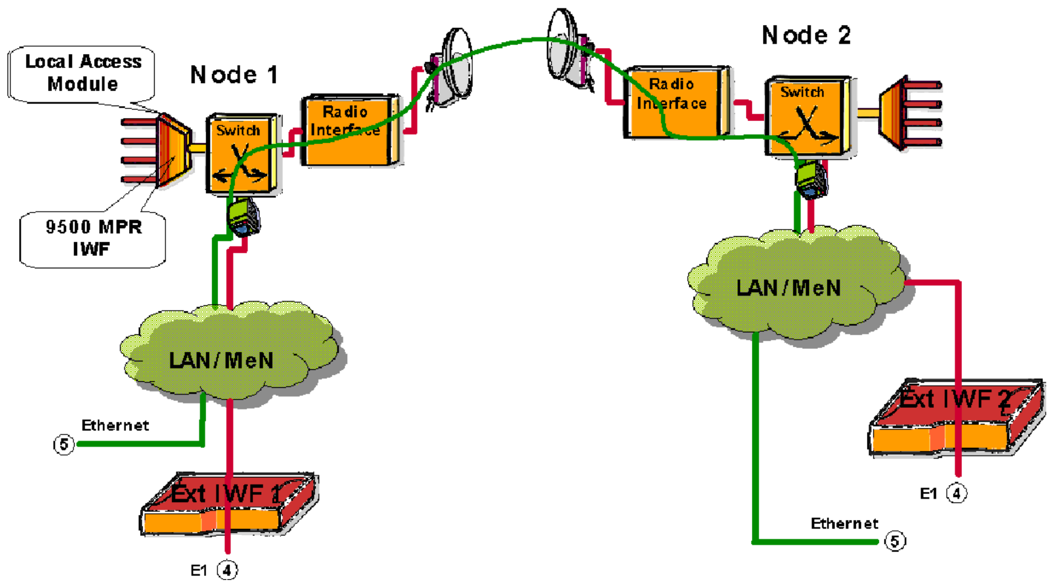
- **Case 2**

  The E1 or T1 stream is inserted in Terminal 1 and extracted in Terminal 2. One IWF is inside the 9500 MPR, but the second IWF is external to the 9500 MPR network. The Circuit Emulation Service is TDM2ETH in Terminal 1 and Terminal 2. The Cross connections to be implemented are PDH-Radio type in Terminal 1 and Radio-Eth type in Terminal 2.

- **Case 3**

  The E1 or T1 stream is inserted/extracted in Terminal 1. One IWF is inside the 9500 MPR, but the second IWF is external to the 9500 MPR network. The Circuit Emulation Service is TDM2ETH in Terminal 1 and Terminal 2. The Cross connections to be implemented are PDH-Eth type in Terminal 1.

Figure 3.68 — Traffic profiles



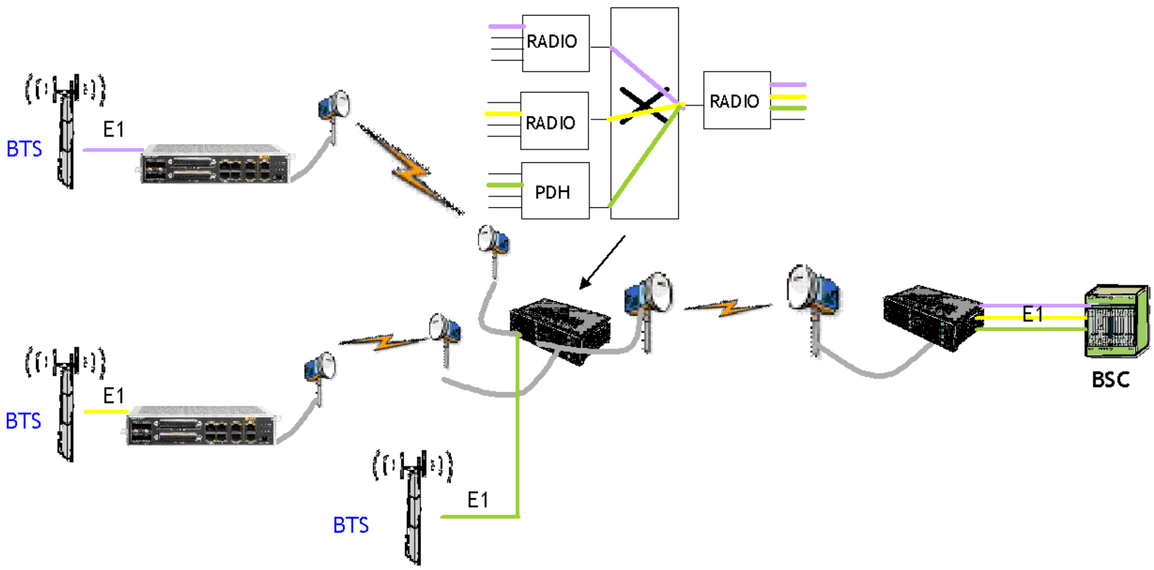
- **Case 4 and 5**

  In these cases Ethernet packets enter Terminal 1 and are extracted in Terminal 2. In case 4 the Ethernet packets encapsulate the E1 or T1 stream; in case 5 the packets are native Ethernet packets. None of the IWFs belongs to the 9500 MPR network. The Circuit Emulation Service is ETH2ETH in Terminal 1 and Terminal 2. No Cross connections must be implemented. The path is automatically implemented with the standard auto-learning algorithm of the 9500 MPR Ethernet switch.

3.10.11.1 — TDM2TDM

E1 or T1 traffic packetized only internally to 9500 MPR equipment. E1 Traffic in TDM2TDM profile shows an example using E1 traffic.

Figure 3.69 — E1 Traffic in TDM2TDM profile



Flow Id present (user defined)

3.10.11.1.1 — Intermediate node configuration (E1 or T1 provisioning):

- node by node (building Cross-connection tables based on Flow Id)

Bandwidth guaranteed (according to QoS → Highest Queue Priority association)

No flooding-autolearning necessary

Both the IWFs belong to 9500 MPR and the packets are not supposed to exit the 9500 MPR network.

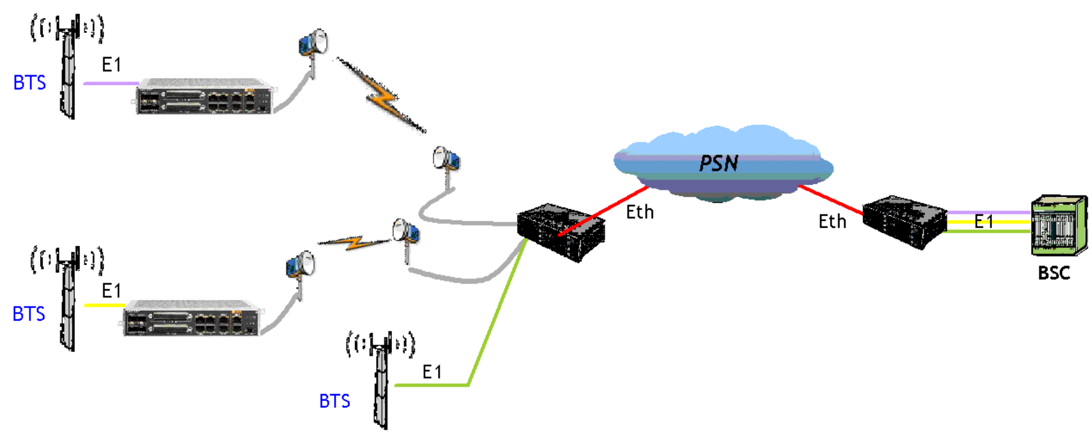
The IWF parameters listed above, have predetermined values and don't need to be provisioned.

- Mac addresses are determined as consequences of the cross connections.
- Payload size is fixed to 121 bytes
- ECID will be the same value as Flow Id (ECID = Emulated Circuit Identifier)
- TDM clock source: clock recovery differential, node timing
- Flow Id provisioned by MCT/NMS

3.10.11.2 — TDM2Eth

E1 or T1 traffic both internal and external to 9500 MPR equipment. Figure 3.70 shows an example using E1 traffic.

Figure 3.70 — E1 Traffic in TDM2Eth profile



Flow Id present (user defined)

All the parameters must be configured compliant with the MEF8 standard

Adaptive or differential clock recovery supported

Bandwidth guaranteed (according to QoS Æ Highest Queue Priority association)

Destination MAC added before going into whole network (MEF8 compliant)

Only one of the IWFs belongs to 9500 MPR and the packets are supposed to exit the 9500 MPR network.

- MAC addresses: in all involved nodes are determined as consequences of the cross connections; the only exception is the Ethernet Terminal Node (the node where the TDM2ETH traffic goes through an user Ethernet port). In such ETN the source address is the node Mac address, the destination Mac address will be provisioned by MCT/NMS.
- Payload size: is fixed to 256 bytes
- ECID: provisioned by MCT/NMS, 2 different values may be used for each direction (ECID = Emulated Circuit Identifier)
- TDM clock source is provisioned by MCT/NMS: clock recovery adaptive, clock recovery differential

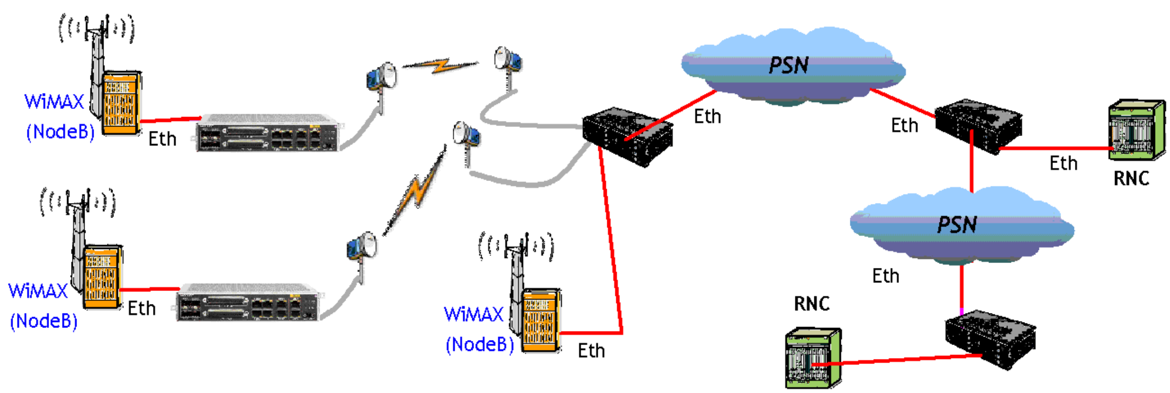
- Flow Id is provisioned by MCT/NMS (One VLAN is assigned to each bi-directional circuit emulated E1 or T1 flow)

3.10.11.3 — ETH2ETH

None of the IWFs belongs to 9500 MPR.

None of the parameters listed in the previous section has to be configured (the 9500 MPR is transparent). Figure 3.71 shows an example using E1 traffic.

Figure 3.71 — E1 Traffic in ETH2ETH (DATA) profile



3.10.12 — MSS-1c Ethernet traffic management

The Ethernet traffic is all the traffic entered the MPR network from user Ethernet ports.

By MCT/NMS it is possible to define the way to manage the Ethernet traffic according to one of the following options:

- 802.1D (MAC Address bridge)
- 802.1Q (Virtual Bridge)
- 802.1ad (QinQ)

3.10.12.1 — Bridge type change

In case of change of the bridge type, a new configuration file must be sent to the NE (or an old file can be used).

3.10.12.2 — Reserved multicast addresses

Table 3.45 summarizes the actions taken for specific reserved multicast addresses. Frames identified with these destination addresses are handled uniquely since they are designed for Layer 2 Control Protocols.

The actions taken by the system can be:

- Discard - The system discards all ingress Ethernet frames and must not generate any egress Ethernet Frame carrying the reserved multicast address.
- Forward - The system accepts all ingress Ethernet frames as standard multicast frames and forwards them accordingly.
- Peer - The system acts as a peer of the connected device in the operation of the relevant Layer 2 Control Protocol.

Table 3.45 — Actions taken for specific reserved multicast addresses

Reserved Multicast Address	Function	Action
01-80-C2-00-00-00	Bridge Group Address	Forward
01-80-C2-00-00-01	Clause 31 (MAC Control) of IEEE 802.3	Flow-Control enabled: Peer Flow-Control disabled: Discard
01-80-C2-00-00-02	Clause 43 (Link Aggregation) and Clause 57 (OAM) of IEEE 802.3 (used by SSM management)	Peer for Link Aggregation and ESMC Discard for OAM
01-80-C2-00-00-03	IEEE 802.1X PAE address	Discard
01-80-C2-00-00-04 - 01-80-C2-00-00-0D	Reserved for future standardization	Discard
01-80-C2-00-00-0E	IEEE 802.1AB LLDP multicast address	Discard
01-80-C2-00-00-0F	Reserved for future standardization	Discard
01-80-C2-00-00-10	All LANs Bridge Management Group Address	Forward
01-80-C2-00-00-11 - 01-80-C2-00-00-1F	Reserved	Forward
01-80-C2-00-00-20	GMRP Address (Clause 10 of IEEE 802.1D)	Forward
01-80-C2-00-00-21	GVRP Address (IEEE 802.1Q)	Forward

Table 3.45 — Actions taken for specific reserved multicast addresses

Reserved Multicast Address	Function	Action
01-80-C2-00-00-22 - 01-80-C2-00-00-2F	Reserved for GARP Application	Forward
01-80-C2-00-00-30 - 01-80-C2-00-00-3F	CCM and LTM Group Destination MAC Addresses (IEEE 802.1ag)	Peer/Forward

3.10.13 — Quality of service (QoS)

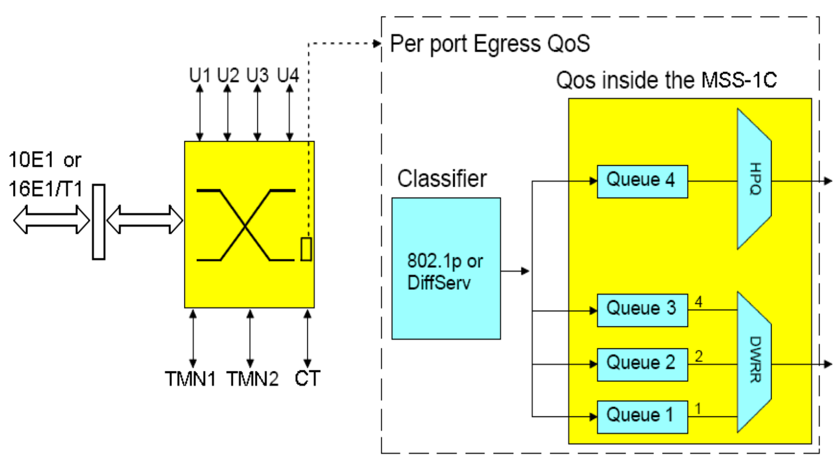
The QoS function inside 9500 MPR is the result of a distributed implementation in the MSS-1c switch, if present, and in the MPT.

The QoS functions must be properly configured in order to achieve the required behavior on Ethernet flows that will be transmitted.

3.10.13.1 — QoS in the MSS-1c

Figure 3.72 shows an overview of the QoS implementation inside the switch.

Figure 3.72 — QoS in the MSS-1c



The Quality of Service feature of the Ethernet switch provides 4 internal queues per port to support different traffic priorities. Typically the high-priority traffic experiences less delay than that low-priority in the switch under congested conditions.

For each egress port according to method of QoS classification configured in the switch, the packets are assigned to each queue.

3.10.13.1.1 — TDM flows classification

All the TDM traffic flows will be assigned to the highest egress priority queue (Q4).

3.10.13.1.2 — Ethernet flows classification

For generic Ethernet flows in the switch the priority of each packet can be assigned according to the information in:

- IEEE 802.1p: the packet is examined for the presence of a valid 802.1P user-priority tag. If the tag is present the correspondent priority is assigned to the packet

Table 3.46 — IEEE 802.1p classification

802.1P priority	Queue
110, 111	Q3 (high priority)
100, 101	Q2
000, 001, 010, 011	Q1

- DiffServ: each packet is classified based on DSCP field in the IP header to determine the priority.

Table 3.47 — DiffServ classification

DiffServ priority	Queue
111000, 110000, 101110, 101000	Q3 (high priority)
100110, 100100, 100010, 100000 011110, 011100, 011010, 011000	Q2
All remaining values	Q1

3.10.13.1.3 — Scheduler

The scheduler algorithm cannot be configured. HQP scheduler algorithm is used on queue Q4.

Deficit Weighted Round Robin (DWRR) is used on the other queues with the following weights:

Table 3.48 — DWRR classification

QUEUE	WEIGHT
Q3 (high priority)	4
Q2	2
Q1	1

3.10.13.1.4 — QoS with jumbo frame

While there is no physical limitation to the number of ports that can receive jumbo frame, if to many jumbo flows are transmitted toward the same port into two different queues the QoS could work in wrong way. It is recommended to forward jumbo frame only in queue Q1 (lower priority).

3.10.13.2 — QoS in the MPT

Figure 3.73 and Figure 3.74 shows an overview of the QoS implementation inside the MPT.

Figure 3.73 — QoS in the MPT with MSS-1

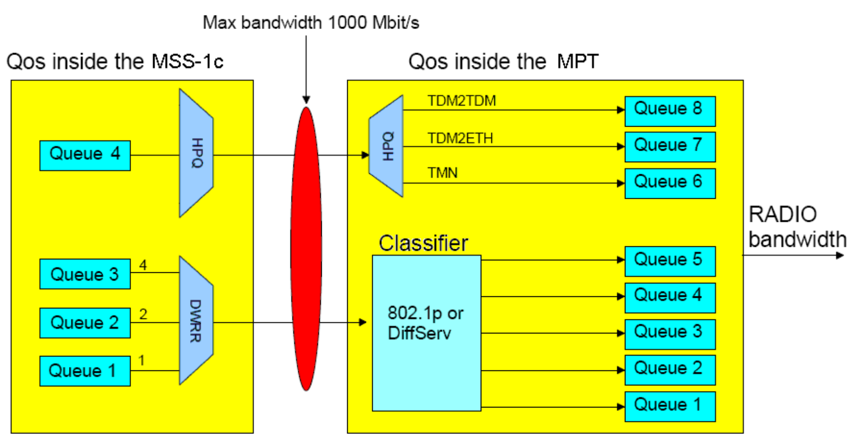
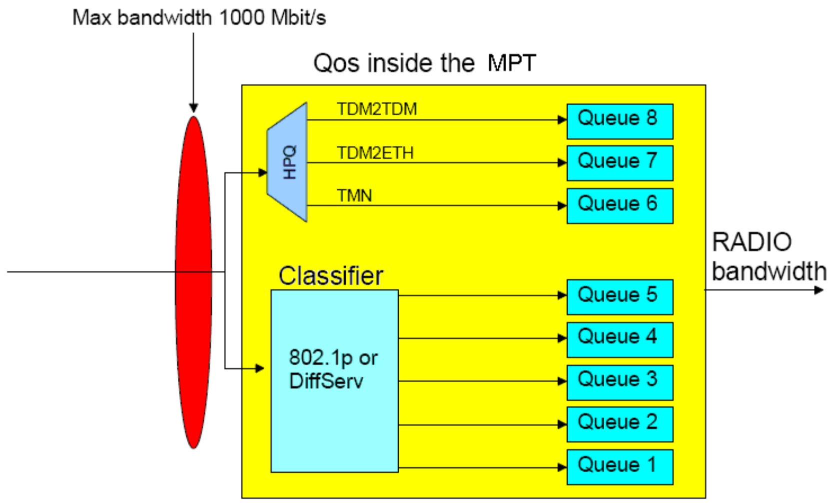


Figure 3.74 — QoS in the MPT for MPR-e



The QoS feature provides eight internal queues to support different traffic priorities. The QoS function assigns the packet to one of the eight egress transmit queues.

- Queue 8 is assigned to TDM2TDM traffic (not used for MPR-e in the current release)
- Queue 7 is assigned to TDM2Eth traffic
- Queue 6 is assigned to TMN

Queues 1 to 5 are assigned to Ethernet traffic according to the information inside the packet as 802.1p field, DiffServ field or Ethertype (MPR-e only).

All the MEF-8 ETH2ETH traffic flows in MPR-e are assigned to the Q5 egress priority queue.

3.10.13.2.1 — QoS based on IEEE std. 802.1p

When the 802.1p QoS mechanism is adopted, the reference is the standard “IEEE 802.1D-2004 Annex G User priorities and traffic classes”, which defines eight traffic types and the corresponding user priority values.

In the Radio Interface module for generic Ethernet traffic, there are five egress queues; therefore, the mapping of the 802.1p value to a queue is as shown in

Table 3.49 — QoS based on 802.1p priority

802.1p priority	Queue
111, 110	Q5 (higher priority)

Table 3.49 — QoS based on 802.1p priority

802.1p priority	Queue
101	Q4
100	Q3
011, 000	Q2
010, 001	Q1

3.10.13.2.2 — QoS based on DiffServ

Table 3.50 — QoS based on DiffServ priority

DiffServ priority	Queue
111000, 110000, 101110, 101000	Q5 (higher priority)
100110, 100100, 100010, 100000	Q4
011110, 011100, 011010, 011000	Q3
010110, 010100, 010010, 010000 001010, 001100, 001010, 001000, 000000	Q2
All remaining values	Q1

3.10.13.2.3 — Scheduler

The HQP (High Queue Preempt) scheduler algorithm is used on Q8, Q7 and Q6.

The other five queues can be selected by the MCT HQP for MPR-e, or the DWRR (Deficit Weighted Round Robin) algorithm.

If the DWRR algorithm will be used, the weight to be assigned to each queue can be configured using the MCT.

By default, the DWRR algorithm is used with the following weights:

Table 3.51 — Default weights

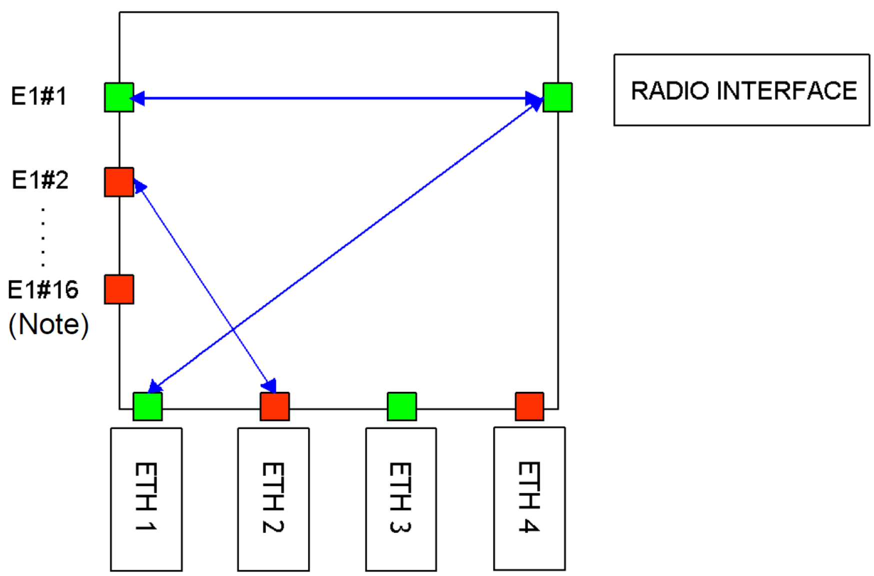
Queue	Weight
Q5 (higher priority)	16
Q4	8
Q3	4

Table 3.51 — Default weights

Queue	Weight
Q2	2
Q1	1

3.10.14 — MSS-1c cross-connections

Figure 3.75 — Cross-connection



Note: Max #10 or #16 depending on the MSS-1C variant.

The cross-connections are realized with a Layer-2 Ethernet Switch inside the MSS-1c.

The decision made by the switch to forward the received packet is based on the destination MAC address.

3.10.14.1 — E1/T1 cross-connection

Each E1 or T1 can be cross connected independently.

E1 or T1 can be cross connected to any of the following ports:

- Radio port (Figure 3.76)
- Ethernet port (Figure 3.77)

Each E1 or T1 must be associated to a unique signal flow ID.

Figure 3.76 — E1/T1 from/to radio port

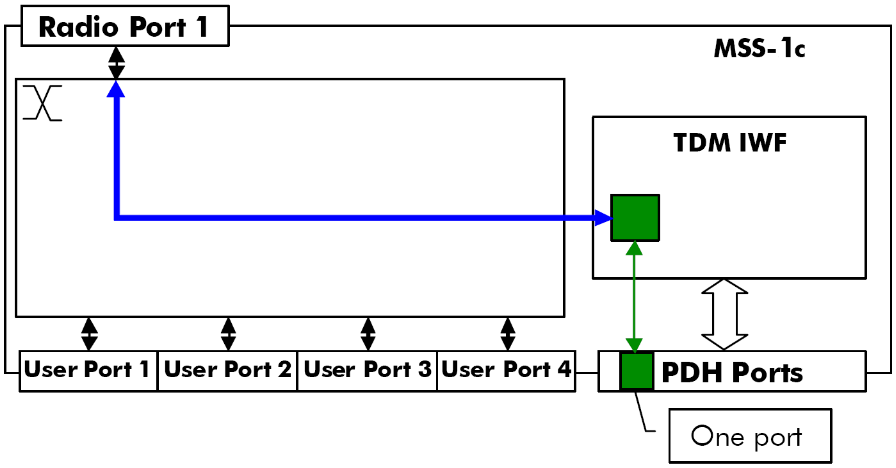
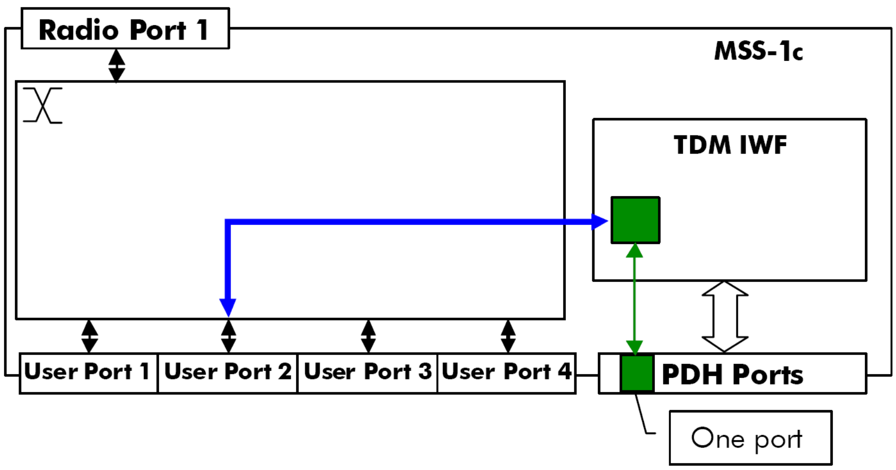


Figure 3.77 — E1/T1 from/to Ethernet port



Typical use of the E1 or T1 from/to Ethernet port is in case of two co-located MSS-Access to expand the number of PDH ports for the other radio direction.

Note: To configure these cross-connections a connected MPT is needed.

3.10.14.2 — Ethernet flows

All flows different from the TDM2TDM and TDM2ETH ones are managed as the standard Ethernet packets:

- if 802.1D is enabled, only the destination address is considered to route the packets.
- if 802.1Q is enabled, the related management is performed looking the C-VLAN and then, according to the destination address, each packet is switched to the correct port: radio, user Ethernet or E1
- if 802.1ad (Q in Q) is enabled, the related management is performed looking the S-VLAN and then, according to the destination address, each packet is switched to the correct port: radio, user Ethernet or E1.

The bandwidth assigned globally to the radio interface to the Ethernet traffic is the consequence, with a given radio capacity, of the number of E1 cross-connected on the radio interface. Hence the available bandwidth for Ethernet flows will be the configured radio bandwidth decreased by the bandwidth used by each TDM2TDM and TDM2ETH.

3.10.15 — Synchronization

3.10.15.1 — Synchronization overview for MSS-1c

TDM data flow is fragmented and the fragments are transmitted over a Packet Switched Network (PSN);

The received fragments need to be reassembled in the original TDM data flow at the “original bit rate”

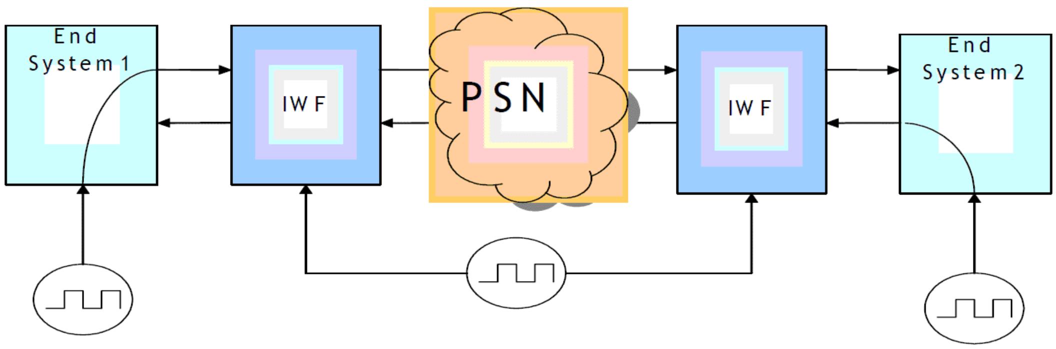
Two main methods can be used to recover at the Rx site, the original bit rate:

- **Differential clock recovery with or without the node timing:** recalculation of the original clock based on the time delta with respect to a reference clock that is available at both Tx and Rx site (**Differential**: used in case of clock distribution on the whole network. It’s more reliable than Adaptive; also used in TDM2TDM traffic (MPR to MPR)). This method can be selected for each E1 stream.

- **Adaptive clock recovery with or without the node timing**: based on the average rate at which the packets (fragments) arrive at Rx site (Adaptive: simpler network, but performances depends on the PDV (Packet Delay Variation) in the Network. Always used when the reference clock isn't distributed on the whole network). This method can be selected for each E1 stream for TDM2Eth only.

Note: In meshed networks (rings) do not close the synchronization configuration.

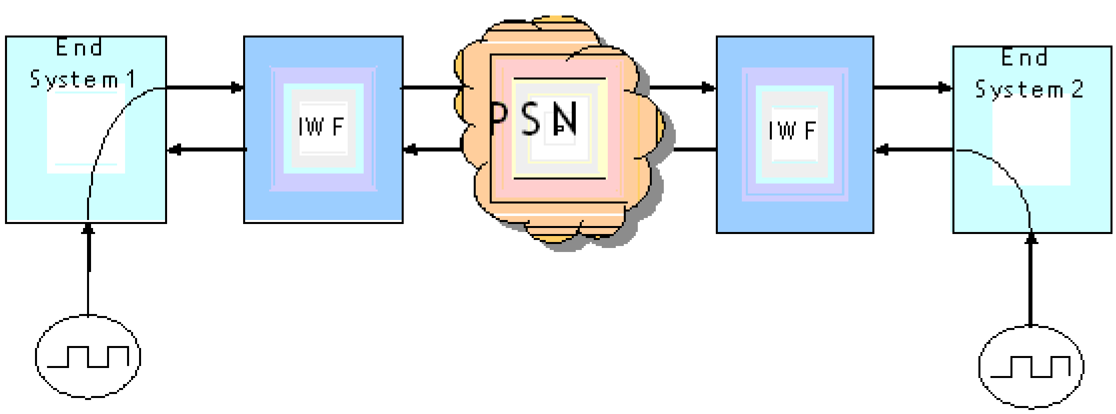
3.10.15.1.1 — Differential clock recovery



A common reference clock is available at both Ends.

The IWF system, at Rx side, generates the output clock based on RTP TimeStamps which are sent together with each Fragments.

3.10.15.1.2 — Adaptive clock recovery



A common reference clock is NOT available at both Ends.

The IWF system, at Rx side, generates the output clock based on data arrival rate: TDM clock is slowly adjusted to maintain the average fill level of a jitter buffer at its midpoint.

3.10.15.1.3 — Node timing

The **Node timing** is timing from the network clock as defined in G.8261. When it is selected the regenerated E1 at receiver side is synchronized to the network element clock (NEC). This method can be selected for each E1 stream.

At MSS-1c level, all the “Node Timed” TDM flows:

- will egress the MSS-1c with the same clock (the MSS-1c NEC);
- MUST ingress the MSS-1c being synchronized by the same clock.

As for any synchronisation clock transmission, the user shall particularly take care to avoid synchronisation loop and TDM traffic hits:

- or the MSS-1c is the master clock and the external equipment must recover its own clock from one of the “node timed” TDM flows and use this recovered clock to generate its TDM flows;
- or the external equipment is the master clock (i.e. it generates all its TDM flows by using its internal clock) and the MSS-1c MUST use one of the “node timed” ingressing TDM flows as clock source for its NEC;
- or both of the MSS-1c and external equipment MUST be synchronized by the same clock if this clock comes from another equipment.

3.10.15.1.4 — Synchronization for MSS-1c

Each Network Element must have a reference clock (NEC), which will be distributed to each circuit of the NE. Such clock is a 25 MHz generated in the MSS-1c in the Clock Reference Unit (CRU) function.

The NEC is locked to a Synchronization Source.

The sources can be:

- Internal Local Oscillator. It is the clock provided by the Local Oscillator inside the NE
- Any E1/T1 available at input traffic interfaces (the specific E1/T1 port has to be chosen)
- The Symbol Rate of the Rx signal of the Radio direction

- SynchE: Any Synchronous Ethernet clock source available at enabled User Ethernet traffic interfaces (both electrical and optical), configured in synchronous operation mode (the User Ethernet ports, SynchE compatible, are given in Ethernet user interface). From ITU-T G.8264 point of view, the MSS is a Synchronous Ethernet equipment equipped with a system clock (NEC).

  A User Ethernet interface configured in synchronous operation mode can work only at 1 Giga. In the particular case of electrical User Ethernet interfaces, these interfaces perform link auto negotiation to determine the master and slave clocks for the link. The clock slave role must be configured as part of auto negotiation parameters in order to use the interface as Synchronous Ethernet clock source.

Some rules have to be followed while configuring the Primary and Secondary clock sources.

All the NECs have to be configured as Master or Slave.

Only one Master is allowed in the network.

- If Master,
  - The Restoration Mode can be Revertive or Not Revertive. If the mode is Revertive, when a failed source becomes available, the switch goes back.
  - The Primary sources must be chosen among 1), 2) or 4).
    - depending on master primary selection, the Master Secondary Source must be selected among 1), 2) or 4).
- If Slave,
  - The Restoration Mode is fixed to Revertive.
  - The Primary Source must be chosen between 3) or 4)
  - The Secondary Source can be chosen among 1), 2) or 4).

For each available sync source, the CRU detects the signal Degrade Alarm on each available sync source. Such Signal Degrade alarm raises also in case of muted (missing) clock.

The Signal Degraded Alarm relevant to the selected Synchronization Source, or the relevant circuit Fail, causes the switching of the Synchronization Source.

3.10.15.2 — Synchronization for MPR-e standalone and 7705 SAR

In case of optical interface between MPR-e standalone and 7705 SAR, standard SynchE shall be used. On the contrary, when copper interface is selected, synchronization must be provisioned for PCR between the MPR-e and a microwave port on the 7705 SAR.

On the 7705 SAR side, PCR is always turned on automatically when a microwave link is enabled on an MWA RJ-45 port or copper SFP is used.

On the MPR-e side, the MPR-e that is connected to the 7705 SAR-8 or 7705 SAR-18 must have PCR enabled and the source and destination MAC addresses of the 7705 SAR-8 or 7705 SAR-18 must be configured as shown in

Table 3.52 — 7705 SAR PMC card MAC addresses

SAR slot #	PMC port #	Source MAC address	Destination MAC address
1	1	00-80-9F-09-F1-11	00-80-9F-09-F1-01
	2	00-80-9F-09-F1-21	
	3	00-80-9F-09-F1-31	
	4	00-80-9F-09-F1-41	
2	1	00-80-9F-09-F2-12	00-80-9F-09-F2-02
	2	00-80-9F-09-F2-22	
	3	00-80-9F-09-F2-32	
	4	00-80-9F-09-F2-42	
3	1	00-80-9F-09-F3-13	00-80-9F-09-F3-03
	2	00-80-9F-09-F3-23	
	3	00-80-9F-09-F3-33	
	4	00-80-9F-09-F3-43	
4	1	00-80-9F-09-F4-14	00-80-9F-09-F4-04
	2	00-80-9F-09-F4-24	
	3	00-80-9F-09-F4-34	
	4	00-80-9F-09-F4-44	
5	1	00-80-9F-09-F5-15	00-80-9F-09-F5-05
	2	00-80-9F-09-F5-25	
	3	00-80-9F-09-F5-35	
	4	00-80-9F-09-F5-45	
6	1	00-80-9F-09-F6-16	00-80-9F-09-F6-06
	2	00-80-9F-09-F6-26	
	3	00-80-9F-09-F6-36	
	4	00-80-9F-09-F6-46	

Table 3.52 — 7705 SAR PMC card MAC addresses

SAR slot #	PMC port #	Source MAC address	Destination MAC address
7	1	00-80-9F-09-F7-17	00-80-9F-09-F7-07
	2	00-80-9F-09-F7-27	
	3	00-80-9F-09-F7-37	
	4	00-80-9F-09-F7-47	
8	1	00-80-9F-09-F8-18	00-80-9F-09-F8-08
	2	00-80-9F-09-F8-28	
	3	00-80-9F-09-F8-38	
	4	00-80-9F-09-F8-48	
9	1	00-80-9F-09-F9-19	00-80-9F-09-F9-09
	2	00-80-9F-09-F9-29	
	3	00-80-9F-09-F9-39	
	4	00-80-9F-09-F9-49	
10	1	00-80-9F-09-FA-1A	00-80-9F-09-FA-0A
	2	00-80-9F-09-FA-2A	
	3	00-80-9F-09-FA-3A	
	4	00-80-9F-09-FA-4A	
11	1	00-80-9F-09-FB-1B	00-80-9F-09-FB-0B
	2	00-80-9F-09-FB-2B	
	3	00-80-9F-09-FB-3B	
	4	00-80-9F-09-FB-4B	
12	1	00-80-9F-09-FC-1C	00-80-9F-09-FC-0C
	2	00-80-9F-09-FC-2C	
	3	00-80-9F-09-FC-3C	
	4	00-80-9F-09-FC-4C	

Note: Slot 7 TO 12 are applicable to SAR-18 chassis only.

The source and destination MAC addresses can also be summarized by the following formula linked to the slot and port number in HEX:

PMC card source MAC address: 00-80-9F-09-F<slot#>-<port#><slot#>

PMC card destination MAC address: 00-80-9F-09-F<slot#>-0<slot#>

For example, for slot number 4 and port number 2:

Source MAC address = 00-80-9F-09-F4-24

Destination MAC address = 00-80-9F-09-F4-04

3.10.15.3 — Synchronization for MPR-e in Single NE mode with 7705 SAR

The MPR-e can be synchronized via either Optical or Electrical interface supporting one of the following methods:

- SynchE (Synchronous Ethernet) with network clock direction configuration (towards or from the radio) as follows:
  - Optical interface: bidirectional synchronization only
  - Electrical 100 Mb/s: bidirectional synchronization only
  - Electrical 1 Gb/s: selection between Autonegotiation, SyncE IN or SyncE OUT
- PCR (Proprietary Clock Recovery
- The MPR-e can also use its internal reference and discard any external synchronization.

Note: SSM is transparently forwarded in most of the configurations (see the Release Notice for exceptions).

In a Single NE solution no special configuration is required. Both 7705 SAR and MPR-e self-detect the port selected and consequently configure the correct synchronization method.

When copper interface is used either using native RJ-45 or Copper SFP on the PMC (7705 SAR) side, PCR is selected both by MPR-e and 7705 SAR self-assigning right MAC addresses.

When optical interface is used, SynchE is selected by both MPR-e and 7705 SAR.

3.11 — Automatic link discovery

Automatic link discovery allows an MPR equipment (MPR-e, MPR-1c, MSS, 7705 SAR and MPR-e in Single NE mode) to discover and store information about its neighbors. This information is then used by network managers such as 5620 SAM to automatically learn the network topology.

The radio link discovery is performed via an Alcatel-Lucent proprietary Discovery Protocol.

In addition the MPR-e supports automatic link discovery over Ethernet using LLDP.

3.11.1 — LLDP overview

LLDP is a neighbor discovery protocol that defines a method for Ethernet network devices to advertise information about themselves, such as device configuration, capabilities and identification, to directly connect LLDP-enabled devices on the same physical LAN and store the information received from other stations in IEEE-defined Management Information Bases (MIB) modules.

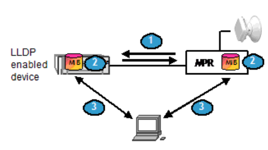
LLDP is a data-link layer protocol operating above the MAC service layer and, as a result, can be used in any networking device that implements a MAC service.

Using LLDP over the User Ethernet interfaces, an MPT in MPR-e topology is able to advertise its own identification information its capabilities and media-specific configuration information and learn the same information from the LLDP-Enabled devices connected to it.

The IEEE 802.1ab Link Layer Discovery Protocol defines a standard way for Ethernet devices to advertise information about themselves to their network neighbors and store information they discover from other device.

Figure 3.78 shows the discovery process.

Figure 3.78 — LLDP



Legend:

1. The MPT and the LLDP enabled device advertise their chassis/port IDs and system descriptions along with other information to each other.
2. The devices store the information they learn about each other in local MIB/databases accessible via SNMP.
3. Network management systems discover the network topology by crawling the NEs and querying the MIB on each device.

3.11.2 — LLDP on MPR-e

By default the LLDP functionality is disabled on the Ethernet user interface. The activation and deactivation of the feature can be done using SNMP or the MCT.

3.11.3 — Transmitting nearest bridge LLDPDUs

The MPR-e originates untagged Nearest Bridge LLDPDUs advertising management information about itself on its LLDP-enabled Ethernet interface.

The MPR-e includes all the optional TLVs in the outgoing Nearest Bridge LLDPDUs:

- portDesc
- sysName
- sysDesc
- sysCap
- Management Address TLV

This is not configurable.

The MPR-e does not originate Nearest non-TPMR and Nearest Customer Bridge LLDPDUs.

3.11.3.1 — Default parameter

The LLDP timers are configured with the default values below and can't be modified.

The following are the default values:

- lldpV2MessageTxInternal = 30 (msgTxInterval)
- lldpV2MessageTxHoldMultiplier = 30 (msgTxHold)
- lldpV2ReinitDelay = 2 (reinitDelay)

- lldpV2NotificationInterval = 30
- lldpV2TxCreditMax = 5 (txCreditMax)
- lldpv2MessageFastTx = 1 (msgFastTx)
- lldpV2TxFastInit = 4 (txFastInit)

The LLDP agent is configured to advertise the NE's public IP address as the local management address. The operator cannot modify this configuration.

If LLDP is activated on the User Ethernet interface, it is enabled for transmission and reception LLDPDUs (Transmit only and Receive only modes are not supported).

3.11.3.2 — SNMP MIB management

These default values are instantiated, with the appropriate scalar object, in the LLDPV2 MIB so that a Network Management System (NMS) could query them.

3.11.4 — Receiving nearest bridge LLDPDUs

The MPR-e terminates the Nearest Bridge LLDPDUs (untagged and tagged).

If the received PDU is identified as a Nearest bridge, then the MPR-e uses the PDU’s content to update its LLDP remote system MIB.

3.11.4.1 — Supported TLVs

Any other optional TLV different from Port Description TLV, System Name TLV, System Description TLV, System Capabilities TLV and Management Address TLV of the received PDU is not managed.

Management Address TLVs containing a Management Address Subtype other than IPv4 (IPV6 is not supported on MPR-e) is not managed and if such a subtype is detected the corresponding entry in the lldpV2RemManAddr SNMP table will not be created.

A non-MPR neighbor may announce several management addresses in its LLDP PDU, even a mix of IPV4 and IPV6 addresses. The MPR-e can store multiple IPV4 addresses; the remaining IPV6 addresses are discarded.

3.11.4.2 — MIB update scenarios

If the neighbor is unknown, that is, no entry exists in the remote systems MIB for that neighbor, the MPR-e creates it.

If the neighbor is known, the MPR-e uses the new information contained in the LLDPDU to replace the existing entry in the MIB. If there are information elements in the existing MIB entry for which there are corresponding elements in the received LLDPDU, then those elements are updated using the received information. Any other information elements in the existing MIB entry are deleted.

3.11.4.3 — Notifying the SNMP manager

When detecting a new neighbor or a neighbor modification, the MPR-e:

1. Sends optics IM (object deletion and object creation) traps to the SNMP manager to notify of the destruction or creation of the LLDP MIB entries and stores these events in its event log.
2. Sends an lldpV2RemTablesChange notification to the manager indicating that something has changed in the LLDP remote systems MIB associated with that neighbor.

3.11.4.4 — Number of supported neighbors at a time

The maximum number of neighbors supported at a time is one.

When a neighbor already exists and a new neighbor is discovered, the information related to the old neighbor is removed from the MPR-e database and the new neighbor takes its place. The management of the Too Many Neighbors condition described in 9.2.7.7.5 of 802.1AB-2009 applies.

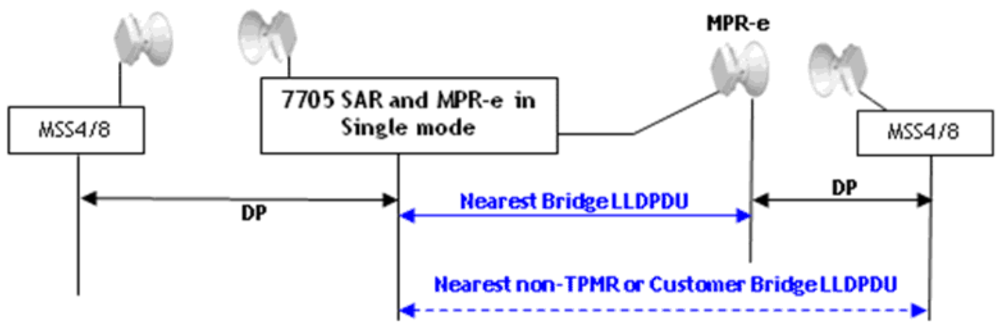
3.11.5 — Transparent relay of nearest non-TPMR bridge and Nearest customer bridge PDUs

Whether its LLDP configuration is enabled or disabled, the MPR-e processes incoming Nearest non-TPMR bridge and Nearest Customer bridge LLDPDUs as data traffic and relays them transparently.

3.11.5.1 — Automatic link discovery scenarios

Figure 3.79 provides an example where Alcatel-Lucent's radio Discovery Protocol and Ethernet user interface LLDP can be used.

Figure 3.79 — Radio discovery protocol and Ethernet user interface LLDP



3.11.5.2 — Displaying Neighbors in the MCT

The MPR-e's radio and Ethernet interface neighbors are visible in the MCT, see NE Neighbors for MPR-e.

4 — NE management by software application

4.1 — Security session management

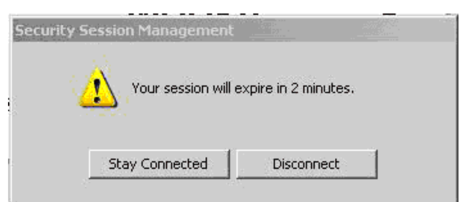
The MCT will close automatically after 30 minutes of session inactivity.

This is not applicable in the following cases:

- When the 15 minutes or 24 hours Performance Monitoring is activated (Normalized, Adaptive or QoS Ethernet)
- When the monitoring of the Power measurements or Modem measurements is activated
- When the an MPR-e is configured in Single NE mode with 7705 SAR

After 25 minutes of idle session, a message dialog will be displayed on the MCT to inform the user about the expiration of the session.The user has 5 minutes to decide to continue or to stop his session. Figure 4.1 shows the expiration message.

Figure 4.1 — Session expiration message

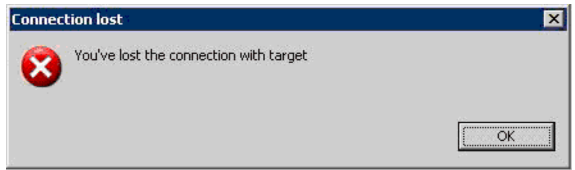


Press the “Stay Connected “button to keep the current session active. The idle period is then restarted.

Press the “Disconnect” button to close the current MCT session.

If no action is done, the MCT will close automatically after the remaining time displayed on the message dialog. Figure 4.2 shows the shutdown message.

Figure 4.2 — Connection lost message



4.2 — WebEML start

This chapter explains all the screens of the **WebEML** (JUSM/CT), which is started by a double click on the WebEML icon on the PC desktop.

The WebEML must be connected to the CT port of the MSS-1c or to the MPR-e Ethernet generic device as explained in the Provisioning chapter.

Refer to Software local copy for information on copying the WebEML from the software package and connecting the PC to the MSS-1c or Ethernet generic device in order to access the MPT-HC/HC-HQAM/MC/XP/XP-HQAM/9558HC.

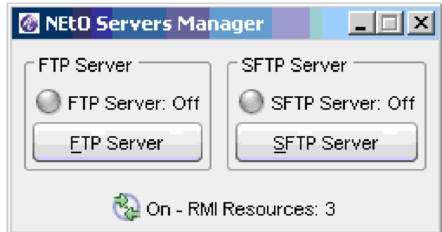
Note: For MPR-e, the PC should be in the same sub-network as the default IP address of the TMN in-band (first connection); see the Maintenance and trouble-clearing chapter for configuration information. If TMN in band is different from the Local NE IP, there also needs to be a route on the PC with the gateway of the TMN in band.

1. To start the **WebEML,** double click on the relevant icon on the PC desktop. See Figure 4.3.

Figure 4.3 — WebEML desktop icon

2. NEtO and NEtO Server Manager open. See Figure 4.4.

Figure 4.4 — NEtO Servers Manager

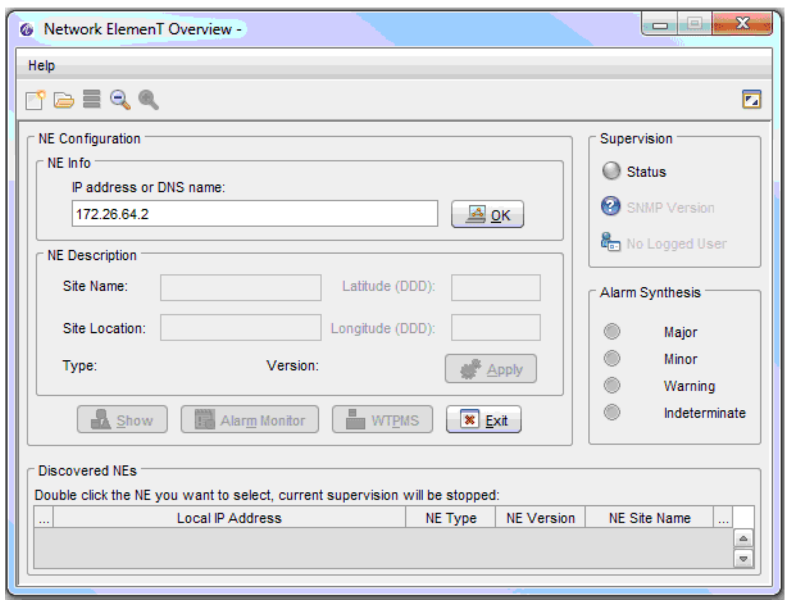


Click on the FTP Server or SFTP Server button to start the FTP server. The Server LED will turn green.

In the example shown in Figure 4.4, three RMI Resources are detected by the NEtO Servers Manager. All three RMI Resources are being managed by the NEtO Servers Manager. This is indicated with the normal status indicator.

3. Check the IP address of the NE (default: 10.0.1.2) and click OK. See Figure 4.5.

Figure 4.5 — NEtO initial screen



Note: For MSS-1c, to access the NE the PC must be configured to “Get automatically an IP address” (DHCP server) and a static route must be added using the command “route add 10.0.1.2 mask 255.255.255.255 192.168.30.1”.

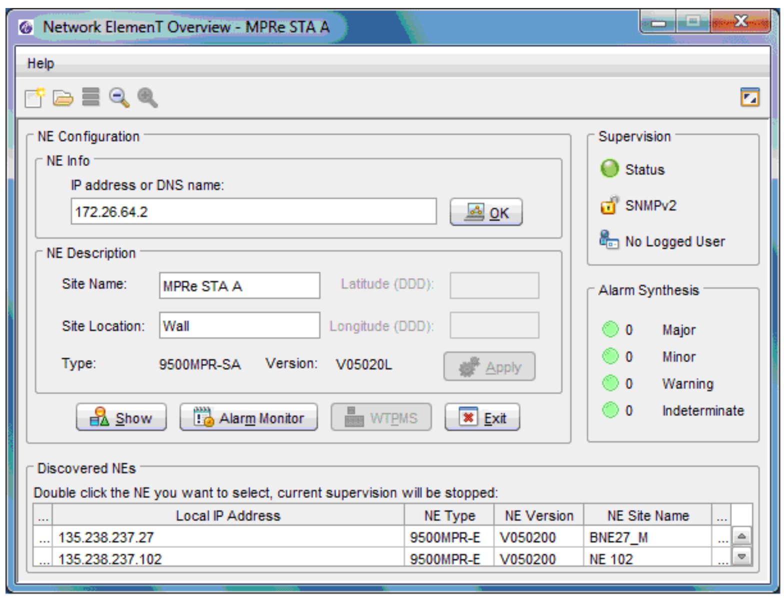
If the NE IP address cannot be retrieved, it is possible to use the local IP address of the CT port of the MSS-1c. This address doesn't need to create a static route.

Without the MPT connected to the MSS-1c, it is not possible to open the WebEML on the CT port from MSS-1c.

If all the WebEML images/icons are missing, check that file msimg32.dll is present in System32.

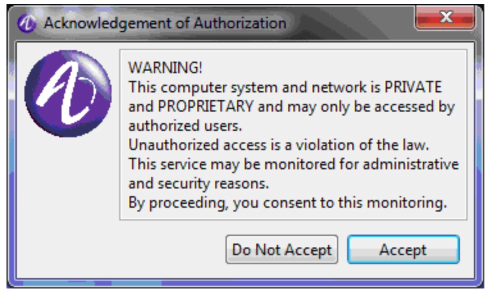
4. When the NE is supervised (LED appears green), click on the **Show** button; see Figure 4.6. The **Main view** appears, as shown in Figure 4.9 for MPR-e and Figure 4.10 for MSS-1c.

Figure 4.6 — NEtO main view with supervised NE



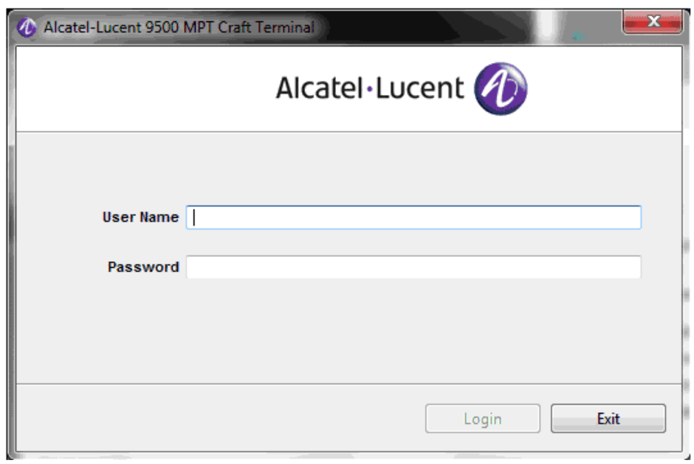
5. A banner appears as shown in Figure 4.7. If you agree to the Acknowledgment of Authorization, click on the **Accept** button.

Figure 4.7 — Consent banner



6. An MPT Craft Terminal (MCT) window opens; see Figure 4.8.

Figure 4.8 — MCT Screen



If no user account is configured, log in as one of the following:

Default Administrator: username Default_Admin, password 9500MPR_alu

Default Craft Person: username Default_Craft, password 9500MPR_craft

Click on the Login button to open the MCT main view.

Figure 4.10 and Figure 4.12 show the Main View of an MPT-HC.

The same screen (and same tabs) will appear with a connection to an MPT-HC-HQAM/MC/XP/XP-HQAM/9558HC. The only difference is the naming.

Figure 4.9 — Main view: system overview for MPR-e

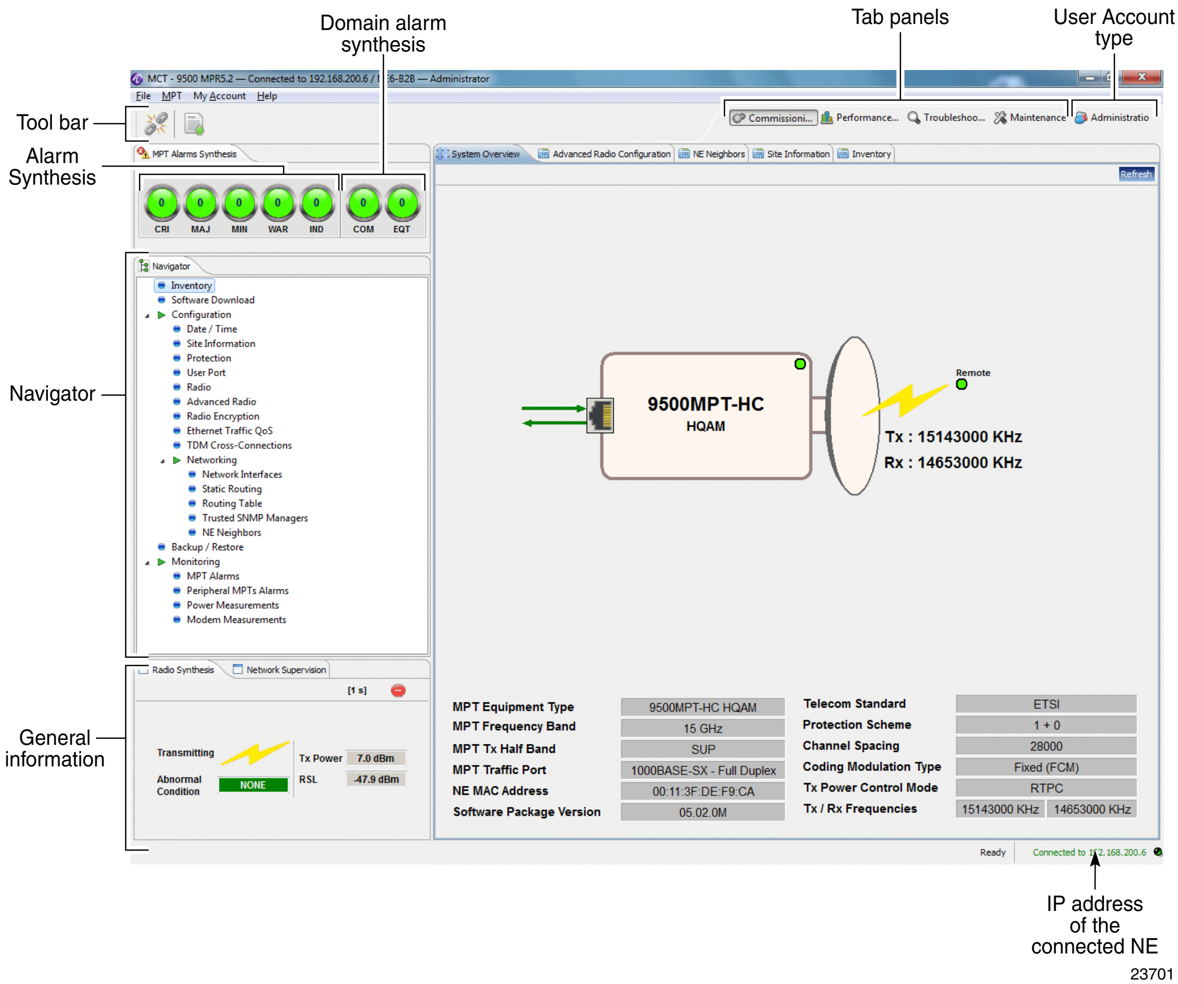
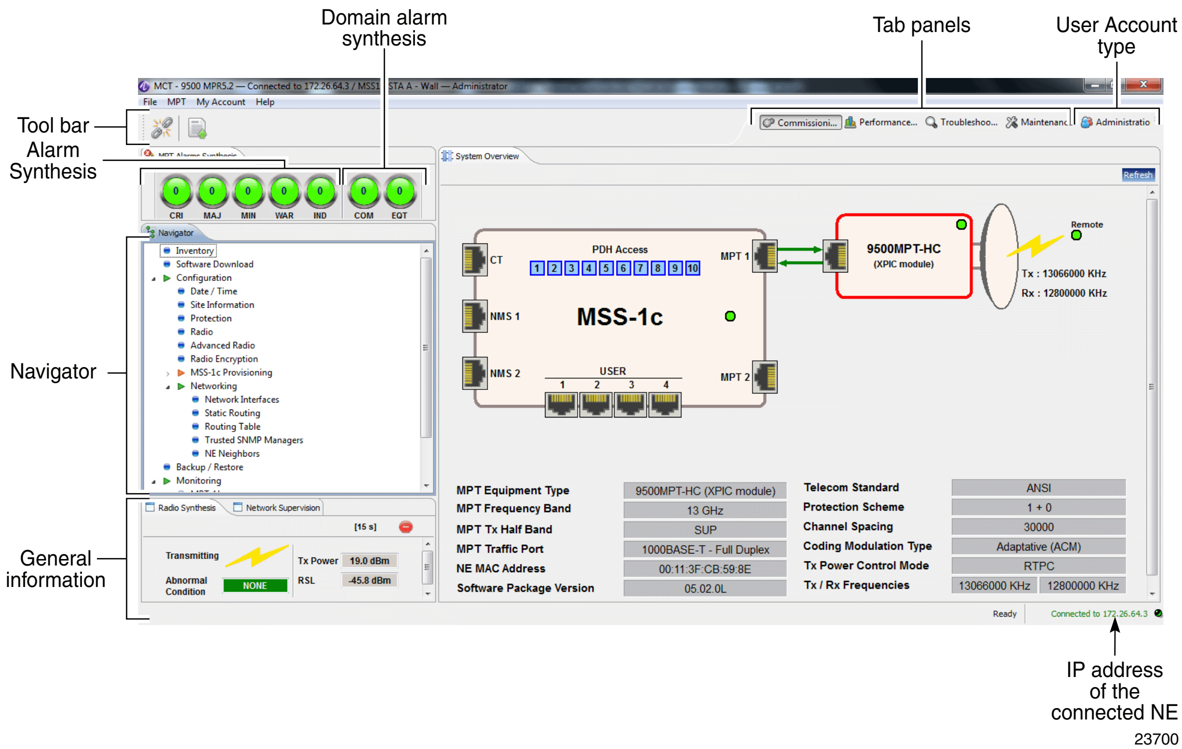
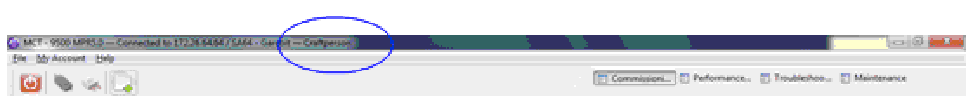


Figure 4.10 — Main view: system overview for MSS-1c



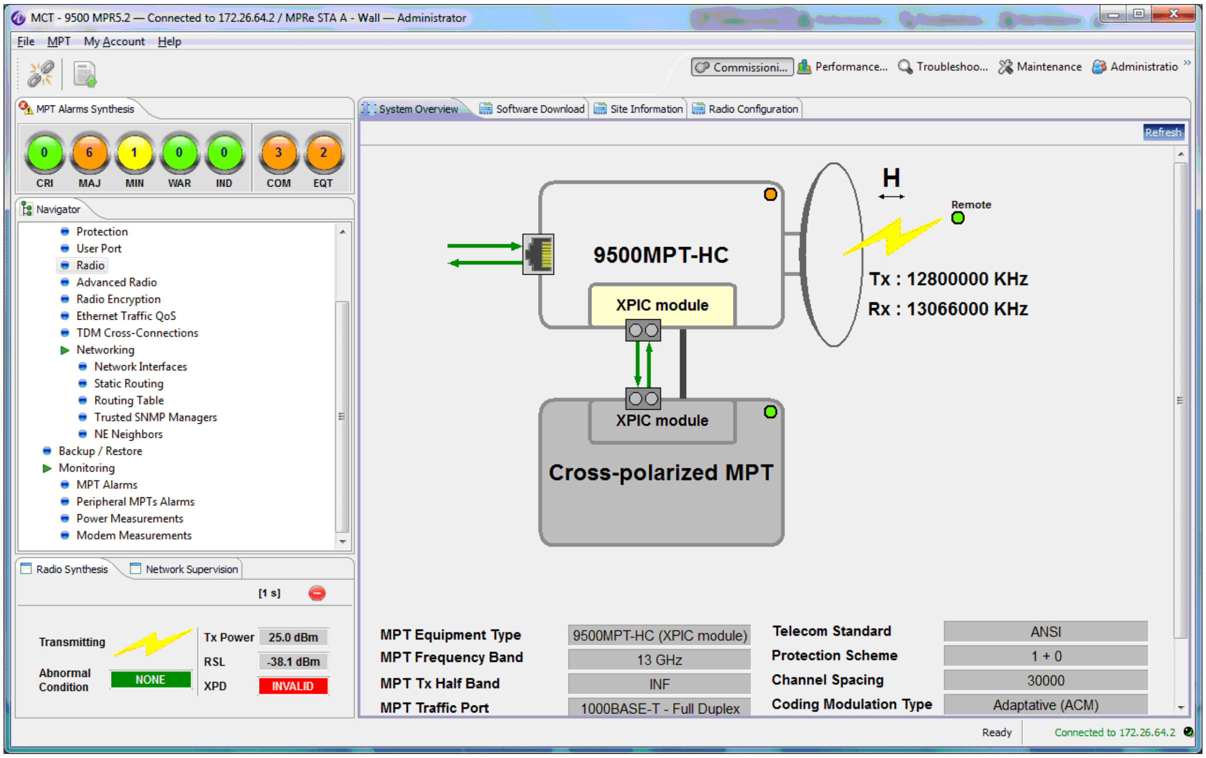
7. Figure 4.11 shows the banner that is displayed for the craft user. The Administration tab and Administrative functions are not available for the craft user.

Figure 4.11 — Craft user banner



Note: If the WebEML is connected to an MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC with the XPIC + RPS external module installed (but with no XPIC feature configured), the screen in Figure 4.12 will appear.

Figure 4.12 — Main view: System overview with MPT-HC V2/MPT-XP with XPIC module



4.3 — 7705 SAR and MPR-e in Single NE: MCT Launcher start

In 9500 MPR R4.1.0, the MCT Launcher is the application that interfaces with the 7705 SAR to show the microwave configuration of the system. This application is the entry point for accessing each individual MPR-e connected to a 7705 SAR in Single NE mode. For any supported radio configuration, each MPR-e is accessed individually and its configuration is performed separately in a dedicated MCT session.

This chapter describes all the screens of the MCT Launcher. The MCT Launcher must be connected to the 7705 SAR as explained in the Provisioning chapter.

See Software local copy for information on copying the MCT Launcher from the software package CD ROM/DVD ROM and connecting the PC to the console port on the 7705 SAR (any port having an IPv4 interface) in order to access the MPR-e.

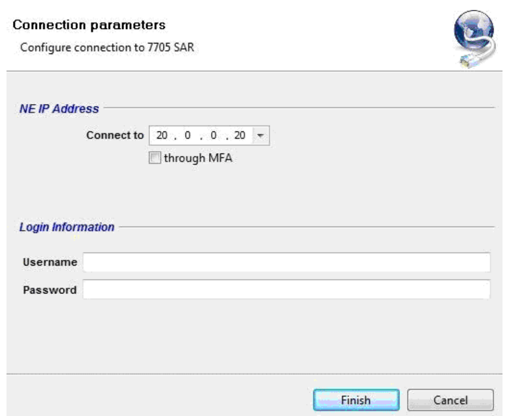
Note: The PC must be in the same subnet as the 7705 SAR IP interface (first connection); see the Maintenance and trouble-clearing chapter for configuration information.

1. To start the MCT Launcher, double-click on the MctLauncher icon on the PC desktop. The MCT Launcher window opens.

Figure 4.13 — MCT Launcher icon

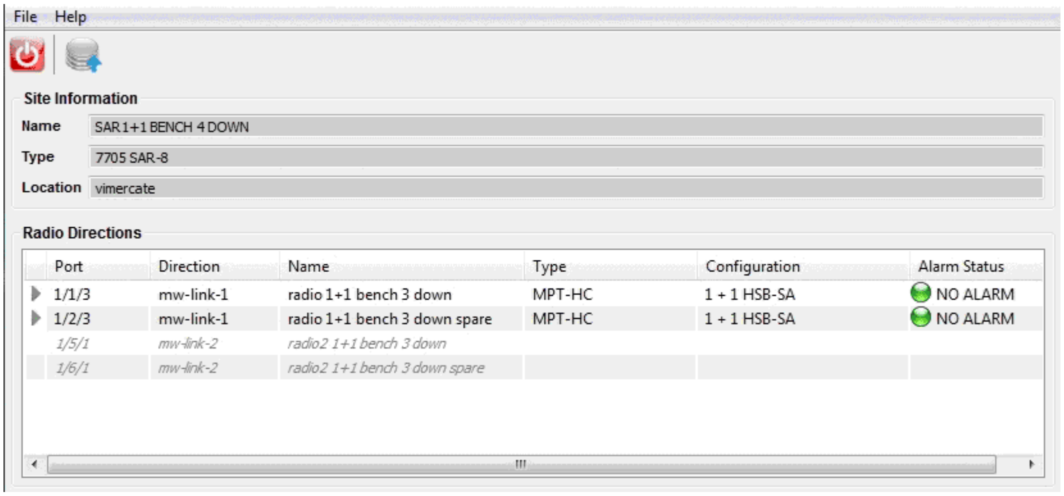
2. Enter the IP address of the 7705 SAR along with the 7705 SAR username and password (default is admin admin for both username and password) and click on the **Finish** button.

Figure 4.14 — MCT Launcher startup screen



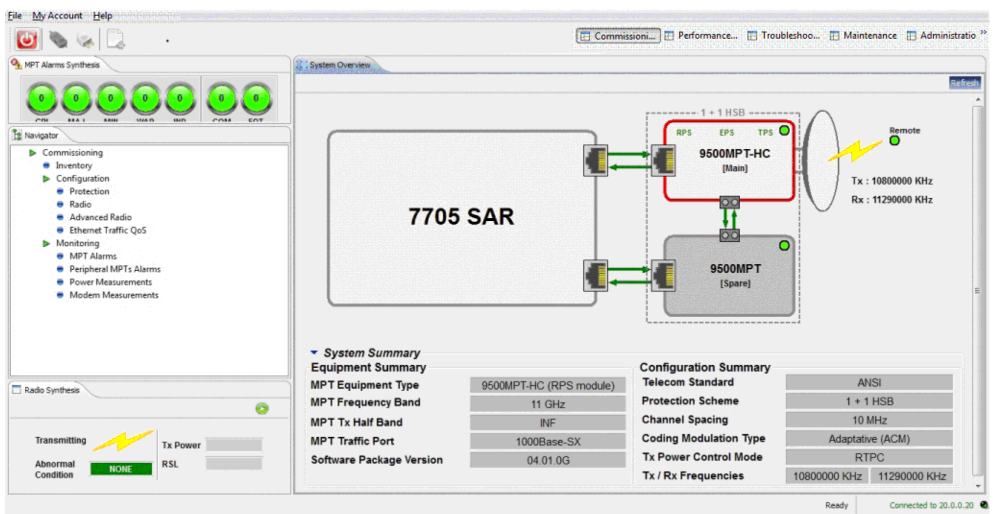
3. The MCT Launcher main screen opens, showing site information and a list of radios configured.

Figure 4.15 — MCT Launcher main screen



4. Click on the green triangle or double click on one valid line in the list to open the MCT System overview.

Figure 4.16 — MCT system overview with 7705 SAR



The MCT Tool bar has the following buttons:

- Exit: to quit the application
- Admin Save: to commit MPR-e configuration into the SAR compact flash

In a dedicated box, the MCT Launcher reports the Name, chassis type and location as per the configuration performed in the 7705 SAR CLI.

The MCT Launcher reports the complete list of MPR-e configured in the 7705 SAR CLI, reflecting their operative status. In a table format, the radio screen shows all MPR-e information inherited according to the mw-link object (configured in CLI) they belong to.

Information for MPR-e units that are operative up appears in black in the list. Information for MPR-e units that are operative down appear in gray.

The first column of the table reports the status of the MCT session for that specific MPR-e. When a green triangle appears, no MCT sessions have been started by the MCT Launcher.

Single click on the green triangle or double click on the specific MPR-e line to start an MCT session. When an MCT session is already opened for an MPR-e, the first column shows a red square. Single click on the red square or double click on a specific MPR-e line to close the MCT session.

When MCT Launcher is closed from either the tool bar or title bar button, all MCT sessions started by the Launcher will close.

Note: The 7705 SAR supports up to six MCT sessions started by a single MCT Launcher session.

4.4 — MCT tool bar

Figure 4.17 — Tool bar

The MCT tool bar has the following buttons:

- Disconnect from NE: to disconnect from the NE
- Export NE information: to export the NE configuration and current alarms to a text file. Only the information related to the MPR-e is reported.

4.5 — Alarm synthesis

The CT provides an alarm functionality that informs the operator on the severity of the different alarms in the NE as well as on the number of current alarms. There are five different alarm severity levels. In the CT these different levels are associated with colors.

- **Red**: Critical alarm (**CRI**)
- **Orange**: Major alarm (**MAJ**)
- **Yellow**: Minor alarm (**MIN**)
- **Cyan**: Warning alarm (**WAR**)
- **Blue**: Indeterminate (**IND**)

The meaning of each icon in the Alarm Synthesis is:

- **CRI** - Critical alarm

  Synthesis of alarms that need immediate troubleshooting (typical: NE isolation)
- **MAJ** - Major (Urgent) alarm

  Synthesis of alarms that need immediate troubleshooting
- **MIN** - Minor (Not Urgent) alarm

  Synthesis of alarms for which an intervention can be deferred
- **WAR** - Warning alarm

  Synthesis of alarms due to failure of another NE in the network
- **IND** - Indeterminate alarm

  Synthesis of alarms not associated with the previous severities. Not operative.

Each alarm severity is represented by an alarm icon situated in the top left hand corner of the view. These alarm icons are always represented on the different Equipment views so that the operator is always aware of the alarms occurring in the system.

Furthermore the number in the alarm icon indicates the number of active alarms with that specific severity.

4.6 — Domain alarm synthesis area

This area contains the icons representing the alarms per domain. Each icon indicates the number of alarm occurrences for each domain.

The meaning of each icon in the Domain alarm synthesis area is:

- **COM** – Communication alarm

  Synthesis of alarms in the Communication domain
- **EQT** – Equipment alarm

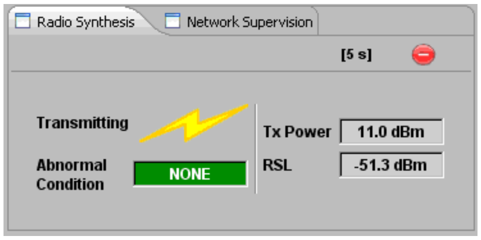
  Synthesis of alarms in the Equipment domain

4.7 — General information on the management state

The different management states concerning the NE are shown in two tab-panels:

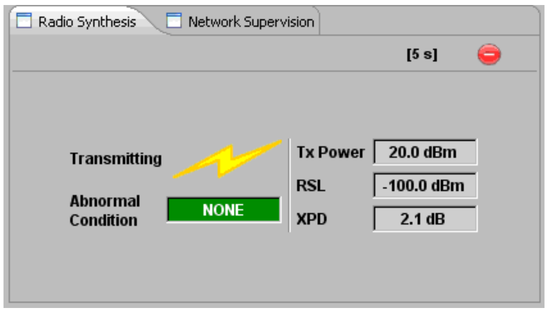
- **Radio Synthesis**

Figure 4.18 — Radio synthesis tab



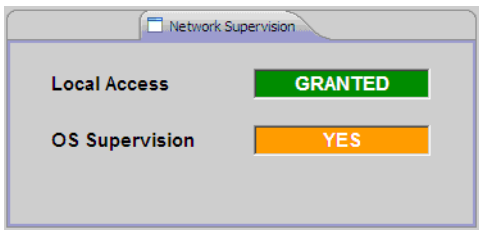
- **Radio Synthesis with XPIC configured (only with MPT-HC/HC-HQAM/XP/XP-HQAM/9558HC in MPR-e configuration)**

Figure 4.19 — Radio synthesis tab with XPIC configured



- **Network Supervision**

Figure 4.20 — Network supervision tab



The **Radio Synthesis** provides information about the:

- **Abnormal Condition** state: indicates whether abnormal conditions have been recognized.

The **Network Supervision** gives information on the:

- **Local Access** state: indicates whether the NE is managed by a craft terminal or by the OS
- **OS Supervision** state: indicates whether the communication with the OS is established

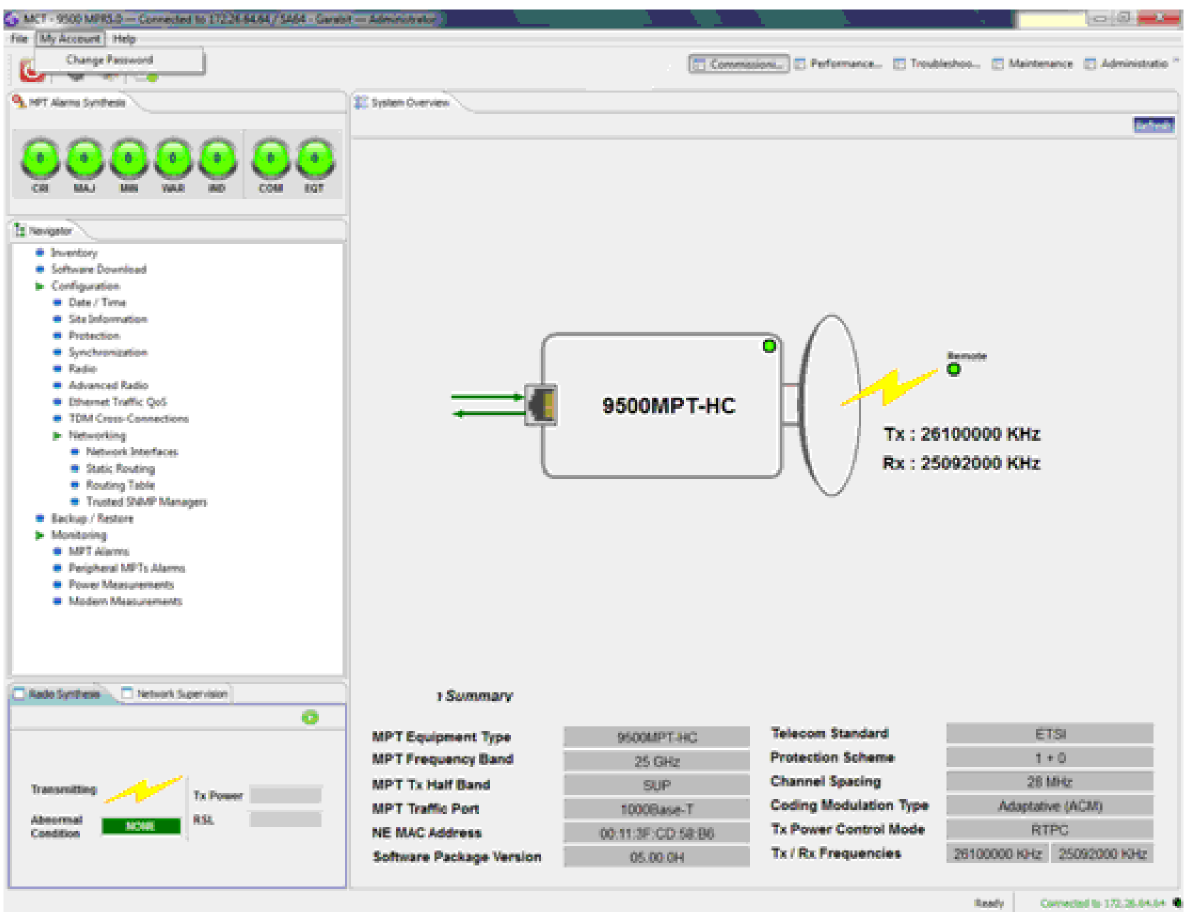
4.8 — My account

The My Account menu can be used by the Craft or Administrator user to change the user's own password.

To change a password:

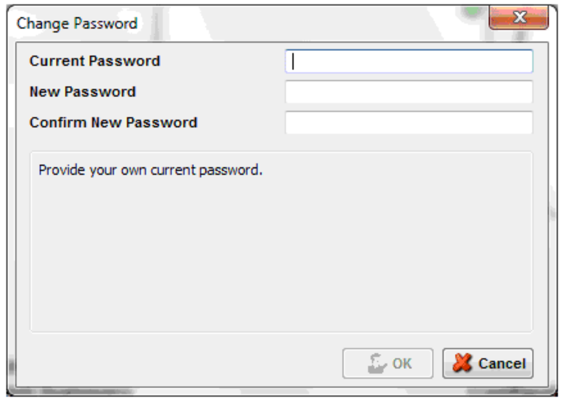
- From the My Account menu, choose Change Password; see Figure 4.21.

Figure 4.21 — My Account Menu



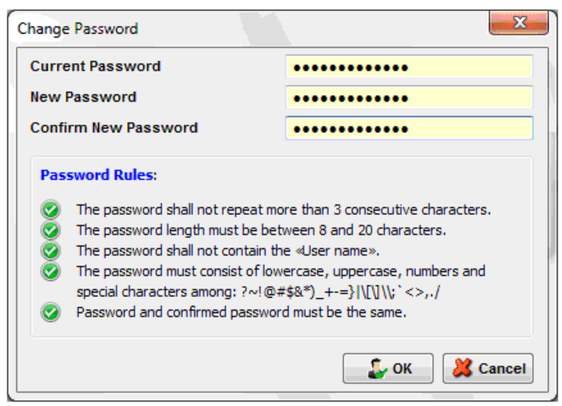
- The Change Password window opens, see Figure 4.22. Enter your current password and enter the new one twice.

Figure 4.22 — Change password window



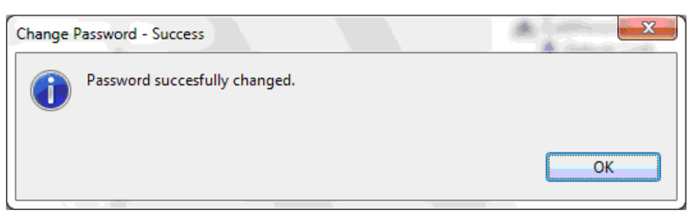
- The password must meet the rules that are displayed on the Change Password window. When each condition is met, the related icon will turn green. When all conditions are met, the OK button is enabled; see Figure 4.23.

Figure 4.23 — Change password window with OK button enabled



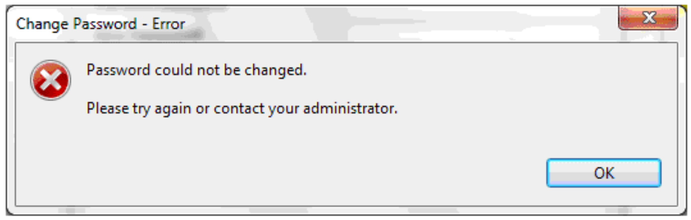
- Click OK to validate the password. A confirmation window opens; see Figure 4.24.

Figure 4.24 — Password change confirmation



- If the password change fails, an error window opens; see Figure 4.25.

Figure 4.25 — Password change failure



4.9 — Navigator area

The Navigator panel displays different options depending on the selected function in the upper tabs.

The following tabs are available:

1. Commissioning
   - Inventory
   - Software download for MSS-1c
   - Software download for MPR-e standalone
   - Configuration
     - Date/time
     - Site information
     - MSS-1c Protection
     - MPR-e Radio scheme configuration
     - Radio
     - Advanced Radio
     - Radio encryption (available only for MPT-HC/HC-HQAM)
     - Ethernet traffic QoS for MPR-e
     - TDM cross-connections for MPR-e
     - MSS-1c provisioning
     - Networking
   - Backup / restore
   - Monitoring
2. Performance monitoring
   - Performance history file upload

- Normalized
- Adaptive modulation
- Ethernet QoS
- RSL history
- Traffic port Ethernet for MPR-e
- Monitoring

3. Troubleshooting
   - Inventory
   - Troubleshooting
   - Monitoring
4. Maintenance
   - Inventory
   - Backup/restore
   - Software download
   - Configuration > Radio
   - Monitoring
5. Monitoring
   - MPT alarms
   - Peripheral NE Alarms
   - Power measurements (not accessible in the Performance tab)
   - Modem measurements (not accessible in the Performance tab)
   - Events (only in the Troubleshooting tab)
6. Administration

The **System Overview** tab (Figure 4.9, Figure 4.10, and Figure 4.16) is a read-only screen, which shows all the configuration parameters of the MPT.

4.9.1 — Commissioning

The Commissionging tab has the following options:

- Inventory
- Software download for MSS-1c
- Software download for MPR-e standalone
- Configuration
- Backup / restore

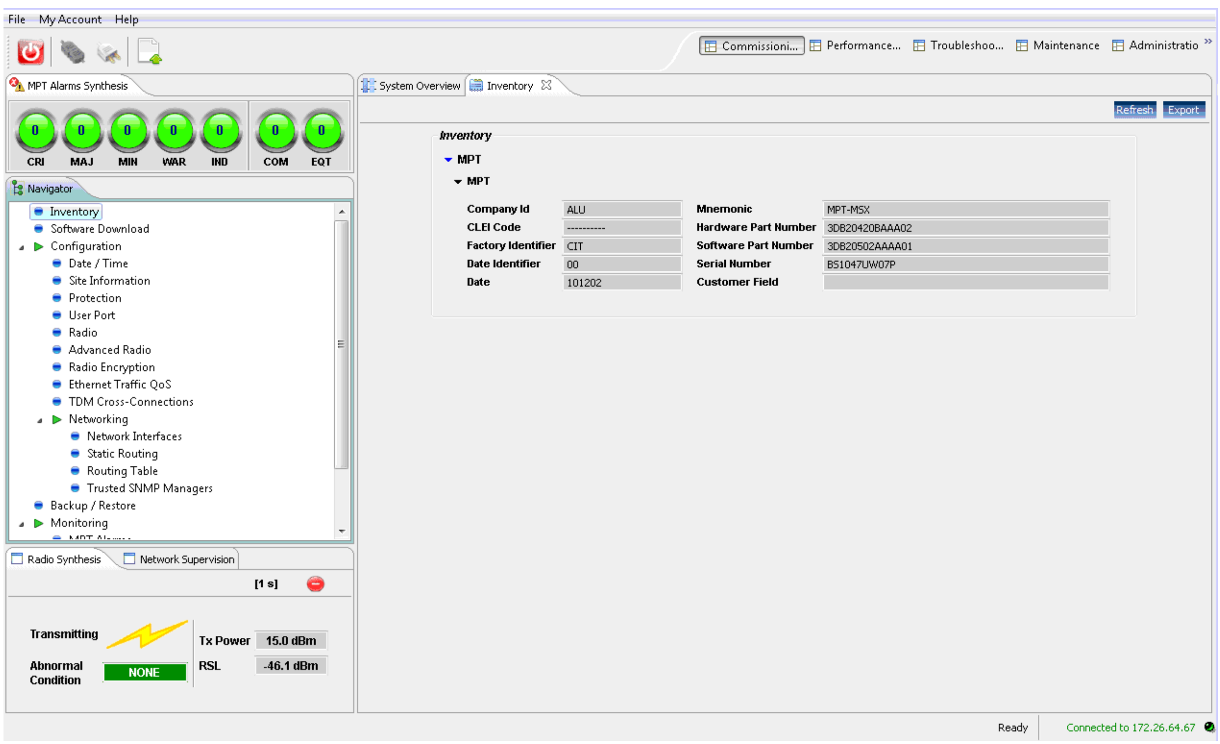
- [Monitoring]

Note: Not all options are applicable for MPR-e in Single NE mode with 7705 SAR configuration.

4.9.1.1 — Inventory

The inventory tab displays all the inventory data of the NE, see Figure 4.26.

Figure 4.26 — Inventory



4.9.1.2 — Software download for MSS-1c

The Software Download tab must be used to perform any of the following:

- download a new software version on the NE (**Software Package Versions** tab)
- get a summary of the specific software versions on the Active bank (**Active Software Package Summary** tab)

- get a summary of the specific software versions on the Stand-by bank (**Stand-by Software Package Summary** tab)

Note: Software rollback is not supported.

4.9.1.2.1 — Software package versions tab

Software Download can be completed using the FTP or SFTP server. The FTP server is chosen by default, see Figure 4.27. Figure 4.28 shows software download using SFTP.

Figure 4.27 — Software download using FTP

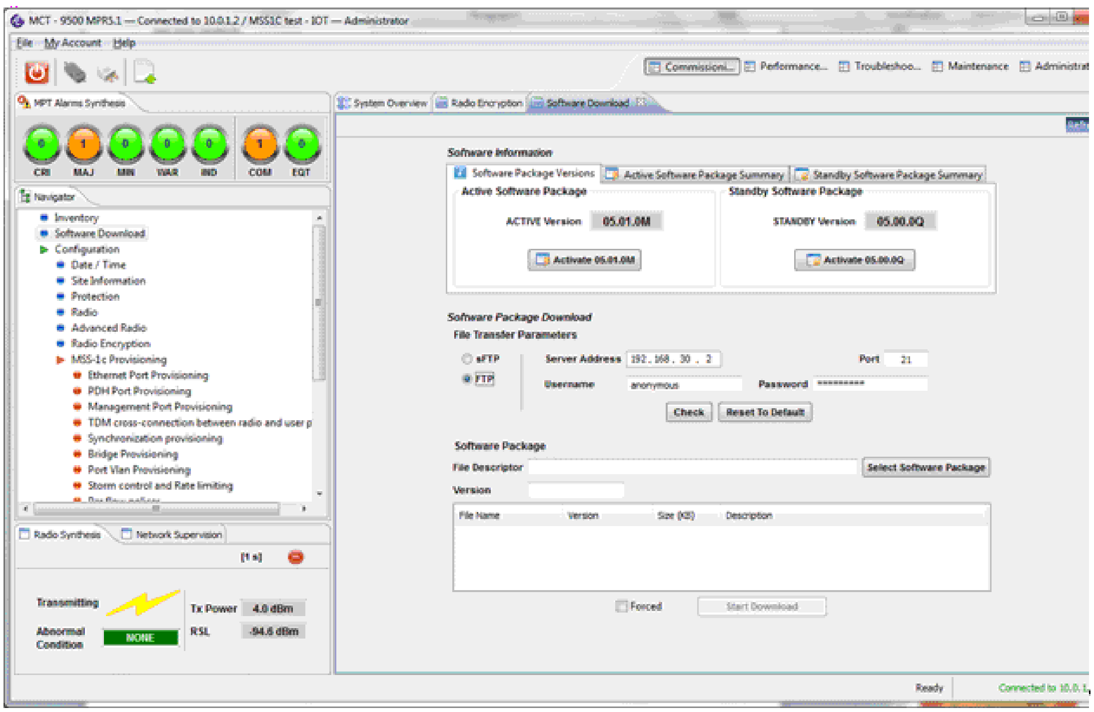
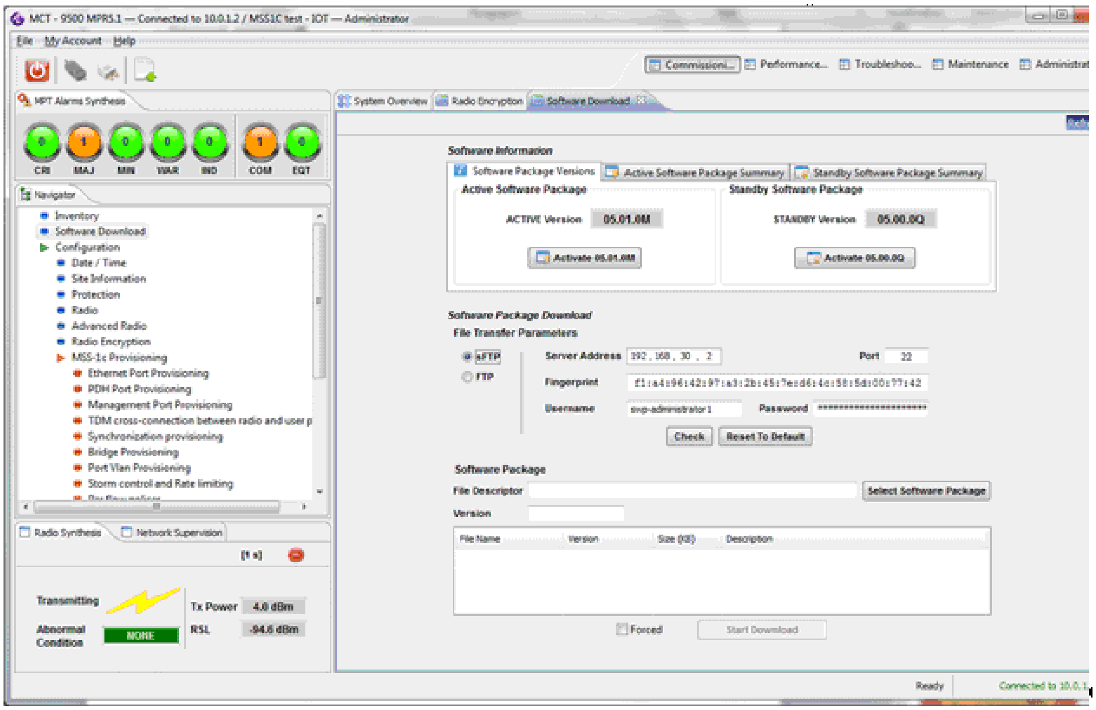


Figure 4.28 — Software download using SFTP



Warning: An FTP Server must be installed on the PC containing the Software Package.

The PC's firewall (Microsoft's default firewall) may prevent the download from starting up.

The **Apache Server**, installed with the WebEML from the TCO Software Suite R5.2 DVD-ROM, is started with NEtO as the default FTP/SFTP server.

To download and activate software:

1. If you will be using FTP, check that the following parameters have been correctly setup:

- Server Address: PC address
- Username: anonymous
- Password: anonymous
- Port: 21

If you will be using SFTP, check that the following parameters have been correctly setup:

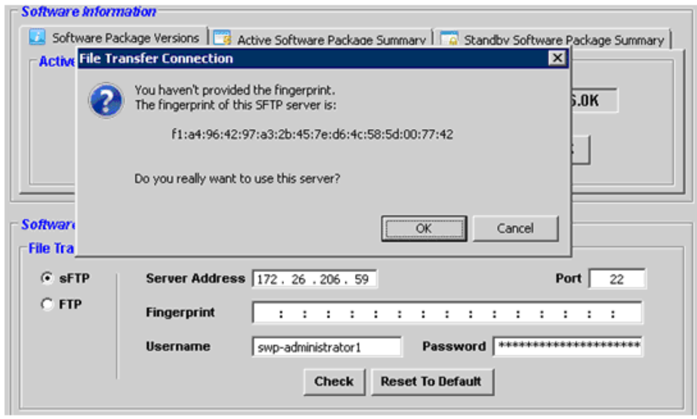
- Server Address: PC address
- Fingerprint: F1:A4:96:42:97:A3:2B:45:7E:D6:4C:58:5D:00:77:42
- Username : swp-administrator1
- Password: not displayed

Click on the **Reset to Default** button to recall the default connection settings if an error is made.

2. Click on the **Check** button. If trouble occurs, check the NEtO Servers Manager window to verify that the FTP/SFTP Server is on.

   If the fingerprint is not filled in manually, the MCT displays the fingerprint in a popup for confirmation, see Figure 4.29.

Figure 4.29 — SFTP fingerprint window



Click on the OK button to continue.

3. In the **Software Package** field, select the file descriptor (previously copied to the PC).

   When the Apache FTP server (embedded in the TCO SW Suite) is used, it is mandatory to copy the SWP component to the FTP root directory:

   “\Document and Settings\<login name>\9500MPR-E\res\home”.

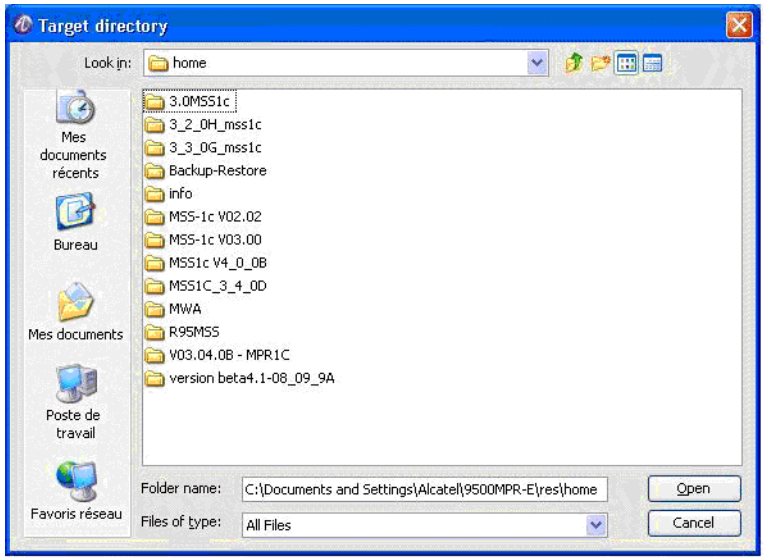
   For example, “R95MSS1C/5_2_0” must to be copied to:

   “\Document and Settings\<login name>\9500MPR-E\res\home”. See Figure 4.30.

Note: The path to the file descriptor, after the SWP local copy, is

/ECT/SWDW/R95MSS1C/5_2_0/R952C.DSC

Figure 4.30 — Directory for the SW component if Apache server is in use



4. Put a check mark on the **Forced** check box to download the complete file without any comparison between the file already present in the stand-by bank and the new file to be downloaded.
5. Click on the **Start Download** button.
6. At the end press the **Activate** button of the Stand-by Software Package. The NE reboots and the supervision is lost.

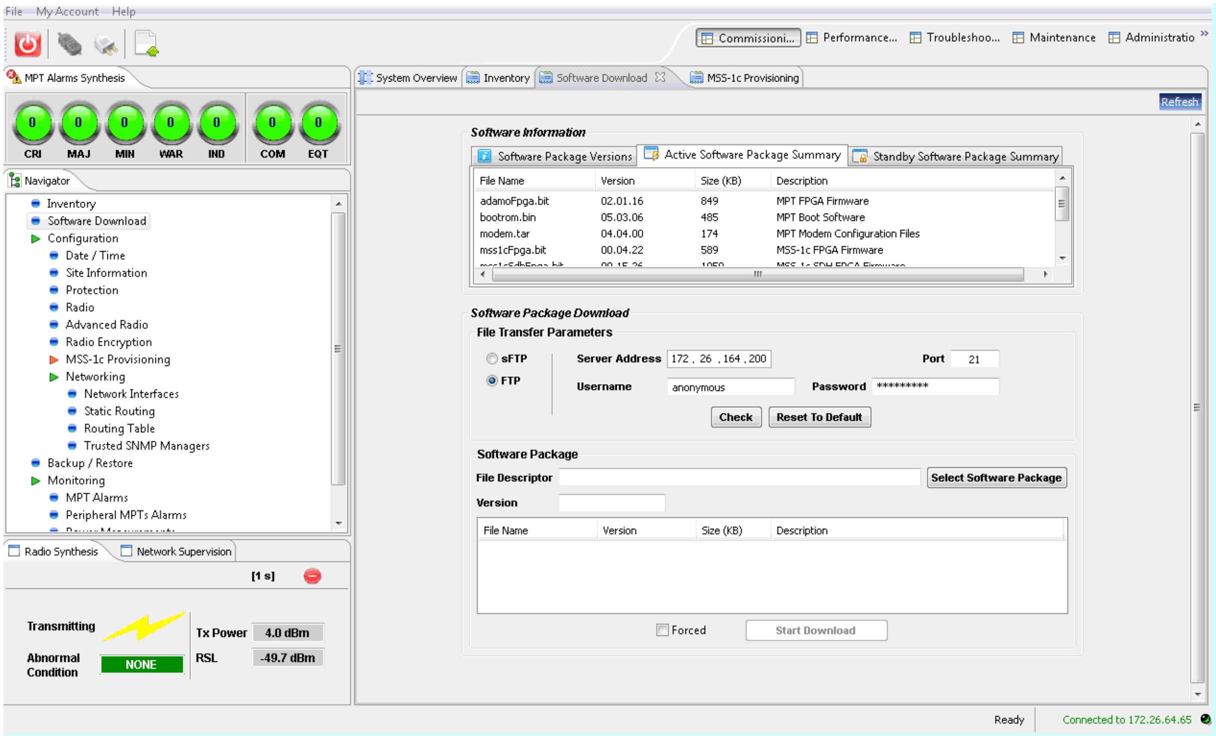
Note: After the activation of the Standby bank, the connection between the WebEML and the MPT is lost.

The WebEML must be relaunched.

4.9.1.2.2 — Active Software Package Summary tab

The Active Software Package Summary tab shows the versions of the programmable different components of the active bank.

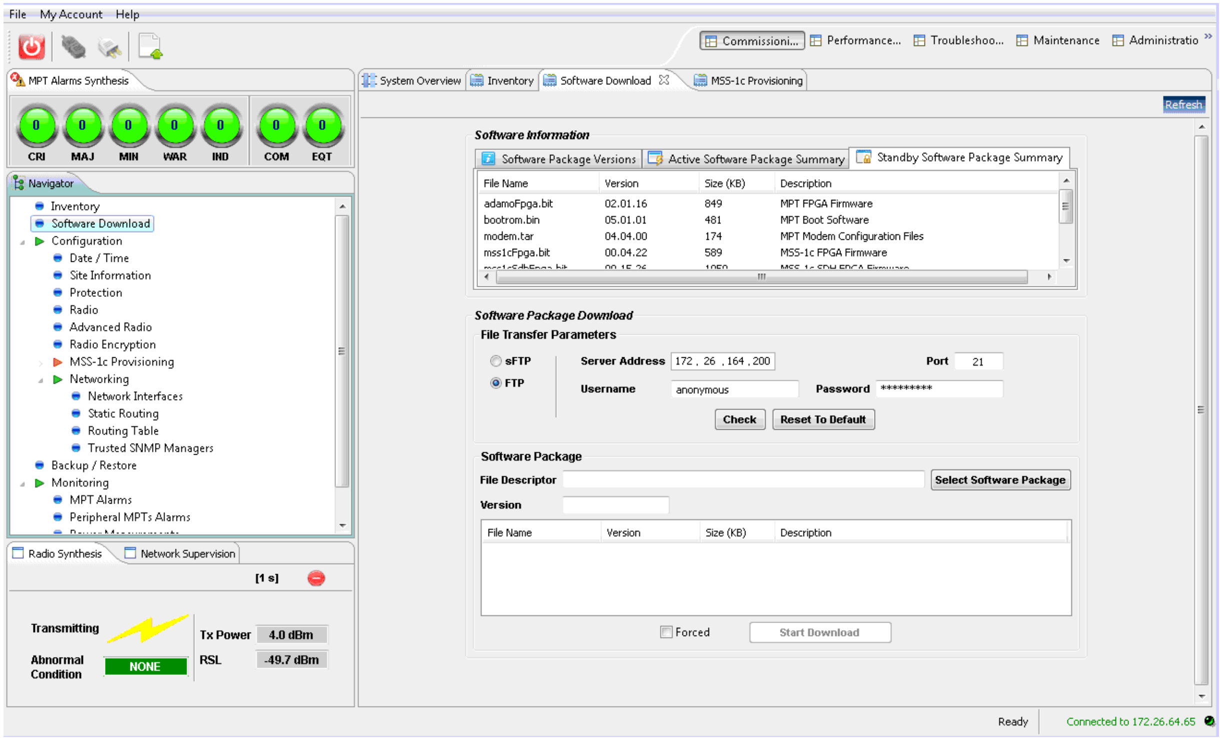
Figure 4.31 — Software download: Active Software Package Summary



4.9.1.2.3 — Standby Software Package Summary tab

The Standby Software Package Summary tab shows the versions of the programmable different components of the stand-by bank.

Figure 4.32 — Software download: Stand-by software package summary



4.9.1.3 — Software download for MPR-e standalone

This menu must be used to download a new software version on the NE (**Software Package Versions** tab) or to get a summary of the specific software versions on the programmable different components on the Active bank (**Active Software Package Summary** tab) or on the Stand-by bank (**Stand-by Software Package Summary** tab).

Note: Software rollback is not supported.

4.9.1.3.1 — Software package versions tab

Software Download can be completed using the FTP or SFTP server. The FTP server is chosen by default, see Figure 4.33. Figure 4.34 shows software download using SFTP.

Figure 4.33 — Software download using FTP

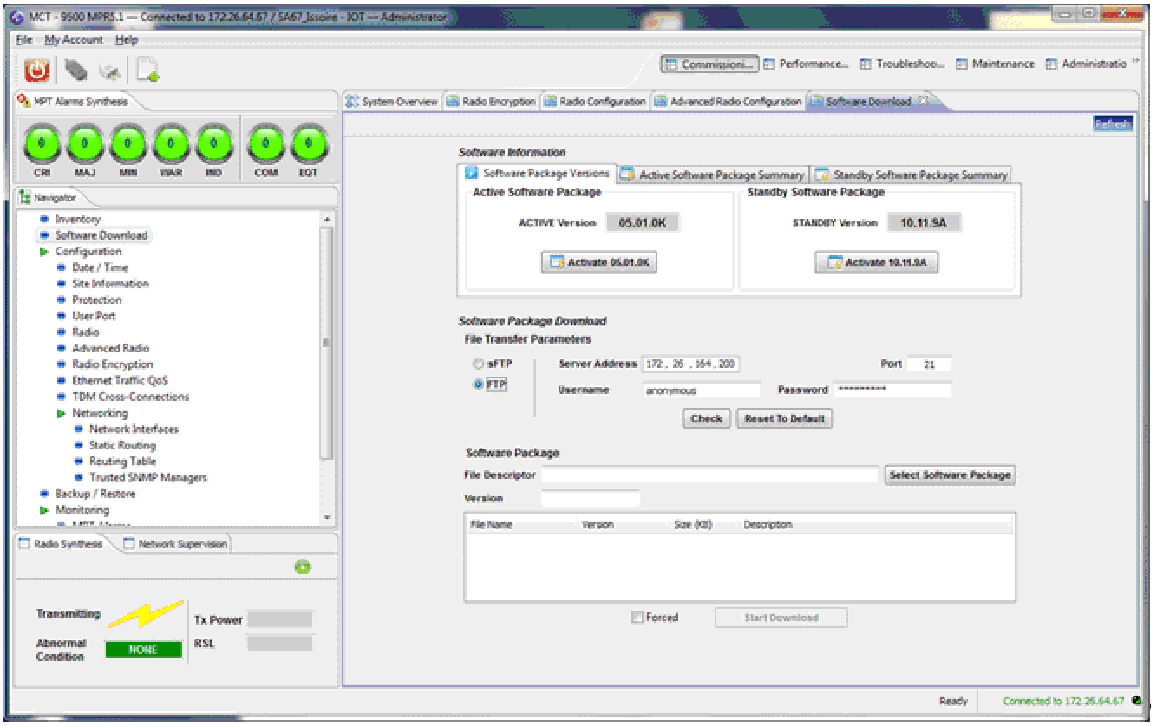
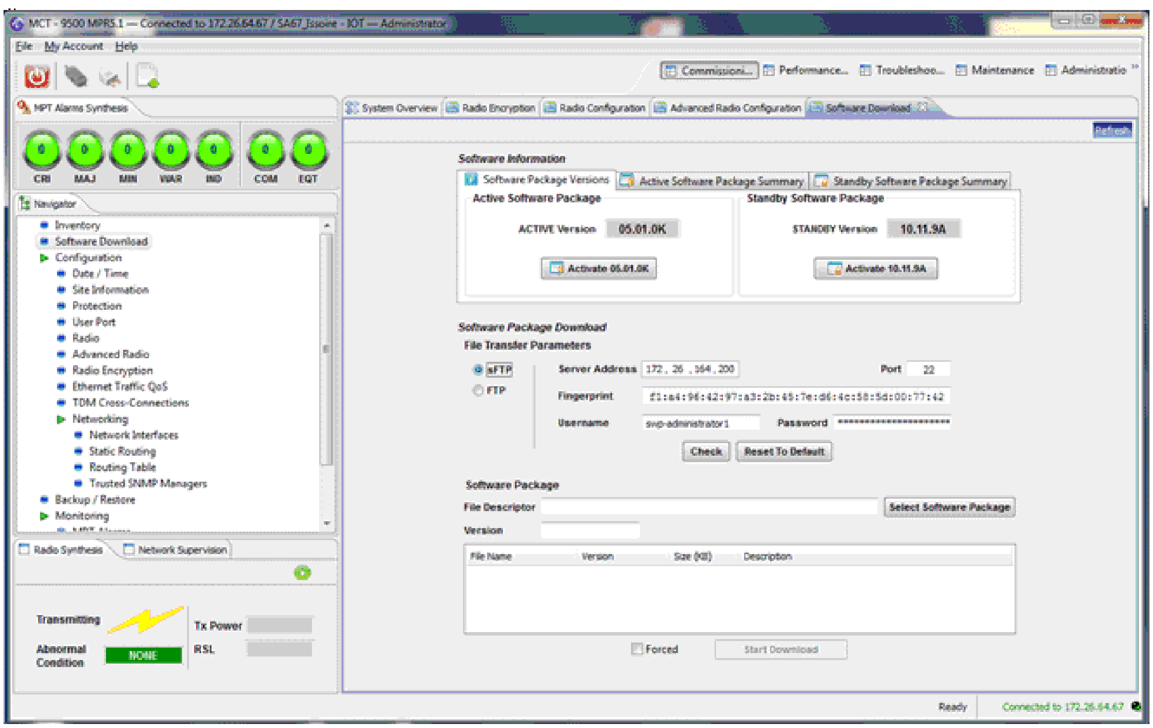


Figure 4.34 — Software download using SFTP



Warning: An FTP Server must be installed on the PC containing the Software Package.

The PC's firewall (Microsoft's default firewall) may prevent the download from starting up.

The **Apache Server**, installed with the WebEML from the TCO Software Suite R5.2 DVD-ROM, is started with NEtO as the default FTP/SFTP server.

To download and activate software:

1. If you will be using FTP, check that the following parameters have been correctly setup:

- Server Address: PC address
- Username: anonymous
- Password: anonymous
- Port: 21

If you will be using SFTP, check that the following parameters have been correctly setup:

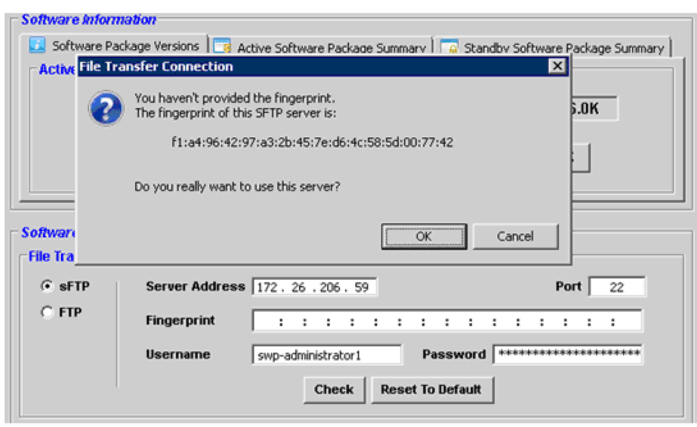
- Server Address: PC address
- Fingerprint: F1:A4:96:42:97:A3:2B:45:7E:D6:4C:58:5D:00:77:42
- Username : swp-administrator1
- Password: not displayed

Click on the **Reset to Default** button to recall the default connection settings if an error is made.

2. Click on the **Check** button. If trouble occurs, check the NEtO Servers Manager window to verify that the FTP/SFTP Server is on.

If the fingerprint is not filled in manually, the MCT displays the fingerprint in a popup for confirmation, see Figure 4.29.

Figure 4.35 — SFTP fingerprint window



Click on the OK button to continue.

3. In the **Software Package** field, select the file descriptor (previously copied to the PC).

   When the Apache FTP server (embedded in the TCO SW Suite) is used, it is mandatory to copy the SWP component to the FTP root directory:

   “\Document and Settings\<login name>\9500MPR-E\res\home”.

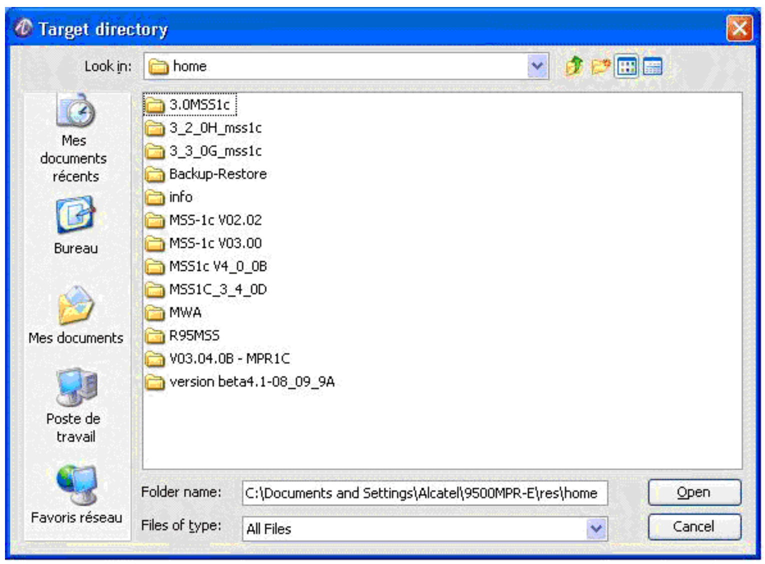
   For example, “R95MPRE/5_2_0” must to be copied to:

   “\Document and Settings\<login name>\9500MPR-E\res\home”. See Figure 4.36.

Note: The path to the file descriptor, after the SWP local copy, is

/ECT/SWDW/R95MPRE/5_2_0/R952C.DSC

Figure 4.36 — Directory for the SW component if Apache server is in use

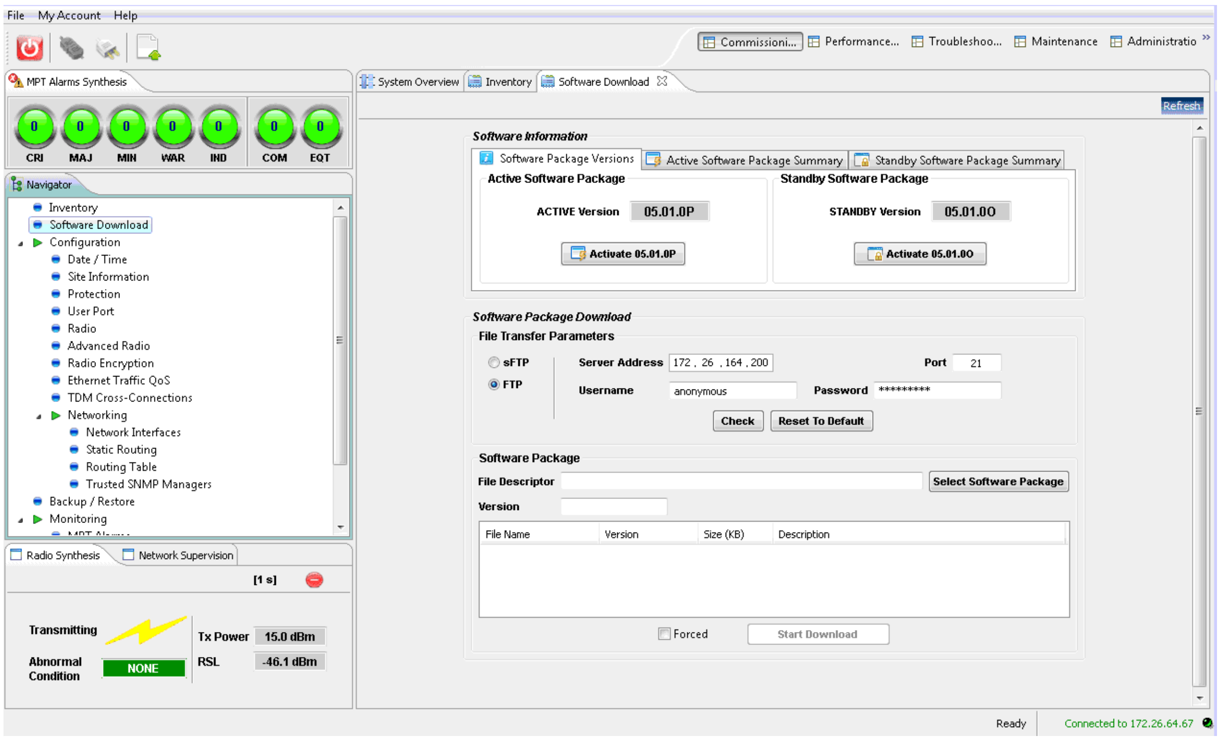


4. Put a check mark on the **Forced** check box to download the complete file without any comparison between the file already present in the stand-by bank and the new file to be downloaded.
5. Click on the **Start Download** button.
6. At the end press the **Activate** button of the Stand-by Software Package. The NE reboots and the supervision is lost.

Note: After the activation of the Standby bank, the connection between the WebEML and the MPT is lost.

The WebEML must be relaunched.

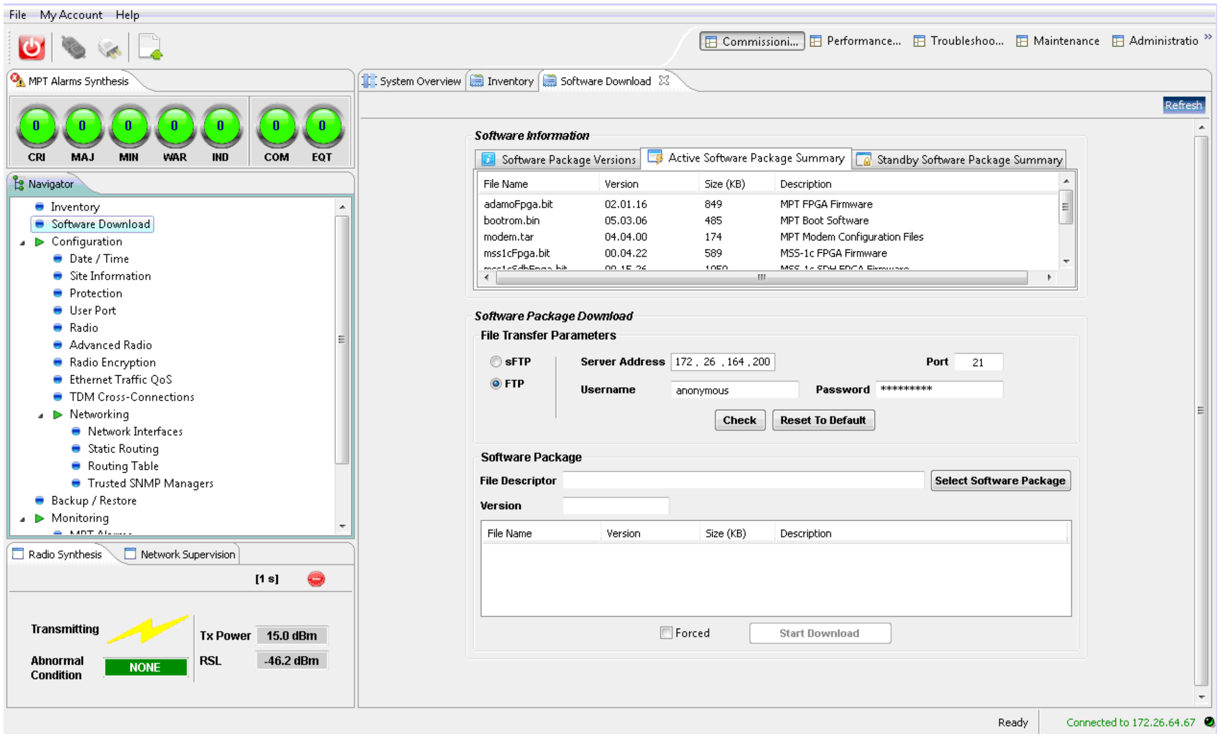
Figure 4.37 — Software download



4.9.1.3.2 — Active Software Package Summary tab

The Active Software Package tab shows the versions of the programmable different components of the active bank.

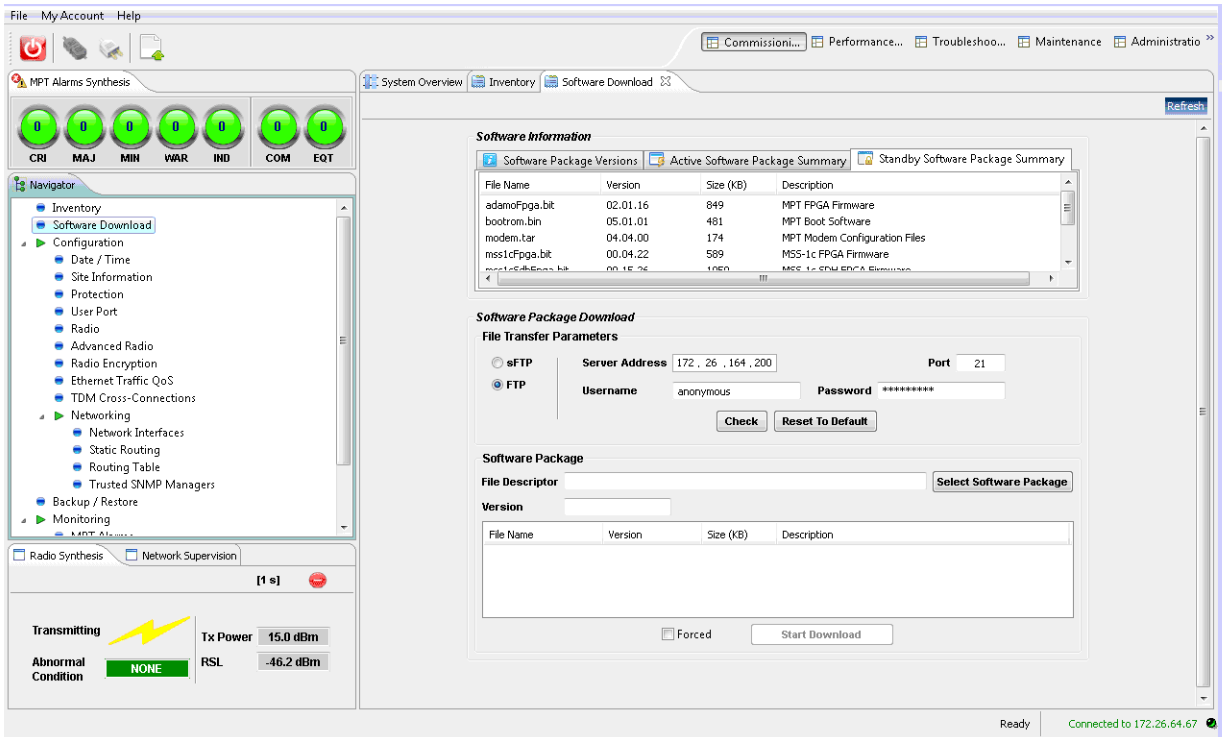
Figure 4.38 — Software download: Active Software Package Summary



4.9.1.3.3 — Standby Software Package Summary tab

The Standby Software Package Summary tab shows the versions of the programmable different components of the stand-by bank.

Figure 4.39 — Software download: Stand-by software package summary



4.9.1.4 — Configuration

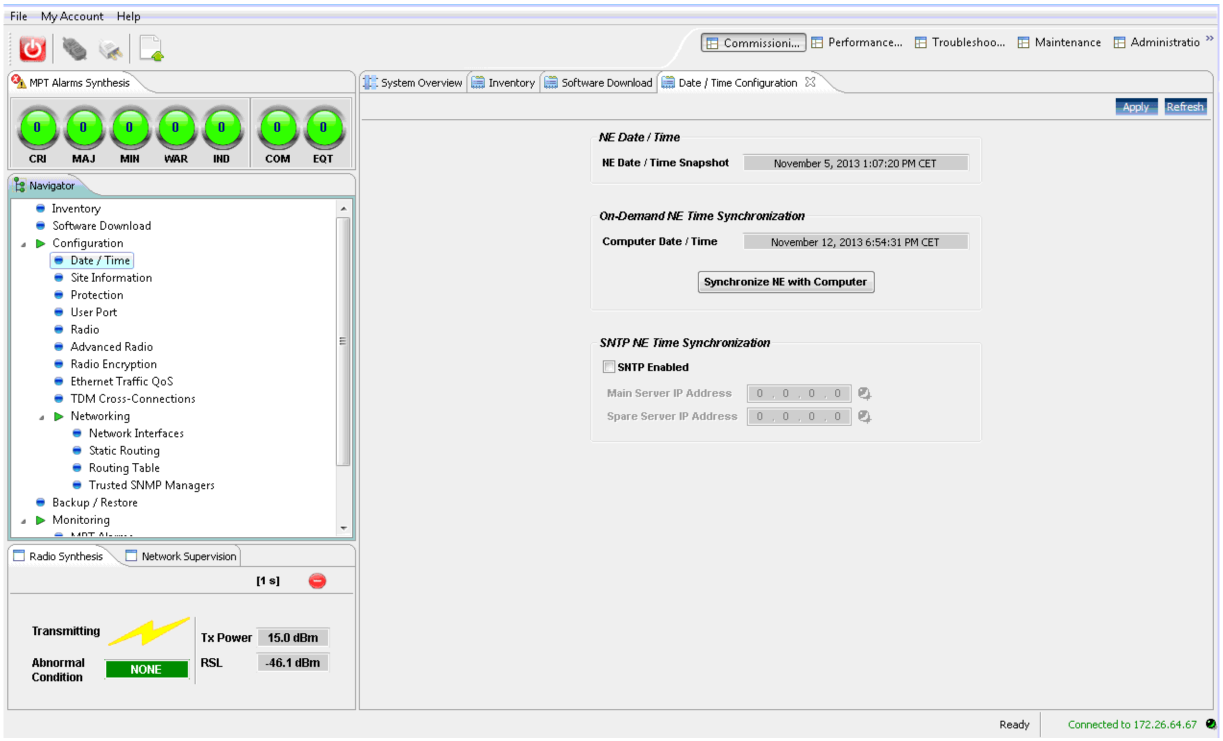
4.9.1.4.1 — Date/time

The NE Date/Time screen displays the current NE time and the current computer time, see Figure 4.40.

To re-align the NE time with the computer time, click on the **Synchronize NE with Computer** button and click on the **Refresh** button.

If an SNTP Server must be used to distribute the time, the SNTP protocol must be enabled by a check mark in the **SNTP Enabled** box and the IP address of the Server must be entered in the relevant field. The IP address of the Spare Server, if available, must be entered in the relevant field.

Figure 4.40 — Date/time configuration

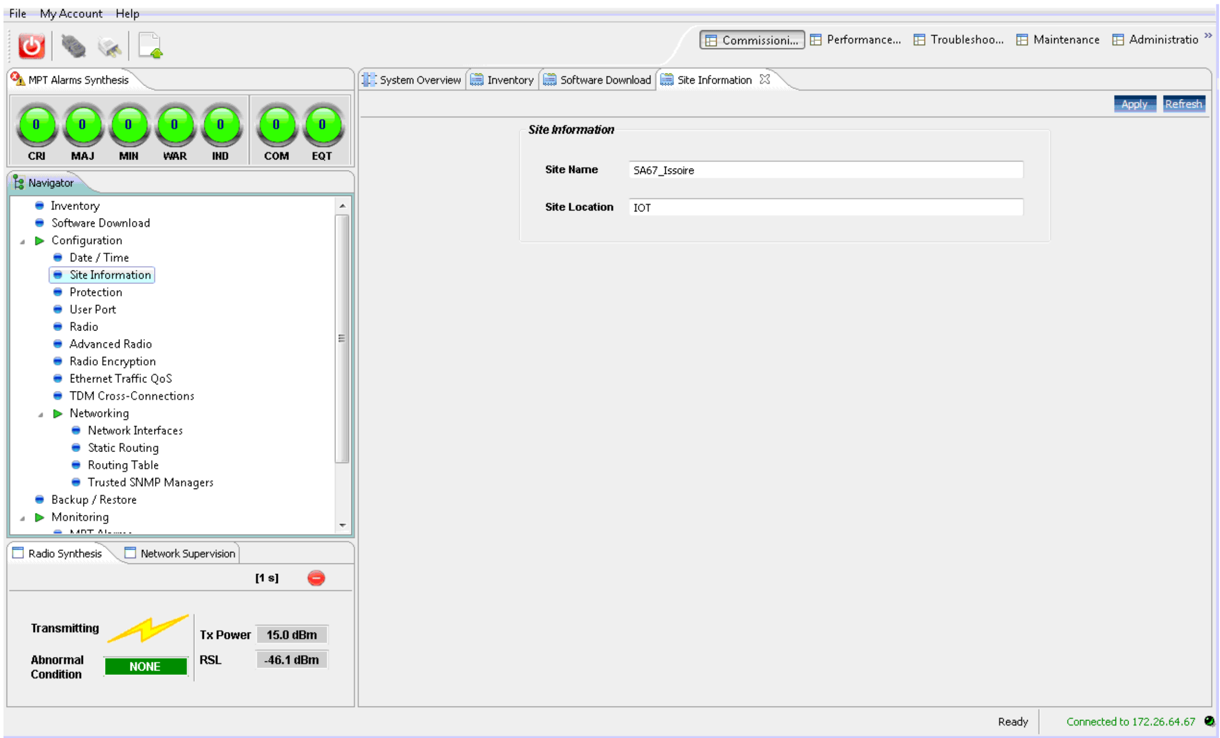


This menu is not applicable in Single NE mode with 7705 SAR configuration.

4.9.1.4.2 — Site information

This menu has to be used to enter the optional information to identify the site (**Site Name** and **Site Location**), see Figure 4.41.

Figure 4.41 — Site information



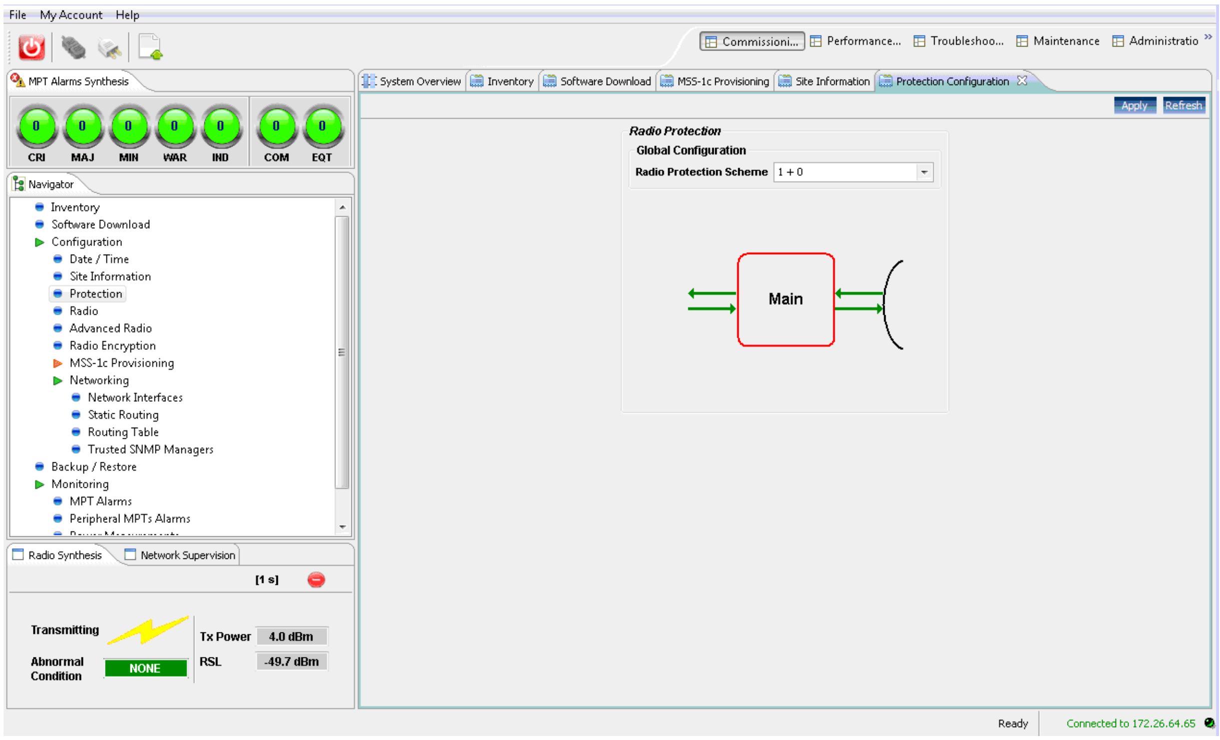
This menu is not applicable for an MPR-e in Single NE mode with 7705 SAR configuration.

4.9.1.4.3 — MSS-1c Protection

Select the 1+0 protection scheme and Apply, see Figure 4.42.

4.9.1.4.3.1 — 1+0 configuration

Figure 4.42 — Protection configuration

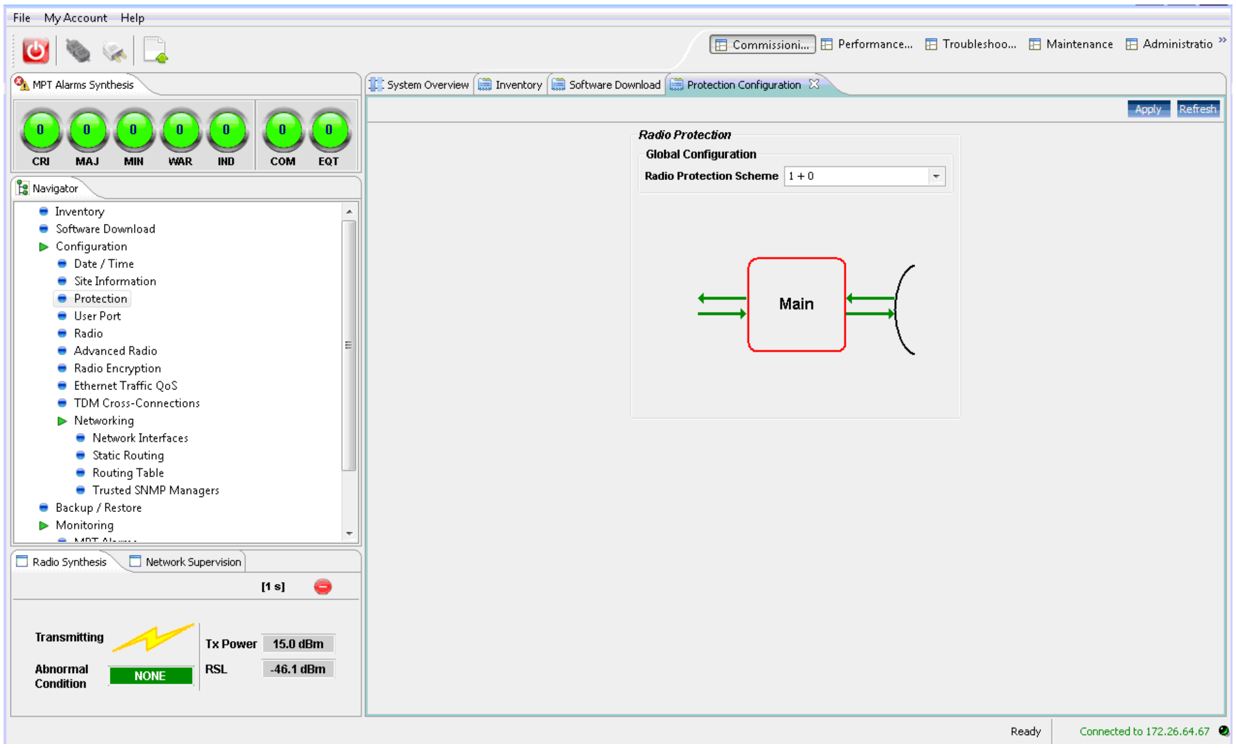


4.9.1.4.4 — MPR-e Radio scheme configuration

For MPR-e standalone, the protection scheme must be explicitly selected as 1+0. When the MPR-e is in Single NE mode with 7705 SAR, the protection scheme is ruled by the 7705 SAR according to mw-link configuration in the CLI.

4.9.1.4.4.1 — 1+0 configuration

Figure 4.43 — 1+0 Protection configuration



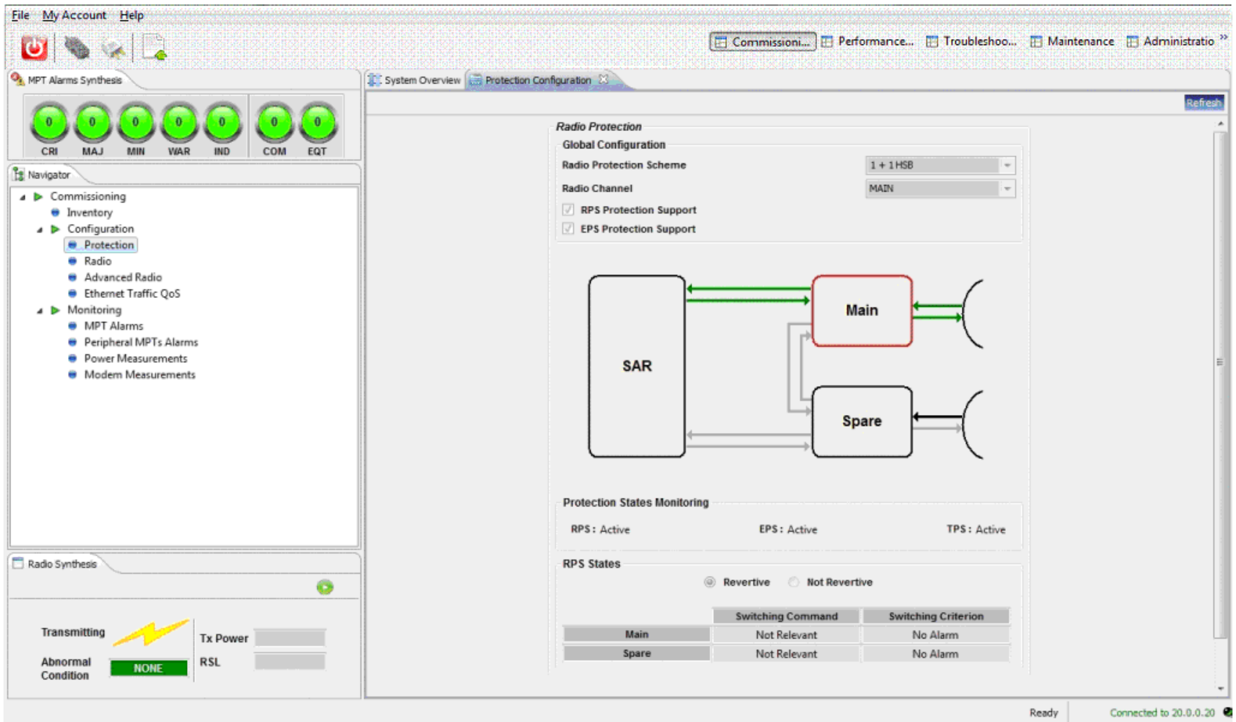
4.9.1.4.4.2 — 1+1 HSB configuration in Single NE mode with 7705 SAR

In 9500 MPR Release 4.1.0, when 1+1 HSB is selected, the screen reports the status of the EPS, TPS and RPS protection. This screen reports only the current status and configuration: it cannot be used to make configuration changes. For more detailed information on 1+1 HSB protection and relative operator commands, see the 7705 SAR OS 6.0.R1 documentation.

Caution: There is no automatic synchronization of the configuration of the two MPTs in a 1+1 HSB configuration. The MCT sessions for the main and the spare MPTs are separate: the operator must verify that the configurations are aligned.

Note: 1+1 HSB is only supported by 9500 MPR Release 4.1.0 when the MPR-e is in Single NE mode with 7705 SAR; see 7705 SAR platform prerequisites for more detailed information.

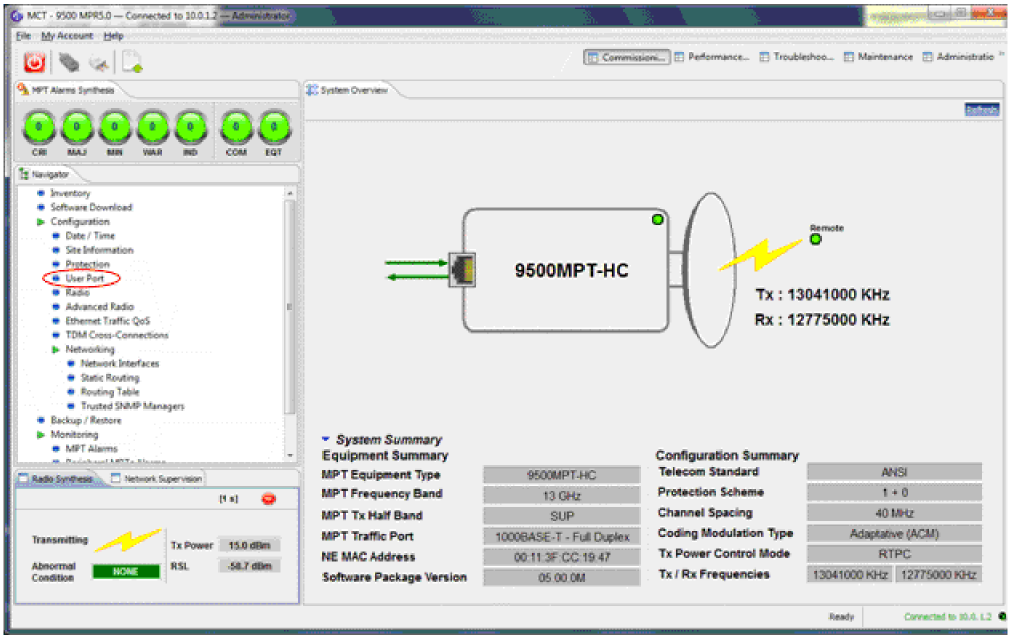
Figure 4.44 — 1+1 HSB configuration



4.9.1.4.5 — User Port for MPR-e

This menu allows the operator to synchronize the MPR-e. As described in Synchronization for MPR-e in Single NE mode with 7705 SAR, when MPR-e is in Single NE mode with 7705 SAR, synchronization is self detected and configured. Consequently, this menu is not available in Single NE mode with 7705 SAR.

Figure 4.45 — User port menu



Depending on the connectivity type used between the MPT and the Ethernet Generic device, the synchronization capabilities will be different.

The following connectivity types can be provisioned:

- Optical
- Electrical 100 Mb/s
- Electrical 1 Gb/s

The active configuration is dimmed and marked Active User Port Configuration.

The following figures show synchronization options.

Figure 4.46 — Optical GE active configuration with SyncE synchronization

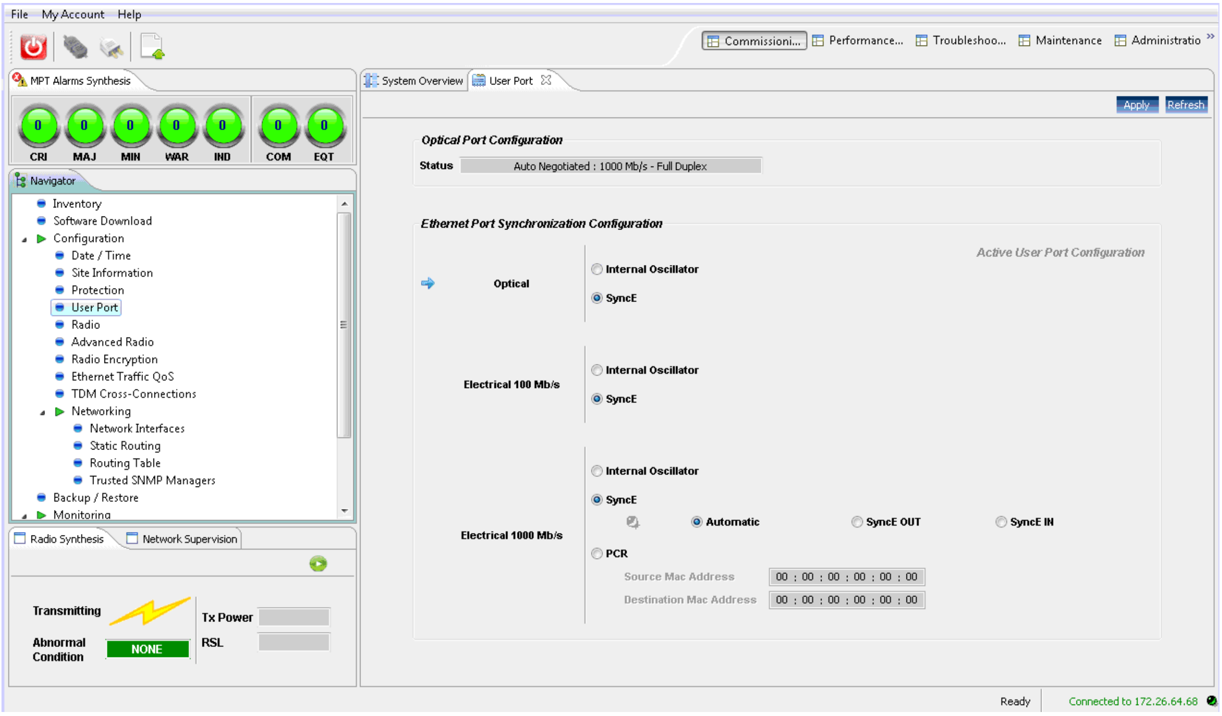


Figure 4.47 — Optical GE active configuration with Internal Oscillator

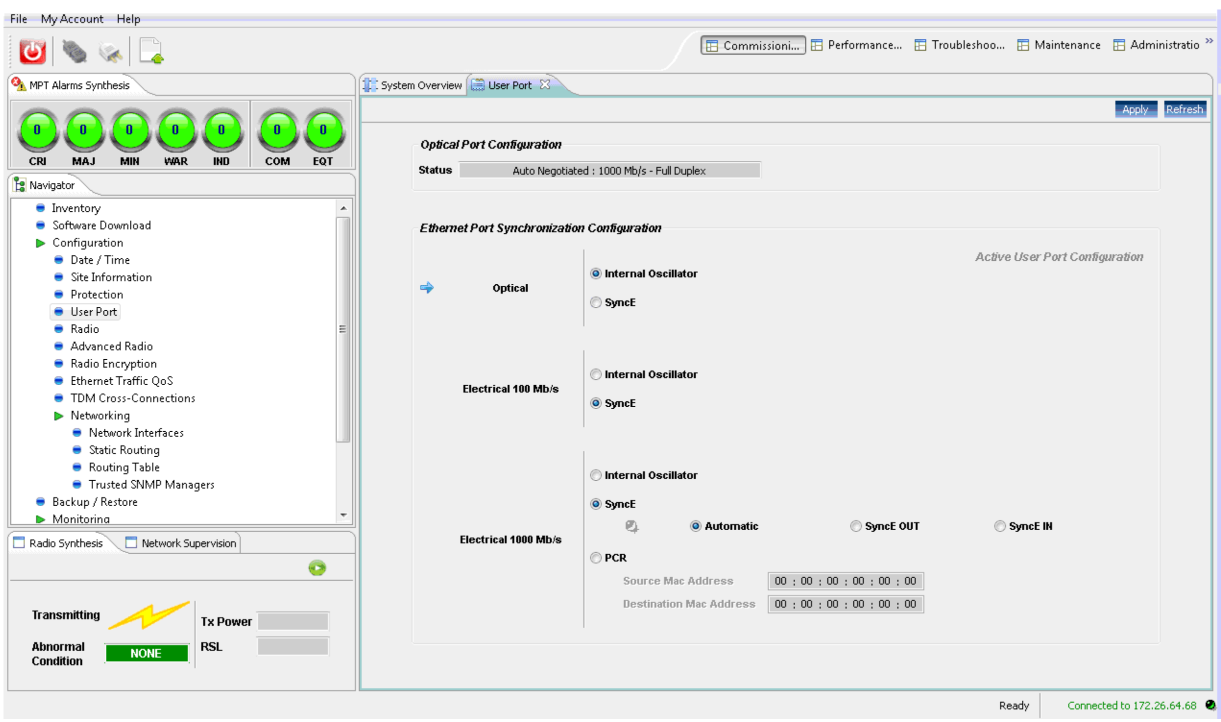
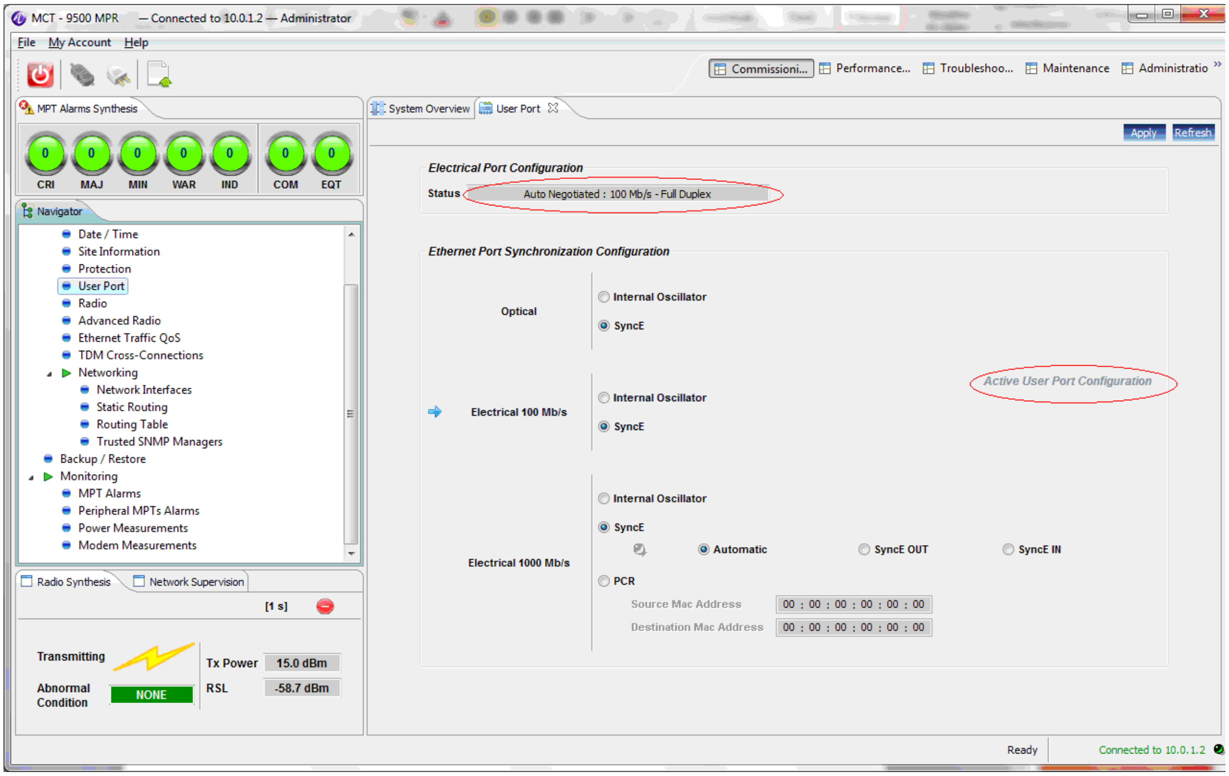


Figure 4.48 — Electrical 100 Mb/s active configuration with SyncE synchronization



In Electrical 100 Mb/s configuration, the synchronization is bidirectional only.

Figure 4.49 — Electrical 100 Mb/s active configuration with Internal Oscillator

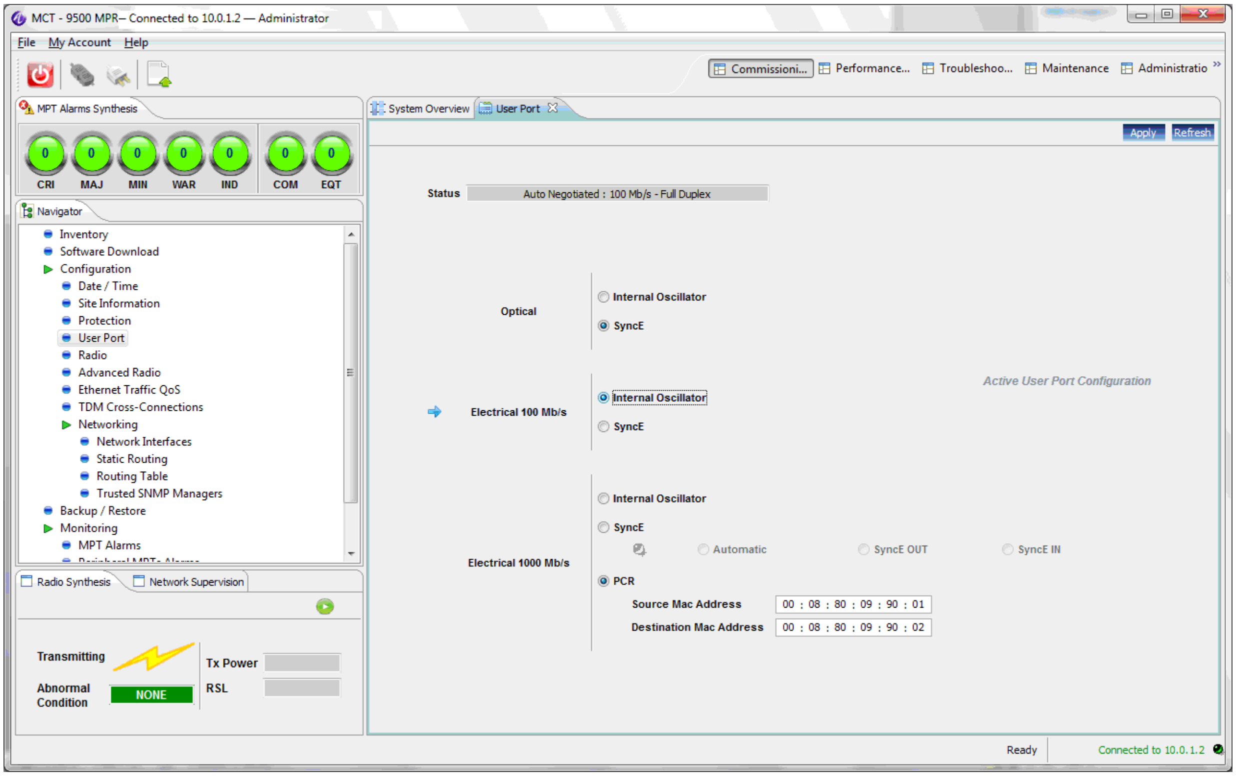
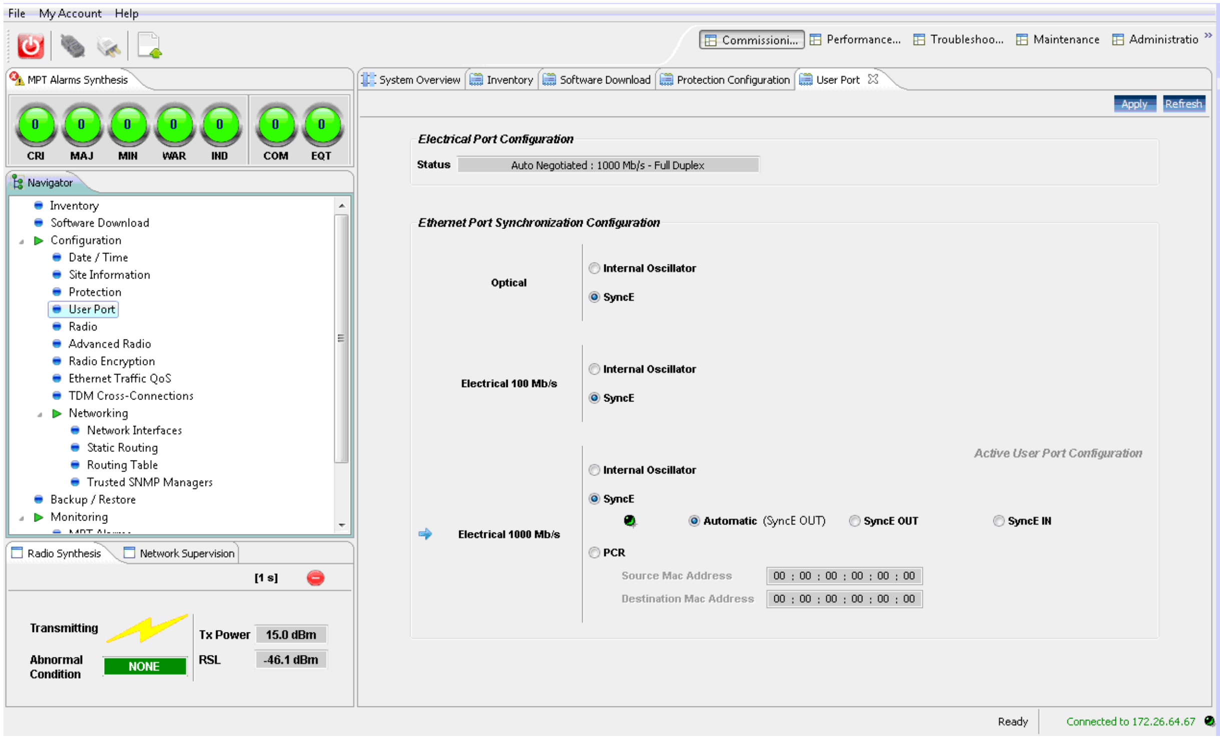
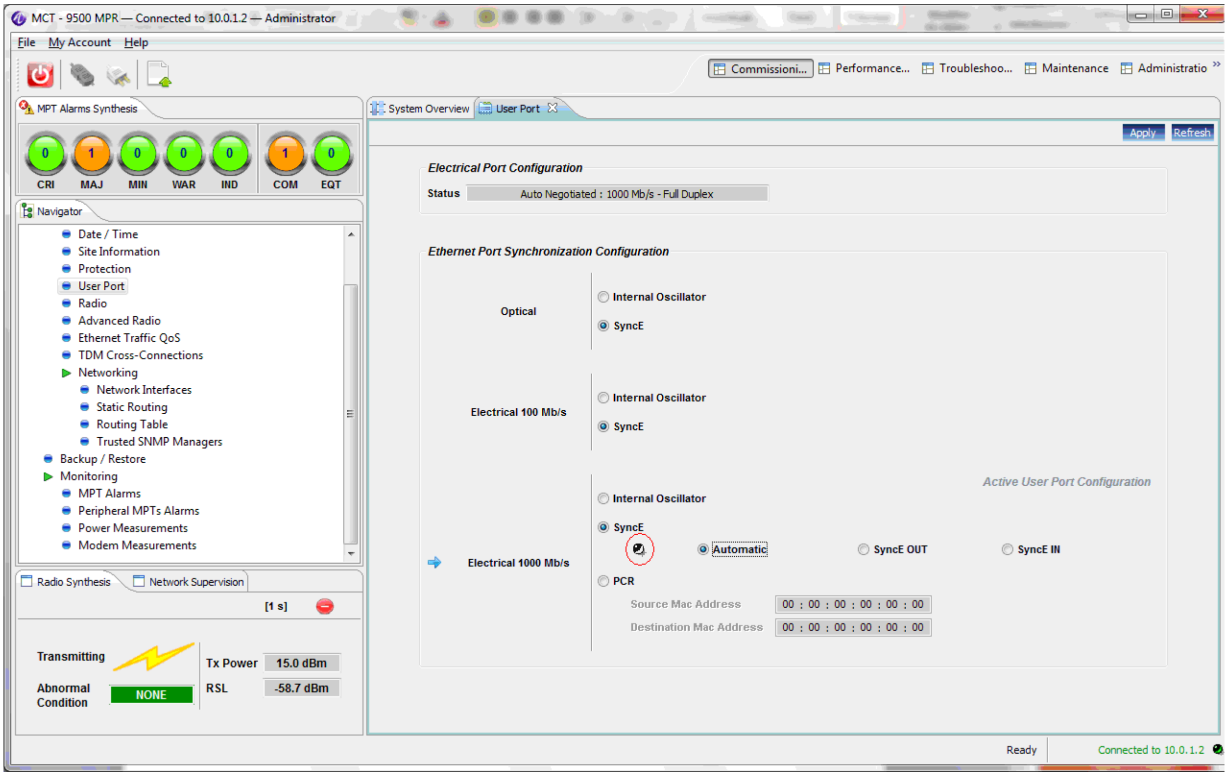


Figure 4.50 — Electrical 1 Gb/s active configuration with automatic SyncE synchronization (green LED)



The green LED indicates that the autonegotiation process is completed.

Figure 4.51 — Electrical 1 Gb/s active configuration with automatic SyncE synchronization (red LED)



The red LED indicates that the autonegotiation process failed or the link is down.

Figure 4.52 — Electrical 1 Gb/s active configuration with manual SyncE synchronization (SyncE IN or SyncE OUT)

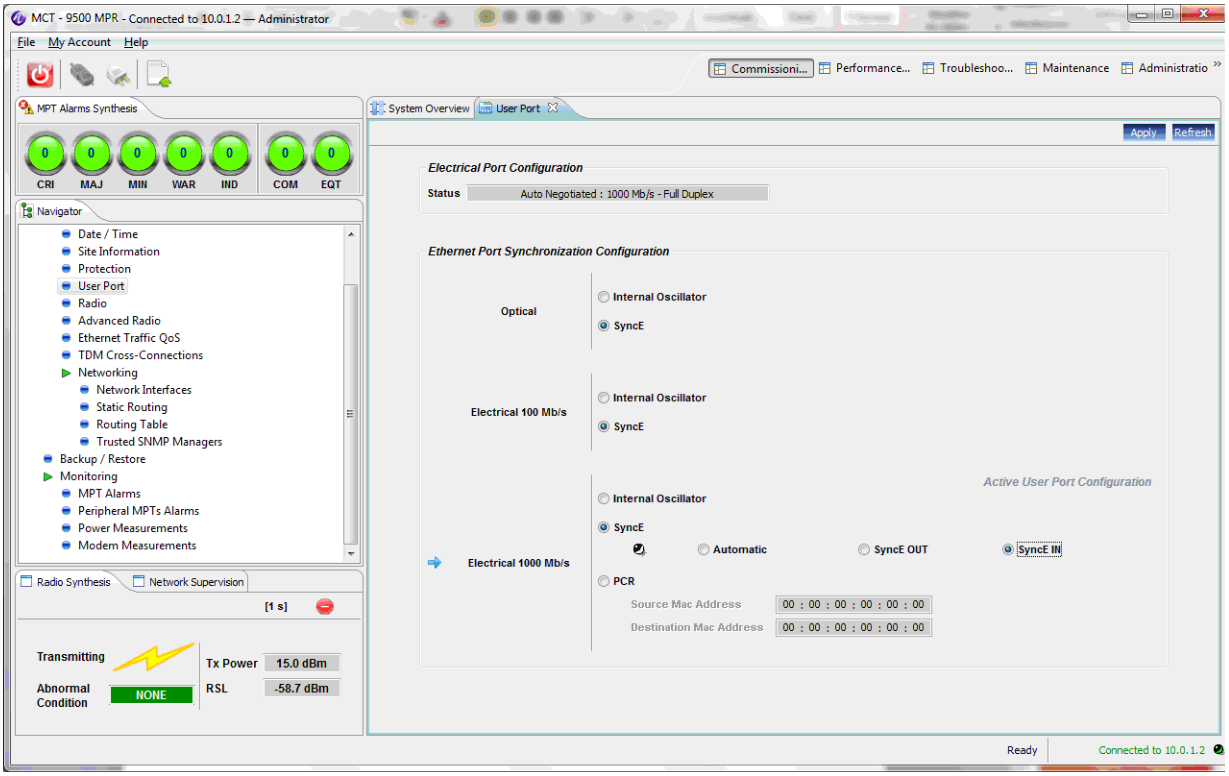
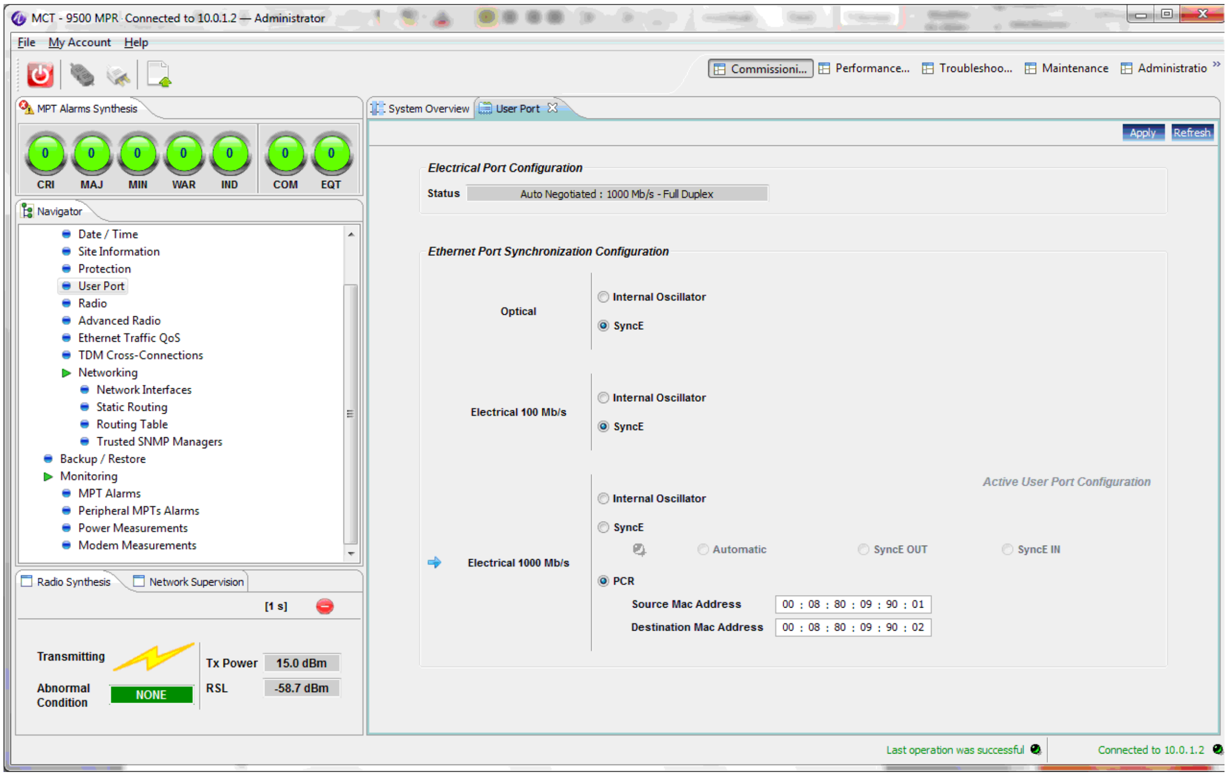


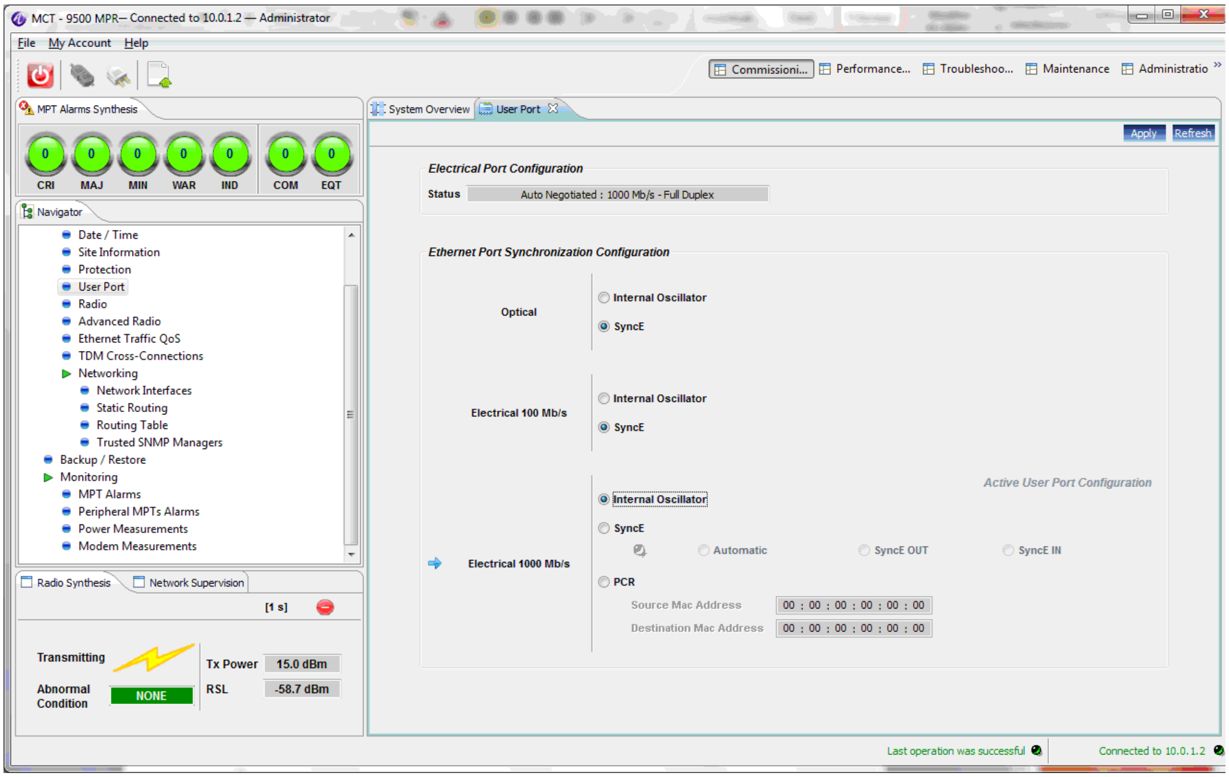
Figure 4.53 — Electrical 1Gb/s active configuration with PCR synchronization



If PCR has been selected, the Source MAC Address and the Destination MAC Address must be entered.

Note: Synchronization must be provisioned for PCR between the MPR-e standalone and a PMC port on the 7705 SAR. The source and destination MAC addresses for the 7705 SAR are available in Table 3.52.

Figure 4.54 — Electrical 1 Gb/s active configuration with Internal Oscillator



4.9.1.4.6 — Radio

To configure the radio, perform the following in the Radio Configuration tab:

1. **Telecommunications standard** panel:

   Select the **ETSI** or **ANSI** market.

2. **Modulation** panel:

   The operation mode can be with Fixed Modulation (FCM) or with the Adaptive Modulation (ACM).

   a. **Operation with Fixed Modulation (FCM)** (Figure 4.56 **and** Figure 4.57)

      i. In the **Coding Modulation Type** field, select "**Fixed (FCM)**".

      ii. In the **Channel Spacing** field, select the channel spacing to be used:

      MPR-E: up to 56 MHz for MPT-HC/HC-HQAM/MC/XP/XP-HQAM

      MPR-A: up to 50 MHz for MPT-HC/HC-HQAM/XP/XP-HQAM/ 9558HC

      iii. For MPT-HC-HQAM only: check the MPT-HC compatibility check box if needed. If the MPT-HC compatibility check box is checked, MPT-HC HQAM and MPT-HC can be mixed on both sides of a radio hop.

iv. Select the **Modem Profile Option**: Current Mask Standard Profile or New Mask Standard Profile

MPR-E: Current mask standard profile or New mask standard profile

MPR-A: Choose Standard Profile

v. In the **Reference Modulation** field, select the Modulation scheme:

MPR-E:

up to 256 QAM for MPT-HC V2, MPT-MC, and MPT-XP

up to 1024QAM for MPT-HC-HQAM (if the compatibility with MPT-HC box is unchecked)

MPR-A:

up to 256 QAM for MPT-HC V2, MPT-XP, and 9558HC

up to 1024QAM for MPT-HC- HQAM (if the compatibility with MPT-HC box is unchecked)

vi. Based on the selected Channel Spacing and the Reference Modulation, the relevant capacity will appear in the Net Radio Capacity field.

b. **Operation with Adaptive Modulation (ACM) (Figure 4.58)**

Adaptive Modulation in a point-to-point system is to adjust the modulation as well as a range of other system parameters based on the near-instantaneous channel quality information perceived by the receiver, which is fed back to the transmitter with the aid of a feedback channel.

The switching between the modulation schemes is hitless and maintains the same RF channel bandwidth.

To configure Adaptive Modulation:

i. In the **Coding Modulation Type** field, select "**Adaptive (ACM)**".

ii. In the **Channel Spacing** field, select the channel spacing.

iii. For MPT-HC-HQAM only: check the MPT-HC compatibility check box if needed. If the MPT-HC compatibility check box is checked, MPT-HC HQAM and MPT-HC can be mixed on both sides of a radio hop.

iv. Select the **Modem Profile Option**:

MPR-E: Choose Current mask standard profile or New mask standard profile

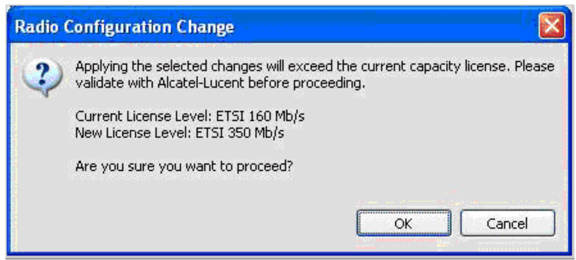
MPR-A: Choose Standard Profile

v. In the **Reference Modulation** field, select the reference modulation. For MPT-HC/HC-HQAM/MC/XP/XP-HQAMP this modulation scheme is the lowest one.

vi. In the **Allowed Modulation** field, select all the modulation schemes to be used with the Adaptive Modulation. The modulation schemes (from the lowest to the highest scheme) must be contiguous. Modulation is limited to 256QAM for MPT-HC, MPT-MC and MPT-XP. For MPT-HC HQAM/XP-HQAM modulation up to 1024QAM is available if the compatibility with MPT-HC is unchecked.

Warning: If the changes increase the current radio bandwidth, the warning message (Figure 4.55) will be raised to the operator. The new setting must be validated with Alcatel-Lucent.

Figure 4.55 — Warning screen



3. **Frequency**

   The system can operate with different types of ODUs according to the RF band and to the channel arrangement. There are ODUs that can manage only one shifter or several predefined shifters.

   In the **Shifter** field, select the suitable shifter.

   In the **Tx frequency** field, enter the suitable Tx frequency (the Rx frequency is automatically calculated by using the entered Tx frequency and the shifter).

   The **Rx frequency** field will displays the calculated Rx frequency, but, by selecting the **Allow Rx Frequency Tuning** check box this frequency can be changed in ±+5 MHz increments to implement the "**Exotic**" shifter configuration, if required.

4. **Tx Mute**

   To mute the transmitter, select the **Mute** check box.

Note: For an MPR-e in a 1+1HSB configuration in Single NE mode with 7705 SAR, in order to mute the entire mw-link a "TX-Mute" command shall be applied to both Main and Spare radios.

5. **Transmit Power Control Mode**

   Select the Mode: **RTPC** or **ATPC**.

6. **RTPC settings**

   - **Tx power without Adaptive Modulation**

     If the ATPC is disabled, the Tx Power field is available. The Tx Power range is displayed in the screen.

     In this field, enter the new value within the allowed transmitted power range.

   - **Tx Power with Adaptive Modulation**

You can modify only the Tx power relevant to the lowest modulation scheme. In this field you must enter the constant power, which will be used with the lowest modulation.

Note: The same power value will be used by the other modulation schemes.

7. **ATPC settings**
   - **ATPC Remote RSL Threshold**

     The value of the low power threshold can be changed by writing the new value in the field. When the Rx power is equal to this power the ATPC algorithm starts to operate.

     The set point of the ATPC regulation (ATPC RSL threshold) must be chosen considering the link budget. For example if the set point is too high, the remote transmitter will permanently remain at maximum power. It is recommended to choose a value at least 15 dB above the 10-6 BER threshold.

     In ATPC+ACM the RSL threshold must be set properly in order to ensure that the maximum throughput capacity is met while ATPC is working. The typical minimum margin compared to the highest modulation 10-6 BER Threshold, is somewhere between 7dB (low modulation) to 11dB (high modulation). These values are for information only and are radio configuration dependent.
   - **Min ATPC Tx power and Max ATPC Tx power**

     The **Min Tx power** and **Max Tx power,** within the Tx Range in the ATPC management, can be written in the relevant field.

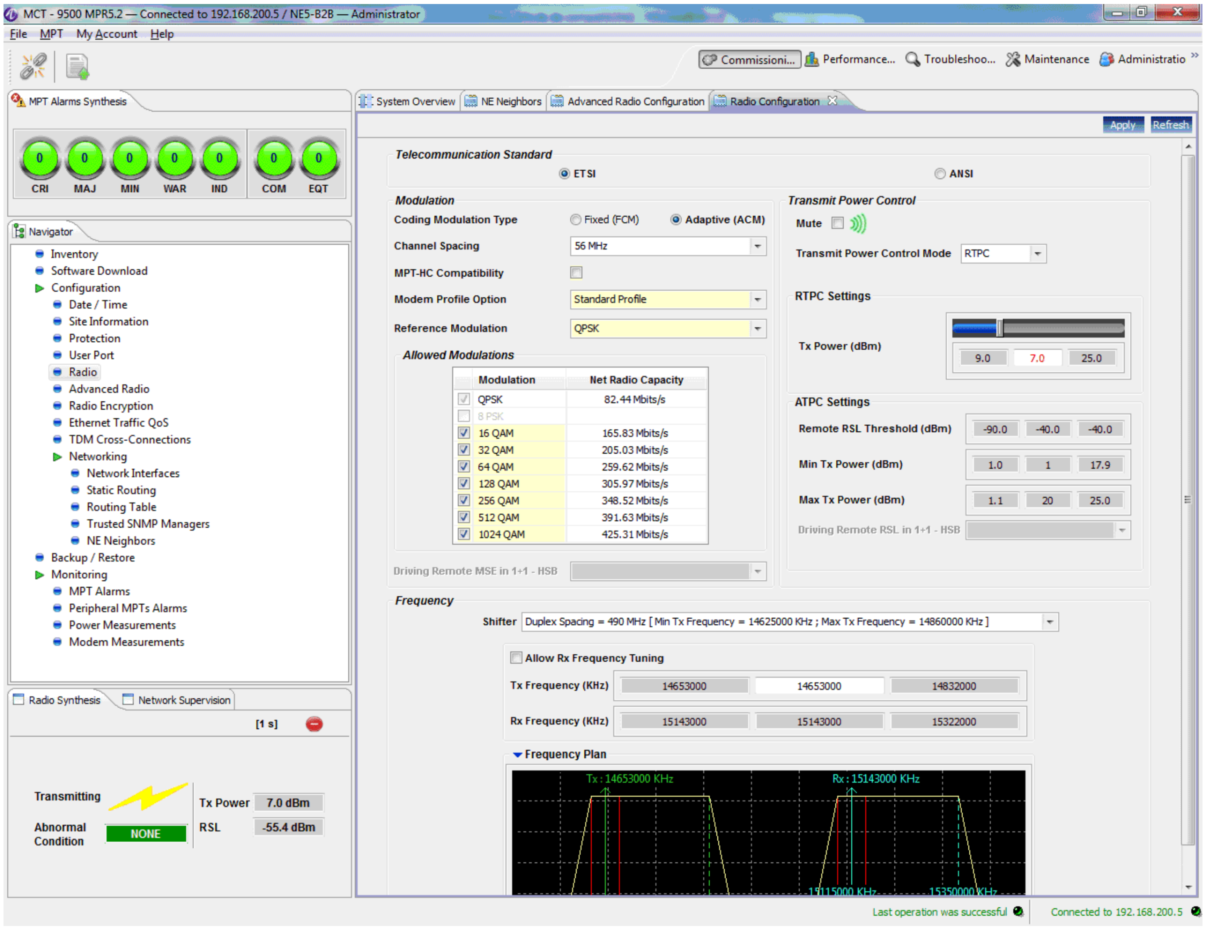
Figure 4.56 — Radio configuration MPT-HC-HQAM: FCM - RTPC

In this example the MPT-HC compatibility is enabled.

Figure 4.57 — Radio configuration MPT-HC-HQAM: FCM - ATPC

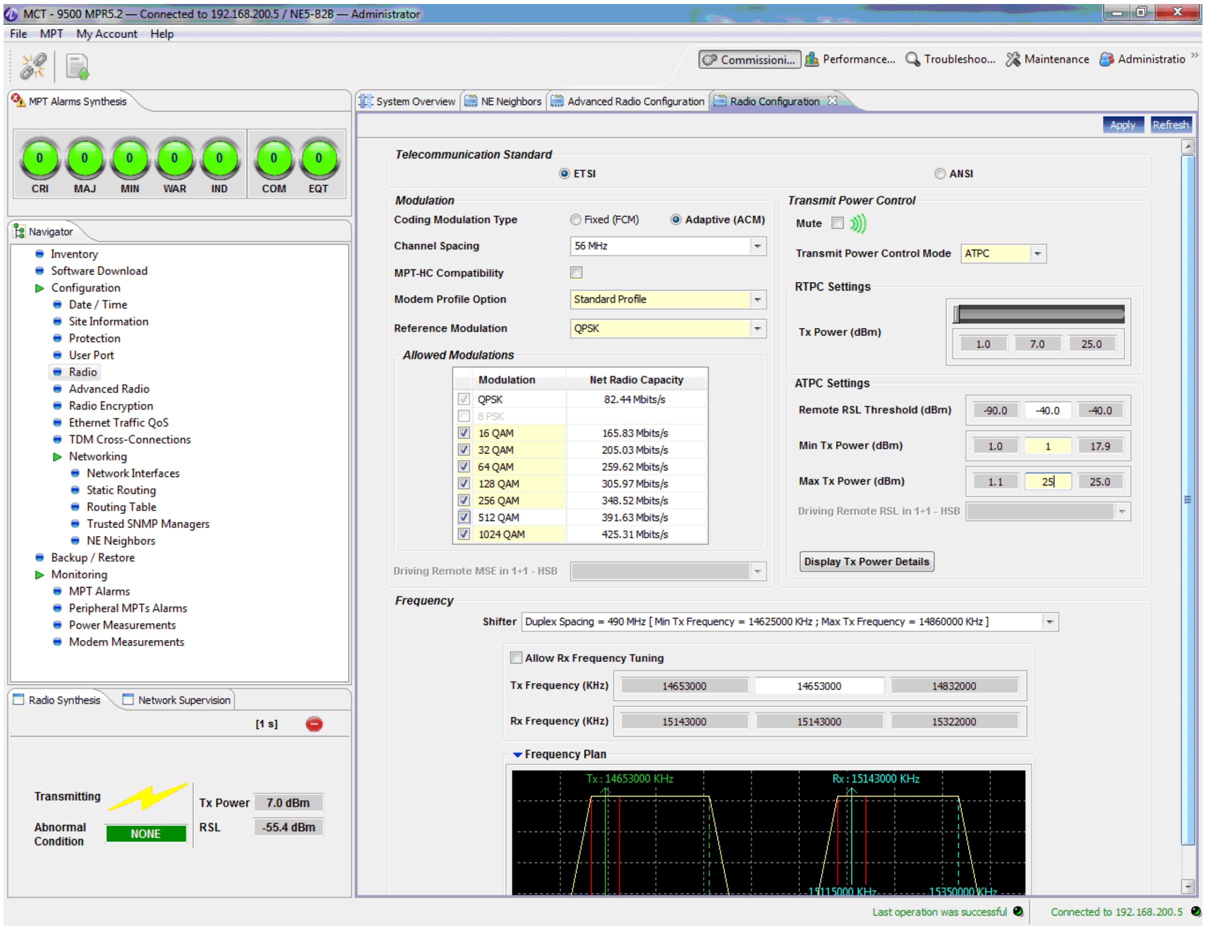
In this example the MPT-HC compatibility is enabled.

Figure 4.58 — Radio configuration MPT-HC-HQAM: ACM - RTPC



In this example MPT-HC compatibility is disabled, offering modulation schemes up to 1024QAM. All modulations from QPSK up to 1024QAM are available.

Figure 4.59 — Radio configuration MPT-HC HQAM: ACM - ATPC



In this example MPT-HC compatibility is disabled, offering modulation schemes up to 1024QAM. All modulations from QPSK up to 1024QAM are available.

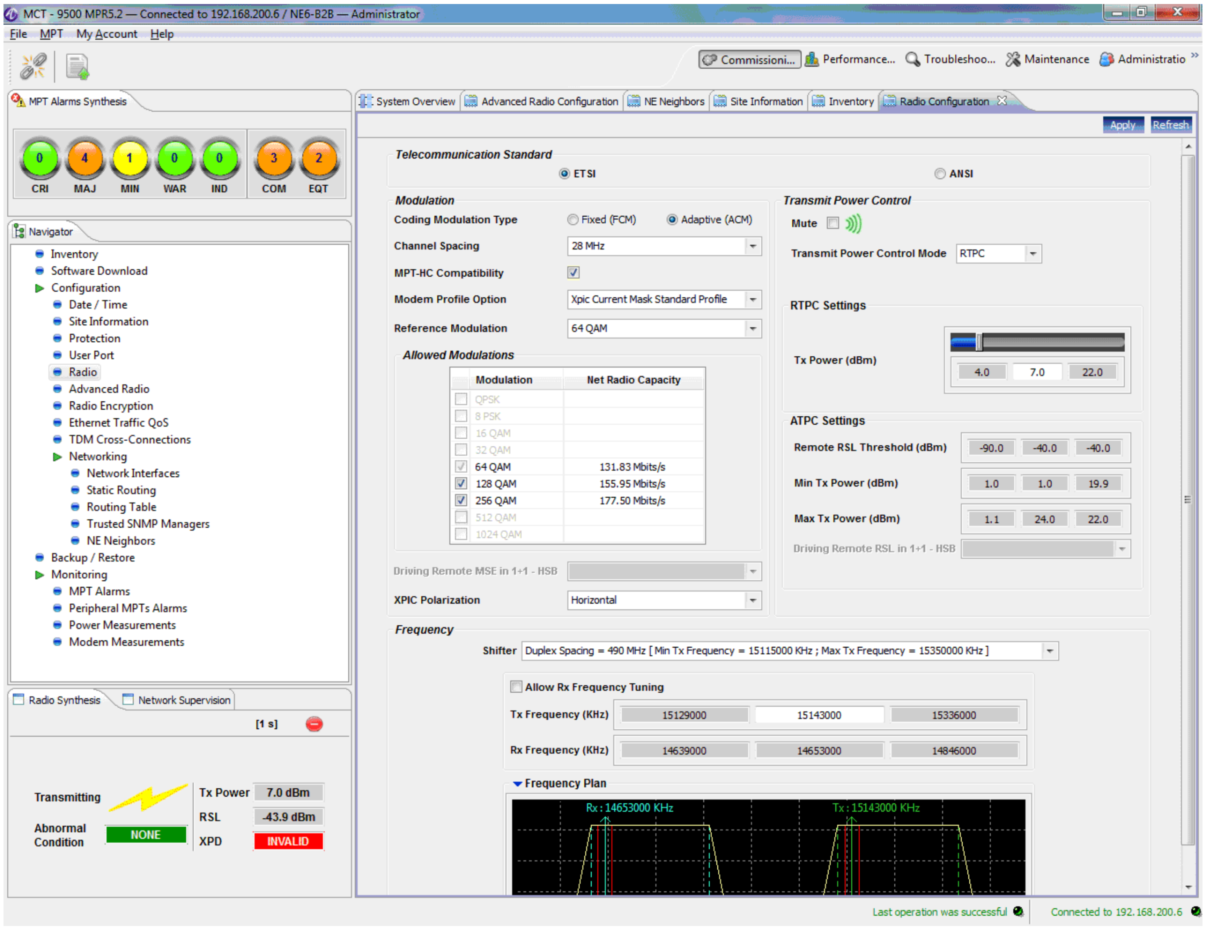
8. XPIC (only for MPR-e with MPT-HC/HC-HQAM/XP/XP-HQAM)

The XPIC can be configured for an MPT-HC V2/MPT-XP (with the RPS + XPIC external module) and for MPT-HC-HQAM/XP-HQAM (with embedded XPIC functions). XPIC is not available in 1+1 HSB protection.

The XPIC can be configured with or without Adaptive Modulation.

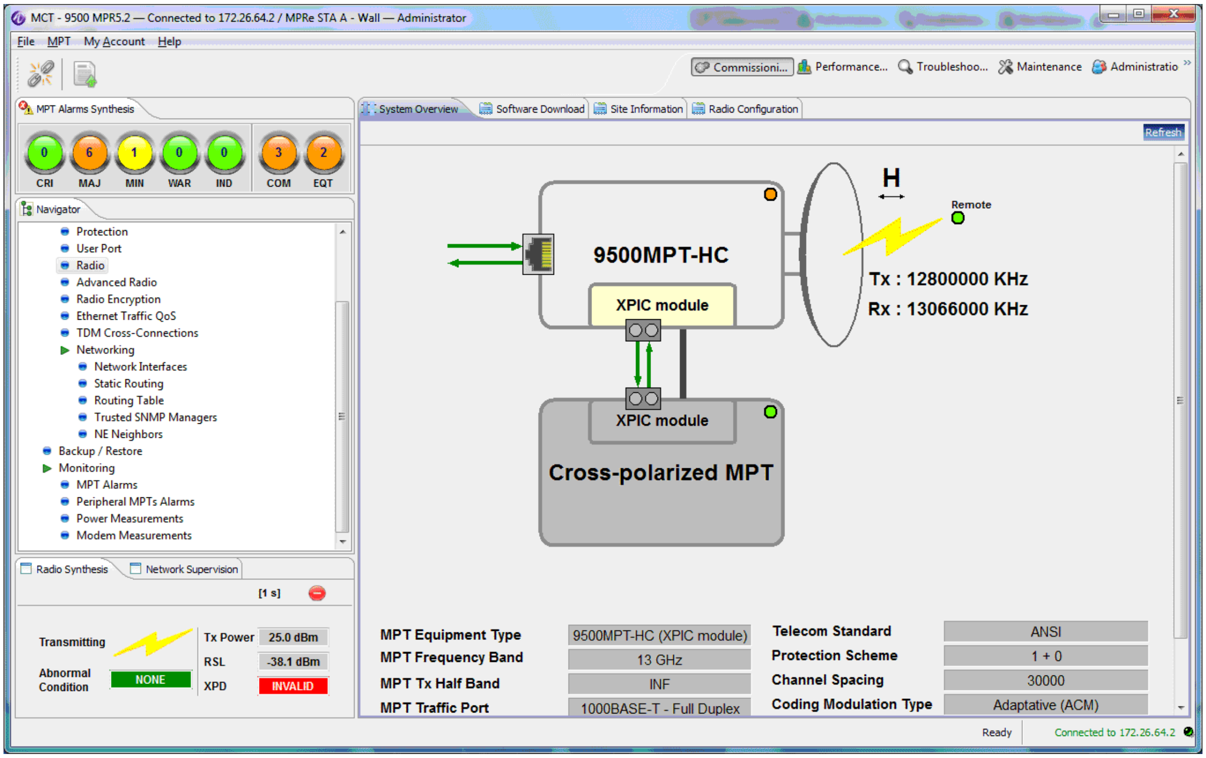
- In the **Modem Profile Option** field select a profile with the XPIC.
- In the **XPIC Polarization** field select the polarization to be associated with the MPT-HC/HC-HQAM/XP/XP-HQAM: Horizontal or Vertical.
- Configure the second MPT-HC/HC-HQAM/XP/XP-HQAM to be associated in the XPIC configuration with the same profile and with opposite polarization.

Figure 4.60 — XPIC configuration (MPT-HC-HQAM)



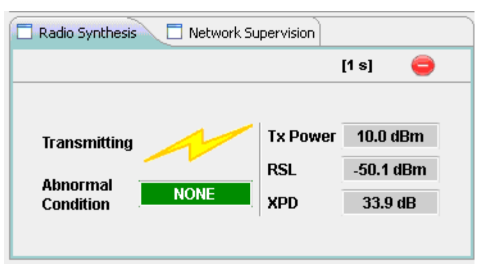
When the XPIC has been configured, the MPT-HC/HC-HQAM/XP/XP-HQAM will appear in the **System Overview** screen (see Figure 4.61).

Figure 4.61 — XPIC with horizontal polarization system overview



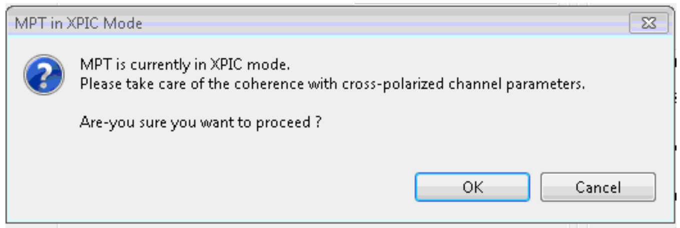
When the XPIC has been configured in the **Radio Synthesis** tab the XPD value is shown (see Figure 4.62).

Figure 4.62 — XPD



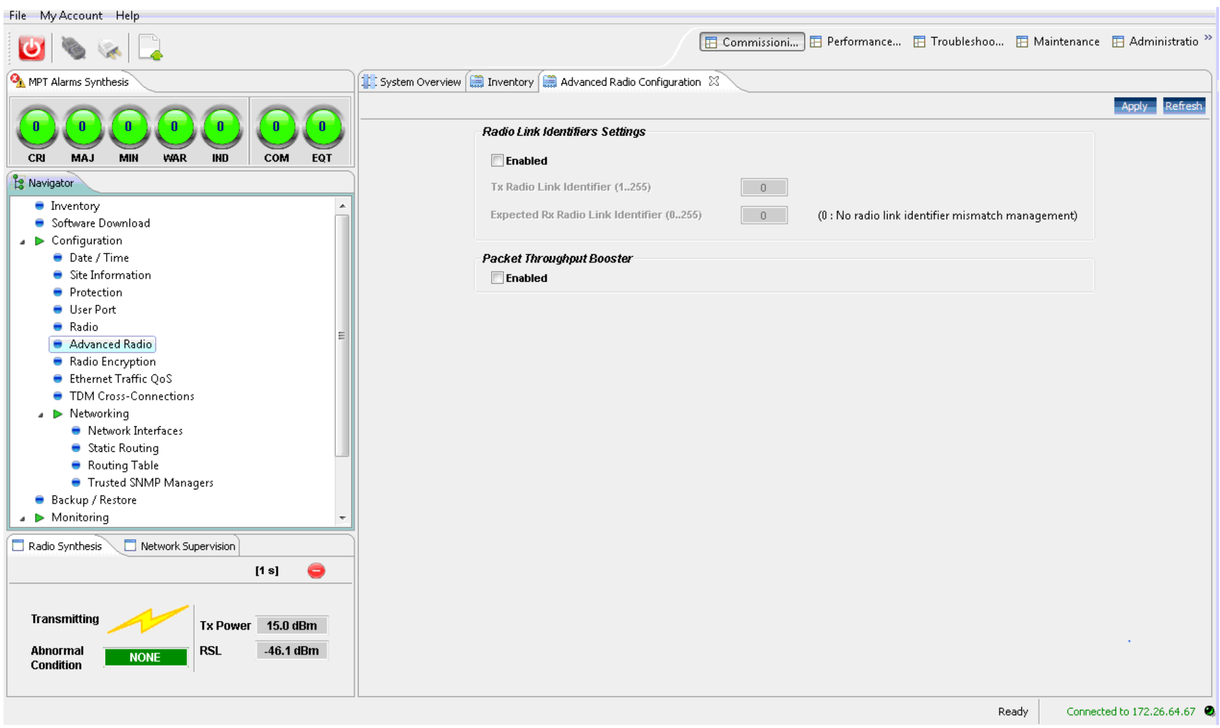
Warning: When you change a radio parameter (such as modulation mode ACM/FCM, modulation/capacity, Tx or Rx freq or shifter value), a warning message is raised (see Figure 4.63). You need to ensure that the radio configuration between the two MPTs involved in XPIC is aligned.

Figure 4.63 — Warning message



4.9.1.4.7 — Advanced Radio

Figure 4.64 — Advanced radio configuration



This menu is used to specify the expected and sent identifier values of parameters related to the link management and, if necessary, to modify them.

If the link identifier is Enabled, the following fields can be filled in:

- **Tx Radio Link Identifier**: this field is the link identifier entered on the transmitting NE (1 to 255)
- **Expected Rx Radio Link Identifier**: this field is the link identifier expected at the receiving NE (0 to 255).

Note: If the Expected Rx Link Identifier is "0", there is no link identifier mismatch management.

- **Packet Throughput Booster**:

  In order to improve the use on air bandwidth, the MPT can compress the packet applying the following principle: whenever a packet is received with a known packet header at remote site, the MPT saves bandwidth by not transmitting this header each time. Only some learning bytes allow to index the corresponding known packet header.

  When activated the MPT will compress, when possible, the packet to save air bandwidth. To activate the Packet Throughput Booster tick the relevant check box in this field.

Note: The remote NE must have also enabled its "Packet Throughput Booster" feature for decompression capabilities.

4.9.1.4.8 — Radio encryption (available only for MPT-HC/HC-HQAM)

The 9500 MPR supports 256bit AES encryption with static key. A key generation string (Passphrase) has to be entered at both ends of the radio link to generate the encryption/ decryption key.

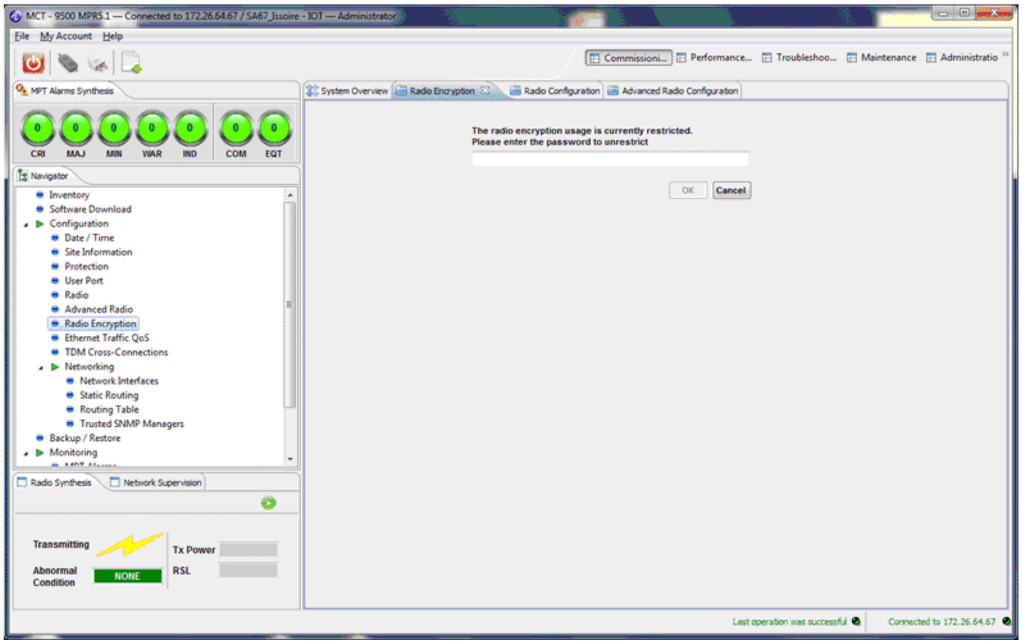
Note: This feature is only available on MPT-HC/HC-HQAM and not supported for MPR-e in 7705 SAR mode.

This service is available through the Configuration > Radio Encryption tab in the Navigator menu, see Figure 4.65.

Since the radio encryption usage is restricted, a password is needed to have access to this service. If you don't have it, contact your Alcatel-Lucent sales representative.

Note: The password is requested only at the first commissioning.

Figure 4.65 — Radio encryption



After entering the access password, you are invited to enter a passphrase of your choice that will be used to generate the encryption key before being able to activate the encryption, see Figure 4.66 and Figure 4.67.

Warning: The passphrase must be the same on the 2 MPTs of the same radio link. In case of passphrase misalignment, no alarm will be reported.

Figure 4.66 — Set radio encryption passphrase

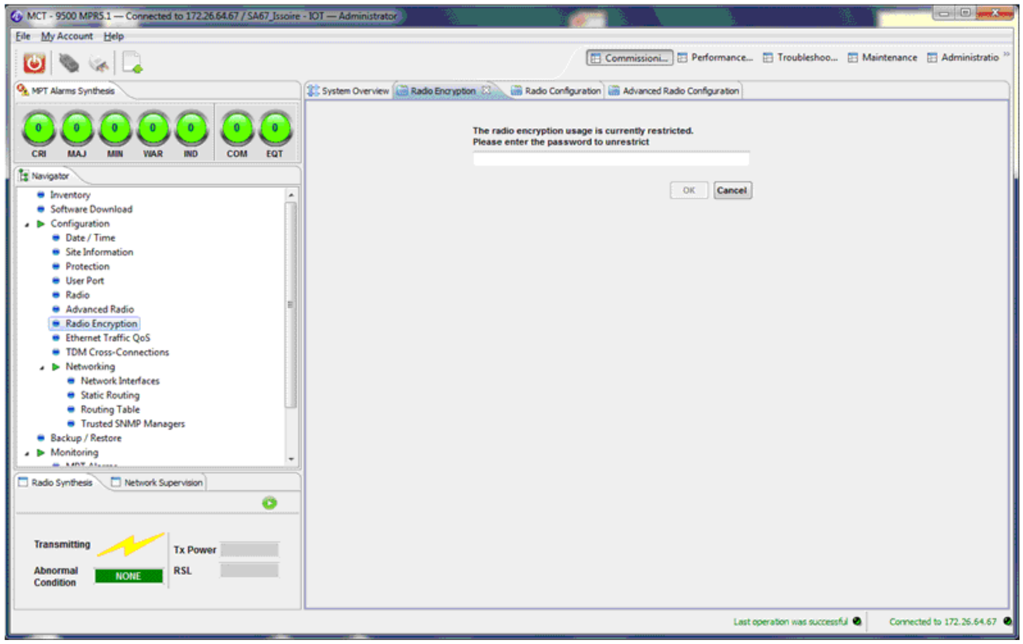
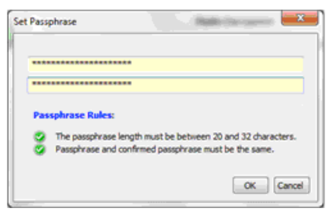


Figure 4.67 — Set passphrase window

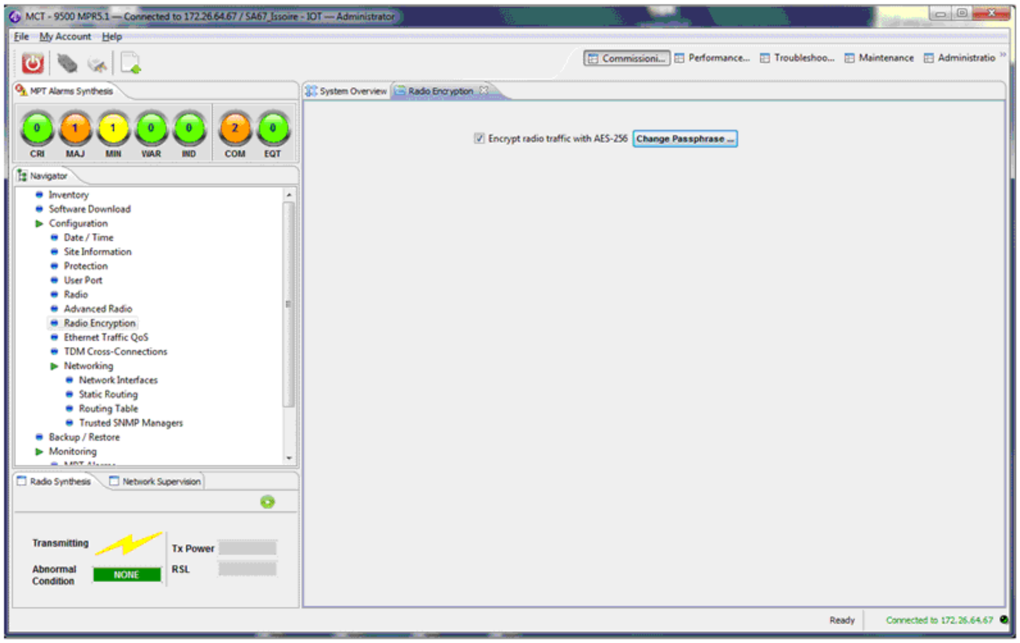


The passphrase must be set twice with a length between 20 and 32 characters. It is possible, for convenience, to copy and paste the passphrase from a text file to the MCT fields. However, it is not authorized to copy the content of an MCT passphrase field and paste it elsewhere.

When the passphrase is accepted, you can activate the radio encryption and modify the passphrase while the AES is running, see Figure 4.68.

Warning: When modifying the passphrase, the radio traffic will be interrupted while the passphrases are not the same on each side of the link.

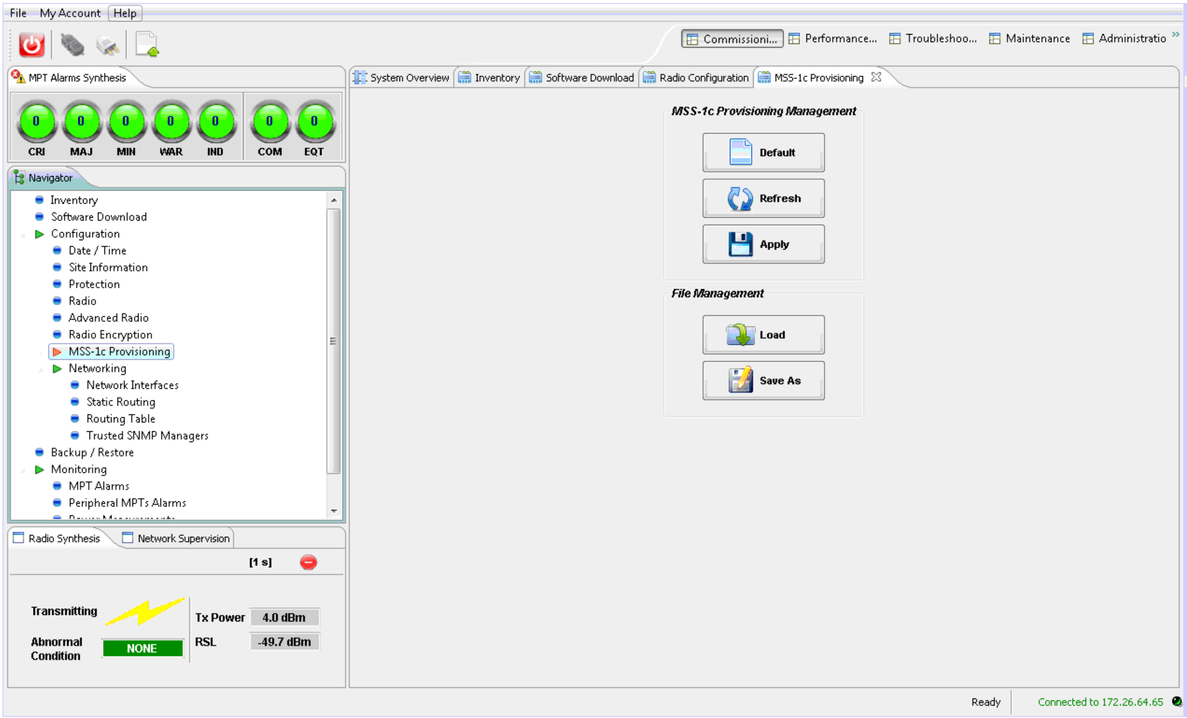
Figure 4.68 — Radio encryption set



4.9.1.4.9 — MSS-1c provisioning

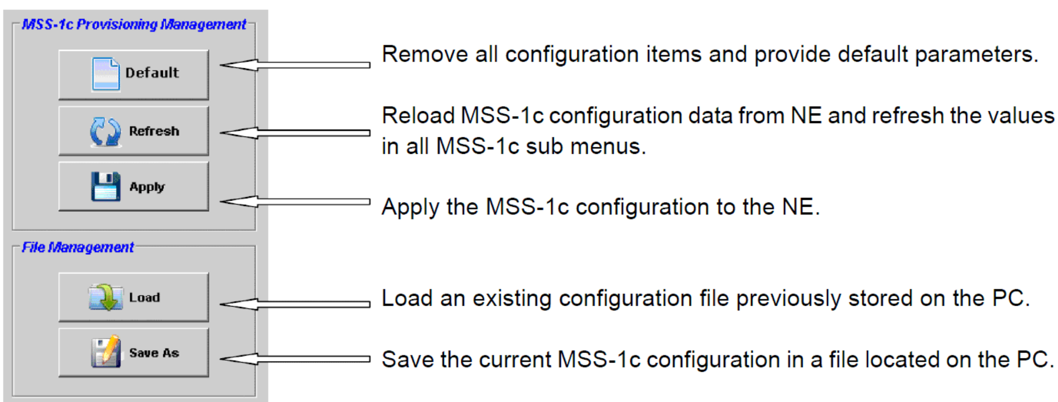
This menu gives access to MSS-1c provisioning:

Figure 4.69 — MSS-1c



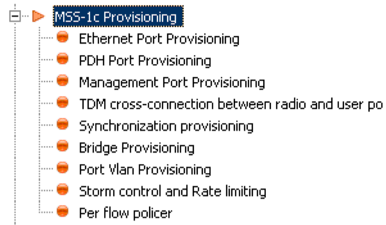
The menu offers the following operations:

Figure 4.70 — Provisioning Management menu



When the MCT is launched the MSS-1c configuration data is read from the NE and the navigator shows all the MSS-1c provisioning sub-menus. If trouble occurs, verify that the FTP Server in the NEtO Servers Manager window is on.

Figure 4.71 — Provisioning sub-menus



To change the MSS-1c configuration, modify the parameters (see Ethernet port provisioning to Per flow policer), then push the Apply button to send and execute the modifications on the NE.

Warning: the modification of some parameters will cause a restart of the NE after the Apply action. See Specific behaviors.

To reset the configuration to the Default one, push the Default button, then fill in the different fields with the right parameters (see Ethernet port provisioning to Per flow policer), then push the Apply button to send and execute the modifications on the NE.

To configure the NE for the first time, fill in the different fields with the right parameters (see Ethernet port provisioning to Per flow policer), then push the Apply button to send and execute the modifications on the NE.

In order to restore the configuration, for example to cancel unwanted modifications, you can push the Refresh button at any time before having applied the configuration.

To load a previously stored configuration, push the Load button and select the file in the browser. You can then modify some parameters or send it as it is by pushing the Apply button.

Warning: in any case the NE will restart after the Apply action.

To save the current configuration, push the Save As button and enter the file name you want.

Note: When the MCT is launched from the 1353OMS, the management of the configuration of the MSS-1c is done through a provisioning file that has to be uploaded/downloaded from/to the NE with a FTP server. The first screen of the MSS-1c provisioning invites the User to do this operation and offers different provisioning modes: "Initial configuration" mode must be used to create a first configuration and the "reconfiguration mode" is appropriate to apply modification on an existing configuration. Regarding the configuration of the MSS-1c itself, the description given in the rest of this section is fully applicable.

4.9.1.4.9.1 — Specific behaviors

4.9.1.4.9.1.1 — A) Parameters leading to a restart

The modification of the parameters, which lead to a NE restart, are the following ones (these parameters are identified by a little lamp):

Table 4.1 — Parameters leading to a restart

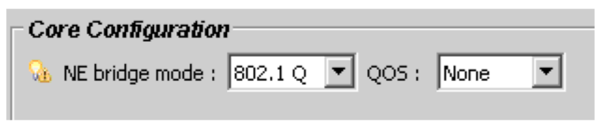
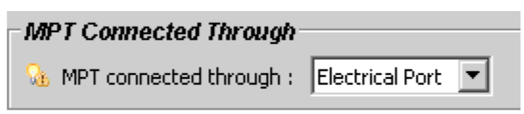
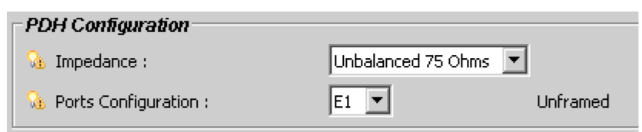
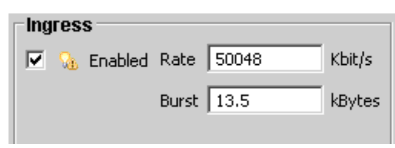
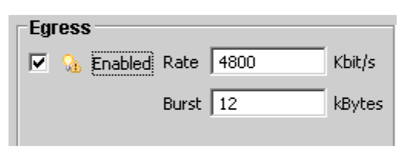
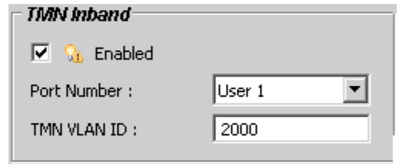
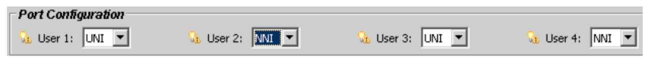
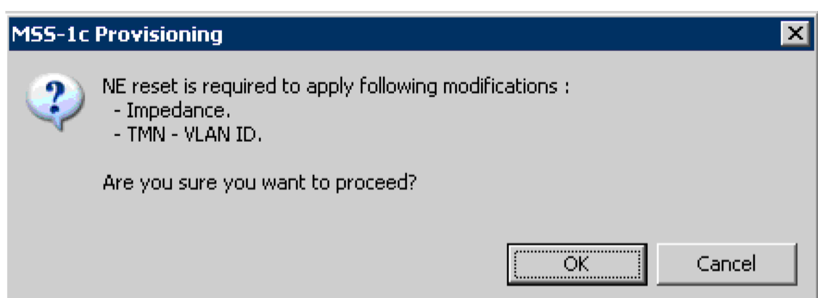
Bridge mode	
Connection of the MPT:	
PDH configuration:	
Disabling Ingress Port Rate Limiting	
Disabling Egress Port Rate Limiting	

Table 4.1 — Parameters leading to a restart

Disabling the TMN in Band	
Modifying the User port configuration (UNI / NNI)	
Modifying the S-TPID in 802.1ad bridge mode	

A tooltip is also displayed when the mouse cursor is placed over the icon.

If one or several parameters are changed, the operator is also warned when he pushes the Apply button.



Pushing the Cancel button will stop the application of the modifications.

Figure 4.72 — Cancel button

And pushing the Refresh button will retrieve the initial configuration.

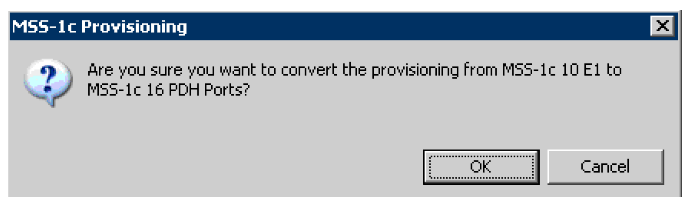
Figure 4.73 — Refresh button

4.9.1.4.9.1.2 — B) Conversions

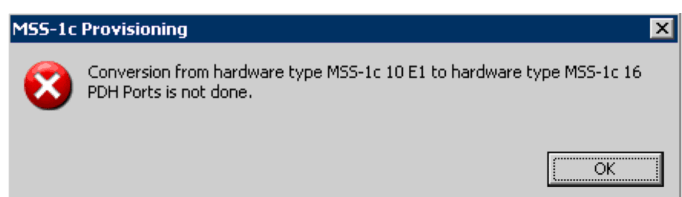
In the conversion situations described in this section, the Navigator shows only this entry:

that is without sub-menus displayed. When the button Refresh is pressed, the messages shown hereafter will be displayed.

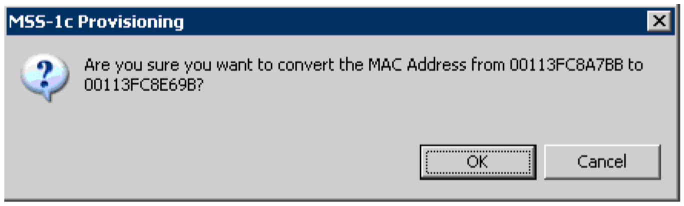
- **Hardware type conversion**: The operator saved a configuration file with a MSS-1c 10 E1. Later he replaces the MSS-1c 10 E1 with a MSS-1c 16 PDH and wants to load this saved configuration on the new MSS-1c. As the MSS-1c hardware is different, a conversion of the data is needed to adapt the configuration to the new MSS-1c 16E1. This message is displayed to warn the operator:

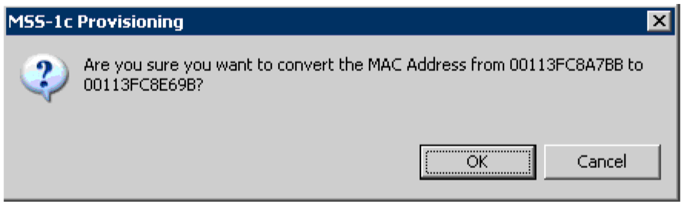
  

  If the operator cancels the conversion, this message is displayed, the loading and conversion are then stopped and the data displayed in the MSS-1c screens stay unmodified.

- **MAC address conversion**: The operator saved a configuration file on a NE. He wants to load this configuration on another NE, with the same type of MSS-1c. As the MAC address of the NE (used to create cross-connections) is different, a conversion of the data is needed to adapt the configuration to the new NE. This message is displayed to warn the operator:



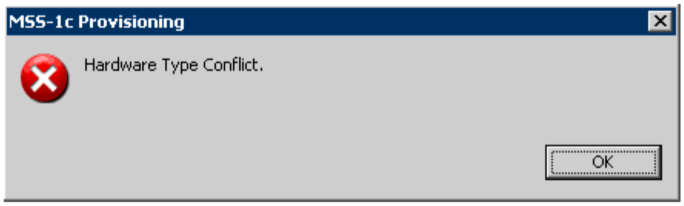


If the operator cancels the conversion, this message is displayed, the loading and conversion are stopped and the data displayed in the MSS-1c screens are unmodified.

- Both conversions may be applied on the same file, one after the other. This is the case when the file has been saved with a MSS-1c 10E1 on another NE.

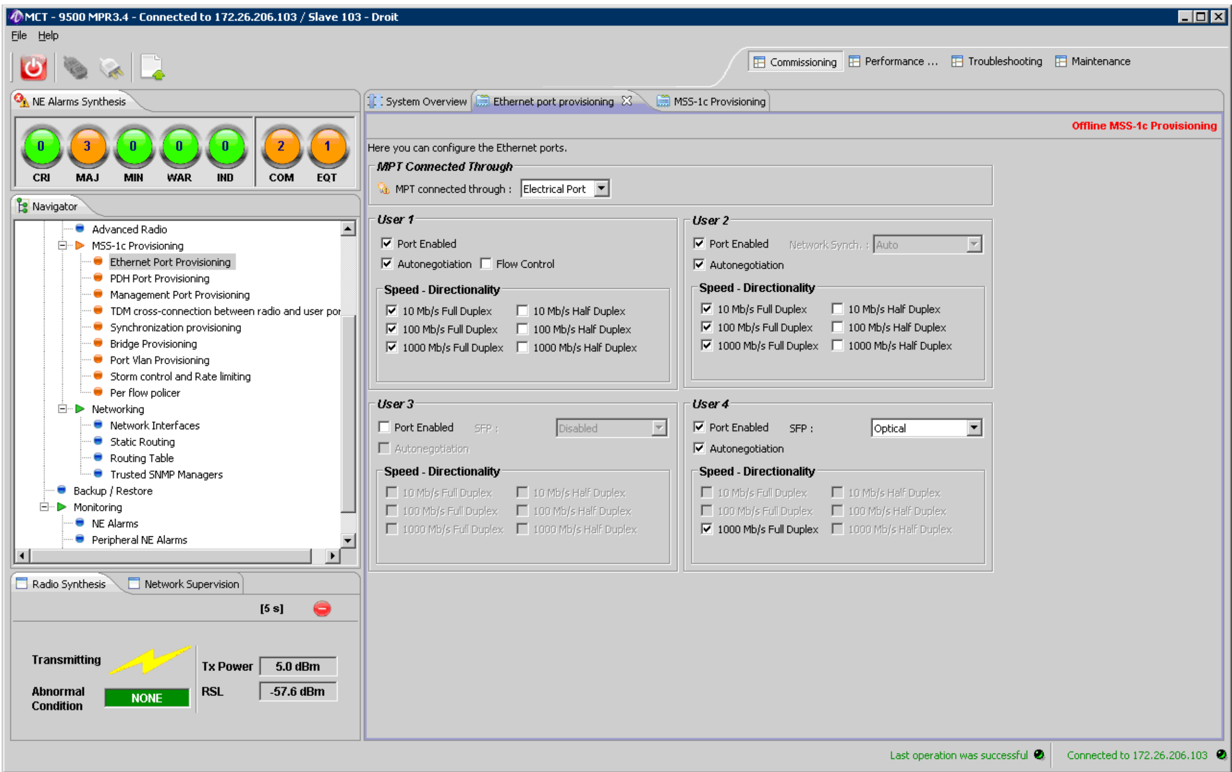
4.9.1.4.9.1.3 — Conversion error

It is not possible to load a configuration file saved in a MSS-1c 16 E1 topology on a MSS-1c 10 E1. There is no conversion provided and this message will warn the operator in this case.



4.9.1.4.9.2 — Ethernet port provisioning

Figure 4.74 — Ethernet ports provisioning



4.9.1.4.9.2.1 — A) MPT connection

MPT connected through: select the right port where the MPT is connected to MSS-1c. This information is used to configure the radio ports used in cross connections (TDM and VLANs).

4.9.1.4.9.2.2 — B) User 1 - electrical port

To configure an Electrical user port like user 1:

- **Port enabled**: check the box
- **Auto negotiation**:
  - check the box: the port will negotiate speed and duplex mode with its peer
  - do not check the box: speed and duplex mode are selected by the operator (Forced mode)

Note: Forced mode setting is not recommended for a definitive configuration. Autonegotiation should be chosen.

- If Auto negotiation is selected, for **Speed** select one or several check boxes, the same for duplex mode
- If Auto negotiation is not selected, for **Speed** select only one value, the same for duplex mode.
- If Auto negotiation is selected, the **Flow Control** can be configured.

4.9.1.4.9.2.3 — C) User 2 - electrical - syncE port

To configure a SyncE electrical port like user 2, proceed the same way as for user 1. In addition configure the Network synchronization.

- **Auto**, if you do not use the syncE property of the port
- **SyncE IN**, if you use the port as synchronization input. MSS-1c receives clock from external equipment.
- **SyncE OUT**, if you use the port as a synchronization output. MSS-1c sends its clock to external equipment.

Note: this feature is authorized only if the port is set in Auto negotiation mode with speed 1000 Mbit/s and full duplex only.

4.9.1.4.9.2.4 — D) User 3 & 4-electrical / optical port

Thanks to SFP connected into the relevant slots, these two ports can be configured in electrical or optical mode.

Once the Port Enable Check box is selected, you can choose the type of SFP in the SFP list (Disable or Electrical or Optical)

In the **Electrical** mode, the configuration is like user 1.

In the **Optical** mode, the Port configuration can be set to Auto negotiation or not (forced mode). The speed is always 1000 Mbit/s.

The duplex mode is always Full Duplex.

Note: In optical mode, User port 4 can be used as SynchE port. It is also the case for User port 3 only on MSS-1c 16PDH.

4.9.1.4.9.3 — PDH ports and local IWF cross connection provisioning

For the explanation of the traffic profiles TDM2TDM and TDM2ETH (see MSS-1c traffic profiles).

Note: The 75 ohm unbalanced impedance with BNC or 1.6/5.6 connectors. The 120 ohm balanced impedance with other connectors.

Two types of MSS-1c are available: MSS-1c-10 E1 and MSS-1c-16 PDH ports (E1 or T1).

The E1/T1 choice is applied on all the PDH ports.

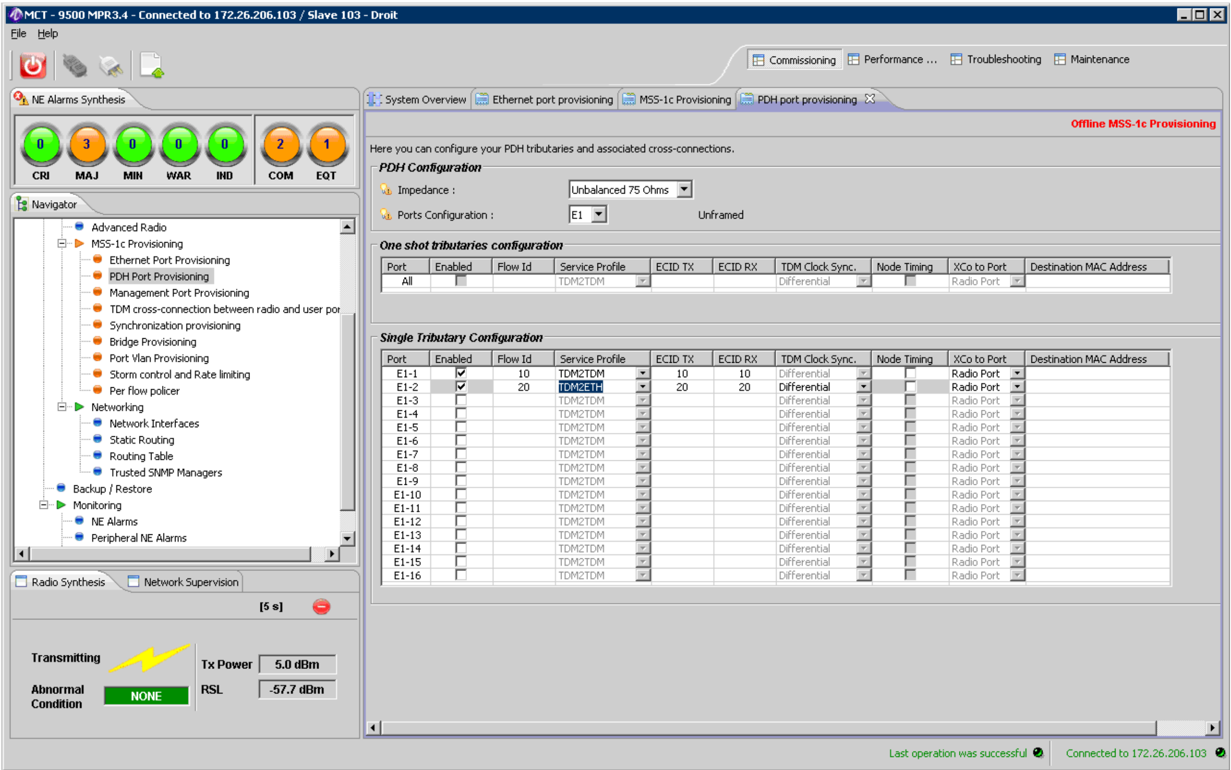
4.9.1.4.9.3.1 — A) TDM2TDM cross connection (E1 case)

To configure a TDM2TDM cross connection:

- Configure the E1 port **Impedance** (75 or 120 ohm). This choice is for all the ports.
- Choose the **E1 port** you want to configure (between 1 and 10 on MSS-1c or 1 and 16 on MSS-1c 16PDH)
- In column **Enabled**: Check the box
- In column **Flow Id**: Enter a valid VLAN Id (between 2 and 4080). Note that VLAN Id is unique.
- In column **Service Profile**: Select TDM2TDM in the list (default value)
- In the column **Node timing**: Check the box or not. When it is selected, the regenerated E1 at receiver side are synchronized to the network element clock (NEC). Note that corresponding incoming TDM flows shall be synchronous to the NEC at transmit side.
- In column **XCo to port**: Select Radio Port (default value). The cross connection is established between an E1 port and the Radio

Port E1-1 is being configured as shown in Figure 4.75.

Figure 4.75 — Cross connection TDM2TDM (E1 case)



The “One shot tributaries configuration” is also available to configure all the tributaries in one shot as shown in Figure 4.76.

Note: If the One shot tributary configuration is not fully displayed, check that you have selected the classic window setting, if you are using Windows 7.

Figure 4.76 — One shot tributaries provisioning

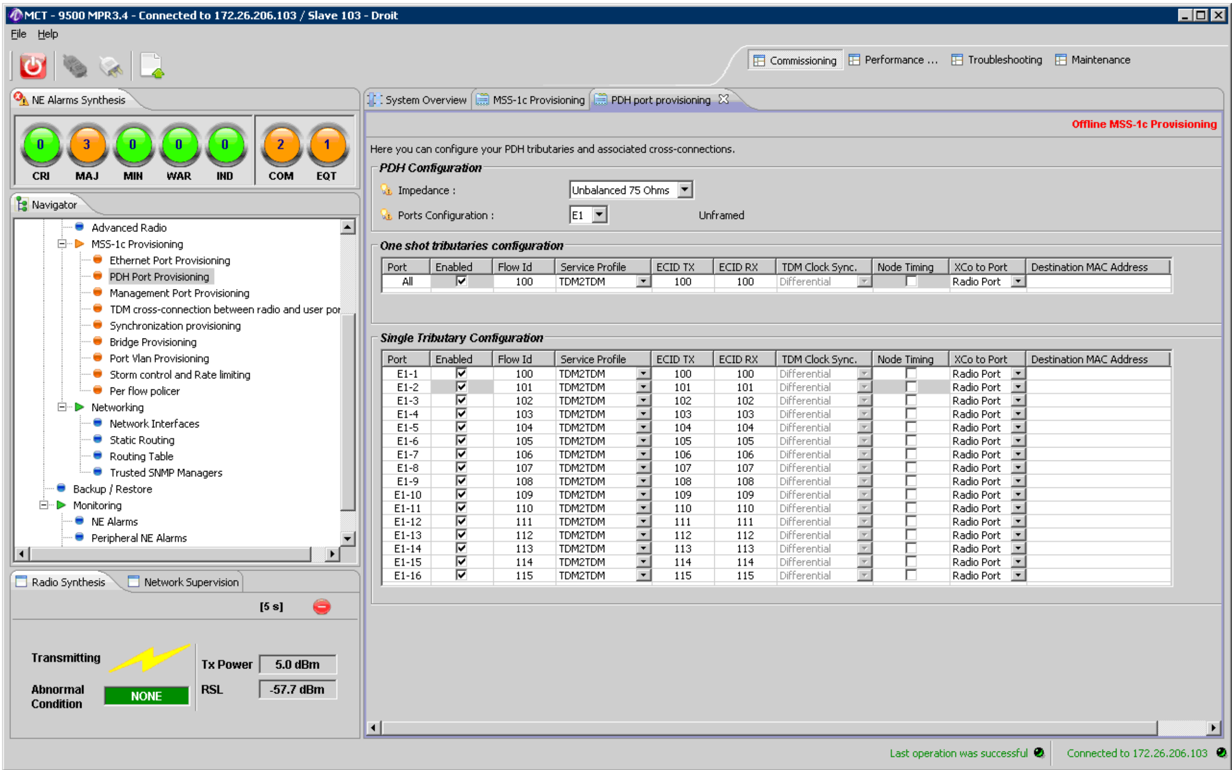
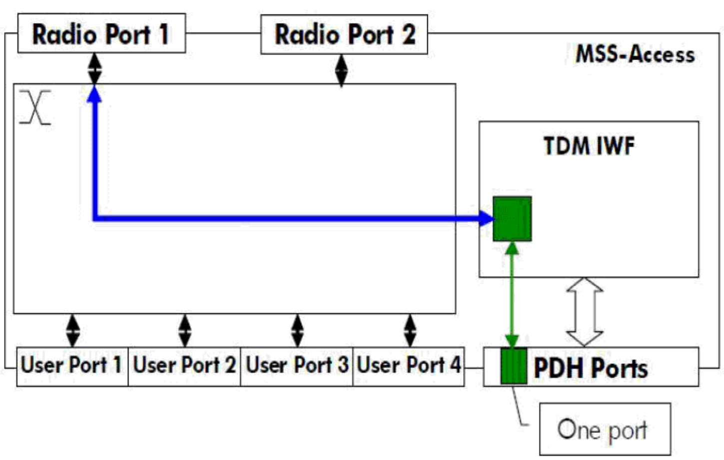


Figure 4.77 shows the different elements involved in the cross connection, in green the PDH part and CES part (encapsulation in Ethernet frame done by IWF), in blue the Ethernet part realized by the switch.

Figure 4.77 — Cross connection functional scheme



4.9.1.4.9.3.2 — B) TDM2TDM cross connection (T1 case)

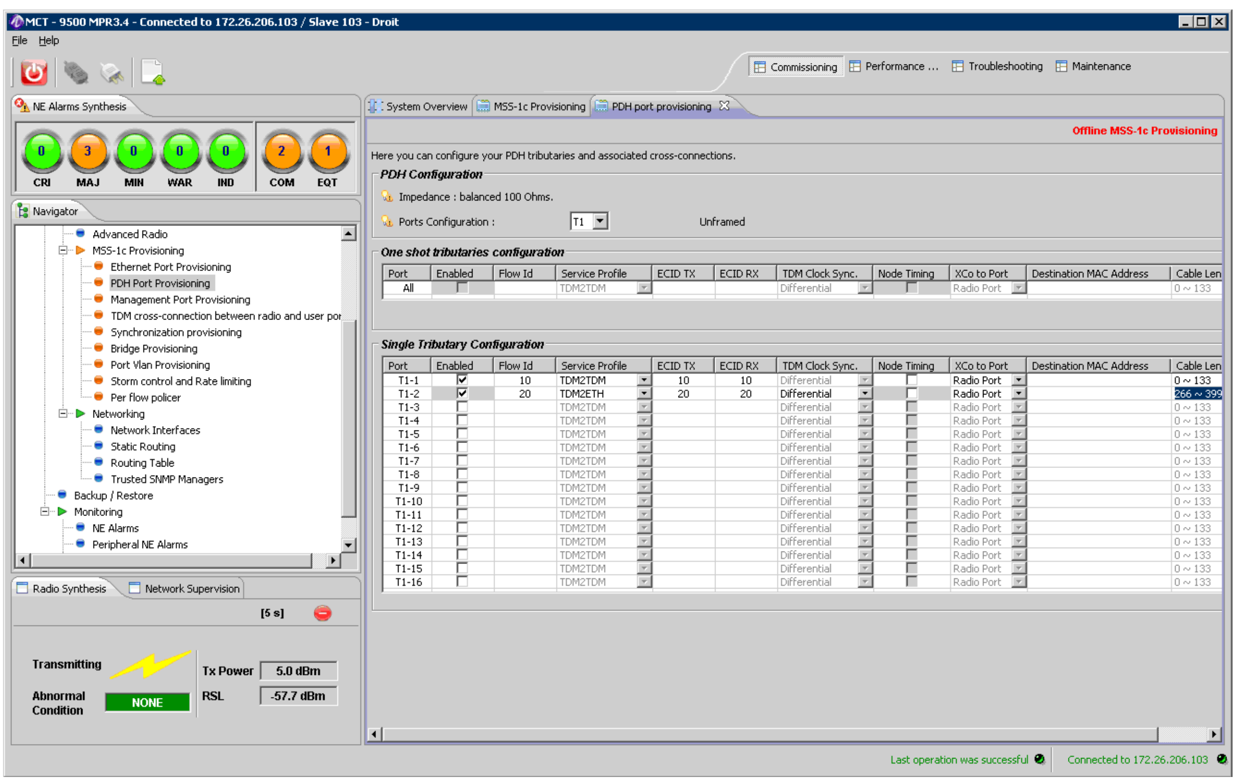
To configure a TDM2TDM cross connection:

- Select the Port configuration: T1
- Choose the **T1 port** you want to configure (between 1 and 16)
- In the column **Enabled**: Check the box
- In the column **Flow Id**: Enter a valid VLAN Id (between 2 and 4080). Note that VLAN Id is unique.
- In the column **Service Profile**: Select TDM2TDM in the list (default value)
- In the column **Node Timing**: Check the box or not. When it is selected, the regenerated T1 at receiver side are synchronized to the network element clock (NEC). Note that corresponding incoming TDM flows shall be synchronous to the NEC at transmit side.
- In the column **XCo to port**: Select Radio Port (default value).

  The cross connection is established between an T1 port and the Radio port.
- In the column **Cable Length**: Select the appropriate length in the list

Port T1-1 is being configured as shown in Figure 4.78.

Figure 4.78 — Cross connection TDM2TDM (T1 case)



4.9.1.4.9.3.3 — C) TDM2ETH cross connection (E1 case)

To configure a TDM2ETH cross connection:

- Configure the E1 port **Impedance** (75 or 120 Ohms). This choice is for all the ports.
- Choose the **E1 port** you want to configure (between 1 and 10 on MSS-1c or 1 and 16 on MSS-1c 16PDH)
- In column **Enabled**: Check the box
- In column **Flow Id**: Enter a valid VLAN Id (between 2 and 4080). Note that VLAN Id is unique.
- In column **Service Profile**: Select TDM2ETH in the list
- In columns **ECID TX** and **ECID RX**: Enter an ECID RX and ECID TX which are identifiers of the E1 flow
- In column **TDM Clock Sync**: Select Differential or Adaptive in the list
- In column **Node Timing**: Check the box or not. When it is selected, the regenerated E1 at receiver side are synchronized to the network element clock (NEC)
- In column **XCo to port**: Select Radio Port (default value). The cross connection is established between an E1 port and the Radio port.

See E1-2 in Figure 4.75.

4.9.1.4.9.3.4 — D) TDM2ETH cross connection (T1 case)

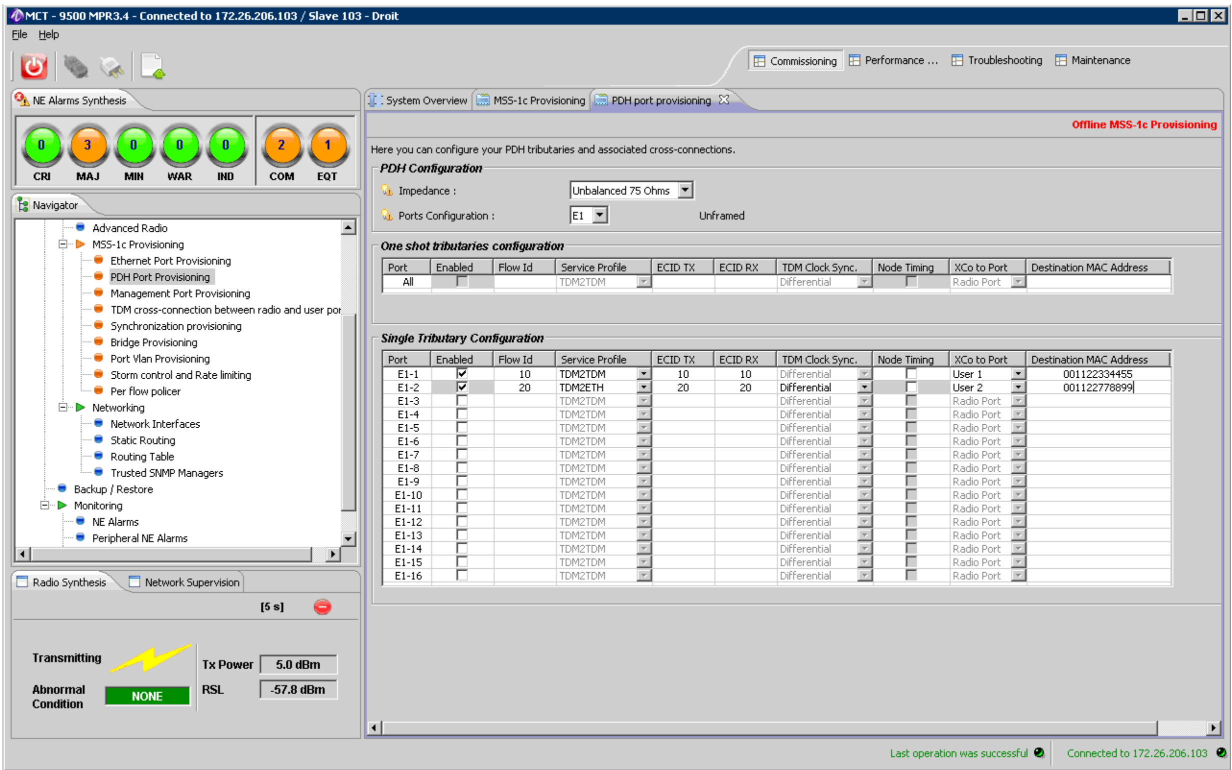
To configure a TDM2ETH cross connection:

- Select the Port configuration: T1
- Choose the **T1 port** you want to configure (between 1 and 16)
- In column **Enabled**: Check the box
- In column **Flow Id**: Enter a valid VLAN Id (between 2 and 4080). Note that VLAN Id is unique.
- In column **Service Profile**: Select TDM2ETH in the list
- In columns **ECID TX and ECID RX**: Enter an ECID RX and ECID TX which are identifiers of the E1 flow
- In column **TDM Clock Sync**: Select Differential or Adaptive in the list
- In column **Node timing**: Check the box or not. When it is selected, the regenerated T1 at receiver side are synchronized to the network element clock (NEC). Note that corresponding incoming TDM flows shall be synchronous to the NEC at transmit side.
- In column **XCo to port**: Select Radio Port (default value). The cross connection is established between an T1 port and the Radio port.
- In column **Cable length**: Select the appropriate length in the list

See T1-2 in the Figure 4.78

4.9.1.4.9.3.5 — E) Cross connection to user Ethernet port

Figure 4.79 — Cross connection to user Ethernet port



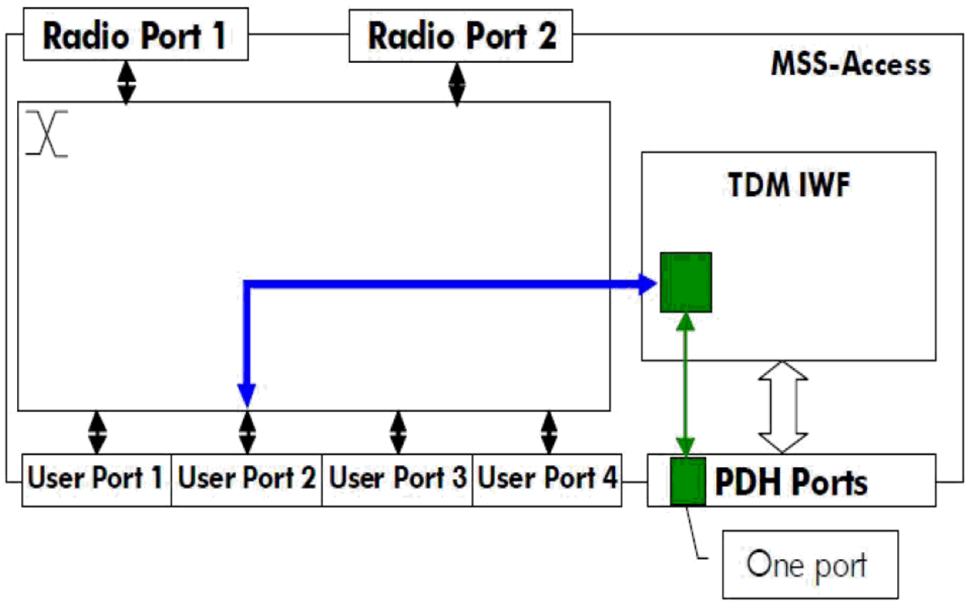
Note: In case of the "One shot tributary configuration" is not fully displayed, check that you have selected "classic window" setting, if you are using Windows Vista or Windows 7.

To configure a cross connection between an E1/T1 port and a user port:

- First, enter the parameters as explained in the previous paragraphs, then
- In column **Service Profile**: Select TDM2TDM or TDM2Eth. If TDM2TDM has been selected the Ethernet user port must be connected to an Ethernet user port of another MSS-c.
- In column **XCO to Port**: Select a user port (user 1 to user 4) in the list
- In column **MAC Addr**: Enter the External IWF MAC address which is used as Destination Address in Ethernet frames built to carry TDM information in MPR network

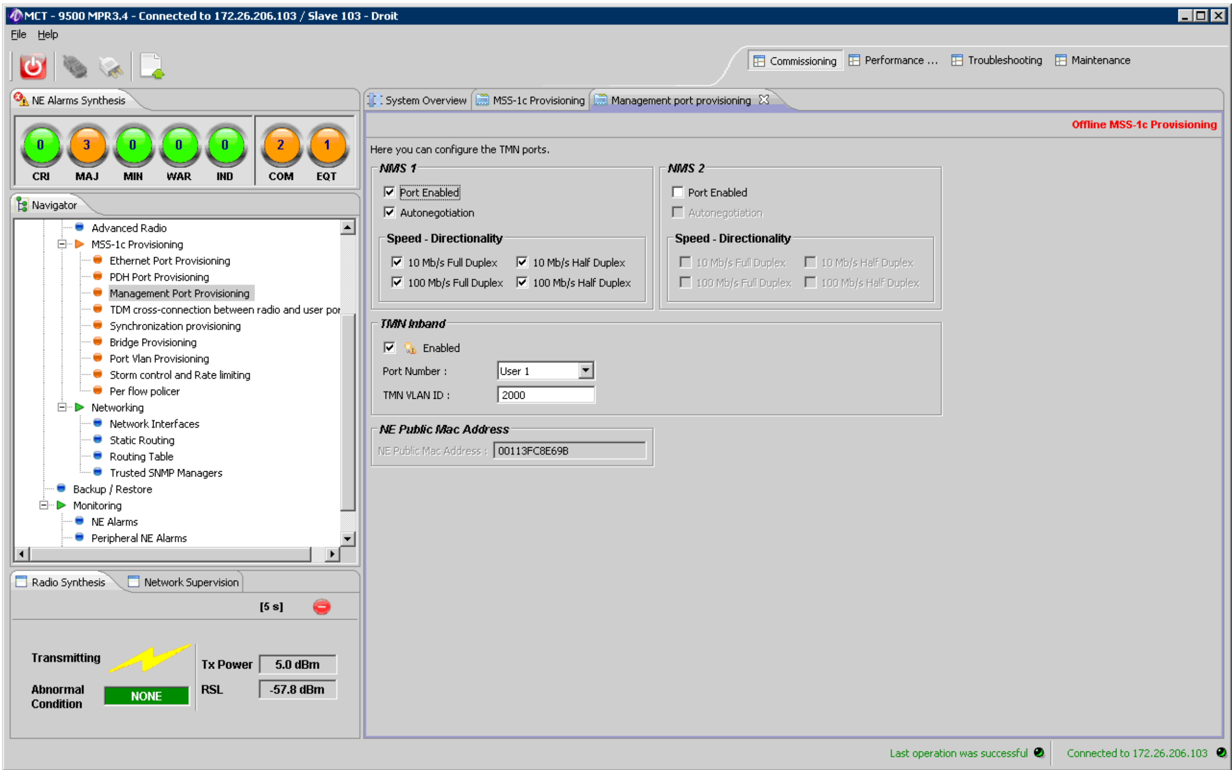
The following picture represents the different elements involved in the cross connection, in green the PDH part and CES part (encapsulation in Ethernet frame done by IWF), in blue the Ethernet part realized by the switch.

Figure 4.80 — Cross connection functional scheme



4.9.1.4.9.4 — Management port provisioning

Figure 4.81 — Management port provisioning



4.9.1.4.9.4.1 — A) NMS1 & NMS2

To configure the NMS1 and NMS2 ports, in the relevant area:

- **Port Enabled**: check the box
- **Auto negotiation**:
  - check the box: the port will negotiate speed and duplex mode with its peer
  - do not check the box: speed and duplex mode are selected by the operator (forced mode)
- If Auto negotiation is selected, for **Speed** select one or several check boxes, the same for duplex mode
- If Auto negotiation is not selected, for **Speed** select only one value, the same for duplex mode

4.9.1.4.9.4.2 — B) In-band TMN on one user ethernet port provisioning

To configure the TMN In-band:

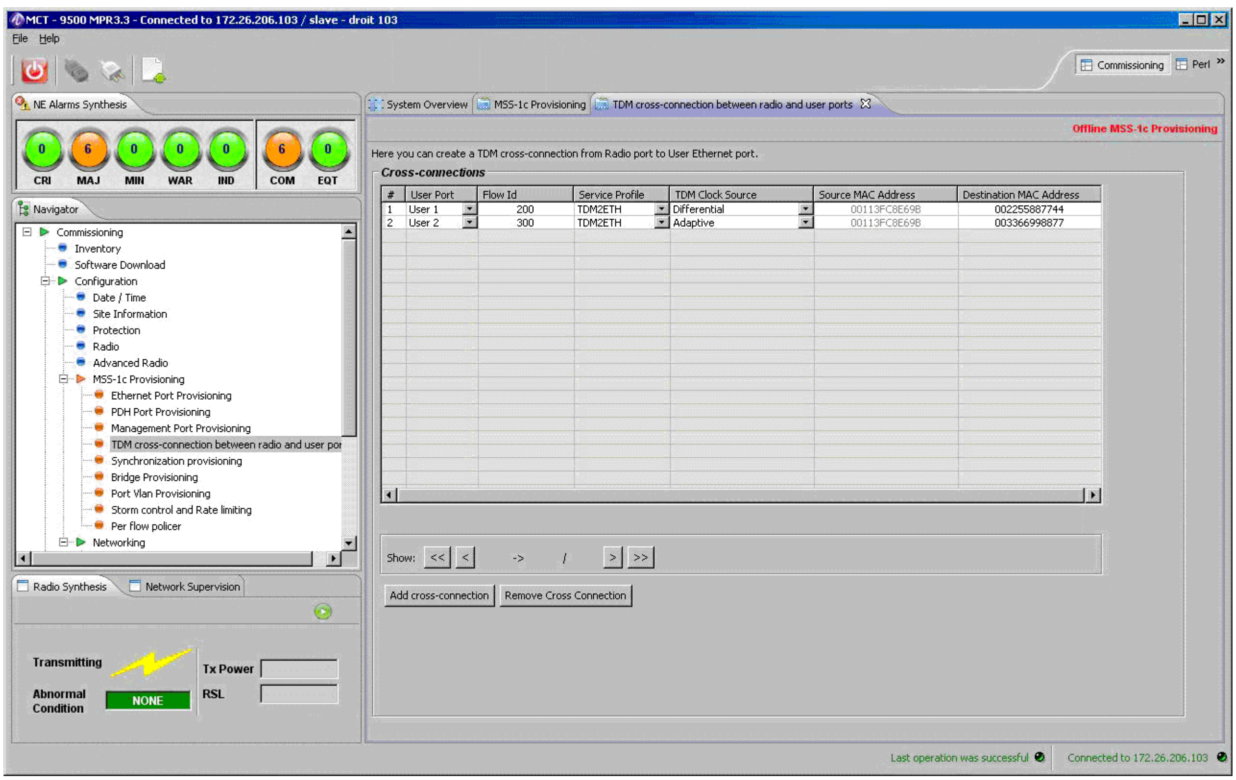
- **Enabled**: Check the box
- **Port number**: Select one port in the list (only available in 802.1Q and 802.1ad bridge mode).
- **TMN VLAN Id**: Enter a valid VLAN Id in the range 2 to 4080.

4.9.1.4.9.4.3 — C) NE public MAC address

NE public MAC address: used as Source Address in Ethernet frames built to carry TDM information in MPR network. This is a read only field. The NE public MAC address is a parameter of the application. It is given at launch time.

4.9.1.4.9.5 — TDM cross connection between radio and ethernet user port

Figure 4.82 — TDM cross connection between radio and ethernet port



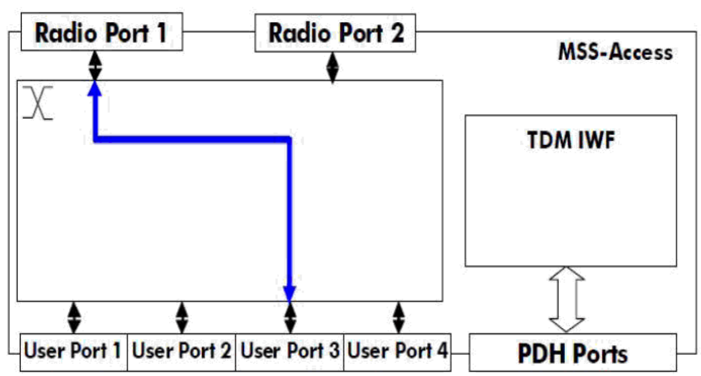
Max. number of cross-connections: 240.

To configure a TDM cross connection between radio and Ethernet port:

- Push button **Add cross-connection** and fill the fields.
- In column **User port**: Select a port in the list
- In column **Flow Id**: Enter a valid VLAN Id (between 2 and 4080). This VLAN Id must be equal to the one used to encapsulate PDH flows at the transmitter side
- In column **Service Profile**: Select TDM2TDM or TDM2ETH, also equal to what is configured at transmitter side
- In column **TDM Clock Sync**: Select Differential or Adaptive in the list. The clock sync is also equal to what is configured at transmitter side: Differential or Adaptive
- In column **Outgoing MAC destination**: enter the MAC address of the destination equipment.
- Note that **Outgoing MAC Source address**, which is equal to the NE MAC address, is displayed for information and will be used with the previous one to generate the cross connection inside the switch.

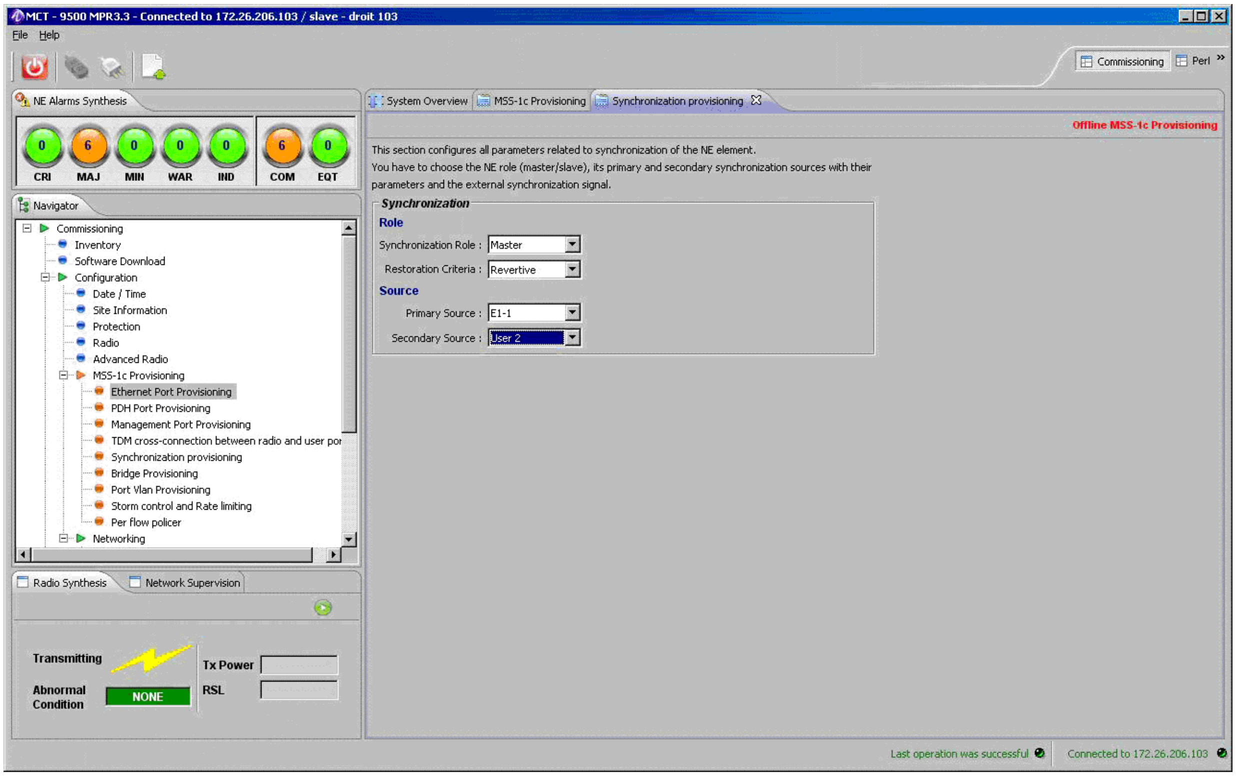
The following picture represents the elements involved in the cross connection, here only the switch. In blue the Ethernet part realized by the switch.

Figure 4.83 — Cross connection functional scheme



4.9.1.4.9.6 — Network synchronization clock provisioning

Figure 4.84 — Network synchronization clock provisioning



Note: Only the ports (ETH and PDH) previously defined are available to support the synchronization.

To configure the network synchronization:

- **Synchronization role**, select in the list:
  - “Master” - the NE sends the clock through the radio link to another NE
  - “Slave” - the NE receives the clock from the radio link or another source
- **Restoration criteria**, select a criteria in the list. This is used to configure the behavior of the synchronization system when it has switched to secondary source and when the primary source becomes available:
  - Revertive means the NEC comes back to the primary source
  - Not revertive means the NEC stays locked to the secondary source and will return to the primary source only when the secondary one will fail
- **Primary source**, select one of the proposed source
- **Secondary source**, select one of the proposed source

For more details on the Synchronization, see Synchronization for MSS-1c.

4.9.1.4.9.7 — Bridge provisioning (create a user virtual LAN)

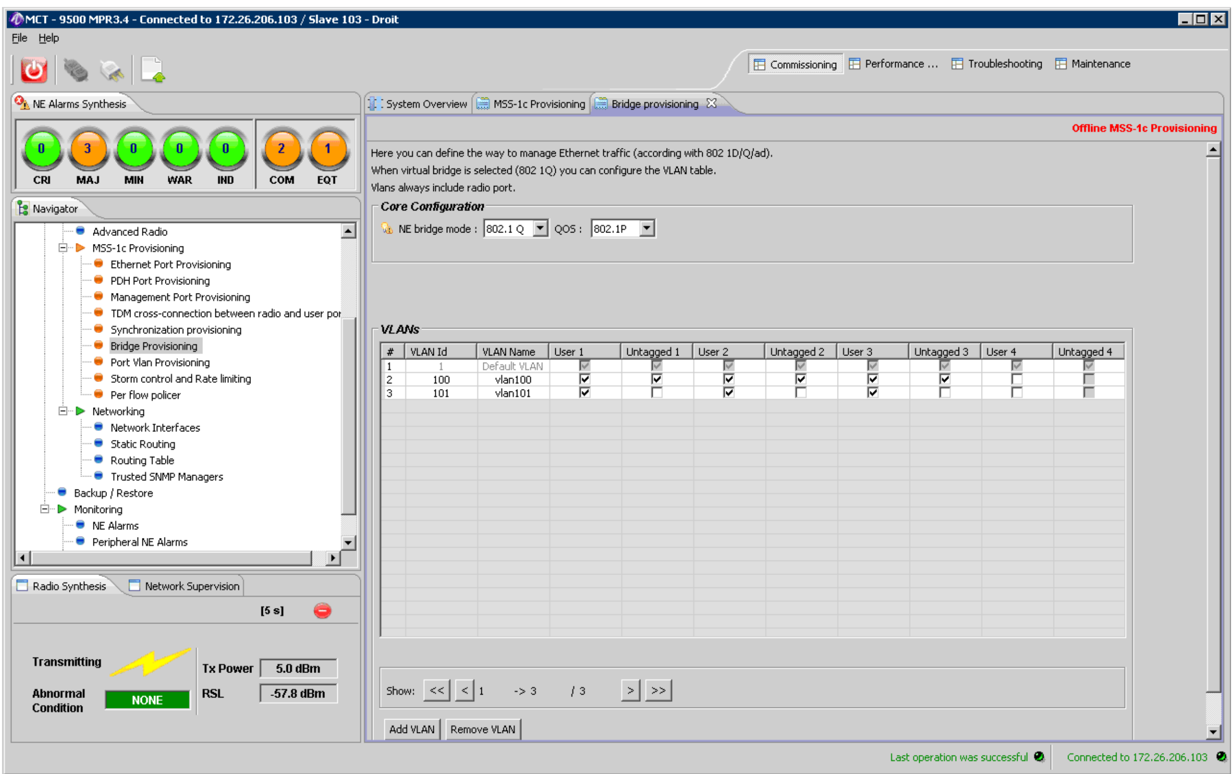
In the **NE bridge mode** field select in the list:

- **802.1D**: default switch configuration, MAC learning based switching
- **802.1Q**: switch mode with Virtual Customer LAN. Switching is based on MAC and C-VLAN
- **802.1ad (Q in Q)**: switch mode with Stacked VLANs. Switching is based on MAC and S-VLAN

4.9.1.4.9.7.1 — A) Create a user virtual LAN

- Select the NE bridge mode in 802.1Q.
- Select a QoS mode: 802.1P, Diffserv or None

Figure 4.85 — NE bridge mode selection



To create a user virtual LAN:

- Push button **Add VLAN** and fill the fields.
- Push the button **Add VLAN** and fill the fields.
- In the column **VLAN Id**: Enter a valid VLAN Id (from 2 to 4080) and not used in another VLAN or cross connection

- In the column **VLAN Name**: Enter a name
- In the columns **User 1 to 4**: Check the box if the port is implied in the VLAN. Both enabled and disabled ports can be member of a VLAN. Note that radio port is automatically included.
- In the columns Untagged User 1 to 4: Check the box if you want the port removes VLAN tag at egress.

To remove an existing virtual LAN:

- Select its VLAN Id in the list
- Push the button Remove VLAN

If the configuration contains more than 20 VLANs, the keys <<, <, > and >> allows to navigate between the different screens which display up to 20 VLANs each.

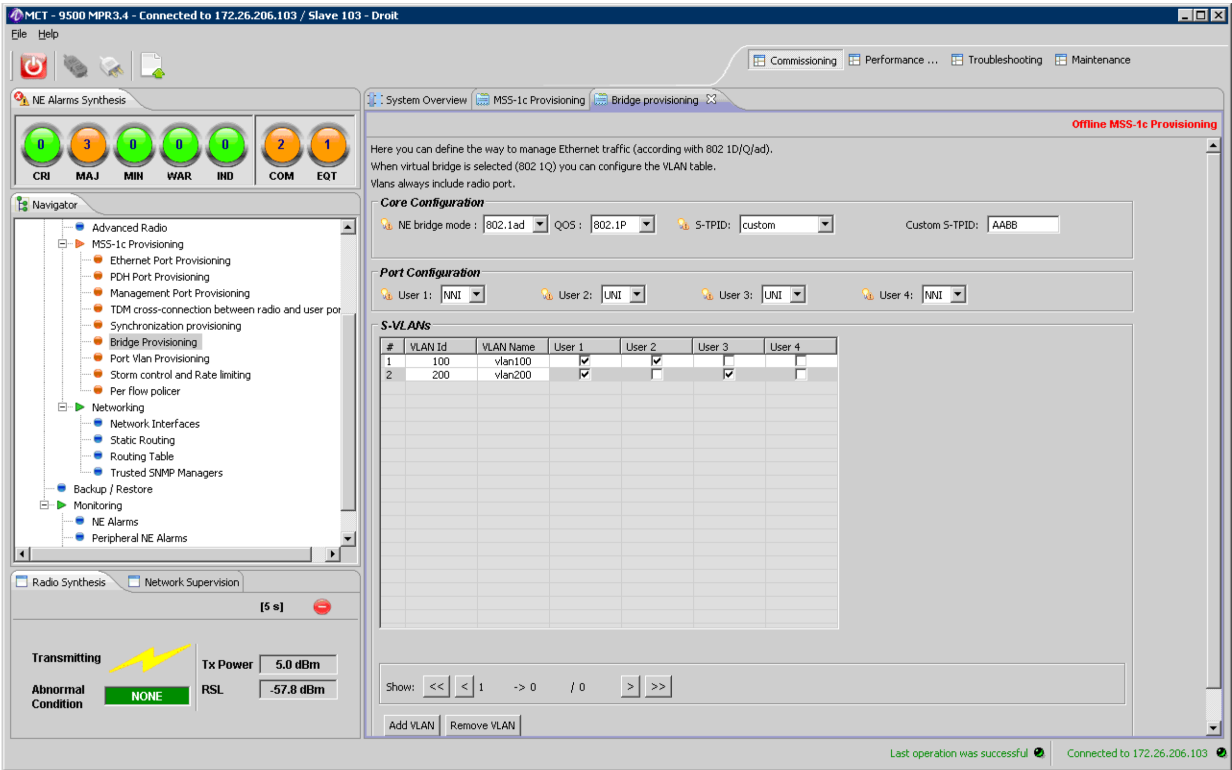
4.9.1.4.9.7.2 — B) Configure the Q in Q mode and create S-VLANs

- Select the NE bridge mode in 802.1ad (Q in Q)
- Select a QoS mode: 802.1P, Diffserv or None
- Select a S-TPID in the proposed list or enter a custom one
- For each port, select the mode UNI or NNI

Note: If all ports are in UNI mode, the S-TPID configuration is not necessary.

Note: Only one S-VLAN is supported when the port is configured in UNI.

Figure 4.86 — NE bridge mode selection



To create a Service VLAN:

- Push the button Add VLAN and fill the fields
- In column VLAN Id: Enter a valid VLAN Id (from 2 to 4080) and not used in another VLAN or cross connection
- In column VLAN Name: Enter a name
- In columns User 1 to 4: Check the box if the port is implied in the VLAN. Both enabled and disabled ports can be member of a VLAN. Note that radio port is automatically included.

To remove a Service VLAN:

- Select its VLAN Id in the list
- Push the button Remove VLAN

If the configuration contains more than 20 VLANs, the keys <<, <, > and >> allows to navigate between the different screens which display up to 20 VLANs each.

4.9.1.4.9.8 — Port VLAN Provisioning

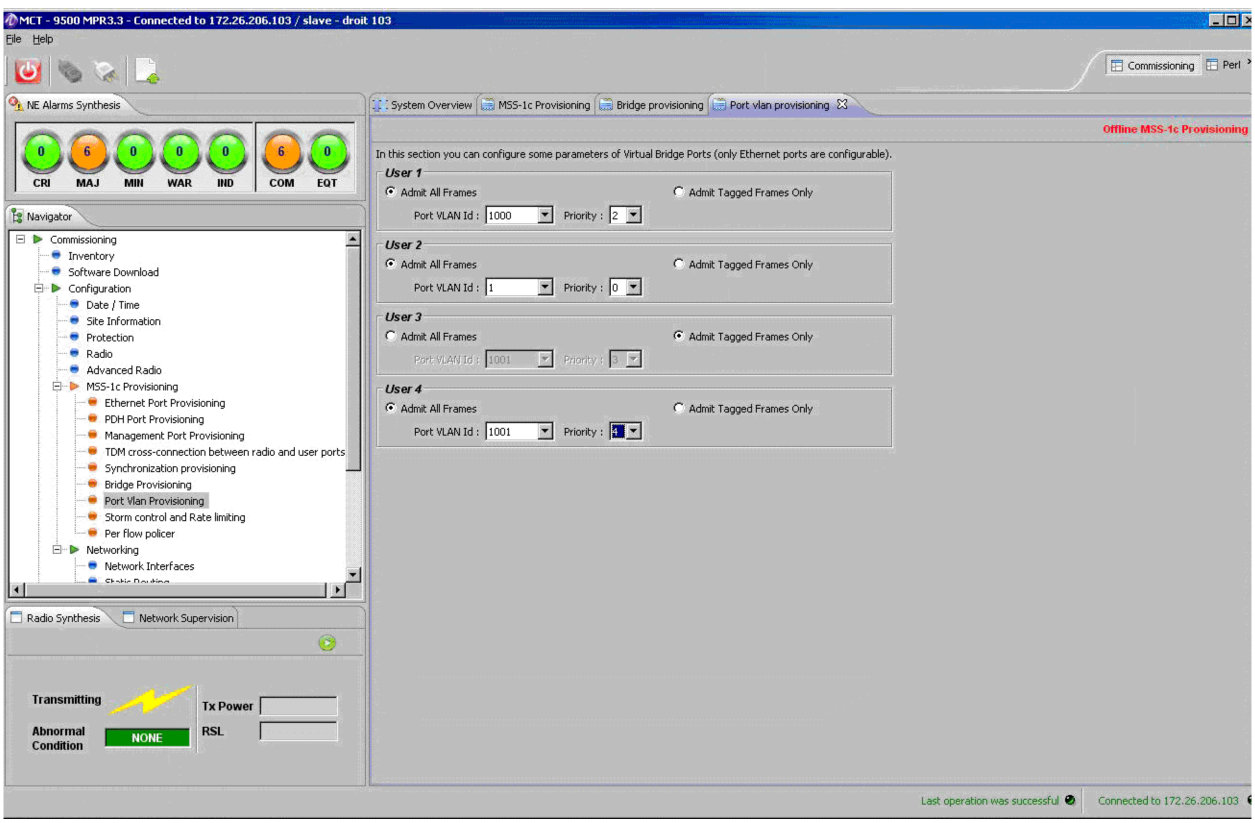
This screen can be filled only if the 802.1Q or 802.1ad bridge modes have been selected in Bridge configuration screen.

4.9.1.4.9.8.1 — A) In 802.1Q mode

To configure the behavior of each user port you can:

- Select Admit all frames and for untagged frames at ingress:
  - Select the VLAN Id in the proposed list. This list contains all the VLAN in which the port is involved.
  - Select the priority in the list (from 0 to 7)
- Or select Admit tagged frames only. In this case untagged frames are dropped.

Figure 4.87 — Port VLAN provisioning



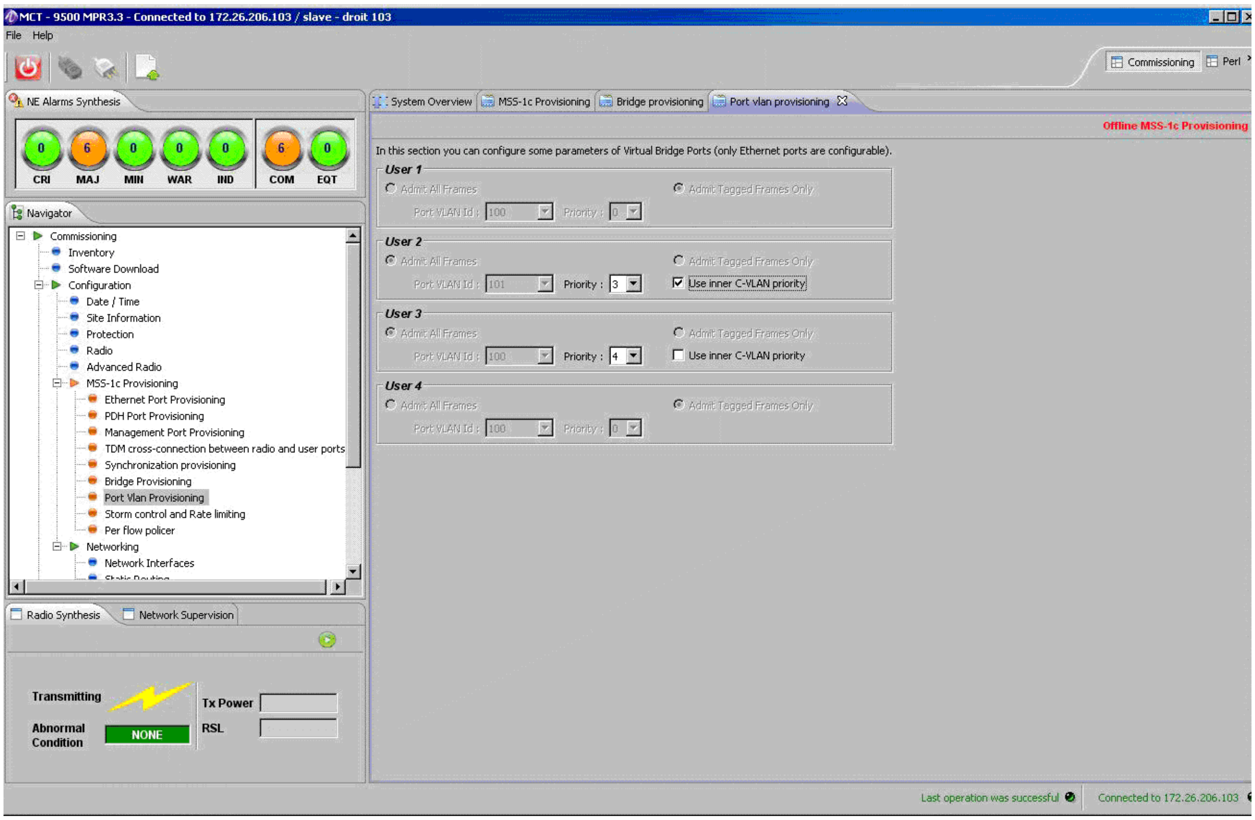
4.9.1.4.9.8.2 — B) In 802.1ad (Q in Q) mode

If the port is configured in NNI, no choice is offered to the operator (“Admit tagged frames only” is automatically selected).

If the port is configured in UNI “Admit all frames” (untagged and C-Tagged frames are admitted) is automatically selected, then the S-VLAN associated to this UNI port is displayed and cannot be changed.

- Select the S_VLAN priority in the list (from 0 to 7)
- Select or not the use of inner C-VLAN priority for S-VLAN priority

Figure 4.88 — Port VLAN provisioning



Note: C-VLANs cannot be modified.

4.9.1.4.9.9 — Storm control and rate limiting

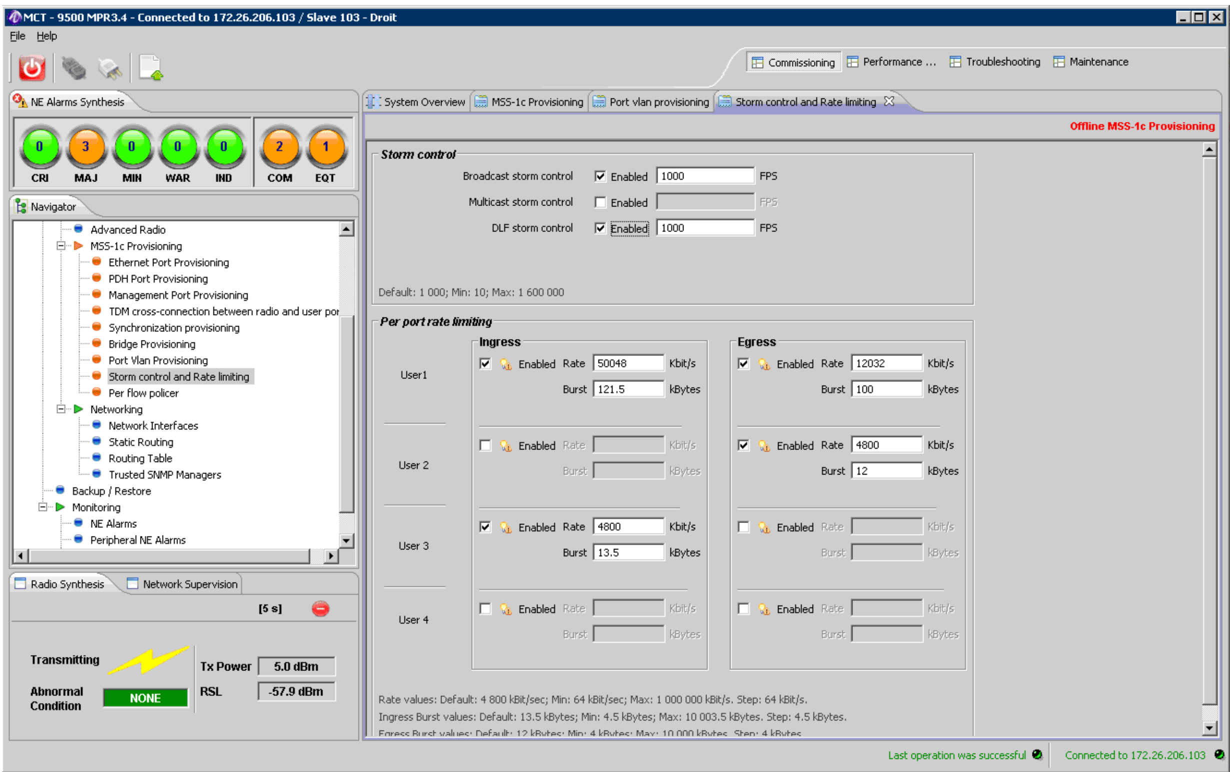
For Broadcast, Multicast and DLF Storm control, to enable this control, select the check box and enter a value in the authorized range.

Per port rate limiting, for each user port, in ingress and egress, rate limit and burst size may be set.

Note: Per port rate limiting: minimum burst size at egress is 114 kBytes. So the burst size limitation will become accurate for bust size limitation set over 2500 kBytes.

Storm Control thresholds are not guaranteed when total rate at ingress is higher than 1 GPSs.

Figure 4.89 — Storm control and rate limiting



4.9.1.4.9.10 — Per flow policer

This feature is used to control the Committed Information Rate, the Peak Information Rate and associated burst size of a flow identified by its VLAN Id.

In 802.1D Bridge mode, the operator can enter any VLAN in the VLAN Id column.

In 802.1Q and 802.1ad Bridge mode, the operator can select a VLAN in the proposed list of existing VLANs (created in the bridge configuration window).

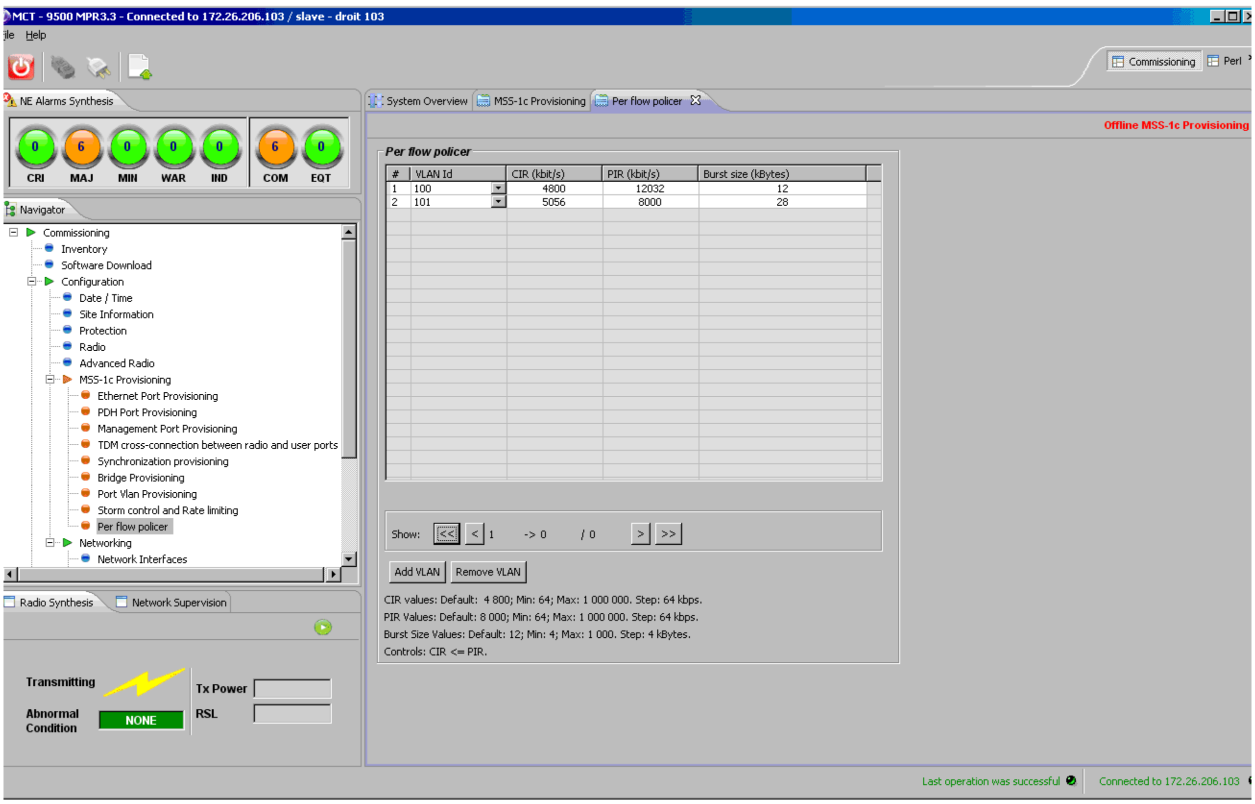
Note: In 802.1Q Bridge mode, VLAN 1 cannot be selected.

For burst size setting over 8000 bytes, the accuracy of the limitation is not guaranteed.

The flows without flow policer rule are not guaranteed (Yellow frames).

Default values are proposed. They can be changed by the operator in the authorized range.

Figure 4.90 — Per flow policer



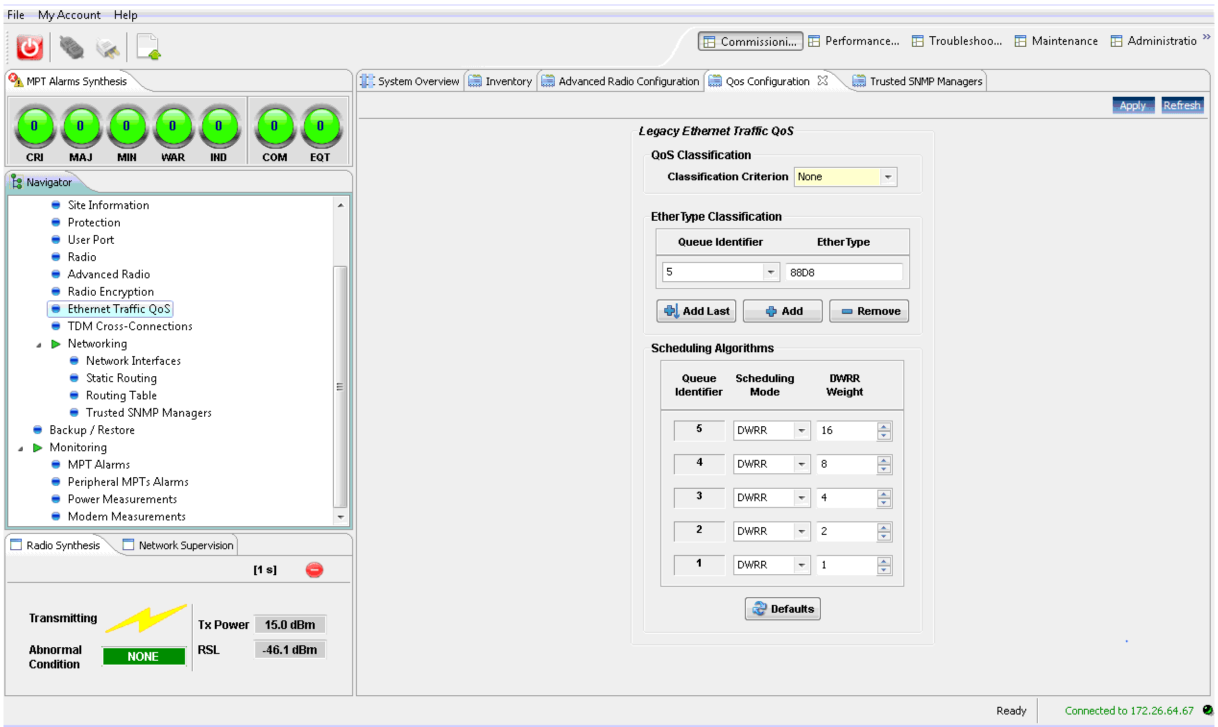
4.9.1.4.10 — Ethernet traffic QoS for MPR-e

This menu allows to:

1. Select the **QoS Classification**
2. Set the **Classification according to the EtherType**
3. Set the **Scheduling Algorithms**

Note: For the QoS the first match for the classification is done according to 802.1p/ DiffServ (point Select the QoS Classification). If there is no match, the classification is done according to the EtherType (point Set the Classification according to the EtherType). If there is no match, the Ethernet frame is sent to the lower-priority queue.

Figure 4.91 — Ethernet traffic QoS



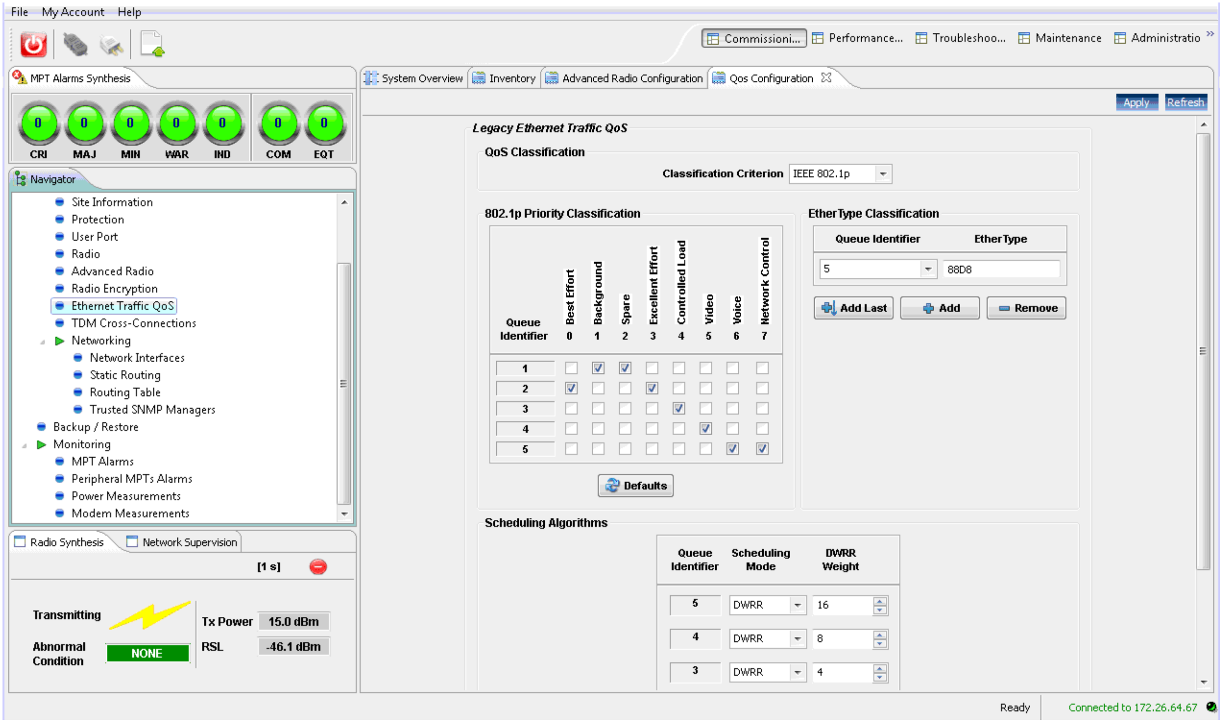
1. **QoS classification**

   Two methods can be selected:

   - IEEE 802.1p
   - DiffServ

   IEEE 802.1p

Figure 4.92 — IEEE 802.1p



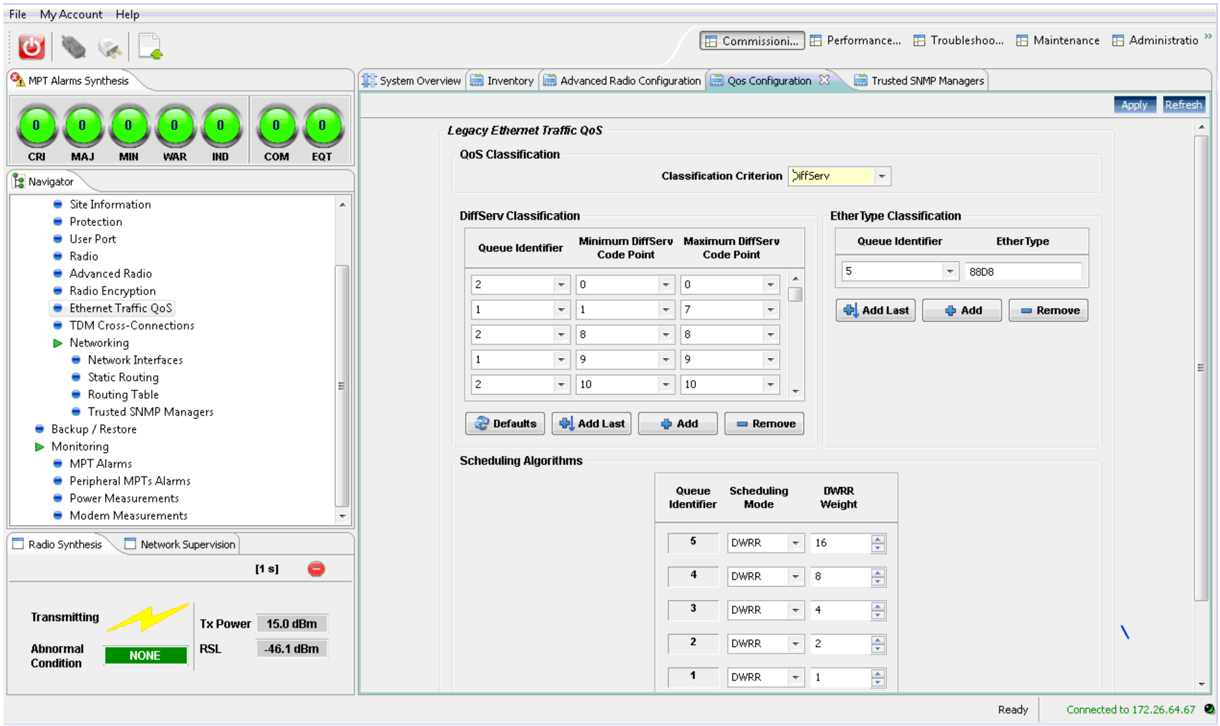
Select the appropriate check boxes for each priority (0 to 7) to be assigned to a specific egress queue (queue 1 to 5).

Note: Queue 5 is the highest-priority queue; queue 1 is the lowest-priority queue.

You can click on the **Default** button to restore the default classification.

DiffServ

Figure 4.93 — DiffServ



A specific range of DiffServ Code Points can be assigned to a specific egress queue (queue 1 to queue 5).

Note: Queue 5 is the highest-priority queue, queue 1 is the lowest-priority queue.

You can click on the **Default** button to restore the default classifications.

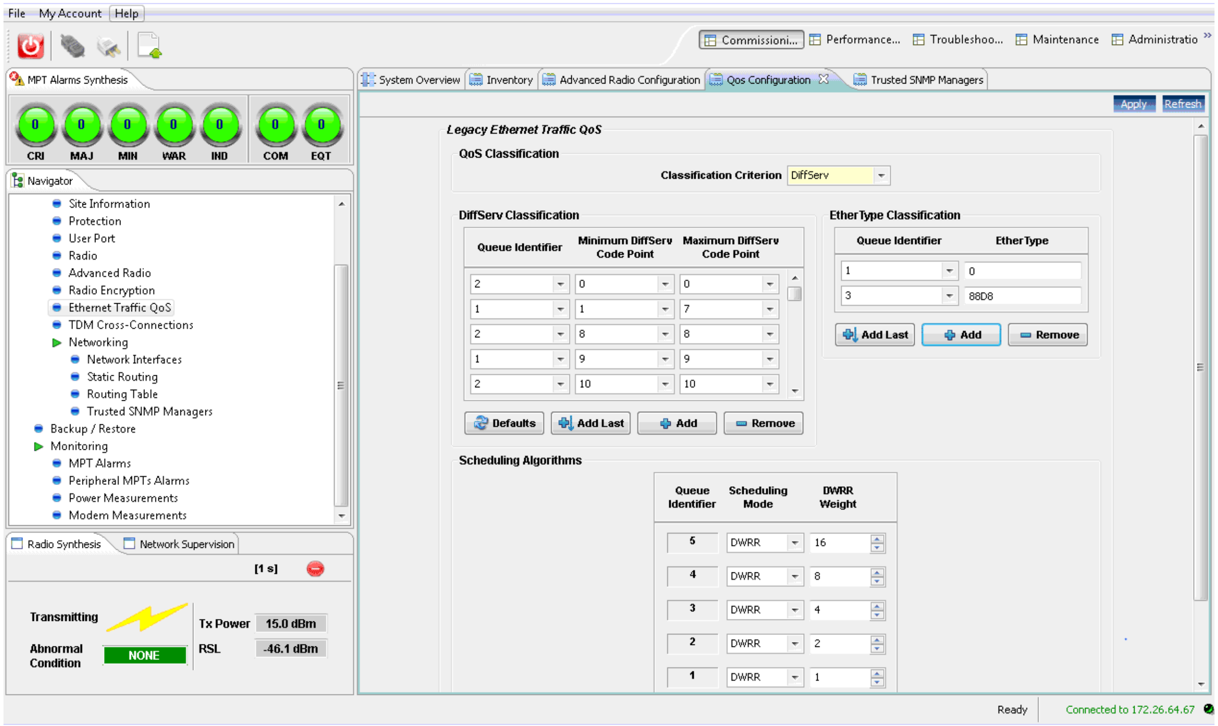
Click on the **Add** button to add a range that can be assigned to a specific queue.

2. **EtherType classification**

Click on the **Add** (or **Add Last**) button to assign a specific egress queue (queue 1 to queue 5) to a specific EtherType.

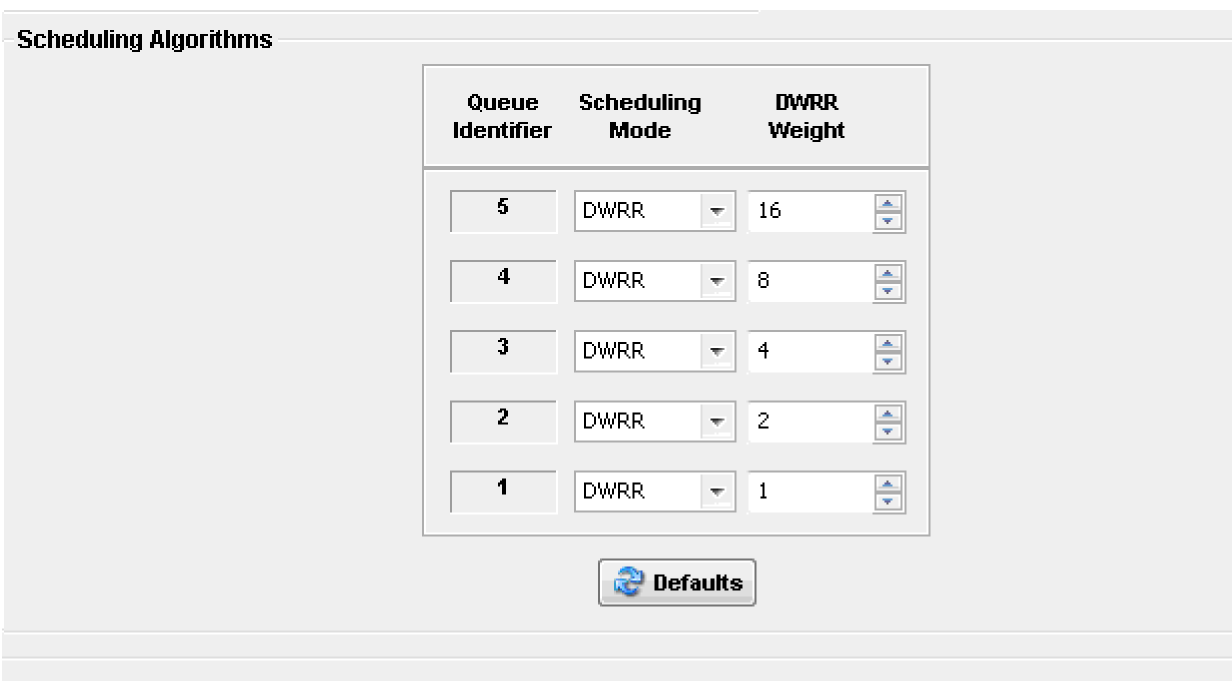
Note: Queue 5 is the highest-priority queue; queue 1 is the lowest-priority queue.

Figure 4.94 — EtherType classification



3. **Scheduling algorithms**

Figure 4.95 — Scheduling algorithms



This menu allows to change the scheduler operation.

Note: The scheduling mode refers only to queue 1 to 5, because for queue 6 to 8 the scheduling mode is fixed to HQP.

The scheduling mode can be DWRR or HQP.

If DWRR has been selected the DWRR weight can be assigned to a specific egress queue (queue 1 to queue 5).

Note: Queue 5 is the highest-priority queue; queue 1 is the lowest-priority queue (valid only for HQP).

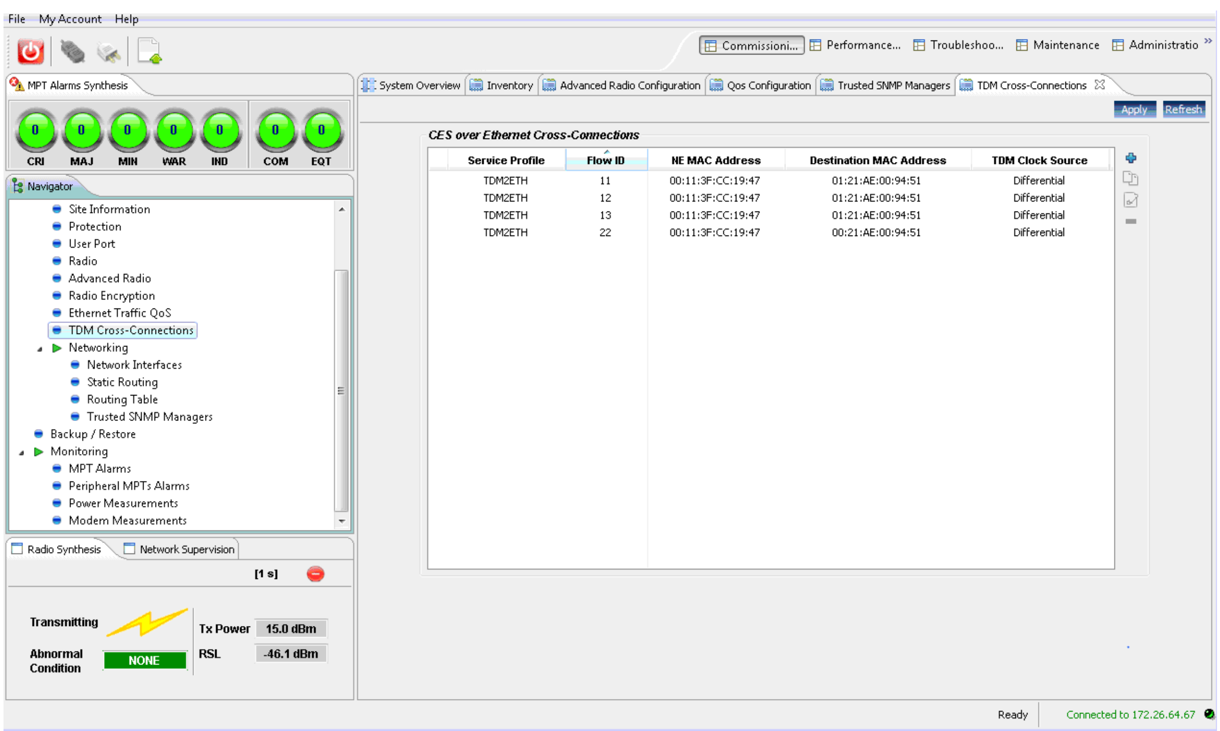
Click on the **Defaults** button to restore the default algorithm.

Note: the HQP mode can be associated with some queues and DWRR mode can be associated with other queues. DWRR cannot be assigned to higher-priority queues than those configured for HQP.

4.9.1.4.11 — TDM cross-connections for MPR-e

This menu allows you to create TDM2ETH cross-connections.

Figure 4.96 — Cross-connection creation



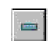
To manage the cross-connections, select one of the following buttons:

- Add new cross-connection

- Clone cross-connection

- Modify selected cross-connection

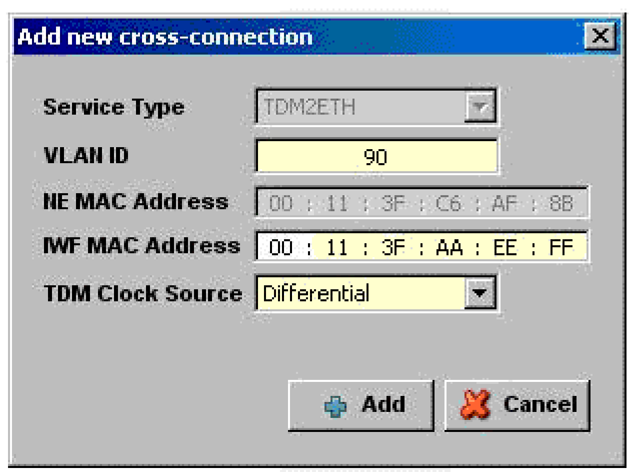
- Remove cross-connection



To create the TDM2ETH cross-connection:

1. Click the **Add new cross-connection** button
2. Enter the VLAN ID
3. Enter the MAC address of the destination IWF
4. Enter the clock source: Differential or Adaptive
5. Click on the **Add** button

Figure 4.97 — TDM2ETH cross-connection



The created cross-connection will appear in the cross-connection list, as shown in Figure 4.96.

An existing cross-connection can be:

- modified by pressing the **Modify cross-connection** button (Figure 4.98)
- deleted by pressing the **Remove cross-connection** button

- cloned by pressing **Clone cross-connection** button to create another cross-connection by modifying the parameters and then pressing the **Add clone** button (Figure 4.99)

Figure 4.98 — Cross-connection modify

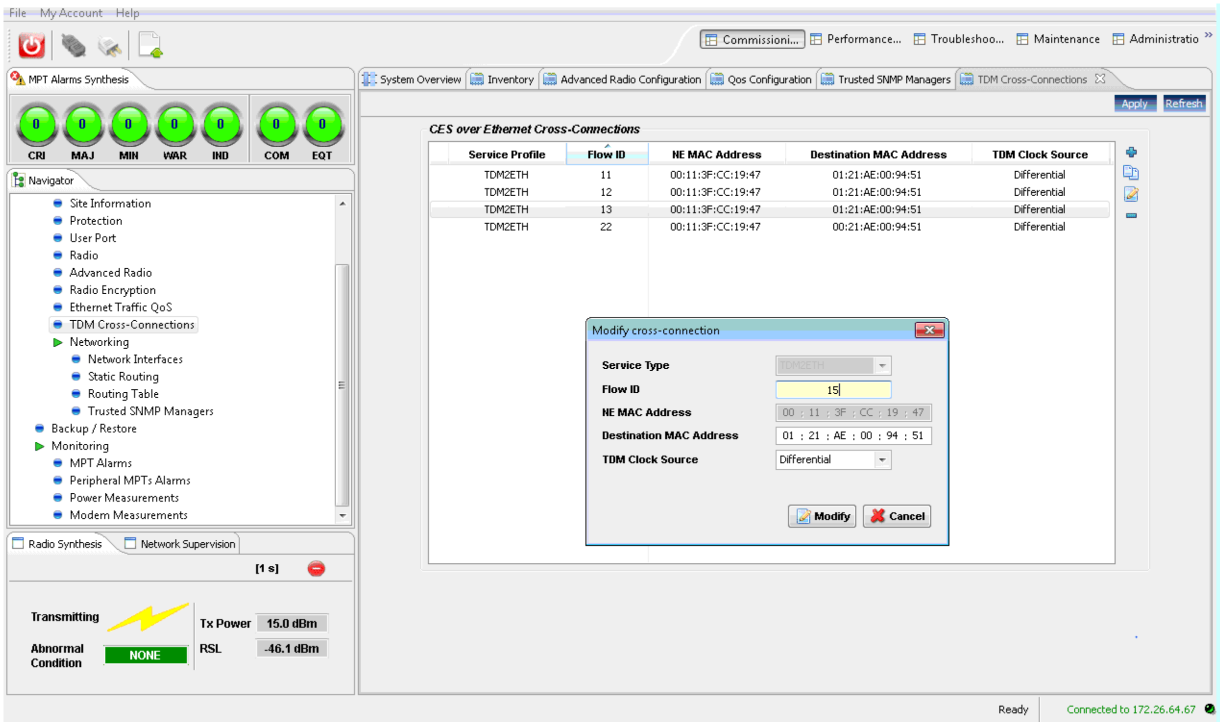
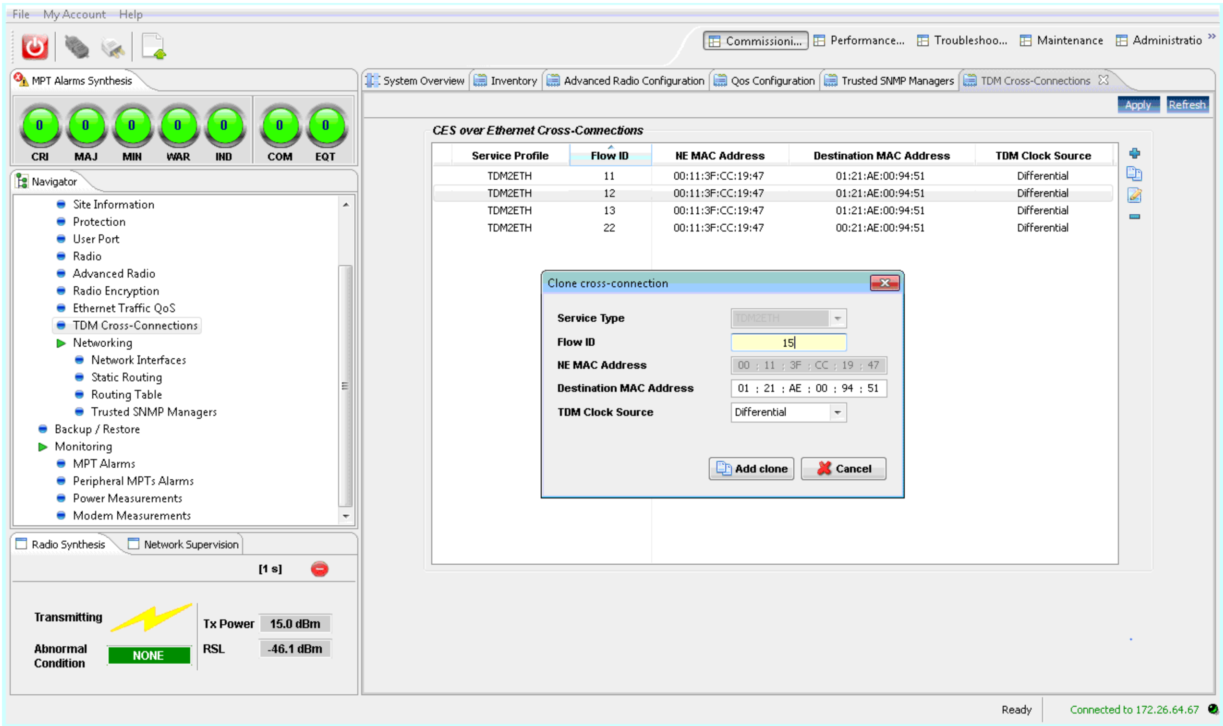


Figure 4.99 — Cross-connection clone



This menu is not applicable in Single NE mode with 7705 SAR configuration. In Single NE mode with 7705 SAR, cross-connections are set up as part of configuration of the 7705 SAR.

4.9.1.4.12 — Networking

This menu must be used to assign (or to show) the networking configuration of the NE.

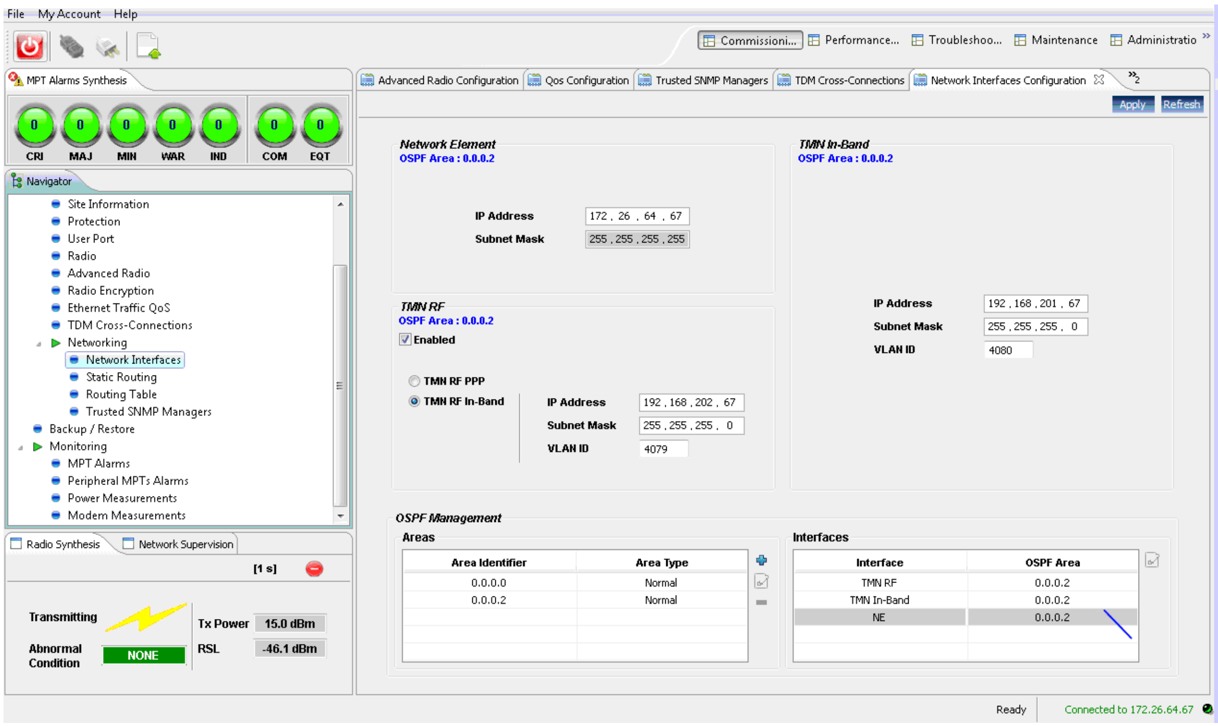
This menu has the following sub-menus:

- Network Interfaces
- Static Routing
- Routing Table
- Trusted SNMP Managers
- NE Neighbors

None of the networking screens are available when MPR-e is in Single NE mode with 7705 SAR configuration. The MPR-e is integrated into the SAR and has to be considered one of its peripherals.

4.9.1.4.12.1 — Network interfaces

Figure 4.100 — Network interfaces



- **Network element field**

  This IP address is the local IP address of the NE.

Warning: The change of this address will close the connection with the MCT and cause a traffic impact.

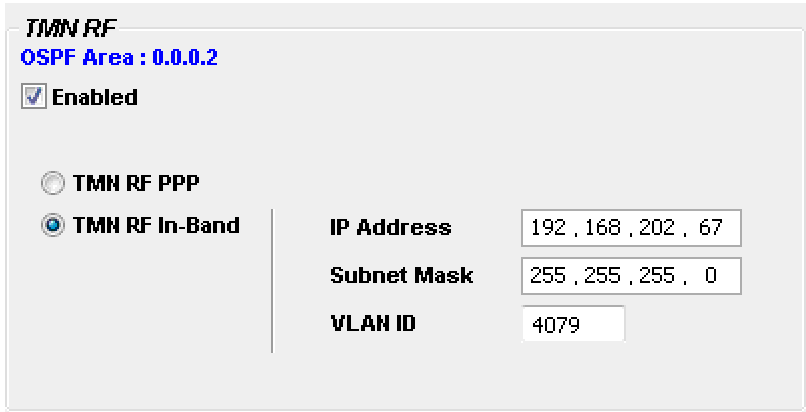
- **TMN RF field**

  Select a check box to obtain access to the NE in the remote radio station.

  TMN RF can be set up over PPP protocol or through an In-Band management (to inter-operate with NEs that do not support PPP).

  1. For the TMN RF over PPP, tick the “TMN RF PPP” (as shown in Figure 4.101)
  2. For the In-band management, tick the “TMN RF In-Band”. Then configure the IP address, the network mask and the VLAN ID [range 2..4080] allocated to the TMN RF in-band interface. This IP address and the remote NE TMN RF In-band IP address must be in the same subnet.

Figure 4.101 — TMN RF field



Note: The TMN RF in-band Van ID must be different from the one configured for User Ethernet TMN in-band.

You need to ensure the consistency of the TMN RF configuration at both ends of the radio interface, otherwise the TMN RF in-band link will not set up.

- **NMS1/NMS2 fields** (MSS-1c only)

  Assign the IP parameters to the 10/100Base-T 2 Ethernet ports (if required) for NMS application.

Note: In case of change of NMS1 (or 2) IP address previously used for NMS2 (or 1), proceed in 2 steps: disable NMS2 (or 1) and apply the configuration then change NMS1 (or 2) and apply the configuration.

Warning: NMS1 and NMS2 must be also enabled through MSS-1c Provisioning Tool.

- **NE IP Parameters field**

  This IP address is the local IP address. The default IP address is: 10.0.1.2. The subnet mask is 255.255.255.255(/32) and cannot be changed.

- **TMN In-band IP parameters**

  Enter the IP Address with the relevant subnet mask for TMN In-band management.

  The VLAN Id can be changed only with the Provisioning Tool (value between 2 and 4080). Default IP addresses: 192.168.100.1. Default subnet mask: 255.255.255.0(/24).

  In the VLAN ID field enter the VLAN ID used for In-band management (default: 4080).

Warning: For MSS-1c, If the TMN In-band is not enabled in the Provisioning Tool, it is not possible to enable the TMN In-band using the WebEML.

Caution: For MPR-e, changes to these parameters will cause the connection with the MPT to be dropped.

Depending on the changes to the parameters and the type of generic device, it may be necessary to change the parameters of the PC/device.

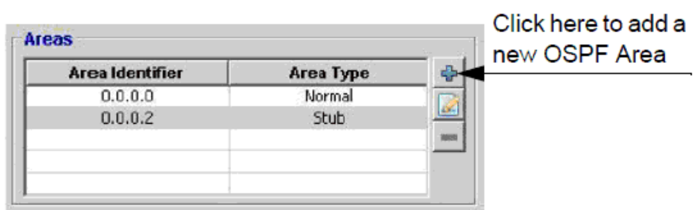
- **CT Field** (MSS-1c only)

  This field is a read-only field with the IP parameters of the PC.
- **OSPF Management field**

  This field includes two areas (**Areas** and **Interfaces**) to manage OSPF.

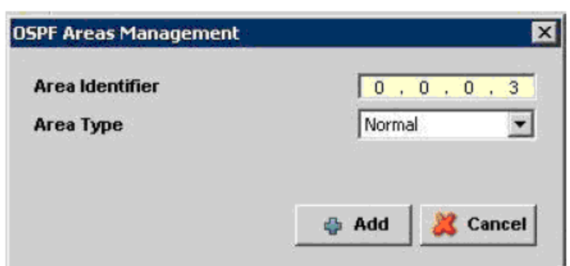
  Each OSPF interface is attached to an OSPF Area the OSPF Area Id. For example, in Figure 4.101, TMN RF is in OSPF Area: 0.0.0.0.
- **To add an OSPF Area**

Figure 4.102 — Areas



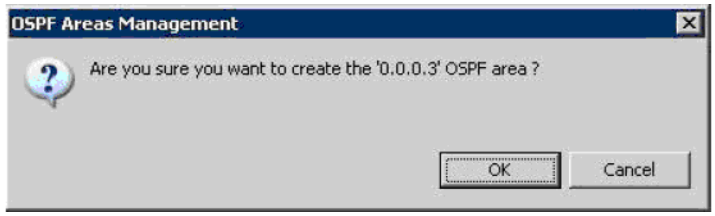
1. Configure the **Area Identifier** and **Area Type** fields.
2. Click on the **Add** button. A configuration message will appear.

Figure 4.103 — OSPF Areas Management



3. Click on the **OK** button.

Figure 4.104 — Configuration message



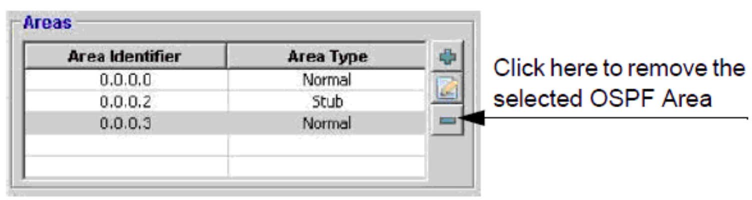
Note: When the 9500 MPR is used in MPR-e configuration with other equipment, the OSPF interface parameters of the equipment must be the same as those of the related TMN interface on the 9500 MPR.

The 9500 MPR OSPF parameters are:

- Hello Interval: 10 seconds
- Router Dead Interval: 40 seconds
- Retransmit Interval: 5 seconds
- Interface Transit Delay: 1 second
- MTU: 1500 bytes

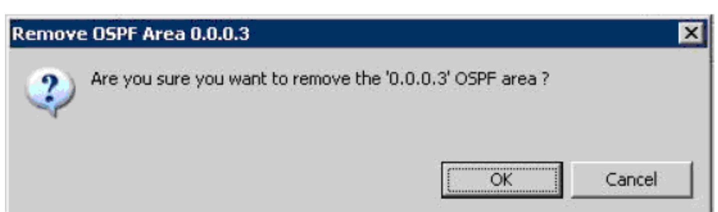
- **To remove an OSPF Area**

Figure 4.105 — Areas



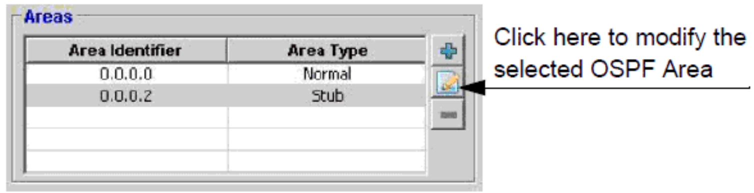
1. Configure the **Area Type**, then click on the **Remove** button. A configuration message will appear.
2. Click on the **OK** button.

Figure 4.106 — Configuration message



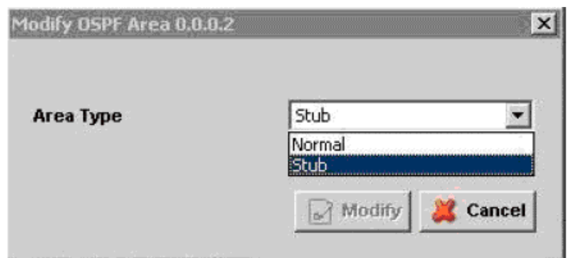
- **To modify an OSPF Area**

Figure 4.107 — Areas



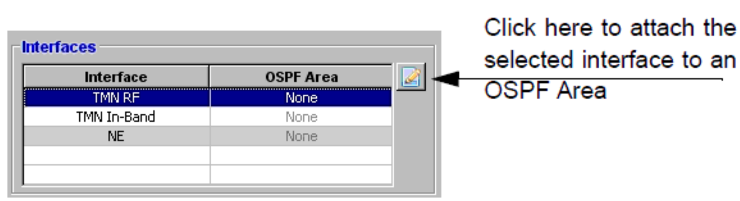
1. Change the **Area Type**.
2. Click on the **Modify** button.

Figure 4.108 — Modify OSPF Area



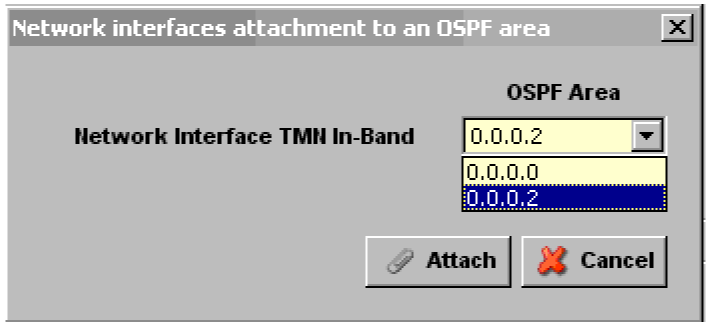
- **To attach an interface to an OSPF Area**

Figure 4.109 — Interfaces



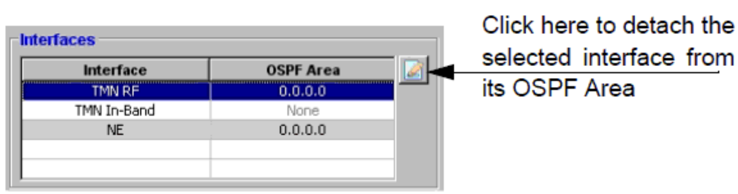
1. Select an OSPF Area in which the interface has to be added.
2. Click on the **Attach** button.

Figure 4.110 — Network interfaces attachment to an OSPF Area



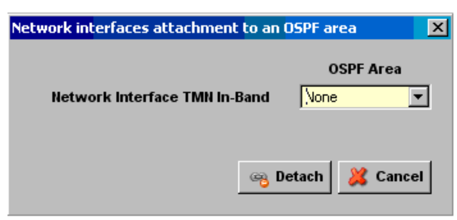
- **To detach an interface**

Figure 4.111 — Interfaces



1. Select **None**.
2. Click on the **Detach** button.

Figure 4.112 — Network interfaces attachment to an OSPF Area



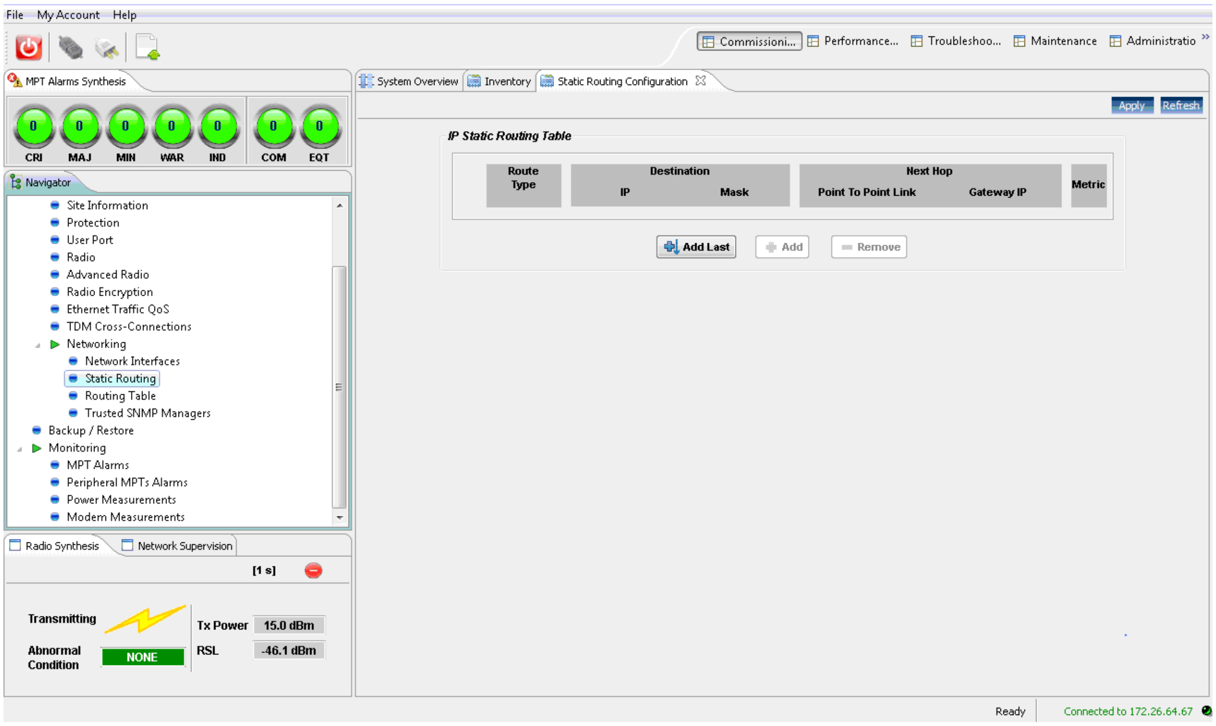
4.9.1.4.12.2 — Static routing

The **Static Routing** menu is used to configure the parameters for IP Static Routing Configuration, see Figure 4.113.

- **Route Type:** the options are Network, Host, and Default.
- **Destination** an address or a range of IP addresses with the subnet mask.

- **Next Hop:** the User can select **Point to Point Link** to address the link on the radio side or **Gateway IP** to define the address of a gateway reachable on the TMN In-band interface.

Figure 4.113 — Static routing



The **Add** button inserts a new Static Routing Table row above the selected row.

The **Add Last** inserts a new Static Routing Table row below the last row.

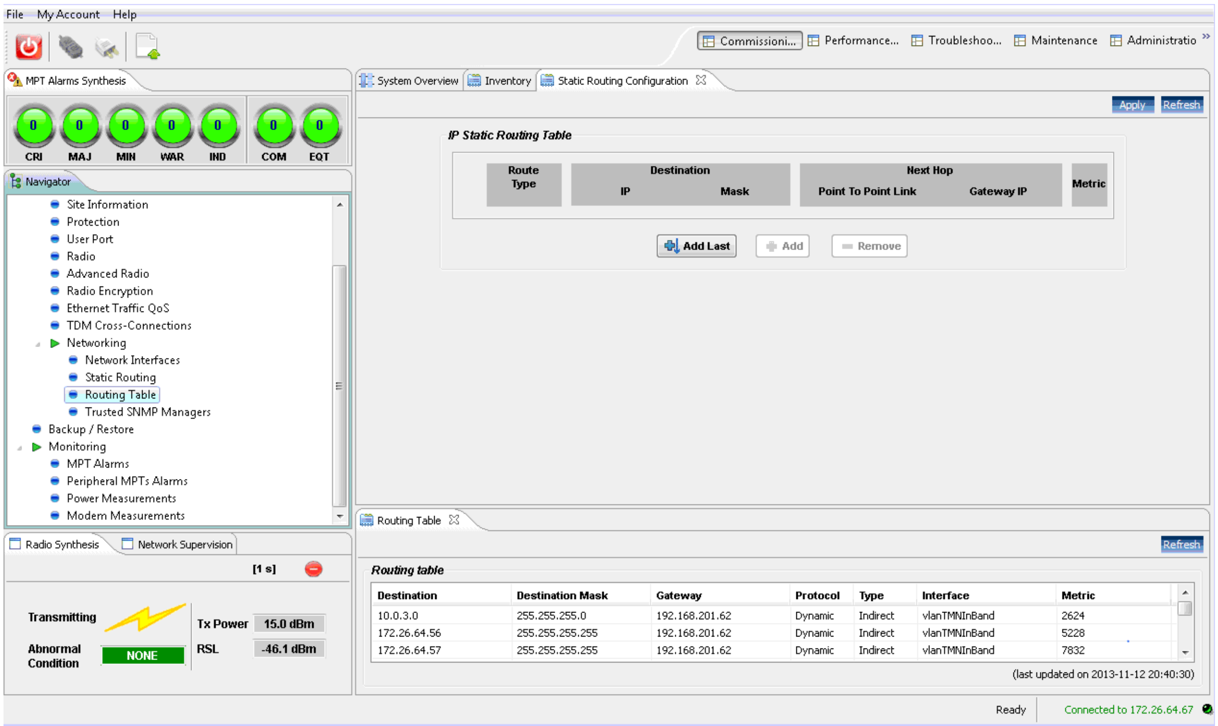
The **Delete** button deletes the selected Static Routing Table row.

Note: For each change, click the **Apply** button to execute the request.

4.9.1.4.12.3 — Routing Table

This menu is a read-only window with the IP routing information summary. See Figure 4.114.

Figure 4.114 — Routing table

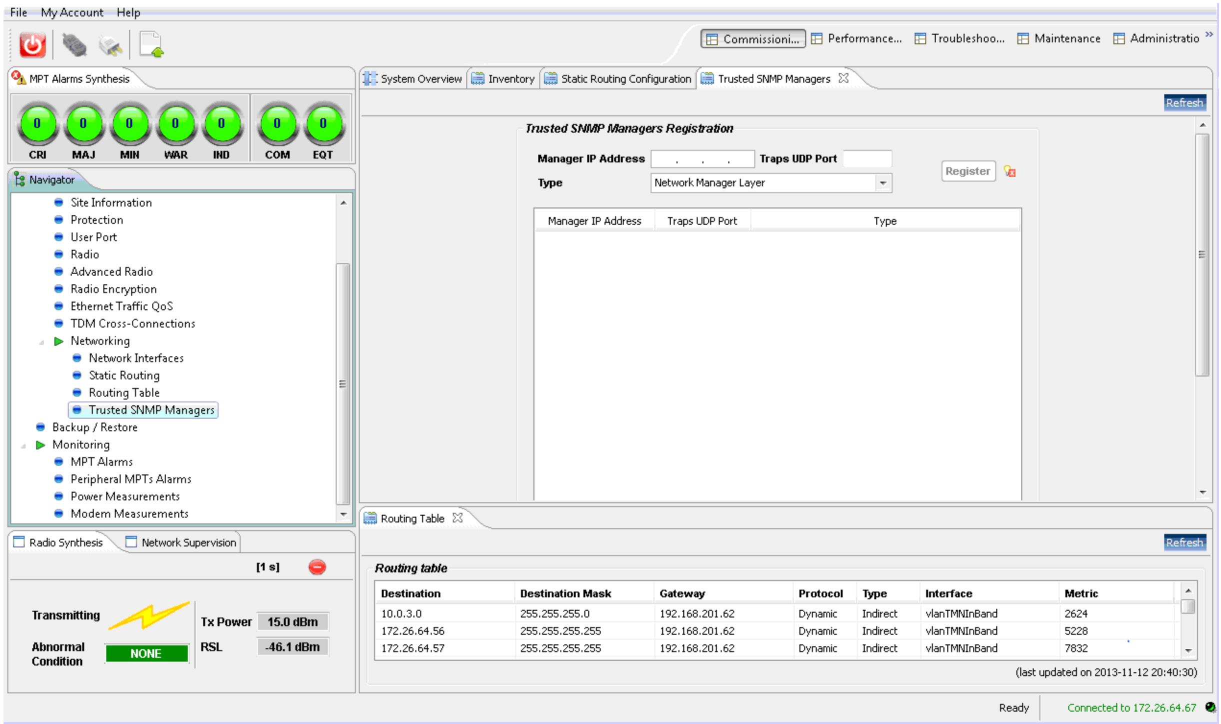


Note: Click on the Refresh button to display the latest changes.

4.9.1.4.12.4 — Trusted SNMP Managers

A Trusted manager is an SNMP manager to which the NE automatically sends the traps generated inside the NE. See Figure 4.115.

Figure 4.115 — Trusted SNMP Managers



To activate a Trusted Manager, enter the **IP Address** of the SNMP manager, the **Traps UDP Port** and the **Manager Type** (Network Manager Layer or Equipment Manager Layer), then click on the **Register** button.

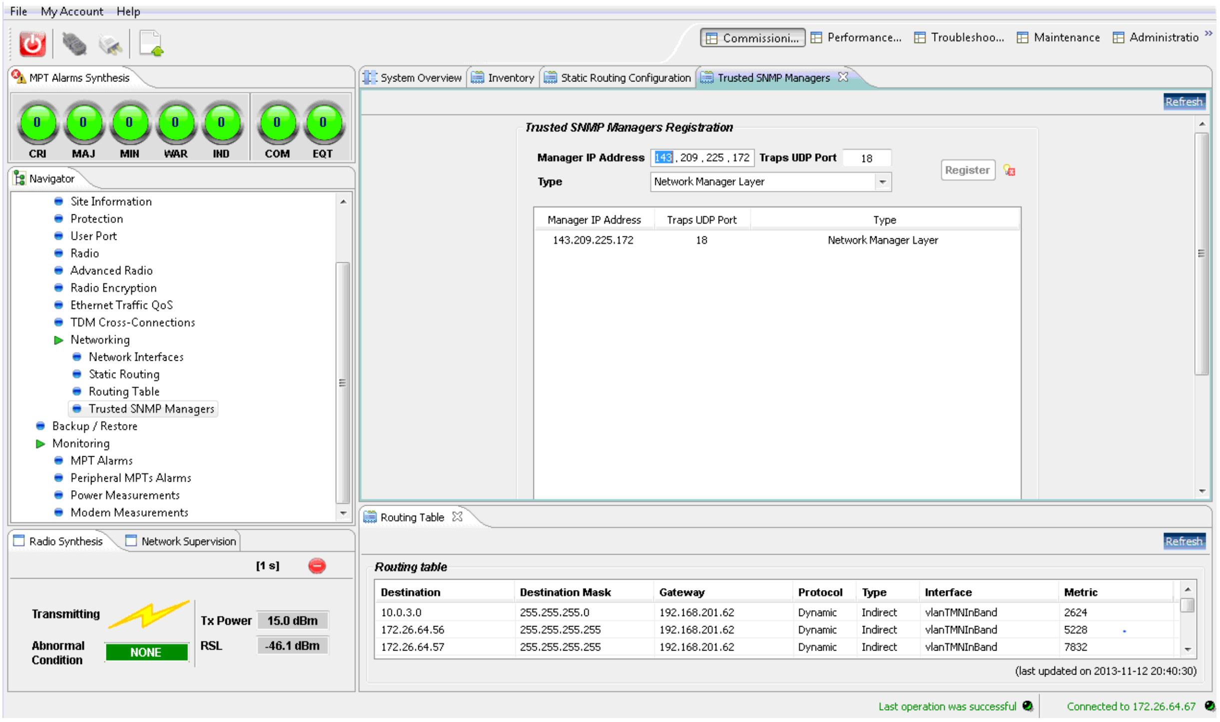
Note about the Manager Type:

- “Network Manager Layer” must be used for 5620 SAM and other NMS system.
- “Equipment Manager Layer” must be used for 1350 OMS system type (where the "alarm type" field is removed from the alarm traps) when automatic registration of the manager is not possible

Note: The **Traps UDP port** corresponds to the port on which the Manager receives the traps.

In Figure 4.116, one Manager has been created.

Figure 4.116 — Manager registration



To delete a Manager select the Manager from the list and click on the **Unregister** button.

4.9.1.4.13 — NE Neighbors for MPR-e

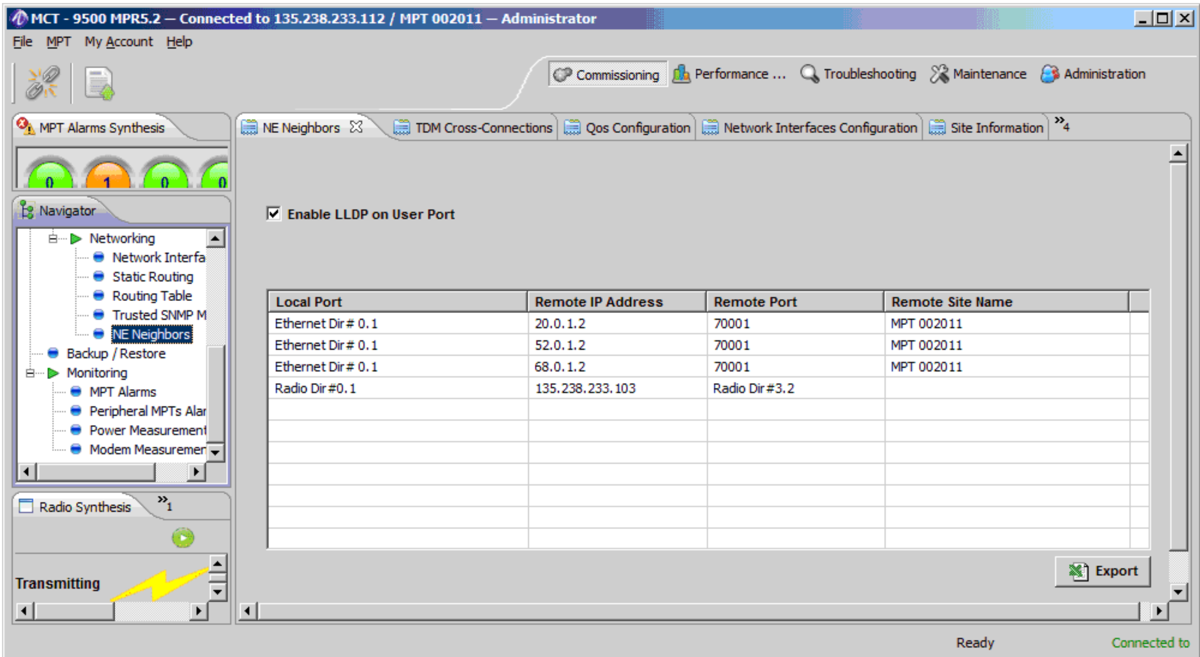
The upper part of the NE Neighbors tab allows the user to enable the LLDP service on the Ethernet user port by checking a check box. By default LLDP is disabled.

The lower part of the tab displays the following:

The radio neighbor of the MPT. The neighbor is unique. It is discovered using an Alcatel-Lucent proprietary discovery protocol. If a radio failure occurs, the shows the current known radio neighbor until a new one is discovered.

The LLDP neighbor of the MPT. The LLDP neighbor is also unique; see Automatic link discovery. However, because a neighbor may announce several management IP addresses in its LLDP PDU, the table may contain several rows, one per IP address. See Figure 4.117.

Figure 4.117 — MPR-e NE Neighbors tab



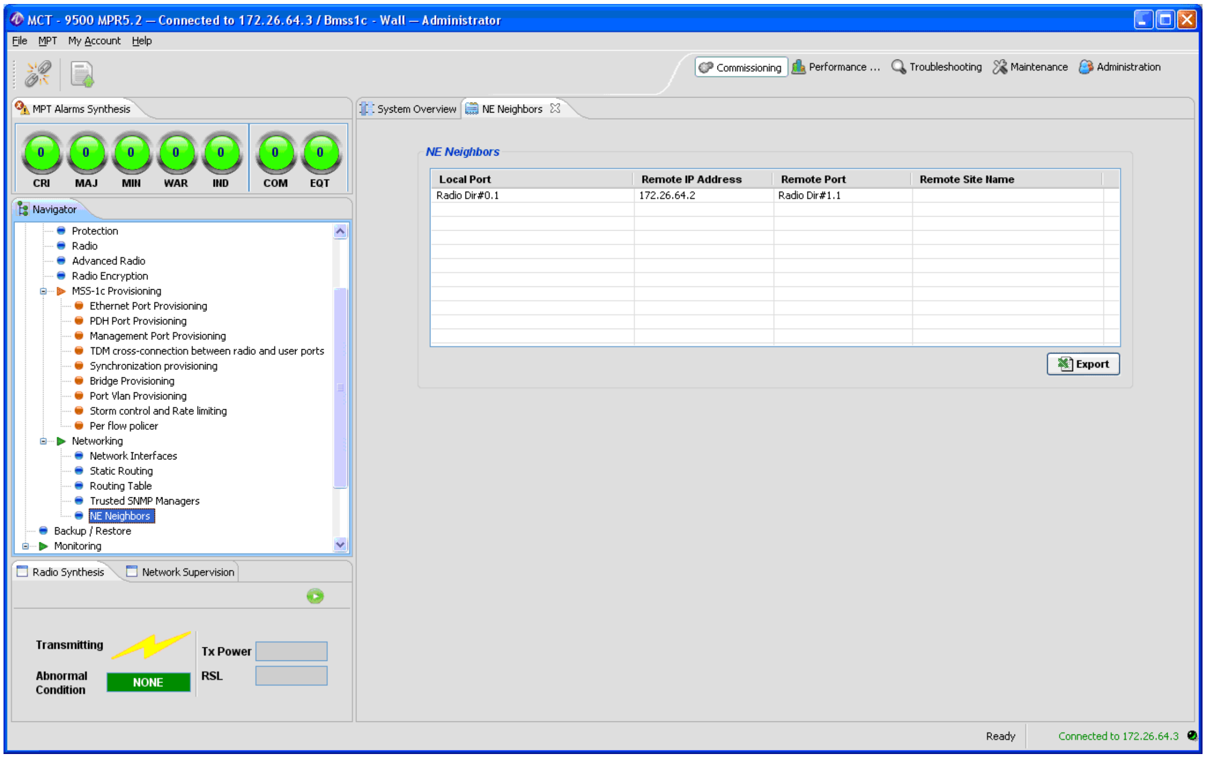
Click on the Export button to export the NE Neighbors information to a .csv file.

4.9.1.4.14 — NE Neighbors for MSS-1c

This view contains a table which automatically displays the MPT's radio neighbor's information, remote IP and remote port only; see Figure 4.118. There is no site name. The site Name field is only used on MPR-e for LLDP.

The radio neighbor is unique. It is discovered through an Alcatel-Lucent proprietary radio discovery protocol. In case of radio failure, the table shows the last known neighbor until a new one is discovered.

Figure 4.118 — MSS-1c NE Neighbors tab



4.9.1.4.15 — Synchronization for MPR-e in 1+1 HSB

In single NE with 7705 SAR and in 1+1 HSB configuration, an alignment of the configuration between Main MPT and Spare MPT is offered.

This synchronization is available from Main MPT to Spare MPT and for the following configuration parameters:

- Telecom Standard (ETSI or ANSI)
- Shifter Duplex
- Tx and Rx frequencies
- Modulation FCM/ACM
- FCM Modulation Scheme
- ACM Modulation List
- ACM Switching Delay
- ACM Threshold offset
- ACM driving Best/Worst MSE
- Tx Radio Link ID

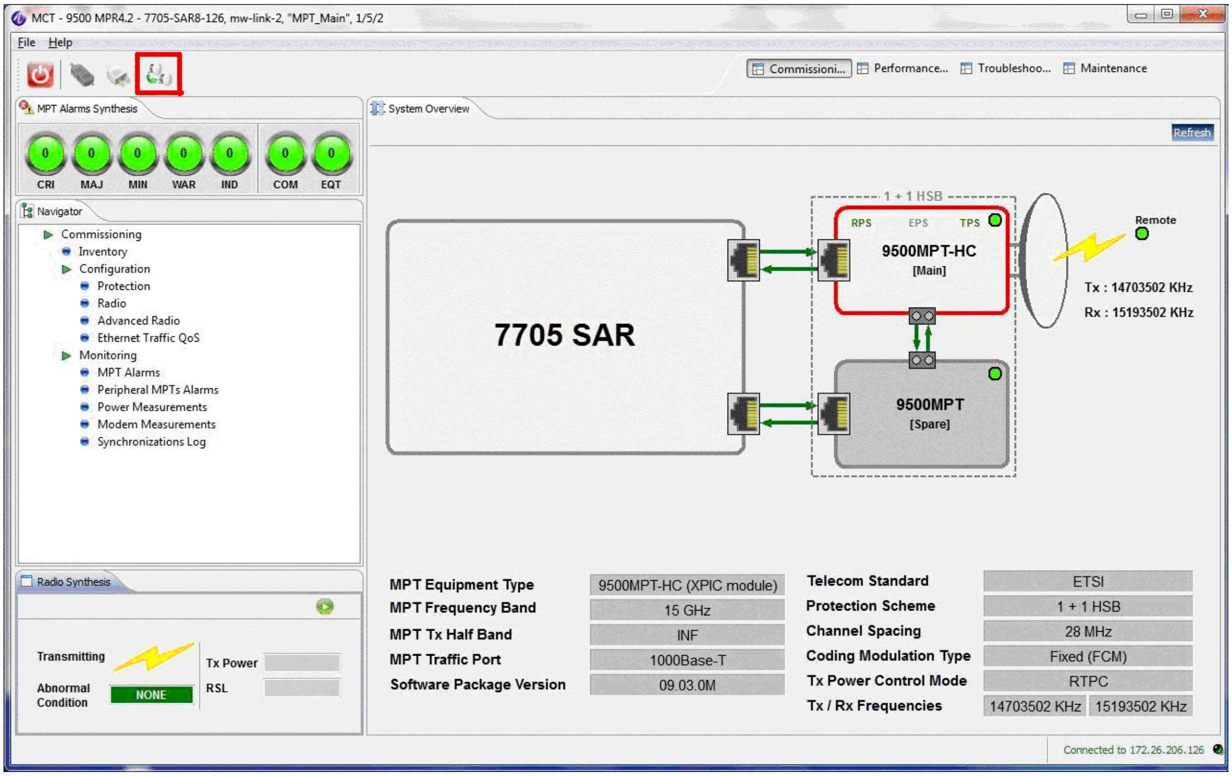
- Rx Radio Link ID
- RTPC/ATPC
- RTPC Tx Power
- ATPC Min/Max Tx - RSL Threshold
- ATPC Driving Min/Max RSL
- MPR-A only: ATPC High Power Timeout enabled
- MPR-A only: ATPC High Power Mode command
- QoS - VLAN to queue mapping
- QoS - DiffServ to queue mapping
- QoS - 802.1p to queue mapping
- QoS - queue scheduling
- QoS - Ethertype to queue mapping
- QoS - Restore default
- QoS - Classification Configuration
- QoS - TMN Traffic parameters (4093)
- QoS - Queue Size
- PM - Counter Thresholds
- Configure Ethernet Compression

All other parameters, particularly troubleshooting commands, are not replicated. These parameters and commands must be set properly on each MPT using the MCT.

4.9.1.4.15.1 — How to configure the synchronization:

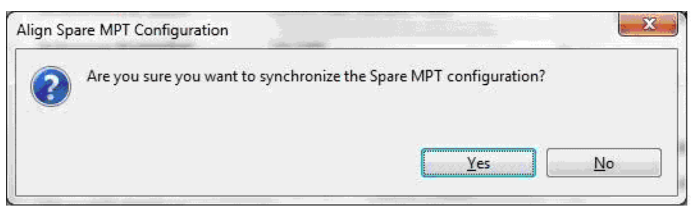
1. Configure the main MPT according to the other procedures in the Configuration section.
2. From the MCT connected to the main MPT, set up the synchronization:
   - Click on the Align Spare MPT Configuration icon

Figure 4.119 — MCT connected to main MPT



The Align Spare MPT Configuration dialog box opens.

Figure 4.120 — Align Spare MPT Configuration dialog box



- Click on the Yes button. The dialog box shows the status of the operation.

Figure 4.121 — Synchronization pending

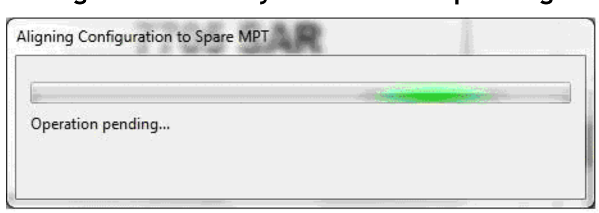
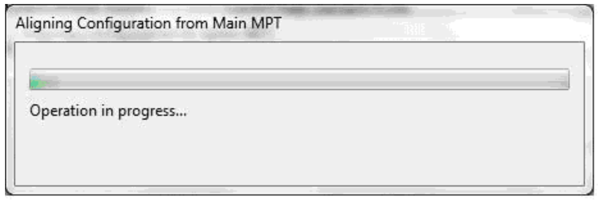
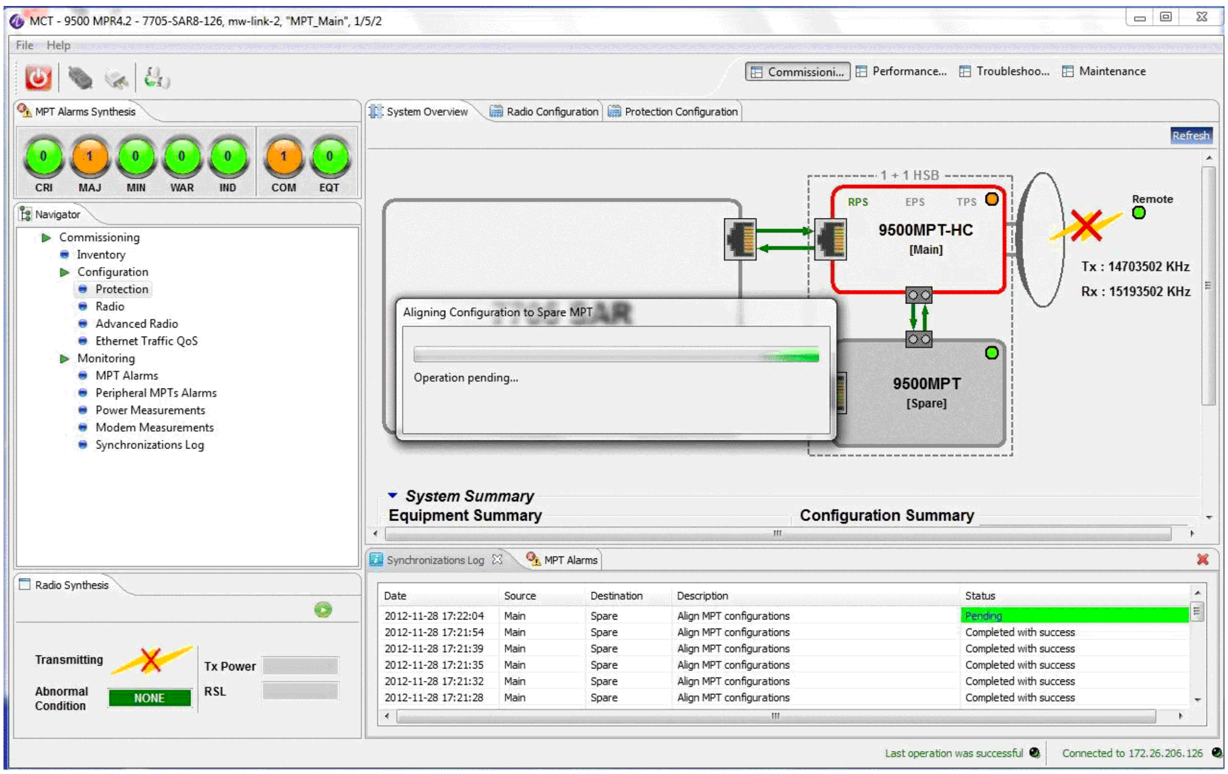


Figure 4.122 — Synchronization in progress



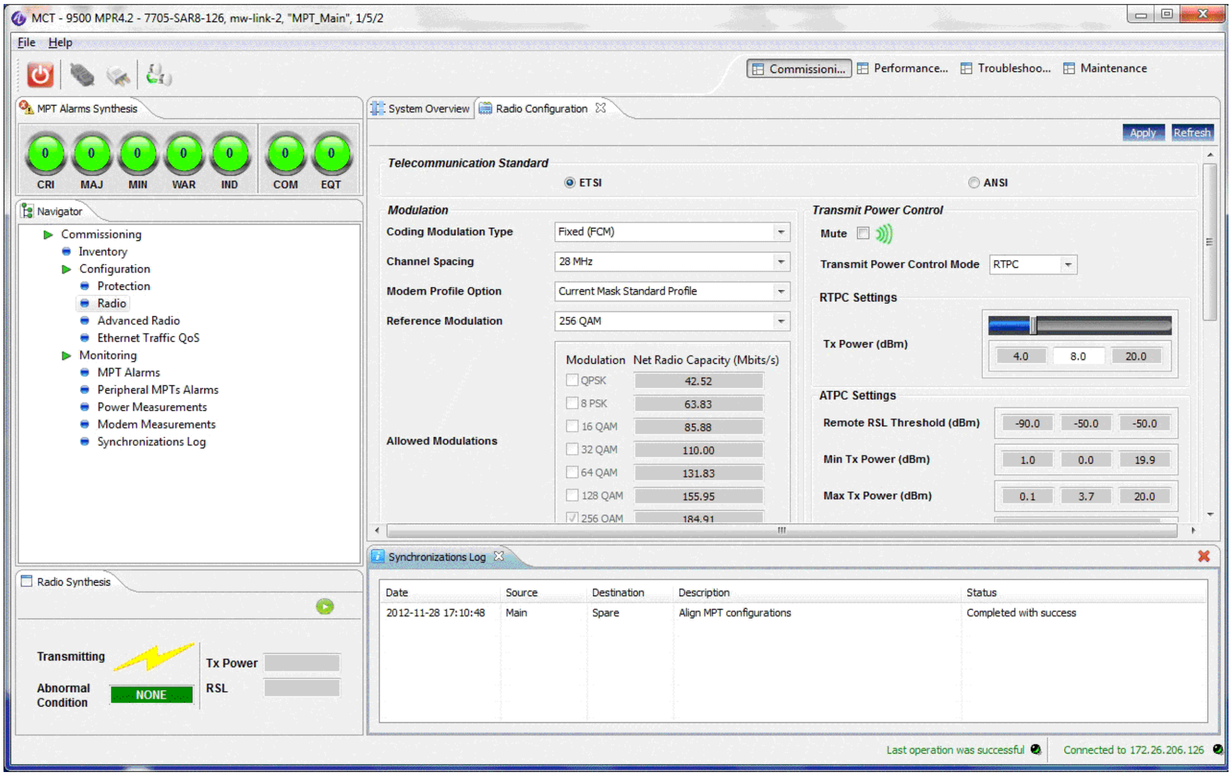
The Synchronization Log appears in the MCT, showing details of the operation.

Figure 4.123 — MCT connected to main MPT with synchronization pending



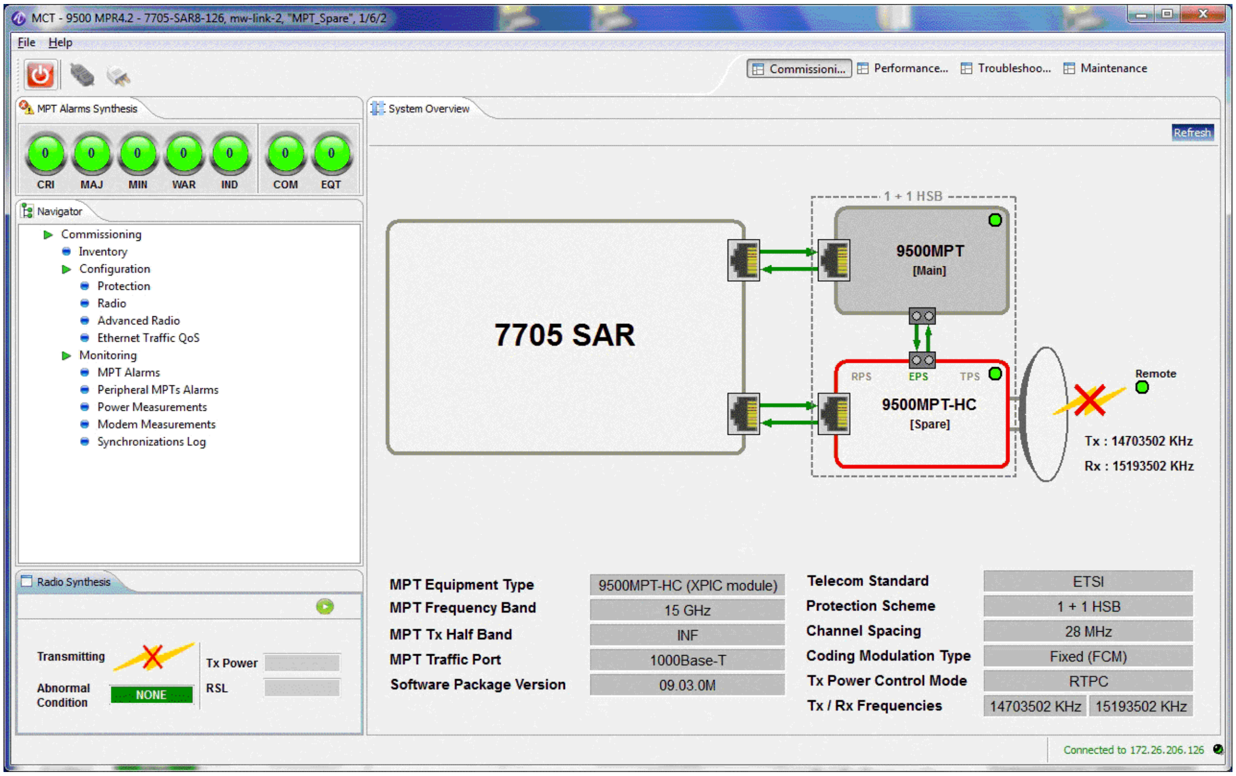
- Verify in the Synchronization log that the operation completed successfully.

Figure 4.124 — MCT connected to main MPT with successful synchronization log



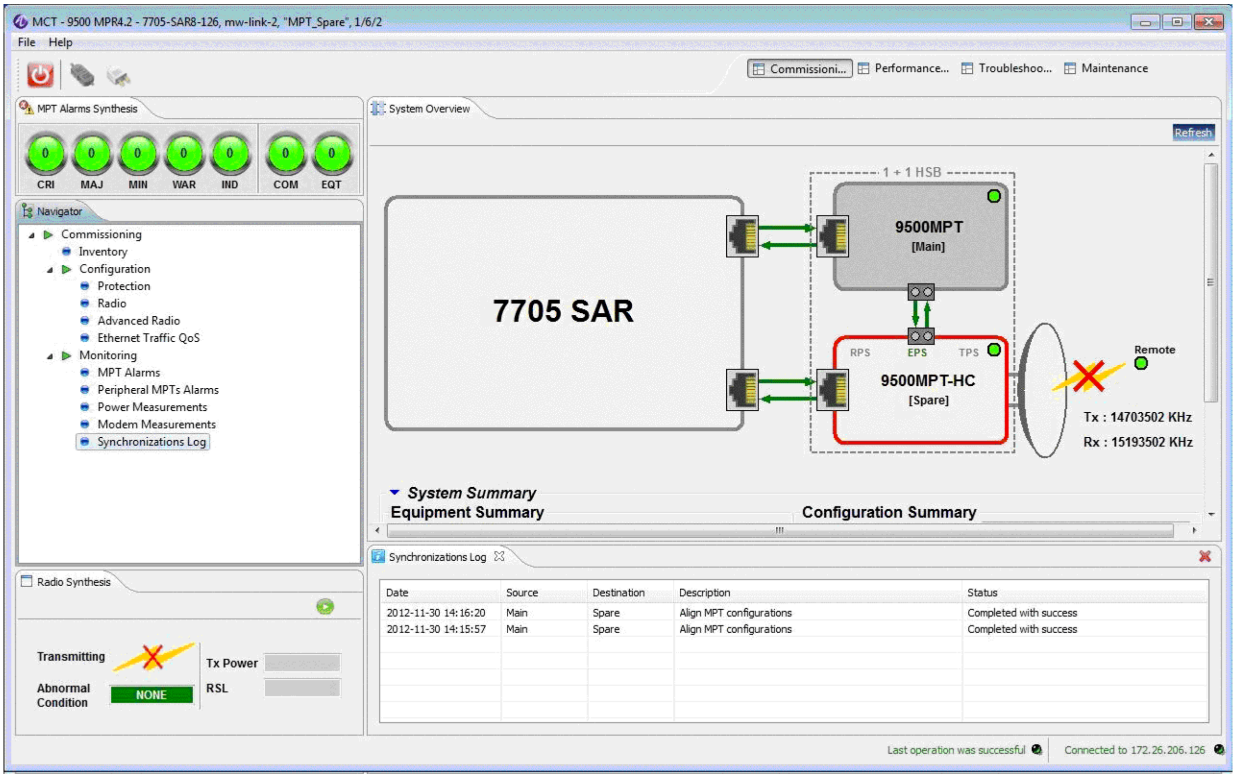
- View the MCT connected to the spare MCT. Note that the Align Spare MPT Configuration icon is not present.

Figure 4.125 — MCT connected to spare MPT



- Click on Synchronization Log to confirm the synchronization is completed.

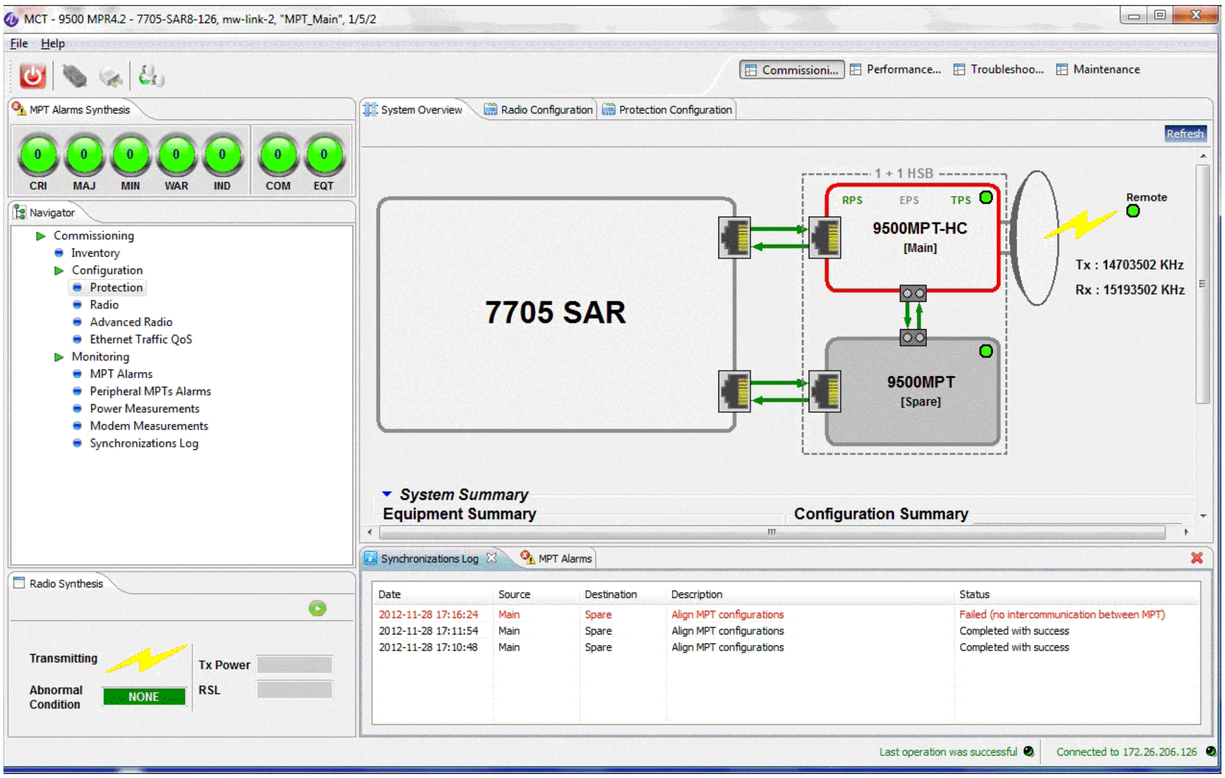
Figure 4.126 — MCT connected to spare MPT with successful synchronization log



- If the synchronization fails, the dialog box and the Synchronization Log will show the reason for the failure.

Figure 4.127 — Synchronization failure dialog box

Figure 4.128 — MCT connected to main MPT with failed synchronization log



In case of synchronization failure, check the state of the coupling cable. If everything is clear, repeat the synchronization operation.

4.9.1.5 — Backup / restore

This menu allows the operator to make a backup (save the NE configuration to the PC) and to make a restore (download a configuration, from a previously done backup, to the NE). The backup and restore is done through FTP (by default) or SFTP.

Warning: The MPT-HC can be used to replace a MPT HC-HQAM only if the MPT HC-HQAM is working in MPT-HC Compatibility mode (see section 4.9.1.4.6).

Note: In an MPR-e in Single NE mode with 7705 SAR configuration, MPR-e backup/restore is done through the 7705 SAR via an FTP session directly on the 7705 SAR compact flash. The MPR-e configuration is always saved on the 7705 SAR and can be backed up and restored as a regular 7705 SAR config.cfg file.

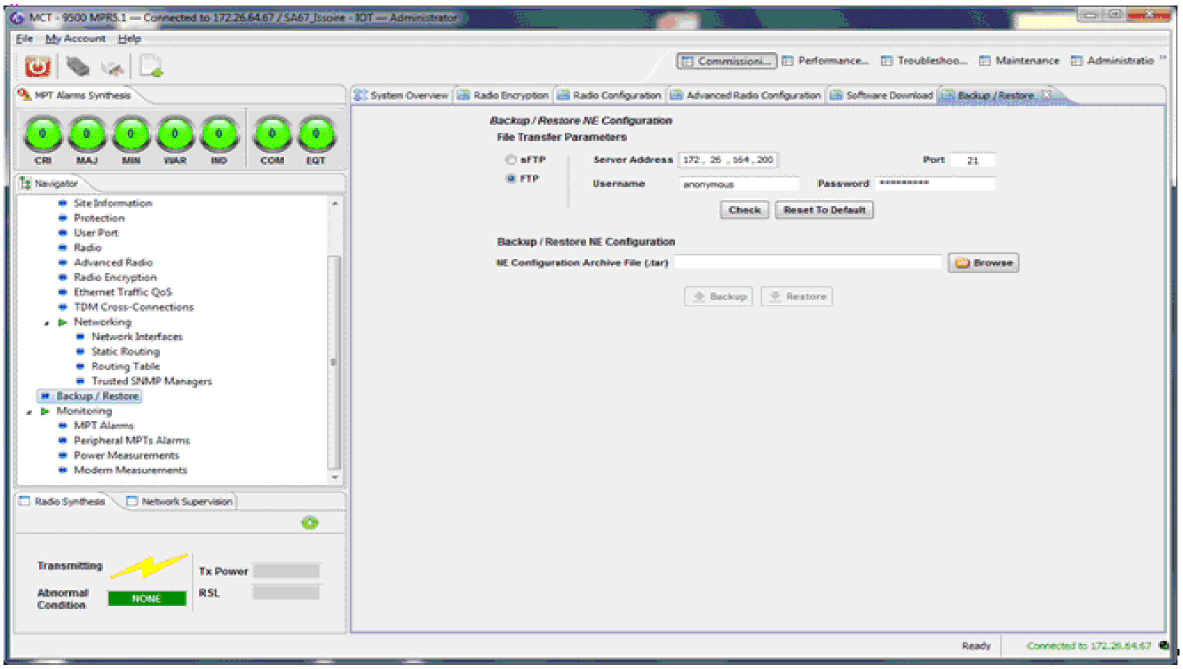


Figure 4.129 — Backup / restore using FTP

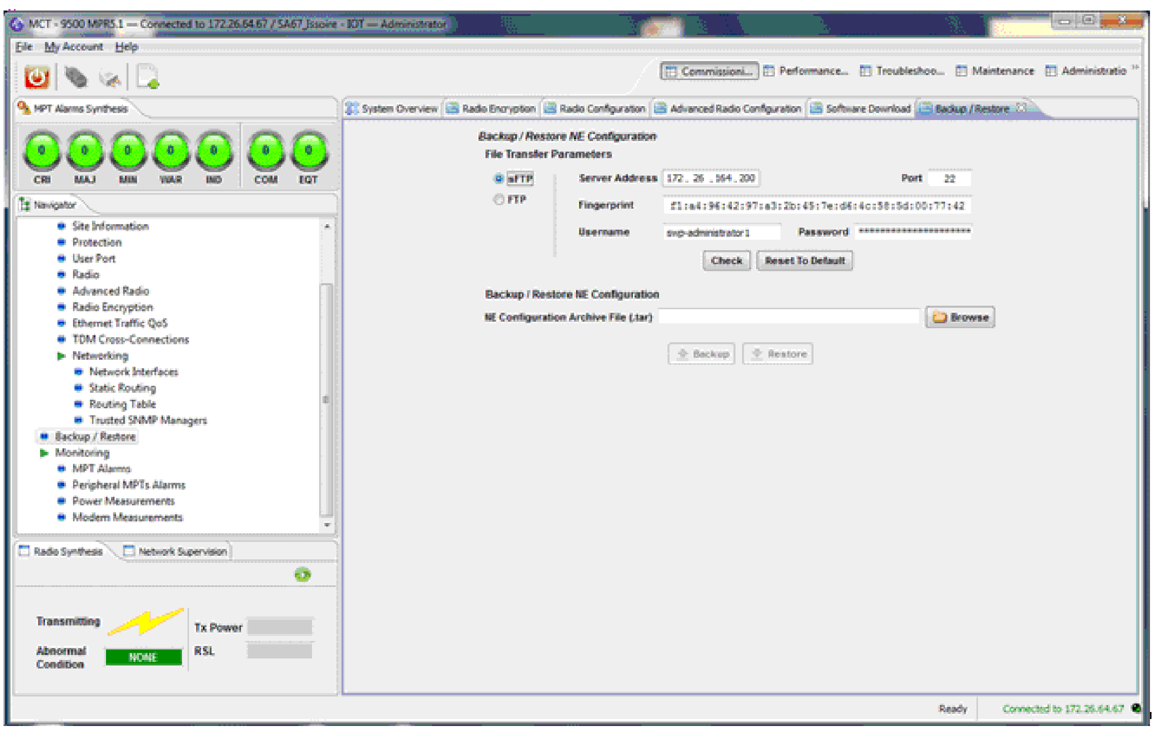


Figure 4.130 — Backup / restore using SFTP

1. Fill the **File Transfer Parameters** fields.

If you will be using FTP, check that the following parameters have been correctly setup:

- Server Address: PC address
- Username: anonymous
- Password: anonymous
- Port: 21

If you will be using SFTP, check that the following parameters have been correctly setup:

- Server Address: PC address
- Fingerprint: F1:A4:96:42:97:A3:2B:45:7E:D6:4C:58:5D:00:77:42
- Username : swp-administrator1
- Password: not displayed

2. Click on the **Browse** button to select the directory and the name of the file.
3. Click on the **Backup** or **Restore** button as required.

Note: If trouble occurs, verify that the FTP Server in the NEtO Servers Manager window is on.

4.9.1.6 — Monitoring

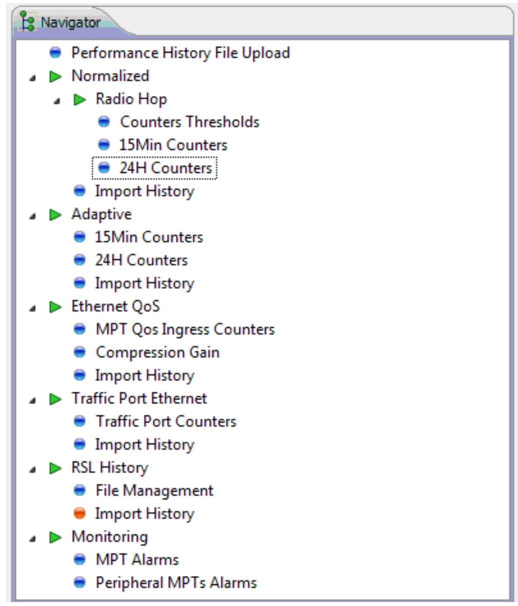
For this menu, see Monitoring.

4.9.2 — Performance monitoring

This menu has the following sub-menus:

- Performance history file upload
- Normalized
- Adaptive modulation
- Ethernet QoS
- RSL history
- Traffic port Ethernet for MPR-e
- Monitoring

Figure 4.131 — Performance monitoring menu



4.9.2.1 — Performance history file upload

This menu allows you to export a .csv file with data regarding the performance counters. This operation is done through an FTP (by default) or SFTP session, see Figure 4.132 and Figure 4.133.

This menu is not available in Single NE mode with 7705 SAR.

1. Check the **File Transfer Parameters** area with the FTP or SFTP Server parameters.
2. the **Apache Server**, available on the TCO Software Suite R5.2 DVD-ROM, is used as default FTP server.

   If you will be using FTP, check that the following parameters have been correctly setup:

   - Server Address: PC address
   - Username: anonymous
   - Password: anonymous
   - Port: 21

   If you will be using SFTP, check that the following parameters have been correctly setup:

   - Server Address: PC address
   - Fingerprint: F1:A4:96:42:97:A3:2B:45:7E:D6:4C:58:5D:00:77:42
   - Username : swp-administrator1

- Password: not displayed

3. In the MSS-1c Performance History Parameters or MPR-e Performance Family field, select the type of counters to be exported:
   - Normalized Performance Counters (see Normalized)
   - Adaptive Modulation Counters (see Adaptive modulation)
   - MSS-1c QoS Ethernet Counters
   - MPR-e QoS Ingress Counters (see MPT QoS ingress counters)
   - MPR-e Traffic Port Counters (see Traffic port counters).

Note: The counters to be exported must be activated.

The counters use GMT timestamps.

4. Select the **History Period** in seconds. The following are the defaults:
   - 5 s for the QoS Ethernet Counters;
   - 5 s for the MPR-e Traffic Port Ethernet Counters;
   - 15 m or 24 h for the Normalized and Adaptive counters
5. Click on the **Apply** button.
6. Click on the **Browse** button to choose the destination directory and to assign the name of the file.
7. Click on **Upload History** to export the file. If trouble occurs, verify that the FTP or SFTP Server in the NEtO Servers Manager window is on.

Figure 4.132 — Performance history file upload using FTP

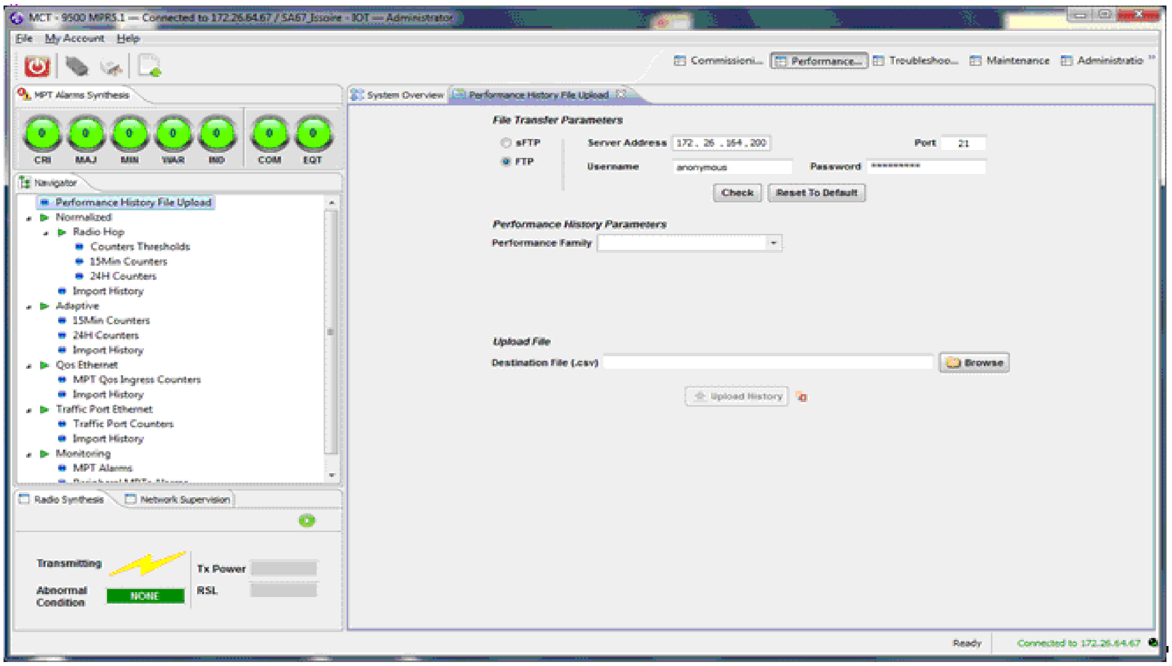
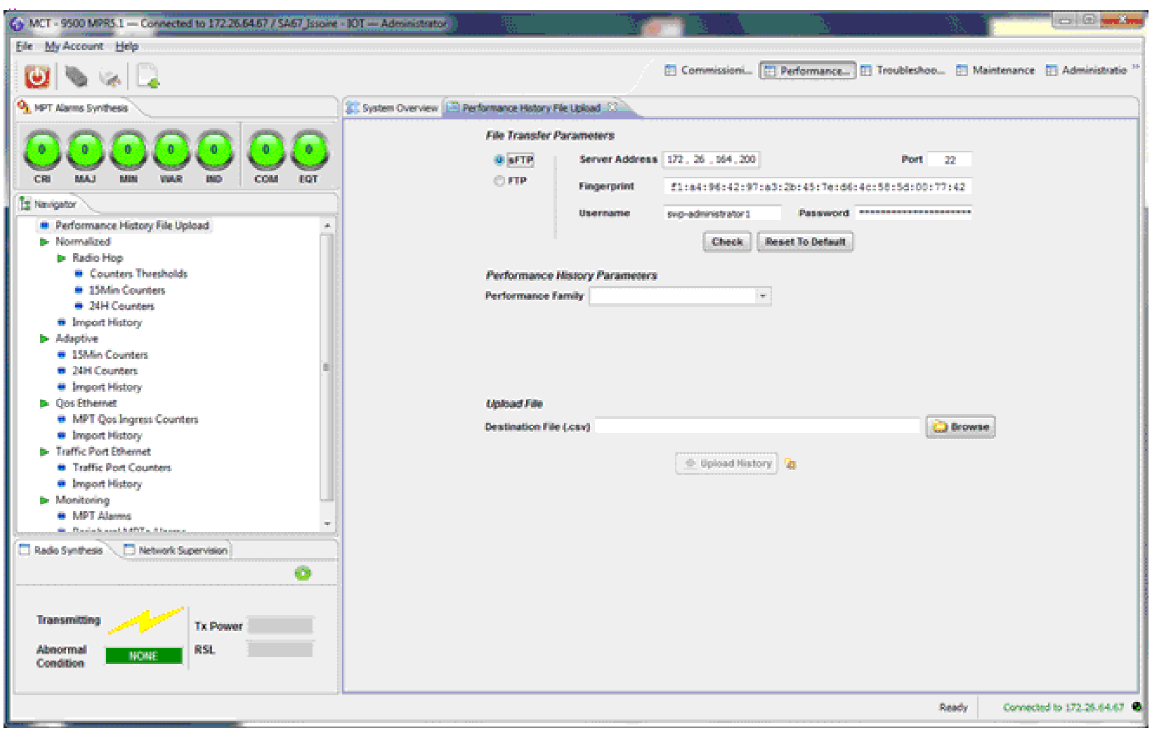
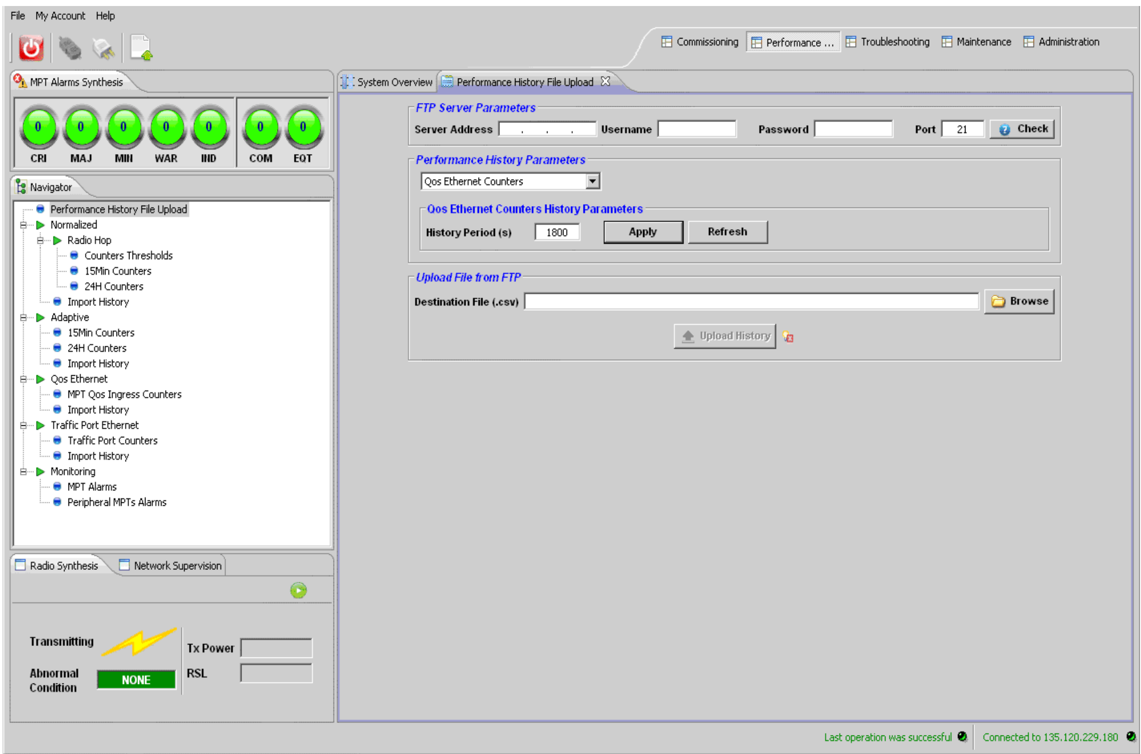


Figure 4.133 — Performance history file upload using SFTP



For the QoS Ethernet Counter history and MPR-e Traffic Port Ethernet Counters file upload the counter period duration can be adjusted from 5 to 3600s. It can be modified by typing the in the History Period field and applying the value.

Figure 4.134 — QoS Ethernet counter period duration



4.9.2.2 — Normalized

The MPR-e supports normalized Hop PM for both 1+0 and 1+1 HSB configuration in Single NE mode with 7705 SAR.

When in 1+1 HSB configuration, Link PM is also provided by the EPS active MPR-e. The EPS standby MPR-e reports only Hop PM and no data for Link PM. Whenever an EPS switch occurs (automatic or issued by operator), the current period is declared suspected and PM link monitoring continues on the new EPS active MPR-e.

4.9.2.2.1 — Counters thresholds

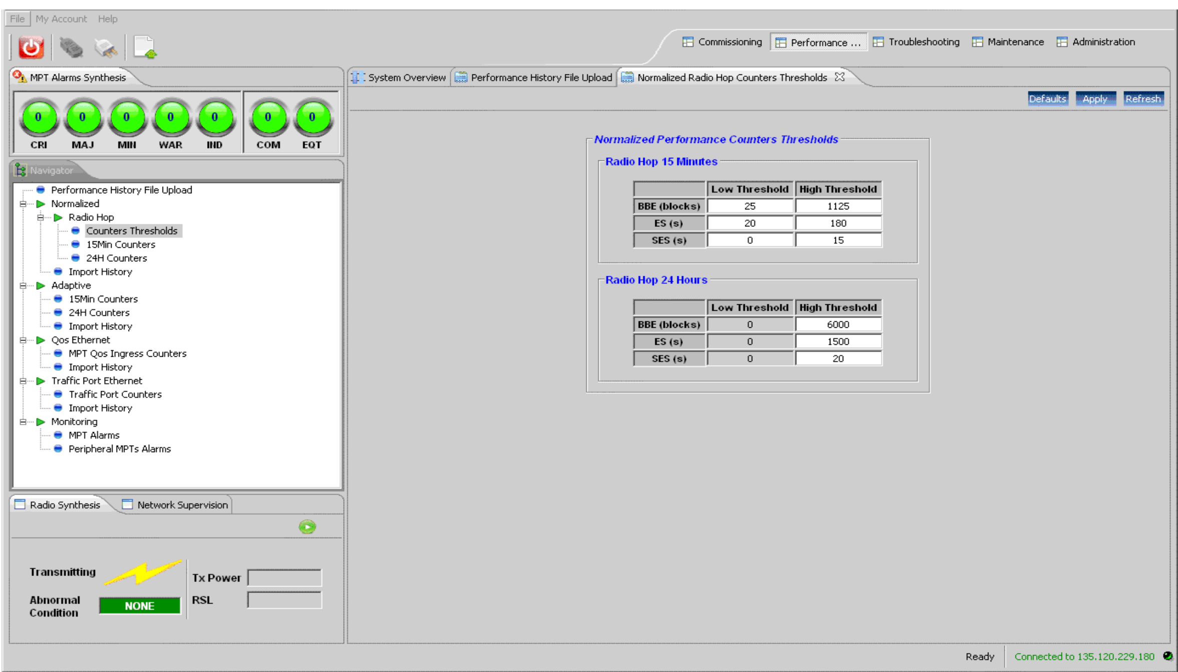
In the Counters Thresholds screen the **Low Threshold** and **High Threshold** can be changed for each G.826 parameter (BBE, ES, SES). The high threshold will cause the activation of a Threshold exceeded alarm during the Performance Monitoring period and the low threshold will cause the deactivation of the same alarm.

Note: For the 24-hour report only the **High Threshold** can be changed.

Click on the **Apply** button to send the new parameters to the equipment.

Click on the **Default** button to restore the default parameters.

Figure 4.135 — Counters thresholds



4.9.2.2.2 — 15Min counters

The upper part of the screen will show the values of the current 15-min period; the lower part will show the last elapsed 15-min period.

Click on the **Activate** button (1) to activate the 15-min normalized NE counter computation.

Click on the **Start** icon (2) to start the monitoring of the current 15-min period (if the NE counter computation is activated) and set the refresh period (range from 1s to 60s with default value to 5s).

Click on the **Reset** button to reset the NE counter computation (if the NE counter computation is activated).

Figure 4.136 — 15Min counter activation

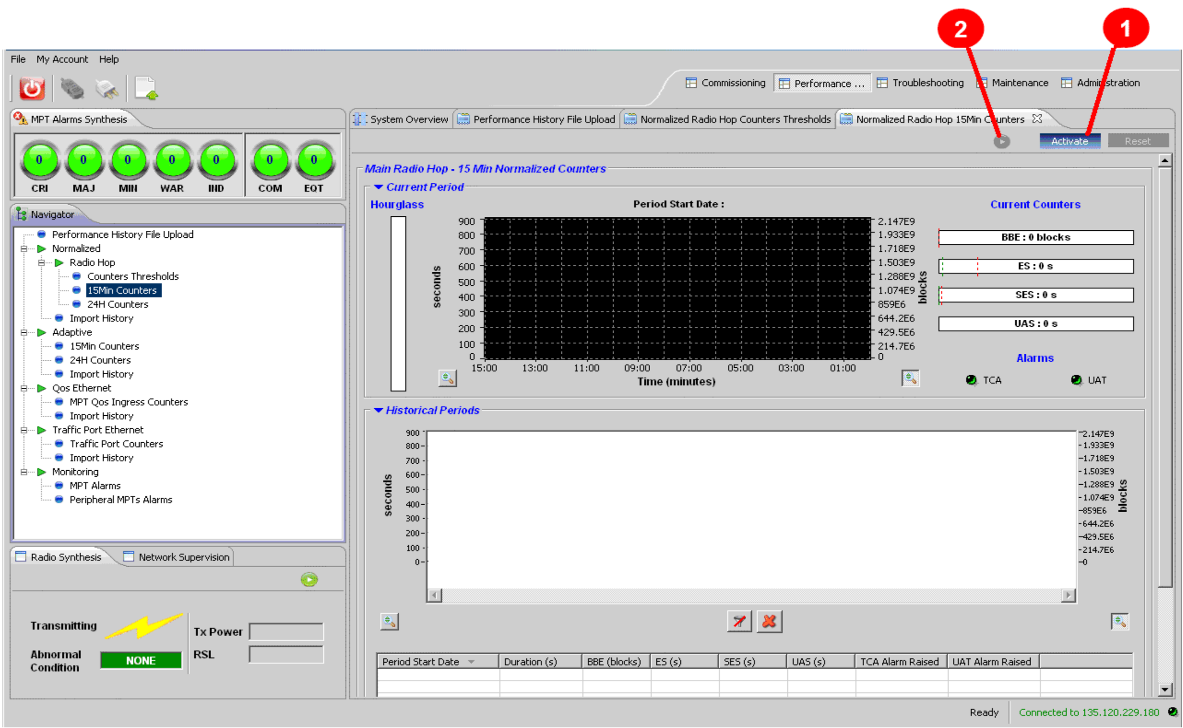
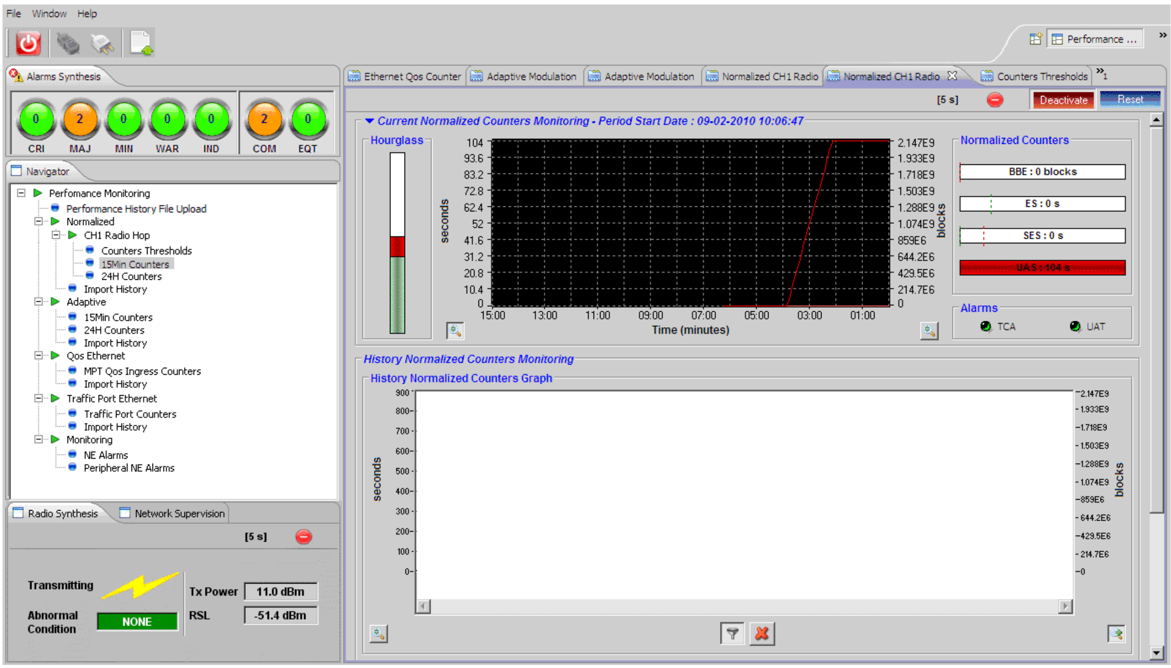
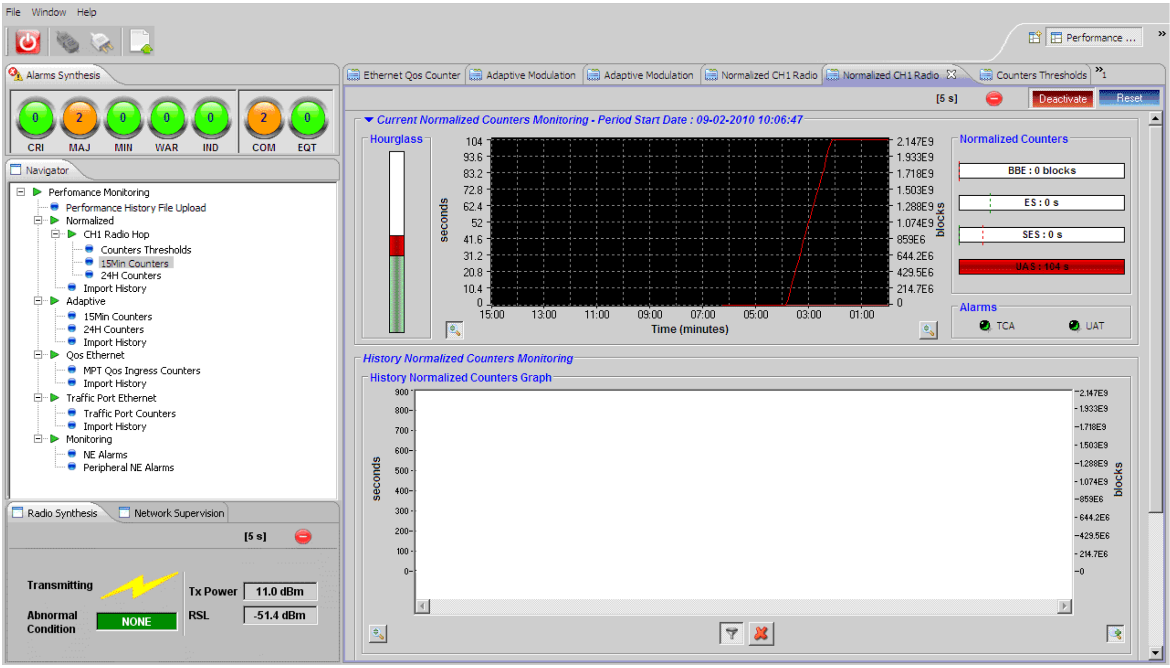


Figure 4.137 — 15Min counter



When a 15-min period is over, the period data is automatically reported and shown on the lower part of the window.

Figure 4.138 — 15Min counter completed



Click on the **Stop** icon (1) to stop the current 15-min counter monitoring.

Click on the **Deactivate** button to deactivate the 15-min normalized NE counter computation (if the counter monitoring is stopped).

Figure 4.139 — 15Min counter deactivation

4.9.2.2.3 — 24H counters

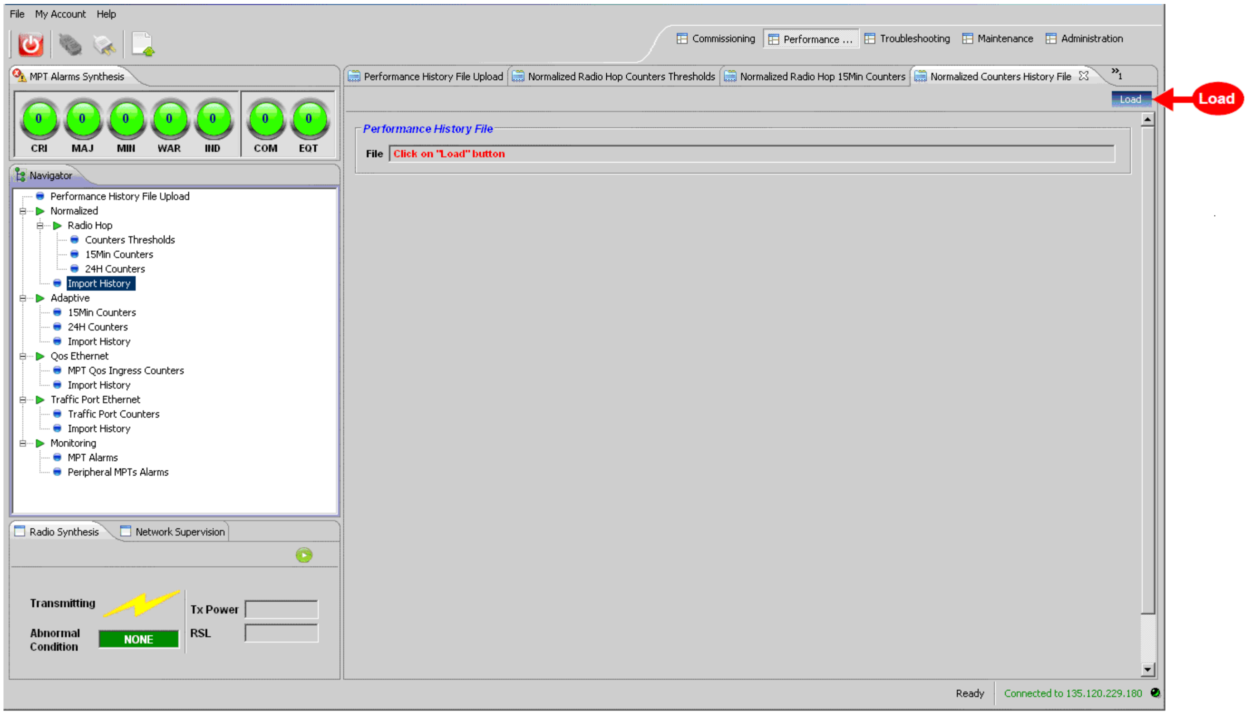
The 24H Counters menu is identical to the 15Min Counters menu, but the period is 24 hours rather than 15 minutes.

4.9.2.2.4 — Import history

This menu displays the counters of the history report.

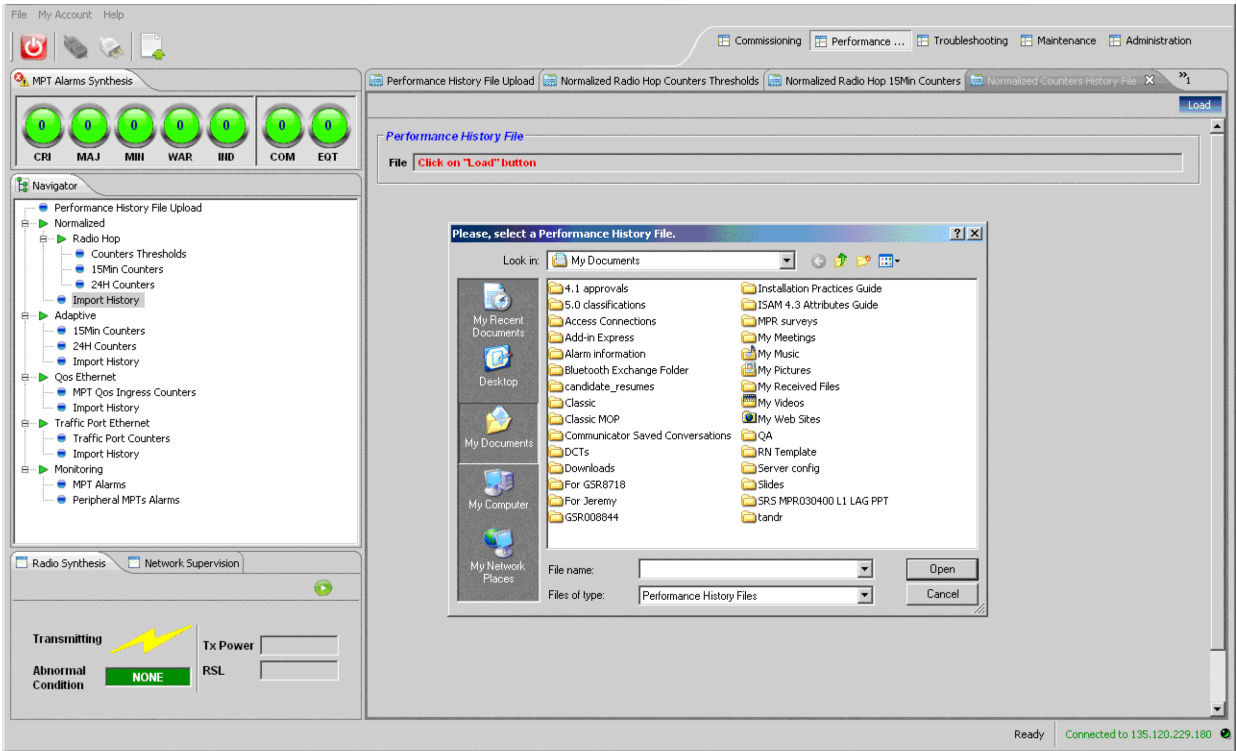
- Select **Import History** and click on the **Load** button.

Figure 4.140 — Import history



- Select the file to be opened and click on the **Open** button.

Figure 4.141 — File selection



The history file opens showing the performance report.

4.9.2.3 — Adaptive modulation

The Adaptive Modulation Counter screen will show the total seconds during which each modulation scheme has been used.

4.9.2.3.1 — 15Min counters

The upper part of the screen will show the values of the current 15-min period; the lower part will show the last elapsed 15-min period.

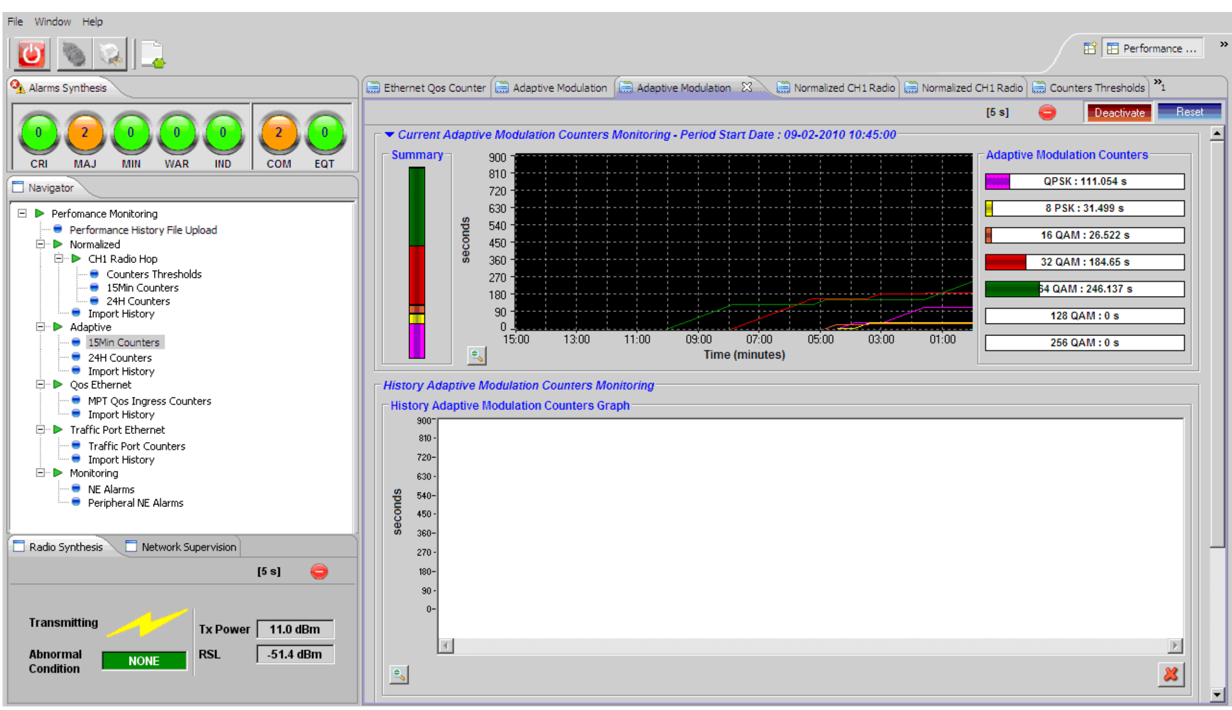
Click on the **Activate** button (1) to activate the 15-min normalized NE counter computation.

Click on the **Start** icon (2) to start the monitoring of the current 15min period (if the NE counter computation is activated) and set the refresh period (range from 1s to 60s with default value to 5s).

Press the **Reset** button to reset the NE counter computation (if the NE counter computation is activated).

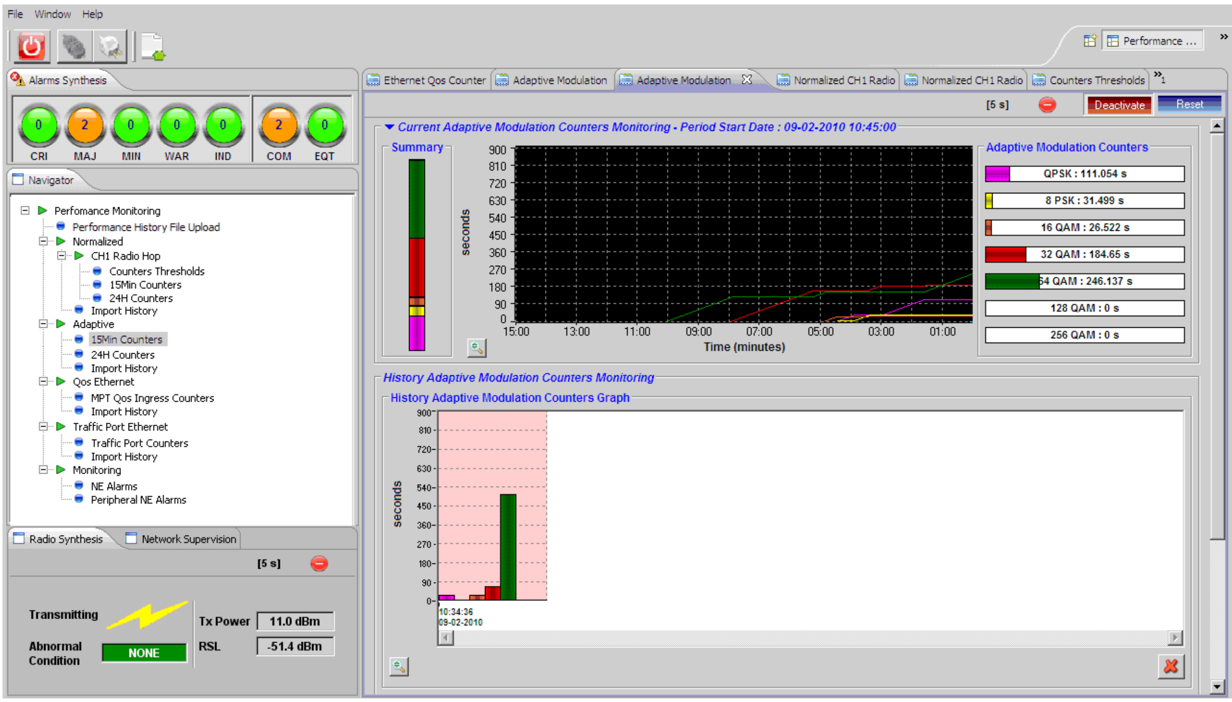
Figure 4.142 — Adaptive modulation counter activation

Figure 4.143 — Adaptive Modulation 15Min counter



When a 15-min period is over, the period data is automatically reported and shown in the lower part of the window.

Figure 4.144 — Adaptive Modulation 15Min counters history



Click on the **Stop** icon (1) to stop the current 15-min counters monitoring.

Click on the **Deactivate** button to deactivate the 15-min normalized NE counter computation (if the counter monitoring is stopped).

Figure 4.145 — 15Min counters deactivation

4.9.2.3.2 — 24H counters

The 24H Counters menu is identical to the 15Min Counters menu, but the period is 24 hours rather than 15 minutes.

4.9.2.3.3 — Import history

See Import history.

4.9.2.4 — Ethernet QoS

4.9.2.4.1 — MPT QoS ingress counters

MPT QoS Ingress counters computation is always activated. The history period can be modified (see Performance history file upload).

The upper part of the window shows a graphical evolution of the counters.

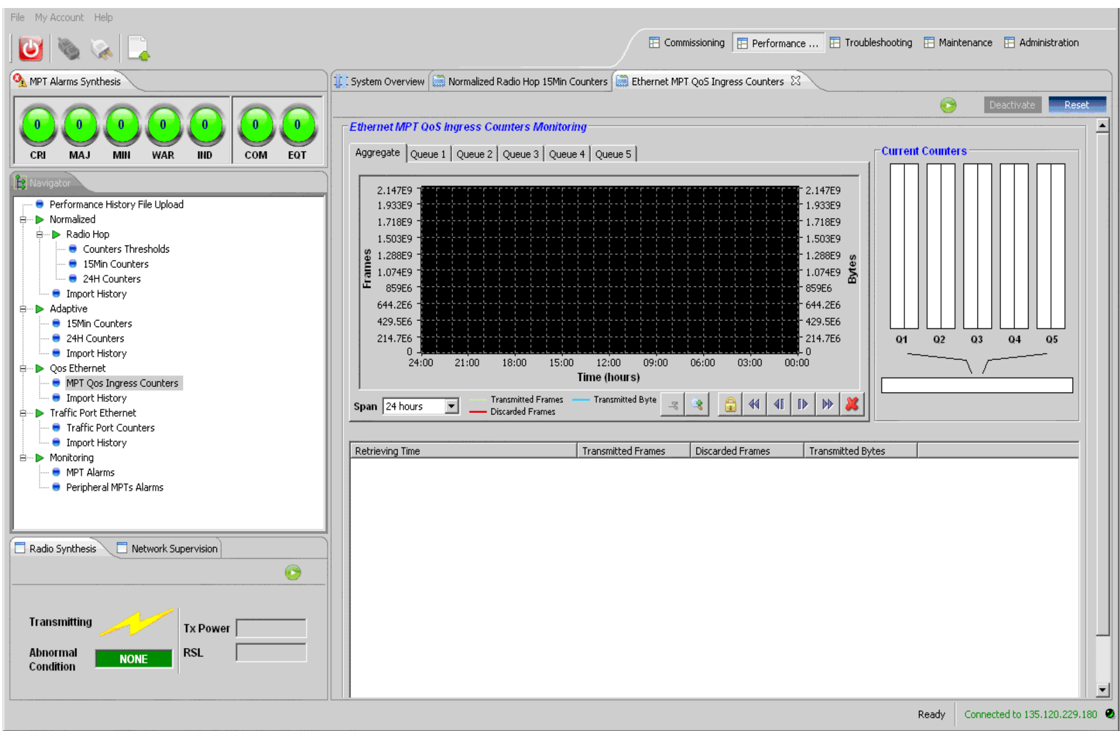
The lower part of the window will show a table reporting the counter values when monitoring is activated. Each time the counters are refreshed, an entry will be added to the table.

Click on the **Start** icon to start the monitoring of the MPT QoS Ingress counters and set the refresh period (range from 5s to 60s with default value to 5s).

Click on the **Stop** icon to stop the MPT QoS Ingress counters monitoring.

Click on the **Reset** button to reset the NE counter computation.

Figure 4.146 — Ethernet: QOS counters



The QoS counters are:

- Transmitted Frames
- Discarded Frames

Note: The Egress Discarded Frames counter is associated with 100Base-Tx. It has no meaning when the MPR-e is working at 1000B-T/1000B-SX

- Transmitted Bytes

The counters are shown in the following formats:

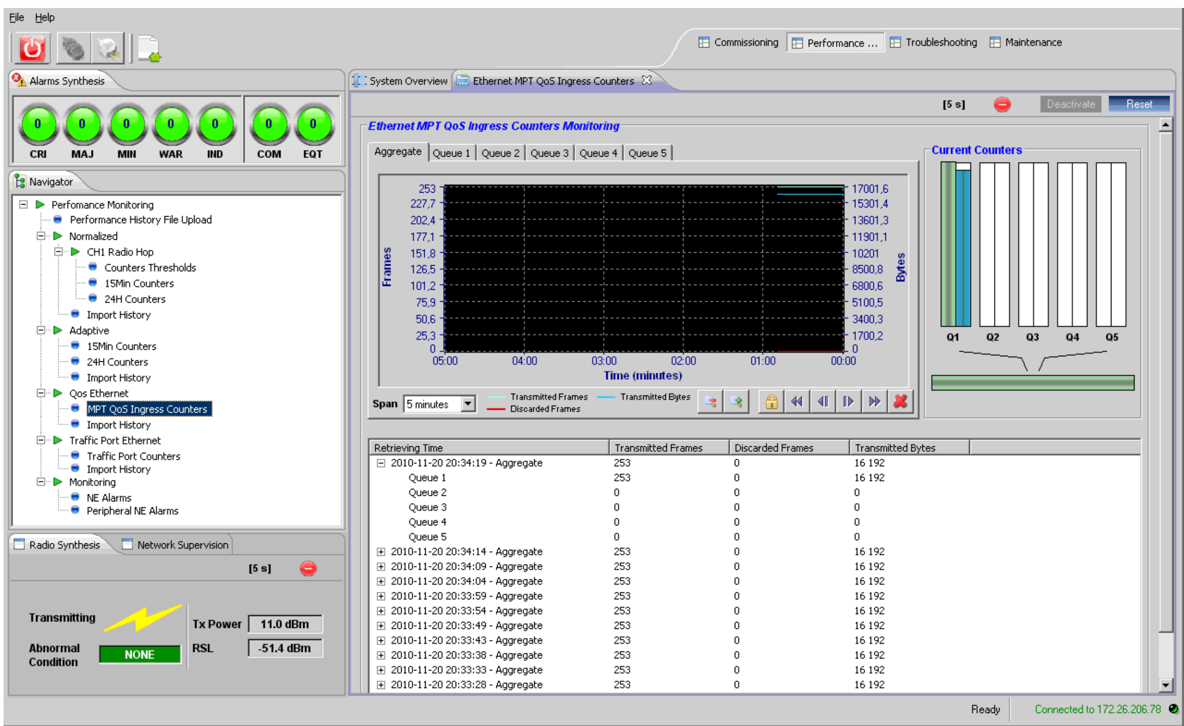
- bar
- graphical
- tabular

Counters can be displayed for a single queue (**Queue #** tab) or for all the queues (**Aggregate** tab).

The default span of the graphical format is 24 hours, but it can be changed.

An example of the QoS Counters screen is given in Figure 4.147.

Figure 4.147 — QoS counters example for Queue 1



4.9.2.4.2 — Import history

See Import history.

4.9.2.5 — Traffic port Ethernet for MPR-e

This menu is not available in Single NE mode with 7705 SAR.

4.9.2.5.1 — Traffic port counters

Traffic Port counters computation is always activated. The history period can be modified (see Performance history file upload).

The upper part of the screen will show a graphical evolution of the counters.

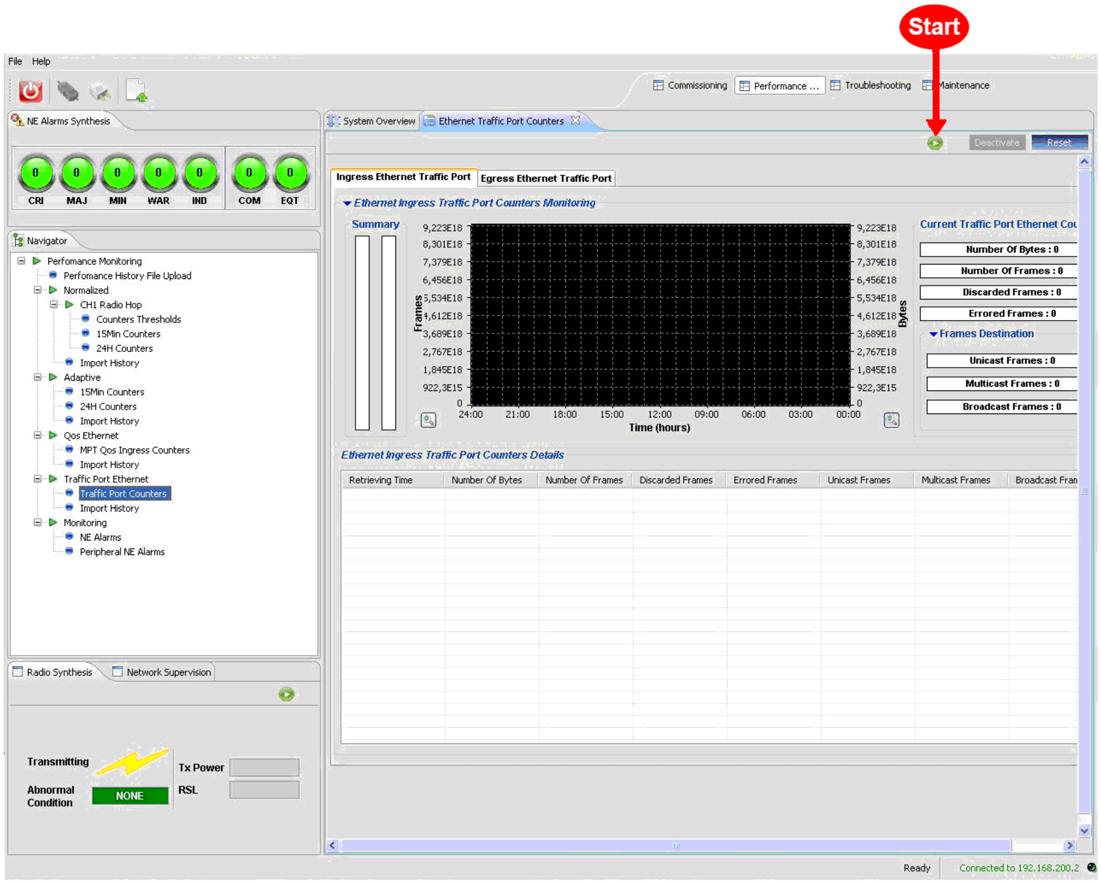
The lower part of the window will show a table reporting the counter values when monitoring is activated. Each time the counters are refreshed, an entry will be added in the table.

Press the **Start** icon to start the monitoring of the Traffic Port counters and set the refresh period (default: 5s).

Press the **Stop** icon to stop the Traffic Port counters monitoring.

Press the **Reset** button to reset the NE counter computation.

Figure 4.148 — Ethernet: Traffic port counters



The Traffic Port Counters are:

- Number of Bytes
- Number of Frames
- Discarded Frames

Note: The Egress Discarded Frames counter is associated with 100Base-Tx. It has no meaning when the MPR-e is working at 1000B-T/1000B-SX

- Errored Frames
- Unicast Frames
- Multicast Frames
- Broadcast Frames

The counters are shown in the following formats:

- bar
- graphical
- tabular

An example of the Traffic Port Counters screen is given in Figure 4.149.