IRITEL
BEOGRAD

CATALOGUE

OTN/DWDM Systems
CWDM Optical Platform
Next Generation SDH Systems
Access Systems
Network Management System
Radio Communications
Power Electronics

IRITEL a.d. BEOGRAD

Batajnički put 23, 11080 Beograd, Serbia
General Manager: (+381 11) 3073 515, Sales: (+381 11) 3073 555
Marketing: (+381 11) 3073 544, Exchange: (+381 11) 3073 400, Fax: (+381 11) 3073 434
http://www.iritel.com, e-mail: info@iritel.com

IRITEL was founded in 1967.

Today, with 160 highly educated and skilled employees, IRITEL represents the leading company in the fields of communications and electronics in South-East Europe.

IRITEL has a Management System: SRPS ISO 9001:2015, SRPS ISO 14001:2015, SRPS ISO 45001:2018, SRPS ISO/IEC 27001:2014 and COPC 9000/21.

The main areas of activity in communications and electronics:

- Transmission systems
- Switching systems
- Radio communications
- Power Electronics
- Engineering

SRPS ISO 9001:2015
СЕРТИФИКАТ бр. QMS-110-2
SRPS ISO 14001:2015
СЕРТИФИКАТ бр. EMS-038-2
SRPS ISO 45001:2018
СЕРТИФИКАТ бр. OH&S-007-1
SRPS ISO/IEC 27001:2014
СЕРТИФИКАТ бр. ISMS-022-2
COPC 9000/21
СЕРТИФИКАТ бр. QS-047-2

TABLE OF CONTENTS

OTP100G

Optical Transport Platform OTN/DWDM up to 8 Tbit/s

- **Multiservice OTN/DWDM Platform**
- **Line Side Coherent Tunable CFP 100G DWDM Transceiver with Integrated CD Compensation**
- **Universal Ports - Plugable Interfaces**

  Any service – Any rate – Any port – Any λ
- **Universal Unit**

  Single Unit Solution =>

  Muxponder, Transponder,

  ODUk Cross connect, 3R Regeneration
- **Unified Platform for 80 Optical Channels**

  DWDM multiplexers, optical amplifiers, dispersion compensation modules

- **Integrated Optical Transport Solution**

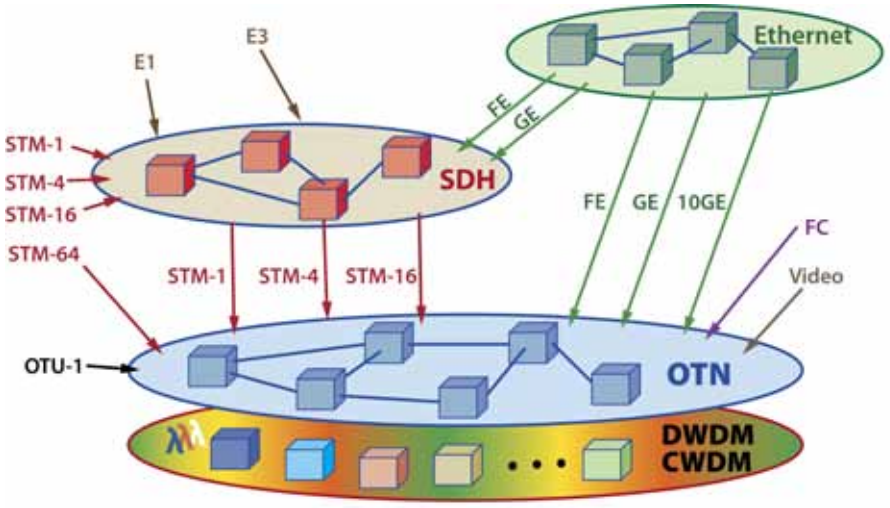
OTN	*SDH/SONET*	*point-to-point*
DWDM	*Ethernet*	*chain*
	Fibre Channel	*ring*
	Video	*mesh*
	CPRI	

MAIN FEATURES

- 100G client/line interfaces are implemented using CFP modules:
  - **OTN** OTU4
  - **Ethernet** 100GE
- 10G client/line interfaces support ***Any service – Any rate – Any port – Any λ*** using XFP modules:
  - **OTN** OTU2/OTU2e
  - **Ethernet** 10GE LAN, 10GE WAN
  - **SDH** STM-64 **SONET** OC-192
  - **Fibre Channel** 8GFC, 10GFC
  - **CPRI Option 7**
- Client/line interfaces for bitrates up to 5 Gb/s are implemented using SFP modules as ***Any service – Any rate – Any port – Any λ***:
  - **OTN** OTU1
  - **Ethernet** GE, FE
  - **SDH** STM-16/4/1, **SONET** OC-48/12/3
  - **SAN: ESCON, FICON, Fibre Channel** FC-12/25/50/100/200/400
  - **Video** DVB-ASI, SD-SDI, HD-SDI
  - **CPRI Option 1, 2, 3, 4, 5**
  - **Bit-transparen**t protocol-independent client services
- **All SFP, SFP+, XFP and CFP interfaces are universal and software configurable** with fixed (1310nm, 1550nm, CWDM, DWDM) or **tunable** (DWDM) lasers
- Support for client signals mapping into **OTN ODU0, ODUflex, ODU1, ODU2, ODU2e, ODU3, ODU4** structures
- Multistage multiplexing
- Mapping into **ODU1/OPU1 tributary slots** of n x 155.52 Mb/s capacity for efficient mapping of client signals at sub-ODU0 granularity
- OTN client signal mapping procedures
  - **AMP** – *Asynchronous Mapping Procedure*
  - **BMP** – *Bit-synchronous Mapping Procedure*
  - **GMP** – *Generic Mapping Procedure*
  - **GFP** – *Generic Framing Procedure:* Framed and Transparent
- Traffic **grooming** based on client signal requirements by using ODUflex, OTN VCAT (Virtual Concatenation) (OPUk-Xv, k=0, 1, 2), and/or n x 155Mb/s *tributary slots*
- OTN non-blocking **ODUk cross connect** supports arbitrary mix of ODUk traffic for each muxponder/transponder unit, **down to ODU0 granularity**
- **FEC** (*Forward Error Correction*) functionality for detecting and correcting transmission errors, supports: ITU-T G.709 FEC, ITU-T G.975.1 I.4 FEC and ITU-T G.975.1 I.7 FEC, SD-FEC (for coherent DWDM 100G line interfaces)
- **Transparent** transfer of timing information for all client signals
- Synchronization support
  - SyncE
  - PTP1588v2
- **Carrier class traffic protection** is implemented at multiple levels and protocols on optical and electrical levels
- **DWDM multiplexing** supports up to **80 channels** of **C-band wavelengths** (192THz – 196THz) with **50GHz** spacing
- **DWDM filters** with low attenuation **upgrade ports** allow DWDM multiplex configuration in steps of 4, 8 or 40 wavelengths, up to 80 wavelengths
- The system can utilize active and/or passive optical filters. Active multiplexers are implemented using software configurable variable optical attenuators (VOA)
- Use of **EDFA and RAMAN optical amplifiers** extends the maximum length of optical sections
- Module for **chromatic dispersion compensation** is based on **FBG** (Fiber Bragg Gratings)
- Up to 8 degrees **ROADM** connectivity
- **DCN** is implemented using **GCC** and **OSC** channels
- Support for **in-system optical parameters monitoring**
- **External monitoring points** provide access for OSA instrument measurements
- **Performance monitoring**
- **Power supply**
  DC power supply -48V DC or -60V DC

EMS/NMS Software

- **SUNCE+ Module OTN**
- Based on **client-server architecture**
- **SNMPv3 based**
  Network Management System (**NMS**)
  Element Management System (**EMS**)



BASIC CONFIGURATION

- **OTP100Gs** is compact 1U system

Applications: Implementing OTN networks at different hierarchy levels, inter-connecting networks based on different technologies, regeneration systems and local ODUk cross connect

- **OTP100G-C4** is four-slot subrack (shelf) module

Applications: In building OTN at different hierarchy levels, inter-connecting networks based on different technologies, regeneration systems, local ODUk cross connect and building passive DWDM optical networks with local wavelength switching

- **OTP100G-C15** is 15-slot subrack (shelf) with the basic application in building OTN/DWDM networks with the maximum traffic capacity of the device is **up to 80 wavelengths** per pair of optical fibers, and with several hundreds of client interfaces
- **OTP100G-C14 is** 14-slot subrack (shelf) with the basic application in building OTN/DWDM networks with the maximum traffic capacity of the device is **up to 80 wavelengths** per pair of optical fibers, and with several hundreds of client interfaces. This subrack has possibility for hardware protection of control and monitoring unit.

Applications OTP100G-C14/C15: Implementing all network configurations with all interface types, at different hierarchy levels, inter-connecting networks based on different technologies, regeneration systems, local ODUk cross connect, building DWDM optical networks and local wavelength switching

MECHANICAL DESIGN

OTP100G-C15/C14 subrack: 586.2 mm x 437 mm x 298 mm

OTP100G-C4 subrack: 225 mm x 485.5 mm x 298.6 mm

OTP100Gs system: 44,4 mm x 437 mm x 280 mm

UNITS

- **OT-CMU** unit is the system control-management unit
- **OT10G-3** unit has the following universal software-configurable client/line interfaces: 16 SFP and 3 10G XFP interfaces. **OT10G-3** features muxponder, transponder, cross connect, synchronization and traffic protection functionalities
- **OT10G-4** is a transponder unit with 4 software-configurable client/line XFP interfaces. **OT10G-4** features transponder, cross connect, synchronization and traffic protection functionalities
- **OT10G-8** is high density transponder unit with 8 software-configurable client/line XFP interfaces. **OT10G-8** features transponder, cross connect, synchronization and traffic protection functionalities
- **OT100G-1** is high density muxponder unit with 10 software-configurable client SFP+ interfaces and one line CFP 100G interfaces. **OT100G-1** features muxponder, cross connect, synchronization and traffic protection functionalities
- **OT100G-2** is high density transponder unit with 2 CFP 100G interfaces (one client and one line). **OT100G-2** features transponder, cross connect, synchronization and traffic protection functionalities
- **pDWDM-4Cx** and **pDWDM-8Cx** are passive units for DWDM multiplexing and demultiplexing of 4 or 8 optical signals. The upgrade ports enable capacity increase
- **DWDM-x** are units for DWDM multiplexing and demultiplexing of 4 **(DWDM-4Cx)** or 8 **(DWDM-8Cx)** or 40 **(DWDM-40CM, DWDM-40CD, DWDM-40HM, DWDM-40HD)** optical signals with variable optical attenuator and photo detector for optical signal level adjustment. The upgrade ports enable capacity increase. Using interleaver unit **DWDM-IL** can be created multiplex of 80 wavelengths. **DWDM-IL** is used to combine and separate odd and even wavelengths to create a 50GHz system.
- **OMA-xy** unit performs the function of amplification optical signal using EDFA and RAMAN amplifiers with *Booster*, *Preamplifier* and *Inline* applications
- **DCM-DxDy** unit performs chromatic dispersion compensation based on FBG
- **OTVOA-x** unit has 4 or 8 variable optical attenuators and photo detectors for optical signal level adjustments
- **OPS-x** unit implements of 1+1 on optical level protection of up to 4 or 8 optical signals

CFP INTERFACES

OI.100G-CT coherent *tunable DWDM 50GHz GRID*

OI.100G-4x28 *tunable DWDM 4x28Gb/s 50GHz GRID*

OI.100G-ER4 40km

OI.100G-LR4 10km

OI.100G-SR10 100m

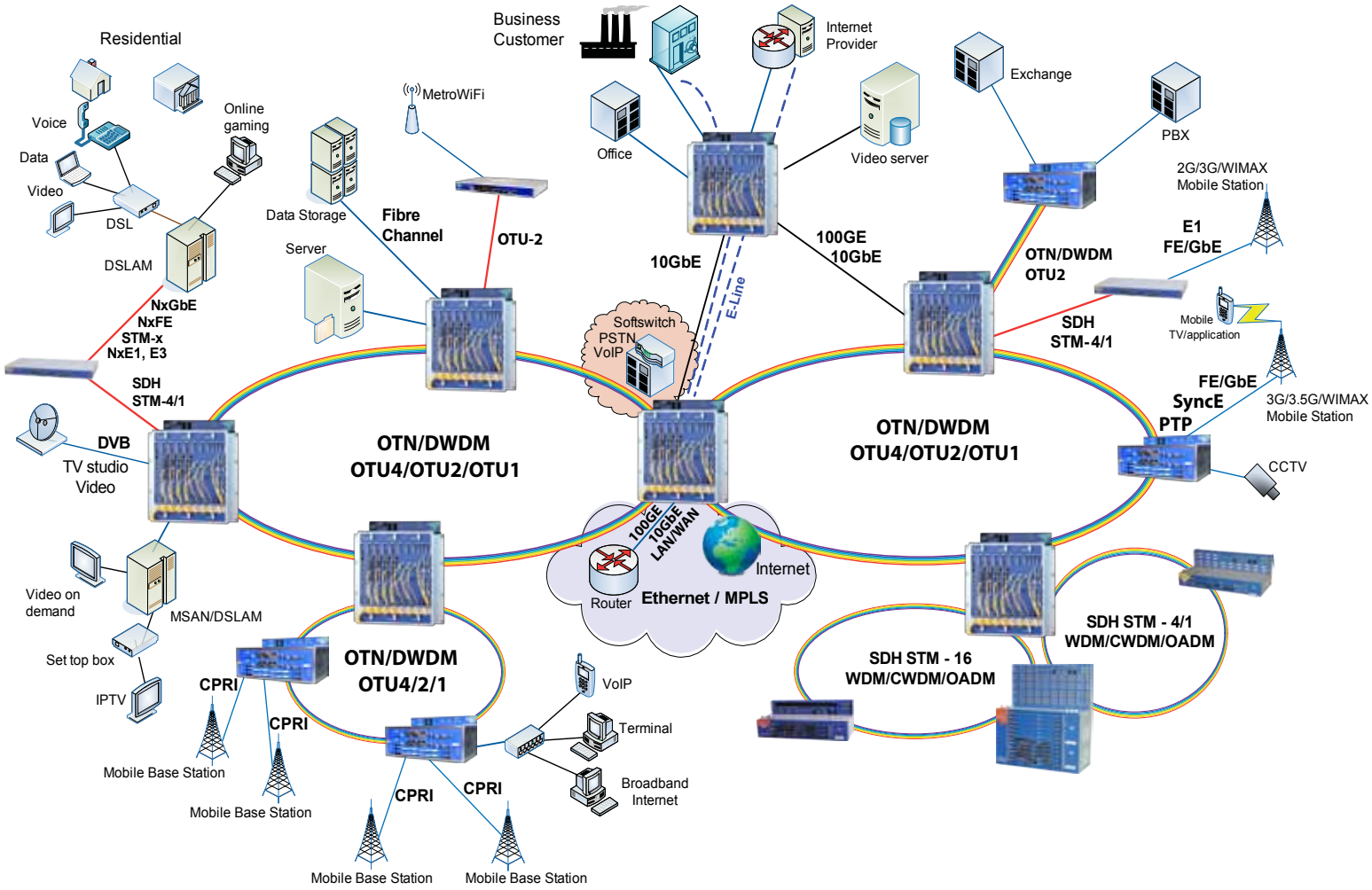
APPLICATIONS IN TRANSPORT NETWORKS

The optical transport platform OTP100G is line of IRITEL's devices for digital signal transmission over optical fibers, based on OTN and DWDM technologies, designed for implementation of local, metropolitan and regional networks of various configurations:

- Point-to-point connections
- Linear add/drop networks
- Ring networks at different hierarchy levels
- For inter-connecting networks based on different technologies
- Mesh networks
- Regeneration systems
- For local switching at ODUk level
- For implementation of passive and active optical networks
- For local switching at optical wavelength level

The OTP100G enables inter-connecting networks based on different technologies: OTN, SDH, Ethernet, SAN (ESCON, FICON, Fibre Channel), video, CPRI, bit-transparent protocol-independent client services, etc.

The OTP100G platform is designed and manufactured with modern modular technology, making it a very flexible solution for building, expanding and upgrading networks. It enables efficient and profitable delivery of telecommunications services.



OTP10G

Optical Transport Platform OTN/DWDM up to 800 Gbit/s

- **Multiservice OTN/DWDM Platform**
- **Universal Ports**
  Any service – Any rate – Any port – Any λ
- **Universal Unit**
  Single Unit Solution =>
  Muxponder, Transponder,
  ODUk Cross connect, 3R Regeneration
- **Unified Platform for 80 Optical Channels**
  DWDM multiplexers, optical amplifiers, dispersion compensation modules

- **Integrated Optical Transport Solution**

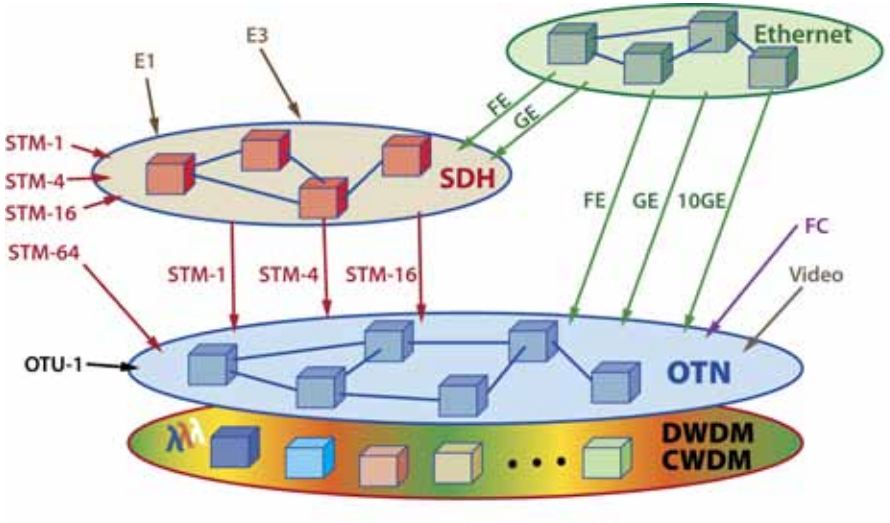
OTN	*SDH/SONET*	*point-to-point*
DWDM	*Ethernet*	*chain*
	Fibre Channel	*ring*
	Video	*mesh*

MAIN FEATURES

- 10G client/line interfaces support
  Any service – Any rate – Any port – Any λ
  using XFP modules:
  - **OTN** OTU2/OTU2e/OTU1e/OTU2f/OTU1f
  - **Ethernet** 10GE LAN, 10GE WAN
  - **SDH** STM-64 **SONET** OC-192
  - **Fibre Channel** 8GFC, 10GFC
- Client/line interfaces for bitrates up to 5 Gb/s are implemented using SFP modules as
  Any service – Any rate – Any port – Any λ:
  - **OTN** OTU1
  - **Ethernet** GE, FE
  - **SDH** STM-16/4/1, **SONET** OC-48/12/3
  - **SAN: ESCON, FICON, Fibre Channel** FC-12/25/50/100/200/400
  - **Video** DVB-ASI, SD-SDI, HD-SDI
  - **Bit-transparen**t protocol-independent client services
- **All SFP and XFP interfaces are universal and software configurable** with fixed (1310nm, 1550nm, CWDM, DWDM) or **tunable** (DWDM) lasers
- Support for client signals mapping into **OTN ODU0, ODUflex, ODU1, ODU2, ODU2e** structures
- Mapping into **ODU1/OPU1 tributary slots** of n x 155.52 Mb/s capacity for efficient mapping of client signals at sub-ODU0 granularity
- OTN client signal mapping procedures
  - **AMP** – *Asynchronous Mapping Procedure*
  - **BMP** – *Bit-synchronous Mapping Procedure*
  - **GMP** – *Generic Mapping Procedure*
  - **GFP** – *Generic Framing Procedure:* Framed and Transparent
- Traffic **grooming** based on client signal requirements by using ODUflex, OTN VCAT (Virtual Concatenation) (OPUk-Xv, k=0, 1, 2), and/or n x 155Mb/s *tributary slots*
- OTN non-blocking **ODUk cross connect** supports arbitrary mix of ODUk traffic for each muxponder/transponder unit, **down to ODU0 granularity**
- **FEC** (*Forward Error Correction*) functionality for detecting and correcting transmission errors, supports: ITU-T G.709 FEC, ITU-T G.975.1 I.4 FEC and ITU-T G.975.1 I.7 FEC
- **Transparent** transfer of timing information for all client signals
- Synchronization support
  - SyncE
  - PTP1588v2
- **Carrier class traffic protection** is implemented at multiple levels and protocols on optical and electrical levels
- **DWDM multiplexing** supports up to **80 channels** of **C-band wavelengths** (192THz – 196THz) with **50GHz** spacing
- **DWDM filters** with low attenuation **upgrade ports** allow DWDM multiplex configuration in steps of 4 or 8 wavelengths, up to 80 wavelengths
- The system can utilize active and/or passive optical filters. Active multiplexers are implemented using software configurable variable optical attenuators (VOA)
- Use of **EDFA and RAMAN optical amplifiers** extends the maximum length of optical sections
- Module for **chromatic dispersion compensation** is based on **FBG** (Fiber Bragg Gratings)
- Up to 8 degrees **ROADM** connectivity
- **DCN** is implemented using **GCC** and **OSC** channels
- Support for **in-system optical parameters monitoring**
- **External monitoring points** provide access for OSA instrument measurements
- **Performance monitoring**
- **100G ready platform**

EMS/NMS Software

- **SUNCE+ Module OTN**
- Based on **client-server architecture**
- **SNMPv3 based**
  Network Management System (**NMS**)
  Element Management System (**EMS**)



BASIC CONFIGURATION

- **OTP10Gs** is compact 1U system with:
  - up to 2 OTN OTU2/2e/1e/2f/1f,
  - up to 8 OTN OTU1,
  - up to 2 universal 10G clients,
  - up to 16 universal clients with bitrates from 16Mb/s to 5Gb/s each

Applications: Implementing OTN networks at different hierarchy levels, inter-connecting networks based on different technologies, regeneration systems and local ODUk cross connect

- **OTP10G-C4** is four-slot subrack (shelf) module with:
  - up to 12 OTN OTU2/2e/1e/2f/1f,
  - up to 16 OTN OTU1,
  - up to 12 universal 10G clients,
  - up to 32 universal clients with bitrates from 16Mb/s to 5Gb/s each,
  - up to 16 DWDM channels add/drop in two directions

Applications: In building OTN at different hierarchy levels, inter-connecting networks based on different technologies, regeneration systems, local ODUk cross connect and building passive DWDM optical networks with local wavelength switching

- **OTP10G-C15** is 15-slot subrack (shelf) with the basic application in building OTN/DWDM networks with the maximum traffic capacity of the device is **up to 80 wavelengths** per pair of optical fibers, and with several hundreds of client interfaces

Applications: Implementing all network configurations with all interface types, at different hierarchy levels, inter-connecting networks based on different technologies, regeneration systems, local ODUk cross connect, building DWDM optical networks and local wavelength switching

MECHANICAL DESIGN

OTP10G-C15 subrack:

Dimensions (H x W x D) 586.2 mm x 437 mm x 298 mm

OTP10G-C4 subrack:

Dimensions (H x W x D) 225 mm x 485.5 mm x 298.6 mm

OTP10Gs system:

Dimensions (H x W x D) 44,4 mm x 437 mm x 280 mm

UNITS

- **OT-CMU** unit is the system control-management unit
- **OT10G-3** unit has the following interfaces: 16 universal software-configurable client/line SFP interfaces and 3 universal software-configurable client/line 10G XFP interfaces. **OT10G-3** features muxponder, transponder, cross connect, synchronization and traffic protection functionalities
- **OT10G-4** is a transponder unit with 4 software-configurable client/line XFP interfaces. **OT10G-4** features transponder, cross connect, synchronization and traffic protection functionalities
- **OT10G-8** is high density transponder unit with 8 software-configurable client/line XFP interfaces. **OT10G-8** features transponder, cross connect, synchronization and traffic protection functionalities
- **pDWDM-4Cx** and **pDWDM-8Cx** are passive units for DWDM multiplexing and demultiplexing of 4 or 8 optical signals. The upgrade ports enable capacity increase
- **DWDM-4Cx** and **DWDM-8Cx** are units for DWDM multiplexing and demultiplexing of 4 or 8 optical signals with variable optical attenuator and photo detector for optical signal level adjustment. The upgrade ports enable capacity increase
- **OMA-xy** unit performs the function of amplification optical signal using EDFA and RAMAN amplifiers with *Booster*, *Preamplifier* and *Inline* applications
- **DCM-DxDy** unit performs chromatic dispersion compensation based on FBG
- **OTVOA-x** unit has 4 or 8 variable optical attenuators and photo detectors for optical signal level adjustments
- **OPS-x** unit implements of 1+1 protection of up to 4 or 8 optical signals

XFP INTERFACES

OI.10G-x *1310nm, 1550nm 10-80km*

OI.D10G-x*-CHx DWDM band 40-88km*

OI.D10G-x*-CHT tunable DWDM 40-80km*

POWER SUPPLY

DC power supply -48V DC or -60V DC

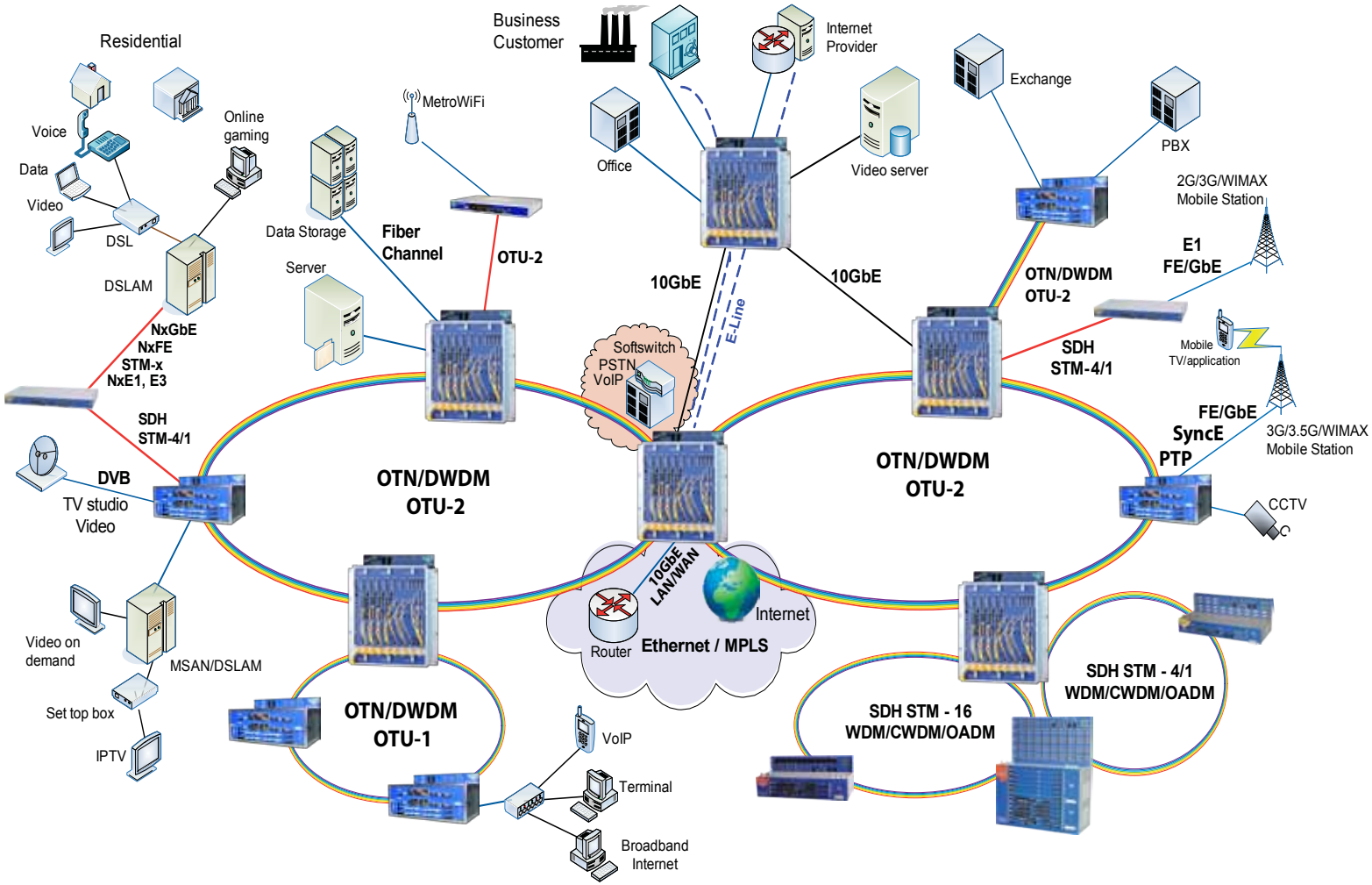
APPLICATIONS IN TRANSPORT NETWORKS

The optical transport platform OTP10G is line of IRITEL's devices for digital signal transmission over optical fibers, based on OTN and DWDM technologies, designed for implementation of local, metropolitan and regional networks of various configurations:

- Point-to-point connections
- Linear add/drop networks
- Ring networks at different hierarchy levels
- For inter-connecting networks based on different technologies
- Mesh networks
- Regeneration systems
- For local switching at ODUk level
- For implementation of passive and active optical networks
- For local switching at optical wavelength level

The OTP10G enables inter-connecting networks based on different technologies: OTN, SDH, Ethernet, SAN (ESCON, FICON, Fibre Channel), video, bit-transparent protocol-independent client services, etc.

The OTP10G platform is designed and manufactured with modern modular technology, making it a very flexible solution for building, expanding and upgrading networks. It enables efficient and profitable delivery of telecommunications services.



CWDM-10G

CWDM Optical Platform up to 16 wavelengths and up to 10 Gb/s

- Multiservice optical transport platform
- Transport of user traffic from 125 Mb/s up to 10.5 Gb/s
- Client interfaces conversion to CWDM wavelength
- Multiplexing up to 16 CWDM wavelengths
- CWDM filters with nine wavelengths (8+1) and upgrade port
- Two additional CWDM management channels
- Application in point-to-point and linear add/drop networks
- EMS/NMS Software SUNCE + (SUNCE-O)
- Web Interface for local management
- Compact 1U solution for ETSI and 19" cabinets
- Supported Ethernet, IP / MPLS, OTN, SDH, FC, CPRI and other types of traffic

DESCRIPTION

The CWDM-10G platform enables simultaneous and independent transmission of multiple client signals by conversion to CWDM wavelengths and their multiplexing. Depending on configuration, system allows transmission of up to 16 user signals over the same number of CWDM wavelengths. Wavelengths from 1471 nm to 1611 nm are used in 8 wavelengths configuration. Wavelengths from 1471 nm to 1611 nm and from 1271 nm to 1411 nm are used in 16 wavelengths configuration. Platform allows use of two additional management channels on 1431 nm and 1451 nm. CWDM wavelength conversion is performed by KTD-10G unit which contains 8 independent transponders. The device is configured and monitored by EMS/NMS Software SUNCE + (SUNCE-O) or Web Interface.

UNITS

- **KTD-10G**
  - Wavelength converter
  - 8 pairs of SFP+ interfaces (8 transponders)
  - Range from 125 Mb/s up to 10.5 Gb/s per each interface
  - Ethernet and RS232 for local access
  - Two SFP+ optical Ethernet ports for monitoring of remote devices
- **CWDM-8Ms-47**
  - Passive optical multiplexer nine CWDM wavelengths
  - Upgrade port for capacity expansion of up to 16 wavelengths using an additional **CWDM-8Ms-27** unit with different channel range
- **CWDM-8Ds-47**
  - Passive optical demultiplexer nine CWDM wavelengths
  - Upgrade port for capacity expansion of up to 16 wavelengths using an additional **CWDM-8Ds-27** unit with different channel range
- **OADM-2s-47/49 and OADM-2-51/53**
  - Passive optical filter for adding and dropping three CWDM wavelengths

MANAGMENT

- EMS/NMS software SUNCE + (SUNCE-O) provides centralized management of CWDM-10G system. Fault, alarms, configuration and security management. Communication between EMS/NMS software and devices is realized by SNMP protocol.
- Web Interface for local management

APPLICATIONS

- Traffic grooming and aggregation of multiple independent user traffic interfaces through a single pair of optical fibers
- Range up to 80 km

TECHNICAL DATA

- Compact 1U solution for ETSI and 19" cabinets
- Simple installation and commissioning of the device
- Operating temperature range -40° C to +85 °C
- All client interfaces, management interfaces and power supply connections are realized on the front panel
- Power supply
  - -48 VDC
  - Power supply range is -40.5 V to -72 V
- Power consumption up to 42 W depending on the number of active transponders
- Weight up to 4 kg depends on charged

CWDM-8s

CWDM Optical Platform up to 16 wavelengths and up to 2.7 Gb/s

- Multiservice optical transport platform
- Transport of user traffic up to 2.7 Gb/s
- Client interfaces conversion to CWDM wavelength
- Multiplexing up to 16 CWDM wavelengths
- CWDM filters with nine wavelengths (8+1) and upgrade port
- Two additional CWDM management channels
- Application in point-to-point and linear add/drop networks
- EMS/NMS Software SUNCE + (SUNCE-O)
- Web Interface for local management
- Compact 1U solution for ETSI and 19" cabinets
- Supported Ethernet, IP / MPLS, OTN, SDH, FC, CPRI and other types of traffic

DESCRIPTION

The CWDM-8s platform enables simultaneous and independent transmission of multiple client signals by conversion to CWDM wavelengths and their multiplexing. Depending on configuration, system allows transmission of up to 16 user signals over the same number of CWDM wavelengths. Wavelengths from 1471 nm to 1611 nm are used in 8 wavelengths configuration. Wavelengths from 1471 nm to 1611 nm and from 1271 nm to 1411 nm are used in 16 wavelengths configuration. Platform allows use of two additional management channels on 1431 nm and 1451 nm. CWDM wavelength conversion is performed by KTD-8Cs unit which contains 8 independent transponders. The device is configured and monitored by EMS/NMS Software SUNCE + (SUNCE-O) or Web Interface.

UNITS

- **KTD-8Cs**
  - Wavelength converter
  - 8 pairs of SFP interfaces (8 transponders)
  - Range from 125 Mb/s up to 2.7 Gb/s per each interface
  - Ethernet and RS232 for local access
  - Two SFP optical Ethernet ports for monitoring of remote devices
- **CWDM-8Ms-47**
  - Passive optical multiplexer nine CWDM wavelengths
  - Upgrade port for capacity expansion of up to 16 wavelengths using an additional **CWDM-8Ms-27** unit with different channel range
- **CWDM-8Ds-47**
  - Passive optical demultiplexer nine CWDM wavelengths
  - Upgrade port for capacity expansion of up to 16 wavelengths using an additional **CWDM-8Ds-27** unit with different channel range
- **OADM-2s-47/49 and OADM-2-51/53**
  - Passive optical filter for adding and dropping three CWDM wavelengths

MANAGMENT

- EMS/NMS software SUNCE + (SUNCE-O) provides centralized management of CWDM-8s system. Fault, alarms, configuration and security management. Communication between EMS/NMS software and devices is realized by SNMP protocol.
- Web Interface for local management

APPLICATIONS

- Traffic grooming and aggregation of multiple independent user traffic interfaces through a single pair of optical fibers
- Range up to 80 km

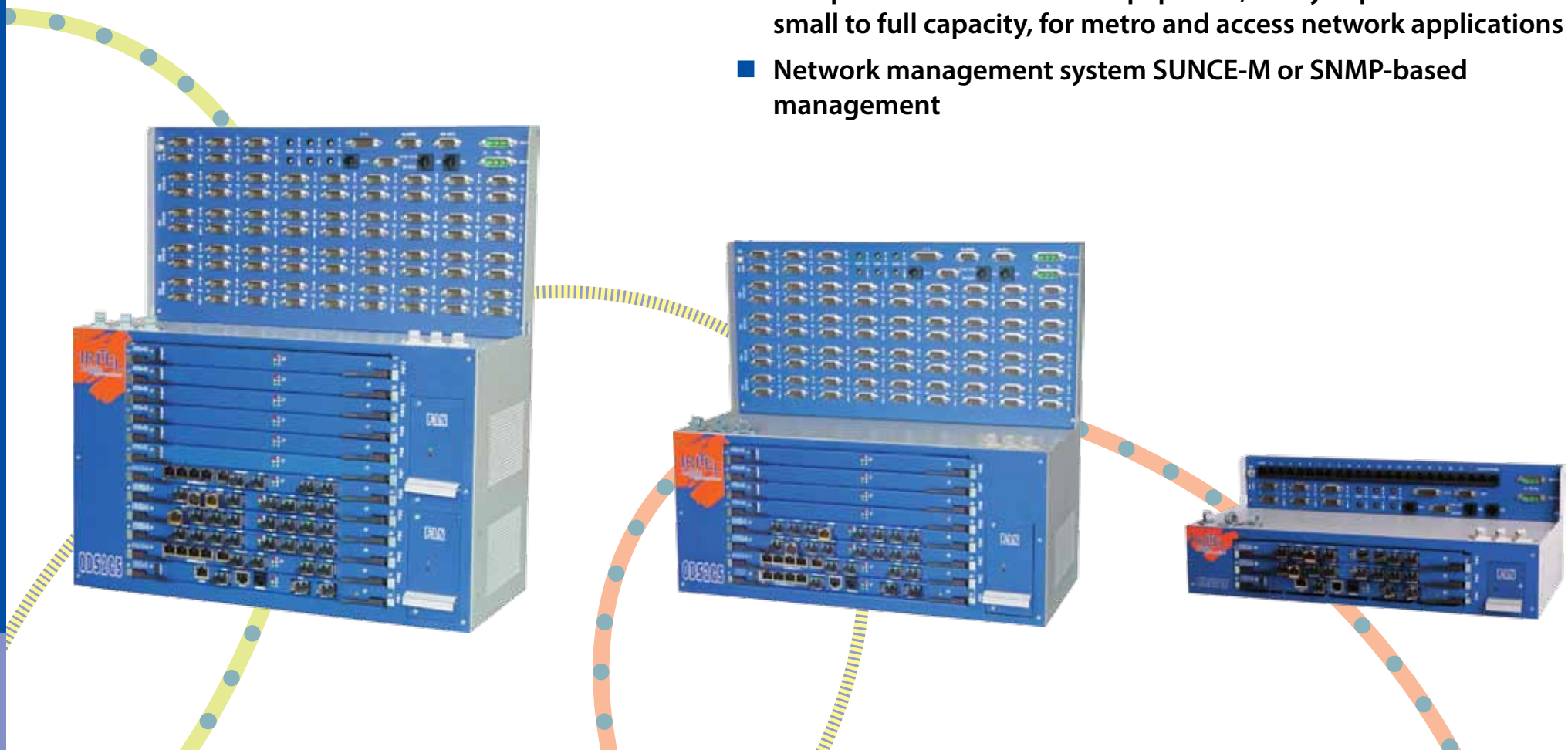
TECHNICAL DATA

- Compact 1U solution for ETSI and 19" cabinets
- Simple installation and commissioning of the device
- Operating temperature range -40° C to +85 °C
- All client interfaces, management interfaces and power supply connections are realized on the front panel
- Power supply
  - -48 VDC
  - Power supply range is -40.5 V to -72 V
- Power consumption up to 35 W depending on the number of active transponders
- Weight up to 4 kg depends on charged

ODS2G5

SDH/SONET Multiservice Optical Digital Systems

- Next generation SDH Optical Digital Systems for STM-16/4/1, E1, E3, 10/100 BaseTx, 100 BaseFx, 1000 BaseX, 1000 BaseT services
- Add/drop, cross-connect and terminal multiplexer
- Ethernet over SDH, GFP/VCAT/LCAS technologies
- Compact and flexible SDH equipment, easily expandable from small to full capacity, for metro and access network applications
- Network management system SUNCE-M or SNMP-based management



Basic configuration

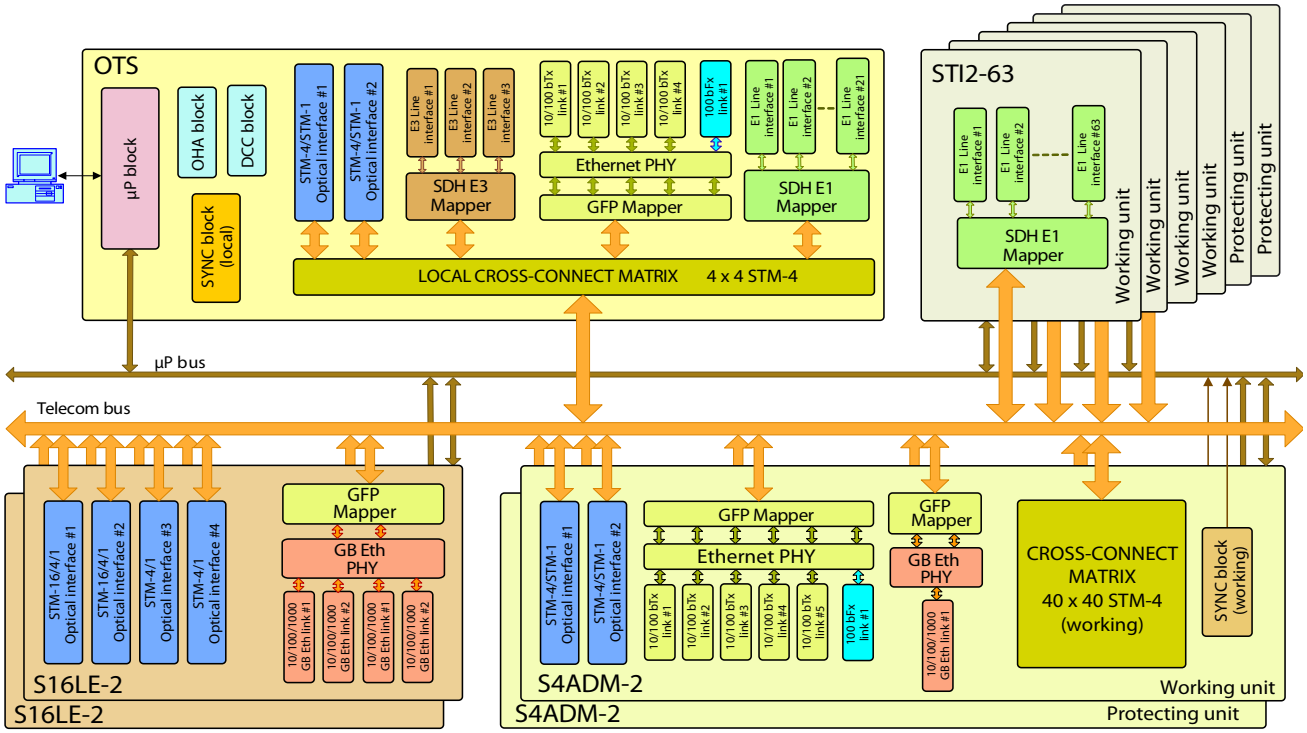
- **ODS2G5C3** configuration for 3 units:
  - up to: 4 x STM-16, 18 x STM-4/1, 21 x 2 Mbit/s, 3 x 34 Mbit/s and 4 x 10/100 BaseTx, 1 x 100 BaseFx, 9 x 1000 BaseT/1000 BaseX
- **ODS2G5C8** configuration for 8 units:
  - up to: 4 x STM-16, 20 x STM-4/1, 273 x 2 Mbit/s, 3 x 34 Mbit/s and 13 x 10/100 BaseTx, 2 x 100 BaseFx, 10 x 1000 BaseT/1000 BaseX
- **ODS2G5C12** configuration for 12 units:
  - up to: 6 x STM-16, 30 x STM-4/1, 273 x 2 Mbit/, 3 x 34 Mbit/s and 20 x 10/100 BaseTx, 3 x 100 BaseFx, 15 x 1000 BaseT/1000 BaseX (cross connect card protection, sync module protection, E1 line protection)

Applications

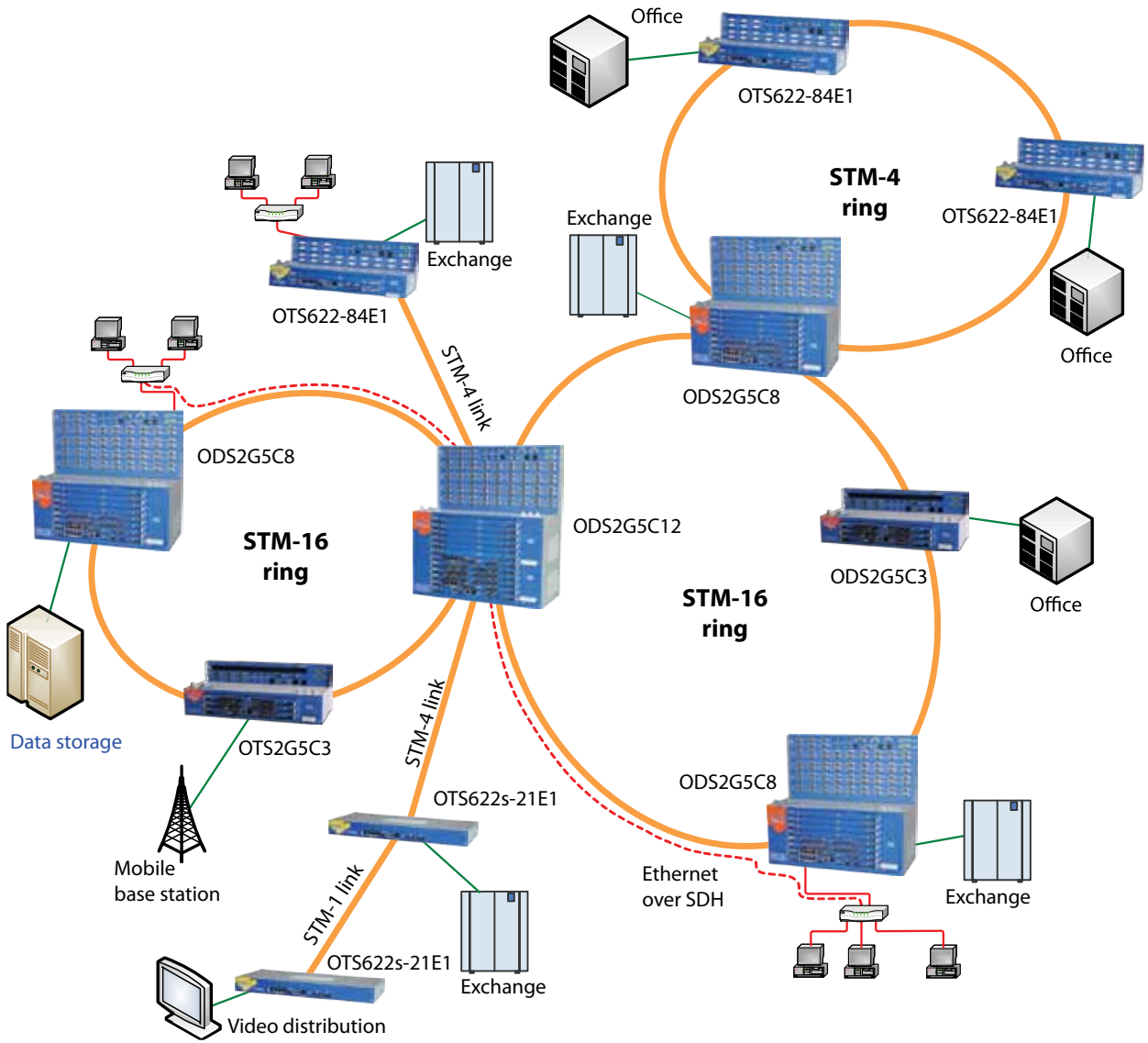
- Point-to-point fiber optic links
- Linear fiber optic networks, providing add-and-drop capability
- All types of fiber rings and complex network structure at STM-16, STM-4 and STM-1 level
- Local cross-connect at VC12 (2 Mbit/s), VC3 (34 Mbit/s) and VC4 levels

Main features

- Multiservice SDH optical digital system for voice and data transmission of up to STM-16 (2.5 Gbit/s)
- Optical line interface 2.5 Gbit/s, 622 Mbit/s and 155 Mbit/s provides transmission over single-mode optical fiber at 1310 nm for section length of up to 50 km, or at 1550 nm for section length of up to 120 km
- Plug-in SFP optical or electrical transceivers, provide STM-16, STM-4 or STM-1 interface configuration on the same unit
- WDM option - two way single fiber transmission (1310 and 1550 nm), passive optical filter
- CWDM option - wavelength division multiplexing (1471, 1491, 1511, 1531, 1551, 1571, 1591, 1611 nm +1310 nm), passive optical filters
- PDH tributary interfaces for 2 Mbit/s and 34 Mbit/s
- Full non blocking cross-connect matrix, capacity 24.88 Gbit/s (160 x 160 VC4) up to VC12 level, S4ADM-2 unit or 44.78 Gbit/s (288 x 288 VC4) up to VC12 level, S16ADM-2 unit
- Ethernet over SDH via GFP/VCAT/LCAS technologies
- Static and dynamic Ethernet traffic capacity adjustment, LCAS procedure
- Line protection at multiplex section, 1+1 MSP, higher order path or lower order path protection (VC12, VC3, VC4), subnetwork protection SNCP
- Advanced fault diagnosis (integrated BER tester, etc)
- Protection configurations (working and reserve modules or units) are possible for cross-connect matrix, synchronization modules, STM-16, STM-4 and STM-1 interfaces and tributary units STI2-63 (1:N 2 Mbit/s tributary protection)
- Unit's configuration parameters are stored in backplane memory, that enable "plug & play" change of units
- SONET option (OC-48/OC-12/OC-3, T1, T3) is software configurable
- ODS2G5 has been designed in compliance with new ITU-T recommendation and ETSI standards



ODS2G5 functional block diagram



ODS2G5 application in complex STM-16 network

Control and monitoring

- Integrated network management system SUNCE-M provides continuous management of ODS2G5 and all other IRITEL's SDH and PDH equipment (OTS622, ODS155, FM-MSAN, ...)
- The computer (PC) in management operations centre is connected to one network element (ODS2G5) using Ethernet 10/100BaseTx or RS232 interface (F interface)
- NMS interconnections of collocated IRITEL's devices using Q2 (RS485) or Q2Et (10/100BaseTx) interfaces
- NMS interconnection of remote IRITEL's SDH equipment using DCC channels (192 kbit/s, 576 kbit/s)
- Additional G.703 2 Mbit/s interfaces used for connections of independent subnetworks to one centralized management system SUNCE-M
- SNMP northbound and southbound interfaces
- SNMP MIB
- Control and monitoring using standard SNMP viewer

Power supply

- DC power supply –48 V DC or –60 V DC

Mechanical design

- Unit's dimension: 277 x 175 mm
- Module's dimension
  - ODS2G5C3 (3 units): 150 x 436.6 x 238 mm
  - ODS2G5C8 (8 units): 400 x 436.6 x 238 mm
  - ODS2G5C12 (12 units): 482 x 436.6 x 238 mm
- ETSI or 19" cabinet's dimension: 2200 x 600 x 300 mm

OTS main unit

TMN interface RS232/V.24, 10/100 BaseTX, Q2 (RS485), Q2Et (10/100 BaseTX), 2 Mbit/s / G.703
EOW telephone interface Z (2-wire)
DCC (F1 or E2) interface 64 kbit/s, V11
Performance management G.826, G.783

21 x 2 Mbit/s interface G.703 (120/75 Ω)
Mapping/multiplexing G.707 at paths: VC12/TU-12/TUG-2/TUG-3/VC4/AU-4/AUG/STM-N

3 x 34 Mbit/s interface G.703 (75 Ω)
Mapping/multiplexing G.707 at paths: VC3/TU3/TUG-3/VC4/AU-4/AUG/STM-N

Ethernet interface 4 x10/100 BaseTx (IEEE 802.3)
1 x100 BaseFx (IEEE 802.3)
Mapping GFP-F G.7041 (n x VC12, n x VC3 or VC4)
Capacity adjustment, LCAS static, dynamic

2 x 155/622 Mbit/s interface G.957, G.703
Jitter and wander G.825
Power consumption max 30 W

OTS-G main unit

Same as OTS except:

Ethernet interface 1x1000 BaseT/BaseX (IEEE 802.3)

S4ADM-2 unit

Cross-connect non blocking matrix capacity 160x160 VC4 (up to VC12 level)
Synchronization according to G.813

2 x 155/622 Mbit/s interface G.957, G.703
Jitter and wander G.825
Ethernet interface 5 x10/100 BaseTx (IEEE 802.3)
1 x100 BaseFx (IEEE 802.3)
1 x1000 BaseT/1000 BaseX (IEEE 802.3)
Power consumption max 30 W

S4LI-4 unit

4 x 155/622 Mbit/s interface G.957, G.703
Jitter and wander G.825
Ethernet interface 2 x10/100 BaseTx (IEEE 802.3)
2 x1000 BaseT/1000 BaseX (IEEE 802.3)
Power consumption max 27 W

S16LI-8 unit

up to 2 x 2.5 Gbit/s interface G.957, G.703
up to 8 x 155/622 Mbit/s interface G.957, G.703
Jitter and wander G.825
Power consumption max 28 W

S16LE-2 unit

up to 2 x 2.5 Gbit/s interface G.957, G.703
up to 4 x 155/622 Mbit/s interface G.957, G.703
Jitter and wander G.825
Ethernet interface
4 x1000 BaseT/1000 BaseX (IEEE 802.3)
Power consumption max 30 W

STI2-63 tributary unit

63 x E1 interface G.703 (120/75 Ω)
Jitter and wander G.823
Mapping/multiplexing G.707 at paths: VC12/TU-12/TUG-2/TUG-3/VC4/AU-4/AUG/STM-N
Power consumption max 25 W

Plug-in SFP transceivers

STM-16: ITU-T G.957

OI.S16A	LC/FPLD 1310 nm/15 km
OI.L16A	LC/FPLD 1310 nm/48 km
OI.S16B	LC/FPLD 1550 nm/15 km
OI.L16B	LC/FPLD 1550 nm/80 km

STM-4: ITU-T G.957

OI.S4A	LC/FPLD 1310 nm/15 km
OI.L4A	LC/DFBLD 1310 nm/48 km
OI.L4B	LC/DFBLD 1550 nm/80 km
OI.L4B1	LC/DFBLD 1550 nm/120 km

STM-1: ITU-T G.957

OI.S1A1	LC/FPLD 1310 nm/15 km
OI.S1A	LC/FPLD 1310 nm/40 km
OI.S1B	LC/DFBLD 1550 nm/93 km
OI.S1 electrical	CMI/12.7 dB at 78 MHz

FE: IEEE 802.3

OI.S1A1	LC/FPLD 1310 nm/15 km
OI.S1A	LC/FPLD 1310 nm/40 km
OI.S1B	LC/DFBLD 1550 nm/93 km

GbE: IEEE 802.3

OI.GbE-AS	LC/MQW FPLD 1310 nm/10 km
OI.GbE-A	LC/DFBLD 1310 nm/40 km
OI.GbE-ZX	LC/DFBLD 1550 nm/60 km
EI.GbE-RJ45	RJ45/CAT5/CATe/CAT6/100 m

Traffic protection

Line protection 1+1 MSP
Path protection VC12, VC3, VC4
Subnetwork protection SNCP

OTS622

SDH/SONET Multiservice Optical Transport Systems

- Next generation SDH Optical Transport Systems for STM-4/1, E1, E3, 10/100BaseTx, 100BaseFx, 1000BaseX, 1000BaseT services
- Add/drop, terminal multiplexer and cross-connect
- Ethernet over SDH, GFP/VCAT/GFP/LCAS technologies
- Compact, flexible and cost-effective SDH equipment for metro and access network applications
- Network management system SUNCE-M or SNMP-based management

Basic configurations

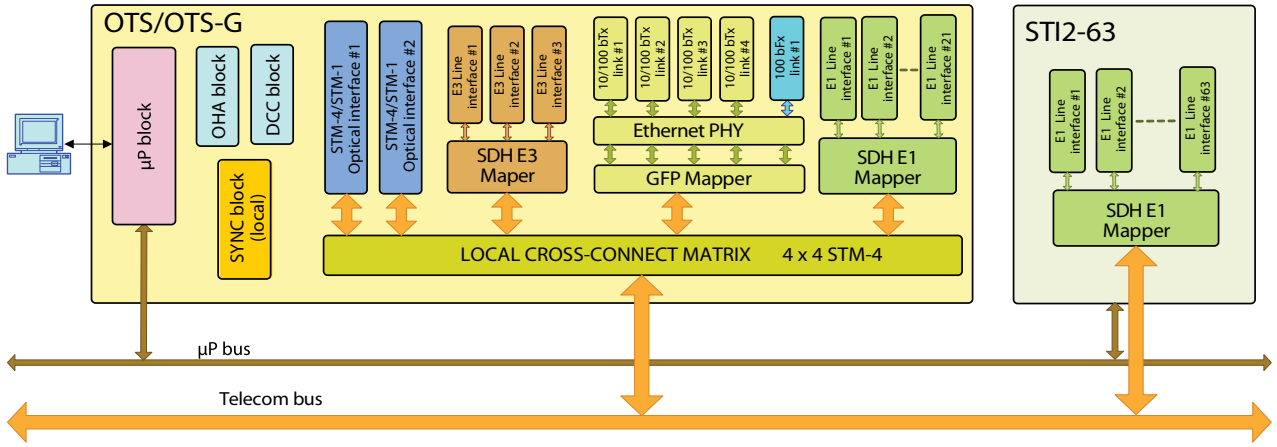
- **OTS622s** compact 1U system, options:
  - **OTS622s-21E1:** 2 x STM-4/1, 21 x 2 Mbit/s
  - **OTS622s-21E1/E3:** 2 x STM-4/1, 21 x 2 Mbit/s, 3 x 34 Mbit/s
  - **FE-5** module for OTS622s-21E1 or OTS622s-21E1/E3: 4 x 10/100BaseTx, 1 x 100BaseFx
  - **GbE-2** module for OTS622s-21E1 or OTS622s-21E1/E3: 1 x 1000BaseX/BaseT
- **OTS622-21E1** "two slots - two OTS/OTSG units":
  - 2 x (2 x STM-4/1), 2 x (21 x 2 Mbit/s) , 2 x (3 x 34 Mbit/s), 2 x [(4 x 10/100BaseTx, 1 x 100BaseFx) or (1 x 1000BaseX/T)]
- **OTS622-84E1** "two slots system":
  - 2 x STM- 4/1, 84 x 2 Mbit/s (OTS/OTSG unit 21 x 2 Mbit/s and one tributary unit 63 x 2 Mbit/s), 3 x 34 Mbit/s, (4 x 10/100BaseTx, 1 x 100BaseFx) or (1 x 1000BaseX/T)

Applications

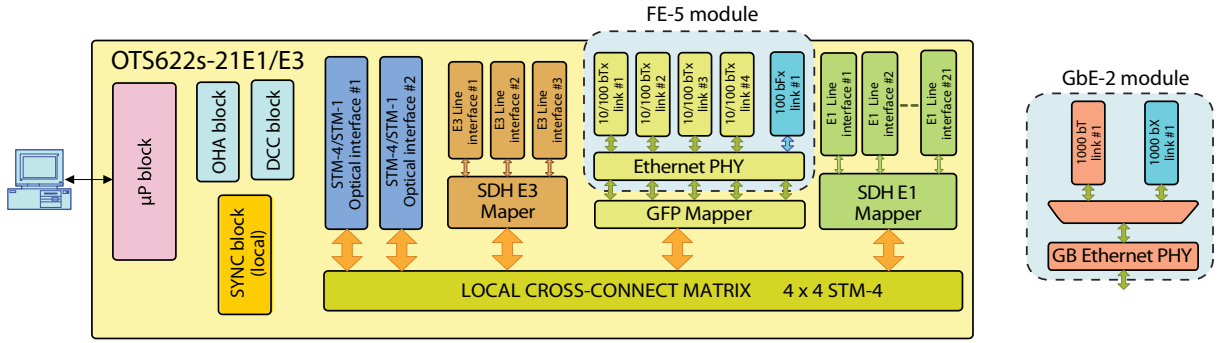
- Point-to-point fiber optic transmission
- Linear fiber optic networks, providing add-and-drop capability
- Add-drop fiber ring at STM-1 or STM-4 level
- Connecting to the same or higher order SDH networks
- Local cross-connect at VC12, VC3 and VC4 levels

Main features

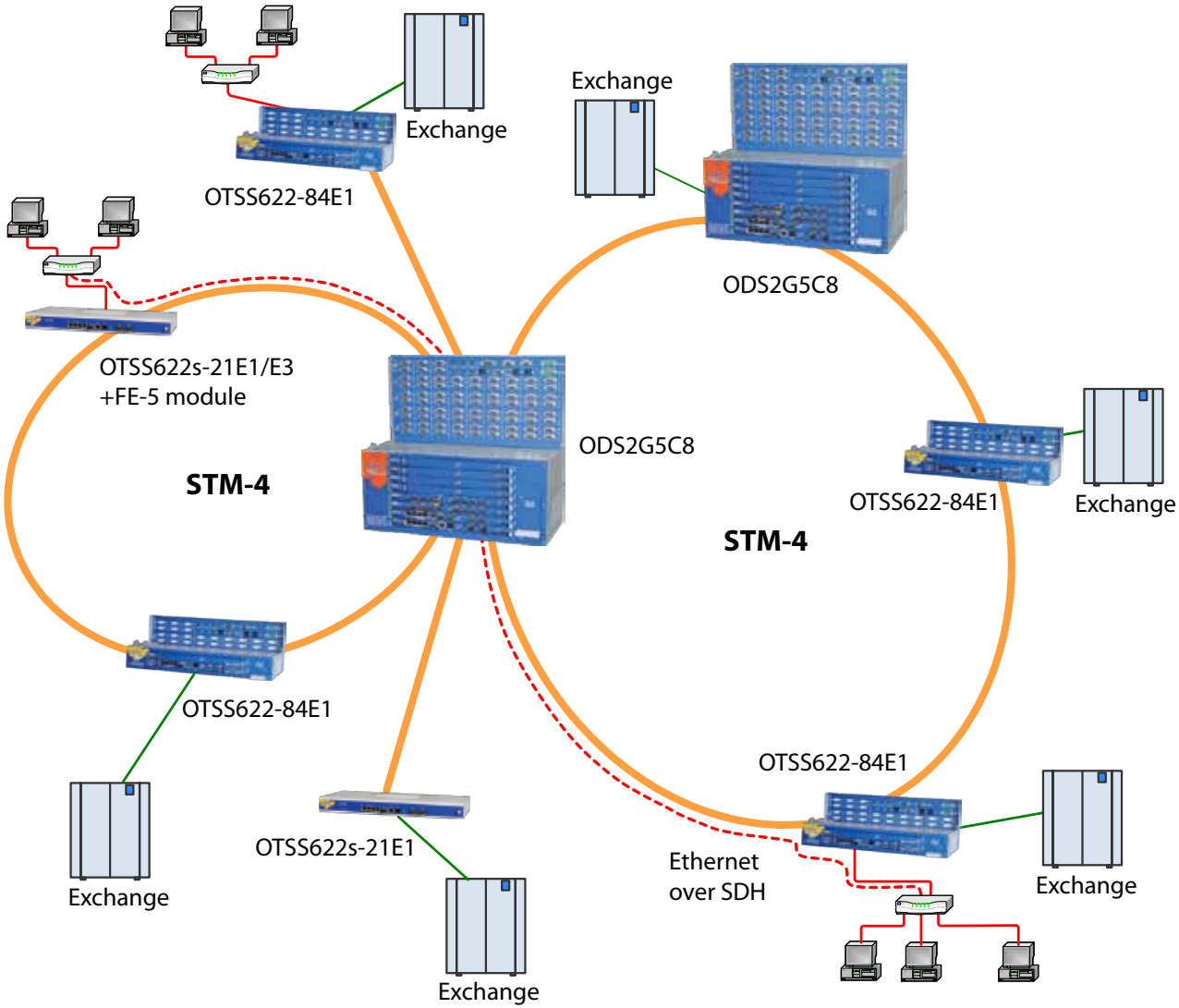
- Multiservice SDH optical transport system for voice and data transmission at STM-1 (155 Mbit/s) and STM-4 (622 Mbit/s) level
- Optical line interfaces 622 Mbit/s and 155 Mbit/s provide transmission over single-mode optical fiber at 1310 nm for section length of up to 50 km, or at 1550 nm for section length of up to 120 km
- Plug-in SFP optical or electrical tranceivers, provide STM-1 or STM-4 interfaces configurations on the same unit
- WDM option-single fiber transmission (1310 and 1550 nm), passive optical filter
- CWDM option - wavelength division multiplexing (1471, 1491, 1511, 1531, 1551, 1571, 1591, 1611 nm +1310 nm), passive optical filter
- Full non blocking cross-connect matrix, capacity 16x16 VC4 (2.5 Gb/s) up to VC12 level
- PDH tributary interfaces for 2 Mbit/s and 34 Mbit/s
- Ethernet over SDH via GFP/VCAT/LCAS technologies
- Static and dynamic Ethernet traffic capacity adjustment, LCAS procedure
- Line protection at multiplex section, 1+1 MSP, higher order path or lower order path protection (VC12, VC3, VC4), subnetwork protection SNCP
- Advanced fault diagnosis (integrated BER tester, etc)
- Unit's configuration parameters are stored in backplane memory, which enables "plug & play" change of units
- SONET option (OC-12/OC-3, T1, T3) is software configurable
- OTS622 has been designed in compliance with new ITU-T recommendation and ETSI standards



OTS622-84E1 block diagram



OTS622s-21E1/E3 block diagram



OTS622 application in complex STM-4 network

Control and monitoring

- Integrated network management system SUNCE-M provides continuous management of OTS622 and all other IRITEL's SDH and PDH equipment (ODS2G5, ODS155, FM-MSAN ...).
- The computer (PC) in management operations centre is connected to one network element (OTS622) using Ethernet 10/100BaseTx or RS232 interface (F interface).
- NMS interconnections of collocated IRITEL's devices using Q2 (RS485) or Q2Et (10/100BaseTx) interfaces
- NMS interconnection of remote IRITEL's SDH equipment using DCC channels (192 kbit/s, 576 kbit/s)
- Additional G.703 / 2 Mbit/s interfaces used for connections of several independent subnetwork on one centralized management system SUNCE-M.
- SNMP northbound and southbound interfaces
  - SNMP MIB
  - Control and monitoring using standard SNMP viewer

Power supply

- DC power supply –48 V DC or –60 V DC
- Optional 230 V AC internal power supply for OTS622s systems

Mechanical design

- Unit: 20 x 277 x 175 mm (H x W x D)
- Mechanical modules
  - OTS622s: 44.5 x 436.6 x 238 mm
  - OTS622-21E1: 150 x 436.6 x 238 mm
  - OTS622-84E1: 150 x 436.6 x 238 mm
- ETSI or 19"cabinet: 2200 x 600 x 300 mm

OTS main unit

TMN interface RS232/V.24, 10/100 BaseTX, Q2 (RS485), Q2Et (10/100 BaseTX), 2 Mbit/s / G.703
EOW telephone interface Z (2-wire)
DCC (F1 or E2) interface 64 kbit/s, V11
Performance management G.826, G.783

21 x 2 Mbit/s interface G.703 (120/75 Ω)
Mapping/multiplexing G.707 at paths: VC12/TU-12/TUG-2/TUG-3/VC4/AU-4/AUG/STM-N

3 x 34 Mbit/s interface G.703 (75 Ω)
Mapping/multiplexing G.707 at paths: VC3/TU3/TUG-3/VC4/AU-4/AUG/STM-N

Ethernet interface 4 x10/100 BaseTx (IEEE 802.3)
1 x100 BaseFx (IEEE 802.3)
Mapping GFP-F G.7041 (n x VC12, n x VC3 or VC4)
Capacity adjustment, LCAS static, dynamic

2 x 155/622 Mbit/s interface G.957, G.703
Jitter and wander G.825
Power consumption max 30 W

OTS-G main unit

Same as OTS except:

Ethernet interface 1x1000 BaseT/BaseX (IEEE 802.3)

STI2-63 tributary unit

63 x E1 interface G.703 (120/75 Ω)
Jitter and wander G.823
Mapping/multiplexing G.707 at paths: VC12/TU-12/TUG-2/TUG-3/VC4/AU-4/AUG/STM-N
Power consumption max 25 W

OTS622s-21E1

compact 1U system
same functionalities as OTS unit, but without interfaces for 34 Mbit/s and Ethernet

OTS622s-21E1/E3

compact 1U system
same functionalities as OTS unit, but without interfaces for Ethernet

FE-5

Fast Ethernet interfaces module for OTS622s systems
Ethernet interface 4 x10/100 BaseTx (IEEE 802.3)
1 x100 BaseFx (IEEE 802.3)

GbE-2

Gigabit Ethernet interface module for OTS622s systems
Ethernet interface 1x1000 BaseT/BaseX (IEEE 802.3)

Traffic protection

Line protection 1+1 MSP
Path protection VC12, VC3, VC4
Subnetwork protection SNCP

Plug-in SFP transceivers

STM-4: ITU-T G.957
OI.S4A LC/FPLD 1310 nm/15 km
OI.L4A LC/DFBLD 1310 nm/48 km
OI.L4B LC/DFBLD 1550 nm/80 km
OI.L4B1 LC/DFBLD 1550 nm/120 km

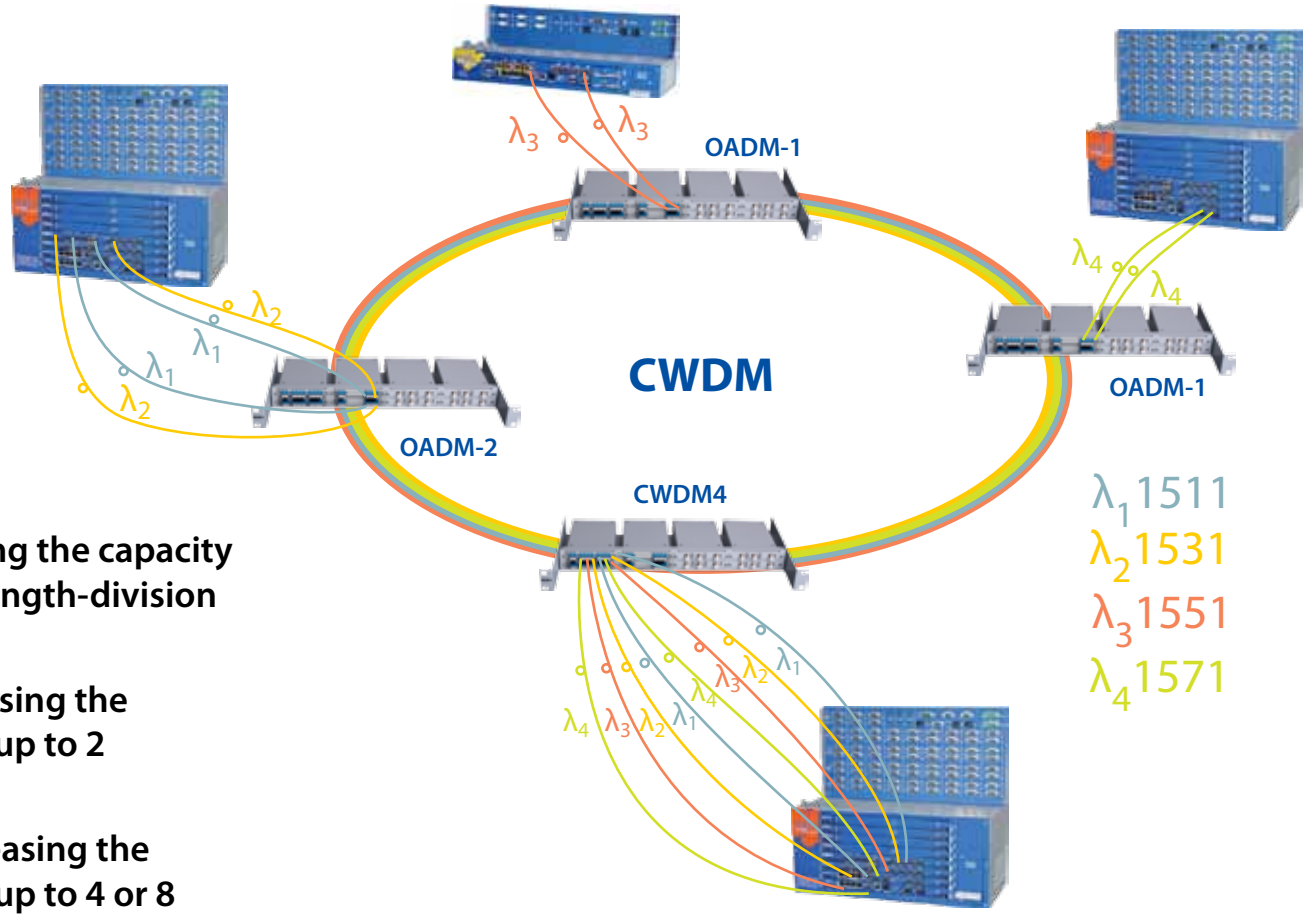
STM-1: ITU-T G.957
OI.S1A1 LC/FPLD 1310 nm/15 km
OI.S1A LC/FPLD 1310 nm/40 km
OI.S1B LC/DFBLD 1550 nm/93 km
OI.S1 electrical CMI/12.7 dB at 78 MHz

FE: IEEE 802.3
OI.S1A1 LC/FPLD 1310 nm/15 km
OI.S1A LC/FPLD 1310 nm/40 km
OI.S1B LC/DFBLD 1550 nm/93 km

GbE: IEEE 802.3
OI.GbE-AS LC/MQW FPLD 1310 nm/10 km
OI.GbE-A LC/DFBLD 1310 nm/30 km
OI.GbE-ZX LC/DFBLD 1550 nm/60 km
EI.GbE-RJ45 RJ45/CAT5/CATe/CAT6/100 m

WDM/CWDM/OADM

Passive Optical Mux/Demux & Optical Add/Drop Multiplexers



- Passive optical modules for increasing the capacity of a single optical fiber using wavelength-division multiplexing
- Passive WDM multiplexers for increasing the capacity of a single optical fiber, for up to 2 wavelengths 1310/1550 nm
- Passive CWDM Mux/Demux for increasing the capacity of a single optical fiber, for up to 4 or 8 wavelengths 1471/1491/1511/1531/1551/1571/1591/1611 nm
- Passive optical add/drop multiplexer for one or two wavelengths

TECHNICAL DATA

WDM

2 wavelengths per one fiber [nm] 1310, 1550

Isolation 25 dB/45* dB
(*high isolation option)

Maximum insertion loss 0.4 dB

Optical connector LC or FC/PC

CWDM4 MUX/DEMUX modules

4 wavelengths [nm] 1511, 1531 1551, 1571
optionally any combination from CWDM8

Maximum insertion loss 1.2* dB/1.8 dB
(*ultra low insertion loss option)

Isolation 30 dB adjacent, 50 dB non-adjacent channels

Optical connector LC

CWDM4e MUX/DEMUX modules

4+1 wavelengths [nm] 1511, 1531 1551, 1571 +1310
optionally any combination from CWDM8

Maximum insertion loss 1.8 dB, (0.8 dB for 1310)

Isolation 30 dB adjacent, 50 dB non-adjacent channels

Optical connector LC

CWDM8 MUX/DEMUX modules

8 wavelengths [nm] 1471, 1491, 1511, 1531,
1551, 1571 1591, 1611

Maximum insertion loss 1.8* dB/2.8 dB
(*ultra low insertion loss option)

Isolation 30 dB adjacent, 50 dB non-adjacent channels

Optical connector LC

CWDM8e MUX/DEMUX modules

8+1 wavelengths [nm] 1471, 1491, 1511, 1531,
1551, 1571, 1591,1611 +1310

Maximum insertion loss 2.8 dB, (0.8 dB for 1310)

Isolation 30 dB adjacent, 50 dB non-adjacent channels

Optical connector LC

OADM-1 ADD/DROP module

add and drop 1 selected wavelength
from CWDM range 1417-1611 nm
(*option add/drop 1310 channel - module **OADM-1e**)

Maximum insertion loss
1 dB for add/drop channel
1.2 dB for pass through channel

Isolation 30 dB adjacent, 50 dB non-adjacent channels

Optical connector LC

OADM-2 ADD/DROP module

add and drop 2 selected wavelengths
from CWDM range 1417-1611 nm
(*option add/drop 1310 channel - module **OADM-2e**)

Maximum insertion loss
1.2 dB for add/drop channel
1.6 dB for pass through channel

Isolation 30 dB adjacent, 50 dB non-adjacent channels

Optical connector LC

WDM-8

Rack mechanical construction for up to eight
WDM/CWDM/OADM modules 19"/ETSI/1U height

Power supply NO (passive modules)

Mechanical dimensions

WDM-8 44.5 x 436.6 x 200 mm

WDM/CWDM/OADM modules 17,3 x 90 x 140 mm

FM-MSAN (FM8x2)

MULTISERVICE ACCESS MULTIPLEXER

- Multiservice Access Node (MSAN)
- Universal access PSTN
- 8 to 72 external and 16 to 80 internal links 2 Mbit/s
- Digital channel cross-connect between all 88 links (non blocking)
- Concentrator according to V5.2 up to 2400 subscribers, for remote multiplexers and/or V5.2 access nodes
- Protocol conversion V5.2-CAS
- Built in optical transmission, TDMoIP access, multiple conference and service channels avaible

Applications

FM-MSAN access multiplexer is designed to allow transmission of voice and data in access telecommunication networks. It can be configured as access multiplexer, drop/insert, cross-connect and fractional multiplexer and concentrator according to V5.2.

Features

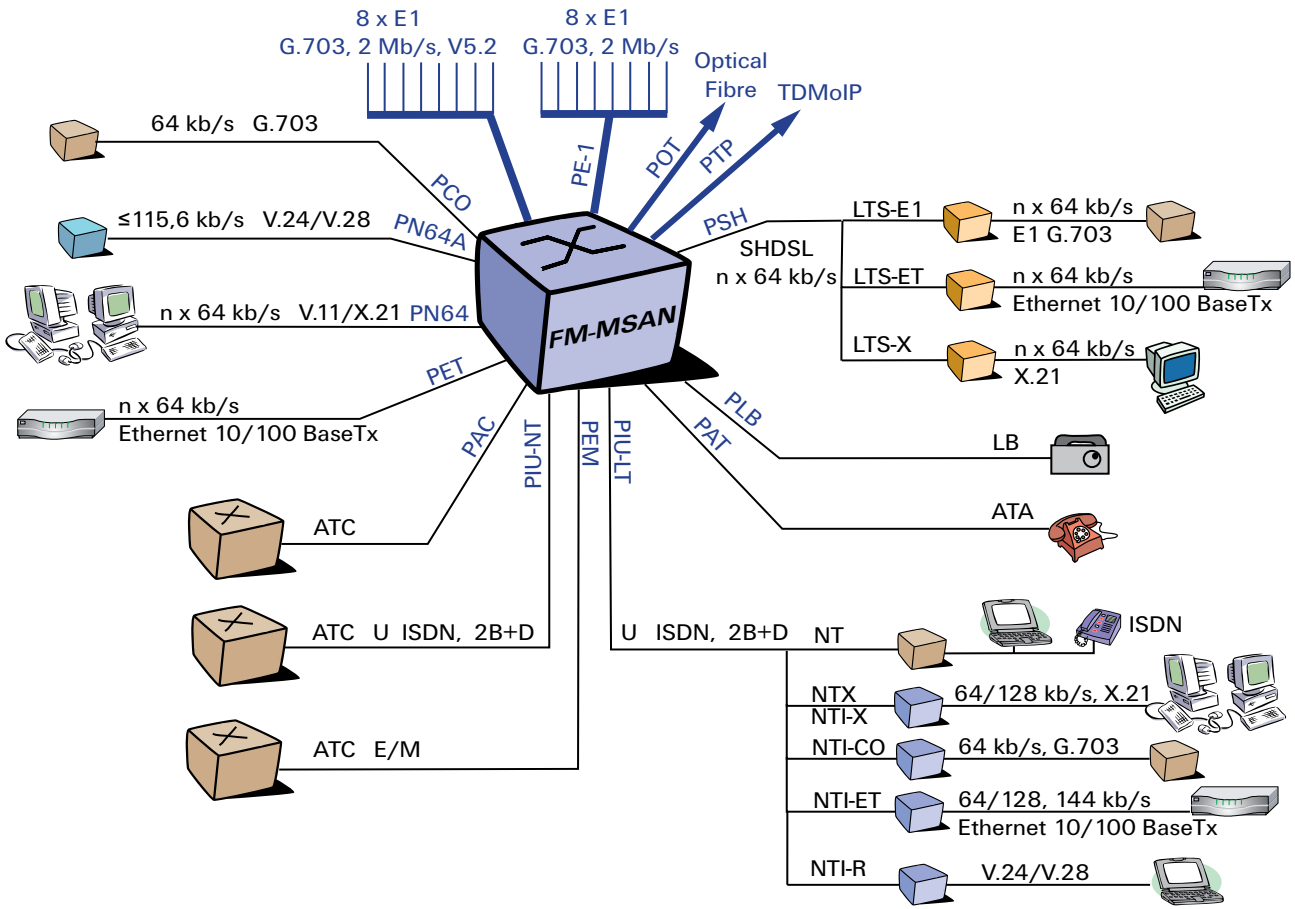
- Supports over 15 different transmission and subscriber, analog and digital interfaces
- Redudant central unit
- Cross-connect non-blocking switching fabric for up to 88 E1 links, CAS signalling includid
- Up to 21 universal unit slots per subracks
- Up to 20 channels per unit
- Advanced traffic protection mechanism for E1 links
- Line test access
- Concentrator according V5.1/V5.2 protocol for POTS and ISDN-BRI/PRI
- Intergarted Optical Transmission Unit
- Intergrated TDM over IP Line Card
- NMS based on client server application with data base replication
- SNMP based agent

Configurations

- FMV– multiplex, cross-connect, control and power supplay unit with V5.2 interface
- Various types of channel units with up to 20 user interfaces
- PE1 – 8xE1 interfaces unit, up to 8 units per FM-MSAN
- Rack configuration – 1 to 4 subracks, 21 (19, 12) universal unit slots, 2 special slots for central unit

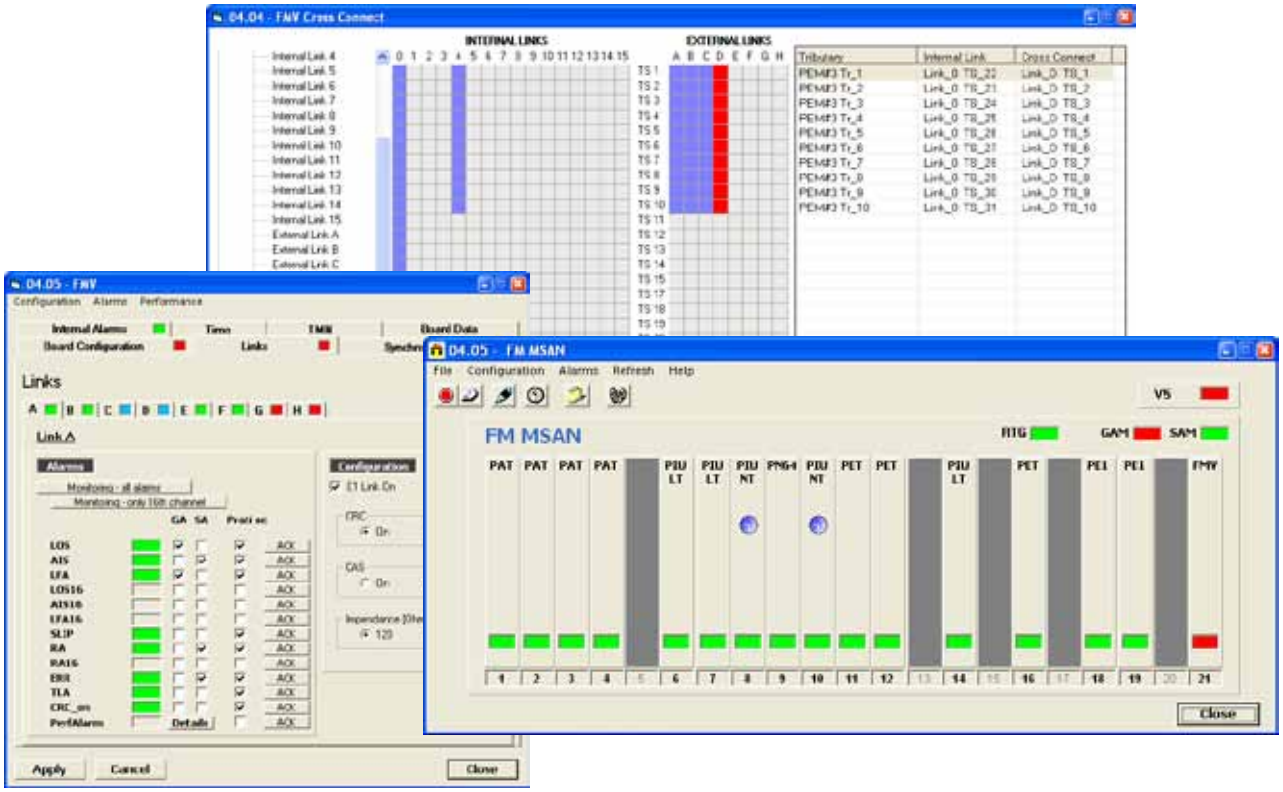
User interfaces

- 2w/4w analog voice interface with E/M signaling
- 2w analog voice interface ATA – for direct connection to a phone
- 2w analog voice interface ATC – for direct connection to a exchange
- 2w analog voice interface LB – for direct connection to a phone with local battery supply
- 64 kbit/s digital interface, codirectional G.703
- n x 64 kbit/s digital interface with X.21 interfece
- Asynhronous/synhronous digital interface V.24, up to 38.4 kbit/s
- ISDN basic rate access U interface
- SHDSL, n×64 kbit/s interface
- Ethernet 10/100 BaseT and 100 BaseFX interface
- Conference connection



Channel units

- PEM10 – 10 channels 2w/4w with E/M signaling
- PAT10 – 10 channels, ATA interface
- PAT20 – 20 channels, ATA interface
- PAC10 – 10 channels, ATC interface
- PLB10 – 10 channels, LB interface
- PCO – 10 channels, 64 kbit/s digital interface, codirectional G.703
- PN64 – 4 channels, n×64 kbit/s, V.11/X.21 interface
- PN64A – 8/4 channels, asynchronous/synchronous transmission from 2.4 up to 115.6 kbit/s, V24/V.28
- PIU-LT – 4 channels, ISDN U interface, 2B1Q for direct connection to a ISDN phone
- PIU-NT – 4 channels, ISDN U interface, 2B1Q for direct connection to a ISDN exchange
- PSH – 4 channels, SHDSL n×64 kbit/s interface or 2 Mbit/s or Ethernet over SHDSL
- PET – 3 channels, n×64 kbit/s Ethernet bridge with 10/100 BaseT or/and 100 Base FX interface
- PIO - 8 x digital I/O
- PCF – up to 5 conferences with up to 60 users
- POT - Integrated Optical Transmission unit with 1+1 APS and additional 2xE1
- PTP - TDM over IP Transmission Unit with additional 2xE1



Control and monitoring

Integrated network management system SUNCE-M provides continuous management of FM-MSAN and all other IRITEL's SDH and PDH equipment (ODS155, OTS622 ...)

For NMS system integration we support standard interface based on SNMP protocol

Synhronization

- From internal built-in oscillator (± 25 ppm)
- From external 2 048 kHz clock
- From received clock on any external link
- From received clock on a chosen digital channel interface

Mechanical design

- Unit (233×160×20 mm) and (233×175×20mm)
- 19"/ETSI cabinet's rack (300×483/533×230 mm)
- 19"/ETSI cabinet for 4 subracks (2200×600×300 mm)
- ETSI cabinet for 3 subracks (1200×600×400 mm)
- Wall mount cabinet for 17 or 14 units and uninteruptable power supply (650×600×300 mm)

E1 Tributaries

2048 kbit/s according to ITU-T G.703, G.704 and G.706

2w/4w analog voice interface with E/M signaling

Impedance 600 Ω

Relative levels

2w/4w input and output levels in steps	–16 up to +4 dBr 0.1 dB

E/M signaling

output (E)	≤ 50 mA/150 V
input (M)	≤ 500 Ω (2 mA)

2 wire analog voice interface ATC

Impedance 600 Ω

Relative levels

output	–4 dBr±3 dB (in 0.1 dB steps)
input	–3 dBr±3 dB (in 0.1 dB steps)

Loop current ≤ 60 mA

Loop resistance ≤ 350 Ω

Ringing load impedance > 1 kΩ + 0.47μF

Ringing detection level 15 up to 35 V_{eff} /25 Hz

Maximum ringing voltage 90 V_{eff}

Ringing frequency 16 up to 50 Hz

Metering

frequency(standard/option)	16/12 kHz ± 1%
sensitivity level	85 mV

2 wire analog voice interface ATA

Impedance ETSI/600 Ω

Relative levels

output	–7 dBr±3 dB (in 0.1 dB steps)
input	0 dBr±3 dBr (in 0.1 dB steps)

Loop feeding 48 V/2x400 Ω, loop resistance up to 1200 Ω,

Ringing signal from ring generator (GZV15) 50 do 75 V_{eff}/25 Hz

Metering

frequency (standard/option)	16/12 kHz ± 1%

2 wire analog voice interface LB

Impedance 600 Ω

Relative levels

output	–4 dBr±3 dB (in 0.1 dB steps)
input	–3 dBr±3 dB (in 0.1 dB steps)

Ringing load impedance > 1 kΩ + 0.47μF

Ringing detection level 15 up to 35 V_{eff} /25 Hz

Maximum ringing voltage 90 V_{eff}

Ringing frequency 16 do 50 Hz

Ringing signal from ring generator (GZV15) 50 do 75 V_{eff}/25 Hz

64 kbit/s digital interface

according to ITU-T G.703, codirectional

n x 64 kbit/s digital interface

according to ITU-T V.11/X.21 or V.35

Asynchronous/synchronous digital interface V.24/V.28

transparent transmission up to 115.6 kbit/s

ISDN interface

U interface channel structure: 2B+D
line code: 2B1Q
according to ETSI ETR 080

SHDSL interface

according to ETSI TS 101 524 and ITU-T G.991.2

Ethernet bridge interface

10/100 BaseT and 100 BaseFX according to IEEE 802.3

External clock reference

2048 kHz according to ITU-T G.703/10

TMN interface

SUNCE-M (proprietary) F (RS232/V.24 or 10/100 BaseTX Ethernet), Q2 (RS485), Q2Et (10/100 bT)

SNMP/V1/V2/V3 RFC 3895 (DS1/E1), RFC 2494 (DS0), RFC 4316 (SHDSL) Proprietary MIB extension for DS0

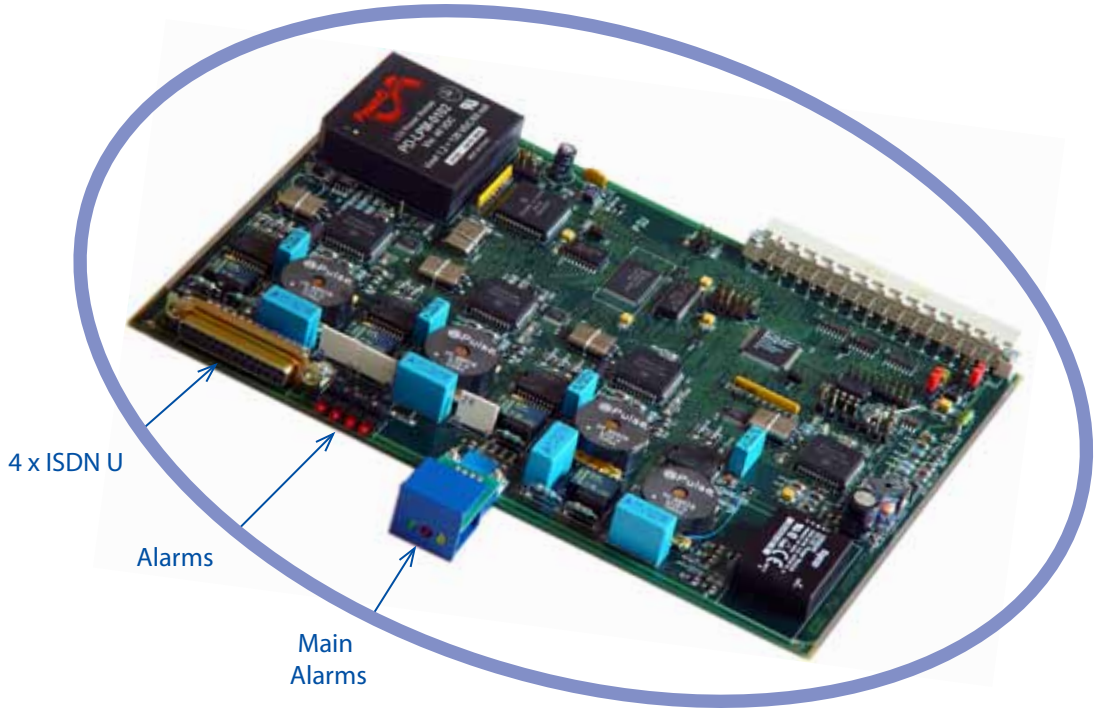
Operating temperature range

-5^0C up to $+45^0$C (class 3.2)

PIU

4 ISDN tributaries with U interface

- **Provides connection to ISDN exchange for 4 remote subscribers, via multiplexers FM2x2, FM-MSAN**
- **Single pair subscriber loop with 2B1Q line code**
- **PIU-LT (Line Termination) and PIU-NT (Network Termination) options**



Applications

PIU unit, as tributary unit within multiplexers FM2x2 and FM-MSAN provides connection of remote customer to ISDN exchange. User NT1 equipment is NT (network termination), whereas U-interface at exchange side is LT. Therefore, PIU unit at customer side must be PIU-LT, and PIU unit at exchange side PIU-NT.

Remote subscriber can be connected with ISDN exchange via more than one PIU-LT/PIU-NT pair, but maximum number of regenerators is six (i.e. three LT/NT pairs). For test purposes ISDN exchange can send diagnostic commands through EOC channel to each PIU unit in chain. 3 bits are reserved for address. "0" is address of NT1 equipment, "1" to "6" are for PIU units in chain, and "7" is for all stations in chain (broadcast).

Basic functions

- 4 ISDN U interfaces on PIU unit
- One U-ISDN occupies 2.5 64kbit/s channels in FM2x2 and FM-MSAN multiplex
- Position of U-ISDN in multiplex is configurable by management software
- Transport via single pair is accomplished by use of 2B1Q line code with near-end echo cancellation
- PIU-LT is equipped with remote power feed source, which can provide power feeding of NT1 without local power supply
- Copper-pair interruption detection
- Short-circuited copper-pair detection
- Remote loopback control from ISDN exchange through EOC
- Performance monitoring

Control and monitoring

PIU unit within multiplexers FM2x2 and FM-MSAN can be controlled by PC software SUNCE-M (Network Manager):

- PIU unit configuration
  - time slot assigning
  - remote power feed control
  - performance monitoring control
  - alarm monitoring control
- Alarm monitoring

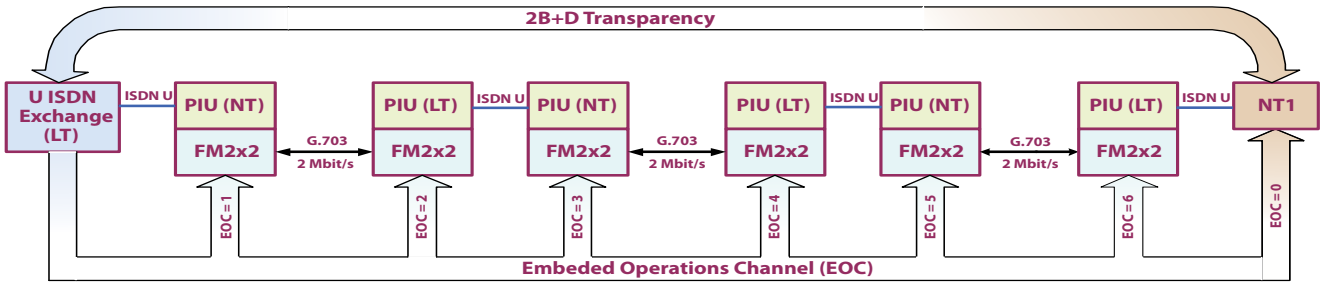
ISDN exchange has loopback control over PIU unit by means of EOC.

Activation and deactivation of U-interfaces is initiated from NT1 or exchange.

TECHNICAL DATA

ISDN U interface	ITU-T G.960, G.961 compliant
Transport type	duplex
Transport medium	one twisted-pair
Line code	2B1Q
Line speed	80 kboud ± 100 ppm
64kbit/s channels per interface	2.5
Maximum line attenuation	
at 40 kHz	36 dBm
at 80 kHz	45 dBm
Maximum line resistance	
without repeaters	1048 Ω
with repeaters	1300 + 700 Ω
Synchronization	
frame	1.5 ms
multiframe	12 ms
Scrambling	$1 + X^{-18} + X^{-23}$
CRC12	$X^{12} + X^{11} + X^3 + X + 1$
Remote power	105 V

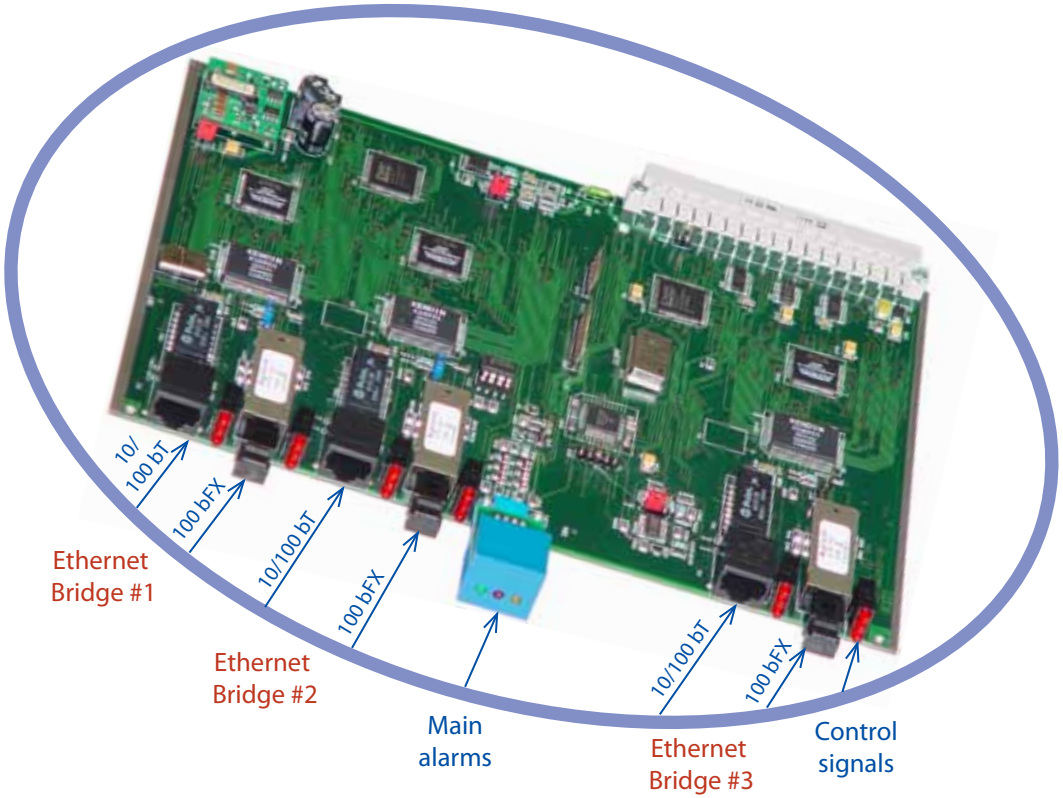
PIU/FM2x2 regenerator chain between remote subscriber and ISDN exchange



PET

3 digital nx64 kbit/s Ethernet Bridge subscribers with 10/100 BaseT or 100 BaseFX interface

- Provides connection of remote LAN network with Ethernet 10/100Base-TX or 100Base-FX interface via telecommunication network with n x 64 kbit/s data rate.
- Programming the number (1 do 31) of 64 kbit/s channels for any of 3 digital subscribers.



Applications

PET unit, as tributary unit within multiplexers, is used when subscriber want to connect devices with Etherent 10/100 Base-T or 10/100 Base FX interfaces through the transport telecommunication network. Any of 3 ports realize the Switch function on level 2 (MAC level). PET unit can be programmed at nx64 kbit/s rate on Ethernet Bridge interface to the transport network.

Basic functions

- 3 independent Ethernet Switches on one unit, 10/100 Base T/100 Base FX interface and one internal WAN interface for nx64 kbit/s Ethernet Brigde function
- Electrical Ethernet interfaces (10/100 BaseT) support auto negotiation procedure which determine the type of interface (10 or 100 Mbit/s, full or half duplex)
- All three Ethernet Switches can be configurated for VLAN
- Support for QoS priority choice according to the port or IEE802.1p
- LED diodes for links activity, full/half duplex transmission and data rate
- Integrated control and monitoring
- When autonegotation is switched off it is possible to programme all three 10/100 BaseT ports independently
- Flow control for full duplex transmission according to IEE802.3x or back pressure flow control for half duplex transmission
- Automatic address learning for MAC frame switching

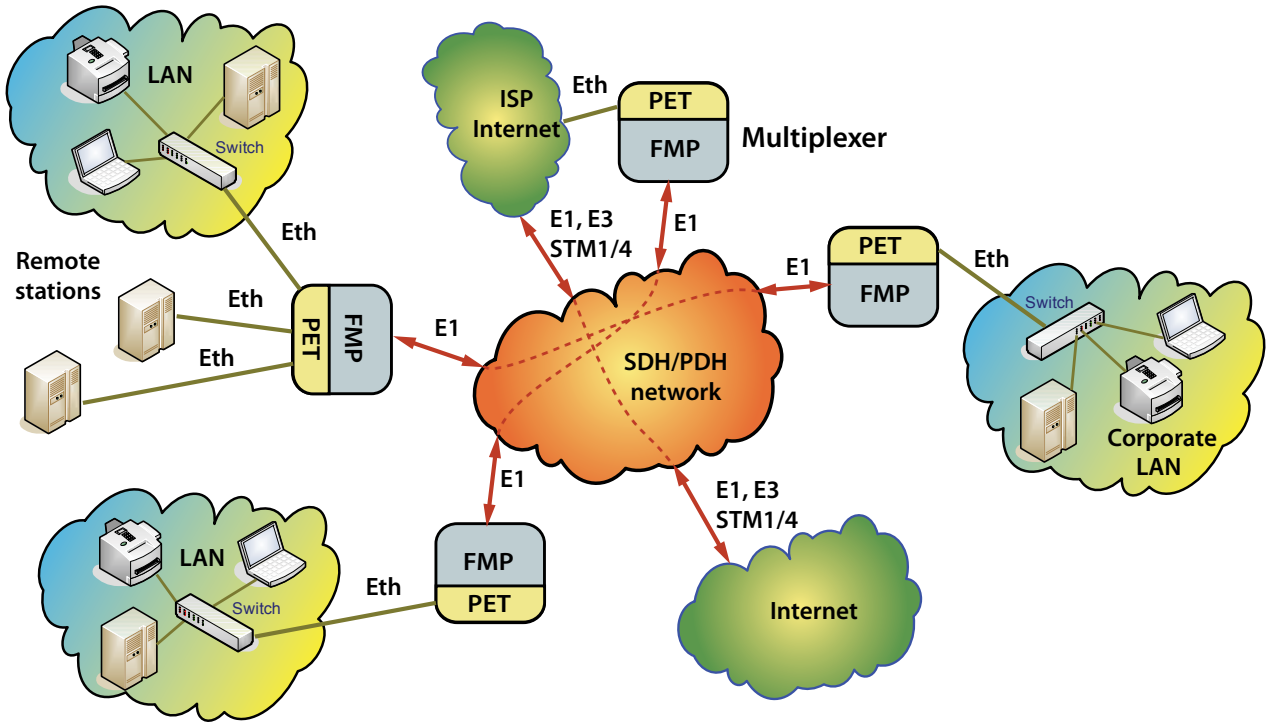
TECHNICAL DATA

Ethernet 10/100 BaseT

Transport type	duplex
Electrical characteristics	IEEE 802.3
Transmission	symmetrical
Section length (UTP cable class 5)	135 m
Connector	RJ45

Ethernet 100 BaseFX

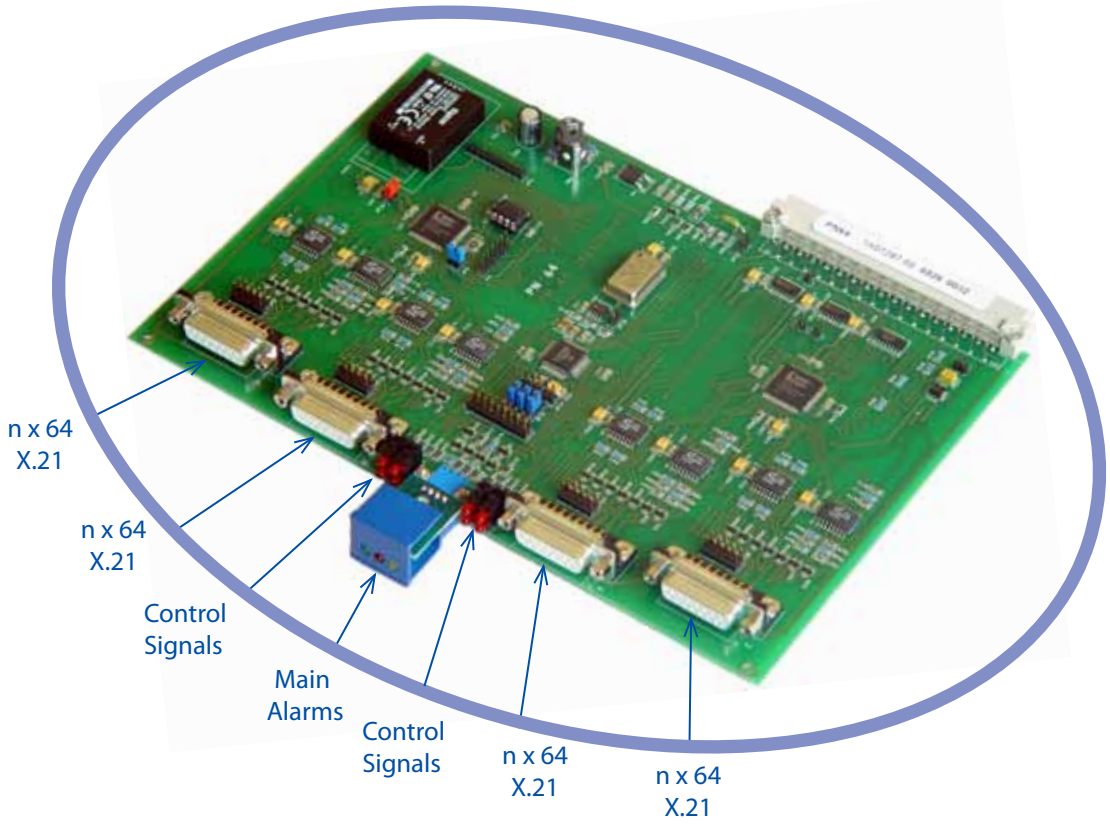
	SFP plug-in module
Transport type	duplex
Optical characteristics	IEEE 802.3
Transmission	singlemode optical fiber
Section length	2000 m
Connector	SC



PN64

4 digital interfaces of X.21/V.11 type, n x 64 kbit/s

- **Provides connection of terminal equipment (DTE) with n x 64kbit/s X.21/V.11 interface to telecommunication network via multiplexers FM2x2 and FM-MSAN (DCE)**
- **Independent selection of number (1 to 31) of 64 kbit/s channels for each interface**



Applications

PN64 unit, as tributary unit within multiplexers FM2x2, and FM-MSAN, provides network access to customer equipment based on X.21 interface. Bit rate n x 64 kbit/s on X.21 interface is programmable and not dependant on protocol type used for providing service to customer.

Basic functions

- 4 n x 64kbit/s X.21 interfaces on one board
- Programmable position in multiplex for each n x 64 kbit/s channel, independent
- Number of 64 kbit/s channels, n per interface can be 1, 2,..., 31
- Independent selection of X.21 interface type: codirectional or contradirectional
- Byte Timing signal (B) is available for contradirectional interface type
- Selectable Byte Timing signal type: time slot (byte) or PCM frame of FM2x2 and FM-MSAN
- Codirectional interface type can be referent clock source for multiplexers FM2x2 and FM-MSAN
- Asymmetric capacity is possible for codirectional interface type
- Unused interfaces can be switched off for power saving
- States of near (DCE) and far (DTE) end are displayed by front LEDs

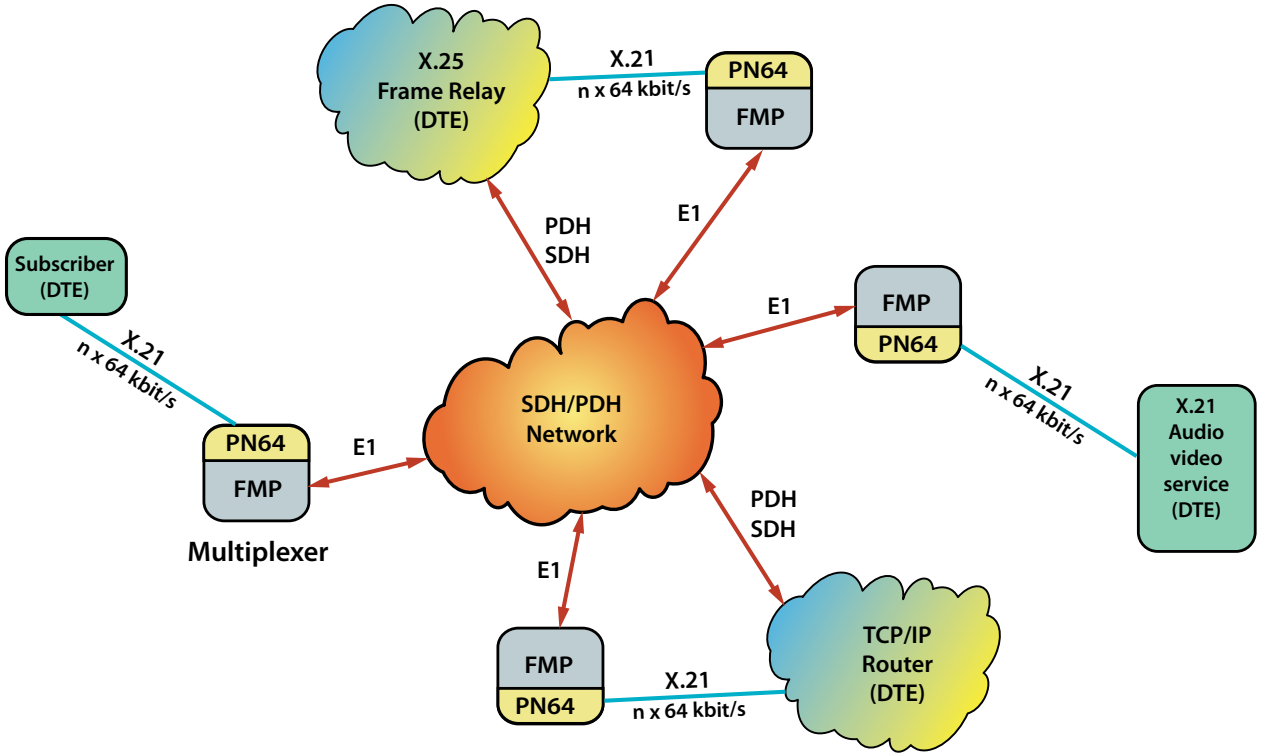
Control and monitoring

PN64 unit within multiplexers FM2x2 and FM-MSAN is controlled by PC software SUNCE-M (Network Manager):

- PN64 unit configuration:
  - activation/deactivation of interfaces
  - time slot assigning
  - contradirectional/codirectional selection
  - referent clock selection
- Alarm monitoring

TECHNICAL DATA

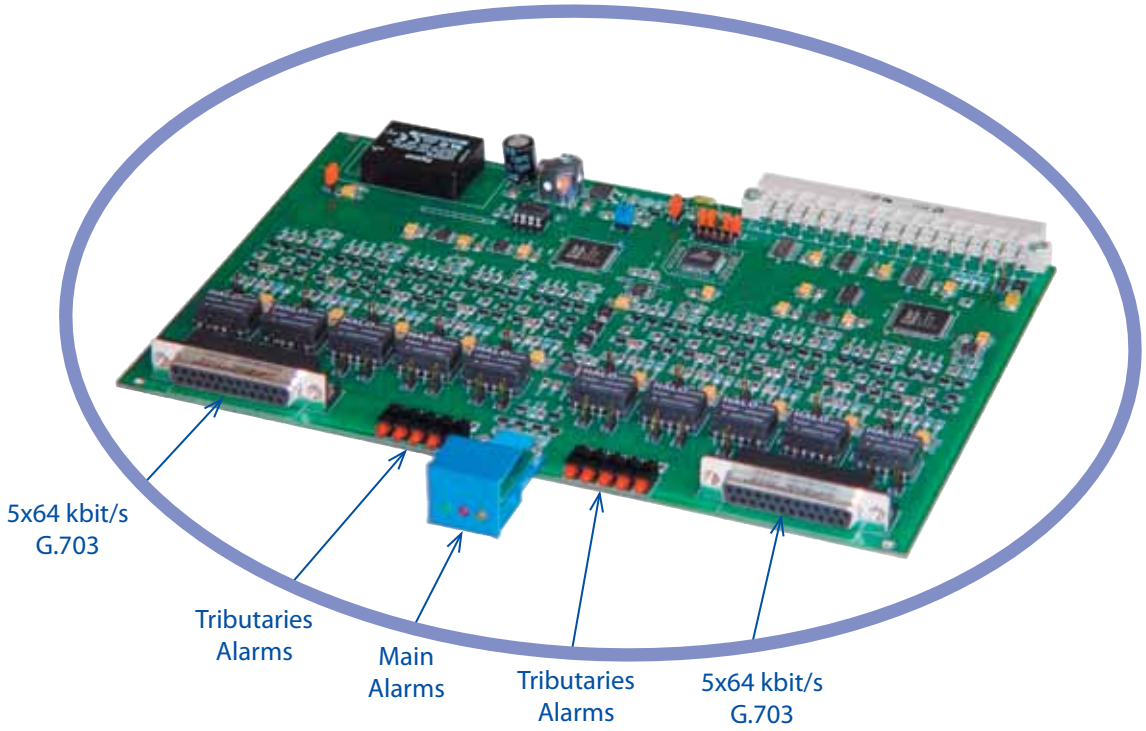
X.21 interface	ITU-T X.27, V.11 compliant
Transport	duplex
Transport medium	6 twisted-pairs
Connector	15-pin SUBD, female
No. of 64kbit/s intervals per interface	1 to 31
Line rate	n x 64 kbit/s
Maximum line length	
up to128 kbit/s	1300 m
up to 2048 kbit/s	60 m
Copper-pair termination	
Transmit (R, S, B and I signals)	120 Ω
Receive (T, X, C signals)	120 Ω



PCO

10 digital G.703 64 kbit/s codirectional interfaces

- **Provides connection for 10 independent subscribers with G.703 64 kbit/s codirectional interfaces via multiplexers FM2x2 and FM-MSAN**



Applications

PCO unit, as a tributary unit within multiplexers FM2x2 and FM-MSAN provides connection between remote customers having equipment based on ITU-T G.703 64 kbit/s codirectional interface though TDM based telecommunication network. Each interface is absolutely transparent regarding the protocol that gives particular service to the customer.

Basic characteristics

- 10 independent 64 kbit/s G.703 codirectional interfaces accessible from rear side
- Each channel could be programmed to occupy any time slot into any external E1 link
- Octet framing programming capability for each channel
- Power saving mode for the unused interfaces
- Each channel can be programmed to be synchronization source for multiplexers FM2x2 and FM-MSAN

Control and monitoring

PCO unit within multiplexers FM2x2 and FM-MSAN is controlled by PC software SUNCE-M (Network Manager):

- PCO unit configuration:
  - Interface activation and deactivation
  - Time slot allocation
  - Framing type definition
  - Alarm monitoring
  - Synchronization
- Centralized alarm monitoring and acquisition functions

TECHNICAL DATA

G.703 64kbit/s codirectional

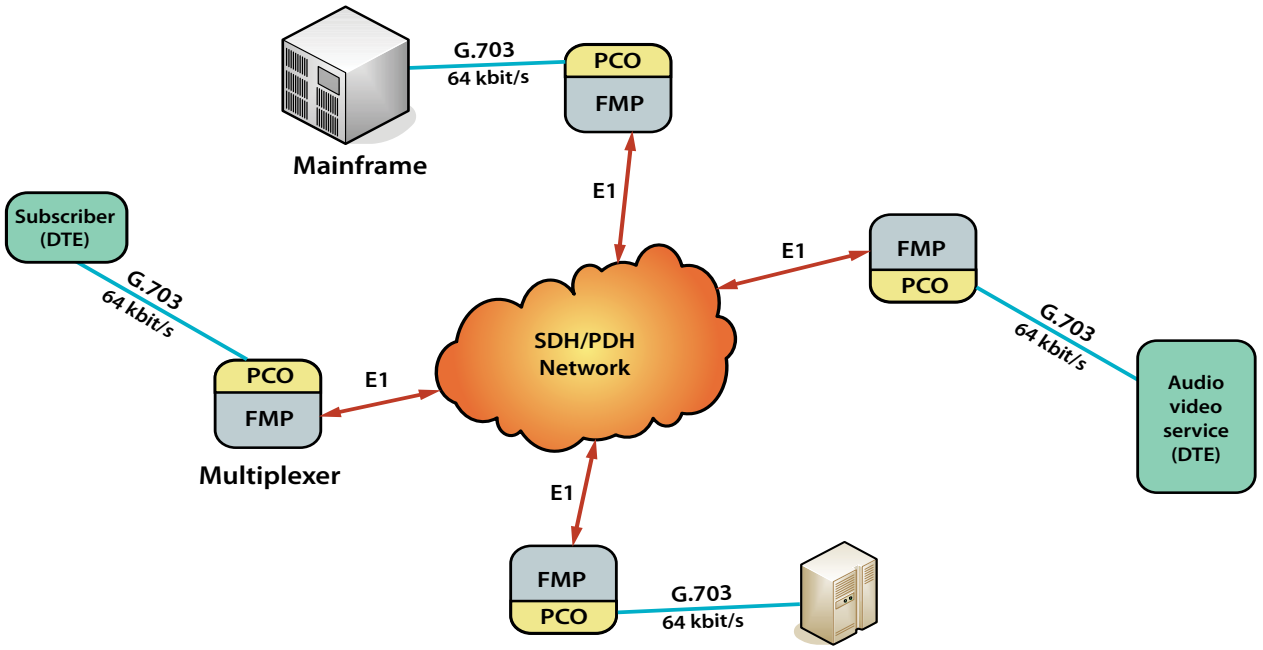
Transmission	full duplex
Transmission medium	2 pairs
Line speed	256 kbit/s±100 pmm
Framing	unframed octet framing

Input

Impedance	120 Ω
Loss at 128 kHz	0 do 3 dB
Return loss:	
4 to 13 kHz	≥12 dB
13 to 256 kHz	≥18 dB
256 to 384 kHz	≥14 dB

Output

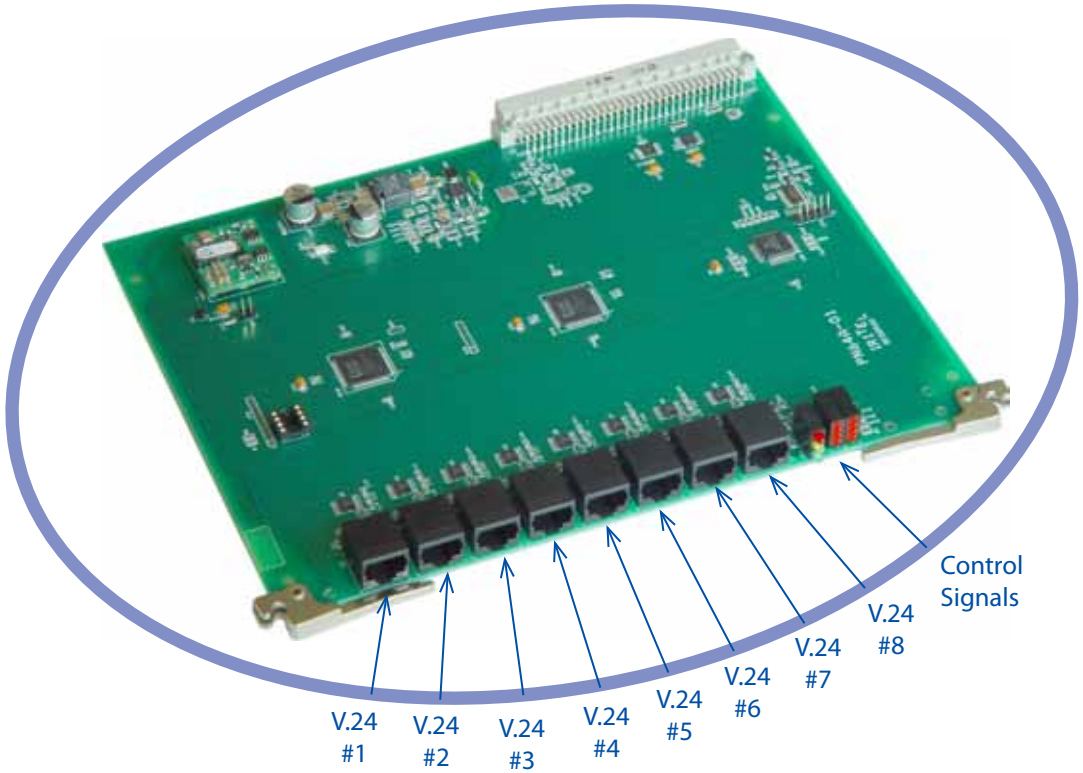
Impedance	120 Ω
Impulse level	1 V ±0,1 V
Impulse width	single 3900 ns double 7800 ns
Impulse shape	according to ITU-T G.703 single 5a/G.703 double 5b/G.703
Section length	800m or better With 24AWG twisted pairs
Connector	25-pin, D-type, female jointly for 5 interfaces



PN64A

8 digital interfaces of V.24/V.28 type

- Asynchronous transmission independent from code and data rate
- Data rate in multiplex 64 kbit/s to 384 kbit/s
- Submultiplexing up to 8 channels in 64 kbit/s
- Interface data rate: 2400 bit/s up to 115.6 kbit/s



Applications

PN64A unit, as tributary unit within multiplexers FM2x2 and FM-MSAN, provides network access to customer equipment based on V.24/V.28 interface for transparent asynchronous data transmission. Used multiplex data rate for transmission is software programmed and can be 64 kbit/s up to 384 kbit/s and submultiplexing up to 8 channels in 64 kbit/s.

Basic functions

- 8 interfaces V.24/V.28 on one unit
- Programmable position of used channels in multiplex
- Selection of data rate in multiplex for transmission: 64 to 384 kbit/s
- Submultiplexing up to 8 channels in 64 kbit/s
- Asynchronous transmission independent from code and data rate

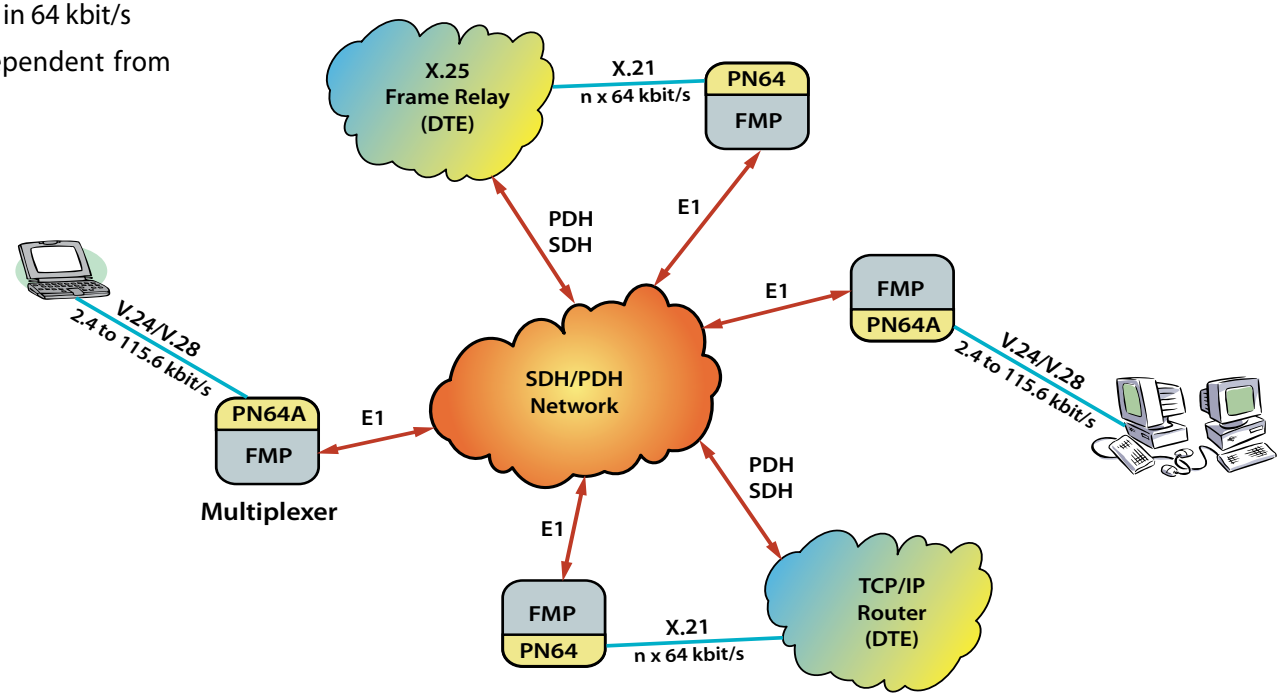
Control and monitoring

PN64A unit within multiplexers FM2x2 and FM-MSAN is controlled by PC software SUNCE-M (Network Manager):

- PN64A unit configuration:
  - activation/deactivation of interfaces
  - time slots assigning
  - submultiplex assigning
- Alarm monitoring

TECHNICAL DATA

Number of interfaces	8
Digital interface (TD, RD, RTS, DCD)	ITU-T V.24/V.28
Transmission method	asynchrounos transparent (ITU-T R.111)
Connector (EIA-561)	RJ-45
No. of 64kbit/s time slots	1 to 6
Interface data rate	2400 bit/s up to 115.6 kbit/s
Asynchronous distortion	<8%



FMOP
FLEXIBLE MULTIPLEXER OPTICAL PLATFORM

- Universal TDM narrowband and packet broadband optical transmission platform
- Up to 400 equivalent 64 kbit/s subscribers
- Wire speed broadband Ethernet Services
- Point to point leased line or switched TDM services over optical transmission medium
- 1+1 optical Automatic Protection Switch (APS)

Applications

FMOP is flexible multiplexer specially designed to allow transmission of TDM narrowband voice and data signals and broadband Ethernet packet data in point to point configurations over optical transmission medium.

Device enables reliable and high quality TDM voice and data services with low latency and guaranteed throughput. FMOP helps user to protect their existing investments in legacy TDM based CO and CPE equipment and at the same time enable smooth transition to a new broadband services. For the users who requires guaranteed quality of services FMOP represents unparallel solution compared to a VoIP technology.

Typically FMOP find application for:

- Connecting remote analog subscribers, FXS, FXO
- Connecting remote ISDN BRA subscribers
- Leased line access to Internet Service Providers (ISP)
- Leased line services over E1 for corporate PABX connections
- IP DSLAM connections to remote IP SWITCH

FMOP multiplexer is suitable to be used by:

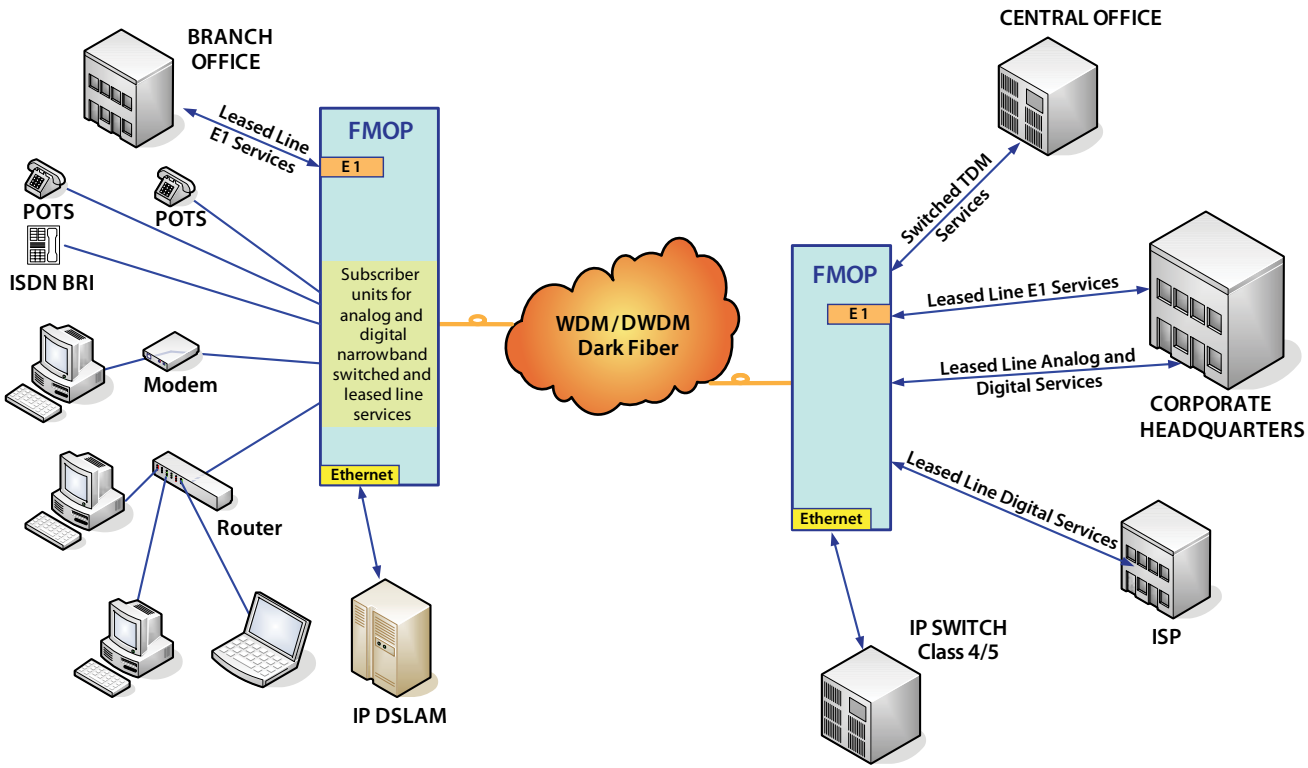
- Public telecommunication networks operators
- Public utility companies
- Large and medium sized companies
- Government offices and agencies

Features

- Supports over 15 different transmission and subscriber, analog and digital interfaces. Shares the same channel units with other multiplexers from IRITEL.
- 4 E1 PDH tributary interfaces for 2 Mbit/s
- Full non-blocking cross-connect
- Up to 21 universal unit slots per subracks
- Up to 20 channels per unit
- Various synchronization sources are available, received clock from line, from a subchannel, from internal oscillator or from external reference
- Line test access
- Integrated network management system, SNMP and SUNCE support
- Supports fiber rings and complex network structure
- Plug-in SFP optical transceivers, provides different fiber type and section lengths
- Wire speed Ethernet bridge functionality
- Optical Line protection, 1+1
- Advanced fault diagnosis (integrated BER tester)

User interfaces

- Analog: 2w/4w with E/M signaling, 2w FXS, 2w FXO, Magnetic
- Digital 64 and nx64 kbit/s: X.21, asynhronous/ synhronous V.24, ISDN U, SHDSL, Ethernet



FOP4/8/16

4/8/16xE1 + 2xFE over Fiber Multiplexer

- Simultaneously multiplexes 16 E1 and one 10/100 Mbit/s Ethernet tributaries
- Plug in optical transceivers supporting short, medium, long, dual or single fiber options
- Up to 120 km section length
- 1+1 optical Automatic Protection Switch (APS) option
- Ring topology support
- Control and monitoring over Embedded Web server and SNMP (MIB: RFC-2495, RFC 2233, RFC 2493) support for NMS
- Local displaying of remote device alarms
- Compact 1U, stand alone or 19”/ETSI mount options
- External office/environmental dry contact alarm inputs and orderwire option
- 220V AC and/or -48V DC options (dual power protection)
- Embedded BER Built In Self Test (BIST) on all E1 tributaries and Optical line

Description

FOP16 is optical transmission equipment that combines up to 16 TDM E1 signals and one packet oriented 100 Mbit/s Ethernet signal through the fiber link. Besides, optical multiplexer FOP16 provides many value-added functions and interfaces in order to meet different customers needs. It is a very flexible and efficient way to use the FOP16 in optical transmission network for voice, data, and wireless applications.

FOP16 provides network management system for local/remote maintenance purpose by a well known and friendly GUI based Web Server and standard SNMP. FOP16 also provide switch and LED indications for field application.

On optical transmission line, the FOP16 provide two fiber links for 1+1 protection or ring configuration.

Application

- Point-to-point fiber optic links
- Linear fiber optic networks, providing add-and drop capability
- Supports fiber rings and complex network structure
- Local cross-connect at E1 (2 Mbit/s) levels

Main features

- Plug-in SFP optical transceivers, provides different fiber type and section lengths
- 16 E1 PDH tributary interfaces for 2 Mbit/s
- Full non blocking cross-connect matrix at E1 level
- Wire speed Ethernet bridge functionality
- Optical Line protection, 1+1
- Advanced fault diagnosis (integrated BER tester)
- Integrated network management system
- SNMP northbound and southbound interfaces SNMP MIB
- Control and monitoring using standard SNMP viewer

TECHNICAL DATA

Optical interface 155520 kbit/s

Number of interfaces	up to 2xSFP
Frame	proprietary
Multiplexing method	ITU-TG.472 like
Optical characteristics	depends on plug in module characteristics
option -S1A	optical connector LC
light source	FPLD, 1310 nm
output power	–5 dBm
typical section length	49 km
option -S1B	optical connector LC
light source	DFBLD, 1550 nm
output power	–5 dBm
typical section length	100 km
sensitivity for 10^{-10} BER	–34 dBm
maximum input level	–10 dBm

Interface G.703 2 Mbit/s

Type of signal	2048 kbit/s ±50 ppm HDB3
Nominal impedance	75 Ω asymmetric 120 Ω symmetric
Input	
Max. cable attenuation	0 - 6 dB at 1024 kHz
Input jitter tolerance	ITU-T G.823
Input return loss	
12 dB in range	50 kHz to 100 kHz
18 dB in range	100 kHz to 2 MHz
14 dB above	2 Mhz
Output	
Nominal impulse amplitude	2.37 V ± 0.237 V, 75 .
Impulse shape according to	ITU-T 15/G.703
Output jitter up to 100 kHz	0.25 UI p-p
in range 18 kHz to 100 kHz	0.05 UI p-p

Ethernet interface

2 x10/100 BaseTx (IEEE 802.3)

Power supply

DC input voltage	–36 to –72 V
Power consumption	<4 W

Environmental conditions

Climatic conditions	class 3.1 ETSI
Temperature	-5°C to +45°C

Physical dimensions (H x W x D)

Unit	440 x 257 x 43.2 mm
Weight	3.15 kg rack-mountable hardware included

FMTP
FLEXIBLE MULTIPLEXER TDMoIP PLATFORM

- Universal TDM narrowband and packet broadband TDM over IP transmission platform
- Up to 400 equivalent 64 kbit/s subscribers
- High speed broadband Ethernet Services
- Point to point or point to multipoint leased line or switched TDM services over Ethernet packet based transmission network
- Various protection mechanisms
- SUNCE and SNMP based TMN support

Applications

FMTP is flexible multiplexer specially designed to allow transmission of narrowband voice and data signals in point to point or point to multipoint configurations Ethernet packet core network.

Device enables reliable and high quality TDM voice and data services with low latency and guaranteed throughput. FMTP helps user to protect their existing investments in legacy TDM based CO and CPE equipment and to avoid costly E1 leased lines necessary for existing equipment operation. For the users who requires guaranteed quality of services FMTP represents unparallel solution compared to a VoIP technology. Typically FMTP find application for:

- Connecting remote analog subscribers, FXS, FXO
- Connecting remote ISDN BRA subscribers
- Leased line services over E1 for corporate PABX connections
- Wireless base station backhauling

FMTP multiplexer is suitable to be used by:

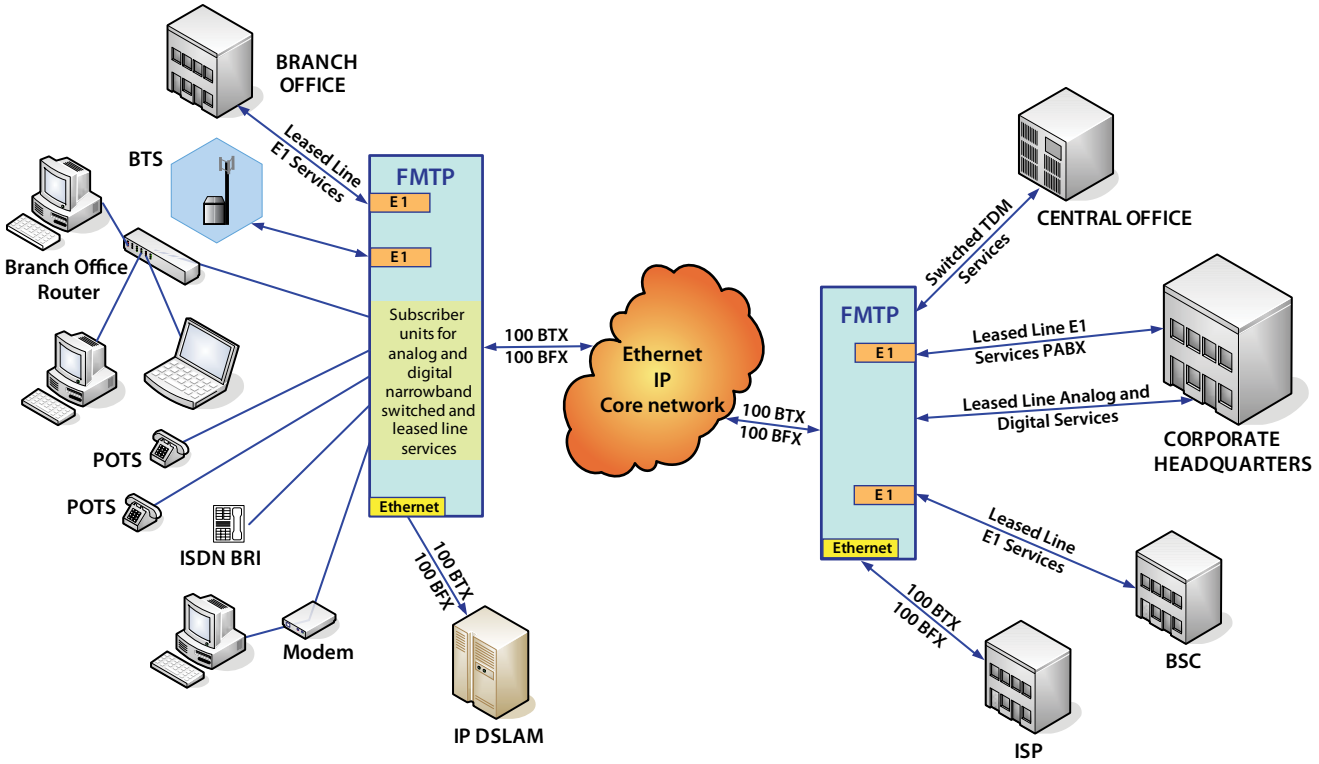
- Public telecommunication networks operators
- Public utility companies
- Large and medium sized companies
- Government offices and agencies

Features

- Supports over 15 different transmission and subscriber, analog and digital interfaces. Shares the same channel units with other multiplexers from IRITEL.
- 2 E1 PDH tributary interfaces for 2 Mbit/s
- Full non-blocking cross-connect
- Up to 21 universal unit slots per subracks
- Up to 20 channels per unit
- Various synchronization sources are available, received clock from line, from a subchannel, from internal oscillator or from external reference
- Line test access
- Integrated network management system, SNMP and SUNCE support
- Plug-in SFP optical transceivers, provides different fiber type and section lengths
- Wire speed Ethernet bridge functionality
- Various protection mechanisms
- Advanced fault diagnosis (integrated BER tester)

User interfaces

- Analog: 2w/4w with E/M signalling, 2w FXS, 2w FXO, Magnetic
- Digital 64 and nx64 kbit/s: X.21, asynchronous/ synchronous V.24, ISDN U, SHDSL, Ethernet



FTP4/8/16

4/8/16xE1 TDM over IP Multiplexer

- Simultaneously performs TDM circuit emulation over enterprise or carrier packet-switched Ethernet L2/L3 networks for 4, 8 or 16 E1
- At the Ethernet line side supports both electrical Fast and optical 100 FX Ethernet interface
- Multiprotocol encapsulation supporting IPv4, IPv6, UDP, RTP, L2TPv3, MPLS and Metro Ethernet.
- Compliant with IETF, ITU-T, MFA Forum and Metro Ethernet Forum Technical Specifications
- Recovered clock jitter and wander compliant to ITU-T G.823, G.824. Supports adaptive clock recovery, differential clock (common clock) (using RTP), external clock
- Lost/misordered packet compensation
- FTP4/816 provide traditional leased-line and TDM switched services transparently over IP with higher voice quality with much lower latency than VoIP and can support all applications that run over E1 circuits, not just voice

Description

FTP4/8/16 is TDM circuit emulation over Ethernet packet switched network transmission unit. It combines 4, 8 or 16 TDM E1 signals over IP based network. FTP4/8/16 enables transparent services for E1 signals from central unit transmission over enterprise or carrier Ethernet network.

Besides TDM traffic transmission over IP based networks FTP4/8/16 provides many value-added functions in order to meet different customers needs including different network management capabilities, traffic protection, synchronization etc.

Applications

- In carrier network FTP4/8/16 typically fins applications for:
  - TDM services over Ethernet MAN, broadband wireless, CATV
  - 2G / 2.5G cellular backhaul over IP/MPLS
  - HDLC-based traffic (ex. Frame Relay) trunking over IP/MPLS
  - PSTN-IP network bridging
  - SS7 transport over IP
- In enterprise applications FPT4/8/16 is suitable to be used for:
  - Private line/toll bypass via Ethernet MAN
  - TDM PBX migration to Ethernet MAN
- In access networks FTP4/816 typically fins application as Multi Tenant Multi Dwelling Unit MTU/MDU

Basic features

- 4, 8 or16 E1, framed or unframed, PDH tributary interfaces
- One 10/100 electrical and one 100 optical Ethernet interface
- Multiprotocol encapsulation supporting IPv4, IPv6, UDP, RTP, L2TPv3, MPLS and Metro Ethernet
- Recovered clock jitter and wander compliant to ITU-T G.823, G.824 synchronization interface
- Lost/misordered packet compensation
- Compliant with:
  - IETF PWE3 Internet drafts for SAToP, TDMoIP, CESoPSN, HDLC
  - ITU-T Recommendations Y.1413 and Y.1414 (clause 10)Y.1453, Y.1452.
  - MFA Forum Implementation Agreements 4.1, 5.1 and 8.0.0
  - Metro Ethernet Forum Technical Specification MEF8
- Supports adaptive clock recovery, differential clock (common clock) (using RTP), external clock and loopback timing modes
- Integrated network management system, SNMP and SUNCE support

TECHNICAL DATA

Ethernet interfaces

Standards	IEEE 802.3, IEEE 802.3u IEEE 802.1p, IEEE 802.1Q
Maximum Frame size	1536 bytes

10/100 BaseTx

Number of interfaces	1
Data rate	10 or 100 Mbits Full/Half duplex
Connector	RJ45

100 BaseFx

Number of interfaces	1
Data rate	100 Mbits Full duplex
Connector	SFP plug in module
option -S1A	optical connector LC
light source	FPLD, 1310 nm
output power	–5 dBm
typical section length	49 km
option -S1B	optical connector LC
light source	DFBLD, 1550 nm
output power	–5 dBm
typical section length	100 km
sensitivity for 10^{-10} BER	–34 dBm
maximum input level	–10 dBm

Interface G.703 2 Mbit/s

Number of interfaces	4, 8, 16
Type of signal	2048 kbit/s ±50 ppm HDB3
Nominal impedance	75 Ω asymmetric 120 Ω symmetric
Input	
Max. cable attenuation	0 - 6 dB at 1024 kHz
Input jitter tolerance	ITU-T G.823
Input return loss	
12 dB in range	50 kHz to 100 kHz
18 dB in range	100 kHz to 2 MHz
14 dB above	2 Mhz
Output	
Nominal impulse amplitude	2.37 V ± 0.237 V, 75 .
Impulse shape according to	ITU-T 15/G.703
Output jitter up to 100 kHz	0.25 UI p-p
in range 18 kHz to 100 kHz	0.05 UI p-p

Power supply

DC input voltage	–36 to –72 V
Power consumption	<5 W

Environmental conditions

Climatic conditions	class 3.2 ETSI
Temperature	-5°C to +45°C

FMVP

FLEXIBLE MULTIPLEXER VoIP PLATFORM

- Universal VoIP Residential Gateway Solution
- Up to 400 POTS analog subscribers (simultaneous VoIP-POTS conversions)
- High speed broadband Ethernet Services
- Media engine supports various voice coders
- Enhanced voice processing and quality enhancement
- Signalling engine - SIP
- SUNCE and SNMP based TMN support

Applications

FMVP is flexible multiplexer specially designed to enable voice services to residential subscriber over packet switched Ethernet and IP based network. The main 4 function of FMVP multiplexer are: Media Engine works on voice coding, Signalization Engine deals with signalization, Application Engine controls software applications and TDM Engine deals with analog and digital subscribers.

Device enables premium voice quality utilizing versatile voice quality enhancement like voice detection, echo cancellation, packet loss concealment, comfort noise generation etc. FMVP helps user to protect their existing investments in subscribers CPE equipment and enables smooth transition to new packet voice services while keeping subscriber infrastructure intact. Besides of VoIP services FMVP offers high speed Ethernet connection suitable to be used for IP DSLAM connectivity thus making the FMVP ideal packet voice and data provisioning platform.

Typically FMVP find application for:

- Connecting residential subscribers to VoIP Soft Swtich

FMVP multiplexer is suitable to be used by:

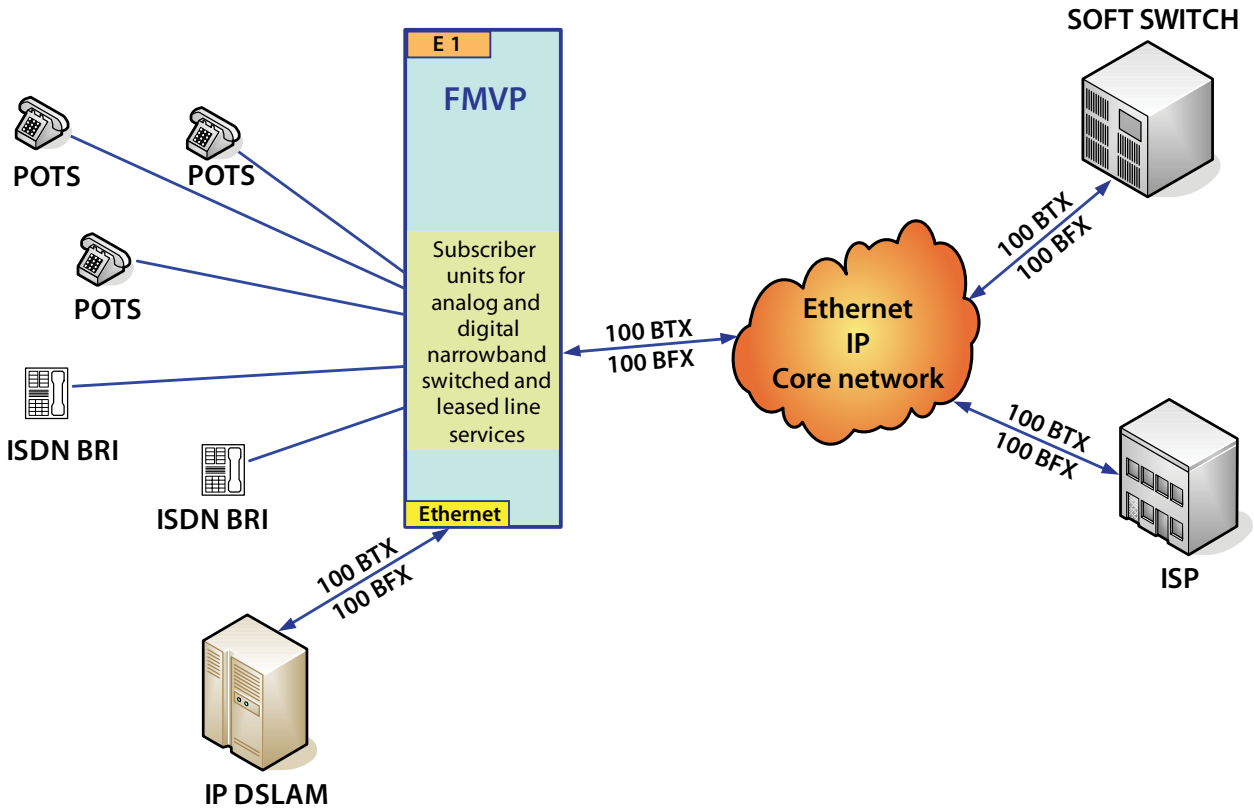
- Public telecommunication networks operators
- Public utility companies
- Large and medium sized companies
- Government offices and agencies

Features

- Supports up to 400 subscribers
- Supports different voice coders: PCM, ADPCM, GSM, Fax Relay
- Echo cancellation: per ITU-T G.168-2000 ECAN 10 ms, 16 ms, 32 ms, 128 ms
- Voice detection: analyses voice activity to detect silence
- Packet Loss Concealment: per ITU-T G.711 Appendix 1
- Comfort Noise Generation: per ITU-T G.711 Appendix 2
- Adaptive Jitter Buffer Manager: fully adaptive or static; dejitter and packet reordering
- Audio Conferencing: support for 3 to N party audio conferences
- DTMF Detect and Generate: per Bellcore GR-506-CORE, TIA 464-B, ITU-T Q.23 and Q.24
- DTMF Relay: per RFC 2833
- Call Progress Tone Handling: per Bellcore GR-506-CORE, ITU-T Q.35
- Integrated network management system, SNMP and SUNCE support

User interfaces

- Subscriber: analog: 2w FXS, 2w FXO, ISDN U Line Termination side
- Auxiliary: Fast Ethernet



V5CAS
PROTOCOL CONVERTOR

- 1 to 8 E1 links (V5)
- Up to 24 E1 links (CAS)
- Digital channel cross-connect (non blocking)
- Remote multiplexers (CAS) connectivity to V5 interface (up to 660 subscribers)
- Concentrator according to V5.2 up to 2400 subscribers, for remote multiplexers and/or V5.2 access nodes
- Factory customerable CAS interface for non IRITEL multiplexers

Applications

V5CAS Protocol convertor provide connection of access multiplexers FM-MSAN and FM2x2 with CAS signalling to telephone exchange with V5 protocol (V5.1/V5.2).

V5CAS enable economic solution to use telephone exchange's V5.2 interfaces for connection access multiplexer with small number of subscribers (60 to 120).

V5CAS enable digital channel cross-connect (64 kbit/s) between all 24 E1 links.

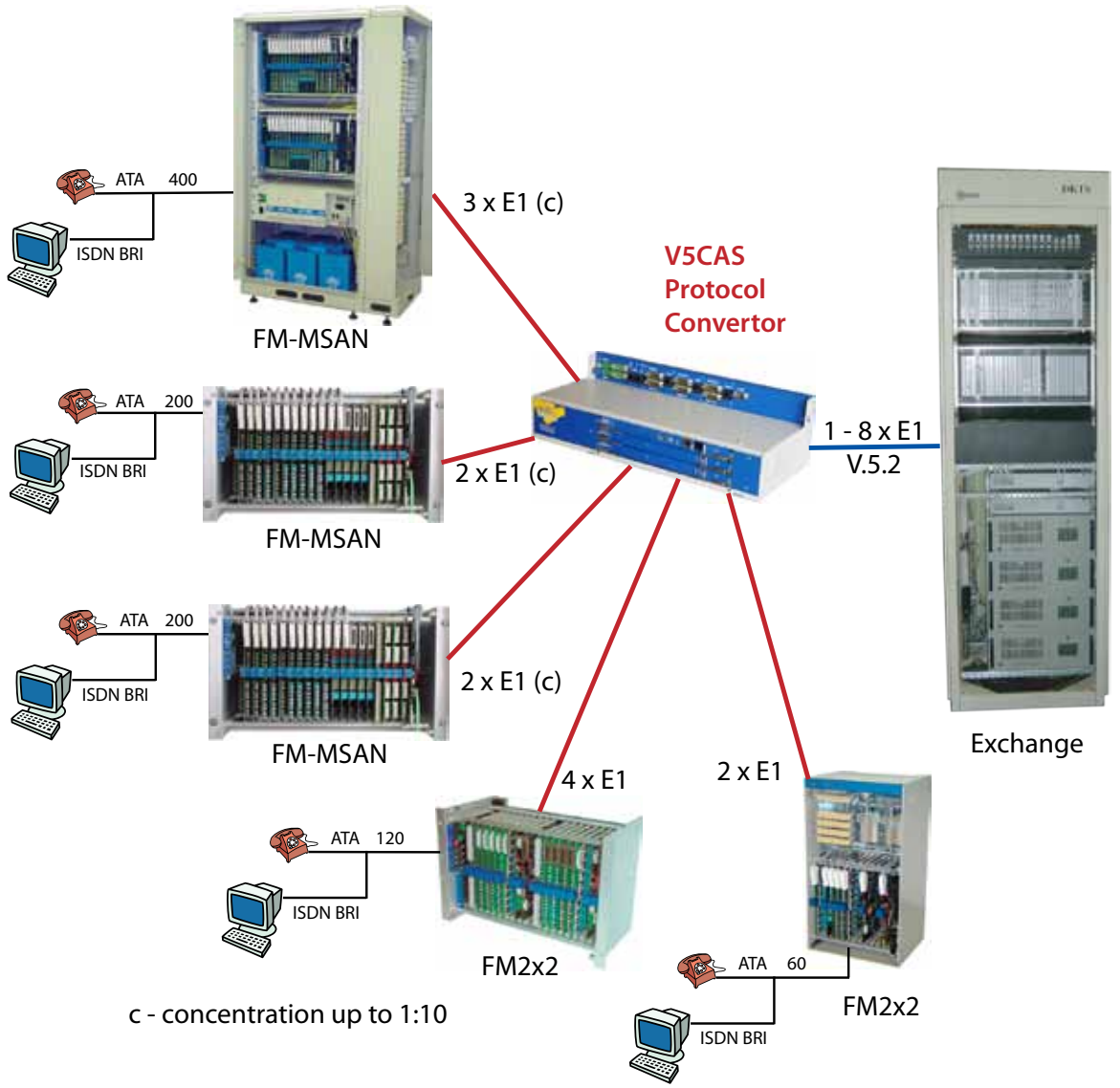
Basic functions

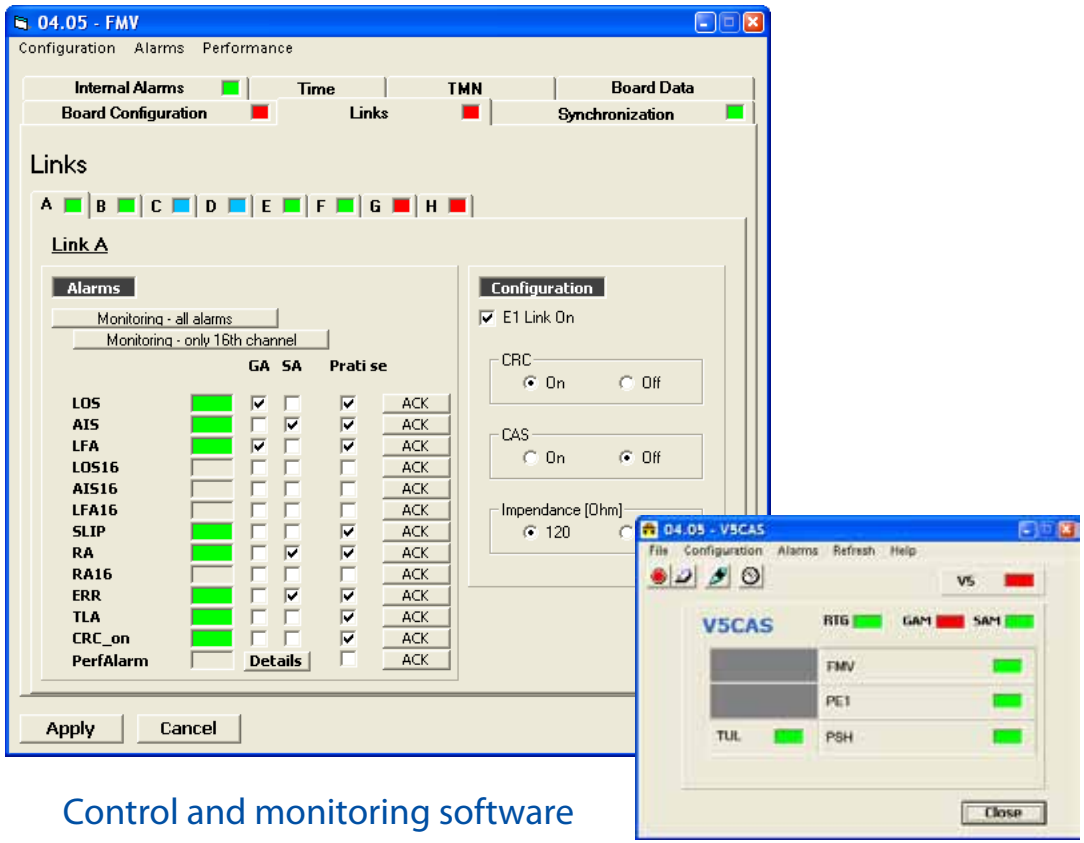
- Connections of remote access nodes: FM2x2 (multiplexer), FM-MSAN (concentrator) to exchange V5.2 interface
- Digital channel cross-connect including corresponding signaling bits between all 24 links (2 Mbit/s) (non blocking)
- Control channel (20 kbit/s or 64 kbit/s) transsmision via V5.2 interface

Configurations

- FMV– multiplex, cross-connect, control and power supplay unit with V5.2 interface
- PE1 – 8xE1 interfaces unit
- PSH – 4 x SHDSL interface unit

V5CAS Protocol convertor application





Control and monitoring software

Control and monitoring

Integrated network management system SUNCE-M provides continuous management of V5CAS and all other IRITEL's SDH and PDH equipment (FM-MSAN, FM2x2, ODS155, OTS622 ...).

For NMS system integration we support standard interface based on SNMP protocol.

Synhronization

- From internal built-in oscillator (± 25 ppm)
- From external 2 048 kHz clock
- From received clock on any external link

Mechanical design

- Unit (233x175x20 mm and 233x100x20mm)
- V5CAS module (120x437x205 mm)
- 19"/ETSI cabinet (2200x600x300 mm)

E1 Tributaries

2048 kbit/s according to ITU-T G.703, G.704 and G.706

E1 Service alarms

according to E/M signalization standard

External clock reference

2048 kHz according to ITU-T G.703/10

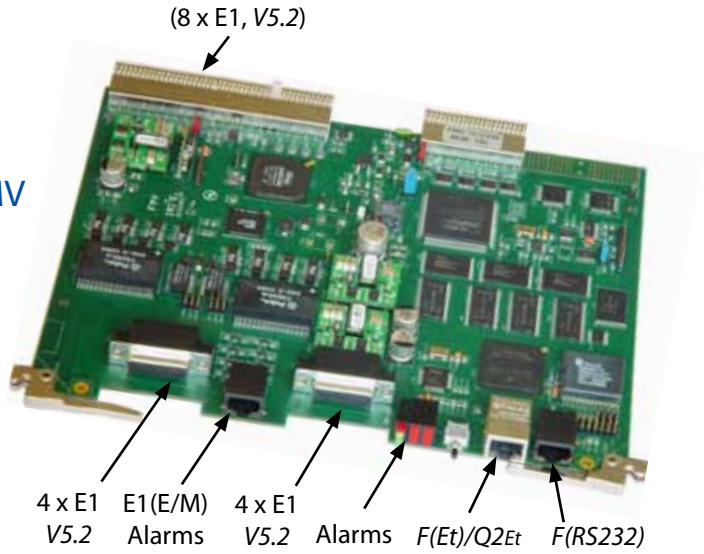
TMN interface

SUNCE-M (proprietary)	F (RS232/V.24 or 10/100 BaseTX Ethernet), Q2 (RS485), Q2Et (10/100 bT)
SNMP/V1/V2/V3	RFC 3895 (DS1/E1)

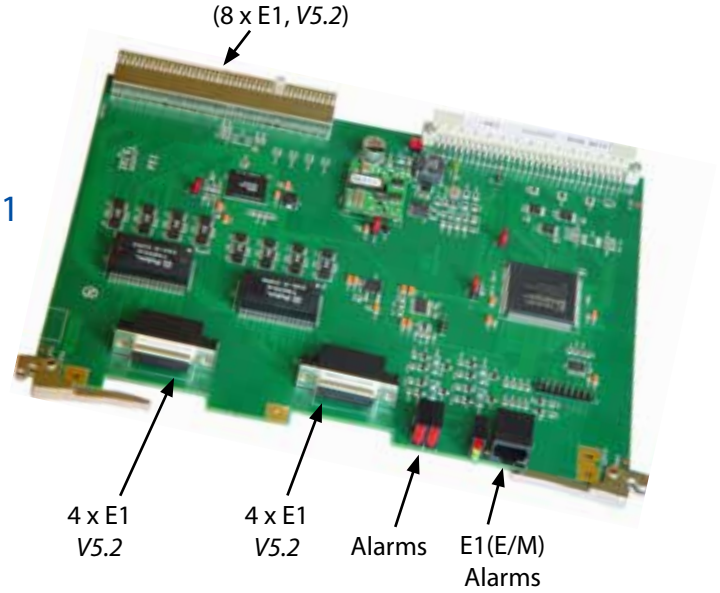
Operating temperature range

-5^{0}C up to +45^{0}C (class 3.2)

FMV

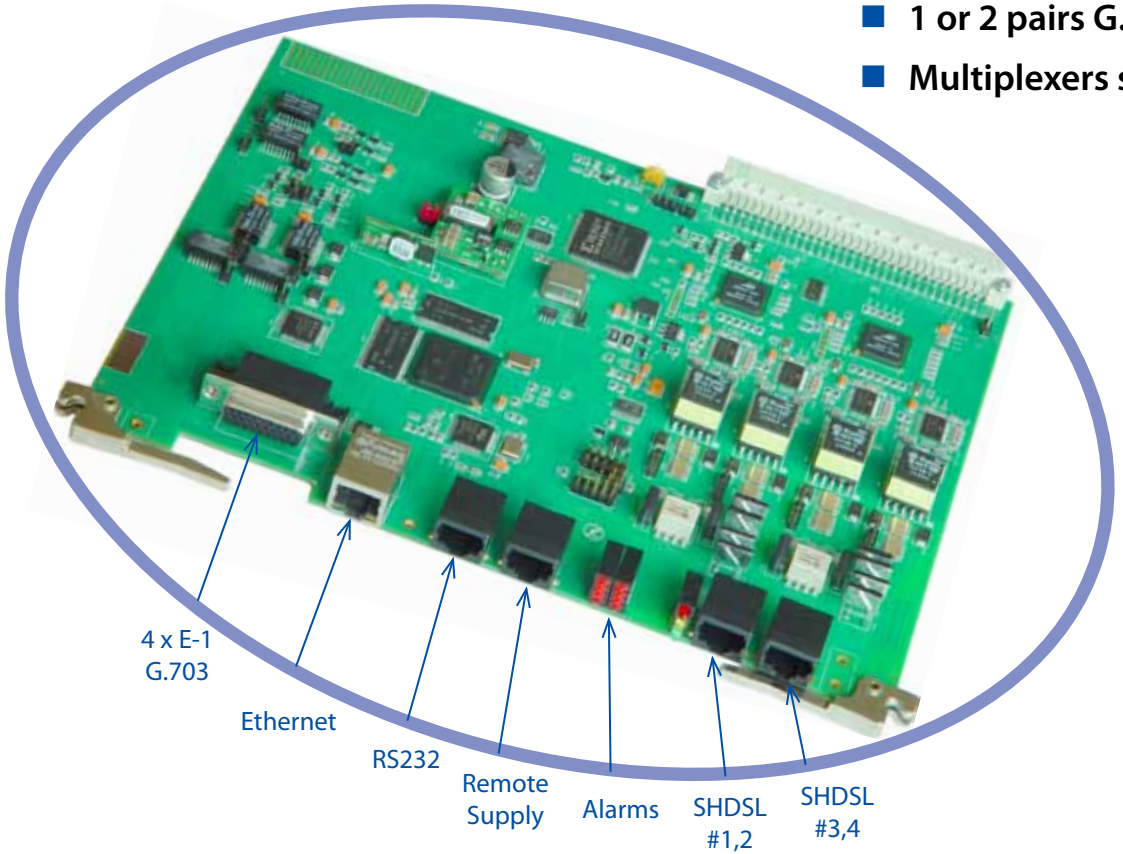


PE1



PSH - SHDSL modem
4 x SHDSL, 4 x E1, 1 x Ethernet

- G.shdsl interface: fractional n x 64 kbit/s from cross-connect field or 2 Mbit/s G.703 – G.shdsl interface converter
- G.703 interface: unframed transparent mode or E1 framer mode
- Ethernet over 1 to 4 SHDSL
- Non-blocking 336 channels cross-connect field
- LTU or NTU mode of G.shdsl operation
- 1 or 2 pairs G.shdsl operation
- Multiplexers subscriber unit or standalone unit



Application

Each G.shdsl interface has two modes of operation.

First mode is n x 64 kbit/s fractional operation, with bit-rate in range from 144 to 2312 kbit/s (G.shdsl subscriber application). In this mode some number of 64kbit/s channels can be assigned to Ethernet (Ethernet-over-G.shdsl application).

Second mode is 2.048 Mbit G.703 (without E1 framer/deframer) to G.shdsl transparent interface converter, with fixed line rate of 2.056 Mbit/s (G.703 range extension application), when paired with one of four G.703 interfaces.

G.shdsl interfaces can be paired to operate in 4-wire mode with maximum total data rate of 2.320 Mbit/s (shared between two copper pairs, 1160 Mbit/s each), if longer loop is needed.

PSH unit can operate as separate unit without FM-MSAN if all four G.703 – G.shdsl pairs operate as interface converters.

Basic characteristics

- Four G.shdsl interfaces on board (ETSI SHDSL: ETSI TS 101 524, ITU-T G.shdsl: ITU-T G.991.2)
- High symmetric line rate of maximum 2320 kbit/s utilizes 16-level TC-PAM modulation, with near-end echo-cancellation
- LTU and NTU modes of G.shdsl
- Line rates from 152 to 2320 kbit/s (144 to 2312 kbit/s subscriber data rate)
- Flexible synchronization options
- Connector for external remote power feed
- LED alarm indication

Monitoring and management

PSH unit management is integrated in IRITEL network management system SUNCE-M, which incorporates:

- Configuration
- Alarm monitoring
- Performance monitoring

TECHNICAL DATA

G.703 (2 Mbit/s) — ITU-T G.703/G.704

Input

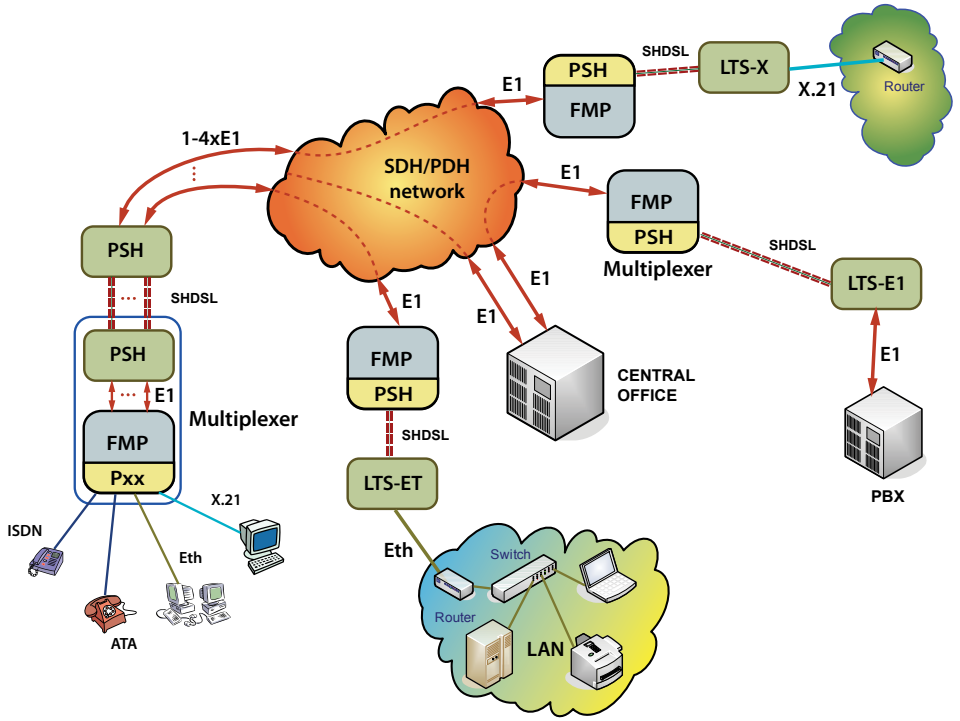
Signal	2048 kbit/s ±50 ppm (HDB3)
Impedance	75 Ω/120 Ω Loss
	0 to 6 dB at 1024 kbit/s
Jitter	according to ITU-T G.823
Return loss	according to ITU-T G.703/9.3

Output

Signal	2048 kbit/s ±50 ppm (HDB3)
Impedance	75 Ω/120 Ω
Impulse level	2.37 V ±0.237 V, 75 Ω
	3 V ±0.3 V, 120 Ω
Impulse width	244 ns
Impulse shape	according to ITU-T 15/G.703
Jitter	according to ITU-T G.823

G.shdsl interface — ETSI TS 101 524, ITU-T G.991.2

Transmission	symmetrical duplex
Transmission medium	one or two (4-wire mode)
twisted pairs	
Modulation	TC-PAM
Line rate	152 kbit/sto 2320 kbit/s
Maximum loop length	
- 0.4 mm copper wire	
152 kbit/s	6000 m
2320 kbit/s	2200 m
- 0.8 mm copper wire	
152 kbit/s	17000 m
2320 kbit/s	6300 m



NTX

iDSL modem with X.21 interface

- NTX is ISDN NT1 modem with U interface (2B+D), 64, 128, 144 kbit/s
- Enables connectivity of distant DTE devices with X.21 interface to telecommunication network, using existing access multiplexers FM2x2 or FM-MSAN with PIU-LT or PN64 tributary units
- Point to point connection of devices based on X.21 interface using single twisted pair transmission medium (NTX LT and NT mode)

Basic features

- One ISDN BRI U Line Termination (LT) or Network Termination (NT) interface with maximum user throughput of 144 kbit/s
- Single copper pair transmission by using 2B1Q line code with near end echo cancellation
- Automatic or manual Embedded Operation Channel management
- Accepts remote power supply provided by LT side
- One X.21 interface, contradirectional, DCE or DTE type for 64, 128 or 144 kbit/s transmission
- In DCE mode synchronization is on internal reference
- In DTE mode synchronization on X.21 S timing signal
- Management thought the PC Graphical User Interface based application via RS232 interface
- Front panel LED alarm and basic configuration status display
- Testing and performance facility
  - Built In Self Test
  - Local and Remote test loops.
  - Far End and Near End Block Error monitoring
- Desktop mountable case
- External (220/110V AC/unregulated 5V DC) or (-48 V DC/5V DC) adapter options

Applications

NTX is basic ISDN NT1 modem with U interface (2B+D). In modem version NTX enables connectivity of distant DTE devices with X.21 interface by using the existing telecommunication network. Access to the existing network could be realized by using Flexible Multiplexer FM2x2 or FM-MSAN through the proper tributary units like PIU-LT or PN64. In this particular application NTX is Network Terminating (NT) device while tributary unit performs ISDN BRA Line termination (LT). Line Termination side, PIU-LT cards, besides of all other LT functionality provides remote power for NTX devices.

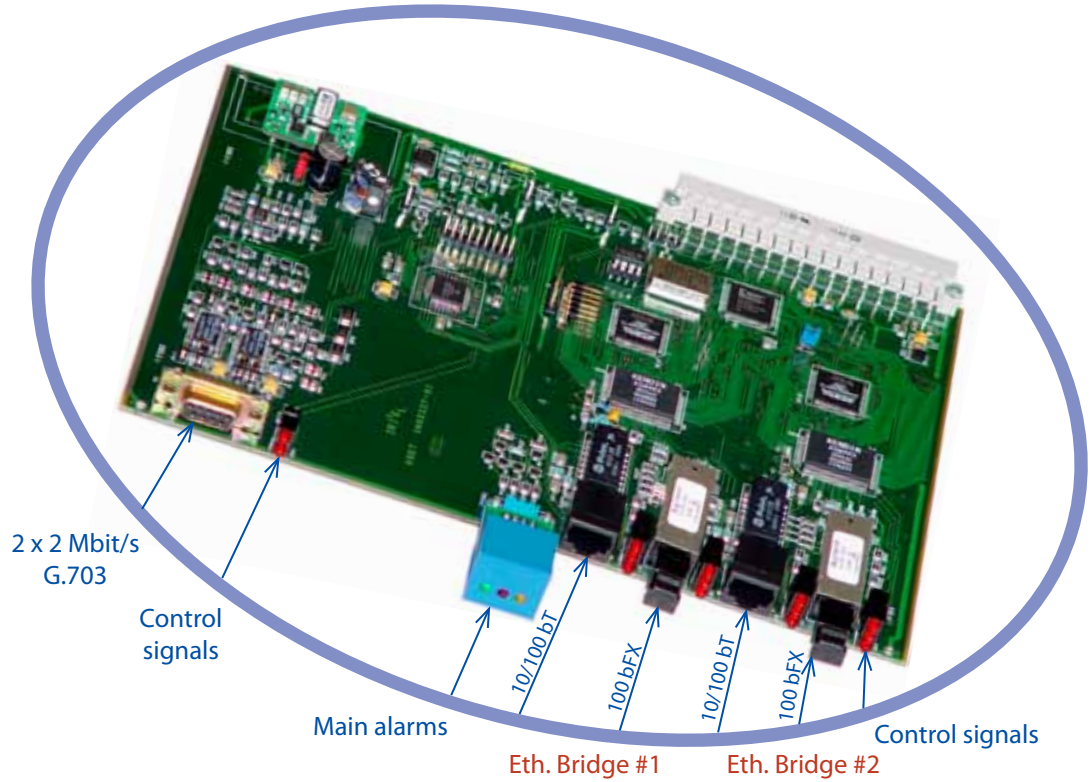
Another typical NTX devices application is bidirectional point to point connection by using single twisted pair transmission medium. Typically this configuration is suitable for direct routers connection in campus or other similar inter-building applications. In order to connect distant routers it is necessary to configure NTX device in one, for instance central or corporate site, in X.21 DCE and ISDN U LT mode. The other NTX, remote device, have to be configured as, X.21 DCE and ISDN U NT. In this case synchronization is obtained from internal reference at the ISDN U LT side; NT side is always synchronized to the peering LT device. Also by adding Remote Power Supply (RPS) device it is possible to power both NTX devices.

TECHNICAL DATA

ISDN U interface	ITU-T G.960, G.961
Transport type	duplex
Transport medium	one twisted-pair
Line code	2B1Q
Line speed	80 kboud ± 100 ppm
64kbit/s channels per interface	2,5
Maximum line attenuation	
at 40 kHz	36 dBm
at 80 kHz	45 dBm
Maximum line resistance	
without repeaters	1048 Ω
with repeaters	1300 + 700 Ω
Synchronization	
frame	1.5 ms
multiframe	12 ms
Scrambling	$1 + X^{-18} + X^{-23}$
CRC12	$X^{12} + X^{11} + X^3 + X + 1$
Remote power	105 V
RS232 interface	ITU-T V.24, V.28
X.21 interface	ITU-T X.21/27, V.11
Transport type	duplex
Transport medium	6 twisted-pair
Connector	15 pin SUBD female
Line rate	64, 128, 144 kbit/s
Maximum line length	
128 kbit/s	1300 m
Copper pair termination	
DCE Transmit (R, S, I)	120 Ω
DCE Receive (T, X, C)	120 Ω
Power	
External AC/DC adapter	220V ac/6V dc
Remote power supply	40-105 V
Power consumption	up to 1 W
Temperature	-5^0C to $+45^0$C
Dimensions	178 x 131.5 x 36 mm

KGET
TWO INTERFACE CONVERTORS
Ethernet over E1

- Two independent Ethernet E1 Bridge
- Provides connection of remote LAN networks with Ethernet 10/100 BaseTX or 100 BaseFX interface via telecommunication network with G.703, 2 Mbit/s interface
- Easy configuration
- Integrated control and monitoring, SUNCE-M



Applications

The main application of KGET Interface Convertor is to connect devices with Ethernet interface through telecommunication network. Any of two Interface Convertor realize Ethernet Bridge function or Switch function at layer 2.

Basic functions

- Two independent Interface Convertors on one unit.
- Any of two Interface Convertor realize Ethernet Bridge function with 2048 kbit/s maximum WAN interface capacity.
- At Ethernet side there are two ports: electrical 10/100 BaseTX interface and optical 100 BaseFX interface.
- Electrical Ethernet interfaces are half/full duplex with auto negotiation procedure which define the type of interface 10 or 100 Mbit/s.
- Interface Convertors are transparent for all higher order protocol (TCP-IP, XNS, ISO,...).
- VLAN can be configured for any port independently.
- Support for QoS priority choice according to the port or IEE802.1p
- Synchronization: local clock or external clock from received G.703 signal.
- Loop test possibility.
- Integrated control and monitoring using OLC unit.

TECHNICAL DATA

G.703 (2 Mbit/s)

Input

Signal type	2048 kbit/s ±50 ppm (HDB3)
Impedance	75 Ω/120 Ω
Cable attenuation	0 to 6 dB at 1024 kbit/s
Input jitter	according to ITU-T G.823
Reflection attenuation	according to ITU-T G.703/9.3

Output

Signal type	2048 kbit/s ±50 ppm (HDB3)
Impedance	75 Ω/120 Ω
Impulse level	2,37 V ±0,237 V, 75 Ω
	3 V ±0,3 V, 120 Ω
Impulse width	244 ns
Impulse shape	according to ITU-T 15/G.703
Output jitter	according to ITU-T G.823

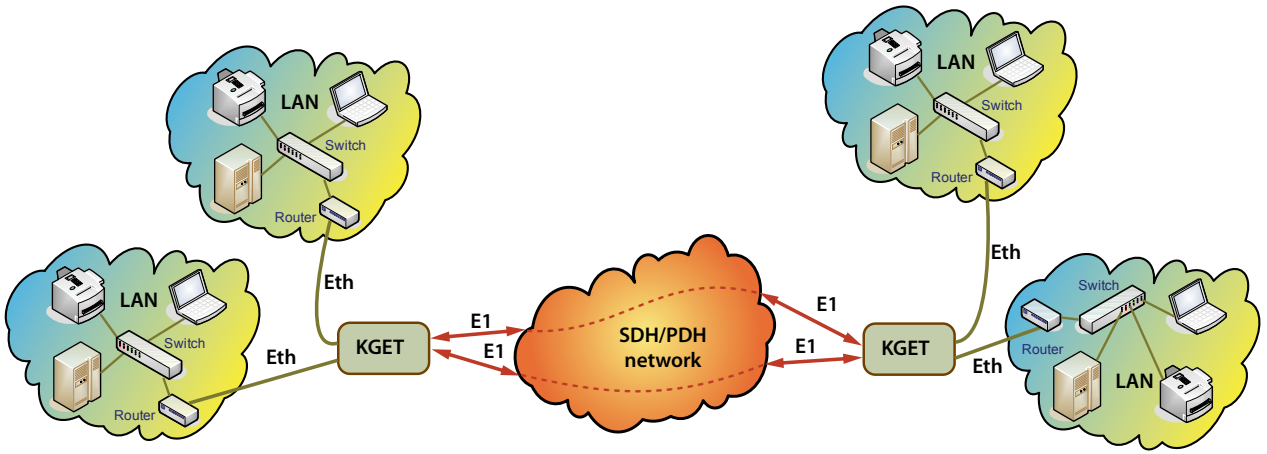
Ethernet 10-100 BaseTX

Transport type	duplex
Electrical characteristics	IEEE 802.3
Transmission	symmetrical
Section length (UTP cable class 5)	135 m
Connector	RJ45

Ethernet 100 BaseFX

SFP plug-in module

Transport type	duplex
Optical characteristics	IEEE 802.3
Transmission	singlemode optical fiber
Section length	2000 m
Connector	SC



KGET8

INTERFACE CONVERTOR

Ethernet over 8 x E1

- Provides connection of remote LAN networks with Ethernet 10/100 BaseTX or 100 BaseFX interface via telecommunication network with G.703, 2 Mbit/s interface
- Easy configuration
- Integrated control and monitoring, SUNCE-M

Applications

- Connection of remote LAN networks with Ethernet interface
- Connection of small capacity IP DSLAM to IP Switch
- IP DSLAM and IP Base station backup/backhaul
- Remote corporative networks LAN connection

Basic functions

- Enables connection of remote Ethernet networks with 8 x E1 links
- Broadband service based on Ethernet technology for existing TDM PDH and SDH network
- For TDM transmission maximum capacity of non framing E1 signal is used
- Interface Convertor realize Ethernet Bridge function with 8 x 2048 kbit/s maximum WAN interface capacity
- At Ethernet side there are two ports: electrical 10/100 BaseTX interface and optical 100 BaseFX interface
- Electrical Ethernet interfaces are half/full duplex with auto negotiation procedure which define the type of interface 10 or 100 Mbit/s
- Interface Convertors are transparent for all higher order protocol (TCP-IP, XNS, ISO,...)
- VLAN can be configured for any port independently
- Support for QoS priority choice according to the port or IEE802.1p
- Loop test and signal generation possibility
- Integrated control and monitoring using OLC or FMV unit.
- Card option ready to be used in standard ETSI or 19" shelves
- Stand alone, rack or desktop mounting options

TECHNICAL DATA

G.703 (2 Mbit/s)

Input

Signal type	2048 kbit/s ±50 ppm (HDB3)
Impedance	75 Ω/120 Ω
Cable attenuation	0 to 6 dB at 1024 kHz
Input jitter	according to ITU-T G.823
Reflection attenuation	according to ITU-T G.703/9.3

Output

Signal type	2048 kbit/s ±50 ppm (HDB3)
Impedance	75 Ω/120 Ω
Impulse level	2,37 V ±0,237 V, 75 Ω
	3 V ±0,3 V, 120 Ω
Impulse width	244 ns
Impulse shape	according to ITU-T 15/G.703
Output jitter	according to ITU-T G.823

Ethernet 10-100 BaseTX

Transport type	duplex
Electrical characteristics	IEEE 802.3
Transmission	symmetrical
Section length (UTP cable class 5)	up to135 m
Connector	RJ45

Ethernet 100 BaseFX

SFP plug-in module

Transport type	duplex
Optical characteristics	IEEE 802.3
Transmission	singlemode optical fiber
Section length	up to 2000 m
Connector	SC

Protocols

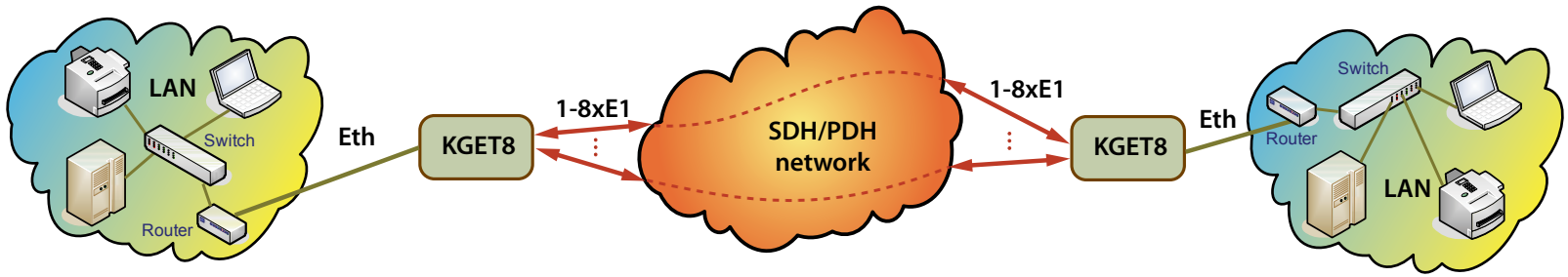
HDLC X.86/LAPS	ML-PPP
IEEE 802.1D	bridging
IEEE 802.1p	QoS
IEEE 802.1Q	VLAN

Power supply

48 Vdc or 220 Vac

Operating temperature range

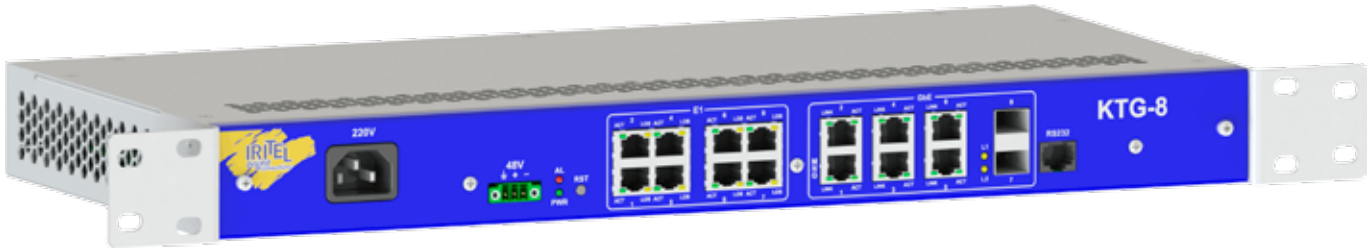
-5^{0} C up to $+45^{0}$ C (class 3.2)



KTG-X

TDM over IP & Ethernet switch

- TDMoIP: up to 8 E1/T1 interfaces
- Ethernet switch (L2):
  - 6 x 100/1000 Base-TX electrical Ethernet interfaces
  - 2 x 100 or 1000 Base-FX optical Ethernet interfaces
- Multiprotocol encapsulation supporting IPv4, IPv6, UDP, RTP, L2TPv3, MPLS and Metro Ethernet
- Compliant with IETF PWE3 Internet drafts for SAToP, CESoPSN, TDMoIP AAL1, HDLC, unframed, framed, with CAS frame
  (PCM frame and multi-frame)
- Recovered clock jitter and wander compliant with ITU-T G.823, G.824 and G.8261
- Supports adaptive clock recovery, differential clock (common clock) (using RTP)
- ToS support for IP level priority, VLAN 802.1p and 802.1Q support for MAC level priority
- Adding and extracting traffic on 100/1000 Mbit/s TX/FX interfaces
- Integrated Ethernet switch makes it modular device
- Power : 48VDC or optional 220VAC/48VDC (automatic switching)
- Management :
  - Embedded Web Server and SNMP Agent
  - EMS/NMS software SUNCE-O



Application

KTG-X is device for aggregation, integration and transmission packet (FE, GbE) and TDM (E1) traffic over IP/MPLS or OTN/DWDM network

- Transparent transmission of E1 links over IP/MPLS or OTN/DWDM network
- Transparent transmission of synchronization for base stations (E1, PTP1588)
- Transparent transmission of HDLC, GPON/EPON, CATV traffic

Basic Functions

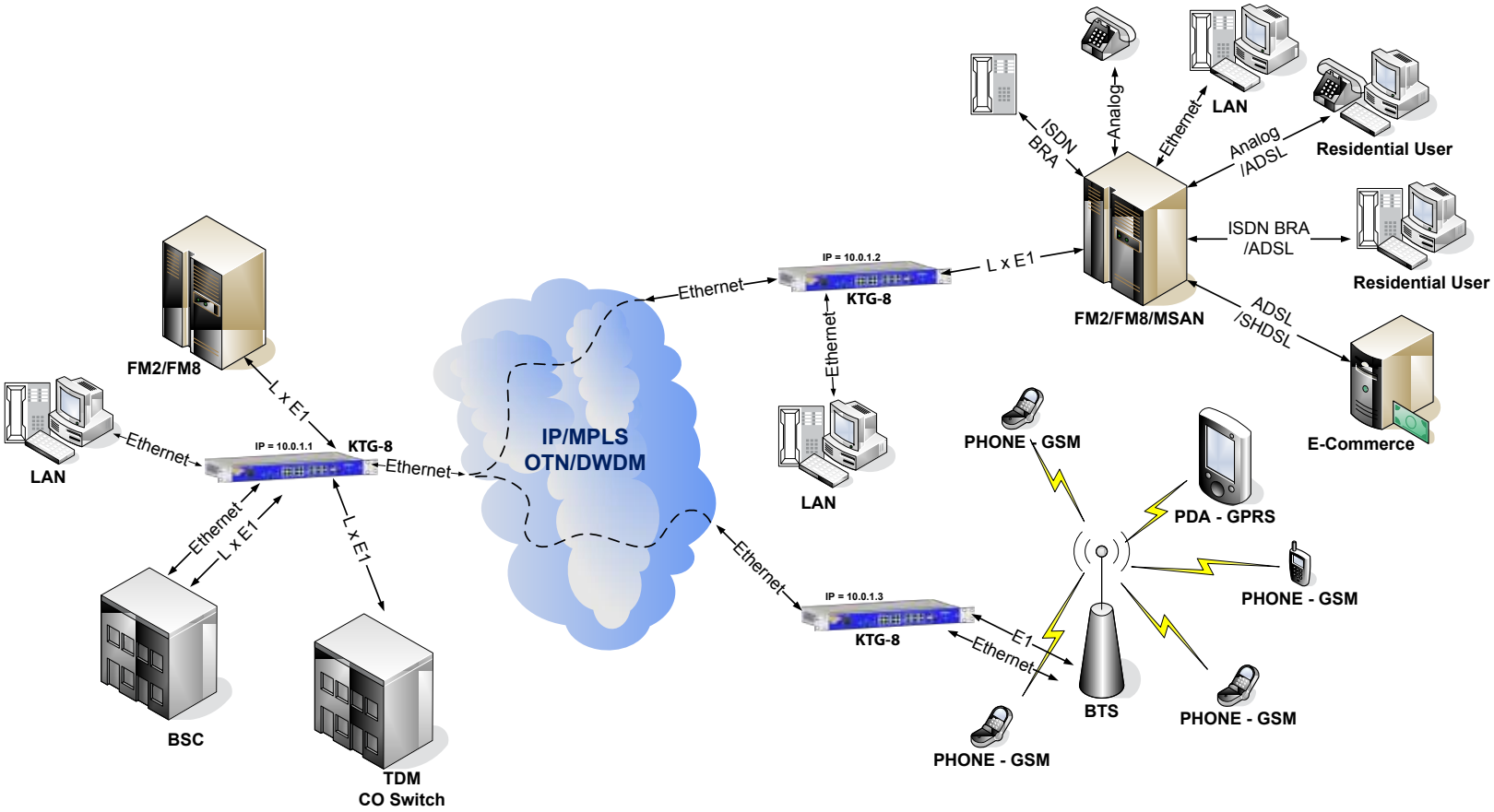
- DMoIP converter up to eight E1/T1 interfaces
- Ethernet switch (L2) with six 100/1000 Base-TX electrical Ethernet interfaces and two 100 or 1000 Base-FX optical Ethernet interfaces
  - 1 Uplink Ethernet 100/1000 Base-TX
  - 1 Add/Drop Uplink Ethernet 100/1000 Base-TX
  - 3 general purpose Ethernet 100/1000 Base-TX interfaces
  - 1 management (MNG) Ethernet 100/1000 Base-TX
  - 1 Uplink Ethernet 100/1000 Base-FX
  - 1 Add/Drop Uplink Ethernet 100/1000 Base-FX
- 1 local management RS232 interface (with RJ45 connector)
- Power consumption P = 10W

Ordering codes

KTG- X	-48VDC
KTG- X - AC	-48VDC/220VAC (automatic switching)

X - model:

4	- 4 x E1 over IP
8	- 8 x E1 over IP



KGET4/8/16

ETHERNET ACCESS INTERFACE CONVERTOR

Ethernet over up to 16x E1 with GFP, VCAT and LCAS

- Transparent Ethernet connection over existing TDM infrastructure
- Provides Ethernet connection over up to 16 E1
- GFP, VCAT and LCAS encapsulation and bonding for up to 16 groups
- QoS and SLA Support for Ethernet subscribers
- Feature rich diagnostics and fault management on all TDM and Ethernet ports
- Monitoring and Configuration via embedded Web Server and SNMP

Applications

- High Capacity Transparent Ethernet Service over existing PDH/SDH networks
- IP DSLAM, WiMAX and Mobile Base station backhaul
- Remote corporative networks LAN connection

Basic features

- KGET16 complies to the latest NG-PDH standards
- KGET16 provides transparency for all higher order protocols (TCP-IP, XNS, ISO,...)
- Generic Framing Procedure (GFP) enables efficient Ethernet packet encapsulation and TDM bandwidth utilization
- Virtual Concatenation (VCAT) provides flexible bandwidth allocation for different subscribers by bonding multiple E1 links into single virtual pipe
- Link Capacity Adjustment Scheme (LCAS) enables smooth virtual pipe capacity change, by adding or removing E1 links from the pipe, without traffic loss
- VLAN capabilities includes stacking and striping for both ingress and egress traffic for all ports independently thus keeping user VLAN settings unchanged. Management traffic can be isolated from user traffic with separate VLAN
- QoS support includes per port VLAN based priority or QoS based on IEE802.1p enabling fine traffic shaping in order to fulfill user requirements for delay sensitive real time voice or video applications
- KGET16 provides local port and in band capacity for remote management via embedded Web Server. For TMN purposes device provides SNMP agent
- E1 port test facility includes loop tests and signal generation and error measurements. All E1 ports under tests are excluded from VCAT LCAS groups thus preventing Ethernet loop storms.

TECHNICAL DATA

E1, G.703 (2 Mbit/s)

Number of ports	4, 8, 16
Connector	RJ45
Input	
Signal type	2048 kbit/s ±50 ppm (HDB3)
Impedance	75 Ω/120 Ω
Cable attenuation	0 to 6 dB at 1024 kHz
Input jitter	according to ITU-T G.823
Reflection attenuation	according to ITU-T G.703/9.3
Output	
Signal type	2048 kbit/s ±50 ppm (HDB3)
Impedance	75 Ω/120 Ω
Impulse level	2.37 V ±0.237 V, 75 Ω 3 V ±0,3 V, 120 Ω
Impulse width	244 ns
Impulse shape	according to ITU-T 15/G.703
Output jitter	according to ITU-T G.823

Ethernet 10-100 BaseTX

Number of ports	2, 4
Transport type	duplex
Electrical characteristics	IEEE 802.3
Transmission	symmetrical
Section length	(UTP cable class 5) up to135 m
Connector	RJ45

Ethernet 100 BaseFX SFP plug-in module

Number of ports	0, 2
Transport type	duplex
Optical characteristics	IEEE 802.3
Transmission	singlemode optical fiber
Section length	up to 2000 m
Connector	SC

Protocols

Encapsulation	GFP, G.7041 GFPoPDH, G.8040
Bonding	VCAT G7043 LCAS, G.7042
Delay Compensation	up to 250 ms

KGET4/8/16S

ETHERNET ACCESS INTERFACE CONVERTOR

Ethernet over up to 16x E1 with GFP, VCAT, LCAS and Encryption

- Transparent Ethernet connection over existing TDM infrastructure with built in AES Encryption
- Per E1 port configurable AES128/192/256 encryption module with flexible key and access management
- Provides Ethernet connection over up to 16 E1
- GFP, VCAT and LCAS encapsulation and bonding for up to 16 groups
- QoS and SLA Support for Ethernet subscribers
- Feature rich diagnostics and fault management on all TDM and Ethernet ports
- Monitoring and Configuration via embedded Web Server and SNMP

Applications

- Secured High Capacity Transparent Ethernet Service over existing PDH/SDH networks for government, financial and other institutions that requires secured data transmission over public telecommunication network.
- IP DSLAM, WiMAX and Mobile Base station backhaul for public and private users
- Secured remote corporative networks LAN connection

Basic features

- KGET16S complies to the latest NG-PDH standards
- KGET16S provides transparency for all higher order protocols (TCP-IP, XNS, ISO,...)
- Advanced Encryption Standard (AES) provides high confidence level of data security over public telecommunication network. Each E1 link at the device is possible to configure to perform data encryption with different key length, key management and key schedule. Encryption procedure includes key exchange, authentication and user data encryption. Each phase of encryption procedure uses their own key.
- Generic Framing Procedure (GFP) enables efficient Ethernet packet encapsulation and TDM bandwidth utilization
- Virtual Concatenation (VCAT) provides flexible bandwidth allocation for different subscribers by bonding multiple E1 links into single virtual pipe
- Link Capacity Adjustment Scheme (LCAS) enables smooth virtual pipe capacity change, by adding or removing E1 links from the pipe, without traffic loss
- VLAN capabilities includes stacking and striping for both ingress and egress traffic for all ports independently thus keeping user VLAN settings unchanged. Management traffic can be isolated from user traffic with separate VLAN
- QoS support includes per port VLAN based priority or QoS based on IEE802.1p enabling fine traffic shaping in order to fulfill user requirements for delay sensitive real time voice or video applications
- KGET16S provides local port and in band capacity for remote management via embedded Web Server. For TMN purposes device provides SNMP agent
- E1 port test facility includes loop tests and signal generation and error measurements. All E1 ports under tests are excluded from VCAT LCAS groups thus preventing Ethernet loop storms

TECHNICAL DATA

E1, G.703 (2 Mbit/s)

Number of ports	4,8,16
Connector	RJ45
Input	
Signal type	2048 kbit/s ±50 ppm (HDB3)
Impedance	75 Ω/120 Ω
Cable attenuation	0 to 6 dB at 1024 kHz
Input jitter	according to ITU-T G.823
Reflection attenuation	according to ITU-T G.703/9.3
Output	
Signal type	2048 kbit/s ±50 ppm (HDB3)
Impedance	75 Ω/120 Ω
Impulse level	2.37 V ±0.237 V, 75 Ω 3 V ±0,3 V, 120 Ω
Impulse width	244 ns
Impulse shape	according to ITU-T 15/G.703
Output jitter	according to ITU-T G.823

Ethernet 10-100 BaseTX

Number of ports	2,4
Transport type	duplex
Electrical characteristics	IEEE 802.3
Transmission	symmetrical
Section length	(UTP cable class 5) up to135 m
Connector	RJ45

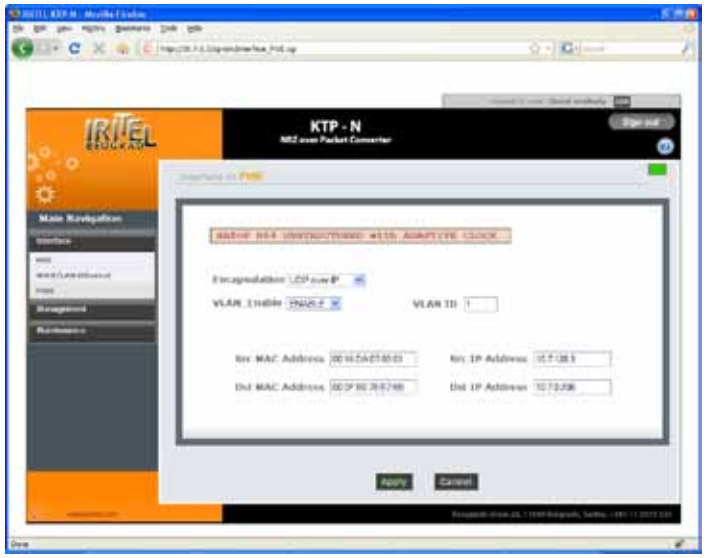
Ethernet 100 BaseFX SFP plug-in module

Number of ports	0,2
Transport type	duplex
Optical characteristics	IEEE 802.3
Transmission	singlemode optical fiber
Section length	up to 2000 m
Connector	SC

Protocols

Encapsulation	GFP, G.7041 GFPoPDH, G.8040
Bonding	VCAT G7043 LCAS, G.7042
Delay Compensation	up to 250 ms
AES	NIST, FIPS197

KTP
INTERFACE CONVERTOR SERIES
TDM over IP



- Performs TDM circuit emulation over enterprise or carrier packet-switched Ethernet L2/L3 networks for different types of user interfaces
- At the Ethernet line side supports both electrical Fast and optical 100 FX Ethernet interface
- Multiprotocol encapsulation supporting IPv4, IPv6, UDP, RTP, L2TPv3, MPLS and Metro Ethernet.
- Compliant with IETF, ITU-T, MFA Forum and Metro Ethernet Forum Technical Specifications
- Recovered clock jitter and wander compliant to ITU-T G.823, G.824. Supports adaptive clock recovery, differential clock (common clock) (using RTP)
- Lost/misordered packet compensation
- Embedded Web Server and SNMP Agent
- Optional AES 128/192/256 Encryption of TDM Stream

Applications

KTP devices performes TDM circuit emulation over packet switched network thus enabling transparent TDM services over enterprise or carrier Ethernet network.

Besides TDM traffic transmission over IP based networks KTP provides many value-added functions in order to meet different customers needs including different network management capabilities, traffic protection, synchronization etc.

- In carrier network KTP typically finds applications for:
  - TDM services over Ethernet MAN, broadband wireless, CATV
  - 2G / 2.5G cellular backhaul over IP/MPLS
  - HDLC-based traffic (ex. Frame Relay) trunking over IP/MPLS
  - PSTN-IP network bridging
  - SS7 transport over IP
- In enterprise applications KTP is suitable to be used for:
  - Private line/toll bypass via Ethernet MAN
  - TDM PBX migration to Ethernet MAN
- In access networks KTP typically finds application as Multi Tenant Multi Dwelling Unit MTU/MDU

Basic functions

- Broad range of, framed or unframed, PDH tributary interfaces
- One 10/100 electrical and one 100 optical Ethernet interface
- Multiprotocol encapsulation supporting IPv4, IPv6, UDP, RTP, L2TPv3, MPLS and Metro Ethernet
- Recovered clock jitter and wander compliant to ITU-T G.823, G.824 synchronization interface
- Lost/misordered packet compensation
- Compliant with:
  - IETF PWE3 Internet drafts for SAToP, TDMoIP, CESoPSN, HDLC
  - ITU-T Recommendations Y.1413 and Y.1414 (clause 10) Y.1453, Y.1452.
  - MFA Forum Implementation Agreements 4.1, 5.1 and 8.0.0
  - Metro Ethernet Forum Technical Specification MEF8
- Supports adaptive clock recovery, differential clock (common clock) (using RTP)
- Embedded Web Server and SNMP Agent

Ordering codes

KTP-*I*-*P*-*S*

I - interface:

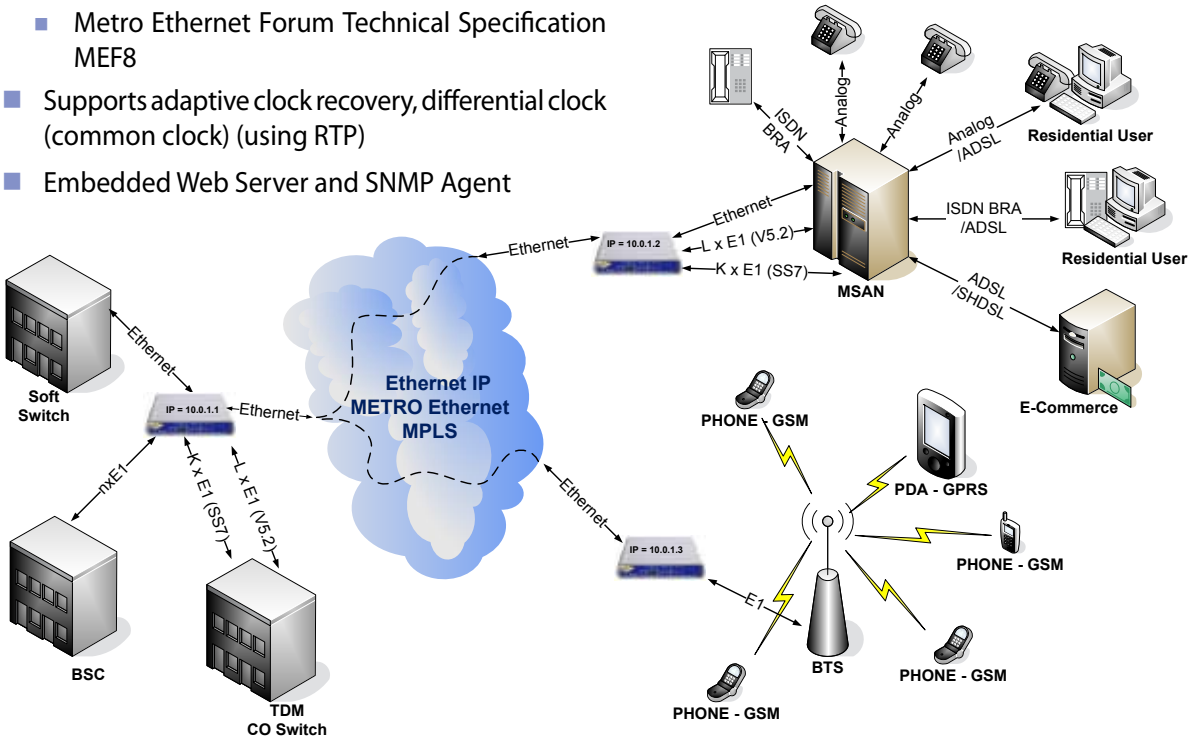
X	- X21/V.11 codirectional or contradirectional n x 64 kbit/s over IP
V	- V.35
N	- NRZ, NATO, 75 Ω, n x 64 kbit/s over IP
E1	- E1 over IP
2E1	- 2 x E1 over IP
4E1	- 4 x E1 over IP
E3	- E3 over IP

P - power option:

D	- 48 Vdc desktop unit
N	- 220 Vac with external AC/DC adapter
R	- card - rack version

S -encryption option:

␣	- no encryption
S	- with encryption



KTG
INTERFACE CONVERTOR SERIES
TDM over IP

- Performs TDM circuit emulation over enterprise or carrier packet-switched 1G Ethernet L2/L3 networks for different types of user interfaces
- At the Ethernet line side supports one 10/100 BaseTx, one 100 BaseFx, two 1000 BaseT and one 1000 BaseX Ethernet interfaces
- Multiprotocol encapsulation supporting IPv4, IPv6, UDP, RTP, L2TPv3, MPLS and Metro Ethernet.
- Compliant with IETF, ITU-T, MFA Forum and Metro Ethernet Forum Technical Specifications
- Recovered clock jitter and wander compliant to ITU-T G.823, G.824. Supports adaptive clock recovery, differential clock (common clock) (using RTP)
- ToS support for IP level priority, VLAN 802.1p and 802.1Q support for MAC level priority
- Lost/misordered packet compensation
- Embedded Web Server and SNMP Agent
- Optional AES 128/192/256 Encryption of TDM Stream

Applications

KTG devices performes TDM circuit emulation over packet switched network thus enabling transparent TDM services over enterprise or carrier Ethernet network.

Besides TDM traffic transmission over IP based networks KTP provides many value-added functions in order to meet different customers needs including different network management capabilities, traffic protection, synchronization etc.

- In carrier network KTG typically finds applications for:
  - TDM services over Ethernet MAN, broadband wireless, CATV
  - 2G / 2.5G cellular backhaul over IP/MPLS
  - HDLC-based traffic (ex. Frame Relay) trunking over IP/MPLS
  - PSTN-IP network bridging
  - SS7 transport over IP
- In enterprise applications KTG is suitable to be used for:
  - Private line/toll bypass via Ethernet MAN
  - TDM PBX migration to Ethernet MAN
- In access networks KTP typically finds application as Multi Tenant Multi Dwelling Unit MTU/MDU

Basic functions

- Broad range of, framed or unframed, PDH tributary interfaces
- One electrical Fast Ethernet 10/100 BaseTx and one optical Fast Ethernet 100 BaseFx interfaces, two 1G electrical and one 1G optical Ethernet interfaces
- Multiprotocol encapsulation supporting IPv4, IPv6, UDP, RTP, L2TPv3, MPLS and Metro Ethernet
- Recovered clock jitter and wander compliant to ITU-T G.823, G.824 synchronization interface
- Lost/misordered packet compensation
- Compliant with:
  - IETF PWE3 Internet drafts for SAToP, TDMoIP, CESoPSN, HDLC
  - ITU-T Recommendations Y.1413 and Y.1414 (clause 10) Y.1453, Y.1452.
  - MFA Forum Implementation Agreements 4.1, 5.1 and 8.0.0
  - Metro Ethernet Forum Technical Specification MEF8
- Supports adaptive clock recovery, differential clock (common clock) (using RTP)
- Embedded Web Server and SNMP Agent

Ordering codes

KTG- *I* **-** *P* **-** *S*

I - interface:

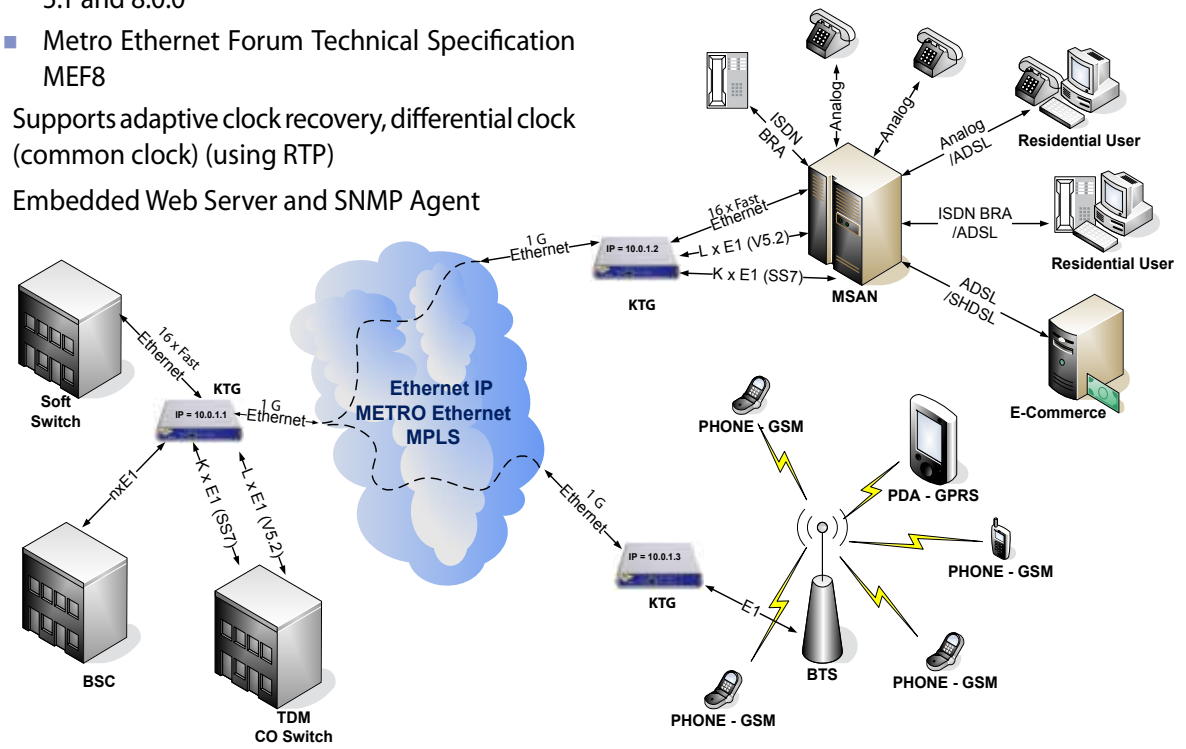
X	- X21/V.11 codirectional or contradirectional n x 64 kbit/s over IP
V	- V.35
N	- NRZ, NATO, 75 Ω, n x 64 kbit/s over IP
E1	- E1 over IP
2E1	- 2 x E1 over IP
4E1	- 4 x E1 over IP
E3	- E3 over IP

P - power option:

D	- 48 Vdc desktop unit
N	- 220 Vac with external AC/DC adapter
R	- card - rack version

S -encryption option:

␣	- no encryption
S	- with encryption



GMC-2U

Unmanaged Gigabit SFP Media Converter

- Configurable Link-Fault-Pass-Through and fiber auto/force mode
- 8192 MAC addresses
- Supports 802.3/802.3u/802.3ab/802.3z/802.3x. Auto-negotiation and Auto MDI/MDIX.
- Full wire-speed forwarding rate
- Supports 10k Jumbo packet size
- Suitable for traffic control and industrial applications in hazardous environment

Introduction

IRITEL GMC-2U Hardened SFP Media Converter provides solution for rugged environments, transportation road-side cabinets, industrial shop floors, multi tenant dwellings or Fiber To The Home (FTTH) applications. Capable of operating at temperature extremes of -20°C to +60°C, this is by far the media converter of choice for harsh environments in which space constraints exist.

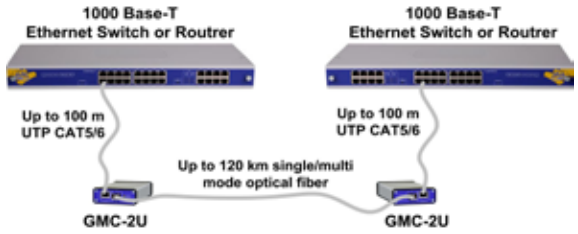
Plug-and-Play Solution:

The hardened media converter is a plug-and-play compact media converter which doesn't have any complicated software to set up.

Applications

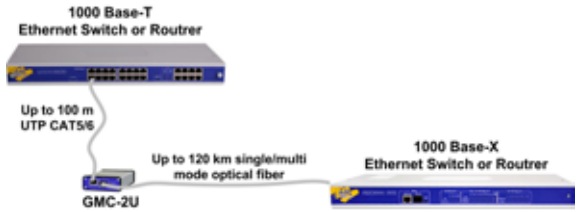
- Network distance extension

  Extend the network distance between two twisted pair Gigabit Switches and/or a Gigabit File Servers with 1000 Base-T interfaces.



- Fiber Mode-Conditioning

  Gigabit Fiber Mode-Conditioning and/or extend the network distance between two twisted pair Gigabit Switches and optical Gigabit Switches/File Servers.



Technical data

Connecting Ethernet Ports

- Connect copper port
  - Plug RJ-45 jack
- Connect optical port
  - Use SFP transceivers supplied by IRITEL or other manufacturers of MSA compliant SFPs.
  - Insert 1G SFP module into the cage.
  - Plug optical connector into the SFP.

Supports Desktop, DIN-Rail, Panel, or Rack Mounting installation

Specifications

Applicable Standards		IEEE 802.3 10Base-T
		IEEE 802.3u 10Base-TX
		IEEE 802.3ab 1000Base-T
		IEEE 802.3z 1000Base-SX/ LX/ BX
Fixed Ports		One copper port, one fiber port
Speed	10Base-T	10/20Mbps for half/full-duplex
	10Base-TX	100/200Mbps for half/full-duplex
	1000Base-T	2000Mbps for full-duplex
	1000Base-SX/LX/BX	2000Mbps for full-duplex
Cable 1000Base-T		4-pair UTP/STP Cat. 5 up to 100m
Fiber 1000Base-X	Multi mode	50 or 62.5μm
	Single mode	9 or 10μm
LED Indicators	Per unit	Power Good (PG)
	Fiber port	Link and Activity (LINK/ACT)
	Copper port	Link and Activity (LINK/ACT)
		Speed 10/100/1G (SPEED)
Dimensions	Width	78mm
	Depth	27mm
	Height	120mm
Weight		220.5 gr
Power	DC Jack	5VDC, External AC/DC reqired
	Max. Current	0.88A
Power Consumption		3W
Operating Temperature		-20°C ~ 60°C
Storage Temperature		-40°C ~ 85°C
Humidity		5 ~ 95%, non-condensing

KFE
INTERFACE CONVERTOR SERIES
Ethernet over TDM

- Ethernet over TDM Bridge
- Provides connection of remote LAN networks with Ethernet 10/100 BaseTX or 100 BaseFX interface via PDH/SDH telecommunication network
- Different TDM interface support:
  - G.703, E1, E3, DS-3, OC-3, V.11, V.35, NRZ
  - SHDSL, SHDSL.bis compliant to EFM applications
- Embedded Web Server and SNMP Agent
- Optional AES 128/192/256 Encryption of TDM Stream

Applications

KFE devices enables connectivity of different equipment with Ethernet interface by utilizing existing TDM or copper infrastructure.

Interface converter KFE basically performs L2 (layer 2) Ethernet Bridge/Switch functionality thus making them transparent for all higher layer protocols.

KFE devices in both, public and private networks, typically find applications for:

- Remote LAN segments connection
  - Campus
  - Corporate
  - Interbuilding
- Subscriber connection to Internet Service Provider
  - ISP hosting
- Remote terminal connections.
  - Point of Sell, POS, and info terminals
  - Automated Teller Machine (ATM)
  - Electronic payment systems, parking, pay tool…
- Remote video surveillance
  - Schools, universities
  - Stadiums or sport arenas
  - Cultural and other public institutions, museums,
  - Galleries
  - Warehouses, shopping centres
- Process control in private in public utility companies
  - Railway
  - Distribution and transmission of electricity
  - Oil and gas utilities
- For traffic control at
  - Big junctions, crossroads
  - Bridges and tunnels
  - Crowded roads
  - Highways
- In special systems requiring data encryption
  - Army
  - Police
  - Government institutions and agencies

Basic functions

- Enable transparent Ethernet service over TDM/copper infrastructure
- At Ethernet side there are two ports: electrical 10/100 BaseTX interface and optical 100 BaseF interface
- Electrical Ethernet interfaces are half/full duplex with auto negotiation procedure which define the type of interface 10 or 100 Mbit/s
- Interface Convertors are transparent for all higher order protocol (TCP-IP, XNS, ISO,...)
- VLAN can be configured for any port independently
- Support for QoS priority choice according to the port or IEE802.1p
- Synchronization: local clock or external clock from received signal
- Optional AES 128/192/256 Encryption of TDM Stream
- Loop test possibility

Ordering codes

KFE-*I*-*P*-*S*

I - interface:

X	- Ethernet over X21/V.11 codirectional or contradirectional n x 64 kbit/s
V	- V.35
N	- Ethernet over NRZ, NATO, 75 Ω, n x 64 kbit/s
E1	- Ethernet over E1
E3	- Ethernet over E3
2E3	- Ethernet over 2 x E3
S1	- Ethernet over one copper pair
S2	- Ethernet over 2 copper pairs
S4	- Ethernet over 4 copper pairs

P - power option:

D	- 48 Vdc with external DC/DC adapter
N	- 220 Vac with external AC/DC adapter
R	- card - rack version

S -encryption option:

	- no encryption
S	- with encryption

KG

Universal TDM, E1 interface converter platform, fractional multiplexer, cross connect device with exchangeable user interface module and optional built-in AES encryption

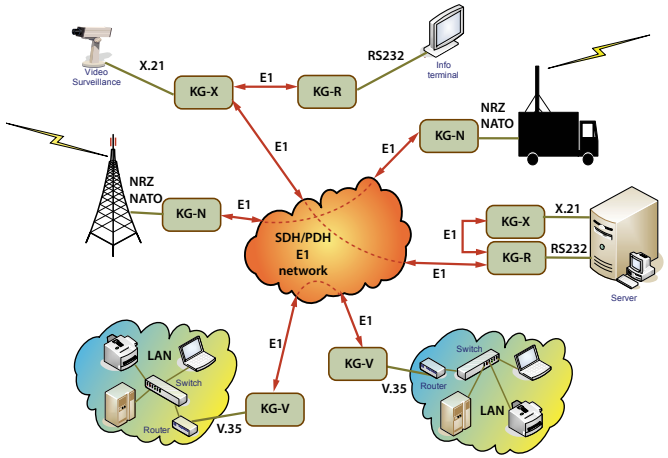
- Device enables user to connect their equipment over exchangeable user interface module via TDM E1 based telecommunication network
- Built in non blocking cross connect enables easy and cost effective add-drop of user interface traffic over spare, non used, E1 time slots with minimum delay including CAS signalling
- Basic Features:
  - 2 E1 framed or non framed interfaces.
  - 1 factory exchangeable user interface module with different number and/or interface types
  - Non blocking cross connect between E1 links and user interface modules including CAS signaling, where applicable
- Different user interface modules with: X.21/V11, V.35, NRZ/NATO, RS232 synchronous and asynchronous interfaces
- Embedded Web server for local managamnet
- Embedded SNMP agent for TMN application
- Optional AES 128/192/256 encryption of user interface data

Application

KG Series Interface Converter is usually used for connecting different devices through a transport TDM digital network that is based on the E1 interface.

In public and private telecommunication networks KG Series typically finds application for:

- Connecting remote LAN segments
- Connecting users to ISP
- Connecting remote terminals
- Remote video surveillance
- Industrial process control.
- Traffic control.
- SCADA systems
- In special service networks which requires data encryption.



Basic features

- The device convert user signal from removable interface modules to E1 signal in one of two E1 network interfaces and vice versa
- E1 links can be configured to work in framed and unframed mode
- Maximum conversion speed in unframed mode is 2048 kbit/s
- In framed mode it is possible to perform the capacity allocation of user signal from removable module to one of the E1 network interface in 64 kbit/s steps
- Unassigned capacity of E1 link can be mutually cross-connect or unlocated E1 link can be used as a protection link (1+1)
- Advanced fault diagnosis (loop test, integrated BER tester) of E1 and user interfaces
- The device can be synchronized from received E1, external reference or from received signal of user (synchronous serial) interface
- Control of remote devices in framed mode; allocating appropriate capacity of E1 signal to the system for centralized monitoring
- Content from the user interface can be encrypt or decrypt before mapping to the desired E1 direction
- The desktop version of the device can be used independently as an interface converter
- In board version of the device can be used as an independent interface converter, or as a part of fractional multiplexer, which in itself combines multiple interface converters with an appropriate user interfaces
- Centralized monitoring and supervision based on the standard packet protocols, SNMP, HTTP, ICMP...

Ordering codes

KG-*I*-P-*S*

I - **Digital Interface:**

E	– Ethernet
X	– X.21 codirectional or contradirectional
V	– V.35
R/2R	– 1/2 x RSR232 asynchronous and synchronous
N	– NRZ/NATO, 75/50 Ω
C/2C	– 1/2 x G.703 codirectional
DIO	– 8 digital inputs / outputs

- **Analog interfaces**:

FXS	– analog telephone, user side
FXO	– analog telephone, exchange side
E&M	– 2w/4w analog exchange side
AIO	– 8 analog inputs / outputs

P - **Power Option**

D	– 48 Vdc with external DC/DC adapter
N	– 220 Vac with external AC/DC adapter
R	– card - rack version

S - **Encryption Option**

	– no encryption
S	– with encryption

SMH884 - FPX

High Performance, 20 port, PoE enabled L2/L3 Fully Managed Ethernet Switch with Fast Hardware based Failover on Optical Links

- Provides 8 electrical Ethernet 10/100 BaseTX, 8 electrical PoE 10/100 BaseTX and 4 Optical SFP 100 BaseFX interfaces
- Provides up to 125 W of power and automatic sensing and power consumption classification for 8 remotely powered devices (PD), 15.4 W per port
- Optical SFP 100 BaseFX interfaces can be configured to work in pure hardware controlled, 1+1 protection mode, thus enabling fast, less than 50 ms, traffic restoration
- Compliant with IEE802.3, IEE802.3u and IEE802.3af standards
- Performs wire speed Ethernet Switching function between all user ports, Ethernet 10/100 BaseTX and 100 BaseFX
- Traffic protection through STP, RSTP and MSTP protocol
- Class of service (CoS) with 4-level priority queuing
- Full duplex, Half duplex Flow Control

- Automatic address learning, address aging and address migration
- Static MAC address filtering, MAC address management
- Up to 12 K MAC address space (different MAC addresses)
- Storm control, broadcast and multicast flooding
- GARP VLAN registration protocol (GVRP)
- Port trunking support, Link Aggregation Group (LAG)
- Software/Firmware field upgrade support, gold configuration backup and restore
- SNMP1/2 based network management interface
- Management thought Embedded Web Server accessible via standard WEB browser
- User name and password based security
- 19" Rack and Desktop mountable metal housing, IP30 protection
- Rear access to all user connectors, LED indication at front panel of device
- External input and output alarm contacts
- Extended temperature and tropicalized interior against excessive humidity
- Redundant DC 48V power supply option

Description

IRITEL SMH884-FPX is hardened, 20 port, fully Managed, Power over Ethernet (PoE) enabled, High Performance Ethernet L2/L3 Switch designed to operate in harsh environments.

TECHNICAL DATA

Ethernet Interface

According to IEEE 802.3 Ethernet 10/100Base-TX:

Interface type	duplex
Electrical characteristics	IEEE 802.3
Transfer	symmetrical
Range(UTP CAT5)	135 m
Isolation	1500 Vrms/50Hz/60s according to IEC EN 60950
Connector	standard RJ45

Power over Ethernet:

Power delivery mode	Mode A, phantom
Power range	Type 1
Maximum delivered power	15.40 W
Maximum power at PD	12.95 W
Maximum current	350 mA
Maximum cable resistance (CAT 3	20 Ω
Voltage Range	44 - 57 V

Ethernet 10/100Base-FX:

Transport type	duplex
Electrical characteristics	IEEE 802.3
Transport medium	single mode optical fiber multimode fiber (option)

Optical SFP Ethernet interfaces

SFP Plug in Tranceiver Type 1	OI.S1A1
Connector type	LC
Transmitter type	1310 nm FPLD
Output power	-15 to -8 dBm
Maximum spectral width of the optical tranceiver	7.7 nm (RMS)
Receiver type	PINFET
Guaranteed sensitivity of the optical receiver	Max -28 dBm
Optical budget	14 dB
Maximum level of the input signal	Min -8 dBm
Section length	15 km
SFP Plug in Tranceiver Type 2	OI.S1A
Connector type	LC
Transmitter type	1310 nm FPLD
Output power	-5 to 0 dBm
Maximum spectral width of the optical tranceiver	4 nm (RMS)
Receiver type	PINFET
Guaranteed sensitivity of the optical receiver	Max -34 dBm
Optical budget	29 dB
Maximum level of the input signal	Min -10 dBm
Section length	40 km

Alarm Interface

Input	
Activation current	5 mA
Maximum current	30 mA
Maximum voltage	70 V
Output	
Maximum current	0.5 A
Type	Relay
Maximum voltage	110 V

Power

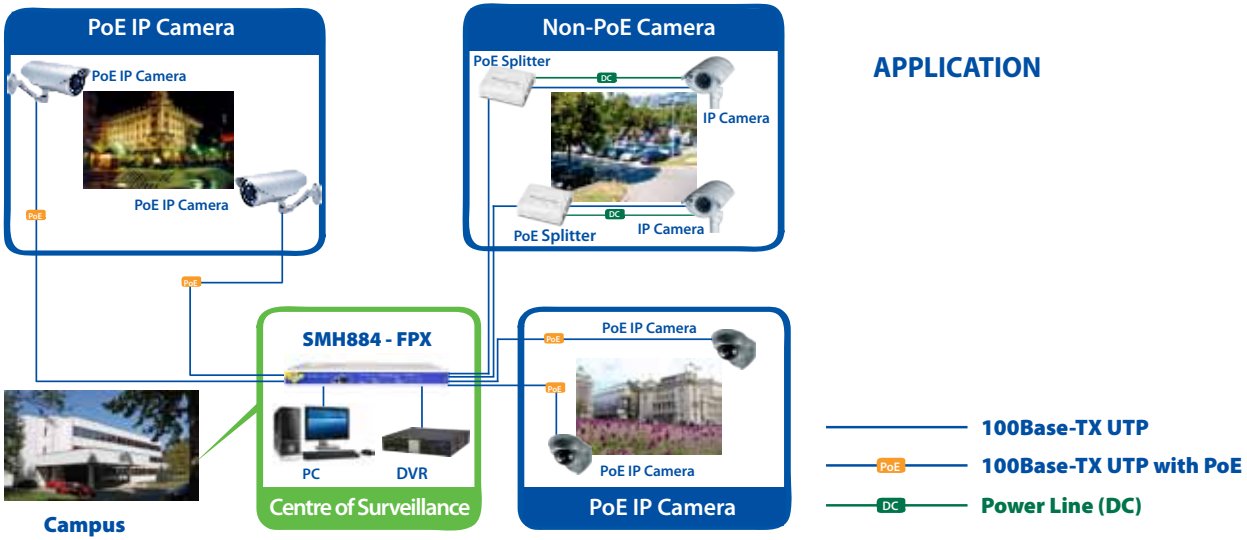
DC Power Supply	without PoE 48V (40 ~ 72V) with PoE IEEE 802.af, 48V (45 ~ 57V)
Dissipation (PoE not included)	up to 12 W

Environment conditions

Extended operation class	
Temperature	- 25º to +60º C
Relative Humidity	5-95% (non condensing)

System Configuration

1U Metal Case Dimension	440 mm x 257 mm x 43.2 mm (17.32" x 10.11" x 1.70")
Case Weight	3.15 kg



PoE24S-2F

High Performance, L2/L3 Fully Managed Gigabit Ethernet Switch, 24 PoE 10/100/1000 BaseTX 2 Optical 100 BaseFX or 1000 BaseX

- Provides 24 electrical PoE 10/100/1000 BaseTX and 2 Optical SFP 100 BaseFX or 1000 BaseX interface
- Provides up to 375 W of power and automatic sensing and power consumption classification for 24 remotely powered devices (PD), 15.4 W per port
- Compliant with IEEE802.3, IEEE802.3u and IEEE802.3af standards
- Performs wire speed Ethernet Switching function between all user ports, Ethernet 10/100/1000 BaseTX and 100 BaseFX or 1000 BaseX
- Traffic protection through STP (Spanning Tree Protocol)
- Quality of service (QoS) support with four traffic classes
- Full duplex, Half duplex, Flow Control
- Automatic address learning, address aging and address migration
- Support for up to 8K MAC address entries with automatic learning and aging
- Egress tagging/untagging selectable per port or by 802.1Q VLAN ID
- Port based VLANs supperted in any combination across multiple chips
- Port trunking support
- Software/Firmware field upgrade support, gold configuration backup and restore
- Network management system SUNCE
- SNMP v1/v2/v3 based network management Interface
- Management thought Embedded Web Server accessible via standard WEB browser
- User name and password based security
- 19" Rack and Desktop mountable metal housing, IP30 protection
- Front access to all user connectors, LED indication at front panel of device
- Extended temperature and tropicalized interior against excessive humidity
- Internal power supply, -48V DC or 220 V AC (option)

Description

IRITEL PoE24S-2F is hardened, 26 ports, Gigabit Ethernet Switch, allowing transparent connectivity to PoE devices, including any IEEE802.3af-compliant end device. Ethernet Switch designed to operate in harsh environments.

TECHNICAL DATA

Ethernet Interface

According to IEEE 802.3
Ethernet 10/100/1000 BaseTX:

Interface type	duplex
Electrical characteristics	IEEE 802.3
Transfer	symmetrical
Range(UTP CAT5)	100 m
Isolation	1500 Vrms/50Hz/60s according to IEC EN 60950
Connector	standard RJ45

Power over Ethernet:

Power delivery mode	Mode A, phantom
Power range	Type 1
Maximum delivered power	15.40 W
Maximum power at PD	12.95 W
Maximum current	350 mA
Maximum cable resistance (CAT 3)	20 Ω
Voltage Range	44 - 57 V

Ethernet 100 BaseFX, 1000 BaseFX:

Transport type	duplex
Electrical characteristics	IEEE 802.3
Transport medium	single mode optical fiber multimode fiber (option)

Optical SFP Ethernet interfaces 1000 BaseFX

SFP Plug in Tranceiver Type 1	OI.GbE-AS
Connector type	LC
Transmitter type	1310 nm MQW FPLD
Output power	-10 to -3 dBm
Maximum spectral width of the optical tranceiver	2.8 nm (RMS)
Receiver type	PINFET
Guaranteed sensitivity of the optical receiver	Max -22 dBm
Maximum level of the input signal	-3 dBm
Section length	10 km
SFP Plug in Tranceiver Type 2	OI.GbE-A
Connector type	LC
Transmitter type	1310 nm DFPLD
Output power	-3 to +2 dBm
Maximum spectral width of the optical tranceiver	1 (-20 dB)
Receiver type	PINFET
Guaranteed sensitivity of the optical receiver	Max -22 dBm
Maximum level of the input signal	-3 dBm
Section length	40 km

Power

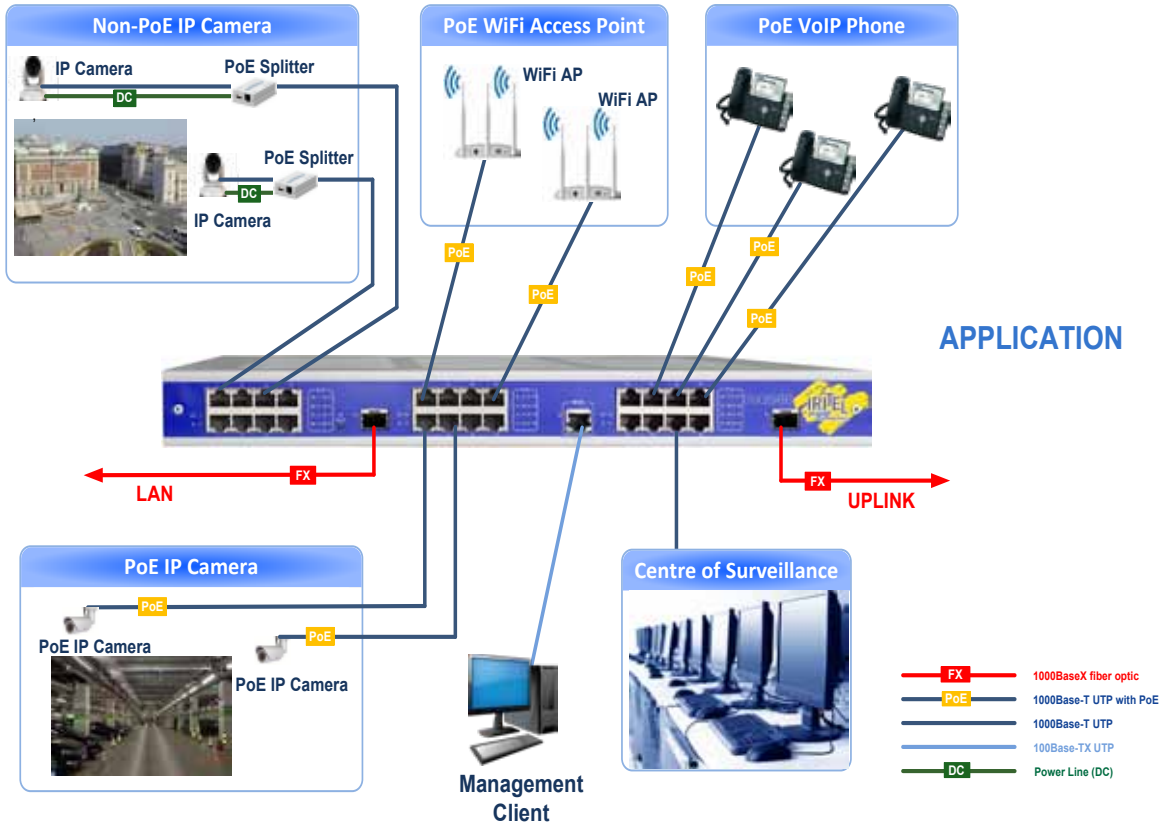
DC Power Supply	without PoE 48V (40 ~ 72V) with PoE IEEE 802.af, 48V (45 ~ 57V)
Dissipation (PoE not included)	up to 55 W

Environment conditions

Extended operation class	
Temperature	- 25º to +60º C
Relative Humidity	5-95% (non condensing)

System Configuration

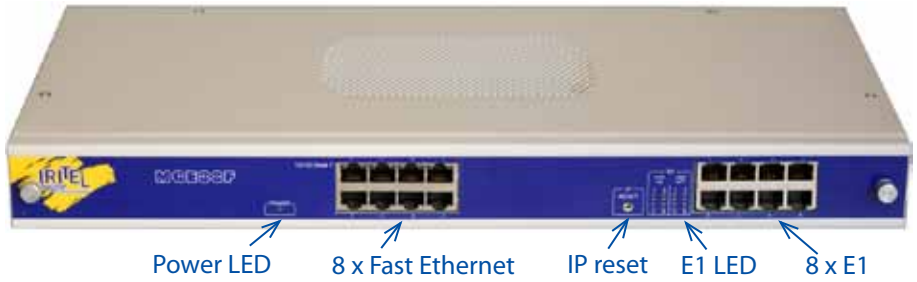
1U Metal Case Dimension	440 mm x 210 mm x 45 mm (17.32" x 8.27" x 1.77")
Case Weight	2.85 kg

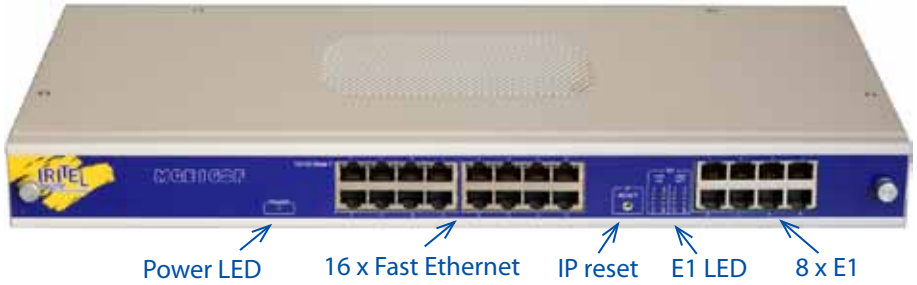


MGE41/84/88/168F

L2/L3 Managed Ethernet Switch with 16 x FE and 8 x E1 media converters

- Compliant with IEEE802.3, IEEE802.3u standards
- Up to16 10/100 Mbit/s Auto-Negotiation RJ45 ports supporting Auto-MDI/MDX
- Up to 8xE1 2048 kbit/s ITU-T G.703 ports with EoE1 media converters, HDCL encapsulation
- Port-Based VLAN and IEEE 802.1Q tag VLAN





- Static MAC address and filtering MAC address management
- Static Port Priority and IEEE 802.1p Class of Service (CoS) with 4-level priority queuing
- Firmware upgrade, gold configuration backed up and restored
- Rack/Desktop - mountable case options
- Management through Embedded Web Server (EWS) which can be accessed via WEB browser
- GARP VLAN Registration Protocol (GVRP)
- Storm control, broadcast and multicast flooding
- Per port ingress and egress rate control
- STP, RSTP, MSTP
- Trunking, Link Aggregation Group (LAG)
- Test facilities, Virtual cable tester and PRBS BIST
- Internal power supply, -48 Vdc or 220 Vac option

Description

IRITEL MGExxxF series of High performance Managed Ethernet Switching devices besides of the true Ethernet access, offers versatile combination of user interfaces integrated together with media converters, thus reducing the need for external media converters.

Application

MGExxxF devices provides edge connectivity utilizing existing E1 and copper infrastructure, applicable in midsized and large scaled campus, corporate and metro access networks, MGExxxF series especially tailored to provide connectivity and LAN extensions between numerus remote sites

Management

Management can be performed through an embedded Web Server (EWS) by using standard internet browser. The well known WEB interfaces significantly reduce learning time and minimize the cost of deployment.

For the Centralized Network Management we offer embedded SNMPv1//2/3 agent.

Available options

- MGE41F
  - 4 x Fast Ethernet, electrical interface
  - 1 x E1, 2048 kbit/s G.703 interfaces
- MGE84F
  - 8 x Fast Ethernet, electrical interface
  - 4 x E1, 2048 kbit/s G.703 interfaces expandable with additional 4 x E1
- MGE88F
  - 8 x Fast Ethernet, electrical interface
  - 8 x E1, 2048 kbit/s G.703 interfaces
- MGE168F
  - 16 x Fast Ethernet, electrical interface
  - 8 x E1, 2048 kbit/s G.703 interfaces

TECHNICAL DATA

Performance

Wire speed switching on all Ethernet and E1 ports

Store and forward mode

Non blocking switch fabric

Port speed:

10/100-TX RJ-45

E1 2048 kbit/s RJ-45

Internal power supply

Interface Standards

802.3 10Base-T & 10Base-FL

802.3u 100Base-TX

E1 ITU-T G.703, HDLC encapsulation

General Standards

802.1d Bridging

802.3x Backpressure/ Flow Control

Redundancy Standards

802.1D Spanning Tree Protocol

802.1W Rapid Spanning Tree

802.1s Multiple Spanning Tree

Link Aggregation, Static port trunk

VLANs

IEEE 802.1Q VLAN Tagging

Port-based VLANs

MAC-based VLANs

GARP VLAN Registration Protocol (GVRP)

Management and Monitoring

WEB

RFC 1157 SNMPv1/v2c

RFC 2570 SNMPv3

RFC1213 MIB-II

RFC1493 Bridge MIB

RFC 2863 Interfaces group MIB

RFC 1643 Ethernet like MIB

Stats, History, Alarms, Events

RFC 2674 802.1Q MIB

IP address allocation

Security

Management Security: user name and password protection

Fault Protection

Broadcast Storm Control

Ingress egress rate control

Quality of Services (QoS)

QoS in layer 2

Traffic prioritization using 802.1p

System Configuration

W x D x H 440mm x 257mm x 43.2mm

(17.32" x 10.11" x 1.70")

Weight 3.15kg (6.94lb)

Mounting 19" rack-mountable hardware included

Power supply

Internal – 48 Vdc, or 220 Vac option

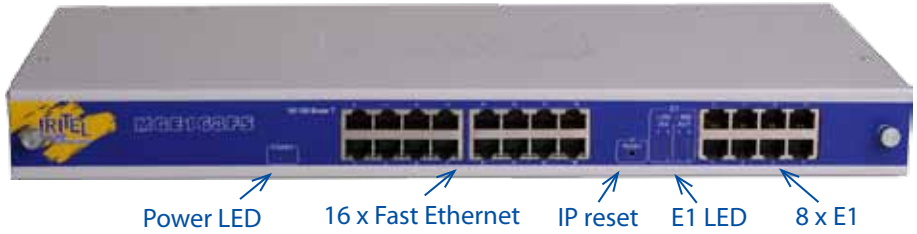
Operating temperature range

– 5^0 C up to +45^0 C, (class 3.2)

MGE168FS

L2/L3 Managed Ethernet Switch with 16 x FE and 8 x E1 media converters with Encryption

- Compliant with IEEE802.3, IEEE802.3u standards
- Up to16 10/100 Mbit/s Auto-Negotiation RJ45 ports supporting Auto-MDI/MDX
- Up to 8xE1 2048 kbit/s ITU-T G.703 ports with EoE1 media converters, HDCL encapsulation
- Port-Based VLAN and IEEE 802.1Q tag VLAN
- Per E1 port configurable AES128/192/256 encryption module with flexible key and access management



- Static MAC address and filtering MAC address management
- Static Port Priority and IEEE 802.1p Class of Service (CoS) with 4-level priority queuing
- Firmware upgrade, gold configuration backed up and restored
- Rack/Desktop - mountable case options
- Management through Embedded Web Server (EWS) which can be accessed via WEB browser
- GARP VLAN Registration Protocol (GVRP)
- Storm control, broadcast and multicast flooding
- Per port ingress and egress rate control
- STP, RSTP, MSTP
- Trunking, Link Aggregation Group (LAG)
- Test facilities, Virtual cable tester and PRBS BIST
- Internal power supply, -48 Vdc or 220 Vac option

Description

IRITEL MGE168FS high performance Managed Ethernet Switching device besides of the true Ethernet access offers versatile combination of user interfaces integrated together with media converters with encryption, thus reducing the need for external media converters.

Encryption Standard (AES) provides high confidence level of data security over public telecommunication network. Each E1 link at the device is possible to configure to perform data encryption with different key length, key management and key schedule. Encryption procedure includes key exchange, authentication and user data encryption. Each phase of encryption procedure uses their own key.

Application

MGE168FS provides edge connectivity utilizing existing E1 and copper infrastructure, applicable in midsized and large scaled campus, corporate and metro access networks. MGE168FS is especially tailored to provide connectivity and LAN extensions between numerus remote sites with encryption.

Management

Management can be performed through an embedded Web Server (EWS) by using standard internet browser. The well known WEB interfaces significantly reduce learning time and minimize the cost of deployment.

For the Centralized Network Management we offer embedded SNMPv1//2/3 agent.

TECHNICAL DATA

Performance
Wire speed switching on all Ethernet and E1 ports

Store and forward mode

Non blocking switch fabric

Port speed:

10/100-TX RJ-45

E1 2048 kbit/s RJ-45

Internal power supply

Interface Standards
802.3 10Base-T & 10Base-FL

802.3u 100Base-TX

E1 ITU-T G.703, HDLC encapsulation

General Standards
802.1d Bridging

802.3x Backpressure/ Flow Control

AES: NIST FIPS197

Redundancy Standards
802.1D Spanning Tree Protocol

802.1W Rapid Spanning Tree

802.1s Multiple Spanning Tree

Link Aggregation, Static port trunk

VLANs
IEEE 802.1Q VLAN Tagging

Port-based VLANs

MAC-based VLANs

GARP VLAN Registration Protocol (GVRP)

Management and Monitoring
WEB

RFC 1157 SNMPv1/v2c

RFC 2570 SNMPv3

RFC1213 MIB-II

RFC1493 Bridge MIB

RFC 2863 Interfaces group MIB

RFC 1643 Ethernet like MIB

Stats, History, Alarms, Events

RFC 2674 802.1Q MIB

IP address allocation

Security
Management Security: user name and password protection

Fault Protection
Broadcast Storm Control

Ingress egress rate control

Quality of Services (QoS)
QoS in layer 2

Traffic prioritization using 802.1p

System Configuration
W x D x H 440mm x 257mm x 43.2mm

(17.32" x 10.11" x 1.70")

Weight 3.15kg (6.94lb)

Mounting 19" rack-mountable hardware included

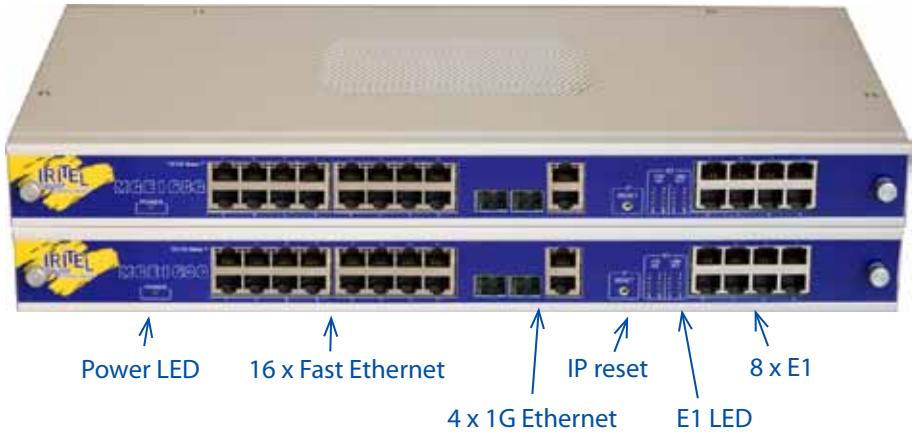
Power supply
Internal – 48 Vdc, or 220 Vac option

Operating temperature range
– 5^0 C up to +45^0 C, (class 3.2)

MGE88/168G

Stackable Gigabit L2/L3 Managed Ethernet Switch with 16xFE, 4xGE and 8xE1 media converters

- Up to 4 10/100/1000 Mbit/s Auto-Negotiation RJ45 ports supporting Auto-MDI/MDX, 1 G SFP optional
- Up to 16 10/100 Mbit/s Auto-Negotiation RJ45 ports supporting Auto-MDI/MDX
- Up to 8xE1 2048 kbit/s ITU-T G.703 ports with EoE1 media converters, HDCL encapsulation
- Stacked devices are fully manageable and behaves as a single device



- Port-Based VLAN and IEEE 802.1Q tag VLAN
- Static MAC address and filtering MAC address management
- Static Port Priority and IEEE 802.1p Class of Service (CoS) with 4-level priority queuing
- Firmware upgrade, gold configuration backed up and restored
- Rack/Desktop - mountable case options
- Internal power supply, -48 Vdc or 220 Vac option

Description

IRITEL MGExxxG series of High performance Managed Ethernet Switching devices besides of the true Ethernet access MGExxxG offers versatile combination of user interfaces integrated together with media converters thus reducing the need for external media converters. Stacked switches behaves as larger switch managed as a single device.

Application

MGExxxF devices provides edge connectivity utilizing existing E1 and copper infrastructure, applicable in midsized and large scaled campus, corporate and metro access networks, MGxxxG is especially tailored to provide connectivity and LAN extensions between numerus remote sites. MGxxxG devices are scalable and they are ideal for extending port count in order to fulfil network growing requirements.

Management

Management can be performed through an embedded Web Server (EWS) by using standard internet browser. The well known WEB interfaces significantly reduce learning time and minimize the cost of deployment.

For the Centralized Network Management we offer embedded SNMPv1//2/3 agent.

Available options

- MGE88G
  - 8 x Fast Ethernet, electrical interface
  - 8 x E1, 2048 kbit/s G.703 interfaces
  - 2 x 1G Electrical interfaces
  - 2 x 1G Optical (SFP) interfaces
- MGE168G
  - 16 x Fast Ethernet, electrical interface
  - 8 x E1, 2048 kbit/s G.703 interfaces
  - 2 x 1G Electrical interfaces
  - 2 x 1G Optical (SFP) interfaces

TECHNICAL DATA

Performance
Wire speed switching on all Ethernet and E1 ports

Store and forward mode

Non blocking switch fabric

Port speed:

10/100-TX RJ-45

E1 2048 kbit/s RJ-45

Internal power supply

Interface Standards
802.3 10Base-T & 10Base-FL

802.3u 100Base-TX

E1 ITU-T G.703, HDLC encapsulation

General Standards
802.1d Bridging

802.3x Backpressure/ Flow Control

Redundancy Standards
802.1D Spanning Tree Protocol

802.1W Rapid Spanning Tree

802.1s Multiple Spanning Tree

Link Aggregation, Static port trunk

VLANs
IEEE 802.1Q VLAN Tagging

Port-based VLANs

MAC-based VLANs

GARP VLAN Registration Protocol (GVRP)

Management and Monitoring
WEB

RFC 1157 SNMPv1/v2c

RFC 2570 SNMPv3

RFC1213 MIB-II

RFC1493 Bridge MIB

RFC 2863 Interfaces group MIB

RFC 1643 Ethernet like MIB

Stats, History, Alarms, Events

RFC 2674 802.1Q MIB

IP address allocation

Security
Management Security: user name and password protection

Fault Protection
Broadcast Storm Control

Ingress egress rate control

Quality of Services (QoS)
QoS in layer 2

Traffic prioritization using 802.1p

System Configuration
W x D x H 440mm x 257mm x 43.2mm

(17.32" x 10.11" x 1.70")

Weight 3.15kg (6.94lb)

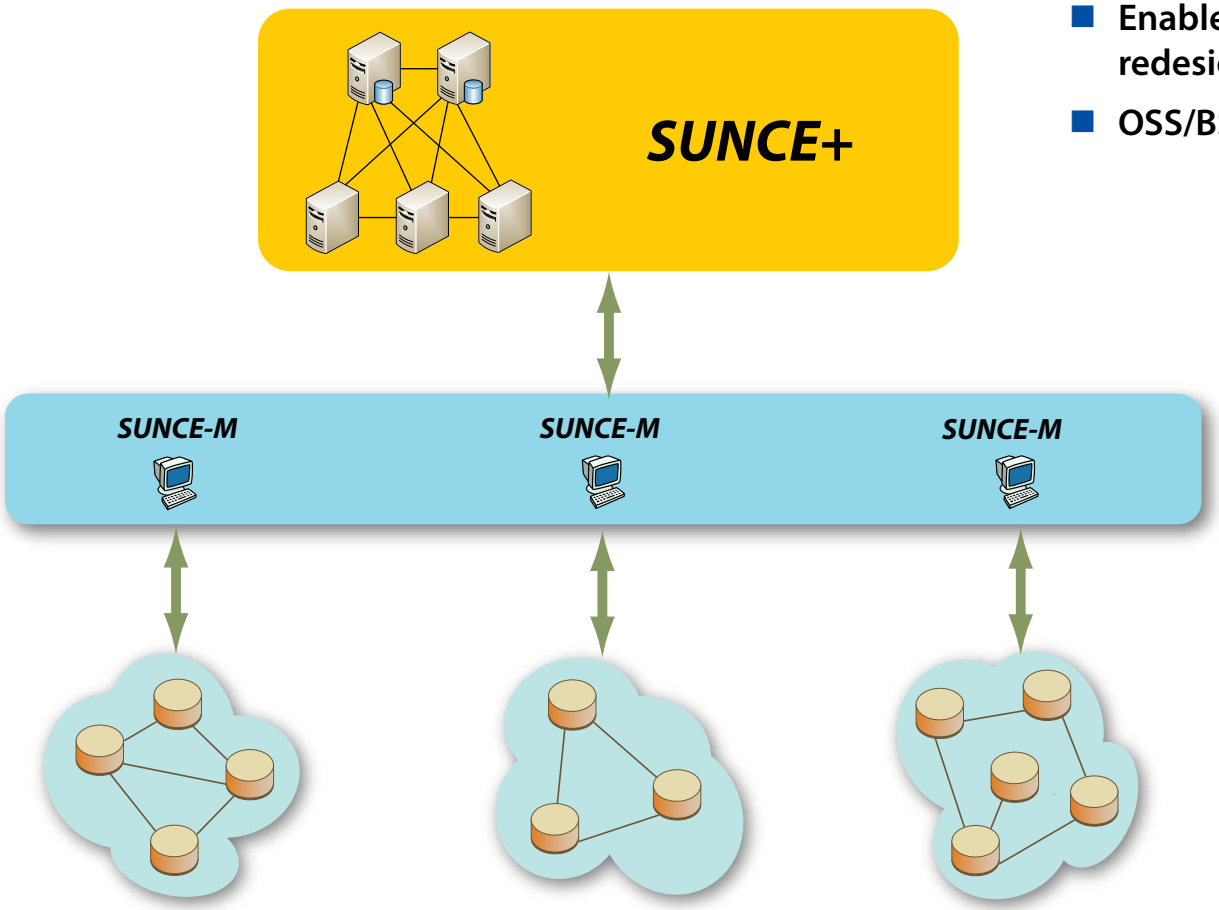
Mounting 19" rack-mountable hardware included

Power supply
Internal – 48 Vdc, or 220 Vac option

Operating temperature range
– 5^0 C up to +45^0 C, (class 3.2)

SUNCE+
Network Management System

- Continuous hierarchical management of complex networks, subnetworks, stations, and devices
- Service and network monitoring
- Operation and maintenance tool, essential for network design
- Enables evolutionary network management redesign
- OSS/BSS system integration



Applications

- Enables integration of all IRITEL transmission systems
- Integration of all elements in network or their subset
- Network topology is presented in hierarchical tree view, from a sub-network layer to a single location and elements in it
- Fast identification of network resource problems improves quality of service
- Client-server architecture enables multi-user access
- Distributed hardware platform
- Operations on IRITEL OTN, SDH and PDH network elements
- Distributed hardware platform, depending on number and complexity of managed systems
- Automatic database failover
- Web browser for application access, over LAN or VPN
- FCAPS management functions (Fault, Configuration, Accounting, Performance, Security)
- Monitoring of current network state and its history
- Monitoring user actions in SUNCE+

Base Module

- Enables database integration, access using Web browser and system administration. Other functions are supported in separate modules.

Module Alarms

- Presents filtered set of current alarms on hierarchical levels
- Monitoring of predefined set of alarms
- Reports of any subset of alarms are generated from history log

Module Remote Access

- Remote access to SUNCE-M system, with local operator rights
- View or change network element parameters and trail management in network

Integration

- Integration with OSS/BSS system (Northbound interface)
- Direct access to new device types through Southbound interface
- Open management interfaces: SNMP, XML...

Module OTN

- Network management system for IRITEL OTN devices

Module Inventory

- Collecting service data from network elements
- Device reports and statistics (unit types, hardware and software versions...)

Module Performance

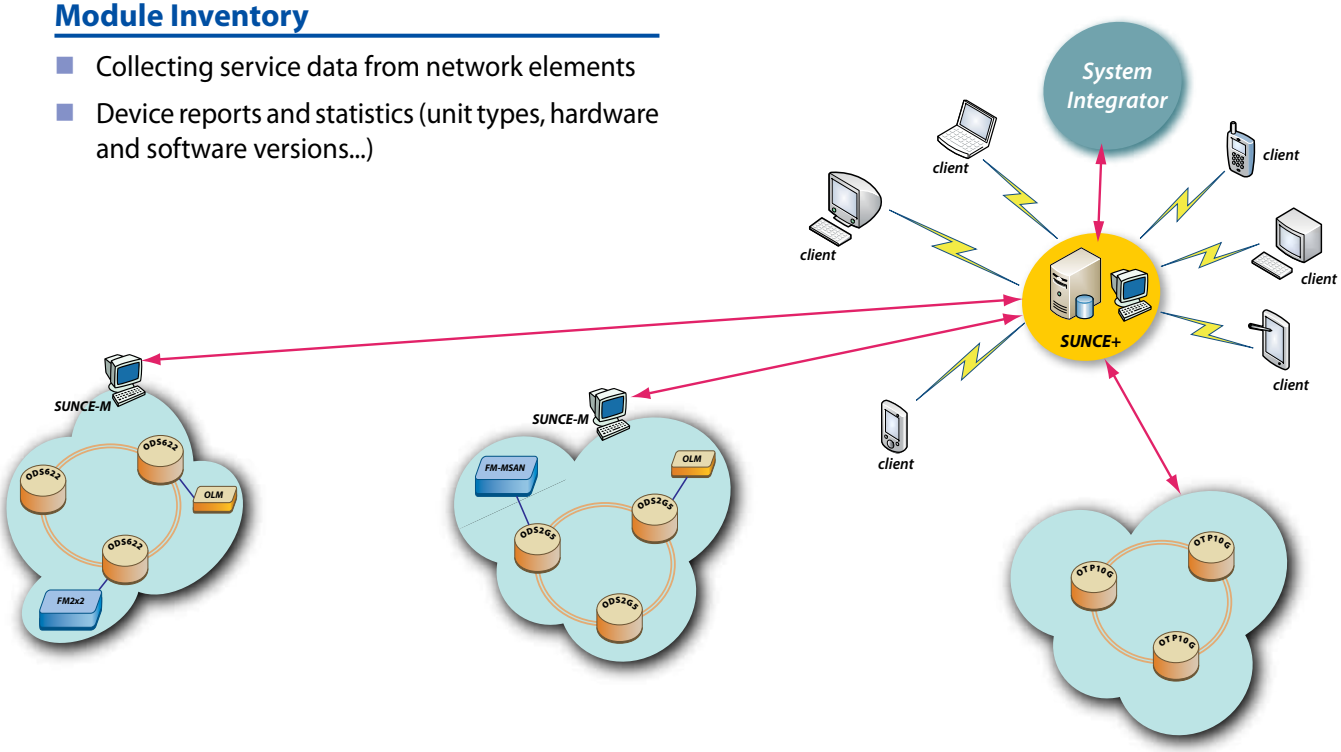
- Provides service availability information on selected customer
- Presents information on point to point free transport capacity

Module Accounting

- Provides services remuneration through access to accounting data

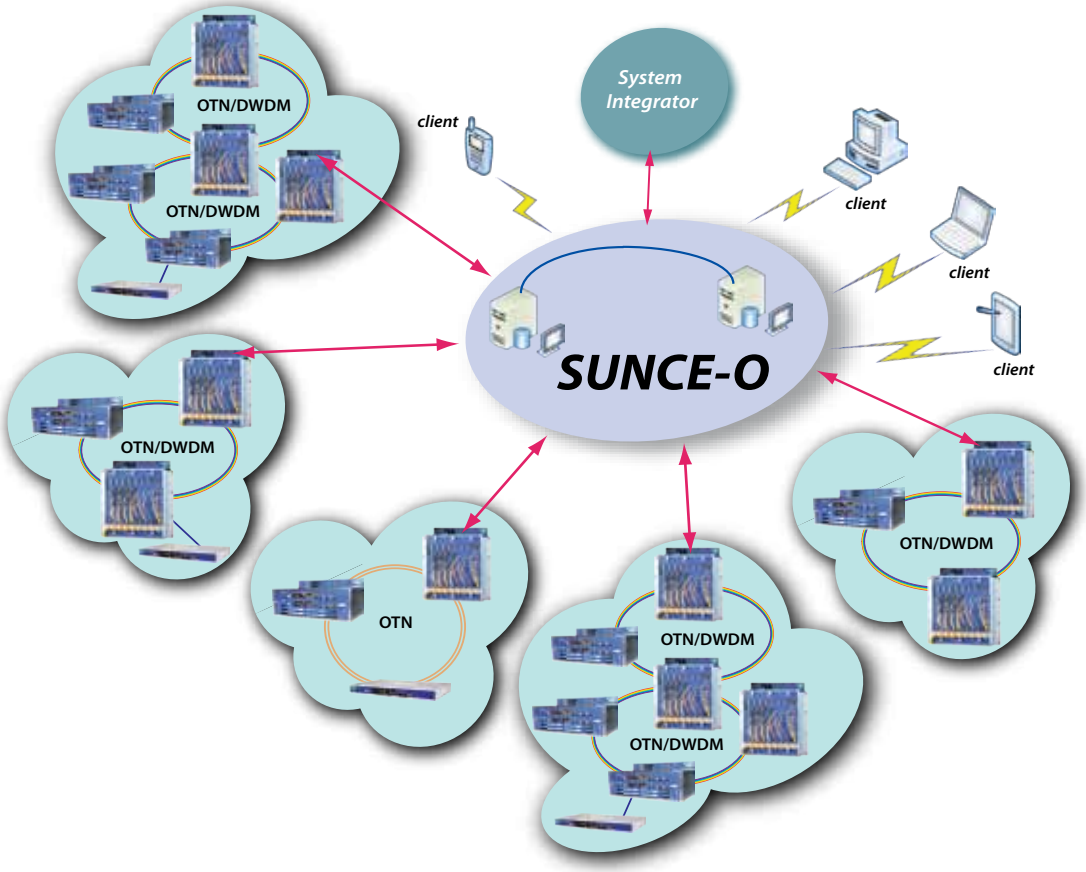
ITU-T Recommendations

- M series: M.3010, M.3300, M.3400



SUNCE-O

OTP10G/100G OTN/DWDM NMS



- Unified and scalable NMS management solution
- Client-server architecture
- From small/local up to large networks
- Easy to meet network growth and development
- Fault, configuration, performance and security management
  - Inventory management
  - OSS/BSS system integration
  - Single platform for OTN and DWDM layers
  - Lower CAPEX and OPEX, faster ROIn

System description

- Configuration and monitoring of OTP10G/100G OTN/DWDM networks
- Element management and network management layers
- Standalone NMS or a module of SUNCE+
- Multi-tier system organization, with multi-user access
- Management functions (Fault, Configuration, Performance, Security)
- Scalable from single to multiple servers
- High availability of servers (automatic failover)
- Northbound interface to OSS/BSS (SNMP, CORBA)
- J2EE software architecture
- Java based rich client software

GUI main features

- Intuitive graphical views
- Network topology is presented in hierarchical tree view (network, sub-network, groups, stations, NE)
- Drag & Drop

Fault management and warnings

- Alarms
- Loops

Configuration management

- OTN
- DWDM
- ODUk cross-connect
- SDH
- Ethernet

Performance management

- Real-time performance data collection and analysis
- Numerical and graphical performance metrics

Provisioning

- Automatic (trail manager)
- Manual provisioning

Security management

- Role based security model with user authentication and authorization
- Audit Log with user activities information
- Secure SNMPv3 protocol for device access

Inventory

- Collecting service data from NE and network
- HW&SW device report

TECHNICAL DATA

International standards support:

ITU-T: M.3010, M.3100, M.3300, M.3400

TMF 513, 608, 814 Development

System requirements for Server side computers

Operating system

Linux 64 bit
(recommended: CentOS 6.3 or newer)

Supported databases

MariaDB (recommended)

MySQL

PostgreSQL

Oracle

Java

JRE/JDK 1.6, 1.7

System requirements for Client side computers

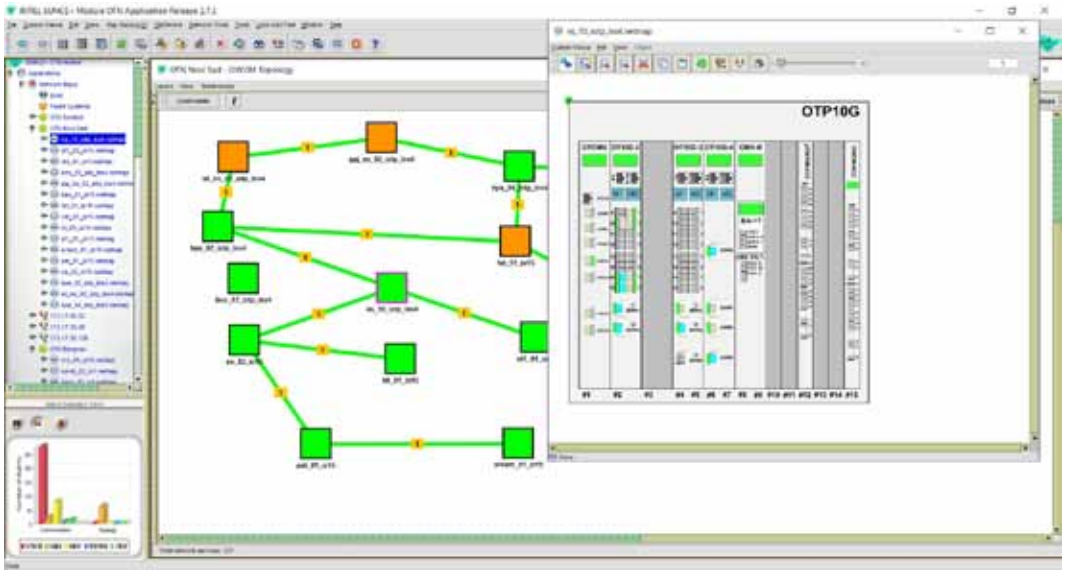
Operating system

Linux (32 bit or 64 bit)

Windows (32 bit or 64 bit)

Java

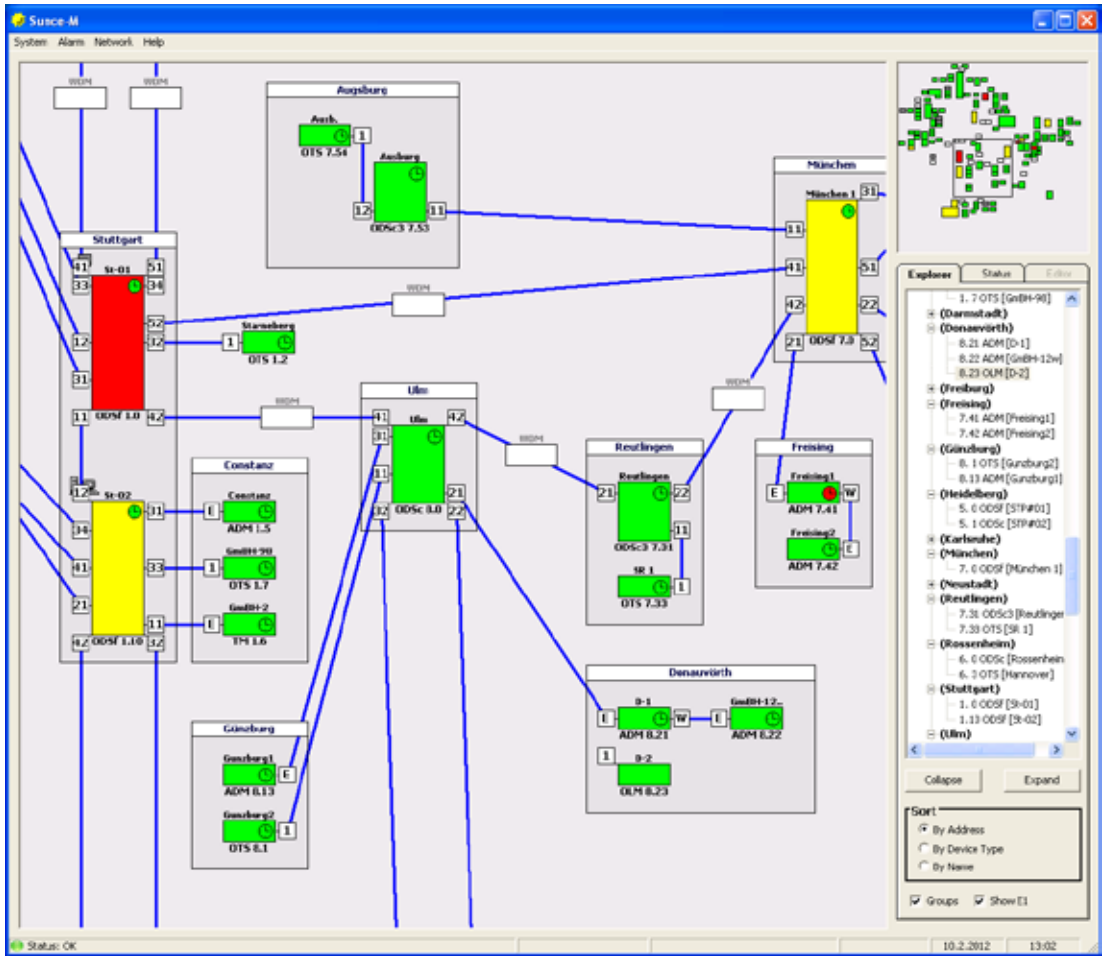
JRE/JDK 1.6, 1.7



SUNCE-M

Integrated Network Management System

- Management system covering the full range of IRITEL SDH and PDH equipment
- Easy to use – from network views to functional blocks on a single board
- Trail manager featuring automatic route calculation



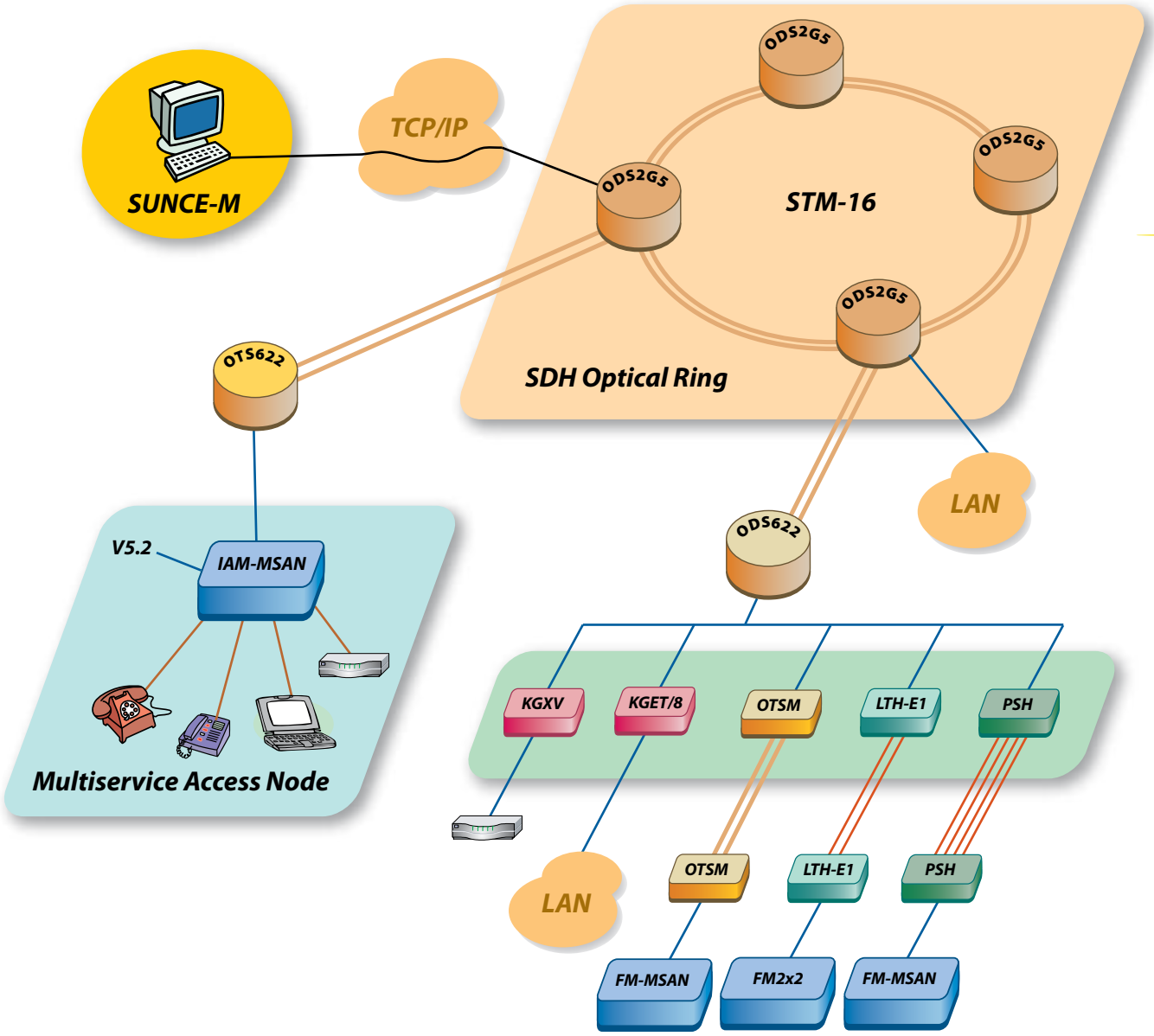
Basic Functions

- Integrated solution for continuous centralized monitoring of the entire network and individual network element
- Intuitive Graphical User Interface facilitates a range of operations, from network view and containment tree view, to functional blocks on a single board
- Enables TMN *(Telecommunications Network Management)* management functions – fault, configuration, performance and security management
- Provides functions of Network Management Layer and Element Management Layer of the TMN functional architecture
- The computer in Management Operations Center is connected to one network element using Ethernet or RS232 serial interface (F interface)
- Provides integration in Network Management System SUNCE+

Network Elements

Each network element is equipped with System Management Unit that exchanges information with SUNCE-M. Supported products in Network Management System:

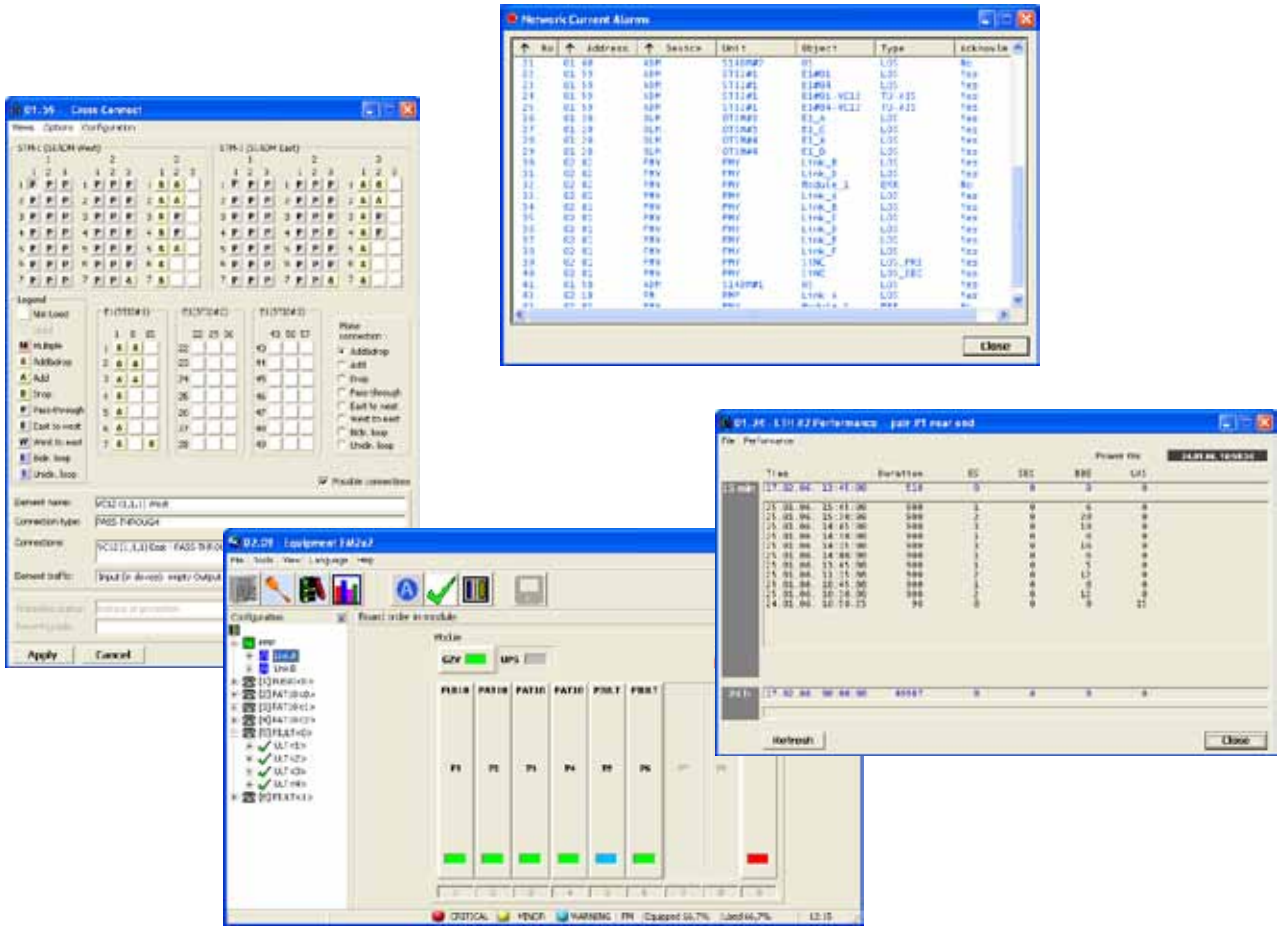
- SDH (STM-16/4/1) Optical Digital Systems: ODS2G5, ODS622/ODS622C, OTS622, ODS155
- Access Systems: FM-MSAN, IP µDSLAM, IAM-MSAN, V5CAS and FM2x2
- DSL modems: PSH (SHDSL) and LTH-E1 (HDSL)
- Optical Terminal and Secondary Multiplexer OTSM 4x2Mbit/s
- Interface Convertors:
  KGXV, 2 Mbit/s G.703 to X.21/V.35 and KGET,
  KGET8, 2 Mbit/s G.703 to Ethernet



Fault Management

Alarm reports from each of the network elements are received automatically and displayed as visual and textual information

- Alarms classification:
  - Communication alarms (transmission and synchronization)
  - Performance alarms
  - Equipment alarms
- Alarm summary is available on various layers - from network element to equipment functional blocks
- Assign alarm severity
- Acknowledge active alarms
- Testing:
  - Close local and remote loops on various levels
  - Configure PMP *(Protected Monitoring Point)*
  - Use built-in PRBS generators and detectors
- Fault event history for the entire network is stored in database, with filtering options for any set of network elements categorized by type of network element, time, classification, severity, acknowledgement and status of the event



Configuration Management

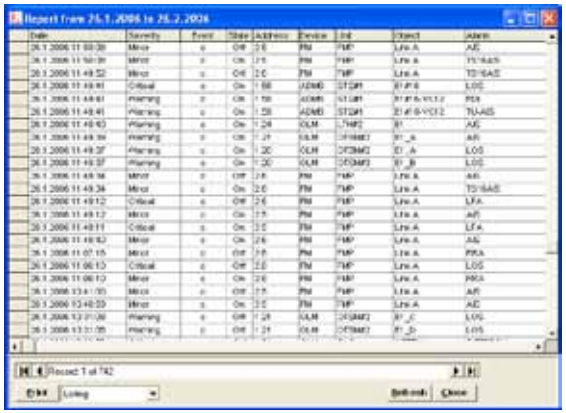
- Create and change network topology using visual network editor
  - Create and delete network elements
  - Connect elements using optical and electrical links
  - Elements can be grouped upon their location
- Edit network element properties
  - Network parameters
  - Module equipping
  - Synchronization parameters
  - Cross-connections
  - Quick configuration using configuration files
- Trail manager with complete trail lifecycle management:
  - Simple point and click to create, change and delete trails
  - Automatic calculation of possible trail routes between network elements
  - Visual presentation of existing trails in network topology view
- Inventory management capabilities include:
  - Tributaries - configuration and services
  - Network status
  - Serial numbers, hardware and software versions

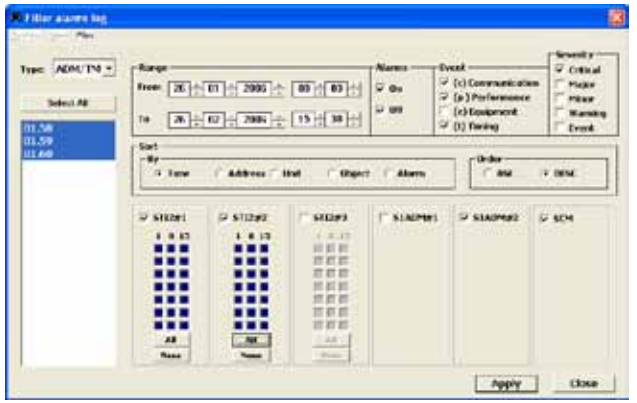
Performance Management

- Analyze and aggregate network performance data on a per network element basis
- Collect performance events grouped in 15 minutes and 24 hours intervals according to ITU-T G.826
  - ES – *Errored Seconds*
  - SES – *Severely Errored Seconds*
  - BBE – *Background Block Error*
  - UAS – *UnAvailable Seconds*
- Adjust performance alarms thresholds
- Examine UAT *(UnAvailable Time)* intervals

Security Management

- User-based security model
- Role based user access control
- User data editing (add, delete, change)
- Review of user actions log with filtering





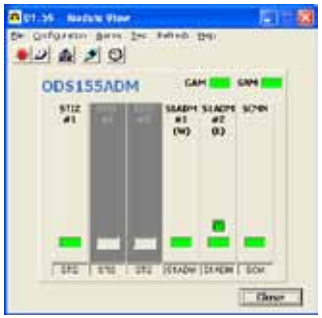
TECHNICAL DATA

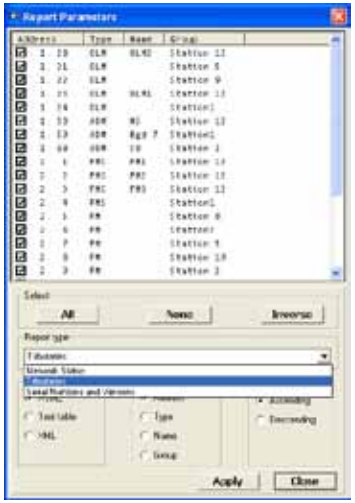
System requirements

Operating System	Windows 8 Windows 7 Windows Vista Windows XP
RAM	2 GB (4 GB recommended)
Free Hard disk capacity	> 1 GB

ITU-T Recommendations

G series	G.781, G.783, G.784, G.826, G.841
M series	M.3010, M.3300, M.3400





CJ-1P

Cellular Jammer

- High quality jamming equipment for mobile communications
- Blocking up to three frequency bands simultaneously GSM 900, GSM 1800 and UMTS
- Various applications
- Compact and modular design

Description

CJ-1P is a high quality jamming equipment for mobile communications. The CJ-1P cell phone jammer unit is intended for blocking all mobile phone types within designated indoor or outdoor areas. Its unique design combines effective jamming and strict compliance with international standards of safety and electromagnetic compatibility.

CJ-1P is a 'plug and play' unit, its installation is quick and its operation is easy. Once the CJ-1P cellular jammer is operating, all mobile phones present within the jamming coverage area are blocked, and cellular activity in the immediate surroundings (including incoming and outgoing calls, SMS, pictures sending, etc.) is jammed.

Basic features

- Fully digitalized
- Effective jamming in a radius between 5-100 meters (depending on cellular signal strength at site)
- Can block up to three frequency bands simultaneously GSM 900, GSM 1800 and UMTS
- Remote controlled
- Blocking range selection
- Can be operated via 12 Vdc/230 Vac power source

Applications

- Prevention of eavesdropping and information transfer:
  - Briefing rooms
  - Military and governmental offices
  - Interrogation rooms
  - Prisons
  - Conference rooms
  - Embassies
  - Government facilities
  - Financial institutions
- Secret services
- Government agencies
- Police Negotiation Team
- Military facilities and forces
- Police Special Forces
- VIP protection agencies
- Elite units

TECHNICAL DATA

Frequency ranges:

GSM 900	925 - 960 MHz
GSM 1800	1805 - 1880 MHz
UMTS	1920 - 2170 MHz

Synthesizer type digital

Jamming signal type fast CW sweep signal, chirp (sweep time as low as 20 usec)

Output power ON/OFF possibility and adjustable 0 - 32 dBm for every band independently

Resolution output power 1 dB

Antenna system four PCB antennas or four omnidirectional antennas (option)

Frequency ranges:

ANTENNA1	925 - 960 MHz
ANTENNA2	1805 - 1880 MHz
ANTENNA3	1920 - 2170 MHz

Impedance 50 Ω unbalanced

Radiation (H-plane), beamwidth at -3 dB 70° at 920; 60° at 1920 MHz

Radiation (E-plane), beamwidth at -3 dB 70° at 920; 60° at 1920 MHz

Radiation angle 0°

Front to back ratio ≥ 15 dB from 880 to 960 MHz
≥ 15 dB from 1710 to 2000 MHz
≥ 10 dB from 2000 to 2170 MHz

Polarization linear vertical

Gain 9 dBi

S.W.R. in bandwidth ≤ 2.0:1 from 880 to 960 MHz
≤ 1.8:1 from 1710 to 2170 MHz

Max. power 1 Watts (CW) at 50° C

Connector SMA-male

Material FR4 substratum the depth of 1.6 ± 10 %
Cu + Sn plate

Dimensions

ANTENNA1	148.3 x 127 x 45 mm
ANTENNA2	148.3 x 127 x 30 mm
ANTENNA3	120.5 x 75.5 x 20 mm
JAMMER UNIT	300 x 265 x 80 mm
BRIEFCASE	500 x 400 x 130 mm

Power supply 230 Vac/12 Vdc/battery 12 Ah

Consumption 30 VA

Operated temperature range -20°C to + 55°C

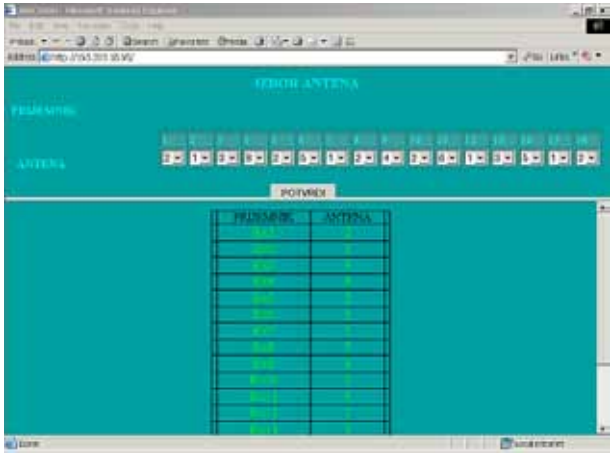
ARK3000

Antenna Distribution System

- 8 antenna inputs and 16 receiver outputs
- Frequency range 20 – 3000 MHz
- Solid state switching matrix
- Seamless Integration
- Local and remote control (Ethernet) as RoIP element
- Modular structure
- Compact and modular design

Description

Antenna Distribution System ARK3000 receives signals from the eight antennas in the frequency range from 20 MHz to 3 GHz and distributes / switches received signal to the sixteen receivers whereby any of RF outputs can be assign any antenna, or pre-defined combination of antennas.



Control over Internet

General characteristics

- Control
  - Local via front panel (touchscreen)
  - Remote via Ethernet link, using any Internet browser via the intuitive user interface
- Easy integration into automated systems for monitoring radio spectrum and radio-surveillance
- Working in an autonomous / manual mode
- Options
- Digitally controlled attenuators on inputs
- DC power supply 12 V/24 V/48 V
- Different types of input connectors
- Different types of input filters
- Control via RS232 or USB interface
- Adaptation of protocols and structure of management posts in order to emulate the existing antenna distributor

TECHNICAL DATA

Antenna Inputs

Number of inputs		8
Frequency subband input		
VHF1:	20 – 88 MHz	2 inputs
VHF2:	110 – 180 MHz	2 inputs
VHF/UHF1:	225 – 470 MHz	2 inputs
UHF1:	100 – 1400 MHz	1 input
UHF2:	500 – 3000 MHz	1 input
Input impedance		50 Ω
Input SWR		≤ 3
Maximum input level		+ 17 dBm
Attenuation of input to output		
VHF1		≥ 60 dB
VHF2		≥ 50 dB
VHF/UHF1		≥ 50 dB
UHF1		≥ 50 dB
UHF2		≥ 50 dB

RF outputs

Number of RF outputs	16
Output impedance	50 Ω
Output SWR	≤ 1.5
1dB compresion point	> +10 dBm
Attenuation between any two outputs	
VHF1	≥ 50 dB
VHF2	≥ 45 dB
VHF/UHF1	≥ 45 dB
UHF1	≥ 45 dB
UHF2	≥ 40 dB
IP2 (the second order intercept)	min 35 dB
Type of connectors (input/output)	N
Gain	min 1 dB
Noise ratio	≤ 5 dB
Interface for remote control	Ethernet 10/100 Mbit/s
Power	220V ±10 %, 50 Hz
Consumption	50 VA
Dimensions	480 x 133 x 365 mm
Weight	15 kg
Operating temperature range	-5 do +45 °C

SDNU

System for Remote Monitoring & Control of Power Electronic Devices

- Simultaneous monitoring and control of power electronics from different vendors, technologies and generation
- Modular system for monitoring and control of power electronic devices in remote locations:
  - Peripheral device for monitoring and control - DNU24
  - Monitoring and control center (local)
  - Main monitoring operations center
- Peripheral device for monitoring and control - DNU24:
  - Continuous measures of electrical and non-electric values in the remote objects and data forwarding to the monitoring center at its request
  - Measured electric and non-electrical values can be wireless send to DNU24
  - Monitoring of alarms and in the case of their appearance forwarding to the monitoring center
  - Control signals from the monitoring center are forwarded to power electronic devices which is possible to control
- Communication between monitoring and control center and DNU24 through TDM, IP and GSM telecommunication network
- Communication between monitoring and control center (local)and main monitoring operations center through SNMP
- Remote control of batteries quality with and without additional load

System Description

Monitoring and control system, for power electronics devices at remote locations, contains different number of DNU24 devices. Each device collecting and transmitting data to monitoring and control center.

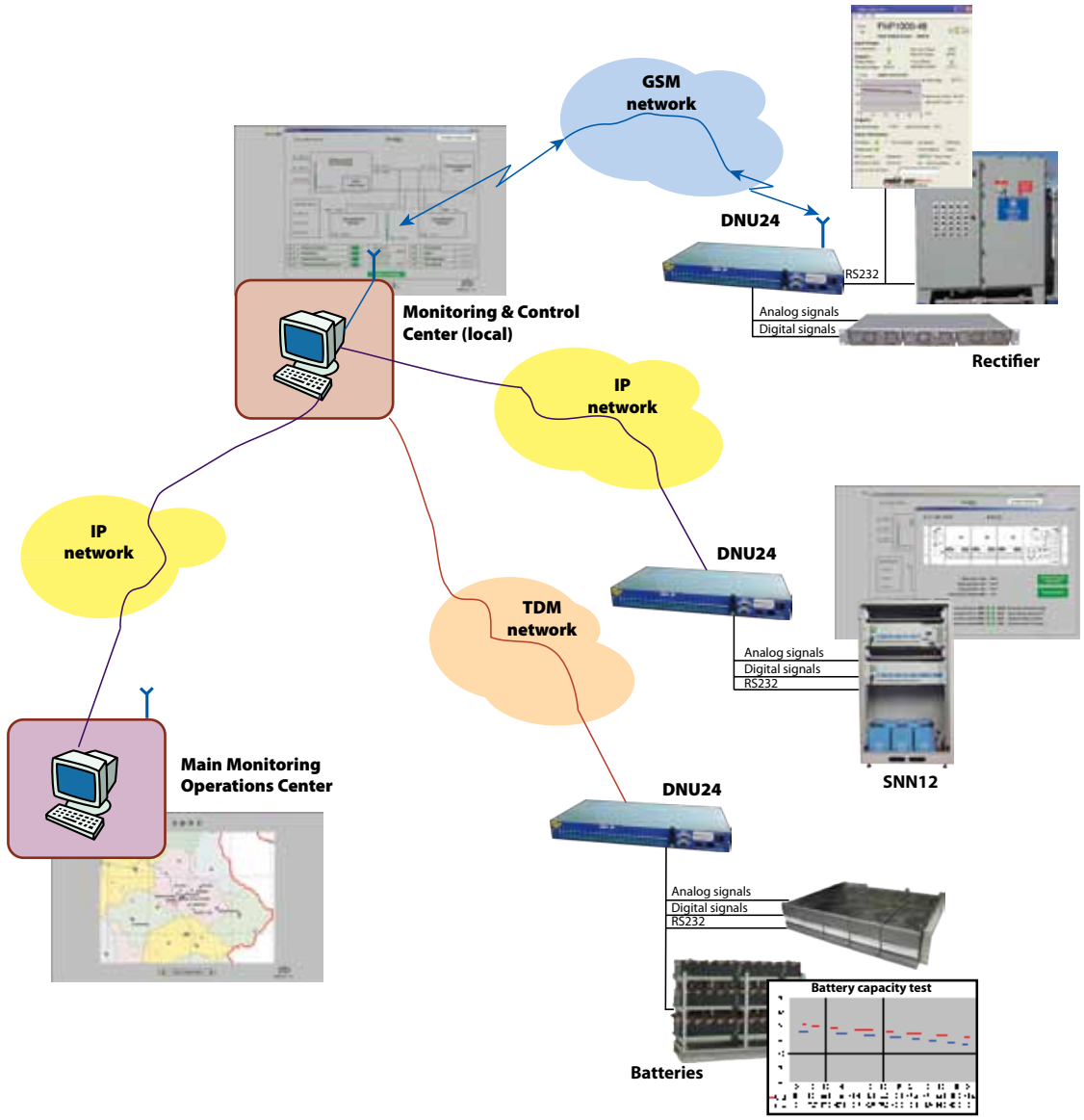
DNU24 is connected with monitoring and control center over TDM (modem, ISDN), IP (Ethernet 10/100 baseTx) or GSM (GPRS) telecommunication network. Type of connection is defined by user in accordance with technical availability.

DNU24

- Capacity of DNU24 are 16 analogue and 8 digital signals
- Measurement and sending data related to electrical values: dc voltage, ac voltage, dc current
- Capturing, and sending to the monitoring and control center, signal wave shapes with 1 ms resolution
- Capturing, and sending data related to incident situations: measuring values 250 sec after and before incident happened
- Measurement and transmission of different values - temperature, pressure, liquid level and other non electrical values
- Data are collected and memorized in internal memory of DNU24 every 1 s
- Monitoring and control center collects data from DNU24 every 15 minutes
- Digital alarm signals, generated from devices under monitoring, DNU24 send to monitoring and control center immediately after their detection
- DNU24 have capacity of control over 4 output digital signals and over RS232 interface
- In case the power electronic devices have own ability for their remote control, DNU24 send their collected data to the monitoring and control center

Battery capacitive test

- Optionally connecting of batteries to additionally test load
- Recording batteries current discharge curves
- Comparison with manufacturer catalogue discharge curve
- Estimation of batteries quality



Monitoring and Control Center

PC with installed necessary software are located in center for remote monitoring and control. Measured data from DNU24 are periodically collecting. Data is stored in the particular database.

In the monitoring center, all data are presented in a clear manner so that the operator have a clear picture about the current state of the system. It is possible to generate a report with the results of measurements over a defined period of time.

- The structure of the system for remote monitoring and control
- The structure of device that is monitored and controlled for each object
- The measured values of all parameters
- The on/off values on remote devices that are controlled
- The data required for system administration
- Statistical data

All data are presented in tabular and graphical way.

Measurement ranges can be changed from the monitoring and control center.

Alarms are present in the monitoring and control center until the authorized person terminate them or until they disappear because the cause is disappeared. No matter how alarms go away, the date and time of an alarm condition are registered and the moment and the reason when the are gone. Low battery alarm is combined with an estimation of how much time the object will have to work on battery.

Monitoring and control center and main monitoring operations center allow statistical analysis of all collected data and generating of reports on all the alarms and the measured values deviations from the nominal value.

Information stored in the database can be transferred to a standard format database (Access, SQL, Oracle, ...) for further processing and eventual integration into other systems for monitoring users.

Control of power electronics devices are available in two ways: through the digital control signals directly from DNU24 and through a defined communication protocol (given from manufacturer of the device which is under control in the object); in that case, communication flows through special ports of DNU24). Commands are given from the center for monitoring and control (sent to DNU24). When the command is executed by a digital signal from DNU24, it is realized as a time switch (time-limited duration with the possibility of interruption).

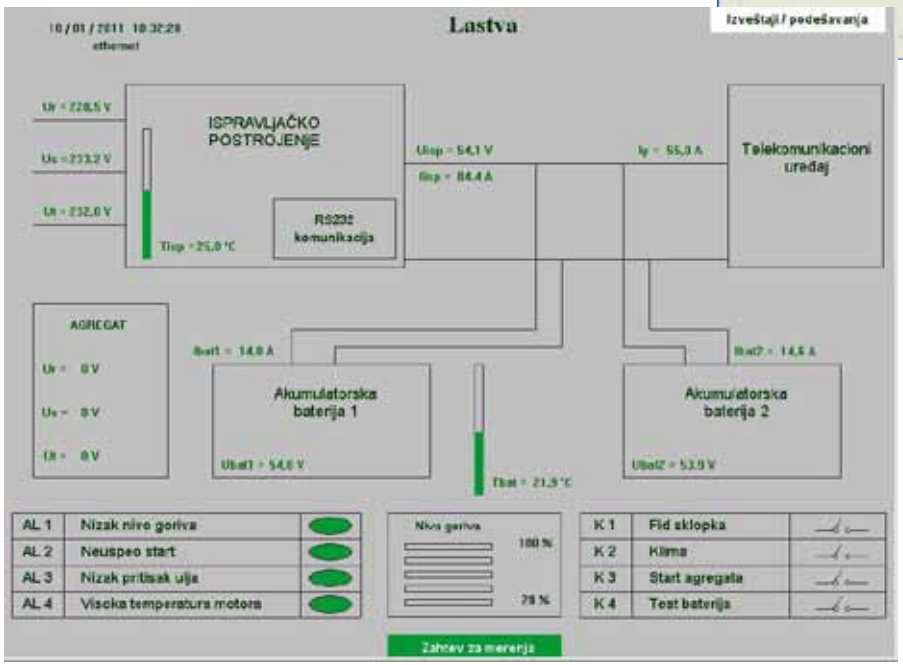
Monitoring and Control Network

Centers for monitoring and control can be connected in a hierarchical network for monitoring and control via an IP network to communicate with the main center.

Protocol for communication with the main monitoring operations center is standardized (SNMP).

Safety Procedures

- Authorization of access by user name and password
- Assigning user accounts that have limit access to options in the system
- Administration of system user - adding, deleting and changing data
- Over viewing of the user history (log files, filtering)



TECHNICAL DATA

DNU24:

Analog measurement

DC voltage (0 - 1000 V)	5 inputs
AC voltage (0 - 300 Veff)	6 inputs
DC currents (-1000 - 1000 A)	
or AC currents (0 - 1000 A)	3 inputs
Temperature	2 inputs

Digital inputs

Alarms (galvanic isolation)	4 inputs

Digital outputs control signals

Opticaly isolated	2 outputs
Realised with relays	2 outputs

Monitoring and Control center:

PC computer with Windows XP Professional

Software

GUI software for monitoring and control center

Software for control of AC voltage wave shapes

Communication software

Software for control

Administration software

Statistical data analysis software

Database software

Software for connecting with main center for monitoring and control

Interfaces

Local communication with other equipment	RS232, RS485
Communication with control and monitoring center	ISDN, Ethernet, GPRS

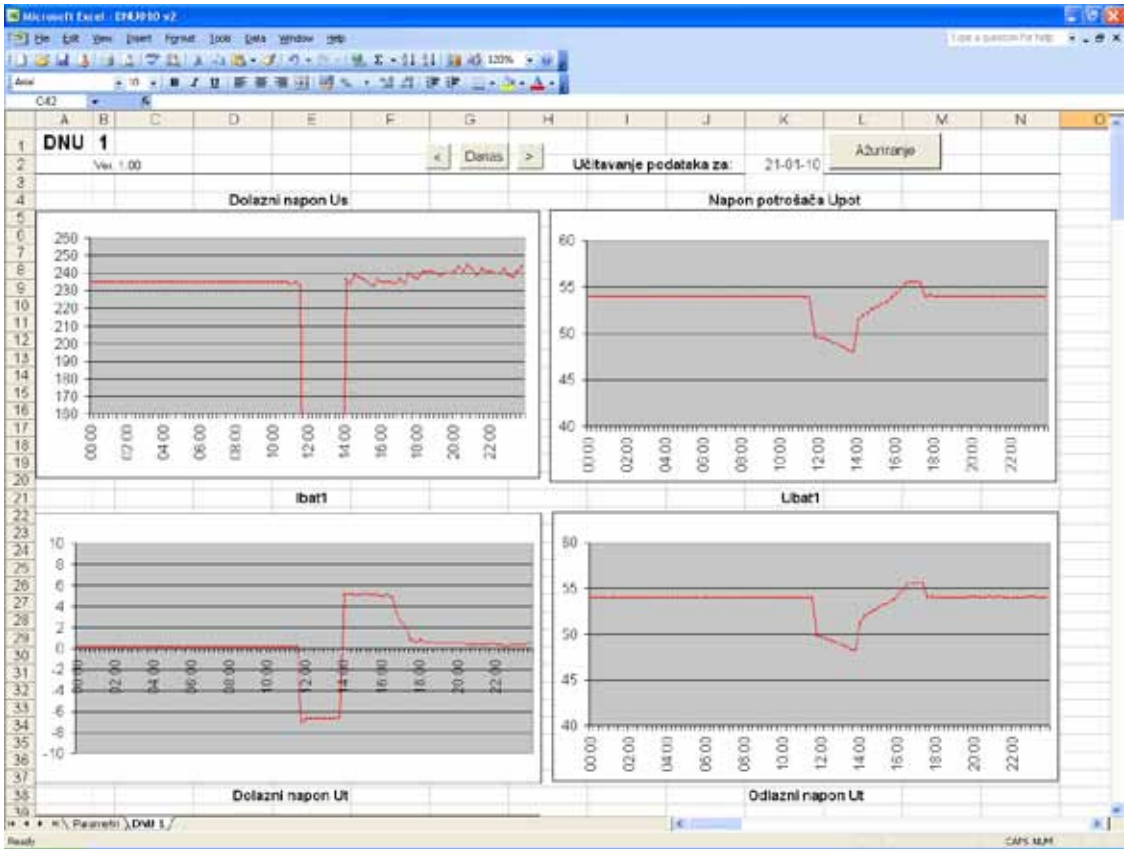
Constructed and tested according to

Safety	EN 60950 (UL1950)
EMC	EN 55022/CISPR22, class A

Environmental conditions

Working temperature	0 to +50°C

Dimensions (W x D x H)	440 x 210x 55 mm
Weight	3 kg



SNN12

Power Supply System 54 Vdc / 3 x 7.5 A

- Compact modular power supply system:
  - SN12 - one shelve (3 rectifiers modules), power 1200 W
  - SNN12 - two shelves (6 rectifiers modules), power 2400 W
- Full front access design – ease of installation and operation
- Parallel working of rectifiers – active current sharing, true redundant configuration (N+1)
- Natural convection cooling – no fans
- Power factor 0.98 (IEC 1000-3-2)
- Two independent battery breaker, up to six load breakers
- Optimal Charging of Batteries
- Programmable low voltage disconnect (LVD)
- Integrated control and monitoring system, SUNCE-M

Description

SNN12 system is power solution designed for telecom, datacom and network applications (48 Vdc nominal) which need to have reliable and permanent DC power supply regardless on main supply failure.

The main parts of SNN12 system are: cabinet, up to two shelves (main and for expansion), and batteries (working and reserve). SNN12 is modular and configurable for different load power: 400, 800 and 1200 W (SN12- main shelf, up to 3 rectifiers units) or 1600, 2000 and 2400 W (two shelves, up to 6 rectifiers units) or 2 ETSI shelves (up to 6 rectifiers). In redundant configuration off power supply system (N+1), reserve rectifier is in parallel work with others rectifiers. Accuracy of rectifiers active current sharing is 5%.

Batteries are paralleled with load and system output. Battery management includes controlled current charging of batteries independent of load current, IU characteristic, automatic temperature compensation with additional cable and sensor and programmable low voltage disconnect.

System overview

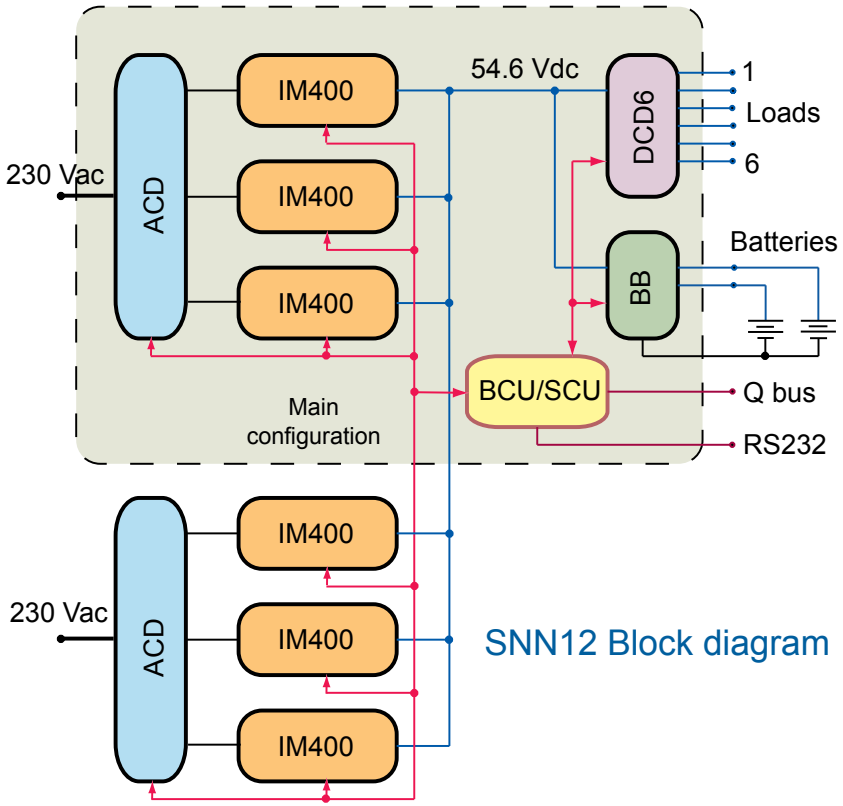
SNN12 system is composed of:

- Up to two AC distribution (ACD)
- Up to 6 rectifier modules (IM400), power of each rectifier 400 W (nominal)
- Load (DC) distribution (DCD2/6) with two or six output fuses (terminals ended with connectors)
- Low Voltage Disconnect module (battery board - BB) with battery breakers and terminal connectors (double)
- BCU – basic control unit (module) for control, monitoring and communications with LCD display and keyboard for self-guided controller operation, LEDs, RS232 and other interfaces
- Batteries

Protections

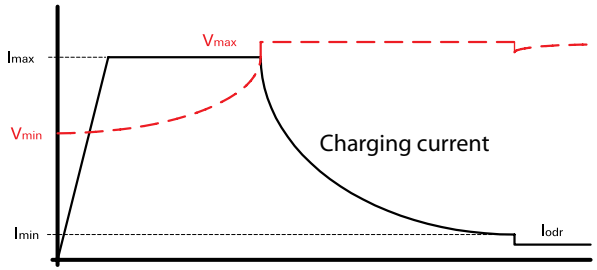
Protections include:

- Overload (current limit) and short circuit protection, active and passive, programmable
- Electronic Low Voltage Disconnect (LVD) - over discharging protection; value of battery turn-off threshold is programmable through keyboard or RS232 interface
- Battery current overcharging – value of charging current is controlled (apart of control module - BCU) and programmable through keyboard or RS232 interface (BCU)
- Over Voltage Protection (OVP) – output dc voltage and input ac voltage, active and passive
- Thermal rectifier protection (active)



SNN12 Block diagram

Batteries charging process



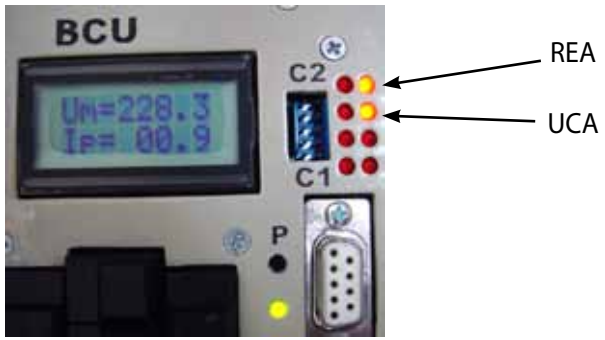
Rectifier module IM400

System monitoring

System monitoring and control can be achieved locally or remotely - integrated through telecommunication network.

All main voltages and currents in system are measured and can be readout on display (also alarms) or via remote user PC-based software package; accidental data, independently of usual measurements are buffered in history files.

- Through keyboard and LCD display (local monitoring and control) next values are enable to adjust:
  - Number of shelves and number of rectifiers
  - Maximal load voltage and current
  - Battery turn-off threshold
  - Maximal battery charging current
- Light indication of basic system alarms are realized with LEDs and also monitored with BCU. These alarms are:
  - Low ac input voltage (main supply alarm – MSA)
  - Rectifier fail (rectifier error alarm – REA)
  - Battery voltage less than 44.5 Vdc i.e. rest capacity ≤10% (under voltage alarm – UVA)
  - Battery alarm less than 53 Vdc (under charge alarm – UCA)
  - Input ac fuse failure (main fuse failure – MFA)
  - Battery fuse failure (battery fuse alarm – BFA)
  - Output load fuse failure (distribution fuse alarm – DFA)
  - Rack door open (open door alarm – ODE)
- Green and red LED on each rectifier indicates correct work or rectifier fail.
- Green and red LED on battery board indicates correct connection and battery employing.
- Integrated System monitoring of basic alarms through telecommunication network is achieved in conjunction with other Iritel equipment using:
  - Q2 bus, with graphic oriented PC based software package (SUNCE-M option – network manager),
  - SN12 connection with flexible multiplexer FM2x2, using RS232 interface.



TECHNICAL DATA

Input data

AC Input voltage	230 Vac (175 — 255 V)
AC Frequency	50 Hz (47 — 63 Hz)
Inrush current according to	EN61000-3-2
Power factor	≥ 0.98

Rectifier IM400 up to 6 p.

Output voltage (main ac supply present)	54.6 Vdc 48 Vdc nominal
Output power	400 W nominal (7.5 A/54.6 Vdc)
Output current limit	7.8 A
Output dynamic responce (change load 20% to 100%)	1.5%
Output load line response	±1%
Output voltage noise	≤50 mV_{eff}, ≤100 mV_{p-p}
Psohometric noise	Ueff ≤ 2 mV (according to CCITT norms)
Efficiency	η > 87%

System data

Output voltage	54.6 Vdc, nominal
Charging current	3 A, standard (30 Ah capacity) adjustable: 2.2—22 A
Temperature compensation	4 mV/C°/cell standard, adjustable: 1—5mv/C°/cell
Max. Output voltage protection (adjustable using BCU)	50—58 Vdc
Max. Load current protection (adjustable using BCU) n - number of rectifier modules	n x 7.5 A

Output specifications under absence of main ac supply

Output voltage	40 — 56 Vdc
Low voltage battery disconnect (LVD) turn-off threshold adjustable	40 — 44 Vdc
Battery turn-on threshold	49 — 52 Vdc

DC (load) distribution

DCD2	2 terminal connectors, up to 30A (automatic) fuse
DCD6	6 terminal connectors, up to 10A (slow) fuse

F - remotes alarms interface (DB9 connector)

Interface	RS232
Number of signals (alarms)	8
Isolation	optoisolation

Batteries 48 V/24 —180 Ah

Designed and tested according to

Safty standard	EN 60950 (UL1950)
EMC standard	EN 55022/CISPR22, class A

Environmental

Ambient operating temperature	0 to +50°C

Dimensions (V x L x H)

Rectifier (IM400)	150 x 105 x 200 mm
ETSI shelf (RE-SN1/2)	150 x 533 x 220 mm
ETSI cabinet	1000/1200/2200 x 600 x 300 mm

SN12

SN12/110

Power Supply System 110 Vdc / 3 x 7.5 A

- Compact modular power supply system - one rack with 3 rectifier modules, power up to 2400 W
- Full front access to supply system – easy installation and operation
- Parallel working of rectifiers – active current sharing, true redundant configuration (N+1)
- Power factor ≥0.98
- Optimal Charging of Batteries
- Additional output for extra battery charging - optionally
- Two independent battery breakers and two load breakers
- Programmable battery low voltage disconnect (LVD) - optionally
- Communication with remote monitoring center
- Use of IRITEL SDNU System for remote monitoring and control of power electronic devices – optionally

Description

SN12/110 system is power solution designed for measurement, control, regulation and telecommunication applications with 110 Vdc (nominal) on output. Voltage supplied to load need to be reliable and permanent DC power supply regardless on main supply failure.

Power supply system SN12/110 is modular and consists from up to 3 rectifier modules in one rack. System is positioned inside cabinet (with additional place inside for other devices included monitoring and control equipment and/or smaller batteries). SN12/110 can be configured for different load power: 800, 1600 or 2400 W. In redundant configuration of power supply system (N+1), reserve rectifier is also active and work in parallel work with others rectifiers. Accuracy of rectifiers active current sharing is 5%.

SN12/110 are delivered in two configurations: basic (described above) and extended for additional batteries charging. Second version going when additional string of batteries is present at user. That auxiliary battery string is connected with primary set of batteries when battery voltage goes under 107 V (without presence of main ac voltage). In this configuration, additional battery charger is delivered with SN12/110 V.

Batteries are paralleled with load and system output. Battery management includes controlled current charging of batteries independent of load current (IU characteristic), automatic temperature compensation. Up to two battery sets can be connected to SN12/110 (parallel to each other).

Temperature compensation with additional cable and sensor is available, also, programmable low voltage disconnect (optionally).

System overview

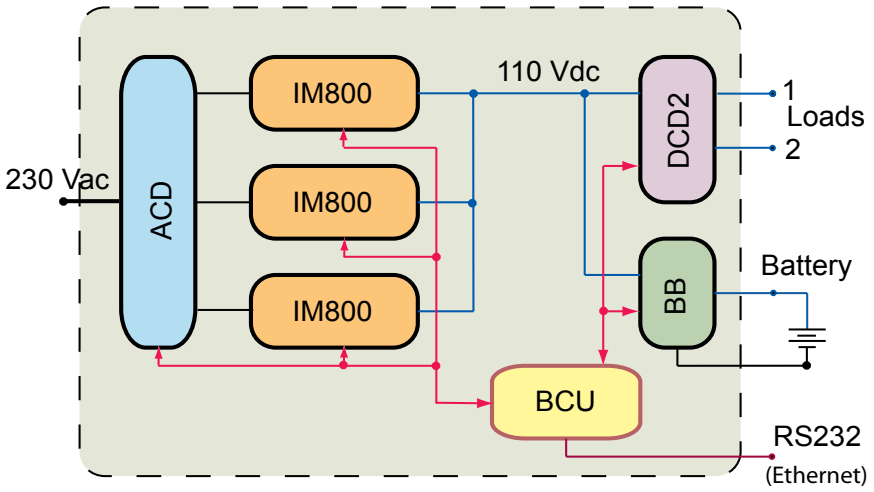
SN12/110 system is composed of:

- AC distribution (ACD)
- Up to 3 rectifier modules (IM800), power of each rectifier 800 W (nominal)
- Load (DC) distribution (DCD2) with two fuses (two equal terminals for user)
- Battery board (BB) with double battery fuses and terminals (for two battery sets) – delivered optionally with Low Voltage Disconnect (LVD) part inside module
- BCU – basic control unit for control, monitoring and communications, with LCD display and keyboard for selfguided controller operation, LEDs, RS232 and other interfaces
- Module for connection with additional battery set - delivered optionally

Protections

Protections include:

- Overload (current limit) and short circuit protection, active and passive, programmable and with fuses
- Electronic Low Voltage Disconnect (LVD) – battery over discharging protection; value of battery turn-off threshold is programmable (through keyboard or RS232 interface) – this is optionally
- Battery current overcharging – value of charging current is controlled independently of load current (even in the case BCU is not active for some reason) and programmable through keyboard or RS232 interface (BCU)
- Over Voltage Protection (OVP) – output dc voltage and input ac voltage, active and passive
- Thermal rectifier protection (active)



Power supply system SN12/110 block diagram

SN12/110 with other equipment in closed cabinet

Rectifier module IM800

System monitoring

System monitoring and control can be achieved locally (display and keyboard on BCU) or remotely through existing telecommunication network. All voltages and currents in system are measured and can be readout on BCU display (also alarms if exist) or via remote user PC-based software; accidental data, independently of usual measurements can be buffered in databases.

Local monitoring and control through keyboard and LCD display on BCU module allows:

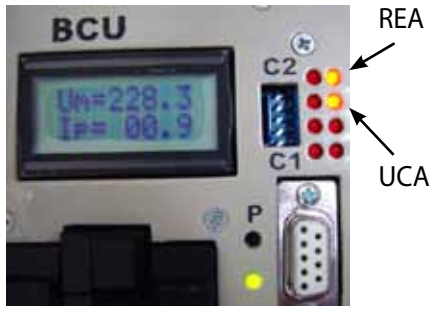
- Measuring of voltages and currents in the system
- Adjusting of next working parameters:
  - Number of shelves and number of rectifiers
  - Maximal load voltage and current
  - Battery turn-off threshold (optionally)
  - Maximal battery charging current
  - Floating and boost voltage and value of current when system goes from boost to float voltage on output

Local light indication of basic system alarms are realized with LEDs on BCU mask. These alarms are:

- Low ac input voltage (main supply alarm – MSA)
- Rectifier fail (rectifier error alarm – REA)
- Battery voltage less than 93 Vdc i.e. rest capacity ≤10% (under voltage alarm – UVA)
- Battery voltage less than 107 Vdc (under charge alarm – UCA)
- Input ac fuse failure (main fuse failure – MFA)
- Battery fuse failure (battery fuse alarm – BFA)
- Output load fuse failure (distribution fuse alarm – DFA)

Green and red LED on each rectifier indicates correct work or rectifier failure.

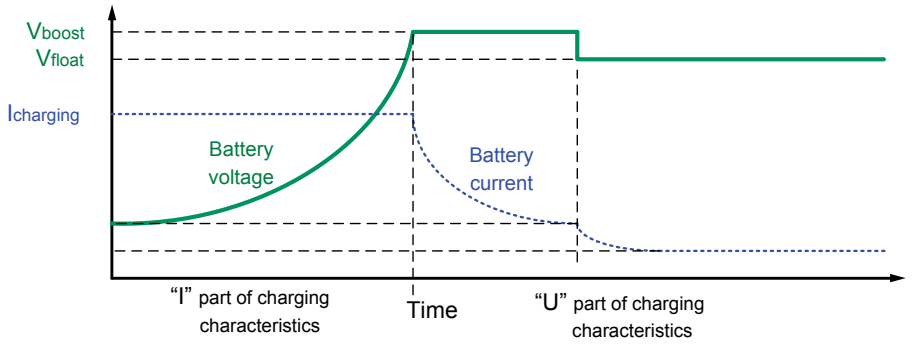
Green and red LED on battery board indicates correct connection and battery employing.



Connection with system for remote monitoring and control

SN12/110 can be connected with any other communication system. Data formatting and protocol are known to end user. For example, System for remote monitoring and control of power electronics – SDNU (IRITEL) or monitoring system SUNCE-M (Network Manager, IRITEL) can be used to communicate with SN12/110 (monitoring of values, control of system by changing system working parameters, data collecting). Also, some already existing monitoring system at user or just PC based software (delivered with SN12/110) are also suitable.

Batteries charging process



TECHNICAL DATA

Input data

Input voltage	230 Vac (175 — 255 V)
Frequency	50 Hz (47 — 63 Hz)
Inrush current according to	EN61000-3-2
Power factor	≥ 0.98

Rectifier IM800 up to 3 pc.

Output voltage (nominal)	110 Vdc
Output power	800 W nominal (7.5 A/110 Vdc)
Output current limit	7.5 Adc
Output dynamic response (change load 20% to 100%)	1.5%
Output load line stability	±1%
Output voltage noise	≤ 50 mV_{eff}, ≤ 100 mV_{p-p}
Efficiency	η > 87%

System data

Output voltage	110 Vdc, nominal
Max. Output voltage (adjustable using BCU)	116 - 128 Vdc
Max. Load current (adjustable using BCU, n - number of rectifier modules)	n x 7.5 A
Charging current	0.1C standard adjustable: 2—16 A
Temperature compensation	4 mV/C°/cell (standard), adjustable: 1—5mv/C°/cell

Output specifications under absence of main ac supply

Output voltage	90 — 120 Vdc
Low voltage battery disconnect (LVD), adjustable, optionally	88 — 96 Vdc
Battery turn-on threshold, adjustable	98 — 104 Vdc

DC (load) distribution

DCD2	2 terminal connectors, up to 30 A fuse (ceramic, 6.3x32 mm)

F - remote alarms interface (DB9 connector)

Interface	RS232
Number of signals (alarms)	8
Isolation	optoisolation

Designed for Batteries with capacity 110 V/24 – 200 Ah

Designed and tested according to

Safety standard	EN 60950 (UL1950)
EMC standard	EN 55022/CISPR22, class A

Environmental

Ambient operating temperature	0 to +50°C

Dimensions (L x W x H)

Rectifier (IM800)	150 x 105 x 200 mm
ETSI rack with fan unit	195 x 533 x 220 mm
ETSI cabinet	1000/1200 x 600 x 450 mm

SN12/110 with extra battery charging, additional devices and system for remote monitoring and control (DNU24) in one cabinet (1000 mm)

NN301/48 Vdc

Small DC Power Supply System

- Compact uninterruptible
  dc power supply system - in one enclosure:
  - Rectifier 230 Vac/48 Vdc, up to 175 W
  - Battery Charger 220 Vac/40,5 — 56 Vdc, up to 125W
  - Batteries 48 Vdc/12 Ah/17 Ah/24 Ah
  - Low Voltage Disconnect block
- Optimal Charging of Batteries
- Each system is completely wired, charged and ready to go

Applications

DC power supply system NN301 is designed for:

- Applications in which electronic equipment need to have reliable and permanent DC power supply regardless on main supply failure
- Equipment to be used in telecom, datacom, and network applications
- Equipment to be used in security and monitoring applications

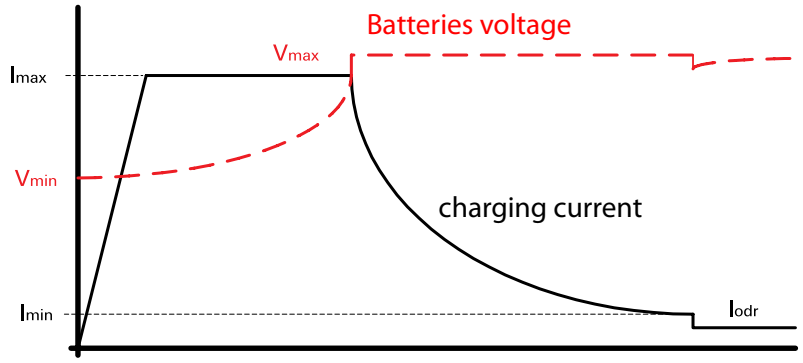
Typical Applications

- Fiber Optic Networks
- Data communications
- PABX/ISDN
- Industrial
- Customer premises

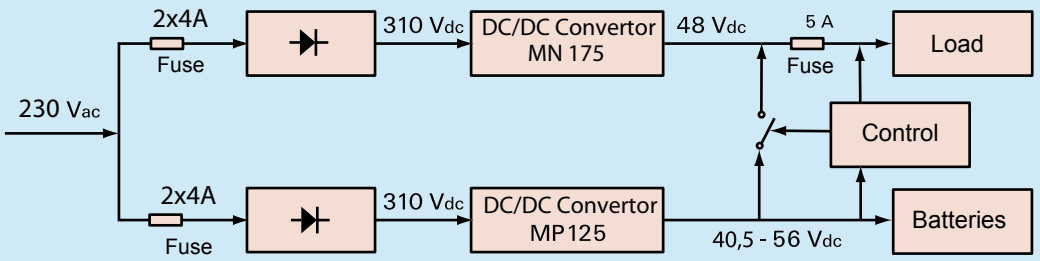
System overview

NN301 contains:

- Rectifier/ Charger N301:
  - Rectifier - DC/DC converter (MN175) providing DC output power to load
  - Charger – DC/DC converter (MP125) providing battery charging:
    - Battery charging is independent of rectifier and move according to optimal charging characteristics given by battery manufacturer
    - It works like current/voltage source (IU characteristics)
  - System of semiconductor switches providing uninterruptible DC output power to load:
    - Connecting load and batteries when ac power is loss (rectifier off)
    - Assuring permanent power to load
- Control block:
  - Controlling system of semiconductor switches mentioned above
  - Detection of system failures – overload detection, loss of AC detection, battery damage
- Battery set (up to 24 Ah)
- Enclosure
- N301 can be used separately



Batteries charging process



NN301 Block diagram

Protections

Protections include:

- Overload (current limit) and short circuit protection - both rectifier and charger
- Over Voltage Protection (OVP) - both rectifier and charger
- Electronic Low Voltage Disconnect (LVD) - Disconnect the battery to the load when the battery drops below 40.5 V
- Output fuse, one 5 A in-line with system negative output,

Batteries and charging

Inside NN301 are stored set of four sealed lead-acid batteries, standard dimensions, with maximum 24 Ah capacity. These kinds of batteries do not need special maintenance. Optimal charging process increasing working life (5 to 12 years) and protect from determination. Automatic temperature compensation is accomplished using temperature sensor on batteries. Charging process has next stages:

- Soft start, charging with constant current, Imax (charger working like current source)
- Charging in two-stage voltage mode:
  - Boost mode - after reaching Vblk voltage, constant voltage of that value is maintained
  - Float mode - after charging current fall under Imin value, voltage become Vfloat (keeping that value), batteries are fully charged

System Monitoring

With LED indicators user can monitoring status of correct NN301 functioning:

- Red neon light on main switch – presence of ac voltage
- Green LED OUT – power to load from rectifier (ac lines)
- Green LED BATT – power to load from batteries
- Green LED1 – charging of batteries in Current/Boost Voltage mode
- Yellow LED2 – charging of batteries in float mode
- Red LED3 – failure of batteries or decreasing of battery capacity

Remote alarms - optoisolated interface:

- Failure (loss or incorrect) main supply voltage
- Output power from batteries (rectifier do not work)
- Battery low level (remain battery capacity low)
- Non-correct charging of battery (failure of charger or batteries)

TECHNICAL DATA

Input data:

AC Input Voltage	230 V_{ac} +10%/–15%
AC Frequency	50 Hz ±5%

Output data (MN175)

Output voltage (main ac supply present)	48 Vdc, nominal, adjustable: 48 – 49.5 Vdc
Output power	175 W nominal, (3.7 A/48.6 V)
Output current limit	4 A, nominal, adjustable: 4.2 – 1.8 A
Output dynamic response (change load 20% to 100%)	±1.5%
Output load line response	±1%
Output voltage ripple and noise	±50 mV_{max}
Psohometric noise	U_{eff} ≤1mV
Efficiency	η >80%

Output data (MP125)

Output battery voltage	54 Vdc, nominal
Output battery voltage in charging process	
Vfloat:	54.6 Vdc, nominal, adjustable: 51 – 55 Vdc (2.275 V/cell, adjustable: 2.12 – 2.3 V/cell)
Vbulk:	57.5 Vdc, nominal, adjustable: 53.5 – 58 Vdc (2.4 V/cell, adjustable: 2.2 – 2.4 V/cell)
Charging current:	2.4 A standard/nominal, adjustable: 2.4 A-1A
Temperature compensation:	4 mV – /C/cell standard, adjusatable: 1 – 8 mV/C/cell

Output data under failure of main ac supply:

Output voltage	40.5 – 56 Vdc
Low voltage battery disconnect (LVD) threshold adjustable	40 – 44 Vdc
Threshold of battery connect	45 – 47 Vdc

Standard battery delivered within NN301:

NP24-12, 12V/24Ah, Yuasa, 4 pcs. in set

Battery recharge time	10h (±1h)

Remote alarms interface (DB9 connector):

Number of signals (alarms)	4
Isolation	optoisolation
Output voltage	5 – 10 V

Designed and tested according to:

Safety standard	EN60950 (UL1950)
EMC standard	EN55022/CISPR22, class A

Environmental:

Ambient operating temperature	+5°C to +50°C

Dimensions:

Physical Size (WxLxH)	415 x 250 x 301 mm
Weight	50 kg (with batteries)

DC UPS

Uninterruptible Power Supply with DC Output Voltage 300 Vdc

- 300/400/600/800 W power uninterruptible power supply
- Provide uninterruptible working of computer and telecommunication equipment supplying from line ac voltage
- DC UPS is applicable in systems which already have equipment supplying from uninterruptible 24/36/48/110 V dc voltage sources
- Protection of batteries from under voltage
- Protection of devices from ac line disturbances and low line voltages

Applications

DC UPS provides uninterruptible working of computer and telecommunication equipment normally supplying from 230 Vac line voltage, 300/400/600/800 W power.

Modern equipment, on their input, have rectification of line voltage, without line transformer. From the line voltage rectifier generates about 300 Vdc, which means that such devices could be supply with 300 Vdc (approximately) instead 230 Vac line voltage.

DC UPS use this possibility. On its output, when line voltage exists, DC UPS generates dc voltage (about 300 Vdc), made by rectification of 230 Vac line voltage. When line voltage is not present, dc output voltage is generated by converting reserve 48 Vdc input voltage (batteries). Reserve 48 Vdc is available in systems, which have uninterruptible dc power supply (for example, telecommunication companies, railroad companies, power distribution companies, etc.).

DC UPS-400 with built in charger (4.5 A/48 V) is marked DC UPS-400/P.

Switching from ac line supplying to reserve battery supplying and vice-versa, is going without time period of output voltage interrupt (that happens with classic off-line UPSs - at output of classic AC UPS exist interrupt in energy supply in period 5-15 ms, because of adding ac voltages, which are not synchronous). That can be accomplished because, on output of DC UPS, dc voltage generated from rectified ac line voltage and dc voltage generated from dc/dc converter are connected in parallel; their sum is output DC UPS voltage.

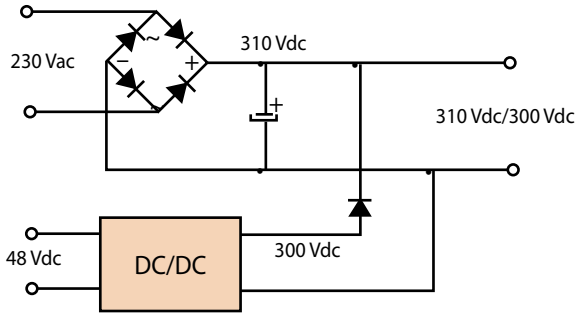
Signalization

LED1 ● Batteries are low and disconnected (Vbat < 44 Vdc)

LED2 ● Batteries are low (Vbat < 46 Vdc)

LED3 ● Line ac voltage is incorrect (not exist or the line is to low), load supplying come from batteries energy

LED4 ● Line is correct, load supplying come from line energy



DC UPS Block diagram

TECHNICAL DATA

Input voltage	230 Vac (205 — 252 V)
Line voltage frequency	48 — 64 Hz
Input dc voltage (batteries)	48 Vdc
Optional	24/36/110/220 Vdc
Output dc voltage	
working "on" line voltage	310 — 340 Vdc
working "on" batteries	300 Vdc
Load power	300/400/600/800 Wmax
Switch time from working on line to working on batteries	0 ms
Protection of batteries from overdischarge	<44 Vdc
Batteries charging time (48 V/38 Ah)	
DC UPS-400/P	<10 h

Number of output connections	
DC UPS-300	4
DC UPS-400	5
DC UPS-600/800	3
EMC standard	Class B
Safety standard	EN 60950
Dimension (H x W x L)	
DC UPS-300	57 x 237 x 335 mm
DC UPS-400/ 600/800	88 x 258 x 423 mm
Weight	
DC UPS-300	2 kg
DC UPS-400/600/800	5 kg

DC UPS-300

DC UPS-400

DC UPS-600/800

SF25
Phase Selector

- SF25 - additional level of security in the overall power supply system
- Monitoring the voltage of each phase from the three-phase mains connection
- Supplying one-phase user by choosing priority phase (Vac>180Vac) from a three-phase main connection
- Maximum load current 25A
- Voltage and time hysteresis during restore of the correct phase

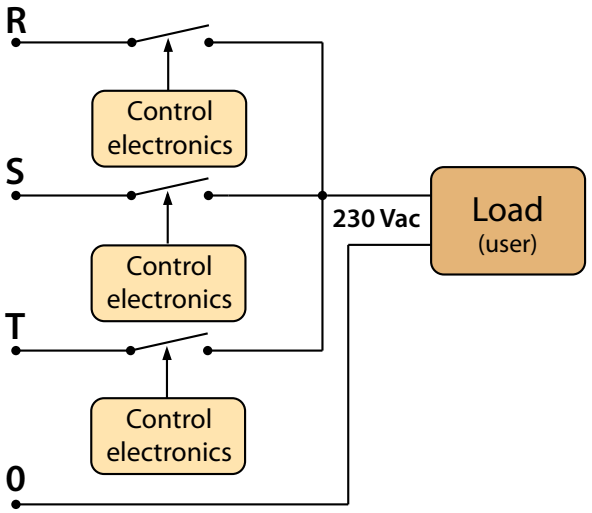
Applications

Phase Selector is a device whose input is three-phase voltage and one phase is forwarded to the output. Neutral is directly forwarded to the output.

- SF25 continuously monitors all present phases present and based on the fact the phases are correct or not and their mutual priorities, determine which phase will be forwarded to the user (output).
- Line is correct if the phase voltage is greater than the minimum. In this way, phase selector plays the role of an additional level of security throughout the whole power supply system.
- With disappearance of one or two phases, user did not stay without main power supply

Basic functions

- The user is connected to one phase only. The control electronics determines which phase form the input will be forwarded to the output. Selector switches off the active phase when registering their disappearance or too low voltage. After that connects the load to the next correct phase, in accordance with the priority of the phase that is determined in advance.
- Switching is performed by relays. The time between fault phase detection, the incorrect phase switch-off and move to the next correct phase, is about 100 msec.
- For each phase there is a voltage and time hysteresis.
- Voltage hysteresis means that, when the phase come on again, after disappearance, voltage must be greater than the upper threshold of hysteresis (eg. 200 Vac), to forward this phase to user again. During the work, phase voltage must be greater than the lower hysteresis threshold (eg. 170 Vac), to consider the phase is correct.
- Time hysteresis means that, after the detection of phase failure, during the one period of time (about 7-8 seconds), return of the same phase to user is stopped (although it is correct and have a greater priority than the current active phase). In this way, it overcomes the problem of instability of the main power network during disappearance of one of the phases.
- Local monitoring of the SF25 functioning and situation with phases can be done via leds.
- SF25 can be delivered to customer already wired



SF25 Block diagram

TECHNICAL DATA

Input

Input voltage per phase	230 Vac nom.
Frequency	50 Hz nom.
Input current per phase	25 Aac max

Phase selector operating parameters

Time hysteresis	5 sec min.
Hysteresis voltage	40 V min.
Phase switch-off (for European standard)	180 Vac nom.
Fixed Adjustable	165 – 210 Vac

Input/output terminal connections

Terminals, for cable cross-section (min)	6 mm^2

Local LED signalization

Control electronics	green LED
Correct phase	green LED (one per phase)

Designed and tested according to

Safety standard EN60950 (UL1950)

Environmental

Ambient operating temperature	– 25C^0 to +50C^0
Air circulation	Natural

Dimensions

Plastic box (WxDxH)	200 x 155 x 80 mm
Enclosure protection	IP55, IP56

Manufacturing and Assembly of Electronic Devices

SMT ASSEMBLY

- Continuous flow SMT line
- Components QFP, QFN, CSP, 0201 to □ 55mm, fine pitch ≥0.4 mm
- BGA, µBGA ≥0.5 mm
- RoHS & non-RoHS Services
- PTH, SMT & mixed technology, Hi-Tech assembly
- Top and bottom placement with Single & double-sided assembly
- Selective soldering of TH components
- No-Clean flux process and closed loop aqueous cleaning system
- Repair and rework including BGA & QFP
- Automated Optical Inspection

- Complete electronic & mechanical design
- PCB design service
- Electronic and electromechanical assemblies
- Wire/cable assembly
- Funcitonal testing
- Temperature cycling
- Burn-in test
- Two surface mount manufacturing lines
- Line for manufacturing prototype

Manufacturing possibilities

- **Automatic continuous flow SMT line with 70,000 chp/h capacity:**
  - Dual vision screen printer
  - Two SMD automatic pick & place machines
  - Reflow soldering processes - 7 and 9 temperature zones
  - Automatic optical inspection
  - Automation
- **Other manufacturing equipment:**
  - Automatic wave soldering, two waves
  - Selective soldering of TH components
  - Di water cleaning, 4 chambres
  - Alcohol solvent cleaning
  - Four clima chambres
  - Assembled PCB rework system
- **Prototype and low volume manufacturing line:**
  - Semi-automatic screen printer
  - Automatic pick and place components (SMD)
  - Reflow soldering process with 4 temperature zones

Quality Assurance

SRPS ISO 9001:2015
СЕРТИФИКАТ бр. QMS-110-2
SRPS ISO 14001:2015
СЕРТИФИКАТ бр. EMS-038-2
SRPS ISO 45001:2018
СЕРТИФИКАТ бр. OH&S-007-1
SRPS ISO/IEC 27001:2014
СЕРТИФИКАТ бр. ISMS-022-2
COPC 9000/21
СЕРТИФИКАТ бр. QS-047-2

- Reliability prediction of component parts, equipment and systems
- Reliability testing of component parts, equipment and systems
- Burn-in testing of component parts, equipment and systems
- Environmental testing of component parts, equipment and systems
- Attesting of component parts, equipment and systems

Quality Assurance

Permanently quality improvement of ours existing products and service, and quality assurance of new products represent one of our basis business policy (politics).

IRITEL's Quality and Environmental management's policies are based on national and international reference standards SRPS ISO 9001:2015, SRPS ISO 14001:2015, SRPS OHSAS 45001:2018, SRPS ISO/IEC 27001:2014 and COPC 9000/21.

Testing determin conformity of product characteristics to standards, technical regulations and specification: Serbian standards (SRPS), international standards (ISO, IEC, CEE) and military standards (SNO, MIL).

Environmental Testing

In our environmental testing laboratory we simulate the environmental conditions to which various products are exposed.

We simulate the conditions to which electrical devices are exposed during both, transportation and operation.

We simulate extreme temperature and humidity in various combinations.

Climatic exposures:

- Cooling up to –80°C
- Heating up to +100°C
- Humidification study state and cyclic, from +10°C to +90°C, and 10% to 98% relative humidity
- Salt mist testing

Mechanical resistance:

- Test samples can be exposed to diverse mechanical impacts on all three axes:
- Sinusoidal vibrations at constant frequency
- Sinusoidal vibrations at changing frequencies (frequency range from 5 Hz to 2000 Hz with accelerations up to 50 g)
- Bump testing with accelerations up to 40 g

IP testing:

IP testing helps us to confirm the level of protection against access to dangerous parts, ingress of solid foreign objects (major objects, testing finger, thorn, wire, dust), and ingress of water.