**HD9416-RA**

SDH STM1/STM4/STM16 ADM/TM CONCENTRATION NODE

### Features
- 6U height, ETSI shelf
- STM16, STM-4 or STM-1 for the Aggregate Line
- TM, ADM, and XC
- SNCP/UPSR Ring protection
- MESH SNCP
- MSP (1+1) protection for Bus or Point-to-Point
- Full Cross-Connect at VC12/VC3/VC4 levels
- 4 Tributary groups with 8 slots for General-Purpose Tributary cards
- Hot-Swappable Redundant Power cards DC or AC
- Hot-Swappable Aggregate Line and Tributary cards

### Aggregate infrastructures:
- 2 x STM-1/4/16 SNCP ring,
- 2 x STM-1/4/16 MSP (1+1) bus, or
- 1 x STM-1/4/16 SNCP with MSP (1+1) 4 fibers ring

### Tributary interface: up to
- 252 x E1/T1 protected (1+1) or 504 unprotected
- 12 x DS3/E3 protected (1+1)
- 64 x 10/100M Ethernet
- 8 Gigabit Ethernet or
- 32 Gigabit Ethernet with HD9400R-2CB-2GSF
- 8 x STM1 with MSP (1+1) or
- 8 x STM1 SNCP Ring
- 4 x STM4 with MSP (1+1) or
- 2 x STM4 SNCP Ring
- 1 x STM16 with MSP (1+1) or a combination of all.

### Backplane supports 92 VC4 with 64 VC4 of the aggregates and 28 VC4 of tributaries. The system support the following aggregate interfaces and Network topologies:
- 2 STM16/4/1 ring with SNCP protection,
- 2 STM16/4/1 linear with MSP(1+1) protection,
- Or a combination of both.

The HD9416-RA with its non blocking crossconnect VC4/VC3/VC12/VC11 is a high density concentration node for TDM links and Ethernet or Gigabit Ethernet circuits. SDH bus or ring infrastructures are supporting the transport of all Ethernet infrastructure with 100% stable level of QoS.

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The HD9416-RA is the last largest HD9400R series configuration of the ADM/TM SDH multiplexer range from CXR. This configuration with two CC16 CPU/aggregate provides a concentration of traffic over the two STM16 (2488Gbps) SNCP rings, plus up to 8 STM1 or 2 STM4 sub-rings or STM16 MSP in a single node. It supports the full cross-connect of all VC12, VC3 and VC4 of all interfaces.

This new generation equipment, based on SDH+ technology, is designed to have full non blocking add & drop capabilities of the following tributaries:
- 252 x E1/T1 protected (1+1) or 504 unprotected
- 12 x DS3/E3 protected (1+1)
- 64 x 10/100M Ethernet
- 8 Gigabit Ethernet or
- 32 Gigabit Ethernet with HD9400R-2CB-2GSF
- 8 x STM1 with MSP (1+1) or
- 8 x STM1 SNCP Ring
- 4 x STM4 with MSP (1+1) or
- 2 x STM4 SNCP Ring
- 1 x STM16 with MSP (1+1) or a combination of all.

The modular SDH-ADM node HD9416-RA supports 2 STM16 per card CC16 and 4 STM16 payload per chassis with 2 CC16 card. The selection of the STM1-4-16 is operated by software selection and SFP module exchange.
The HX9416-RA is a fully modular ETSI shelf 19” and 23” 6U. This equipment and all cards are compliant with relevant ITU recommendations, ETSI standard, all European regulations CE, EMC and RoHS.

The security of operations is guaranteed by the redundancy of AC or DC power supply with load sharing, the redundancy of the CPU and all aggregate or tributary fiber optic interfaces are protected in MSP (1+1) or SNCP Rings or MESH SNCP modes. Every card is hot-swapable and doesn't affect the running services.

The HX9416-RA is composed of a chassis HX9400-RA with two HX9400R-CC16 CPU/Cross-connect cards providing a non-blocking high order cross-connect of VC4 in any STM1/STM4/STM16, and low order cross-connect VC12 in VC4 or VC3 in VC4. The cross-connect capability is 92 VC4 or 6 x 16 x 63 = 6048 VC12. This gives to this equipment a large capacity as an SDH central node or hub.

The HX9400R, like all devices of the CXR HX9XXX series are based on the SDH-Plus feature. They are supporting GFP, VCAT and LCAS protocols. These are optimizing the transport of IP over SDH infrastructure. These features give to this range of equipment a real capability to transport the Ethernet flow with a high level security and a permanent QoS.

The system is bounding in a GFP trunk n x VC12 or n x VC3 and could reserve VCxx for variable bandwidth on demand.

The HX9416-RA provides powerful Operation, Administration, Maintenance and Provisioning (OAM&P) functionalities. This includes fault management, performance monitoring, configuration management, and network security management. Logs and reports can be printed as well as viewed directly.

Optical features:
The SFP optical modules with Digital Diagnostic Monitor (DDM) control the temperature and receiving/transmitting power. This is very reliable for management and optimize the life of the optical modules.

CXR supplies STM1 SFPs to support up to 240km and STM16 SFPs to support up to 160km. To exceed these distances CXR can supply external EDFA-PA, EDFA-BA and RFA Raman amplifier to reach in one jump up to 320km;

CXR supplies CDWM/DWDM SFP and filters to share the fibers with others optical circuit. We provide point to point solution or ring solution and we share fiber with other signal up to 16 lambdas and 10GE circuits.

The HX9400R series can be managed locally over a console port or LAN port as craft interface with a menu-driven interfaces or remotely via DCC channel or in-band/out-band LAN with a menu-driven or in SNMP.

For centralized administration of the SDH and PDH equipments CXR proposes a light solution named CXRView-Plus and a very powerful Telecommunication system (TMS) named the CXR-INMS.

CXRView-Plus SNMP NMS is based on SNMPc from CastleRock. Over Windows plateform the user can setup, monitor all devices, store and restore configuration of software release and their updates and exchange of PDH/SDH devices so the user can show the active status of links between devices.

CXR-INMS is a powerful SDH EMS/ NMS. It provides a complete set of operation interfaces that are consistent with the Telecommunication Management Network (TMN) concept (ITU Recommendation M.30.6.784) for SDH Network Element/Operations System (NE/OS), NE/NE, and NE/Craft communications. This system gives the possibility to create circuits end to end with automatic commissioning of the crossed PDH and SDH nodes.
The HX9416-RA structure with two CPU/Aggregates HX9400R-CC16 makes it possible to deploy different topologies of SDH aggregates and tributaries. This configuration supports 2 SNCP ring STM1/4/16 or 2 MSP 1+1 or one SNCP + MSP (1+1) STM1/4/16 ring with 4 fibers or 4 independent STM1/4/16.

Each interface STM1, STM4 or STM16 are independent and can be selected by the selection of optical module or the setting for multi-rate SFP module.
These mains interfaces are also supporting serial or bus topologies as a drop insert (ADM) or as a simple or double Terminal Multiplexer (TM).

The **HX9400R** can also provide a mix of ring and TM. This can be STM1 or STM4 link depending on setting and optical module selection.
The SNCP MESH feature gives the possibility to mix several SNCP protections and to share VC4-x pipes with different circuits protected in SNCP. This is possible only with HX9400R-CC16 CPU/Cross-connect. It is available at VC4, VC3 or VC12 level.

**Maximum of Tributaries Ring and Bus**

**CCU16 SNCP Ring Configuration:**
- 2 * XCU16 agg. STM-16 Ring
- 8 * STM-1 Ring (Tributary)
  - 2 * STM-1 Slot 1&2
  - 2 * STM-1 Slot 5&6
  - 2 * STM-1 Slot 6&8
- 2 * STM-4 Ring (Tributary)
  - Slot 1 to 3 & 5 to 7

**MSP Configuration**
- 1 STM-16 slot 3 or 4
- 6 STM-1 Slots 1&2, 5 &6 & 7 & 8

**Capacity BW Slot:**
- Trib Group #1 = 4 x VC4 Slot 1&2
- Trib Group #2 = 16 x VC4 Slot 3&4
- Trib Group #3 = 4 x VC4 Slot 5&6
- Trib Group #4 = 4 x VC4 Slot 7&8
Maximum capacity of HX9416-RA with 2 HX9400R-CC16 CPU/Cross-connect. All cards are hot swappable and the physical and software re-configuration is processed without any interruption of others circuits.

<table>
<thead>
<tr>
<th>Trib Group</th>
<th>Slot</th>
<th>Backplane BW</th>
<th>E1/T1</th>
<th>DS3/E3</th>
<th>Ethernet</th>
<th>Optical (SFP)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SWM-8TTX-GTX</td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
<td>FE</td>
</tr>
<tr>
<td>#1</td>
<td>Trib 1</td>
<td>4 VC4 or 2VC4+2VC4</td>
<td>16/32/63</td>
<td>3</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Trib 2</td>
<td>16/32/63</td>
<td>3</td>
<td>8</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>#2</td>
<td>Trib 3</td>
<td>16 VC4 or 8VC4+8VC4</td>
<td>16/32/63</td>
<td>3</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Trib 4</td>
<td>8VC4+8VC4</td>
<td>16/32/63</td>
<td>3</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>XCU1</td>
<td>2 x 16 VC4</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>XCU2</td>
<td>2 x 16 VC4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#3</td>
<td>Trib 5</td>
<td>4 VC4 or 2VC4+2VC4</td>
<td>16/32/63</td>
<td>3</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Trib 6</td>
<td>16/32/63</td>
<td>3</td>
<td>8</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>#4</td>
<td>Trib 7</td>
<td>4 VC4 or 2VC4+2VC4</td>
<td>16/32/63</td>
<td>3</td>
<td>8</td>
<td>1</td>
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<tr>
<td></td>
<td>Trib 8</td>
<td>16/32/63</td>
<td>3</td>
<td>8</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>92</td>
<td>504</td>
<td>24</td>
<td>64</td>
<td>14</td>
</tr>
</tbody>
</table>

Expected delivery date of cards to support this capabilities:
Q4 - 2013 chassis HX9416RA and 4 GE card HX9400R-2CB-2GSF
Q2 - 2014 STM16/OC48 tributary card HX9400R-STM16
Q2 - 2014 4 x STM1/OC3 tributary card HX9400R-4STM1
<table>
<thead>
<tr>
<th>Model Numbers</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HX9400RA-6U</td>
<td>Main chassis 6U, STM1/4/16 or OC3/12/48 modular system w/o modules, CPU &amp; power supply</td>
</tr>
<tr>
<td>HX9400R-CB</td>
<td>Connector board (1 per chassis)</td>
</tr>
<tr>
<td>HX9400R-FAN</td>
<td>FAN board(1 per chassis)</td>
</tr>
<tr>
<td>HX9400R-CC4</td>
<td>CPU card with cross-connect and 2 aggregate STM1/4 or OC3/12/24 with 2 SFP slots w/o SFP module (2 per chassis)</td>
</tr>
<tr>
<td>HX9400R-CC16</td>
<td>CPU card with cross-connect and 2 aggregate STM1/4/16 or OC3/12/48, with 2 SFP slots w/o SFP module (2 per chassis)</td>
</tr>
<tr>
<td>HX9400R-DC48</td>
<td>DC power supply for HX9400-6U, -48v (2 per chassis)</td>
</tr>
<tr>
<td>HX9400R-ACDC</td>
<td>DC power supply for HX9400-6U and DC 48v (2 per chassis)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TRIBUTARY CARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>HX9400R-ADSM1/4</td>
</tr>
<tr>
<td>HX9400R-16E1/4T1_or_E1-75</td>
</tr>
<tr>
<td>HX9400R-32E1/4T1_or_E1-75</td>
</tr>
<tr>
<td>HX9400R-63E1/4T1_or_E1-75</td>
</tr>
<tr>
<td>HX9400R-3DS3E3</td>
</tr>
<tr>
<td>HX9400R-DSM3E3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SDH STM16/4/1 INFRASTRUCTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet tributary card manageable switch level 2 with 1000BaseT and 8 x 10/100BaseT, 8 WAN, GE and FE cannot be used together, support E-LINE and E-LAN</td>
</tr>
<tr>
<td>Ethernet tributary card manageable switch with, 1x 1000BaseT and 8 x 10/100BaseT, 8 WAN, GE and FE cannot be used together, support E-LINE only</td>
</tr>
<tr>
<td>Ethernet tributary card with switch, 2x 10/100/1000BaseT and 2x Combo 10/100/1000BaseT and 2x SFP, 4x4VC, supports E-Line and E-WAN</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SFP MODULES</th>
</tr>
</thead>
<tbody>
<tr>
<td>SFP-STMI-1E</td>
</tr>
<tr>
<td>SFP-STMI-M2</td>
</tr>
<tr>
<td>SFP-STMI-SM3D</td>
</tr>
<tr>
<td>SFP-STMI-SM5D</td>
</tr>
<tr>
<td>SFP-STMI-SM15-W13</td>
</tr>
<tr>
<td>SFP-STMI-SM15-W15</td>
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<tr>
<td>SFP-STMI-SM15-W16</td>
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<tr>
<td>SFP-STMI-SM5-W15</td>
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<tr>
<td>SFP-STMI-SM50-150D</td>
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<tr>
<td>SFP-STMI-SM120-150D</td>
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<tr>
<td>SFP-STMI-SM160-150D</td>
</tr>
<tr>
<td>SFP-STMI-SM200-150D</td>
</tr>
<tr>
<td>SFP-STMI-SM240-150D</td>
</tr>
</tbody>
</table>

| STM16/OC48, GE, 2GE SFP MODULE, with DDM Standard range -5 to +70°C |
| SFP-STMI-SM15D | SFP module STM16/OC48 single mode 1310 DBF for 15km, LC, with DDM |
| SFP-STMI-SM40D | SFP module STM16/OC48 single mode 1310mm for 40km, LC, with DDM |
| SFP-STMI-SM50D | SFP module STM16/OC48 single mode 1550mm for 80km, LC, with DDM |
| SFP-STMI-SM120-150D | SFP module STM16/OC48 single mode 1550mm DBF for 120km, TX 1 to 5dBm, RX -30dBm , LC, with DDM |
| SFP-STMI-SM160-150D | SFP module STM16/OC48 single mode 1550mm DBF for 160km, TX 5 to 8dBm, RX -30dBm , LC, with DDM |
| SFP-STMI-SM50-CxxD | SFP module STM16/OC48 single mode, CWDM Cxx, DBF for 120km, LC, with DDM, please precise the color of lambda Cxx |
| SFP-STMI-SM40-CxxD | SFP module STM16/OC48 single mode, CWDM Cxx, DBF for 80km, LC, with DDM, please precise the color of lambda Cxx |
| SFP-STMI-SM50-CxxD | SFP module STM16/OC48 single mode, CWDM Cxx, DBF for 80km, LC, with DDM, please precise the color of lambda Cxx |
| SFP-STMI-SM120DXXD | SFP module STM16/OC48 single mode, CWDM Cxx, DBF for 120km, LC, with DDM |
**SDH STM16/4/1 INFRASTRUCTURE**

**SPECIFICATIONS 1/4**

**Physical/Electrical**
- HX9400R-6U: 6U chassis 433mm x 264mm x 223.5mm (W/H/D)
- HX9x0R-FILTER: 0.5U chassis 433mm x 22mm x 223.5mm (W/H/D)
- HX9x0R-FILTER-CBL-T: 2U chassis 433mm x 88mm x 223.5mm (W/H/D)
- AC Power: 90 to 240 VAC, 50/60Hz
- DC 48V Power: -36 to -72 Vdc ± 15%
- DC 24V Power: By use of DC 48v card and a 1U 19" chassis with dual channel converter 24V to 48V the DCDC-2X24-48-300W-1U
- DC 17 to 31 V to DC 48 V 300W each channel
- Temperature: -5 to +55°C
- Humidity: 0-95%RH (non-condensing)
- Mounting: Desk-top stackable, 19/23 inch rack mountable supply with brackets, and wall mountable
- EOW: RJ-45
- LAN port: RJ-45
- Console port: DB-9 and Ethernet
- E1/T1 interface connector: SCSII-II 68 pins
- Optical Interface connector: SFP module with LC connectors
- Number of Optical STM-x: Up to 4 STM16, 4 STM4 or 16 STM1
- Number of E1/T1 channels: Card of 16E1/T1, 32 E1/T1 or 63 E1/63T1

**Clock Source**
Up to 4 clocks with priority from:
- Internal,
- STM-N Line 4 aggregate or 6 tributaries,
- 2 External input 2MHz or G704 w or w/o SSM,
- E1 PDH source,
2 output clocks

**Management Interface**
- Consol port: DB9F, RS232 DCE, user interface VT100 menu driven
- Standard: SNMP V1 and V3 (RFC1213, RFC2571 to RFC2575)
- OSS interface: 10/100BaseT FE (IEEE 802.3u ), Telnet and SSH V2
- NE/NE interface: DCC/HDLCEthernet type II

**Alarm Input/Output**
- Inputs
  - Ports: 4
  - Activation current: 3 mA
  - Internal resistance: 1K
  - Deactivation current: 1.5 mA
  - Connectors: RJ-45
- Outputs
  - Ports: 4
  - Maximum switching voltage: 110 Vdc, 125 Vac
  - Initial insul. resist.: Min. 100M ohm (at 500Vdc)
  - Connectors: RJ-45
  - Use: SNMP TRAP or Transmission from Input to Output

**Standards Compliance**
- ANSI: T1.105, T1.107
- IEEE: 802.1q & 802.1ad(VLAN), 802.1w(RSTP), 802.1s(MSTP), 802.3x(flow control), 802.3u, 802.1p(QoS)

**Certification**
- EMC: FCC Part 15 Subpart B, Class A; EN 55022, Class A; EN55024; EN300 386
- *In test for DC48v only:
  - IEC61850-3, IEEE1613 for utilization in electric substation (DC48v)
  - EN-50121-4 for Railway/Tramway station (*in development)
- SAFETY: IEC60950-1/EN 60950-1
SPECIFICATIONS 2/4

Maximum Cross-connect Aggregate module HX9416-RA
- HX9400R-CC16 owns dual SFP STM1/4/16 or OC3/12/48 ports, supports 92VC4 Payload and full cross connect.
- Chassis supports maximum 2 HX9400R-CC16 or supports 4 x 16 VC4 Payload aggregate

Maximum Number of Tributary Interfaces
- 1 STM16/OC48
- 4 STM4/OC12
- 16 STM1/OC3
- 504 E1/T1 Tributaries
- 24x DS3/E3 Tributaries
- 32 x Gigabit Ethernet Tributaries
- 64 x 10/100M Ethernet Tributaries

Optical STM16/STM4/STM1 aggregate line: HX9400R-CC16 card

Card
- CPU with 2 SFP slots for STM1/4/16 or OC3/12/48 modules

SFP module w DDM
- Dual uni-directional fiber 1310 or 1550nm up to 160km in STM16
- Single bi-directional fiber WDM 1310 and 1550nm up to 40km
- Dual uni-directional fiber CWDM 80km
- Dual uni-directional fiber DWDM up to 120km in STM16

Long distance fiber
- CXR can provide solution with EDFA-PA, EDFA-BA and Raman Amplifiers to reach maximum: 310km for STM1/STM4 and 260km for STM16, contact CXR for more information.

CPU
- Fiber section is independent of the CPU, the Fiber section can work if the CPU is off.

Tributary STM1/STM4 card HX9400R-ADSTM1/4

Optical interfaces
- 2 SFP slots for 2 STM1 or 1 STM4 modules

Payload support
- See table with according to the tributaries groups # 1, 2, 3 and 4

Maximum number of card
- 8 cards with 2 SFP STM1
- 4 cards with 1 SFP STM4
- 4 +4 cards with 1 SFP STM4 in 1+1 protection

Tributary 4STM1/OC3 card HX9400R-4STM1-OC3

Optical interfaces
- 4 SFP slots for 4 STM1/OC3 module

Payload support
- See table with tributaries groups # 1, 2, 3 and 4, usable with HX9416-RA only

Tributary 7 FOM for QX3440 card HX9400R-7FOM-4E1

Optical interfaces
- 7 SFP slots for 7 FO links to QX3440-4E14FO in QX3440, QX3440S and QX3440D

Payload support
- Use SFP: SFP-STM1-MM or SMxx
- 7 x 4 E1 with independent clocks

MSP 1+1
- 2 cards support 7 links of 4E1 to QX3440 with 1+1 PDH protection.

HX9000R with 2
HX9400R-7FOM

1+1 PDH protection
Protect HX and QX cards and FO SPAM

Up to 7
QX3440S/D
with 2
QX3440-4E1FO

SDH STM16/4/1 INFASTRUCTURE
### E1/T1, E3/DS3 Card

#### Tributary 16/32/63 E1 card: HX9400R-16E1/T1 or HX9400R-16E1-75

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line Rate</td>
<td>2.048 Mbps ± 50 ppm</td>
</tr>
<tr>
<td>Framing</td>
<td>Unframed</td>
</tr>
<tr>
<td>Line Code</td>
<td>AMI/HDB3</td>
</tr>
<tr>
<td>Output Mask</td>
<td>ETS 300 689 Sec.4.2.1.2 ITU G.703 ITU G.823</td>
</tr>
<tr>
<td>Input/Output Signal</td>
<td>ITU G.703</td>
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<tr>
<td>Jitter</td>
<td>ITU G.823</td>
</tr>
<tr>
<td>Impedance</td>
<td>75ohms or 120ohms on order</td>
</tr>
</tbody>
</table>

#### Tributary 16/32/63 T1 card: HX9400R-16E1-75

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line Rate</td>
<td>1.544 Mbps ± 32 ppm</td>
</tr>
<tr>
<td>Framing</td>
<td>Unframed</td>
</tr>
<tr>
<td>Line Code</td>
<td>AMI/B8ZS</td>
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<tr>
<td>Output Mask</td>
<td>Bellcore GR-499-core</td>
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<tr>
<td>Input Signal</td>
<td>DSX-1 6dB to ~30dB</td>
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<tr>
<td>Jitter</td>
<td>ITU G.824</td>
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<tr>
<td>Impedance</td>
<td>100ohms</td>
</tr>
</tbody>
</table>

### Software HX9400R-DS3M13

- M13: Support multiplexing from one DS3 to 28 T1
- G.747: Support multiplexing from one DS3 to 21 E1
- E13: Attention this function is not supported (E3 to 16 E1)
**ETHERNET CARD**

**Tributary Ethernet/Gigabit Ethernet card: HX9400R-GTX-8TTX**

This Ethernet card non switch supports only E-Line or Point to Point over SDH circuit. It is using EoS technology in GFP and the protection is provided by the SDH.

**Line Rate**
- 8 x 10/100 Mbps RJ45
- 1 x 10/100/1000Mbps RJ45

**Mode**
- E-Line
  - Non switch card support 8 E-Line mode
  - FE and GE can't work together
- Point-to-Point
  - 8 WAN/LAN FE or 1 WAN/LAN GE

**Mapping**
- n x VC12, n x VC3 or n x VC4

**Process Protocol**
- VCAT, GFP(G.7041), LAPS, LCAS (G.7042) and non-LCAS

**Tributary Ethernet/Gigabit Ethernet switch card: HX9400R-SWM-GTX-8TTX**

This card includes a powerful Layer 2 switch. It is supporting the E-Line or Point to Point and E-LAN or EPV-LAN over SDH circuit, the Port Trunking on LAN or WAN side and the Port Mapping.

It is using EoS technology in GFP but also PPP-PCP to be connected to other vendor ADM switch.

The 8 VCG can be use from LAN to VLAN over SDH circuits.

The VLAN of customer port can be mapped in SDH VCG in order to guaranty the fixed bandwidth per VLAN.

The protection is based on circuit protection but also on RSTP.

This card is usable in all Tributary Slots and supports 2 or 4 VC4 of EoSDH throughput.

**Line Rate**
- 8 x 10/100Mbps RJ45
- 1 x 10/100/1000 Mbps RJ45

**Mode**
- E-Line
- E-LAN
- Port-MAP
- Port-Trunking

**Layer2 Protocol**
- RSTP (802.1W)
- VLAN (802.1Q, 802.1P)
- Flow Control (802.3X)
- MSTP (802.1S)
- IGMP Snooping
- QoS

**Process Protocol**
- VCAT, GFP(G.7041), LAPS, LCAS (G.7042) and non-LCAS
- Or BCP-PPP or EoS Layer 2 RFC2615

**Maximum support**
- One E-Line with 8 VLAN/VCG of 622Mbps
- One E-LAN to 8 distants
- Up to four E-LAN 2 with directions
**GIGABIT ETHERNET CARD**

**Tributary Gigabit Ethernet switch card: HX9400R-2CB-2GSF**

This Layer 2 Ethernet switch card has a 8 Gbps switching matrix. The card is particularly used with HX9416RA chassis in Tributary Group 2, or Slots 3 and 4, which support 2.5Gbps backplane. This card is planned to work on the other slots with less WAN bandwidth in later release.

The powerful Layer 2 switch provides high volume process on LAN and WAN/SDH sides.

The card **HX9400R-2CB-2GSF** is supporting point to point E-LINE and multipoint E-LAN modes.

In **E-LAN** mode this card supports up to 48 VCG and each VCG support up to 32 VLAN ID.

In **E-Line** mode, this support 4 links.

The card support LAN over SDH/SONET or 2 **E-LAN** or 24 **EPV-LAN** over SDH circuit. The Port Trunking on LAN or WAN side and the Port Mapping can help the implementation of Ethernet transport infrastructure.

EPV-LAN, EPV-Line, EPV-Tree are supported with simple tagging or Q-in-Q. The VLAN of customer port can be map in a VCG, then in n VCx, in order to guarantee the fixed bandwidth per VLAN.

The bandwidth of each pipe is selected with a bandwidth of nVC3 or nVC4.

This card is using EoS technology with VCAT and in GFP but also PPP-CP according to RFC2615 in order to be connected to other vendor SDH ADM switch.

All Ethernet circuits are transported with fixed TDM bandwidth and 100% guaranty

<table>
<thead>
<tr>
<th>Line Rate</th>
<th>Gigabit Ethernet ports</th>
<th>Gigabit Ethernet ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>On Slots 3 and 4</td>
<td>Support 2.48Gbps or 16 VC4 per TG or 8VC4 per Slot</td>
<td>Mapping nVC3 or nVC4, nVC3 or nVC4,</td>
</tr>
<tr>
<td>On Slots 1, 2, 5, 6, 7 and 8</td>
<td>Support 622Mbps or 4 VC4 per TG or 2VC4 per Slot</td>
<td>Mapping n VC12, nVC3 or nVC4,</td>
</tr>
<tr>
<td>Ethernet ports</td>
<td>4 LAN and 4 WAN Ethernet Private Virtual for Ethernet transport with VLAN and Q-in-Q up to 48 EPV</td>
<td>SDH side 48 VCG</td>
</tr>
<tr>
<td>Mode</td>
<td>Point-to-point Maximum 48</td>
<td>Multipoint Maximum 24</td>
</tr>
<tr>
<td>Layer2 Protocol</td>
<td>RSTP (802.1W), VLAN (802.1Q, 802.1P) Flow Control (802.3X) MSTP (802.1S) IGMP Snooping QoS</td>
<td>8 Gbps of switching matrix</td>
</tr>
<tr>
<td>Process Protocol</td>
<td>VCAT, GFP(G.7041), LAPS, LCAS (G.7042) and non-LCAS BCP-PPP or EoS Layer 2 RFC2615</td>
<td></td>
</tr>
</tbody>
</table>
**STM16 TRUNKING CARD**

**Tributary STM16/OC48 card: HX9400R-STM16**

This STM16/OC48 trunk card gives the possibility to interconnect two chassis HX9416-RA over the Tributary Group 2, or Slots 3 and 4, which supports 2,5Gbps. In this configuration, the bundle of two chassis can provide up to 8 STM16 interfaces or 4 SNCP STM16 and 12 slots for E1, E3 and Ethernet/Gigabit Ethernet or TDMoE tributary cards. The CXR-iNMS will manage both units as a single node.

In case of a redundant network request, this card gives the possibility to create STM16 SNCP + MSP network and to double the network with 2,5Gbps optical interfaces.

**TDMoETHERNET CARD**

**Tributary PseudoWire: HX9400R-PWSTM4**

This STM4/OC12 backplane card is planned to support the encapsulation of TDM circuits VC4, VC3, VC12 and VC11 in PseudoWire emulation circuits or TDM over PSN (Ethernet or IP). This card includes a Gigabit-Ethernet Layer 2 switch with 2x10/100/1000BaseT LAN and 2 Combo SFP GSX/GLX and 10/100/1000BaseT as WAN to interconnect the HX9416R to other Pseudowire equipments. The card will support 1024 Pseudowires or Bundles and the system will provide:
- STM1 to STM1, one VC4 transport
- STM4 to STM4, one VC4-4 transport
- STM1 to 63 E1, from one VC4 to 63 VC12 with small device like CIP-2E1 as CPE
- STM1 to x FE1, from one VC4 to x VC12 and n TS circuit with small CIP-2E1 as CPE

The TDM circuit between A and Z node can cross pure SDH sections and PseudoWire over Ethernet sections.

This system support the following encapsulation/emulation: SAToP (RFC4553), TDMoIP (RFC5087)* CESo-

PSN (RFC5086)*, HDLCoPSN(RFC5087,4618)**,Sonet/SDH CEP (RFC4842)

A full range of PseudoWire devices are available within the CXR range to carry STM1/4,
CXR proposes a range of CWDM or DWDM solutions to multiply the capacity of the fiber. These passive optical multiplexing technologies support:

- In CWDM: 1+4, 1+8, 16 or 18 optical circuits on a same fiber and
- In DWDM: 4, 8, 16, 32 or 48 optical circuits on a same fiber

We can share the fiber link from low speed to 10Gbps optical circuits including CXR optical E1/E3 modem/multiplexer, STM1, STM4 or STM16 from HX9XXX series, STM64 from SDAS780B, 100FX, 1000LX and 10GE circuits from CXR switch or any optical equipment in these formats from any vendor.

CXR supplies SFP, passive Mux/Dmux, OADM and transponders up to 2,5Gbps:

**CWDM and DWDM SFP** in HX9416-RA or other devices provide transmission in colored wavelength with a spectral width (at -20dB) of 1nm for CWDM and 0,3nm for DWDM. These optical Lambdas (λ) are multiplexed by CWDM/DWDM chassis.

- **SFP CWDM STM1/4/16** with a budget over 30dB
- **SFP CWDM 100FX/1000LX/10GZR** with a budget over 30dB
- **SFP DWDM STM1/4/16** with a budget over 35dB
- **SFP DWDM 100FX/1000LX/10GZR** with a budget over 35dB

**CWDM/DWDM-2/8LGX Modular multiplexer/de-multiplexer** with LGX plug-in with CWDM or DWDM function for 4 or 4+1 lambdas.

**CWDM/DWDM-1U Fixed chassis multiplexer/de-multiplexer** to support 8, 8+1; 16, 32 and 40 lambdas with duplex connectors LC/PC, SC/PC or FC/PC.

**FOS-25G-SFP-SFP** is a transponder with two SFP slots. It makes the optical conversion of 1310nm or 1550nm to lambda in the bandwidth 4Mbps to 2,5Gbps. It is supporting FE 100FX, GE 1000FX, 2 GE, STM1, STM4, STM16. It operates the 2/3R functions: Re-shaping, Re-amplifying and for standard rate Re-timing. This is a small to large rack card system.

The information contained in this document are provided without warranty and do not constitute a contractual document. In order to improve its products, CXR reserves its right to modify, without notice, any part of this document and the specification it contains.
CXR propose all solutions to reach long distance in STM-x with EDFA-BA (Booster amplifier), de EDFA-PA (Pre-amplifier), Raman amplifier (RFA) and filters (DCM) and signal encryption/decryption (FEC). This can reach up to 300/310km with STM16/2.4G lines.

**TDM / SONET / SDH Transport Network**
- Voice, synchronous, asynchronous, analog stream over TDM
- Ethernet EsPDH and EsS
- SNCP and MSP (1+1) protection
- QxS
- SONET / SDH Synchronization

**Ethernet transport Network**
- Ethernet, Gigabit Ethernet and 10 GE
- E1/T1 and SONET/SDH encapsulation over packet for any stream – voice, synchronous, asynchronous, analog
- ACR synchronization or PTP – IEEE 1588 solutions

**SDH STM16/4/16 Infrastructure**

**NG SDH/Sonet STM1/4/16 or OC3/12/48**
- SNCP Ring protection & MSP (1+1)
- Ethernet transport EsSDH, VCAT/GFP & LCAS
- Gigabit Ethernet
- Synchronous stream encapsulated over TDMat, CESoPSN or SaToP over Ethernet

**Ethernet GE/10GE**
- Protection RSTP/MSTP
- G.8031/G.8032
- E1/T1, STM1 Transport TDMoIP/SAToE/CESoPSN
- Voice: analog, ISDN, Radio
- Secure mobile systems
- Data: any kind of low to high speed Ethernet, Gigabit Ethernet / 10GE
- Video over IP