DATA SHEET

infinera

XTM SERIES

FRONTHAUL FLEXPONDER

Unique Flexibility in Fronthaul Applications

Infinera's range of fronthaul flexponders are part of the XTM Series metro packet-optical platform, and contain traffic units for mobile fronthaul applications. The range includes a chassis-based one-slot Fronthaul Access Unit (FHAU/1) and two hardened units; the 1-rack unit (1RU) Fronthaul Access Unit (TM-FHA1U), and the Remote Fronthaul Unit (RFU)* which is a fully hardened unit for outdoor deployments.

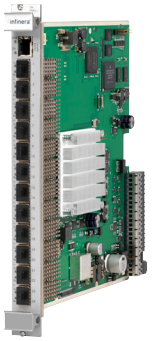
The FHAU/1 is a one-slot plug in unit for mounting in any of the XTM Series chassis options, TM-102/II (1RU), TM-301 (3RU) or TM-3000 (11RU). The TM-FHA1U is a stand-alone chassis intended for deployments in less environmentally- controlled locations such as street cabinets, and the Remote Fronthaul Unit (RFU) is a fully hardened outdoor unit for deployments directly on a pole or wall.

Functions and features are the same in the three units, and all three variants can be combined in different ways to meet the many installation and feature requirements in fronthaul networks.

The flexponder can operate as a muxponder, a transponder, or a mix of the two functions, which provides valuable flexibility in terms of node functionality and reduced spares holding.

Optimized for Mobile Fronthaul Applications with Low yet Highly Stable Latency and Superior Sync Performance

The flexponders use a unique time-division multiplexing (TDM) technique for mobile fronthaul applications. The low yet highly stable latency capabilities provided by the flexponders enable multiplexing of multiple fronthaul formats into one wavelength, while still maintaining the low latency performance of each client signal. This avoids multiple fronthaul formats being transported separately over multiple wavelengths and allows a more efficient use of the fiber infrastructure.



1 Slot Fronthaul Access Unit (FHAU/1)

Remote Fronthaul Unit (RFU)

1 RU Fronthaul Access Unit (TM-FHA1U)

Key benefits:

- High level of functional flexibility allowing the units to work as muxponders, transponders, or in hybrid mode
- Wide range of deployment options, from chassis-based units to fully hardened units for outdoor deployments
- Low yet highly stable latency performance to meet stringent Common Public Radio Interface (CPRI) and Open Base Station Architecture Initiative (OBSAI) requirements
- Delay compensation for network protection
- Superior sync capabilities to meet tough CPRI and OBSAI requirements and allow independent and transparent transport of each client signal
- Total capacity of 84 Gb/s
- Transports CPRI/OBSAI and Synchronous Ethernet (SyncE) signals on the same wavelength
- Layer 2-aware, enabling future migration to Ethernet-based fronthaul networks
- Optional forward error correction (FEC) for improved transmission performance
- Technology-agnostic. Pluggable transceivers enable usage in CWDM as well as DWDM networks

The signals are multiplexed into a 10 gigabit per second (Gb/s) digital frame while maintaining the original synchronization of each client signal. Each client signal is therefore transported independently and transparently end-to-end both from a data and synchronization perspective.

The digital frame also provides performance monitoring (PM) of the line signal and inserts an embedded management channel for remote management connectivity. The latter removes the need for optical supervisor channels (OSC) or a special data communication network (DCN) for the internal management traffic.

The flexponders support real-time delay measurement end-to-end across the fronthaul network, giving a measurement of total fiber and equipment latency. If protection is required then delay compensation can be supported in protection switching scenarios. This delay compensation functionality will ensure a protection switchover with minimal change in the delay within the fronthaul network, and therefore no change in the latency seen by the overlying radio access network (RAN). This feature minimizes the impact on mobile end users as some RAN equipment reacts badly to changes in fronthaul network latency in a protection switch scenario.

FEC for Improved Transmission Performance

To improve transmission performance, the flexponder range has optional forward error correction. The FEC coding is by default turned off to minimize latency. With FEC enabled, however, the flexponder will offer improved transmission performance in amplified networks (i.e. noise-limited), but also better performance on dispersion-limited designs (e.g. in CWDM networks).

Protection with Delay Compensation

The flexponder range can be configured with two line ports, and the second port can be initiated to provide sub-50 millsecond 1+1 line protection configuration. The flexponder can support normal 1+1 line protection and single-ended line protection. Single-ended line protection supports delay compensation. The delay compensation functionality is a single-fiber solution and will ensure a protection switchover with as low a traffic impact as possible. This is an Infinera patent pending solution that enables the use of fewer line interfaces at the remote radio head (RRH) site.

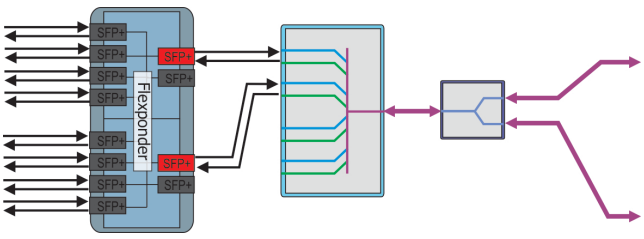


Fig 1: Muxponder with Single-ended Line Protection

Example: Transponder Point-to-point Configuration

When configured as a transponder, the flexponder provides up to six independent transponder functions, all supporting bitrates up to 14.025 Gb/s. The pluggable optical technology used with the flexponder supports up to CPRI Option 9 (12.165 Gb/s). In the example below, however, a multi-rate transceiver technology that supports CPRI Option 3 to Option 8 is used. As a network operator increases the CPRI rate from CPRI Option 3 to Option 8, the multi-rate transceiver technology is remotely reconfigured via management software.

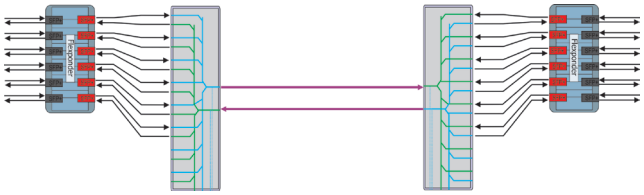


Fig 2: Transponder Point-to-point Configuration over Dual Fiber Using an Eight-channel Mux-Demux Unit

Example: Muxponder Point-to-point Configuration

The flexponder can be configured as two separate muxponder functions in one traffic unit. Hence, in the example of transporting CPRI Option 3, the flexponder can transport up to eight CPRI Option 3 channels over two optical wavelengths. Each muxponder function supports SyncE clients in addition to CPRI or OBSAI clients.

Fig 3: Muxponder Point-to-point Configuration over Single Fiber Using a Four-channel Mux-Demux Unit

Layer 2 Management VLANs

Remote access to a Layer 2 client that is connected to a gigabit Ethernet (GbE) port is easily provided via a management virtual local area network (VLAN) within the GbE signal. This provides an integrated solution for management of both Layer 1 and Layer 2 devices in the same network.

Tailored Network Element Options

The FHAU/1 unit can be mounted in any TM-3000 (11RU), TM-301 (3RU) or TM-102/II (1RU) chassis. This enables a tailored setup depending on current and future capacity needs of the site. The TM-FHA1U is a hardened 1RU chassis for deployment in less controlled environments such as outside plant cabinets. The RFU is a fully hardened unit for deployment in outdoor environments such as on a pole or wall. The broad range of deployment options available create unprecedented flexibility when it comes to matching installation requirements.

Low Power Design

A fully equipped FHAU/1 consumes less than 58 watts (W), including all optics. Low power consumption in combination with a small footprint reduces site costs and enables more capacity to be handled at sites with restrictions on power consumption, cooling and space.

Specifications

Supported Traffic Formats	Example configurations: • Two muxponder functions, each supporting 4x2457.6 Mb/s (one port is optional SyncE) • Six transponder functions, each supporting CPRI Option 1-9 and OBSAI
Layer 1 Performance Monitoring	Client GbE: Based on CRC Client CPRI: Based on 8B10B coding errors Line: Based on CRC 15 min/24 h statistics presented according to G.826
Synchronization	Through-timing. Supports SyncE transport (G.8262/Y.1362 option 1)
Latency	The latency differs depending on client rates supported. CPRI Option 3: 1.93 µs (with FEC 4.06 µs) CPRI Option 7: 0.66 µs (with FEC 2.80 µs)
Interfaces	The flexponder contains 12 SFP+ ports, all having different functions (line/client) depending on configuration. The interfaces supports SM, MM, CWDM, DWDM tunable
Layer 2 Features	Ethernet utilization PM (in %) per GbE port Inject and extract of management VLAN on all GbE ports
Protection	Single-ended line protection (with delay compensation) 1+1 line protection. Non-revertive switching typically <15 ms
Power Consumption	FHAU/1: max 58 W worst case (with all client ports active and using DWDM transceivers) TM-FHA1U: max 75 W worst case (with all client ports active and using DWDM transceivers) RFU: max 55 W worst case (with all client ports active and using DWDM transceivers)
Misc. Line Interface Features	Embedded management channels on line signals Trail trace insertion to validate connection Delay measurement function
Environmental	TM-FHA1U: -40 to 65 °C / -40 to 149 °F (requires a IP65, GR-487 cabinet) RFU: -40 to 55 °C / -40 to 131 °F (GR-3108, Class 4)

Specifications and Features Are Subject to Change
* The RFU comes in a later release

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