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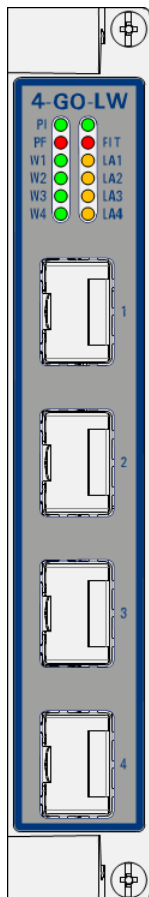
A **BELDEN** BRAND

User Manual

Installation

Dragon PTN

Interface Module PTN-4-GO-LW



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1. INTRODUCTION

1.1 General

This document is valid as of Dragon PTN Release 3.0DR.

This document describes the PTN-4-GO-LW interface module which provides four 1Gbps LAN/WAN optical ports on the front panel (LAN = Local Area Network; WAN = Wide Area Network). These optical ports are SFP based. Each individual port can be configured as either LAN or WAN port via HiProvision (=Dragon PTN Management System). By default, each port is configured as WAN port. PTN-4-GO-LW refers to '4 ports – Gigabit Optical port – LAN WAN'.

The PTN-4-GO-LW IFM can be used in the following IFM slots in the

- node:
- ▶ IFM1,2,3,4,9 (1G/4*1G slots): Fully operational;
 - ▶ IFM5,6,7,8 (1G/10G slots): port1 = operational;port2,3,4 = not operational;
 - ▶ IFM10 (1G slot): port1,2,3 = operational; port4 = not operational;
 - ▶ IFM slot overviews for nodes can be found in the Dragon PTN Nodes manual Ref. [3] in Table 1.

Main supported features:

- ▶ Gigabit Ethernet Ports:
 - ▶ 4 x SFP (Fiber, optical): 1000BASE-X / Smart SFP;
- ▶ Synchronization
 - ▶ SyncE;
 - ▶ PTP IEEE 1588v2 (=Precision Time Protocol) (future support);
- ▶ Smart SFP;
- ▶ LAN or WAN function selectable per port;
- ▶ E-Tree in an Ethernet Service;

1.2 Manual References

Table 1 is an overview of the manuals referred to in this manual. All these manuals can be found in the HiProvision (=Dragon PTN Management System) Help function.

Table 1 Manual References

Ref.	Manual	Title
[1]	UM_BasicConfig_Dragon-PTN_and_HiProvision-Operation_Rel_4-0DR_1019_en.pdf	Dragon PTN and HiProvision Operation
[2]	IG_Dragon-PTN_Installation-and-Operation_02_1019_en.pdf	Dragon PTN Installation and Operation
[3]	IG_Dragon-PTN_Nodes_02_1019_en.pdf	Dragon PTN Nodes: PTN2210, PTN2209, PTN2206, PTN1104
[4]	IG_Dragon-PTN_PTN-CSM310-A_02_1019_en.pdf	Dragon PTN Switching Module: PTN-CSM310-A
[5]	IG_Dragon-PTN_PTN-1-10G-LW_02_1019_en.pdf	Dragon PTN Interface Module: PTN-1-10G-LW
[6]	IG_Dragon-PTN_PTN-4-GC-LW_PTN-4-GCB-LW_02_1019_en.pdf	Dragon PTN Interface Module: PTN-4-GC-LW/PTN-4-GCB-LW
[7]	IG_Dragon-PTN_PTN-8-FXS_01_1019_en.pdf	Dragon PTN Interface Module: PTN-8-FXS

[8]	IG_Dragon-PTN_TRMs_SFP_XFP_02_1019_en.pdf	Dragon PTN TRMs (Transmit Receive Modules: SFP, XFP)
[9]	IG_Dragon-PTN_General-Specifications_01_1019_en.pdf	Dragon PTN General Specifications

2. MODULE DESCRIPTION

2.1 Front Panel

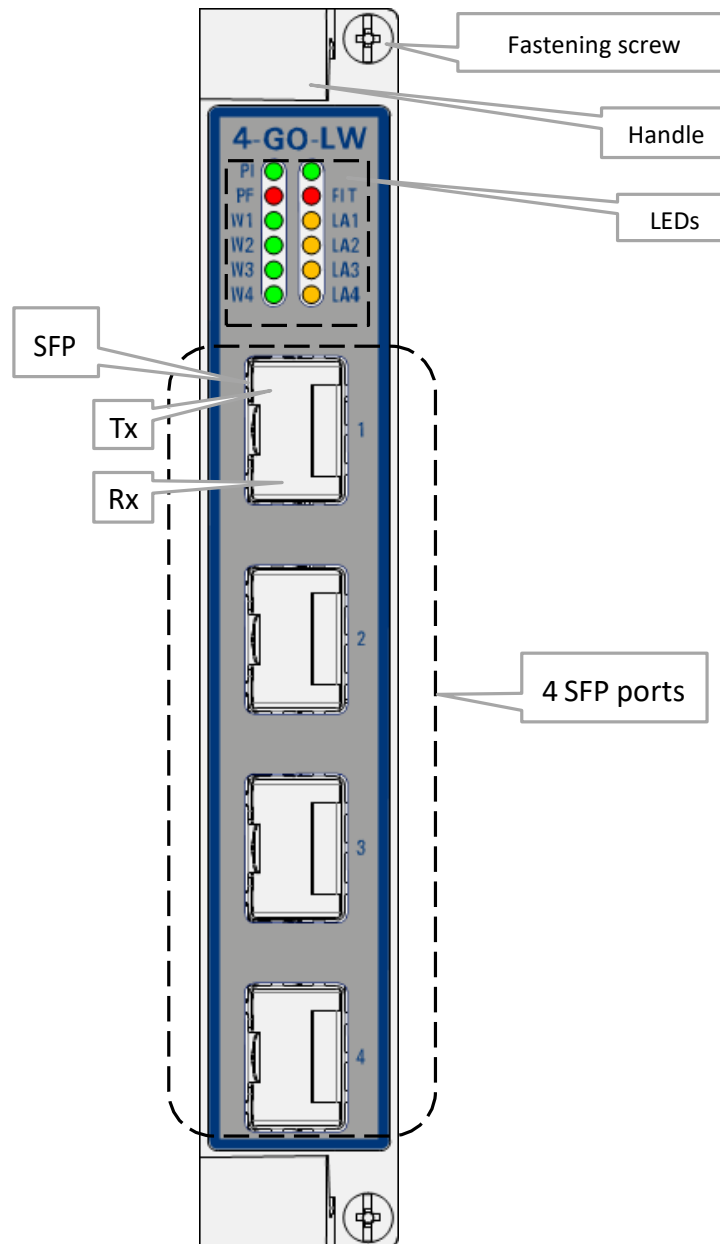


Figure 1 Front Panel

2.1.1 Handle

a. Insert the Module into the Node

Take the front panel handles to insert or slide the module into the Dragon PTN node. Push the module thoroughly into the node's backplane. Next, tighten the two fastening screws in the front panel corners.

b. Remove the Module from the Node

Untighten the two fastening screws in the front panel corners. Take the front panel handles to pull out and finally remove the module from the Dragon PTN node.

2.1.2 LEDs

The meaning of the LEDs depends on the mode of operation (= boot or normal) in which the PTN-4-GO-LW module currently is running. After plugging in the module or rebooting it, the module turns into the boot operation, see Table 2. After the module has gone through all the cycles in the table below (=rebooted successfully), the module turns into the normal operation, see LEDs in Table 3.

Table 2 LED Indications In Boot Operation

Cycle	PI	PF	FLT	Spare LED	W[1..4]	LA[1..4]
1	x	---	Slow blinking	---	---	---
2	x	---	Fast blinking	---	---	---
3	x	---	---	---	---	---
4	x	---	x	---	x	---
5	x	---	---	---	x	---

x : LED is lit / --- : LED is not lit
The sub cycle times may vary.
The entire boot cycle time [1→5] takes approximately 2 minutes.

Table 3 LED Indications in Normal Operation

LED	Color	Status
PI (=Power Input)	Not lit, dark	+12V power input to the board not OK
	Green	+12V power input to the board OK
PF (=Power Failure)	Not lit, dark	power generation on the board itself is OK
	Red	power generation on the board itself is erroneous
FLT (=FauLT)	Not lit, dark	no other fault or error situation, different from PF, is active on the module
	Red	a fault or error situation, different from PF, is active on the module
W<port n°>	Not lit, dark	The link on port<port n°> is a LAN link
	Green	The link on port<port n°> is a WAN link
LA<port n°>	Normal SFP or RJ45	
	Not lit, dark	The link on port<port n°> is down
	Yellow lit	The link on port<port n°> is up, no activity
	Yellow blinking	The link on port<port n°> is up, with activity
	Smart SFP (see §2.2.7)	
	Not lit, dark	The port is administratively down or no service programmed on this port
	Yellow blinking	A service is programmed on this port. CAUTION: The link status and link activity to the SDH/SONET network cannot be derived from this LA LED, instead it must be derived from the Smart SFP status/alarms information in HiProvision.

2.1.3 Connectors

This module has following ports:

- ▶ SFP: 100/1000 Gigabit Ethernet fiber port / Smart SFP; The SFPs that can be used for this port can be found in Ref. [8] in Table 1;

2.2 Functional Operation

The PTN-4-GO-LW performs following major tasks:

2.2.1 Media Module for Ethernet: Interfacing to a LAN or WAN Network

WAN ports interconnect nodes within the Dragon PTN network (MPLS-TP) whereas LAN ports interconnect the nodes with their applications.

Each Ethernet front port can be configured individually as LAN or a WAN port in HiProvision. By default, each port is configured as WAN port. A LAN port talks Ethernet and a WAN port talks MPLS-TP. As a result, the node can serve as an edge node (or LER = Label Edge Router) where traffic is received on a LAN port, mapped into pseudowire and forwarded to the correct label switched path on a WAN port.

For a configured application service, the node can operate as a:

- ▶ LER = Label Edge Router or access node: The node is located on the edge between the LAN and WAN. The node converts Ethernet into MPLS-TP and vice versa;
- ▶ LSR = Label Switching Router: The node is fully located in the WAN. The node has no end-points for the configured application service, it only forwards MPLS-TP traffic via label switched paths;

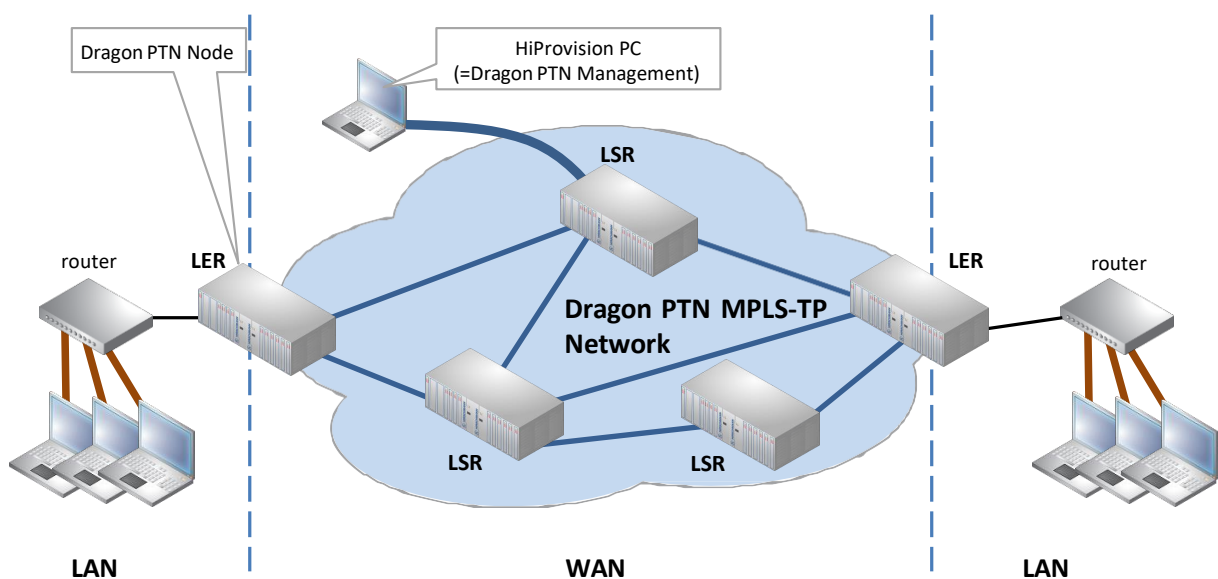


Figure 2 General Example: LAN/WAN

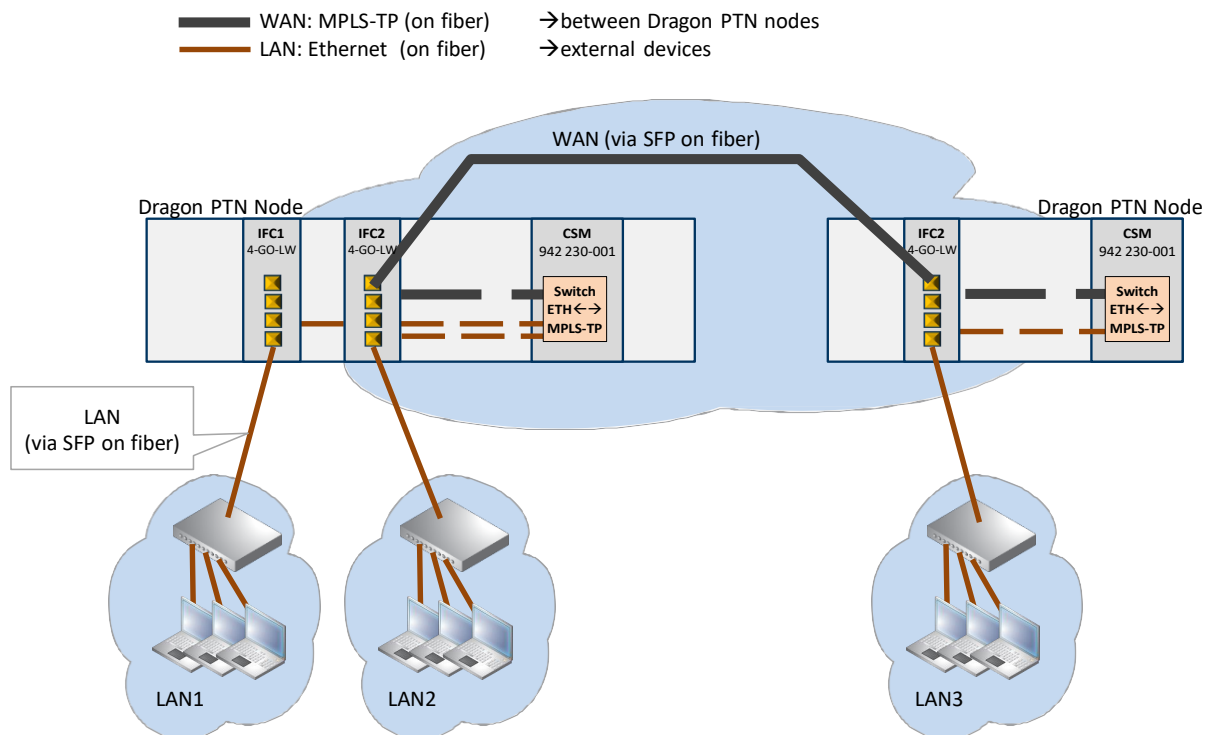


Figure 3 Detailed Example: Interfacing to a LAN or WAN Network

2.2.2 Ethernet Service

a. General

The PTN-4-GO-LW IFM access or end-points communicate over the Dragon PTN network via an Ethernet service. This service must be configured via HiProvision. This service can operate port or VLAN based. An optional E-Tree can be configured as well on this Ethernet service.

b. Port Based / VLAN Based

- ▶ Port based: Use this mode if all the traffic on a port must be transported transparently in one and the same service;
- ▶ VLAN based/VLAN ID: Use this mode if each VLAN (ID) on a port must have its own service. Ethernet packets with the configured VLAN ID will be forwarded in this service, other VLAN IDs and untagged packets will be dropped. This behavior can be overruled by a more advanced VLAN processing in the 'VLAN Tagging/Untagging' feature in HiProvision. This feature also supports VLAN translation which replaces VLAN ID 'x' into VLAN ID 'y'.

c. E-Tree

An E-Tree is a rooted (not routed) point-to-multipoint partial service within a programmed Ethernet service. E-Tree can be used as a security precaution to separate different customers (=leaves) using the same Ethernet service while accessing one or more ISPs (=roots).

When an E-Tree is used, each service endpoint is designated as either **leaf** or **root**. A leaf can only communicate with a root. A root can communicate with all the roots and leaves.

2.2.3 Voice Service

The PTN-4-GO-LW IFM ports can be configured in the Ethernet part of the Voice service. See Ref. [1] and Ref.[7] in Table 1 for more information on the Voice service.

2.2.4 I/O with the Central Switching Module (=CSM)

The PTN-4-GO-LW module receives traffic (Ethernet or MPLS-TP) via its front panel ports and forwards this to the CSM via the backplane. The CSM does all the processing on this data (synchronization, CRC checks, conversions, switching...). The resulting data will be forwarded via the backplane to one of the IFMs in the node.

2.2.5 Synchronization / Clock Distribution / Network Timing

The Dragon PTN network provides a number of mechanisms to perform synchronization / clock distribution / network timing. The CSM makes sure that all the included IFMs in the node are synchronized. See the table below for an overview of the mechanisms that are supported on the PTN-4-GO-LW module.

It means that the front ports of the PTN-4-GO-LW module can be used to recover a clock from an incoming data stream and redistribute this clock via an outgoing datastream;

Table 4 Synchronization / Clock Distribution / Network Timing Overview

Mechanism	Domain	What is Synchronized?	Purpose
SyncE	Network wide	Clock Frequency	Distribute a synchronous clock, based on a PRC (=Primary Reference Clock), network wide over all the nodes that need it.
PTP IEEE 1588v2 (future support)	Network wide	Timestamping	A protocol to synchronize real-time clocks (timestamping) in Dragon PTN network elements and/or connected devices.

a. SyncE (=Synchronous Ethernet)

See the manuals in Ref.[1] and Ref.[4] for more detailed information.

b. PTP IEEE 1588v2 (=Precision Time Protocol) (Future Support)

See the HiProvision manual in Ref.[1] for more detailed information.

2.2.6 MPLS-TP Compliancy

See the CSM manual in Ref.[4].

2.2.7 Smart SFP

Smart SFP is a hot-pluggable optical transceiver that converts incoming STM/OC frames from a fiber-optic SDH/SONET network into Ethernet frames at the PTN-4-GO-LW front port 1 or vice versa for outgoing frames. As a result, Dragon PTN allows to transparently transport synchronous digital bit streams from an SDH/SONET network via the PTN-4-GO-LW IFMs.

Smart SFPs must be used in a point-to-point port based Ethernet service over Dragon PTN.

The Smart SFP has an optional security feature onboard which allows to secure the point-to-point connection to only two dedicated MAC addresses. This can be done via setting the Destination MAC Address in HiProvision for the Smart SFPs. Furthermore, the Smart SFPs need some extra Quality of Service settings in HiProvision, see Ref. [1] in Table 1.

For clocking/Synchronisation, SyncE must be configured in the nodes that have Smart SFPs plugged in.

Smart SFPs also generate appropriate alarms, e.g. Loss of Signal, Loss of Frame etc.

NOTE: Smart SFP is also called TSoP (Transparent Sonet/SDH over Packet).

NOTE: The supported Smart SFPs and speeds can be found in Ref. [8] in Table 1.

NOTE: SFPs are typically used on WAN ports whereas Smart SFPs are used on LAN ports.

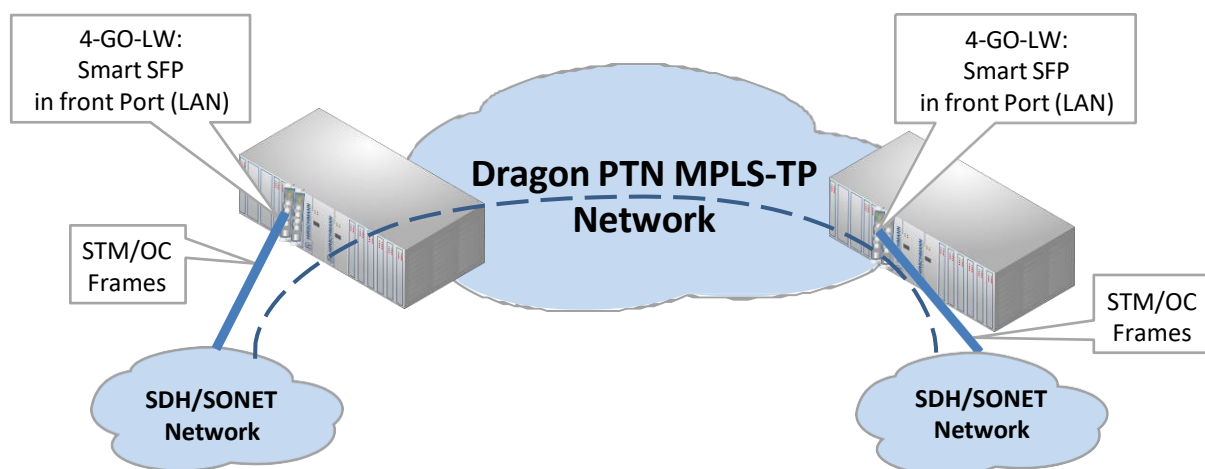


Figure 4 SDH/SONET over Dragon PTN via Smart SFPs

2.2.8 Storm Control on Ethernet LAN Port

NOTE: Storm Control is not relevant/supported on WAN Ports;

A traffic storm is the growing of excessive network traffic due to Ethernet packets flooding the LAN. Such a storm can for example occur because of a data loop in the network due to no or misconfiguration of MSTP. These storms degrade the network performance and must be avoided whenever possible.

The storm control feature:

- ▶ is an extra protection against these traffic storms;
- ▶ can be configured on the IFM ports;
- ▶ limits the amount of unlearned received data (Unicast, Broadcast, Multicast) on the LAN port ingress or input side;
- ▶ limits the amount of transmitted data (all data) on the LAN port egress or output side;
- ▶ Data that exceeds the configured limitations will be dropped. As a result, a possible data storm cannot overload the node processor or the node will limit outgoing data.

See Ref. [1] in Table 1 for more configuration information in HiProvision.

2.2.9 BPDU Guard on Ethernet LAN Port

NOTE: BPDU Guard is not relevant/supported on WAN Ports;

BPDU Guard (=Bridge Protocol Data Unit) is a LAN port property or feature that:

- ▶ shuts down the LAN port when a BPDU packet enters this port;
- ▶ sends out dummy BPDU packets.

As a result, this feature or IFM:

- ▶ protects the network against possible loops created via this IFM, although this IFM does not support MSTP;
- ▶ protects a running MSTP protocol somewhere else in the Dragon PTN network from external MSTP influences via this LAN port, e.g. root bridge protection etc...

See Ref. [1] in Table 1 for more configuration information in HiProvision.

2.3 Onboard Interfaces

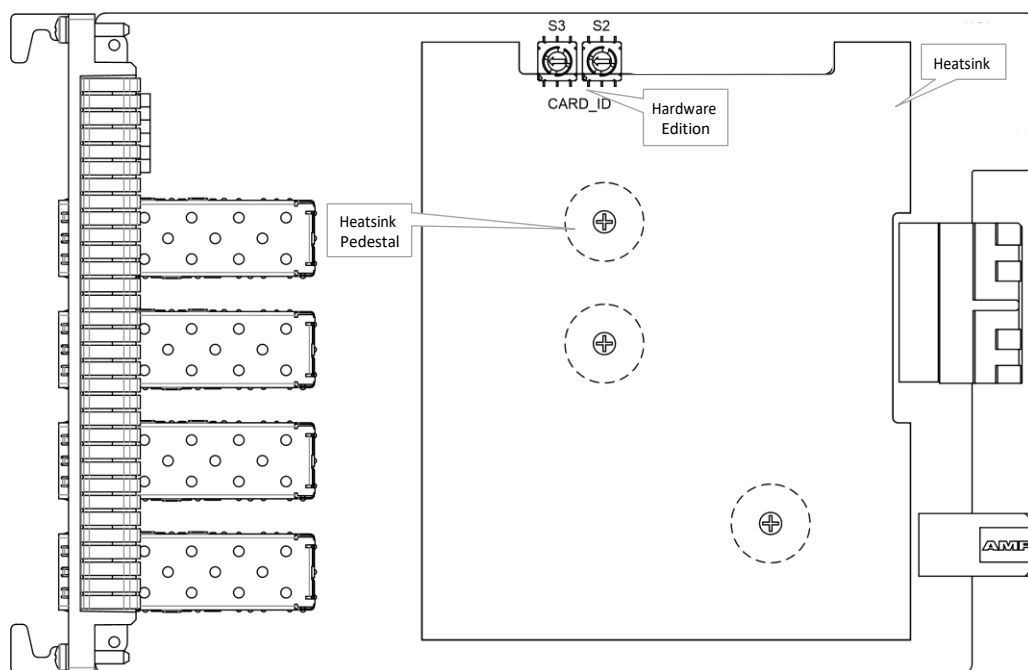


Figure 5 PTN-4-GO-LW: Side View

2.3.1 Straps

No straps on the board.

2.3.2 Rotary DIP Switches

a. Hardware Edition

The Hardware Edition (labeled as CARD_ID) is set in decimal code using rotary switches S2 to S3 (S3 = most significant). It can be read out as well via HiProvision. This edition has been factory set and **MUST NOT BE CHANGED!**

Example: Setting S3='0' and S2='5' indicates Hardware Edition '5' (dec).

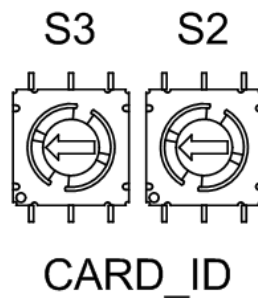


Figure 6 Hardware Edition

3. MODULE SPECIFICATIONS

3.1 General Specifications

For general specifications like temperature, humidity, EMI... see Ref.[9] in Table 1.

3.2 Other Specifications

Table 5 Other Specifications

Description	Value
Weight	0.26 kg / 0.6 lb
MTBF	170 years at 25°C/77°F
Power Consumption	7.5 W (measured at 25°C/77°F, with data transport)
Module Size	width: 20.32 mm / 0.8 inches height: 126 mm / 4.96 inches depth: 195 mm / 7.68 inches

3.3 Ordering Information

▶ PTN-4-GO-LW: 942 236-002.

4. ABBREVIATIONS

BPDU	Bridge Protocol Data Unit
CE	Conformité Européenne
CSM	Central Switching Module
EFM-F	Ethernet in the First Mile Over Point-to-Point Fiber
EMI	Electromagnetic Interference
FLT	Fault
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
IFM	InterFace Module
ISP	Internet Service Provider
LAN	Local Area Network
LER	Label Edge Router
LSR	Label Switching Router
LVD	Low Voltage Directive
MIB	Management Information Base
MSTP	Multiple Spanning Tree
MTBF	Mean Time Between Failures
PD	Powered Device
PF	Power Failure
PI	Power Input
PSC	Protection State Coordination
PSE	Power Source Equipment
PSU	Power Supply Unit
PTN	Packet Transport Network
PTP	Precision Time Protocol
SNMP	Simple Network Management Protocol
SyncE	Synchronous Ethernet
TE	Dragon PTN Management System
TSoP	Transparent Sonet/SDH over Packet
WAN	Wide Area Network