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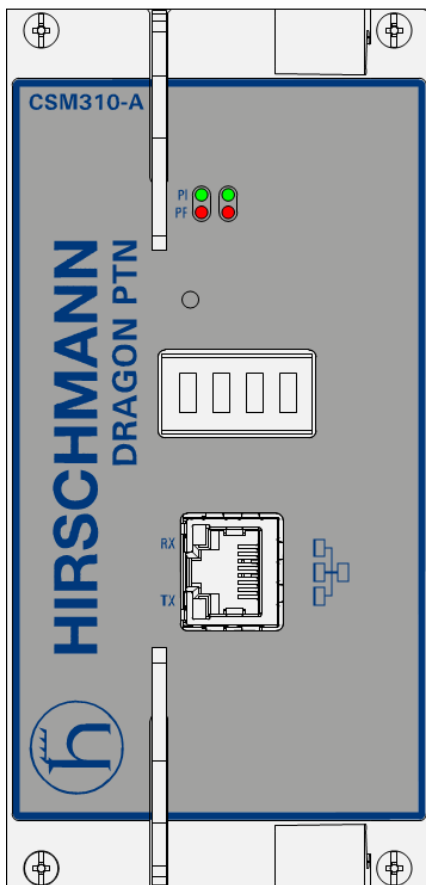
A **BELDEN** BRAND

# User Manual

Installation

Dragon PTN

Central Switching Module PTN-CSM310-A



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## Contents

<b>1.</b>	<b>INTRODUCTION .....</b>	<b>5</b>
<b>1.1</b>	<b>General.....</b>	<b>5</b>
<b>1.2</b>	<b>Manual References .....</b>	<b>6</b>
<b>2.</b>	<b>MODULE DESCRIPTION .....</b>	<b>6</b>
<b>2.1</b>	<b>Front Panel .....</b>	<b>6</b>
2.1.1	Handle - Extractor Handle - Tightening Screws .....	6
2.1.2	LEDs.....	7
2.1.3	Reset Button - Factory Default - Reboot Node.....	8
2.1.4	Alphanumeric Display .....	8
2.1.5	HiProvision Management Port/Channel .....	12
<b>2.2</b>	<b>Functional Operation .....</b>	<b>13</b>
2.2.1	Exchange Data with the Outside World .....	13
2.2.2	I/O with NSM, PSUs, IFMs and Dragon PTN Network .....	13
2.2.3	Central Node Switching .....	13
2.2.4	Management Channel / DCN Channel / HiProvision Interface .....	13
2.2.5	Synchronization / Clock Distribution / Network Timing.....	14
2.2.6	Self-test.....	16
2.2.7	Alarming.....	16
<b>2.3</b>	<b>Onboard Interfaces .....</b>	<b>16</b>
2.3.1	Heat Sink.....	17
2.3.2	Straps .....	17
2.3.3	DIP Switches .....	17
2.3.4	CSM Replacement / Micro SD Memory Card .....	17
<b>2.4</b>	<b>CSM Redundancy .....</b>	<b>18</b>
2.4.1	General .....	18
2.4.2	Redundancy States .....	18
2.4.3	CSM Switchover .....	19
2.4.4	Revertive/Non-revertive Behavior .....	19
2.4.5	HiProvision PC - CSM Connections - IP Addresses.....	19
2.4.6	Reset Button - Factory Default - Reboot Node.....	20
2.4.7	Micro SD Card .....	20
<b>2.5</b>	<b>Add a New Node to a Live Network.....</b>	<b>20</b>
<b>3.</b>	<b>MODULE SPECIFICATIONS .....</b>	<b>20</b>
<b>3.1</b>	<b>General Specifications.....</b>	<b>20</b>
<b>3.2</b>	<b>Other Specifications .....</b>	<b>20</b>
<b>3.3</b>	<b>Ordering Information.....</b>	<b>20</b>
<b>4.</b>	<b>ABBREVIATIONS .....</b>	<b>21</b>

## List of figures

Figure 1	Front Panel .....	6
Figure 2	HiProvision Management Connector .....	12

Figure 3 Dragon PTN Management ..... 13

Figure 4 SyncE Clock Recovery ..... 15

Figure 5 IEEE 1588v2 ..... 15

Figure 6 CSM310-A: Side View ..... 16

Figure 7 Hardware Edition..... 17

Figure 8 Micro SD Memory Card Interface..... 18

**List of Tables**

Table 1 Manual References ..... 6

Table 2 LED Indications In Boot Operation ..... 7

Table 3 LED Indications in Normal Operation ..... 7

Table 4 Display: Reboot Operation ..... 9

Table 5 CSM Display: Normal Operation ..... 10

Table 6 CSM Display: Error List..... 11

Table 7 RJ45 HiProvision Management Connector: Pin Assignments..... 12

Table 8 Synchronization / Clock Distribution / Network Timing Overview..... 14

Table 9 Other Specifications..... 20

## 1. INTRODUCTION

### 1.1 General

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

This document describes the CSM310-A Central Switching module (=CSM), which is the heart of the Dragon PTN nodes. This module provides the main processing within the Dragon PTN nodes via an Integrated Ethernet Multilayer Switch and onboard Traffic Manager.

The CSM310-A must be plugged in into a CSM slot in the node. For an overview of the CSM slots, see the Dragon PTN Nodes manual Ref. [3] in Table 1.

The meaning of **CSM310-A**:

- ▶ CSM: Central Switching Module;
- ▶ 3: refers to the 3-series;
- ▶ 10: refers to the ability to drive '10 Gbps' ports;
- ▶ A: variant of the central switching module;

Main supported features:

- ▶ Central switching fabric
- ▶ Ethernet
  - ▶ (future) Linear Protection switching: ITU G.8031
  - ▶ (future) Ring Protection switching: ERP ITU G.8032v2/Y.1731
- ▶ MPLS-TP
  - ▶ Label switched paths
  - ▶ Pseudowires
  - ▶ Linear Protection switching
  - ▶ Ring Protection switching: ERP ITU G.8032v2/Y.1731
  - ▶ OAM (Y.1731 / BFD)
- ▶ Service plane
  - ▶ Virtual switches
  - ▶ L2 / L3 Ethernet features
- ▶ Synchronization
  - ▶ SyncE
  - ▶ PTP IEEE 1588v2 (=Precision Time Protocol) (future support)
- ▶ Non-blocking capacity for
  - ▶ 4 x '1 Gbps / 10 Gbps' ports
  - ▶ 24 x '1 Gbps' ports
- ▶ Hot Swappable (only relevant for nodes with two redundant CSMs)

## 1.2 Manual References

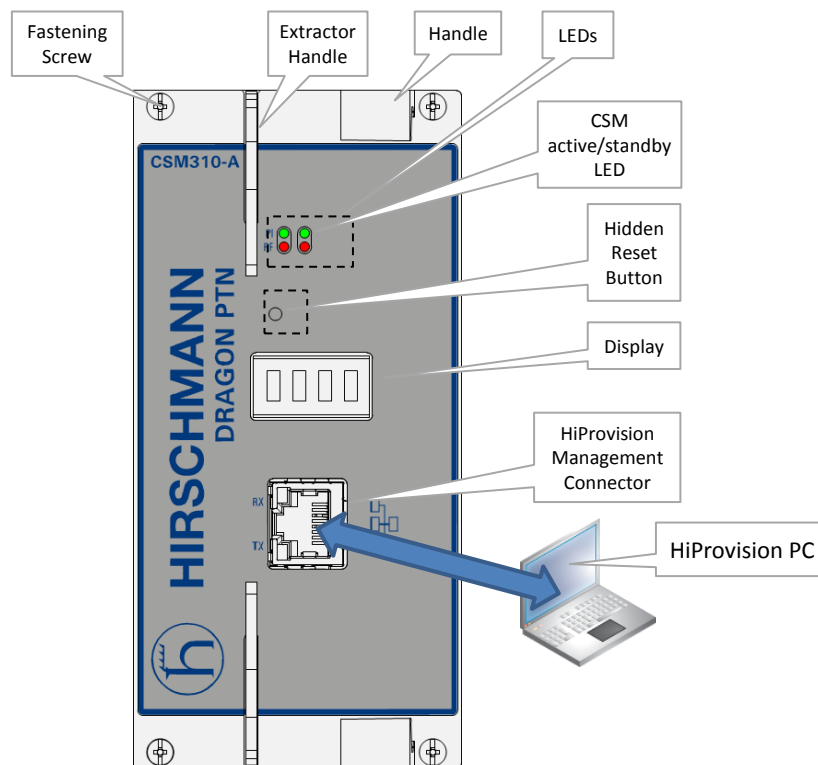
Table 1 is an overview of the manuals referred to in this manual. ‘&’ refers to the language code, ‘\*’ refers to the manual issue. All these manuals can be found in the HiProvision (=Dragon PTN Management System) Help function.

**Table 1 Manual References**

Ref.	Number	Title
[1]	DRA-DRM821-&-*	Dragon PTN and HiProvision Operation
[2]	DRA-DRM801-&-*	Dragon PTN Installation and Operation
[3]	DRB-DRM802-&-*	Dragon PTN Nodes: PTN2210, PTN2209, PTN2206, PTN1104
[4]	DRA-DRM810-&-*	Dragon PTN General Specifications

## 2. MODULE DESCRIPTION

### 2.1 Front Panel



**Figure 1 Front Panel**

#### 2.1.1 Handle - Extractor Handle - Tightening Screws

##### 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. After having inserted it, press the top and bottom extractor handles inwards to push the module maximally into the node, see Figure 6. Next, tighten the four fastening screws in the front panel corners.

**b. Remove the module from the node**

**CAUTION:**

- 1) Do not touch the heat sink when the CSM is in operation, or when removing the CSM from the node. It can be extremely hot. Risk of getting burned!**
- 2) The CSM could be heavier than expected because of the heat sink.**

Urtighten the four fastening screws in the front panel corners. Detach the module from the node by pushing and holding both the top and bottom extractor handles outwards, see Figure 6. Take the front panel handles (only hold the front panel handles, do not touch the heat sink (see §2.3.1), it can be extremely hot, risk of getting burned) 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 CSM310-A 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 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
1	x	---	Slow blinking	x (=active CSM) or --- (=standby/passive CSM)
2	x	---	Fast blinking	
3	x	---	---	

x : LED is lit ; --- : LED is not lit; The sub cycle times may vary.  
 The entire boot cycle time [1→ 3] takes approximately 5 minutes.  
 The node is reachable again when it can be discovered and measured by HiProvision (=Dragon PTN Management System, see also Ref. [1] in Table 1);

**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
<spare, blank>	Not lit, dark	This CSM is the standby/passive CSM in case of CSM Redundancy
	Green	This CSM is the active CSM

**CAUTION: At installation time, if the spare LED on both redundant CSMs are lit together, it means that both CSMs are active at the same time. This is not allowed! Make sure that both CSMs are plugged in properly.**

### 2.1.3 Reset Button - Factory Default - Reboot Node

This pushbutton is hidden and accessible through a small hole on the front panel. This button can be pushed with a sharp fine object e.g. a needle, toothpick...

- **Push short:** Warm restart:
  - ▶ **Single CSM:** Pushing the RESET button forces a warm start of the CSM without affecting the CSM configuration;
  - ▶ **Redundant CSMs:** Pushing the RESET button on...
    - ▶ ... both CSMs simultaneously force a warm start without affecting the CSM configuration, the CSM that was active before the reboot becomes the active one again after the reboot;
    - ▶ ... the Standby/Passive CSM forces a warm reboot of this CSM only, the other active CSM keeps up and running to keep the node alive;
    - ▶ ... the Active CSM initiates a switchover. The current active CSM will warm reboot and the other standby CSM takes over and becomes the active one to keep the node alive.
- **Push long:** Warm restart + factory default settings:
  - ▶ **Single CSM:** Pushing the RESET button for at least seven seconds forces a warm start or reboot of the node and reloads the CSM and its micro SD memory card (see §2.3.4) with factory default settings. As a result, reloading the CSM configuration from HiProvision will be necessary;
  - ▶ **Redundant CSMs:** Pushing the RESET button for at least seven seconds...
    - ▶ ...on both CSMs simultaneously affects the entire node. The node reboots and both CSMs get a new default configuration as described for a single CSM. The left-hand CSM (=CSM-1) becomes the active one by default;
    - ▶ ...in any other way than described above is not relevant because the CSM that remains active keeps the current configuration and will overwrite the default configuration of the reset CSM immediately after it has rebooted.
  - ▶ During the (re)boot of a CSM, its LEDs (see §2.1.2) and display (see §2.1.4) will follow a boot-cycle. If the entire node boots (single CSM, or both redundant CSMs together), the node will be reachable again three minutes after the reset has been released. The entire (re)boot will be finished approximately five minutes after the reset button has been released. The node is reachable again when it can be discovered and measured by HiProvision;

**CAUTION: A reboot of a single CSM or active CSM (with redundant CSMs) will affect all communication through this node.**

### 2.1.4 Alphanumeric Display

The 4-character alphanumeric display provides some basic information on the node. The display shows information during reboot of the node and during normal operation.

### a. During Reboot of the Node

The display reboot cycle takes approximately 20 seconds whereas the reboot of the entire CSM310-A takes approximately 5 minutes. After the display reboot cycle, the display returns to the normal operation cycle, see next paragraph.

**Table 4 Display: Reboot Operation**

Display	Description
<b>Normal (re)boot, boot cycle</b>	
Boot	1 <sup>st</sup> step of the display reboot cycle.
Ld1, Ld2, Ld1t, Ld2t	2 <sup>nd</sup> step of the display reboot cycle. The CSM can have two firmware loads (active and spare load) onboard that have been uploaded via HiProvision. If load1 is active, load2 is the spare load and vice versa. This display cycle shows which firmware load is used to boot the CSM: <b>Ld1:</b> Load1 is active and used by the CSM during this boot;  <b>Ld2:</b> Load2 is active and used by the CSM during this boot;  <b>Ld1t:</b> The CSM boots with testload1 (=not the active one). This is a result of a commit in the firmware upgrade phase via HiProvision. If the user accepts this load in HiProvision within 20 minutes, this test load becomes the active one. If not, the CSM will again reboot with load2 and indicate Ld2;  <b>Ld2t:</b> The CSM boots with testload2 (=not the active one). This is a result of a commit in the firmware upgrade phase via HiProvision. If the user accepts this load in HiProvision within 20 minutes, this test load becomes the active one. If not, the CSM will again reboot with load1 and indicate Ld1;
Init	3 <sup>rd</sup> step of the display reboot cycle.
FAC RST (optional)	This cycle is only shown if a factory reset has been initiated (see §2.1.3).
<b>Erroneous (re)boot</b>	
DDR!	Indicates a hardware failure on the CSM module. Replace the CSM (§2.3.4).
RBT!	Indicates a hardware failure on the CSM module. Replace the CSM (§2.3.4).
NLD!	Indicates an invalid load. Reboot the node. If the problem persists, replace the CSM (§2.3.4).
CLD!	Indicates a corrupt load. Reboot the node. If the problem persists, replace the CSM (§2.3.4).

**b. During Normal Operation**

**Table 5 CSM Display: Normal Operation**

Display	Description
<Redundancy State>	<p>Indicates the redundancy (=RDST) state of the CSM. In case of a single CSM (or non-redundant CSM), the value will always be RDST ACT.</p> <p>Possible values with redundant CSMs:</p> <ul style="list-style-type: none"> <li>- RDST ACT: Indicates the active CSM. This CSM is currently managing and monitoring all the activity and connections in the node. The active NSM is also indicated via the NSM LEDs, see Ref. [3] in Table 1.</li> <li>- RDST STB: Indicates the redundant CSM which is in hot-standby mode. This CSM is ready, doing nothing and just waiting for a switchover to occur, which can be initiated either automatically or manually, see also §2.4.</li> <li>- RDST PAS: Indicates the redundant CSM which is in passive mode. This CSM has started up, without (serious) errors during the self-test. The CSM software is operational but the node configuration data on this CSM has not been synchronized yet with the configuration data on the active CSM. The RDST PAS mode will shortly turn into the RDST STB mode.</li> <li>- RDST SWO: Indicates the switchover state, only possible on the active CSM, after a switchover on user request either via HiProvision or by pushing the NSM switchover button, the state is only briefly displayed.</li> </ul>
IP <IP Address>	<p>This is the IP address of the HiProvision management port on the front panel, which is in the range [172.16.0.1 -&gt; 172.20.100.209]. This dedicated IP address depends on the node number and the slot in which the CSM has been plugged (CSM-1 or CSM-2). If two redundant CSMs are plugged into the node, both CSMs have an IP address in a different /28 subnet. See Ref.[1] in Table 1 to find out which IP addresses must be used in the connected HiProvision PC.</p> <p><b>Note:</b> For security reasons, it can be configured in HiProvision how many times ('n') the IP address must scroll on the CSM display after plugging in the management cable. By default, it is displayed forever in every display cycle.</p>
VERS <Load Version>	Example: VERS 1.2.9
NODE <Node Number>	<p>Indicates the node number (of the own node) that has been configured via the rotary DIP switches on the NSM. Example: NODE 830. NODE 9001 indicates a problem with the node number. See NODENUMBER INVALID in error list in Table 6.</p>
SHDN	is only shown on the display when a reboot has been initiated
ERR <Error list> (see Table 6)	<p>Everything is fine, no errors: OK</p> <p>errors active: Only the active CSM displays errors. Example with cable faults (S indicates the slot number, I indicates the interface or port number): ERR &lt;error 1&gt; , ... , &lt;error n&gt; ERR CBLF S1 I1 , CBLF S1 I2</p>

**Table 6 CSM Display: Error List**

Display	Description	Curative Action
CBLF S<x> P<y>	Indicates a cable fault in interface slot <x> on port <y>. Example: CBLF S1 P1	Check the cabling in that slot or port and reconnect cables where necessary.
CSM<x> FW1	Can only occur on redundant CSMs. If it occurs, it is displayed on both CSMs. It indicates that the firmware version on CSM1 differs from the version on CSM2. (x = 1 or 2)	Make sure that both CSMs run on the same firmware version. If the mismatch remains, there will be no CSM Redundancy. The last active CSM will remain active, the other CSM will not become standby but remains passive.
CSM<x> HW1	Switch error on CSM<x> (x = 1 or 2).	Replace the CSM (§2.3.4).
CSM<x> HW2	Clock distribution error on CSM<x> (x = 1 or 2).	Replace the CSM (§2.3.4).
CSM<x> HW3	SD Memory card error on CSM<x> (x = 1 or 2). The CSM stays fully operational while the error is active.	<p>The SD card replacement (see below) is not urgent and can be postponed until a later maintenance timeframe.</p> <p><b>Single CSM:</b> Pull out the CSM (the node goes down), and replace the broken SD card. Plug in the CSM again.</p> <p><b>Redundant CSMs:</b> If the broken SD card is in the active CSM, switch over first to make this CSM standby. Pull out the standby CSM, replace the SD card and plug in the CSM again.</p> <p>In both cases above, the new SD card will get a copy of the current CSM configuration after CSM insertion.</p>
CSM<x> HW4	Processor error on CSM<x> (x = 1 or 2).	Replace the CSM (§2.3.4).
CSM<x> HW5	Flash memory error on CSM<x> (x = 1 or 2).	Replace the CSM (§2.3.4).
CSM<x> TEMP	High temperature on CSM<x> (x = 1 or 2).	Provide enough room below and above the node for ventilation as described in the installation manual in Ref. [2] in Table 1.
NODENUMBER INVALID	The NSM cannot read its configured node number or its node number is configured beyond the valid node number range of 0001 to 8999. E.g. node number 9307 generates this error. In case of this error, 'NODE 9001' will be displayed as in the normal cycle. 9001 is a special node number to indicate node number problems.	Verify the configured node number and make sure to have it configured in the valid range of 0001 to 8999. If it is in the valid range, replace the NSM.
NSM NODENUMBER MISMATCH	Indicates a mismatch between the configured node number on the NSM and HiProvision.	Make sure that both node numbers on the NSM and HiProvision match.
NSM ERROR	NSM not reachable.	Make sure the NSM is plugged in correctly. If it is still not reachable, replace the NSM.
PSU<x> INPUT	PSU<x> input voltage missing (x = 1 or 2).	Make sure that the PSU<x> is plugged in correctly and powered up. If the problem persists, replace PSU<x>.
PSU<x> OUTPUT	PSU<x> output voltage missing (x = 1 or 2).	
PSU<x> TEMP	PSU<x> temperature out of range (x = 1 or 2).	
POE<x> FAILURE	PoE PSU<x> (Power over Ethernet) has not enough input voltage to deliver the normal PoE power (x = 1 or 2).	Check the input voltage of the PoE PSU<x>.
S<x> HWERR	The module in slot S<x> has a hardware error. Example: S4 HWERR	Replace the IFM.

Display	Description	Curative Action
S<x> IFM MISMATCH	The interface slot <x> has a module type mismatch. The module plugged in in slot <x> in this node, differs from the HiProvision configuration in that node slot <x>. Example: S3 IFM MISMATCH	Make sure that the configured module in HiProvision is the same as the module plugged in in that specific slot.
S<x> TEMP	High temperature on the IFM in interface slot<x> (x = 1 or 2). Example: S4 TEMP	Make sure that the node has enough room below and above the node for ventilation as described in the installation manual in Ref. [2] in Table 1.

### 2.1.5 HiProvision Management Port/Channel

This RJ45 Ethernet connector must be used to manage the Dragon PTN network via HiProvision (=Dragon PTN Management System). This connector allows HiProvision to access the Dragon PTN management or DCN channel, which is built up dynamically between all the connected nodes within the network, see also Ref. [1] in Table 1.

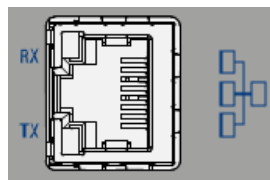
In case of CSM Redundancy, it does not matter to which CSM the HiProvision PC has been connected, see also §2.4.4.

**NOTE:** DCN = Data Communication Network

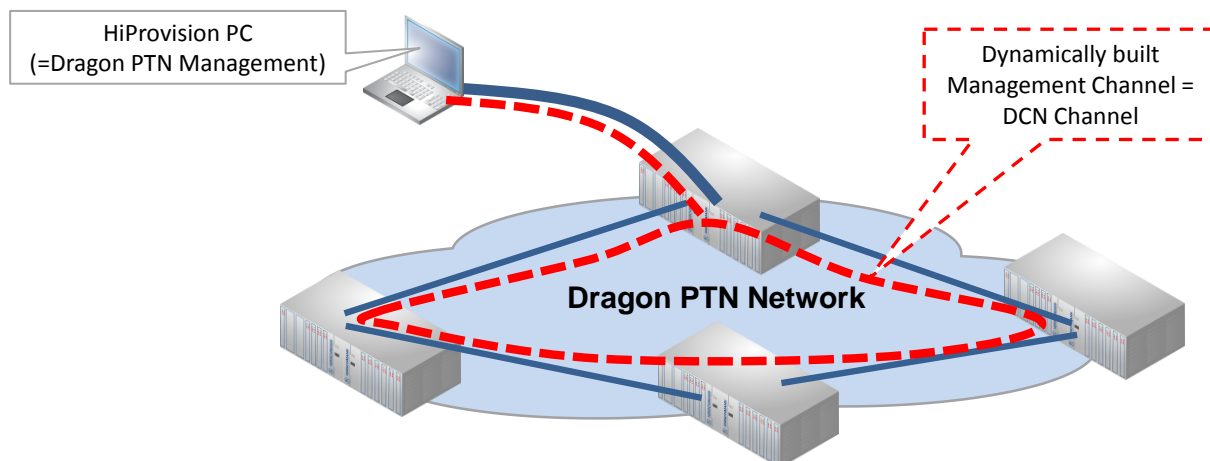
**NOTE:** The management port can be disabled via HiProvision for security reasons, see Ref. [1] in Table 1. The management port is by default up.

**Table 7 RJ45 HiProvision Management Connector: Pin Assignments**

Pin No.	Signal
1	Transmit output (+)
2	Transmit output (-)
3	Receive input (+)
4, 5	---
6	Receive input (-)
7, 8	---



**Figure 2 HiProvision Management Connector**



**Figure 3 Dragon PTN Management**

## 2.2 Functional Operation

### 2.2.1 Exchange Data with the Outside World

The node exchanges services data (Ethernet, MPLS-TP, E1/T1, SHDSL, C37.94, Serial data...) with the outside world via the IFMs that are plugged into the Dragon PTN node. This means that a Dragon PTN node communicates with other Dragon PTN nodes via its IFMs, not via the CSM. The only data to enter/leave the front panel of the CSM310-A is the management data exchanged with HiProvision.

### 2.2.2 I/O with NSM, PSUs, IFMs and Dragon PTN Network

The active CSM processes status & control data between the NSM, PSUs, IFMs, backup CSM and the Dragon PTN network via the node's backplane. The active CSM communicates this and its own status & control data to HiProvision.

Furthermore, the active CSM controls the flow of user data by switching MPLS-TP packets between the Dragon PTN network and the IFMs in its node. The IFMs are connected to the active CSM in a star configuration resulting in an individual data bus for each IFM. Data transfer is full duplex. See also §2.2.3.

### 2.2.3 Central Node Switching

The switch on the CSM is non-blocking and has following data bus:

- ▶ 4 x '1 Gbps / 10 Gbps' ports
- ▶ 24 x '1 Gbps' ports

Which node slot supports '1 Gbps / 10 Gbps' (for one-port-IFM) or '1 Gbps' (for four-port-IFM) is described in the Dragon PTN Nodes manual, see Ref. [3] in Table 1.

The onboard switch supports the features described in §1.1.

### 2.2.4 Management Channel / DCN Channel / HiProvision Interface

The management or DCN channel (=Data Communication Network) is a dedicated channel needed by HiProvision to configure, monitor and manage the Dragon PTN network.

The management channel is built up dynamically during the HiProvision Discovery phase. This channel is a collection of inter-node MPLS-TP WAN connections. All the Dragon PTN management packets travelling over the Dragon PTN network will have a high priority QoS (=Quality of Service) to ensure that these packets always reach their destination.

**NOTE:** See also §2.1.5, for the Discovery function, see Ref.[1] in Table 1;

## 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 IFMs included in the node are synchronized. See the table below for an overview of the mechanisms.

**Table 8 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)

SyncE distributes a synchronous clock, based on a PRC, network wide over all the nodes that need such a synchronous signal. The PRC is a very stable high quality clock that can be used as a reference for network wide clock distribution.

In HiProvision, an operator can configure (see manual Ref.[1]) a clock distribution tree with the participating nodes and IFMs together with the necessary clock priorities. A clock is recovered from an incoming data signal on an IFM interface port (e.g. Data1 on a 4-GC-LW module,) and forwarded to the CSM via the backplane, see figure below. The CSM cleans up and redistributes this clock over the entire node to all the interface slots. If multiple recovered clocks are available in a node, the CSM will select the best available clock.

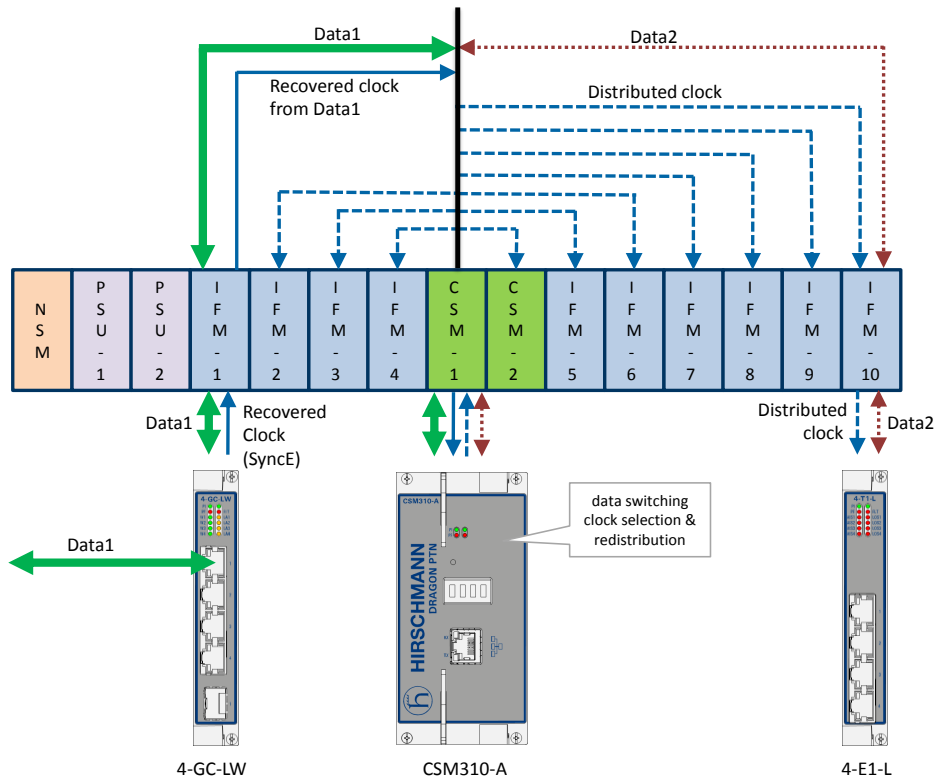
How the best available clock is determined must be configured in HiProvision:

- Ethernet services: the best available clock can be determined dynamically via SSMS (=Sync Status Message) or statically via a dedicated interface port. SSMS are transmitted to downstream neighbor nodes to report the stability and accuracy of its distributed clock;
- Circuit Emulation Services: the best available clock must be assigned statically to a dedicated interface port;

**NOTE:** The IFM manual indicates whether an IFM port can participate in SyncE;

**NOTE:** The CSM management port does not participate in the SyncE clock distribution;

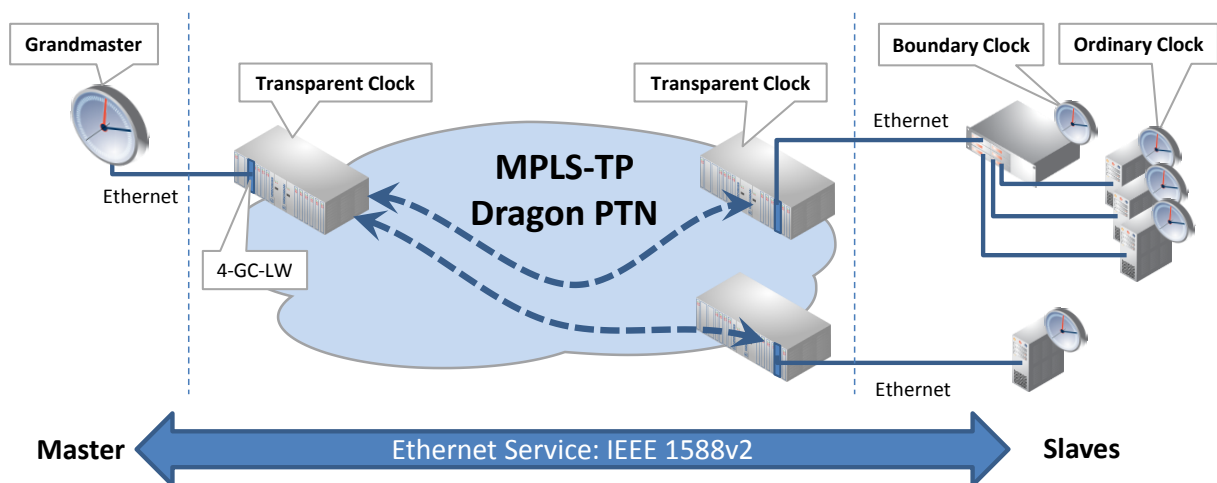
**NOTE:** If no distributed clock is available in a node, the node falls back to the local clock oscillator on the CSM;



**Figure 4 SyncE Clock Recovery**

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

The Precision Time Protocol (=PTP), as defined in IEEE 1588v2, is a protocol that manages the distribution of a synchronous timestamp clock (micro-second accuracy), network wide between an external grandmaster clock and its slaves or substations. The CSM verifies that all the IFMs in the node have the same node-internal timestamp. If not, the CSM will raise an alarm. This node-internal timestamp must be the same on each IFM to guarantee that the calculated node-traverse time needed for IEEE 1588 messages, will be consistent and correct through the entire node. More detailed info can be found in Ref.[1] in Table 1.



**Figure 5 IEEE 1588v2**

## 2.2.6 Self-test

When switching on the supply voltage, the node goes through a self-test, before switching itself into the network. During this test, the main function blocks are tested e.g. processor, memories etc....

## 2.2.7 Alarming

### a. Hardware Device Alarms

The CSM supervises all the hardware in the node and generates the necessary device alarms when something goes wrong in the node. These alarms are collected by HiProvision. It can be configured in HiProvision via the Device Settings to output one or more of these alarms to the digital output contacts (=DO) on the NSM in the node, see also [1], [3] in Table 1.

### b. SNMP Traps (future)

Every module in an Dragon PTN node, either NSM, CSM or IFM has a MIB onboard. Every parameter in each MIB can be configured for alarming. The CSM310-A will monitor all the MIBs in its node. If a parameter value changes somewhere in the node, the CSM310-A will send out an (SNMP) trap via the management or DCN channel on the network. HiProvision decides whether the captured (SNMP) trap results in an alarm or not. All the alarms will be visualized by HiProvision.

E.g. the user can configure the minimum and maximum value of a temperature parameter on an IFM. If the temperature exceeds the allowed configured temperature range, HiProvision will show a temperature alarm for this module on that specific node.

## 2.3 Onboard Interfaces

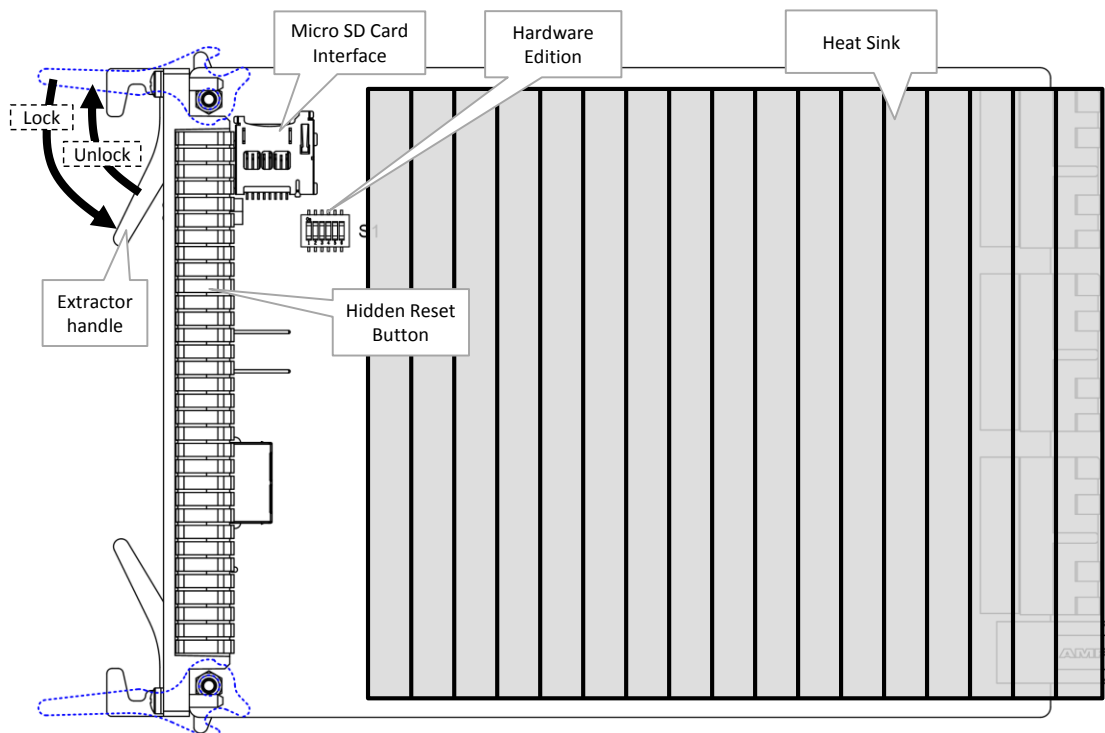


Figure 6 CSM310-A: Side View

### 2.3.1 Heat Sink

A heat sink is required for the natural cooling of the CSM module. Both sides of the CSM module have a heat sink attached. A heat sink can reach a high temperature during operation.

**CAUTION: Do not touch the heat sink when the CSM is in operation, or when removing the CSM from the node. It can be extremely hot. Risk of getting burned!**

### 2.3.2 Straps

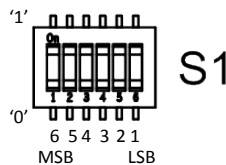
No user relevant straps.

### 2.3.3 DIP Switches

#### a. Hardware Edition

DIP switch 'S1' indicates the hardware edition of the CSM in a binary way, using six bits. This edition has been factory set and must not be changed. It can also be read out via HiProvision. A switch in the up position indicates a logical '1'.

Example: Setting '000101' (bin) indicates hardware edition '5' (dec).



**Figure 7 Hardware Edition**

### 2.3.4 CSM Replacement / Micro SD Memory Card

The SD card has two purposes:

- Allow the easy and fast replacement of a broken CSM in the live network without further HiProvision interaction. The SD card on the broken CSM always holds the latest node configuration downloaded via HiProvision.
- ▶ Offer a container for 'network database' backups. When a backup of the database to this node has been initiated in HiProvision via 'network backups', HiProvision will store this database on this SD card. See also Ref. [1] in Table 1.

#### **CAUTION:**

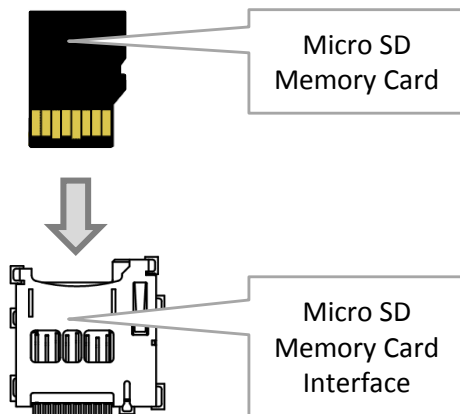
**The SD card from a broken CSM can be reused in the new replacing CSM, provided that both CSMs have the same firmware version and are used in the same node.**

This SD card interface has an SD card plugged in by default. Every time HiProvision loads a new or updated configuration into the node, this SD card will be updated. As a result, this SD card always holds the latest node configuration.

Follow the steps below to replace a broken CSM with a new CSM:

- ▶ Remove the SD card from the new CSM by pushing down and releasing the SD card;
- ▶ In case of CSM redundancy: If the active CSM has to be replaced, switch over first to make this CSM the standby CSM;

- ▶ Remove the broken CSM (=hot-swappable) from the powered node;
- ▶ Remove the SD card from the broken CSM and insert it into the new CSM;
- Plug in the new CSM into the node. The node will reboot with the new CSM, which already has the correct node configuration from the SD card. A new load of the node via HiProvision will not be necessary.



**Figure 8 Micro SD Memory Card Interface**

**NOTE:** This SD card is neither required nor essential for the CSM to operate, but it makes a possible CSM replacement in the future a lot easier and faster.

**NOTE:** If the reset button has been pushed at least for seven seconds (see §2.1.3), the latest configuration on the SD card will be replaced with the factory default settings.

## 2.4 CSM Redundancy

### 2.4.1 General

Prerequisite: both CSMs must have the same firmware version.

The Dragon PTN nodes XT-2209-A, XT-2210-A and XT-2206-A can be equipped with redundant CSM modules.

CSM Redundancy means that two CSMs are installed in the node. One CSM will be the active one while the other CSM will be the redundant one. Both CSMs will contain the complete configuration data of all connections that are configured in that node.

CSM Redundancy provides a higher availability of the services through a node if one CSM should fail. If one fails, the redundant hot-standby CSM will take over automatically to keep the node and all its services alive (with a minimal service interrupt).

In normal operation one CSM actively controls the backplane and IFMs, whereas the other CSM is in standby mode. Both CSMs have a dedicated heartbeat mechanism to control which CSM is active and which CSM is in standby mode.

### 2.4.2 Redundancy States

A CSM can be in three different redundancy states: ACT (=Active), STB (=Standby) or PAS (=Passive). The current state of each CSM can be viewed on the CSM display (see §2.1.4) or on the LEDs of the NSM.

**CAUTION: At installation time, if the spare LED on both redundant CSMs are lit together, it means that both CSMs are active at the same time. This is not allowed! Make sure that both CSMs are plugged in properly.**

### 2.4.3 CSM Switchover

An automatic switchover from the active CSM (=ACT) to the standby CSM (=STB) occurs when:

- ▶ The active CSM gets broken;
- ▶ The active CSM is pulled out from the node. It is strongly advised not to pull out the active CSM intentionally! When a CSM has to be pulled out, make sure it is in standby/passive mode first via switching-over.

A manual switchover from the active CSM (=ACT) to the standby CSM (=STB) can be done via:

- ▶ The hidden CSM1/2 switchover button on the NSM module has been pushed for approximately 4 seconds until the other CSM becomes active, indicated by the LEDs on the NSM;
- ▶ The hidden reset button on the active CSM has been pushed (see also §2.1.3);
- ▶ HiProvision, see Ref. [1] Table 1;

**NOTE:** With CSM redundancy, a switchover is only possible when both CSMs have the same firmware version and one CSM is 'active' and the other CSM is 'standby'.

When a switchover occurs, the connections or services going through that node will be interrupted shortly.

**CAUTION: In case of CSM redundancy, never pull out or reset the active CSM. If you want to pull out or reset the active CSM (e.g. CSM1), switchover first via HiProvision or the CSM1/2 button on the NSM. As a result, the intended CSM becomes standby and can be pulled out or reset.**

### 2.4.4 Revertive/Non-revertive Behavior

CSM Redundancy is non-revertive: once a switchover of the CSM has occurred, the new active CSM stays active until a manual switchover or switchover caused by an error occurs. No automatic switchback to the original CSM will occur when this one returns back up and running after an error.

### 2.4.5 HiProvision PC - CSM Connections - IP Addresses

If two CSMs are plugged into the node, HiProvision must only be connected to one of both CSMs, either the left-hand CSM (=CSM-1) or right-hand CSM (=CSM-2). If one of both CSMs is active, the HiProvision will always see the Dragon PTN network, even if it is connected to the standby (STB) or passive (PAS) CSM.

If a redundant cable connection between the HiProvision PC and the CSMs is desired as well, provide two NICs in the HiProvision PC and connect each NIC to one of both CSMs resulting in two connected CSMs.

It is also possible to install a switch between the HiProvision PC and the node. The result would be one or two cables from the CSMs to the switch and one or two cables from the switch to one or two NIC cards on the HiProvision PC. If one cable goes from the HiProvision PC to a switch which has two cables connected to each one CSM, the NIC in the HiProvision PC must have two IP addresses configured.

To assign IP addresses to the NIC cards in the HiProvision PC, see the 'HiProvision and Operation manual' Ref. [1] in Table 1. For each connected CSM from one HiProvision PC, one 'Discovery Entry point' must be created in HiProvision.

**2.4.6 Reset Button - Factory Default - Reboot Node**

See §2.1.3.

**2.4.7 Micro SD Card**

The Micro SD Card of the redundant CSM will automatically get the configuration of the active CSM.

**2.5 Add a New Node to a Live Network**

See Ref.[2] in Table 1.

**3. MODULE SPECIFICATIONS**

**3.1 General Specifications**

For general specifications like temperature, humidity, EMI ... see Ref.[4] in Table 1.

**3.2 Other Specifications**

**Table 9 Other Specifications**

Description	Value
Weight	1.1 kg / 2.4 lb
MTBF	71 years at 25°C/77°F
Power Consumption	27W (measured at 25°C/77°F, with data transport)
Module Size	width: 60.6 mm / 2.39 inches height: 126 mm / 4.96 inches depth: 195 mm / 7.68 inches
HiProvision Connection	Via a twisted pair RJ45 connector for 10/100 Mbps BASE-T Ethernet interface

**3.3 Ordering Information**

PTN-CSM310-A: 942 230-001

#### 4. ABBREVIATIONS

<b>BFD</b>	Bidirectional Forwarding Detection
<b>CE</b>	Conformité Européenne
<b>CSM</b>	Central Switching Module
<b>DCN</b>	Data Communication Network
<b>EC</b>	Electromagnetic Compatibility
<b>EMI</b>	Electromagnetic Interference
<b>ERP</b>	Ethernet Ring Protection
<b>FLT</b>	Fault
<b>IEC</b>	International Electrotechnical Commission
<b>IEEE</b>	Institute of Electrical and Electronics Engineers
<b>IETF</b>	Internet Engineering Task Force
<b>IFM</b>	InterFace Module
<b>ITU</b>	International Telecommunication Union
<b>LED</b>	Light Emitting Diode
<b>MIB</b>	Management Information Base
<b>MPLS-TP</b>	Multiprotocol Label Switching – Transport Profile
<b>MTBF</b>	Mean Time Between Failures
<b>NSM</b>	Node Support Module
<b>OAM</b>	Operations, Administration and Maintenance
<b>PF</b>	Power Failure
<b>PI</b>	Power Input
<b>PRC</b>	Primary Reference Clock
<b>PSU</b>	Power Supply Unit
<b>PTN</b>	Packet Transport Network
<b>PTP</b>	Precision Time Protocol
<b>SD</b>	Secure Digital
<b>SHDSL</b>	Symmetrical High Bitrate Digital Subscriber Line
<b>SNMP</b>	Simple Network Management Protocol
<b>SSM</b>	Sync Status Message
<b>SyncE</b>	Synchronous Ethernet
<b>WAN</b>	Wide Area Network
<b>WEEE</b>	Waste of Electrical and Electronic Equipment