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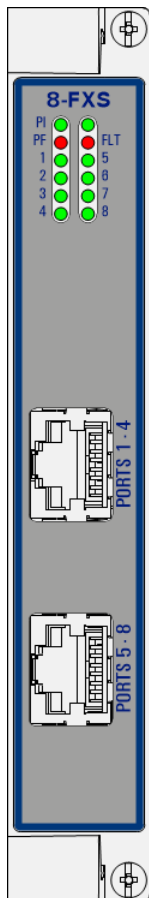
A **BELDEN** BRAND

User Manual

Installation

Dragon PTN

Interface Module PTN-8-FXS



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1. INTRODUCTION

1.1 General

This document is valid as of Dragon PTN Release 4.0DR.

In general, FXS (=Foreign eXchange Subscriber) and FXO (=Foreign eXchange Office) gateways translate analog voice/modem/fax signals to IP packets and vice versa.

- ▶ FXO: towards analog PBX (=Private Branch eXchange) or PSTN;
- ▶ FXS: towards analog telephones, modems or faxes.

The PTN-8-FXS interface module is a VoIP module and makes the transport of analog voice through the Dragon PTN packet network possible. It will convert analog voice into SIP (=Session Initiation Protocol) and RTP messages and vice versa. The SIP messages will be packetized into MPLS-TP packets via a Voice service in HiProvision, to transport the data through the Dragon PTN network. HiProvision is the Dragon PTN management system.

The Voice service can set up connections between both analog phones and SIP elements (client, server, trunk). SIP elements can be connected to the Dragon PTN network via Ethernet Interface Modules (e.g. PTN-4-GC-LW, ...). Depending on where the call handling must be done, two different modes can be selected:

- ▶ Remote extension (FXO Gateway): call handling via FXO gateway to analog public or private telephone networks;
- ▶ SIP-server: call handling done in dedicated external SIP server;

This Interface Module provides 8 ports for connecting 8 analog phones to the Dragon PTN network. It can be used in any Interface Module slot of any node. An Interface Module slot overview can be found in Ref. [3] in Table 1.

Maximum four Voice services can be configured per PTN-8-FXS module. The main supported features are:

- ▶ Packetizing of analog voice;
- ▶ 8 ports FXS (G.712 compliant);
- ▶ Integrated battery feed and ringing generator;
- ▶ DTMF Dialing;
- ▶ Converts analog FXS port into SIP Client;
- ▶ Support for G.711 a/ μ law and G.729 encoding/decoding; ▶ Modem and fax compatible (no T.38);

- ▶ Remote Extension: FXO interworking possible via external device;
- ▶ Interworks with standard SIP servers;
- ▶ Voice service modes:

- ▶ Remote extension (Routable);
- ▶ SIP-server (Routable);

NOTE: Routable: FXO Gateway or SIP Server can be located in an IP subnet different from the IP subnet assigned to the 8-FXS ports;

- ▶ Compatible products can be found in §3.

A general analog Voice service example can be found in the next figure:

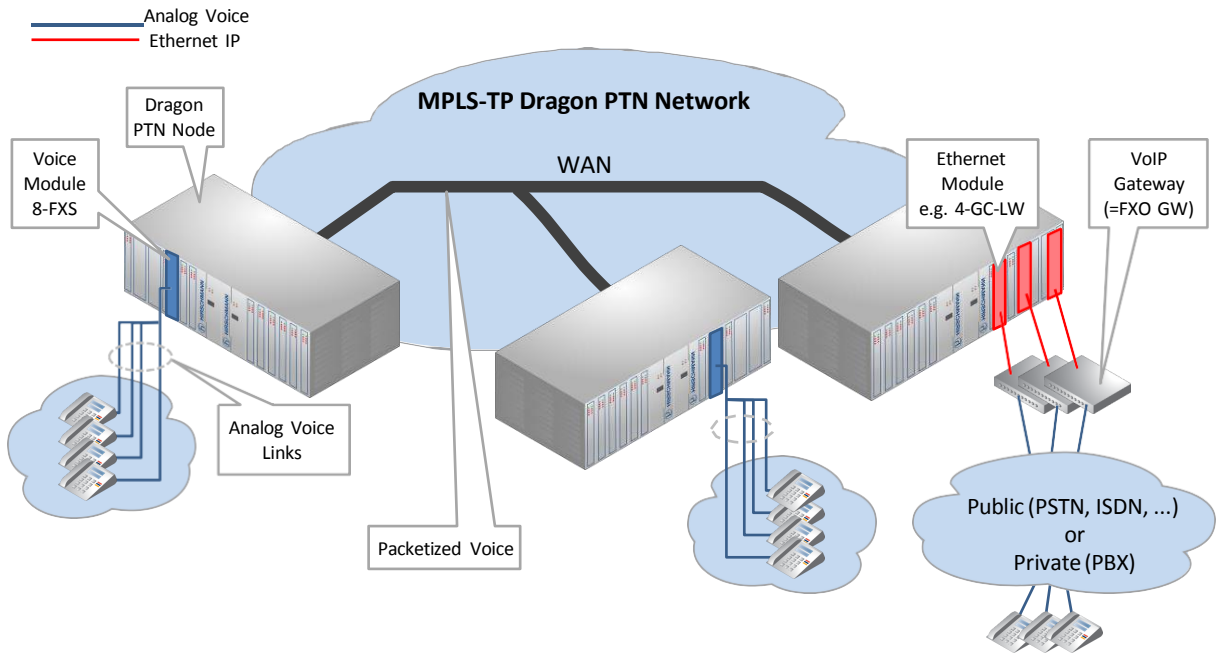


Figure 1 Analog Voice Example: Remote Extension

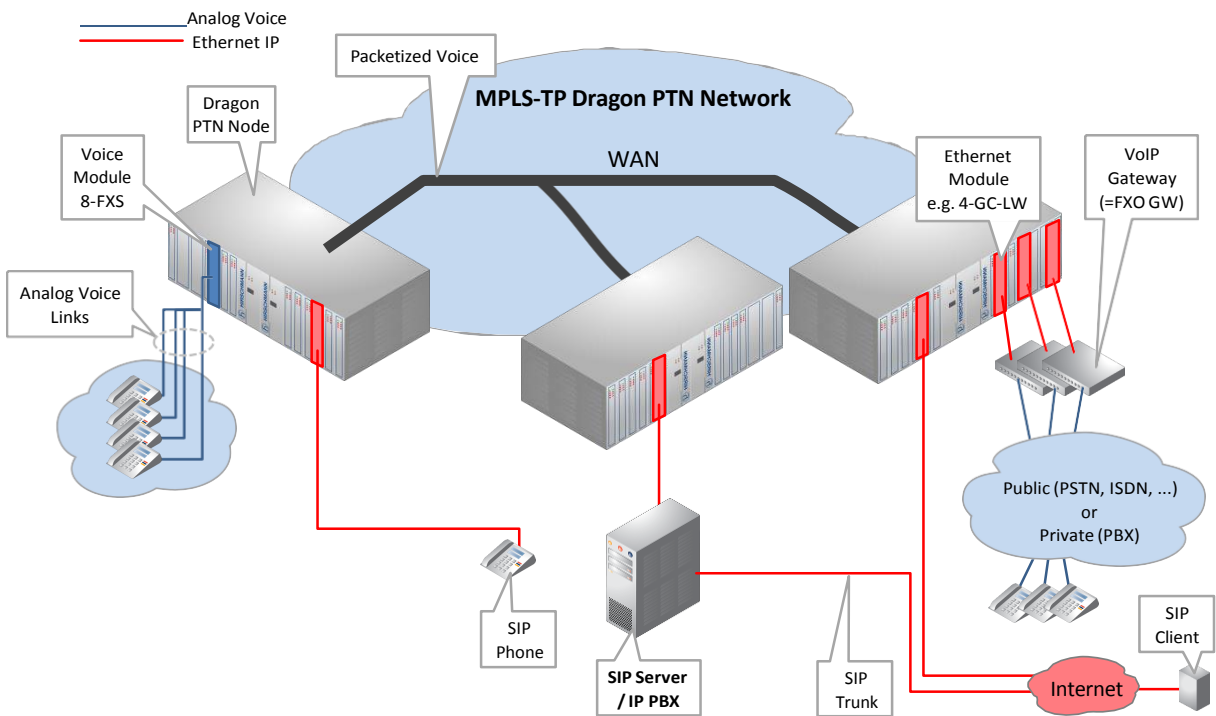


Figure 2 Analog Voice Example: SIP Server

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-4-GC-LW_PTN-4-GCB-LW_02_1019_en.pdf | Dragon PTN Interface Module: PTN-4-GC-LW / PTN-4-GCB-LW |
| [6] | IG_Dragon-PTN_PTN-1-10G-LW_02_1019_en.pdf | Dragon PTN Interface Module: PTN-1-10G-LW |
| [7] | IG_Dragon-PTN_PTN-4-GO-LW_01_1019_en.pdf | Dragon PTN Interface Module: PTN-4-GO-LW |
| [8] | IG_Dragon-PTN_General-Specifications_01_1019_en.pdf | Dragon PTN General Specifications |

2. MODULE DESCRIPTION

2.1 Front Panel

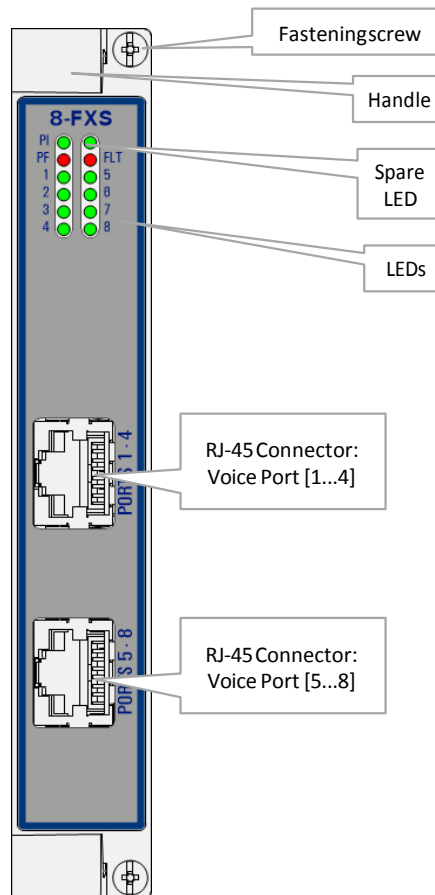


Figure 3 Front Panel

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-8-FXS 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 | Port[1..8] |
|-------|----|-----|---------------|-----------|---------------|
| 1 | x | --- | --- | --- | see Table 3 |
| 2 | x | --- | Slow blinking | --- | see Table 3 |
| 3 | x | --- | Fast blinking | --- | see Table 3 |
| 4 | x | --- | --- | --- | --- |
| 5 | x | --- | --- | --- | slow blinking |

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

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 | Not lit, Green | spare |
| <port n°> | Not lit, dark | - port configured (*): connected analog phone is on hook and registered (**) |
| | Green, slow blinking | connected analog phone is on hook together with one of the conditions below: - not configured - not registered (**) |
| | Green, fast blinking | connected analog phone is off hook together with one of the conditions below: - not configured - not registered (**) |
| | Green, lit | connected analog phone is off hook and registered (**) |

(*) Port Configured: a port is configured when it is programmed in a Voice service and it has a created account. The account must have been created via the Voice Protocol wizard in HiProvision.

(**) Register: The analog phones must have been announced or registered first to a third party FXO gateway or SIP-server. This occurs via a 'REGISTER' message. After registration, the SIP server or FXO gateway knows via which IP address and extension number the analog phones can be reached. The REGISTER message will be sent automatically by the port, every 120 seconds, after the port has been configured and loaded in HiProvision. No phone has to be connected yet to start the registration. See also §2.2.5 for more info on the Register flow.

2.1.3 RJ-45 Connector Connections and Cables

The PTN-8-FXS module provides 8 analog voice ports via 2 RJ-45 connectors, each connector providing 4 ports. Each port provides one tip/ring pair. Connections to this Interface Module can be made via a connection kit that can be plugged as well in a patch panel:

- ▶ PTN-8-FXS Connection Kit (future support) includes:
 - ▶ An RJ-45 drop cable (1.5m) wired out on 4*RJ-11 couplers to connect ports [1..4];
 - ▶ An RJ-45 drop cable (1.5m) wired out on 4*RJ-11 couplers to connect ports [5..8];
- ▶ Patch panel (order no. 942 256-204):
 - ▶ 24 ports feedthrough patch panel. The RJ-45 drop cables from the connection kit can be plugged into this patch panel.
 - ▶ Analog telephony RJ11 cables must be plugged into the RJ-11 couplers to connect to the PTN-8-FXS ports;
- ▶ See the table and figures below for an overview and description of the different connections, connectors and pin assignments.

Table 4 Connection Products

| Description | Ordering Number |
|---|-----------------|
| PTN-8-FXS Connection Kit | future support |
| Patch panel 1 U feedthrough 24 ports (to be used in combo with the PTN-8-FXS Connection | 942 256-204 |

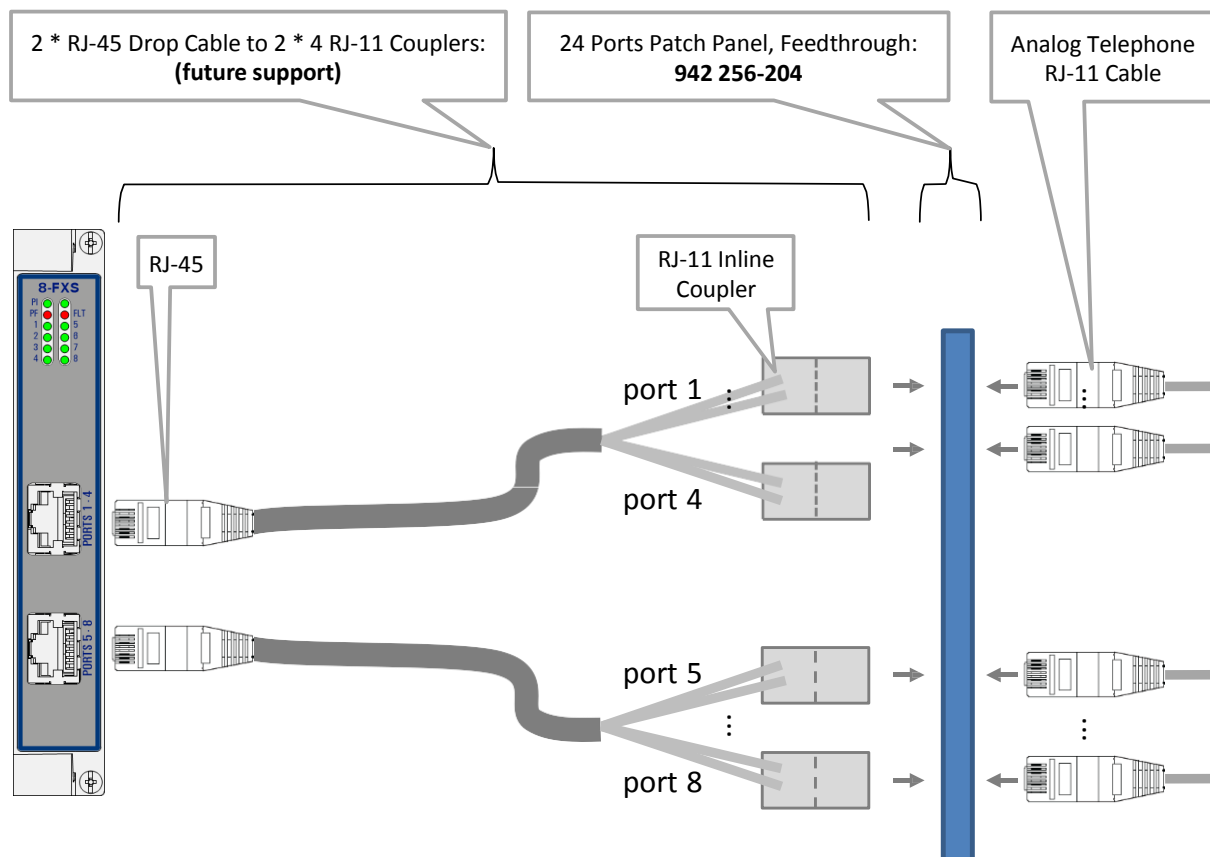


Figure 4 PTN-8-FXS Connection: Unplugged

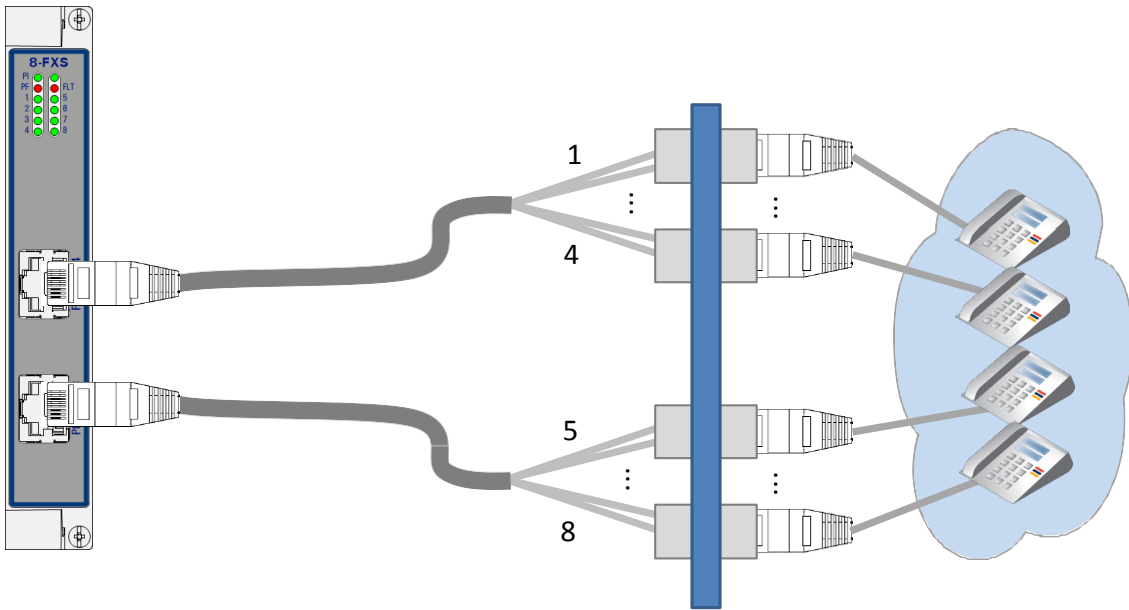


Figure 5 PTN-8-FXS Connection: Plugged

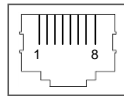


Figure 6 RJ-45 Connector

Table 5 RJ-45 Cable-Coupler: Pin Assignments

| RJ45 Connector Cable | | | | Coupler | | |
|----------------------|---------|-------------|--------------|-------------|---------|------------|
| Port No. | Pin No. | Description | Wire Colors | Coupler No. | Pin No. | Color |
| 1 | 1 | TIP1 | white/orange | 1 | 2 | Green |
| | 2 | RING1 | orange | | 3 | White Blue |
| 2 | 3 | TIP2 | white/green | 2 | 2 | Green |
| | 6 | RING2 | green | | 3 | White Blue |
| 3 | 4 | TIP3 | blue | 3 | 2 | Green |
| | 5 | RING3 | white/blue | | 3 | White Blue |
| 4 | 7 | TIP4 | white/brown | 4 | 2 | Green |
| | 8 | RING4 | brown | | 3 | White Blue |
| 5 | 1 | TIP5 | white/orange | 5 | 2 | Green |
| | 2 | RING5 | orange | | 3 | White Blue |
| 6 | 3 | TIP6 | white/green | 6 | 2 | Green |
| | 6 | RING6 | green | | 3 | White Blue |
| 7 | 4 | TIP7 | blue | 7 | 2 | Green |
| | 5 | RING7 | white/blue | | 3 | White Blue |
| 8 | 7 | TIP8 | white/brown | 8 | 2 | Green |
| | 8 | RING8 | brown | | 3 | White Blue |

2.2 Functional Operation

2.2.1 General

An application network can be connected to the MPLS-TP Dragon PTN network via one of the PTN-8 FXS interface ports. The PTN-8-FXS module can interface with 8 analog telephone lines. In Figure 1 and Figure 2, a common functional setup is shown.

In Figure 7 below, a more detailed functional setup is shown. An application network interfaces the Dragon PTN node via the FXS ports on the PTN-8-FXS module. The PTN-8-FXS converts this traffic into Ethernet traffic on the backplane. The Central Switching Module (=PTN-CSM310-A) converts this Ethernet traffic into packetized MPLS-TP and transmits it via an Ethernet Interface Module (e.g. PTN-4-GC-LW) onto the Dragon PTN MPLS-TP network.

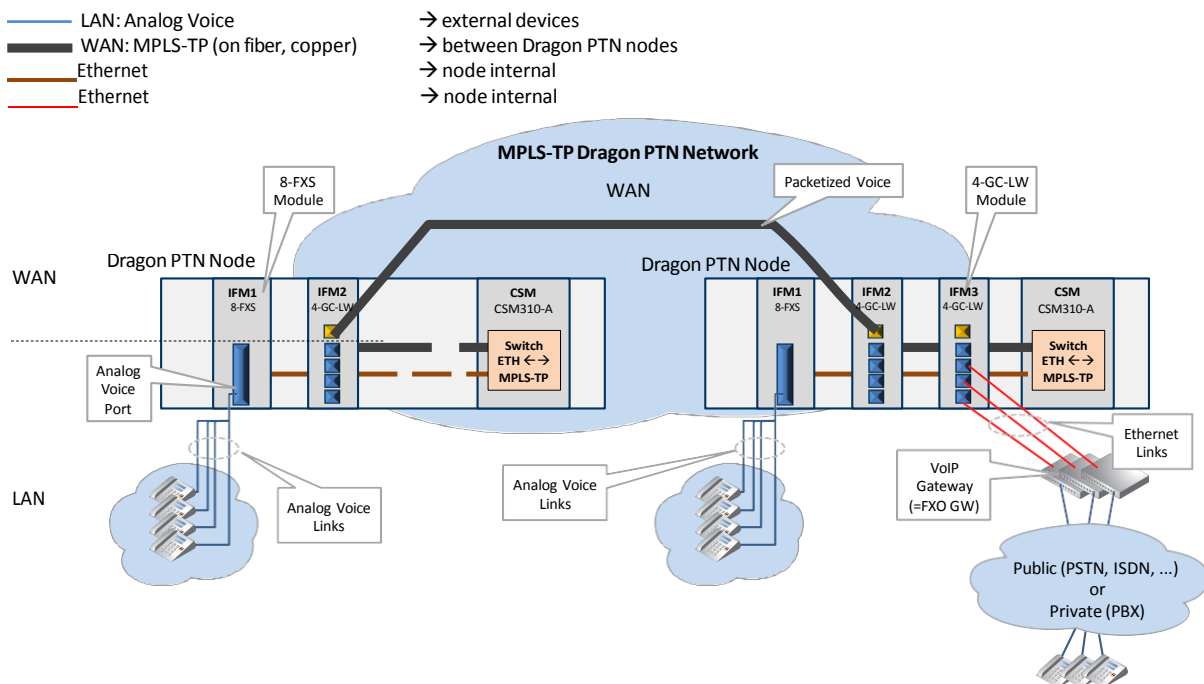


Figure 7 Detailed Functional PTN-8-FXS Example

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

The PTN-8-FXS module receives analog voice via its front panel ports and converts this into Ethernet traffic which is forwarded to the CSM via the backplane. The CSM does all the processing on this data (synchronization, CRC checks, conversions, switching...). The CSM converts this data into MPLS-TP packets and transmits it via an Ethernet Interface Module (e.g. PTN-4-GC-LW) onto the WAN. On the destination side, the same processing occurs in reverse order.

2.2.3 Voice Service: Remote Extension (FXO Gateway)

- ▶ See Figure 1: connections between FXS \leftrightarrow VoIP Gateway (=FXO-GW);
- ▶ Analog phones in the Dragon PTN network are a remote extension of the public (PSTN) and/or private (PBX) telephone network. The extension is possible via a third party FXO-GW (e.g. Patton);

- ▶ Analog phones are connected to an FXS interface (PTN-8-FXS module);
- ▶ FXO Gateways are connected to an Ethernet interface (e.g. PTN-4-GC-LW module);
- ▶ Voice switching and telephony feature handling between all phones are performed in the PSTN or PBX;
- ▶ DTMF (=Dual Tone Multi-Frequency) must be used for number dialing;
- ▶ Analog speech and signaling are converted and packetized by the FXS interface and the FXO-GW towards the Dragon PTN network

To set up an entire Voice service in HiProvision (See Ref.[1] in Table 1):

- a. Configure a Voice service in HiProvision. A voice service requires at least one PTN-8-FXS port and one Ethernet port (e.g. 4-GC-LW).
- b. Configure a Voice Protocol in the configured Voice service. This voice protocol is necessary to configure extra/enhanced voice parameters.

NOTE: PTN-8-FXS ports are always consumed per pair in a Voice service: port1+port2; port3+port4; port5+port6; port7+port8. So if you configure port5 in a first service
e.g. Voice1, port6 can only be used in the same Voice1 service.

2.2.4 Voice Service: SIP-Server

- ▶ See Figure 2: SIP elements like a SIP Phone and VoIP gateway can be registered on and handled by the SIP Server;
- ▶ Analog phones are connected to an FXS interface (PTN-8-FXS module) which are registered on the SIP Server;
- ▶ Voice switching and telephony feature handling for all calls are performed in the SIP Server;
- ▶ Possible SIP telephony features depend on the used SIP devices and their interoperability.

To set up an entire Voice service in HiProvision (See Ref.[1] in Table 1):

- c. Configure a Voice service in HiProvision. A voice service requires at least one PTN-8-FXS port and one Ethernet port (e.g. PTN-4-GC-LW).
- d. Configure a Voice Protocol in the configured Voice service. This voice protocol is necessary to configure extra/enhanced voice parameters.

NOTE: PTN-8-FXS ports are always consumed per pair in a Voice service: port1+port2; port3+port4; port5+port6; port7+port8. So if you configure port5 in a first service
e.g. Voice1, port6 can only be used in the same Voice1 service.

2.2.5 SIP Connections

After a Voice service and Voice protocol has been configured in HiProvision, voice calls (or connections) between analog and/or SIP clients can be set up via SIP calls.

Before any SIP call is possible between end clients A and B, both A and B must register first to a SIP Server, whatever mode is used, either Remote Extension or SIP Server. A registration attempt from the PTN-8-FXS Interface Module automatically occurs (every 120 seconds) when the port on which A or B is or will be connected, is configured in HiProvision. As a result of a successful registration process, A and B and their location will be known by the SIP server.

- ▶ Remote Extension mode: The external FXO Gateway device acts as SIP server;
- ▶ SIP Server mode: A Server PC with SIP Server software can act as SIP server;

Once the registration has been done, a voice call between A and B is possible. Basically, when A calls B, a SIP Invite message will be sent to the SIP server first, which redirects the Invite message to B. B starts ringing, picks up the phone and the Voice call has been set up. Once the voice call has been established, Real-time Transport Protocol (=RTP) is used to transport the call data.

- ▶ Remote Extension mode: the RTP stream always goes through the FXO Gateway device;
- ▶ SIP-Server mode: It can be configured in the SIP Server itself whether the RTP stream goes through the SIP Server. If for example the calls must be monitored or recorded, the RTP must go through the SIP server. Find below some example SIP flow examples.

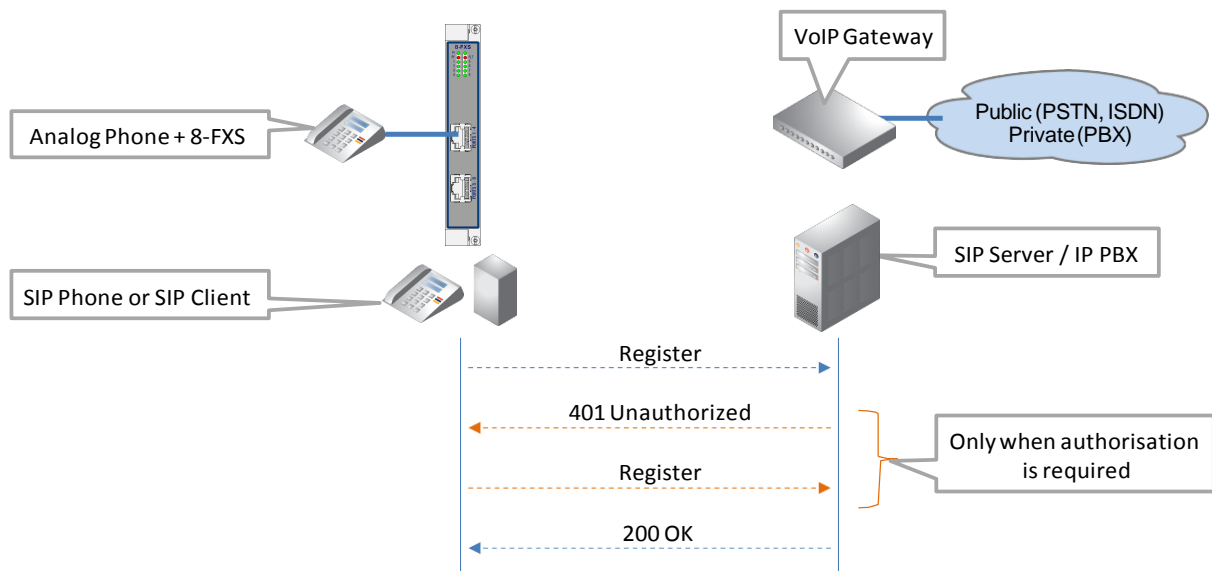


Figure 8 Basic SIP Registration Process

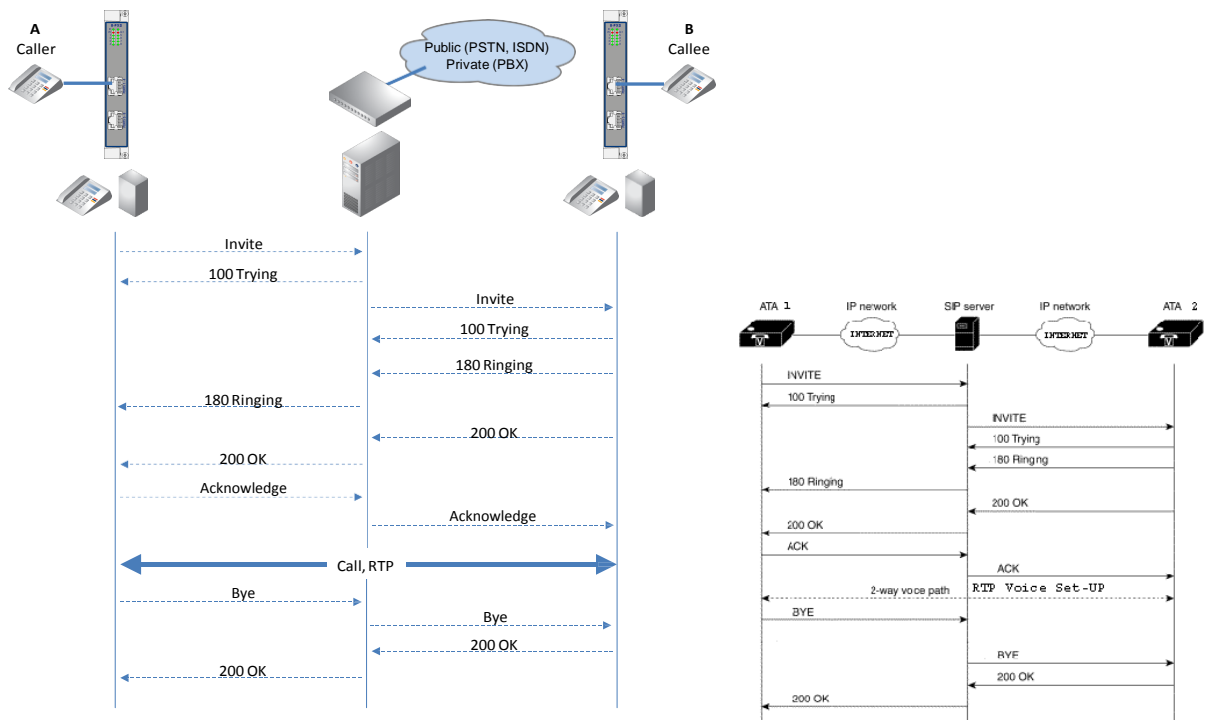


Figure 9 Basic SIP Call Example Setup Between End-Points

CAUTION: The call setup in the figure above may slightly differ depending on the selected mode!

2.3 Onboard Interfaces

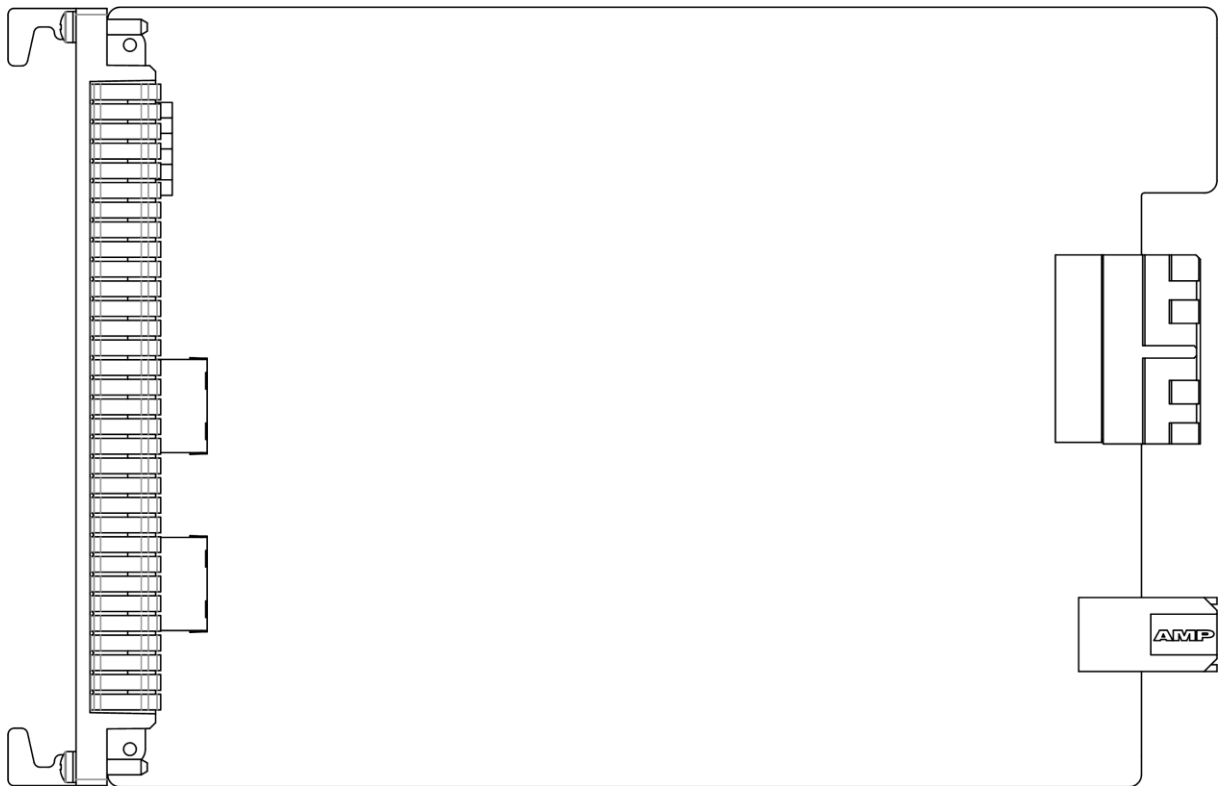


Figure 10 PTN-8-FXS: Side View

2.3.1 Straps

No user relevant straps.

2.3.2 DIP Switches

No user DIP switches.

2.3.3 Hardware Edition

The hardware edition of the Interface Module has been factory set and can not be changed. It can be read out via HiProvision in the Software tile, see Ref. [1] in Table 1.

3. COMPATIBILITY

The PTN-8-FXS Interface Module is compatible with:

- ▶ PTN-4-GC-LW Interface Module, PTN-4-GCB-LW Interface Module, PTN-1-10G-LW Interface Module, PTN-4-DSL-LW Interface Module;
- ▶ FXO Gateway: Patton SmartNode: SN4332/JO/UI (Multiport Analog Voip gateway): SmartNode Multiport FXO VoIP GW, 32 FXO ports presented on RJ21, 1x Fast Ethernet, Internal UI Power. NOTE: SN43xx : → xx indicates amount of ports. Other similar Patton devices with more/less ports are supported as well.

It means that PTN-8-FXS and all the products mentioned above can be programmed in the same Voice service.

4. MODULE SPECIFICATIONS

4.1 General Specifications

For general specifications like temperature, humidity, EMI ... see Ref.[8] in Table 1.

4.2 Other Specifications

Table 6 Other Specifications

| Description | Value |
|-------------------|---|
| Weight | 0.23 kg / 0.5 lb |
| MTBF | 185 years at 25°C/77°F |
| Power Consumption | Measured at 25°C/77°F, with data transport: - All phones on-hook: 5.6W - Extra per phone off-hook: 0.9W - Ringing state: max. 9W - All phones off-hook: 12.8W |
| Module Size | width: 20.32 mm / 0.8 inches height: 126 mm / 4.96 inches depth: 195 mm / 7.68 inches |

4.3 Ordering Information

- ▶ PTN-8-FXS: future support;
- ▶ PTN-8-FXS Connection Kit: future support;
- ▶ Patch panel 1 U feedthrough 24 ports (to be used in combo with the PTN-8-FXS Connection Kit): 942 256-204.

5. ABBREVIATIONS

| | |
|----------------|---|
| CSM | Central Switching Module |
| DTMF | Dual Tone Multi-Frequency |
| EMI | Electromagnetic Interference |
| ETH | Ethernet |
| FLT | Fault |
| FXO | Foreign eXchange Office |
| FXS | Foreign eXchange Subscriber |
| GW | Gateway |
| IEEE | Institute of Electrical and Electronics Engineers |
| IP | Internet Protocol |
| ISDN | Integrated Services Digital Network |
| kbps | Kilobit per Second |
| LAN | Local Area Network |
| LOS | Loss Of Signal |
| Mbps | Megabit per Second |
| MPLS-TP | MultiProtocol Label Switching – Transport Profile |
| MTBF | Mean Time Between Failures |
| PBX | Private Branch Exchange |
| PF | Power Failure |
| PI | Power Input |
| PTN | Packet Transport Network |
| PSTN | Public Switched Telephone Network |
| RTP | Real-time Transport Protocol |
| SIP | Session Initiation Protocol |
| VoIP | Voice over IP |
| WAN | Wide Area Network |