point2point

DC COUPLED ANALOGUE FIBRE OPTIC LINK

User Handbook

PDx-HB-8

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Safety Information

Please read the whole of this section
before using your ***point2point*** *product.*

Electrical Safety

The Rack Cases that are used in conjunction with the DC Digital Link family are Safety Class 1 instruments (they have a metal case that is directly connected to earth via the power supply cable).

When operating the equipment note the following:

- Hazardous voltages exist within the equipment.
- Do not remove equipment covers when operating.
- Make sure that only fuses of the required rated current, and of the specified type (anti-surge, quick blow, etc.) are used for replacement.
- There are no user serviceable parts inside this unit.

Optical Safety

The ***point2point*** DC Analogue Transmitter **singlemode** modules contain laser diode sources operating at 1300nm. These devices are rated at under IEC60825-1 "Safety of Laser Products", Part 1, First Edition, 2001 as CLASS 1 radiation emitting devices.

The ***point2point*** DC Analogue Transmitter **multimode** modules contain laser diode sources operating at 850nm. These devices are rated at under IEC60825-1 "Safety of Laser Products", Part 1, First Edition, 2001 as CLASS 1 radiation emitting devices.

When operating the equipment note the following:

- Never look into the end of an optical fibre or connector directly or by reflection either with the naked eye or through an optical instrument.
- Never leave equipment with radiating bare fibres accessible – always cap the connectors.
- Do not remove equipment covers when operating.

Adjustment, maintenance and repair of the equipment should only be carried out by suitably qualified personnel.

For more information on the Rack Case and Accessories, please refer to the generic system handbook Sxx-HB.

Important Handling Instructions

Connecting Fibre Optic Connectors

The fibre optic cable supplied with your **singlemode version** 2MHz or 10MHz DC Link is terminated with **FC/APC** screw-type type connectors. FC/APC connectors are high precision screw type connectors and should only be finger tightened. This type of cable should not be confused with FC/PC type connectors supplied with other, older PPM equipment.

The fibre optic cable supplied with your **multimode version** 2MHz or 10MHz DC Link is terminated with **ST** bayonet-type connectors.

The optical connectors should be cleaned in accordance with the instructions in Appendix I **before each and every** connection, even if they have been protected with dust caps.

The protective dust caps on the equipment and cable connectors should only be removed immediately before the connectors are mated.

Care should be taken not to drop the optical connector or to subject it to any other excessive physical shock.

Disconnecting Fibre Optic Connectors

The connectors should be removed by unscrewing and withdrawing the connector.

UNDER NO CIRCUMSTANCES SHOULD THE FIBRE BE PULLED TO REMOVE THE CONNECTOR.

Immediately after removing the connectors, all protective Dust Covers and End Caps should be fitted.

Care Of Fibre Optic Connectors

When the fibre optic cables are not connected, it is essential that the cable and equipment connectors are protected by the dust caps provided with the system. Failure to do so may result in damage to the fibre ends, which are critical to the system performance.

System performance may be compromised by dirt on the connector end or its alignment surfaces. Refer to Appendix I for instructions on cleaning the optical connectors.

Connector performance will be compromised if its end face is scratched or chipped.

Bend Radius

All fibre optic cable is subject to a minimum bend radius beyond which physical damage may occur to the cable. The cable supplied with this system consists of a simplex glass optical fibre with 3mm tight jacket ruggedisation. The minimum bend radius (MBR) for this type of fibre can be found in the specifications in Appendix II.

1 Introduction

The ***point2point*** DC Links are a family of non-galvanic link systems designed for the transmission of analogue signals from true DC up to your specified bandwidth, in electrically noisy environments.

The system consists of a Transmit Module, which converts the input electrical signal to an optical signal, a fibre optic cable down which the signal is conveyed, and a Receive Module which recovers the original signal.

This handbook covers ***point2point*** DC transmitter modules with part numbers starting PDT-H or PDT-N, and receiver modules with part numbers starting PDR-H or PDR-N.

1.1 Transmitter Module

The Transmitter Module contains the signal conditioning circuitry, optical transmitter, power supply filtering/regulation and basic control circuitry.

The optional Battery Pack (Shielded Remote housing option only) attaches to the side of the Transmitter Module and provides electrical power to the transmit electronics. Battery packs are quickly and easily changed. This enables the system to be operated continuously, with minimum delays whilst batteries are charged.

1.2 Receiver Module

The Receiver Module receives the optical signal from the Transmitter Module, and converts it back into an analogue electrical signal.

The optional Battery Pack (Shielded Remote options only) attaches to the side of the Receive Module and provides electrical power to the receive electronics.

1.3 Fibre Optic Cable

The fibre optic cables used in conjunction with the **singlemode version *point2point*** DC Links are terminated with a single FC/APC optical connector at each end.

The fibre optic cables used in conjunction with the **multimode version *point2point*** DC Links are terminated with a single ST optical connector at each end.

Care of fibre optic connectors

When the fibre optic cables are not connected, it is essential that the cable and equipment connectors are protected by the Dust Caps provided with the system. Failure to do so may result in damage to the fibre ends, which are critical to the system performance.

System performance may be compromised by dirt on the connector end or in the detector.

Refer to Appendix I for instructions on cleaning the optical connectors.

Connector performance will be compromised if its end face is scratched.

2 Setting up and using the DC Link

This section describes the connections between your DC Fibre Optic Link Transmitter and Receiver Modules, and the operation of both units in a system.

Please read fully document Sxx-HB for information on installing your ***point2point*** equipment before attempting to make any measurements.

2.1 Module Operation

2.1.1 Shielded Remote Modules

The Module is switched on automatically by connection to a fully charged Battery Pack using the Battery Pack U-Link. Removal of the link powers down the Module.

2.1.2 Rack Plug-In Modules

The Module is powered up when the Rack Unit is switched on at the On/Standby switch or, if a System Controller is fitted, when the Controller is switched on.

2.1.3 Plug-In Converter Sleeve

The module is powered up when the Rack Plug-In Module is plugged into the sleeve, and the 12V converter sleeve power supply is plugged into the 2.1mm connector socket on the rear of the converter sleeve.

2.2 Using the Transmit Module

2.2.1 Analogue Signal Input

The user's signal is applied to the Signal Input on the Transmitter Module. Maximum ratings for this input are given in the technical specifications in Appendix II.

If the maximum ratings are exceeded, the Signal LED on the Transmitter Module front panel will illuminate RED. If this occurs, the input signal will be distorted on recovery at the Receiver Module.

2.2.2 Fibre Optic Cable Connection

The fibre optic cable, which carries the optical signal from Transmitter to Receiver Modules, is terminated in singlemode FC/APC type or multimode ST type optical connectors.

The connectors are mated by aligning the lug on the connector with the notch in the receptacle shroud, gently pushing the connector into the receptacle, and finger-tightening the nut.

It is important to replace the dust caps on both the connectors and modules when not in use. Contamination may give rise to erroneous results and may damage the equipment.

2.3 Using the Receive Module

2.3.1 Analogue Signal Output

The measured signal is retrieved from the signal output connector (see diagram). The output can be plugged directly into an oscilloscope but should be terminated with 50Ω. If the output is not terminated, then the voltage measured at the output will appear 2x larger than expected.

Output impedance, maximum current ratings and level specifications can be found in Technical Specifications Appendix II.

2.3.2 Fibre Optic Cable Connection

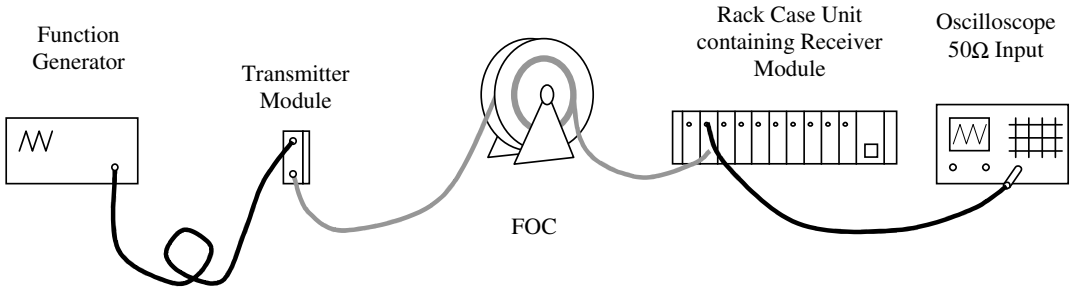
The fibre optic cable, which carries the optical signal from Transmitter to Receiver Modules, is terminated in singlemode FC/APC type or multimode ST type optical connectors.

The connectors are mated by aligning the lug on the connector with the notch in the receptacle shroud, gently pushing the connector into the receptacle, and finger-tightening the nut.

It is important to replace the dust caps on both the connectors and modules when not in use. Contamination may give rise to erroneous results and may damage the equipment.

2.4 System Integration

The diagram below illustrates a typical system configuration comprising a Shielded Remote Transmitter Module and Rack Plug-In Receiver Module. The electrical source is a function generator and the recovered signal is displayed on an oscilloscope.



The sequence in which the equipment is initially set up to make a measurement is not critical, though it is recommended that the Fibre Optic Cable is attached to both Transmitter Module and Receiver Module before the Transmitter Module is powered up. This way, there is no optical hazard presented by laser light propagating through a free end of the fibre.

When the Transmitter and Receiver Modules are connected via the FOC and switched on, the Signal LED on the Receiver will change from RED to GREEN. This indicates that the Transmitter and Receiver Modules have established a "lock". At this point the signal presented at the Transmitter Module input is mirrored at the output of the Receiver Module. Lock will normally be established in a matter of milliseconds after valid data is received, but the process may take up to a second under some conditions.

In the situation where the Receiver Module is operating without the Transmitter Module being in place, for example while changing the Battery Pack on a Shielded Remote Transmitter Module, the Receiver Module output voltage will be 0V ± 100mV.

Once a lock has been re-established, the LED will illuminate GREEN and the Transmit Module input signal will reappear at the Receive Module Output.

Due to the technology used, the ***point2point*** range of DC coupled analogue fibre optic links are extremely tolerant to fluctuations in insertion loss in the optical path. The signal to noise ratio and system gain remain unaffected by path loss over a very wide range of fibre lengths and attenuations.

While increased optical path loss does not have an apparent effect on the link integrity, optical connector cleanliness is as important with these links as with any other. Please refer to Appendix I for instructions on how to correctly maintain your product.

3 Battery Packs

The Battery Packs used on the DC Link Shielded Satellite Modules provide a nominal output voltage of 14.4V. A fully charged Battery Pack may have an open circuit voltage of more than 17V.

3.1 Battery Pack Operation

The Modules have been designed for minimal current consumption, specified in Appendix II.
For more details of the battery operation please refer to the battery handbook

All Shielded Satellite Modules have an automatic shutdown feature to protect damage to the Battery Packs. When a fully changed Battery Pack is attached to a Module, the Module powers up. This is indicated by the Power Status LED illuminating green.

As the batteries reach the end of their discharge cycle, the Power Status LED will illuminate red to warn the user that the Module will power down shortly. The Module will continue to function in this mode without performance impairment for several minutes allowing measurements to be completed

When a Battery Pack becomes fully discharged, the module to which it is attached will shut down. At this point, it is necessary to replace the Battery Pack with one that is fully charged.

Instructions on how to change a Battery Pack are detailed in the ***point2point*** generic system handbook Sxx-HB.

Optical Transmit Modules in shut-down mode should not be left in this mode for extended periods with the Battery Pack attached, as this may over-discharge the Battery Pack, causing permanent damage.

More information on the Battery Pack including Battery Pack Care and Charging can be found in the ***point2point*** generic system handbook, Battery Handbook and charger handbooks.

4 Maintenance and Fault-Finding Guide

Refer to the following table that gives a list of commonly encountered problems and suggested solutions.

Fault	Possible Causes	Solution
Illuminated Power Switch does not illuminate on the rear of the Rack Case Unit.	Power is not attached to the rack unit. Mains switch is turned off. Fuse has blown in rack unit.	Connect mains power to the rack unit, and switch on power. Switch on mains switch. Replace fuse (2A anti-surge).
Power Status LED does not light on Shielded Remote Module when Battery Pack is attached.	Battery Pack is discharged. Battery Pack U-link is not fitted at rear of module.	Recharge/replace Battery Pack. Attach Battery Pack U-link.
Power Status LED on Shielded Remote Module illuminates red.	Battery Pack power is low. External Power Supply voltage is low.	Recharge/replace Battery Pack. See Specification for allowable range of supply voltages.
Power Status LED does not light on Rack Plug-In Module.	Rack Unit is not powered. Rack Mount Module is not correctly plugged into Rack Unit.	Connect mains power to the Rack Unit, and switch on power. Power down Rack Unit, Push Module fully home, Re-apply power to Rack Unit.
Receive Module Signal Status LED is illuminated red.	Dirt on the fibre optic connectors. Broken optical fibre.	Clean the fibre optic connector. Refer to Appendix I. Contact PPM.
Transmit Module Signal Status LED is illuminated red.	Over voltage on Transmit Module input.	Reduce input voltage.

The ***point2point*** range of DC link Transmitter and Receiver Modules are calibrated for optimum performance and accuracy before dispatch. In order to guarantee the continued performance and reliability of the link, it is strongly recommended that your fibre optic link be returned to PPM for calibration annually.

In the event of any problems or queries about the equipment, contact PPM or your local agent.

5 Product Warranty

The Company guarantees its products, and will maintain them for a period of three years from the date of shipment and at no cost to the customer. Extended warranty options are available at the time of purchase.

Please note that the customer is responsible for shipping costs to return the unit to PPM.

The Company or its agents will maintain its products in full working order and make all necessary adjustments and parts replacements during the Company's normal working hours provided that the Customer will pay at the rates currently charged by the Company for any replacements made necessary by accident, misuse, neglect, wilful act or default or any cause other than normal use.

Claims must be made promptly, and during the guarantee period.

IMPORTANT:-

Please contact both your selling agent and PPM prior to returning any goods for Warranty or Non-Warranty repairs. Goods will not be accepted without a valid Goods Return Number (GRN).

Appendix I : Fibre Optic Connector Cleaning Procedure

This ***point2point*** fibre optic cable is fitted with screw type 'FC/APC' or bayonet type ST optical connectors. It is important to keep these clean to ensure accurate measurements.

The optical connectors should be cleaned **before each and every use**, even where they have been protected with dust caps.

Cleaning items required

- Lint free fibre cleaning tissues (normal cosmetic tissues produce dust and are not acceptable);
- Reagent grade Iso Propyl Alcohol;
- Air duster or FILTERED compressed air line.

Cable Connector Cleaning

- Dampen a patch of cleaning tissue with IPA and clean all surfaces of the plug ferrule.
- Using a dry cleaning tissue, dry the ferrule and polish the end face.
- Using the air duster, blow away any residue from the end of the connector.

Module Female Receptacle Cleaning (only recommended if problems are being experienced)

- Twist a cleaning tissue to form a stiff probe, and moisten with IPA. Gently push the probe into the receptacle and twist around several times to dislodge any dirt.
- Repeat the above process with a dry tissue.
- Using the air duster, blow away any residue from the receptacle.

Important Notes

- IPA is flammable. Follow appropriate precautions / local guidelines when handling and storing.
- IPA can be harmful if spilt on skin. Use appropriate protection when handling.
- It should only be necessary to clean the female receptacles on the modules if problems are being experienced.
- **Never inspect an optical fibre or connector with the naked eye or an instrument unless you are convinced that there is no optical radiation being emitted by the fibre. Remove all power sources to all modules, and completely disconnect the optical fibres.**

Appendix II : Specifications

System Electrical Performance (at 25°C unless otherwise noted)

	PDx-Hx-6x, PDx-Hx-1x	**PDx-Nx-6x, PDx-Nx-1x**
Passband	DC to 2MHz	DC to 10MHz
Flatness	DC-1MHz : ±1dB DC-2MHz : ±3dB	DC-2MHz : ±1dB DC-10MHz : ±3dB
Risetime	<200ns	<40ns
Instantaneous Dynamic Range	>52dB (V.sig.p-p / V.noise.rms in 10MHz)	
Phase Flatness	<±10°	
End to End Delay	650ns	
Output Noise (Full Band)	<5mV$_{rms}$ for ±1V f.s.d. <50mV$_{rms}$ for ±10V f.s.d.	<5mV$_{rms}$ for ±1V f.s.d.
Transmitter Input Impedance	1MΩ//25pF typ.	
Receiver Output Impedance	50Ω @ ±1V standard	50Ω @ ±1V
Maximum Receiver Load	25mA	
Transmitter Input Voltage Range	±1V standard ±10V, ±20V, ±50V & ±100V options	
Receiver Output Voltage Range	±1V into 50Ω load standard ±10V into 1MΩ // 125pF load optional (suitable for 1 metre coaxial lead connected to an oscilloscope)	±1V into 50Ω load
Output DC Temperature Drift	Better than 1mV/°C for ±1V f.s.d. Better than 10mV/°C for ±10V f.s.d	Better than 1mV/°C ±1V f.s.d.
Output DC Offset	Better than 1% of f.s.d.	
Gain Accuracy at 100Hz (excluding DC Offset error)	Better than ±1% with ±1V f.s.d. receiver terminated in 50Ω load or ±10V f.s.d. receiver terminated in 1MΩ load	Better than ±1% with ±1V f.s.d. receiver output terminated in 50Ω load
Operating Temperature	-10°C to +40°C	
Optical Path Length	1m to greater than 1km for singlemode / 1m to greater than 500m for multimode	
Optical fibre type	Singlemode: 8/125 Multimode: 50/125 or 62.5/125 graded index, <2.5dB/km, >400MHz.km	
Electrical Signal Connector	Shielded Module: TNC 50Ω Plug-In Module: BNC 50Ω	
Optical Signal Connector	FC/APC Singlemode OR ST Multimode	
Front Panel Indication Transmitter Module Receiver Module	 Power supply status & Input Over-range warning Power supply status & Link Lock status	
Supply Voltage Shielded Module Plug-In Module	 13 - 15Vdc 12Vdc	
Current Consumption	<500mA @14.4V <600mA @12.0V	
Housing Options	Shielded Module Plug-In Module Standalone Module (using 75002)	

Plug-In Case Suitability	SRK-3P, SRK-3RP

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CR2696

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