

Inner Range Fibre Modem - Single-mode P/N: 995087PCB&K / 995087 Revision C (See Note 1 below)

Optically Isolated LAN Interface for Integriti, Inception & Concept 3000/4000

INSTALLATION MANUAL

OVERVIEW:

The Inner Range Single-mode Fibre Modem provides 2 separate, optically isolated ports to extend &/or isolate the RS485 system LAN. The typical transmission distance between each Fibre Modem is up to 13,000 metres. Each Port has a Transmit and Receive pair with SC connectors which accommodate Single-mode 9/125µm optical fibre cables. The Fibre Modem has been designed to provide maximum Isolation with minimal delay.

The Fibre Modem can be powered from the LAN or from an external DC supply via the relevant 10-way Power connector. LED indicators show operational status (RUN) and the status of each receive line (FAULT). Data flow is indicated with TX and RX LED indicators for each of the three ports. Two switched outputs are also provided, which can be wired directly into Zone Inputs on a Controller or LAN Module to monitor the state of each receive port.

The Fibre Modem can be used in a "LOOP" mode or in a "STAR" mode to create 2 separate electrically isolated LAN segments. The Fibre Modems can also be "daisy chained" to cover larger sites.

Optical fibre transmits signals as light pulses rather than electrical pulses. This light transmission is unaffected by electromagnetic fields which allows cables to be routed near electrical conductors and machines. In addition, the Fibre Cable usually has a metal free construction so there are no earth loop problems between LAN connections and the cable will not transmit lightning pulses. This elimination of earth loops makes Fibre cable the primary choice for inter-building links.

IMPORTANT NOTES:

- 1) This installation manual is relevant to Single-mode Fibre Modem PCBs Revision C or later.
For Revision A & Revision B PCBs refer to the Fibre Modem - Single Mode Installation Manual Rev. 1.2, May 2015.**
- 2) The Fibre modem is transparent to the Control Module; it simply passes all LAN communication data as it is received. The Fibre Modem is not addressed and does not generate any LAN messages of its own; therefore it is not treated as a "LAN Module" by the Controller.
However, as the Fibre Modem connects to the Wired LAN, it does possess a pair of LAN Bias Links which must be configured correctly.**
- 3) A minimum of two Fibre Modems are required for each installation.**

Disclaimer:

While every effort has been made to ensure the accuracy of this manual, the manufacturer assumes no responsibility or liability for any errors or omissions. Due to ongoing development, this manual is subject to change without notice.

SPECIFICATIONS

Supply Voltage:	11 to 14V DC. (LAN or External Supply)
Current Consumption:	150mA (Idle) 260mA (max.)
Installation environment:	0° to 49° Celsius (32° to 120° F) 15% to 85% Relative humidity (non-condensing) For Indoor use only.
Fibre Optic Connections:	Type SC.
Fibre Optic Cable:	9/125µm diameter (1300nm wavelength) Single-mode Cable.
TX Optical Power:	-18dBm (min.)
RX Optical power:	-32dBm (min. for logic operation)
Maximum Modem to Modem:	Optical Cable Distance: 13,000 metres (13km)
PCB Physical dimensions:	105mm x 94mm (94mm x 94mm with snap-off strip removed) Fibre Connector head protrudes 15mm from PCB

PARTS LIST

- | | |
|---|--|
| <ul style="list-style-type: none"> - Single-mode Fibre Modem PCB Assembly - Installation Manual (this document) - Jumper links supplied on PCB | <p>Installation Kit Consisting Of:</p> <ul style="list-style-type: none"> - 4 x Metal M3 PCB Mounting Clips - 4 x M3x10mm Screws - 4 x Plastic Self-adhesive PCB Standoffs - 1 x 8 Way Plug-on Screw Terminal - 1 x 6.3mm Female QC Connector |
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Note: No Fibre Patch cables supplied.

FCC NOTICE (North America)

This device complies with Part 15 of the FCC Rules and Innovation, Science and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference; and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Class B product:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off & on, the user is encourage to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

Warning: Any changes or modifications not expressly approved by Inner Range Pty Ltd could void the user's authority to operate this equipment

ISED Canada

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

MOUNTING THE PCB

1. The PCB should be mounted in a compatible Inner Range tamper-monitored enclosure using the 4 metal PCB mounting clips and M3 x 10mm screws.
- e.g.
 - An existing enclosure that houses a Module that the Fibre Modem will be connected to.
 - A separate tamper protected enclosure such as 995200XS (unpowered), 995200PEI/995200PE3 (powered) or other compatible enclosure that meets system design, power supply & regulatory requirements.
2. The Fibre Modem must be powered by a battery-backed power supply. Three power supply input options are available:
 - a) The LAN+ / 0V terminals on T1 are used to power the Fibre Modem from the LAN power if available, or from the +/- outputs on a separate power supply. e.g. The LAN+/- outputs on an Inner Range 3A Smart Power Supply.
 - b) P5 is used to power the PCB from an Integriti Power Supply via the 10-way PSU bus cable provided with the supply.
 - c) P3 is used to power the PCB from a Concept 2A Power Supply via the ribbon cable provided with the supply.
3. Make sure the optical fibre cables are installed correctly and do not exceed the minimum bend radius specification of the manufacturer when the enclosure cover is secured.

FIBRE NETWORK DESIGN CONSIDERATIONS

The Fibre Modems can be used in a number of different configurations.

The flexible design allows daisy-chain, star and loop wiring, or a combination of these configurations.

See pages 7 & 8 for examples.

LAN Bias.

Jumper Links are provided to enable the LAN Bias to be configured correctly for the Wire LAN segment that the Fibre Modem is connected to. See Pages 4, 7 & 8 for details.

Single-mode Fibre Modem and Fibre Optic cable limits

When designing the Fibre Modem network for a particular Inner Range system, a number of factors limit the number of Fibre Modems and/or the length of fibre optic cabling that can be used. These are as follows:

- The Fibre Modem signal processing delay.
- The propagation delay and signal attenuation of the Optical Fibre cable connected between Fibre modems.
- The propagation delay and signal attenuation of the RS485 twisted pair LAN cable connecting the Fibre modem to the RS485 LAN Modules.

To simplify the Single-mode fibre network design, use the following rules.

- 1) Maximum length of Optical Fibre cable between two Fibre Modems must not exceed 13000 metres (13km).
- 2) Maximum length of twisted pair LAN cable from a Fibre Modem LAN Port to the furthest Module on that segment of LAN must not exceed 1500m (1.5km).
- 3) No two Modules on the LAN shall be more than 15 "Delay Units" apart.
- 4) When used in a loop configuration, the Fibre optic loop may be no more than 14 "Delay Units" in length.

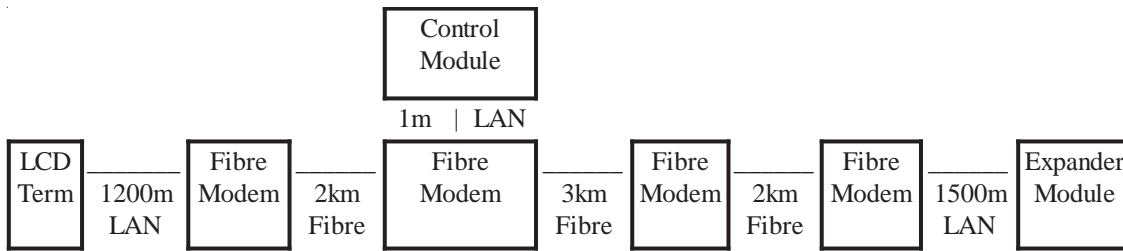
The number of "Delay Units" is calculated as follows:

- Add 1 Delay Unit for each Fibre Modem in the path.
- Add 1 Delay Unit for each 1000 metres (1km) of Optical Fibre cable in the path.
- Add 1 Delay Unit for each 1350 metres (1.35km) of twisted pair LAN cable in the path.

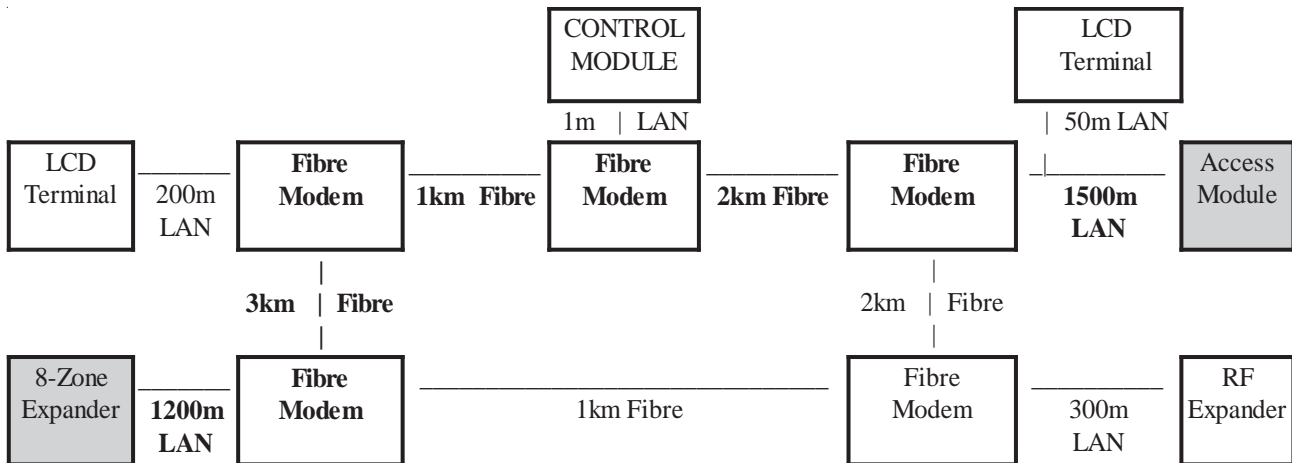
e.g. The following Single-mode fibre system designs are acceptable.



The total "Delay Units" for the two Modules furthest apart in this design = 14.
 3 (Fibre Modems) + 10 (10km of Optical Fibre) + 1 (1350m of LAN cable)



The total "Delay Units" for the two Modules furthest apart in this design = 13.
 4 (Fibre Modems) + 7 (7km of Optical Fibre) + 2 (2700m of LAN cable)



Two calculations are required for this design:

-The total "Delay Units" for the Fibre optic loop in this design = 14 (maximum allowed)
 5 (Fibre Modems) + 9 (9km of Optical Fibre)

-The two Modules furthest apart in this design are the 8-Zone Expander and the Access Module (highlighted).
 The total "Delay Units" between these two Modules via the worst case path (shown in bold text) is 12.
 4 (Fibre Modems) + 6 (6km of Optical Fibre) + 2 (2700m of LAN cable)

LAN BIAS LINKS.

Links LK1 & LK2 are not fitted when the Wired LAN connection connects to:

- A Control Module.
- The Wired LAN connection on another Fibre Modem that already has the LAN Bias Links fitted.
 (In this case, only the Fibre Modem that provides the path to the Control Module has the LAN Bias Links fitted)
- Port 2 or 3 on a LAN Isolator.

Links are fitted in all other circumstances when the Wired LAN connection connects to one or more remote Modules.

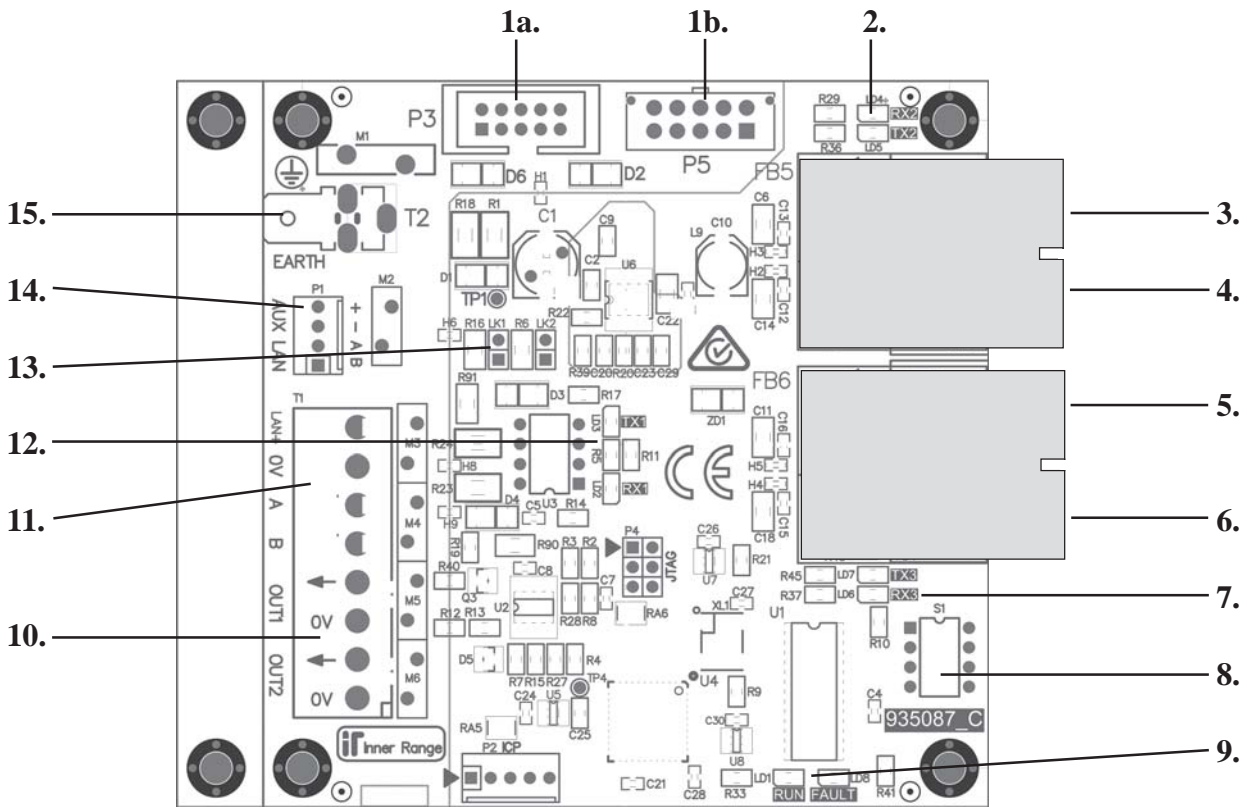
NOTE (Concept 3000/4000 Only): When measuring LAN A-B Voltage on a LAN segment biased by a Fibre Modem (i.e. LAN Bias Links fitted), the acceptable voltage range is 200 to 800mV. (Not 200-400mV as stated in other Concept 3000/4000 installation manuals)

LAN TERMINATION. (Concept 3000/4000 Only)

When using Fibre Modems in Concept 3000/4000 systems, each optically isolated segment of the Wired LAN is treated as an independent LAN system for the purposes of determining where LAN termination is to be fitted.

A Termination Link is NOT provided on Fibre Modem PCBs Rev. C or later. Use the LAN Termination Link on the connected Modules to provide LAN Termination. If only one Module is connected, fit a 470 Ohm Resistor across the Fibre Modem LAN A & B terminals. Refer to the relevant Concept Control Module Installation Manual for additional details.

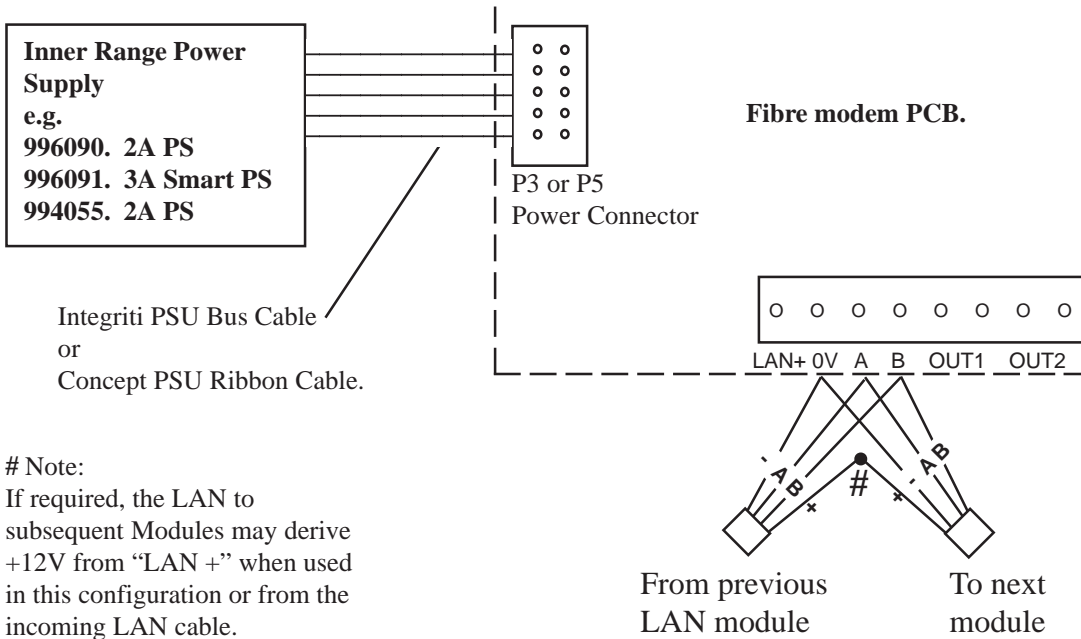
PCB LAYOUT



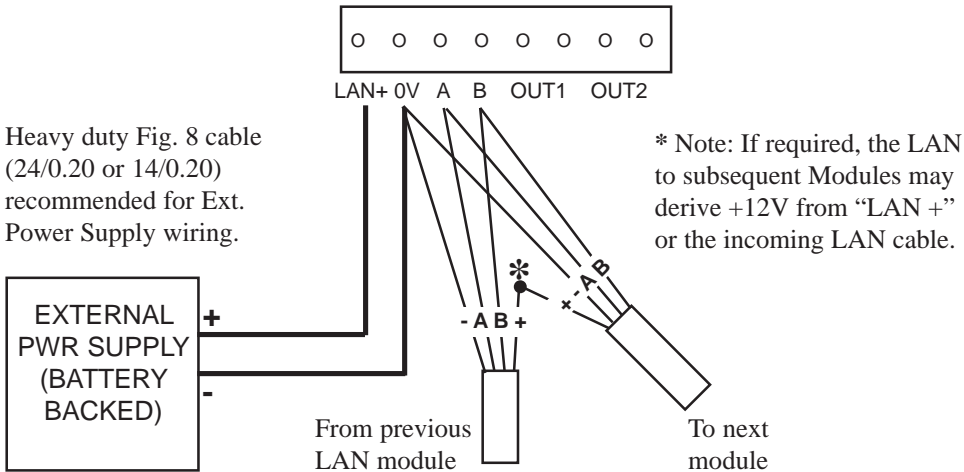
1. **P3 or P5.** Connect to Inner Range Power Supply. *See Page 6 for details.*
2. **RX2 / TX2.** Optic PORT 1 Receive & Transmit indication. Flashing = Port Active.
3. **Fibre Optic Port 1 Receiver.**
4. **Fibre Optic Port 1 Transmitter**
5. **Fibre Optic Port 2 Receiver.**
6. **Fibre Optic Port 2 Transmitter.**
7. **TX3 / RX3.** Optic PORT 2 Transmit & Receive indication. Flashing = Port Active.
8. **S1. DIPSwitch.** Not fitted.
9. **STATUS LAMPS.** RUN: Fibre Modem Status. Flashing = Normal Operation.
FAULT. Indicates Fibre Optic Port Status. *See Page 7 for details.*
10. **T1. OUT1 / OUT2.** Optical PORT Fault Status. *See Page 7 for details.*
11. **T1. LAN+, 0V, A, B.** Wired LAN Connection. Twisted Pair Cable must be used for LAN A & LAN B.
12. **TX1 / RX1.** Wired LAN data Transmit & Receive indication. Flashing = Port Active.
13. **LK1/LK2. LAN BIAS.** LAN Bias Links for Wired LAN Connection. *See details below.*
14. **P1. AUX LAN.** Ancillary LAN Connection. For temporary connection of an LCD/EliteX Terminal when required.
15. **EARTH.** The PCB design includes on-board LAN Surge Protection. This is used to protect the wired LAN from outside electrical interference. Even inside a building there can be sources of interference. e.g. Electric motors, welders, and their cabling. If protection is required, the "EARTH" connection must be wired to an effective EARTH.

POWER & LAN WIRING

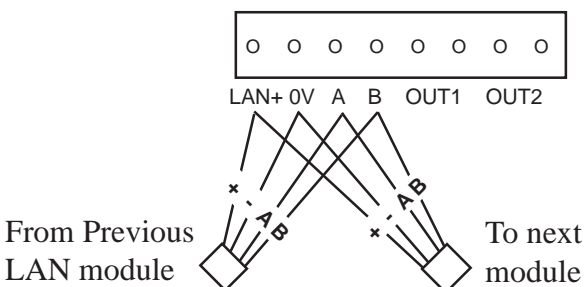
MODEM POWERED USING INTEGRITI OR CONCEPT POWER CONNECTOR



MODEM POWERED FROM EXTERNAL SUPPLY



MODEM POWERED FROM THE LAN



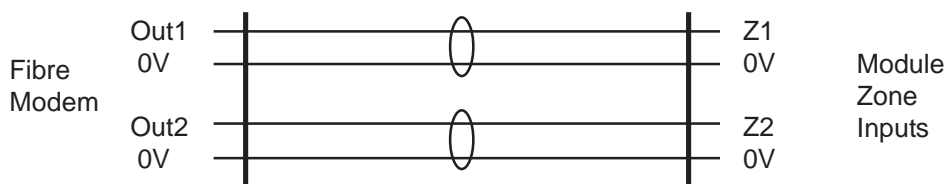
MONITORING THE FIBRE OPTIC STATUS

The Fibre Modem monitors the Receive data input of the Optical Ports. If no data is received after a period of 255 seconds the output goes into Alarm. This will also occur if the RX input on either Optical Port is not connected.

Fault	Fault LED	OUT 1	OUT 2
Data Detected in Both Ports	OFF	Seal	Seal
Data not Detected in Port 1	Fast Flash	Alarm	Seal
Data not Detected in Port 2	Slow Flash	Seal	Alarm
Data not Detected in Both Ports	ON	Alarm	Alarm

The outputs OUT 1 and OUT 2 can be monitored by connecting them to spare Zone Inputs on the nearest module on the LAN. They are wired directly to the Zone Inputs, as the End-of-Line resistors are included on the Fibre Modem.

NOTE: The on-board EOL Resistors are configured for the 2k2/6k8 EOL scheme which is compatible with Integriti, Inception & Concept platforms.



SINGLE-MODE FIBRE MODEM CONFIGURATIONS

Fig. 1. Building to Building Connection.

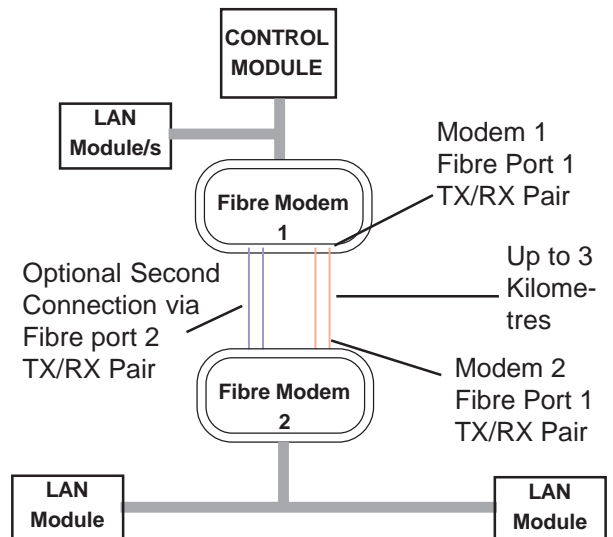
The basic Building to Building connection uses 2 Fibre Modems.

The main connection is made by connecting Port 1 of Modem 1 to Port 1 of Modem 2.

A backup connection can be made (recommended) between Port 2 of Modem 1 and Port 2 of Modem 2.

Lan Bias links must be installed in the Remote Fibre Modem (Modem 2)

If another Fibre modem is connected on this remote wire LAN, the LAN Bias Links must not be installed in that modem.



SINGLE-MODE FIBRE MODEM CONFIGURATIONS Cont.

Fig. 2. Fibre Loop Backbone

This configuration provides LAN connection between the Control Module and every remote Module even if the Fibre Cable is broken.

This diagram shows an Alarm system with five remote LAN connections.

Each remote LAN segment is connected to the main LAN via the Fibre modems.

The total length of Fibre optic cable used in the loop will be limited to less than 7km due to the number of Fibre Modems used. See pages 2 & 3 for details.

When the fibre is cut, for example between Modem 3 and Modem 4, OUT 2 on Modem 3 will go into Alarm indicating that data is no longer being received. The LAN connection for segment 4 is still intact and the data will go via Modem 5 and Modem 6, while the data for Modem 3 will go via Modem 2.

All Fibre Modems with the exception of Modem 1, must have the LAN Bias Links installed.

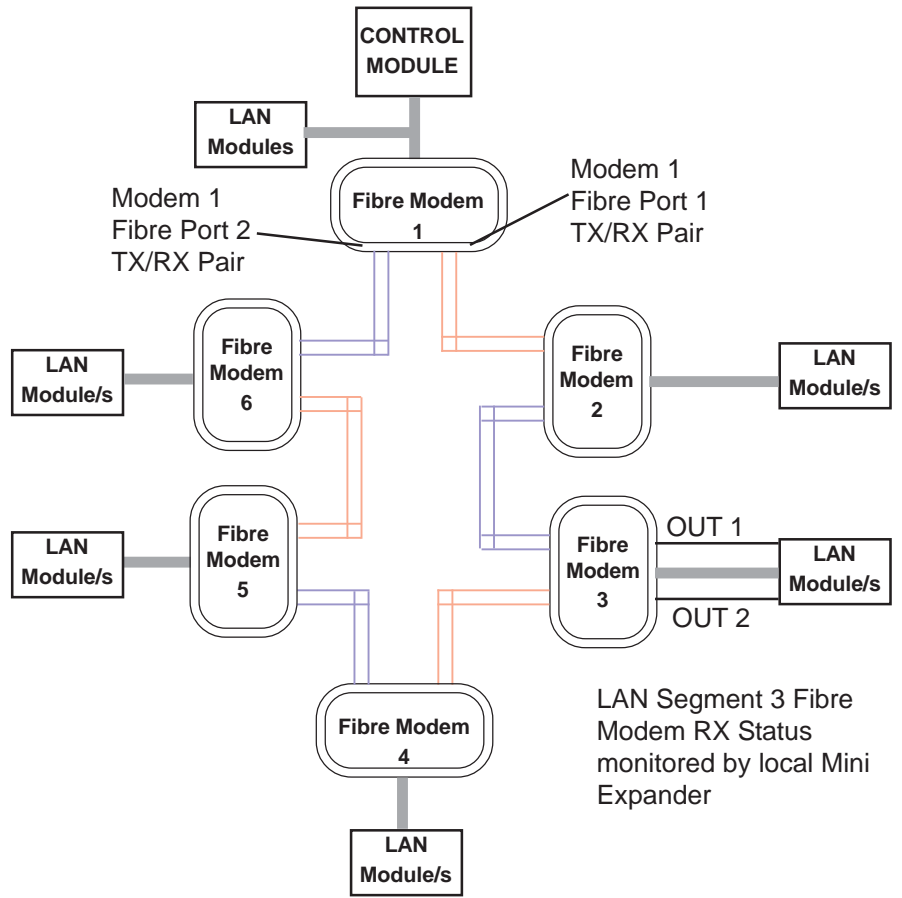


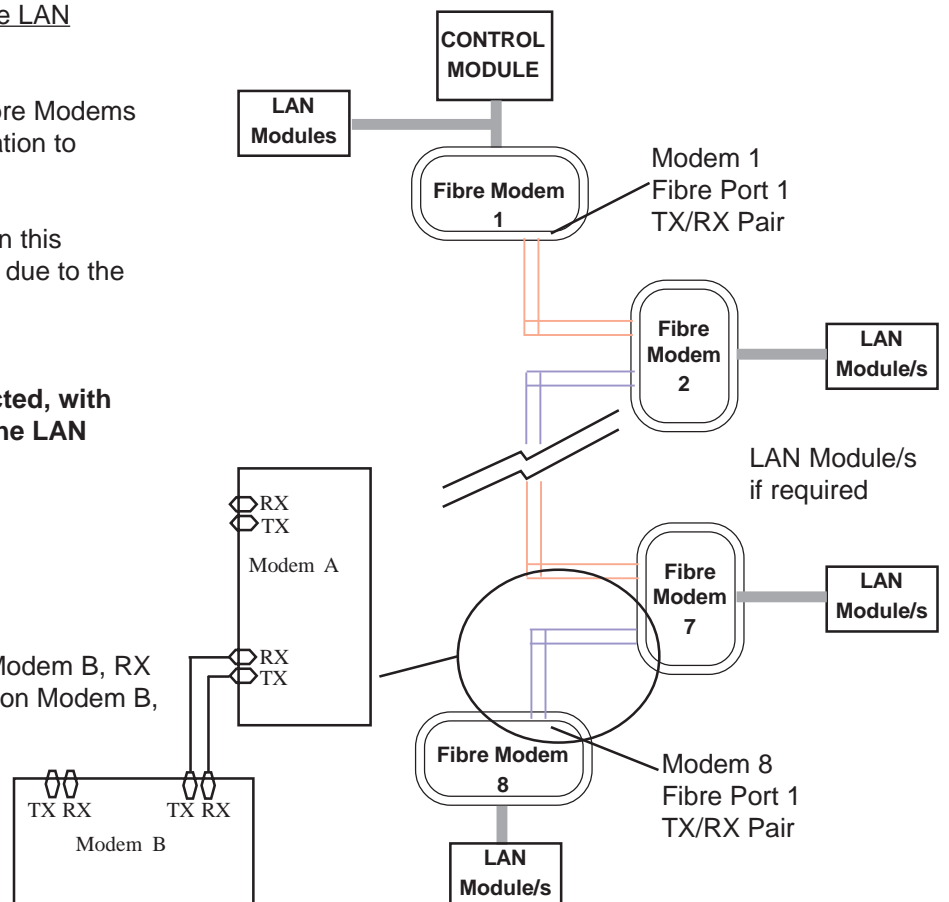
Fig. 3. Daisy-chain connection to a remote LAN segment.

This diagram shows a system where 8 Fibre Modems have been used in a daisy-chain configuration to connect to remote Modules.

The total length of Fibre optic cable used in this application will be limited to less than 5km due to the number of Fibre Modems used.

See pages 2 & 3 for details.

All Fibre Modems with Modules connected, with the exception of Modem 1, must have the LAN Bias Links installed.



When Connecting Modem A to Modem B, RX on Modem A is connected to TX on Modem B, and TX is connected to RX.

