

# **Fibre Modem - Single-mode**

## **P/N: 995087**

### **Concept 3000 / Access 4000**

### **Optically Isolated LAN Interface**

## **INSTALLATION GUIDE**

### **OVERVIEW:**

The Inner Range Single-mode Fibre Modem provides 2 separate, optically isolated ports to the Model 3000/4000 LAN. 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 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 Concept 3000/4000 Module to monitor the state of each receive port.

The typical transmission distance between each Fibre Modem is up to 13,000 metres.

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 electro-magnetic 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) 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 Wire LAN, it does possess a LAN termination link and a pair of LAN Bias Links which must be configured correctly.

**2) 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.

**Designed & manufactured in Australia.**

## **SPECIFICATIONS**

Supply Voltage:	11 to 14V DC. (LAN or External Supply)
Current Consumption:	150mA (Idle) 260mA (max.)
Installation environment:	0° to 50° Celsius 15% to 85% Relative humidity (non-condensing)
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)
Physical dimensions:	PCB: 96 x 96 mm Fibre Connector head protrudes 15mm from PCB
Enclosure:	White Plastic 238(L) x 118(W) x 74(D)mm

## **PARTS LIST**

- Fibre Modem assembled in White Plastic enclosure.
- 8 way connector and Jumper links supplied on PCB.
- 635081 Fibre Modem Installation Guide (this document).

**Note: No Fibre Patch cables supplied.**

## **MOUNTING THE ENCLOSURE**

1. The Fibre Modem is supplied in a plastic enclosure which can be mounted in a convenient location using fasteners through the four mounting holes in the base.
2. Make sure the optical fibre cables are installed correctly and do not exceed the minimum radius specification of the manufacturer when the enclosure cover is secured.
3. Secure the enclosure cover, using the screws provided.

## **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 Termination and LAN Bias.

Jumper Links are provided to enable the LAN Termination and 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 Concept 3000/4000 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 Concept 3000/4000 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.

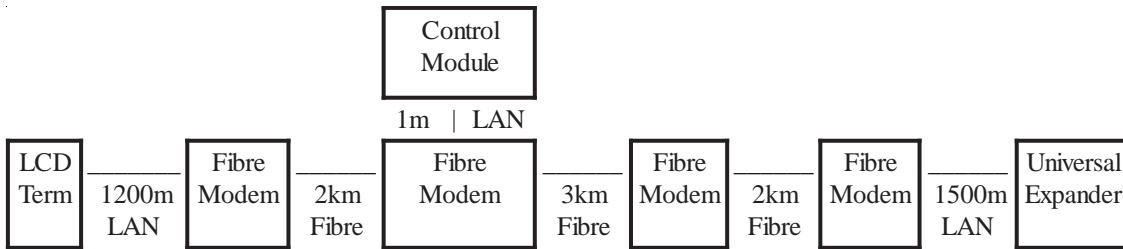
The number of "Delay Units" is calculated as follows:

- 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.

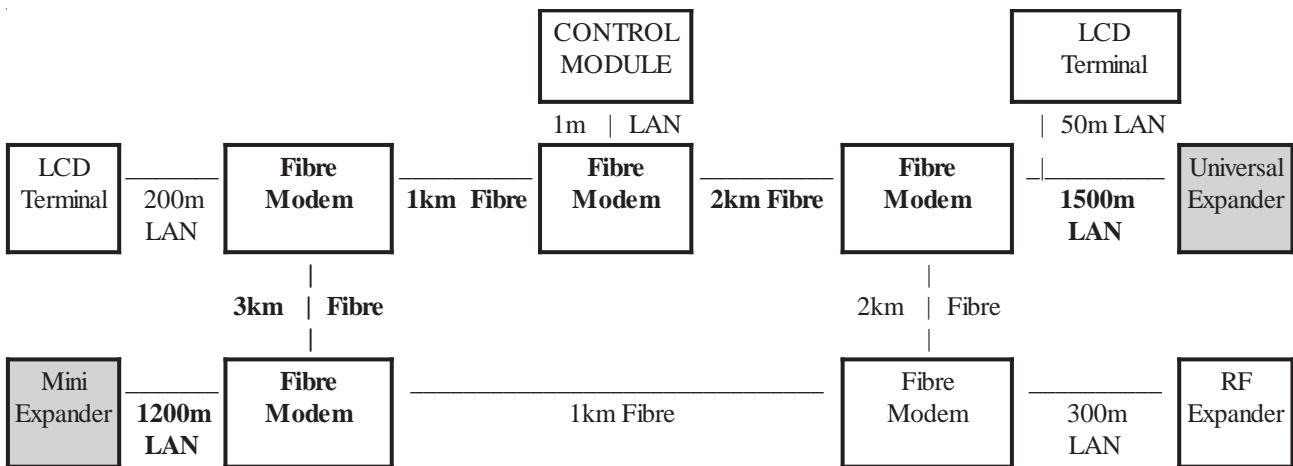
e.g. The following Single-mode fibre system designs are acceptable.



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 Mini Expander and the Universal Expander (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)

## THE SINGLE-MODE FIBRE MODEM PCB

### EARTH.

The Fibre Modem has been designed with on-board LAN input Surge Protection. Surge Protection is used to protect the wire LAN from outside interference (electrical surges). Even inside a building there can be sources of electrical interference. e.g. Electric motors, welders, and their cabling. If Surge protection is required, the "EARTH" connection must be wired to an effective EARTH.

### P1. (AUX LAN)

Ancillary LAN Connection.  
For temporary connection of an LCD Terminal when required.

### LK3 (TERM).

LAN Termination Jumper Link.

When using Fibre Modems, each optically isolated segment of the Wire LAN is treated as an independent LAN system for the purposes of determining where LAN termination is to be fitted.

Link LK3 should be fitted:

- When the Fibre Modem is the first or last connection on a daisy-chained Wire LAN segment.
- When the Fibre Modem is one of the two devices that are furthest apart on a star-configured Wire LAN segment.

**TX1.** Wire LAN data transmit indication.

**RX1.** Wire LAN data receive indication.

### T1.

LAN+, 0V, A, B. Wire LAN Connection.  
Twisted Pair Cable must be used for LAN A & LAN B.

OUT 1 , OUT 2. Optical PORT Fault Status.  
*See Page 7 for details.*

### LK4/LK5. (LAN BIAS)

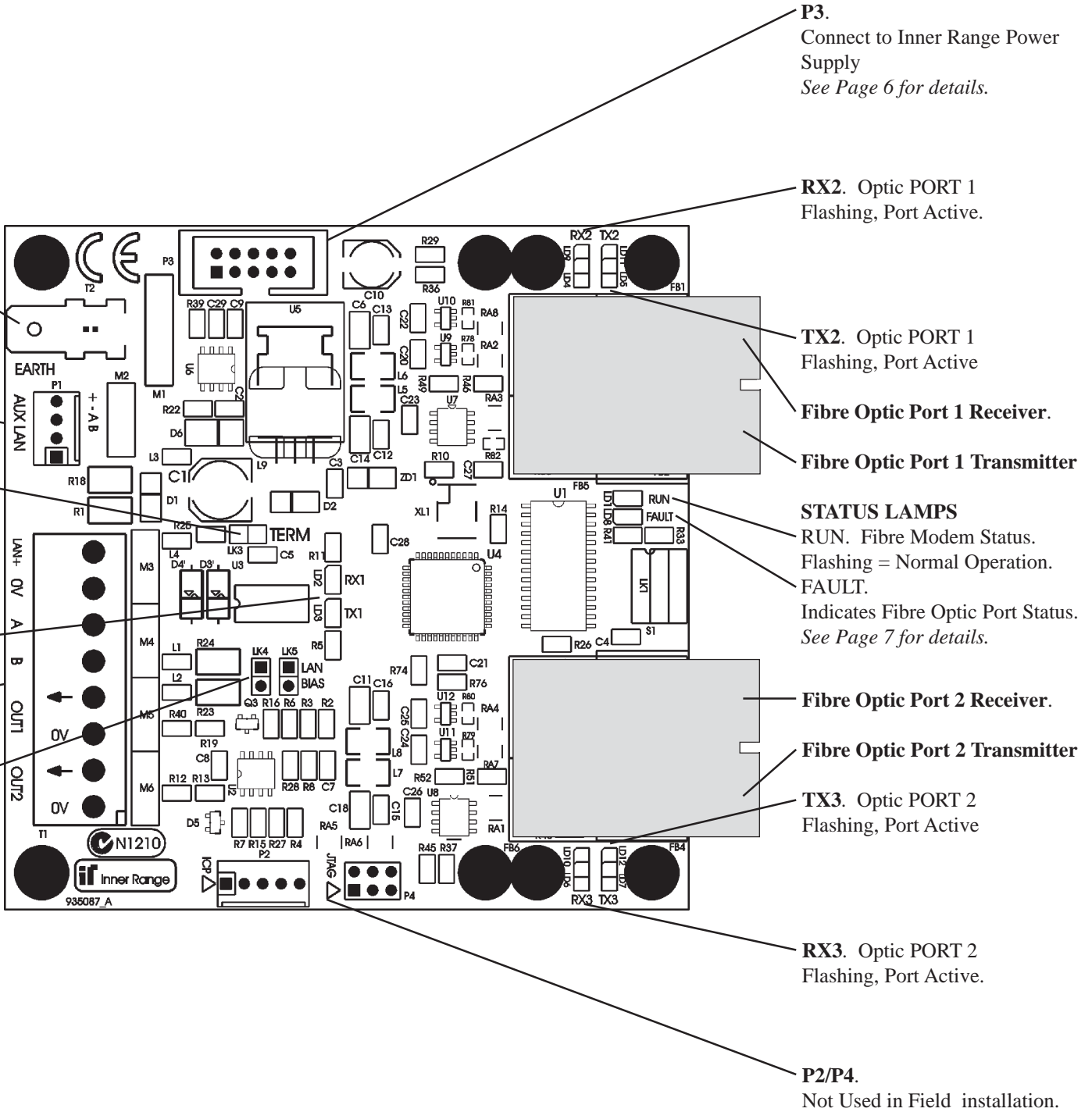
LAN Bias Links for Wire LAN Connection.

Links are not fitted when the Wire LAN connection connects to:

- A Control Module.
- The Wire LAN connection on another Fibre Modem that already has LK4/LK5 fitted.  
(In this case, only the Fibre Modem that provides the path to the Control Module has LK4/LK5 fitted)
- Port 2 or 3 on a LAN Isolator.

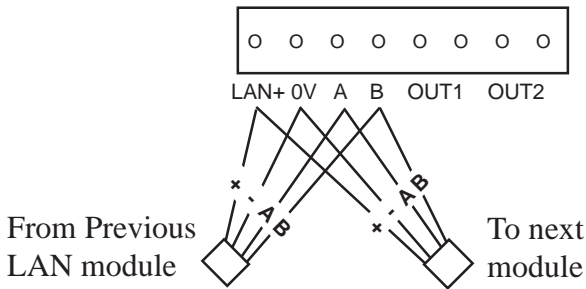
Links are fitted in all other circumstances when the Wire LAN connection connects to one or more remote Modules.

NOTE: When measuring LAN A-B Voltage on a LAN segment biased by a Fibre Modem (i.e. LK4/LK5 fitted), the acceptable voltage range is 200 to 800mV. (Not 200 - 400mV as stated in other Concept 3000/4000 installation manuals)

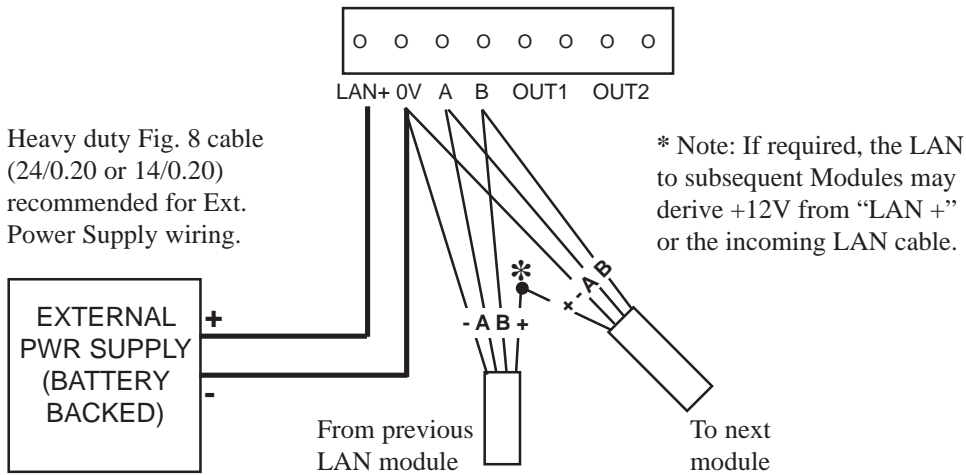


**POWER & LAN WIRING**

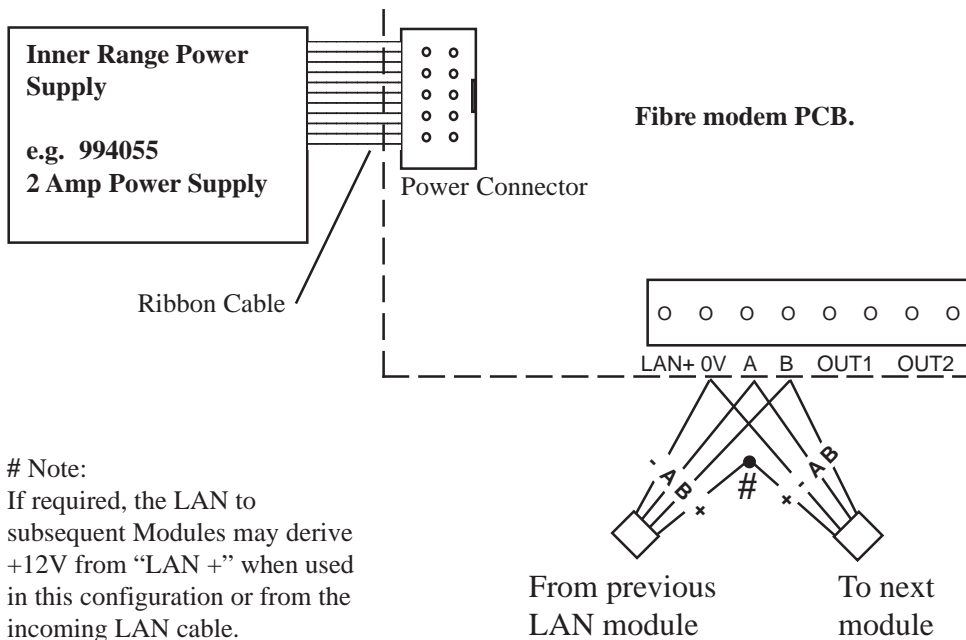
**MODEM POWERED FROM THE LAN**



**MODEM POWERED FROM EXTERNAL SUPPLY**



**MODEM POWERED USING POWER CONNECTOR**

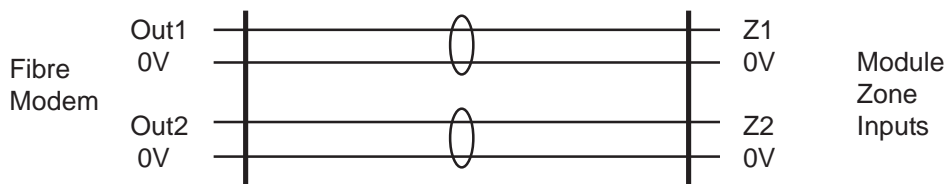


### MONITORING THE FIBRE OPTIC STATUS

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

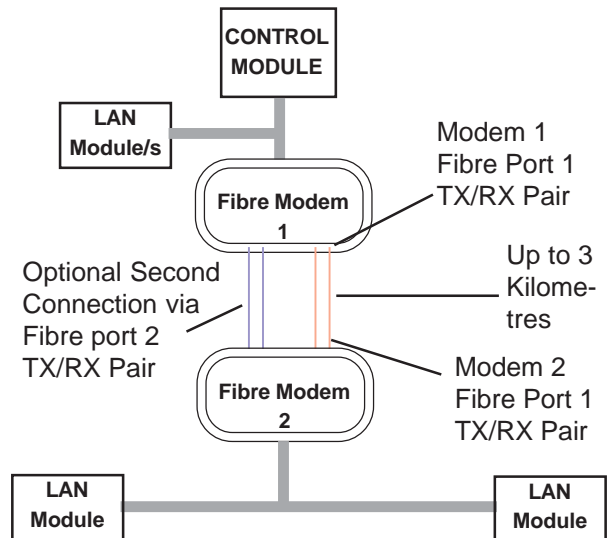
The outputs OUT 1 and OUT 2 can be monitored by connecting them to spare Zone Inputs on the nearest module on the LAN. They are wired directly to the Zone Inputs, as the End-of-Line resistors are included on the Fibre Modem.



### 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 LK4/LK5 must be installed in the Remote Fibre Modem (Modem 2)  
 If another Fibre modem is connected on this remote wire LAN, LK4/LK5 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.

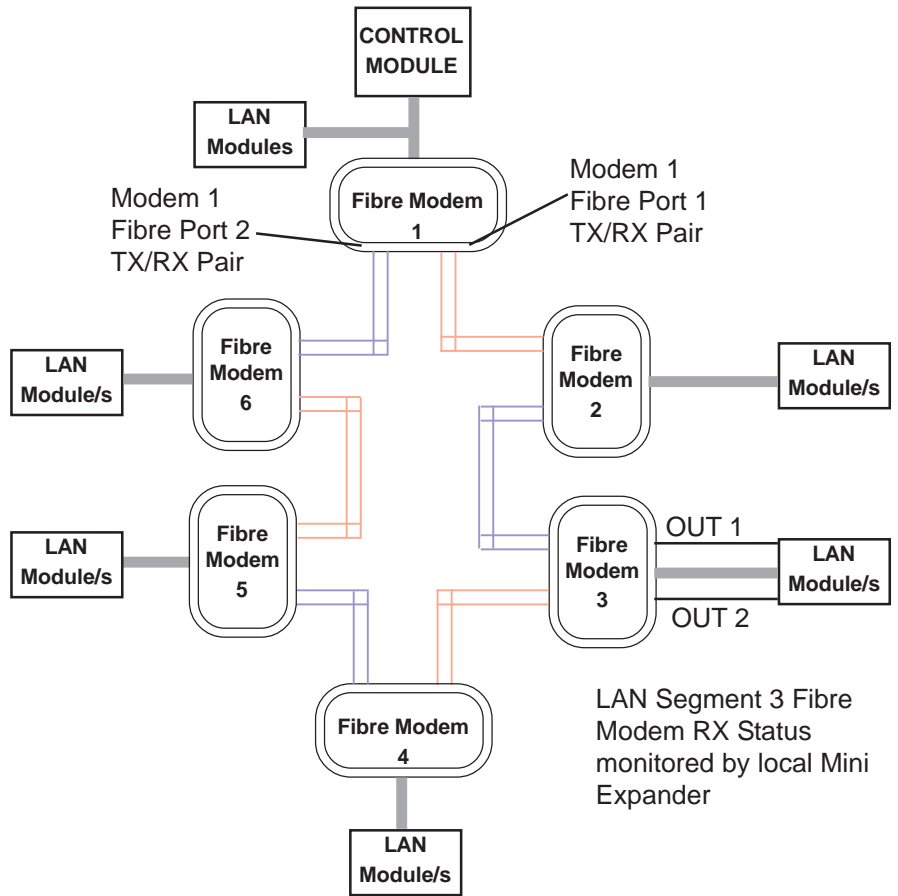
This diagram shows an Alarm system with five remote LAN connections.

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 LK4/LK5 installed.**



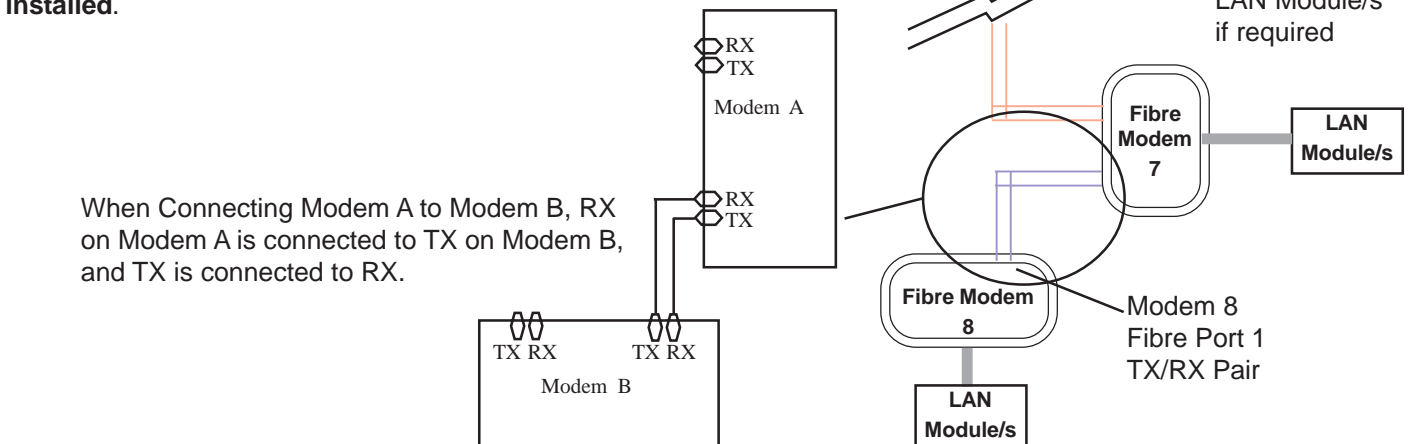
**Fig. 3. Daisy-chain connection to a remote LAN segment.**

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 LK4/LK5 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.