



### DESCRIPTION

The 8927 fibre-optic transceiver plugs onto the standard serial link ribbon cable from any GEM 80 controller, and enables a fibre-optic cable to be used instead of the 20mA current loop.

One unit is required for each end of an optical cable. A controller having a control port with multidrop capability may drive a number of these units in parallel, the ribbon cable simply looping from one to another.

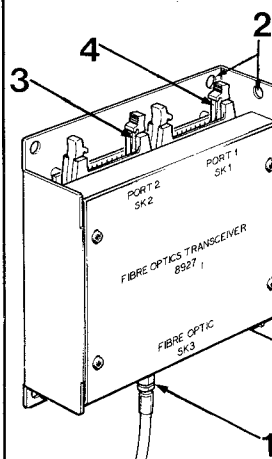
### FEATURES

- \* Optical communication for the ultimate in safety, noise immunity and isolation.
- \* No cable segregation required.
- \* Bi-directional working over a single optical fibre.
- \* No speed derating at maximum length.
- \* Add-on unit compatible with any GEM 80 controller.

### SPECIFICATION

|                       |                                                                                                     |
|-----------------------|-----------------------------------------------------------------------------------------------------|
| Electrical connection | : 20 way ribbon cable plugs into 1 of 2 connectors to choose which port of controller is used.      |
| Optical connection    | : Radiall SMA connector.                                                                            |
| Speed                 | : 2400 to 9600 bit/s.                                                                               |
| Optical power margin  | : 18dB min. with fibre of 200um core dia. and 0.22NA.                                               |
| Optical wavelength    | : 700nm visible red.                                                                                |
| Parallel operation    | : up to 16 units subject to software drive capability of host controller, and power supply loading. |
| Temperature           | : 0 to 60°C operating.<br>-20 to 70°C storage.                                                      |
| Humidity              | : 10 to 90% non-condensing.                                                                         |
| Weight                | : 330g.                                                                                             |

### 8927 Fibre-Optic Transceiver



1. Optical connector
2. Mounting holes
3. Ribbon cable connector using GEM 80 port 2
4. Alternative ribbon to select GEM 80 port 1.

Dimensions : 146 x 119 x 38mm overall.  
(H x W x D)

Mounting : Quarter rack width on two mounting channels at 222mm centres.  
: Edge mounting at 39mm min centres for close stacking  
: Any orientation to suit cabling convenience.

Power : 40mA @ +15V from host  
consumption controller.

### APPLICATION NOTES

#### 1. Fibre-optic cable

There are a number of suppliers of suitable plastic clad silica (PCS) fibre based optical cables offering a choice of characteristics.

The essential criterion in choosing an optical cable is the availability of a Radiall SMA connector compatible with the cable.

The user is advised to check that the ruggedness and temperature range of the cable are suitable for the application, and that the attenuation at 700nm is low enough to allow adequate transmission distance.

The preferred core diameter is 200um. Larger core size or larger numerical aperture (NA) than 0.22 will improve the optical power margin by an unspecified amount and vice versa.

Radiall produce a field termination kit based upon a crimp and cleave technique which allows cables to be terminated easily in a few minutes.

## 2. Transmission distance

The optical power margin is quoted after allowing for losses in coupling from the transceiver unit to the cable, and also for degradation with age and temperature. The user should allow for any additional connectors in mid-cable by deducting 2dB per mating pair. Such connectors may be needed if the cable cannot readily be obtained in one continuous length, or if a damaged cable has to be repaired by cutting out a damaged section.

Dividing the remaining optical power margin by the cable attenuation gives the maximum transmission distance.

Typical maximum cable lengths (km):-

|                                       | 8dB/km | 25dB/km |
|---------------------------------------|--------|---------|
| One continuous cable                  | 2.25   | 0.72    |
| Allowing 4dB for two mid-cable joints | 1.75   | 0.56    |

## 3. Electrical Connections

The serial link ribbon cable from the host controller is plugged into one or other of the two connectors on the transceiver unit, depending on which of the two ports of the GEM 80 controller is to drive the serial link. Under no circumstances should a connection be made to both the ribbon cable connectors on the transceiver unit.

The ribbon cable may continue on to further transceiver units or to an electrical termination panel as required. Fig.1 to Fig.3 illustrate typical ribbon cable arrangements.

Electrical and optical routes may NOT be mixed from the same control port.

When one port is used for an optical link and the other for 20mA current loop link, the terminals on the electrical termination panel associated with the optical link must be left open circuit, and the plug-in continuity relay on the termination panel must be absent. The user is advised to make particular note of these points when converting a link from electrical operation to optical, because there may be links on the termination panel previously used to connect the 20mA current sources, and there may be a continuity relay no longer needed (the type number of the termination panel should be altered if a relay is removed).

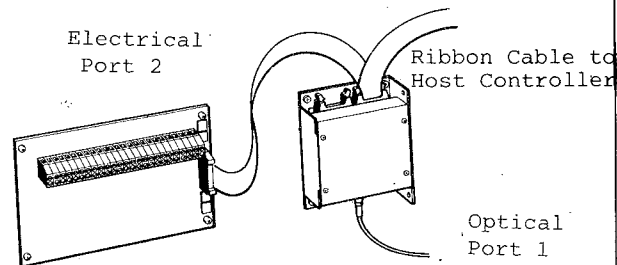


Fig.1 Termination panel type 8038 and optical transceiver used together.

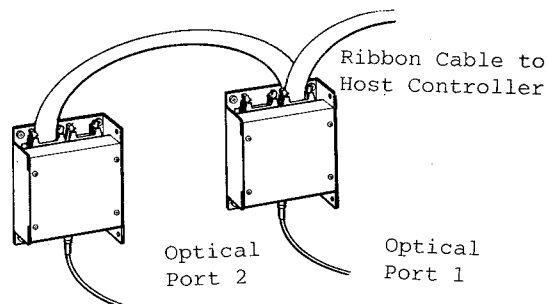


Fig.2 Connections for both ports optical.

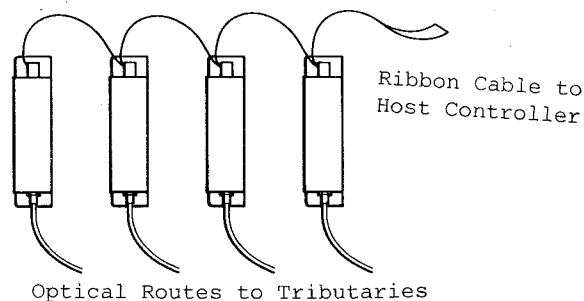


Fig.3 Transceivers driven in parallel from multidrop control port

## 4. Multidrop optical links

The standard circuit arrangement for all existing GEM 80 serial ports provides two 20mA current sources for each port. These current sources are derived from the +15V supply of the host GEM 80 controller, and are sufficient to power a single optical transceiver.

The control port of a multidrop optical link requires additional power which cannot be derived from the 20mA current sources, and a modification is therefore being introduced to provide a +15V supply on pin 9 of the serial link ribbon cable (previously connected to 0V).

In due course it is intended that all new controllers with a multidrop capability should be supplied with this modification already built in. GEM 80/100 and 130 controllers manufactured since May 82 incorporate this change, and it is intended that all 200 series controllers supplied after the end of 1982 shall include a modified version of the 8066 backplane. In the meantime, any user wishing to use a multidrop optical link is advised to contact GEC (GEM 80 Customer Support Unit) to establish the details of any modifications necessary to his particular equipment to provide the +15V supply.

It is possible for the user to program the 8847 serial communications equipment to serve as the control port for a multidrop serial link. If multidrop optical working is desired, then at present it is necessary to add a wire at the rear of the subrack to connect +15V from pin 31a on the upper connector (wire wrap) to pin 9 of the serial link ribbon socket (solder) on the 8503 backplane.

The number of transceiver units which can be connected in parallel is normally determined by the software drive capability of the host GEM 80 controller. For example a GEM 80/130 has a multidrop control port capable of communication with 4 tributaries, while the 225/235/245 have a control port with a 7-drop capability. Standard GEM 80 tributary ports can be allocated 15 different addresses, so it is possible to construct a 15-drop optical serial link using the 8847 programmable serial communications equipment to create a 15-drop control port to be used with standard GEM 80 tributary ports. The electrical interface to the transceiver places a loading limit of 16 transceivers maximum in parallel.

#### 5. Power supply requirements

By convention the 20mA current sources for a 20mA current loop link are provided at the control port, and no power is supplied at the tributary port. Users of optical links should note that power is required at both ends of an optical link, and allowance should be made for this in the power supply loading calculations.

The return side of 20mA sources used for electrical links is connected to -15V in GEM 80 200 series controllers, and therefore constitutes a load on the -15V rail. The power return from fibre-optic transceivers is direct to OV i.e. there is no load on the -15V rail.

#### 6. Mounting Details

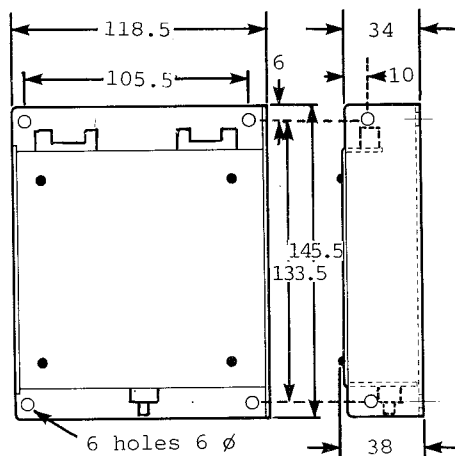


Fig.4 Mounting dimensions

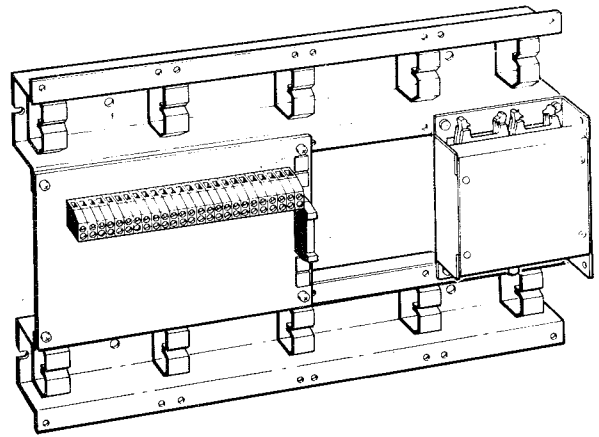


Fig.5 Typical use of mounting channel

#### 7. Trouble shooting

The intensity and wavelength (visible red) of the light source in the GEM 80 fibre-optic transceiver is such that it presents no safety hazard.

It may however be regarded as good safety practice never to look directly at the end of an optical cable, because intense light sources may be used in other applications of optical cables, and these can cause damage to the eyesight. There is particular danger if the radiation is in the infra red part of the spectrum, because this is invisible.

It is therefore recommended that if a user wishes to inspect the light in an optical cable, it should be directed onto a plain sheet of white paper and viewed indirectly.

It is recommended that the transmit and receive LED lamps on the GEM 80 processor module front panel should be used for trouble shooting optical serial links. The symptom of a faulty transceiver is that the transmit light at one end is flashing, but the receive light at the other end is not flashing. As with electrical links, the most likely cause of link maloperation is incorrect setting of configuration data e.g. different signalling rates at opposite ends of the same link

If a transceiver fault is suspected, it is recommended that fault diagnosis should be by substitution of spare transceivers, first at one end and then at the other end of the link. On no account should the user attempt to check or adjust the alignment of the optical device, which is preset in manufacture.

The GEM 80 serial link statistics provided for a GEM 80 control port provide a simple means of checking the reliability of an optical serial link. Since the optical link itself is virtually immune to interference, there should be no link failures except transiently during equipment start-up. Any significant level of retries indicates a hardware fault, either in the electronics or excessive attenuation in the optical cable.

## 8. Signalling rate

Unlike 20mA current loop serial links, there is no trade off of link speed against distance. It will be usual therefore for most optical links to operate at the maximum speed i.e. 9600 bit/s. Lower speed operation is possible, but the user should note that unlike 20mA current loop links there is a minimum signalling speed of 2400 bit/s.

## ORDERING CODES

### 1. Equipment

Fibre-optic transceiver 8927-0000

### 2. Spares

Available as complete unit only. There are no user replaceable parts.

### 3. Optional extras

Mounting channel (up to 4 transceivers may be mounted between a pair of channels) 8959-0000

Typical cables:-  
(approx. 8dB/km at 700nm)

Without armoured cladding Hytran LS/QSF200A

With armoured cladding Hytran MLS/QSF200A

Available from:- Hytran Products  
Pilkington P.E.Ltd.  
Glascoed Road  
St.Asaph  
Clwyd LL17 0LL

Terminators and terminating kits are supplied by:-

Radiall Microwave Components  
Invincible Road  
Farnborough  
Hants

Also available from:-

Optronics Ltd.  
Cambridge Science Park  
Milton Road  
Cambridge CB4 4BH

Terminator for above cable:-

Radiall type F705.017.040

Cable coupler for joining two terminated cables:-

Radiall type F705.700.000 panel mounted  
F705.720.000 straight

Terminating kit:-

Radiall type F780.010.000  
(includes fibre cutting tool, fibre crimp tool, fibre positioner, fibre stripping tools)

Radiall cable crimp equipment:-

tool type R282.240  
plus jaws type R282.241

Conventional wire stripping tools are suitable for cutting back the outer sheath of optical cable. A suitable tool is available from Optronics Ltd. as "Ideal Stripmaster".

Note The Company's policy is one of continuous development and improvement and therefore the right is reserved to supply products which may differ in detail from those described and illustrated in this publication. All our products and materials are sold subject to Conditions of Sale available from us on request

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