

MULTIPLEXER HOW IT WORKS

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1. Introduction

The function of a multiplexer is to combine a number of signals onto a single communication channel. In the case of OPT 100 Series Multiplexers the single communication channel is an optical fibre. For a bi-directional link two fibres are required: one carrying the signal in each direction. A typical link is shown on the diagram below:

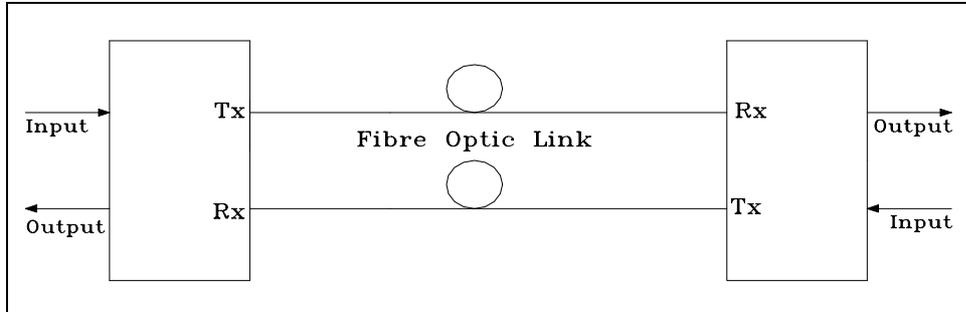


Figure 1. A typical point to point transmission of multiplexed signals

In certain application, where safety is involved, it is very often necessary to send identical signals using two different path so that if one connection is interrupted the alarm signals can still reach their intended destination by an alternative route. The OPT 100 Series Multiplexers allow a construction of a pseudo- ring configuration to fulfil the requirement.

2. Basic Concepts of the Multiplexer

At a closer examination we can see that a typical multiplexer consists of several stages of signal conditioning and encoding. The multiplexer accepts any input signal. It always has an interface that converts any type of signal into signals that may be handled by the multiplexer, typically a TTL or ECL voltage levels. For example an RS232 input signal may have voltage up to 25V peak to peak, the multiplexer, however, will see only TTL voltage levels. (See figure 2)

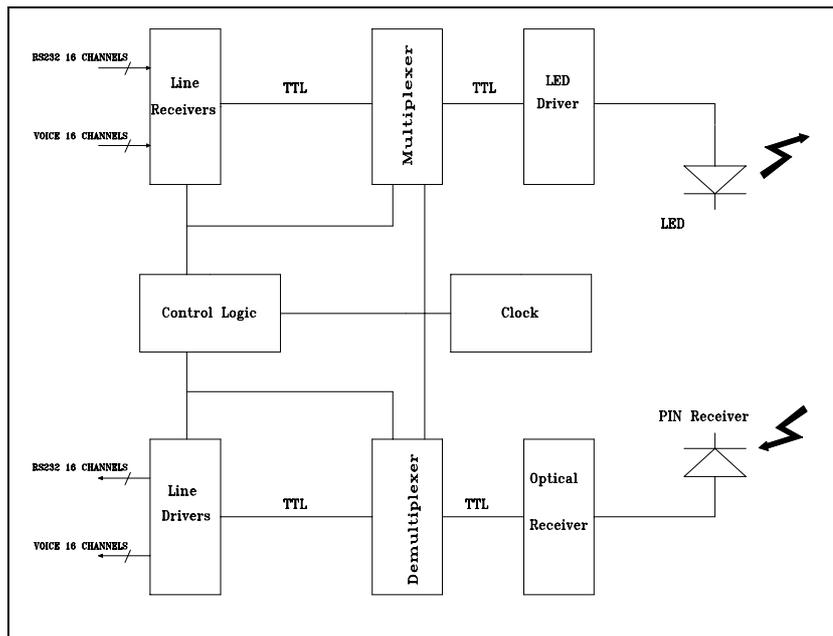


Figure 2. A block diagram of a point to point multiplexer

As the diagram shows, there are a number of different types of signals that arrive and leave the multiplexer. Each type of signal has a specific line driver and a receiver that convert the signals to TTL voltage levels. Once all the inputs are converted into TTL signals they may be combined and coded for transmission. Each incoming signal is sampled in a rapid succession and then transmitted as a serial bit stream, on an optical fibre by appropriately modulating the light emitting diode (LED). At the other end of the fibre an optical receiver converts the light signals to electrical signals and the process is reversed. This method of multiplexing is referred to as Time Division Multiplexing (TDM).

3. A method for Dropping and Inserting of signals reaching the multiplexer from two directions.

So far we have described a point to point transmission of signals. The OPT100 multiplexer, however, differs from a typical point to point multiplexer in that it allows dropping and inserting signals at various locations. To achieve this the system uses two optical cards, each with a transmitter and a receiver. A pseudo-ring may be constructed using OPT 100 multiplexers. This is described below.

The multiplexer has two optical cards and therefore it can communicate with two other multiplexers. The figure 3 shows the method inserting and dropping signals at given location of signals arriving from two different multiplexers.

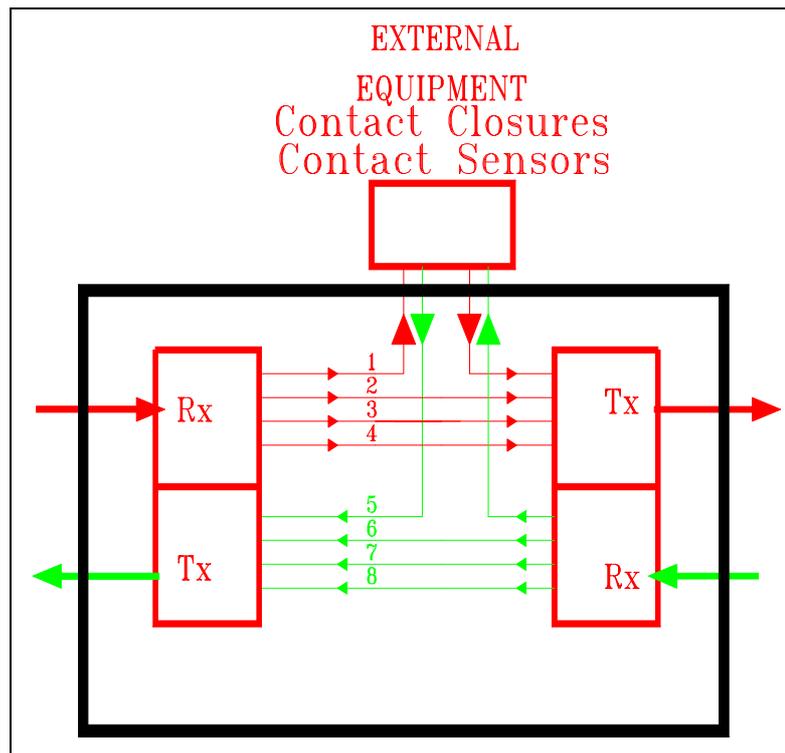


Figure 3. A method for Dropping and Inserting of signals reaching the multiplexer from two directions.

Thick lines represent fibres; thin lines represent electrical signals.

Signal number 1 arriving from the left terminates at the External Equipment (EQ). Signals 2, 3 and 4, however, travel to the next drop off point. Also at this location, the EQ inserts another signal into channel 1 which then travels to the next station on the right. Signals 5, 6, 7 and 8 are treated in exactly the same way except they propagated in the opposite direction of i.e. from right to left. The

above description referred only to 4 signals travelling in each direction in order to keep the explanation simple. The multiplexer is capable of handling at least 128 RS232 channels, operating at 19.2Kb/s, and 128 Voice channels with a bandwidth of 3.4KHz or mixture of any other type of signal.

By using multiplexers with two optical cards a signal ring may be implemented. A diagram below, figure 4, shows a typical ring system with two stations. The principle described here using only the two station may be extended to many stations.

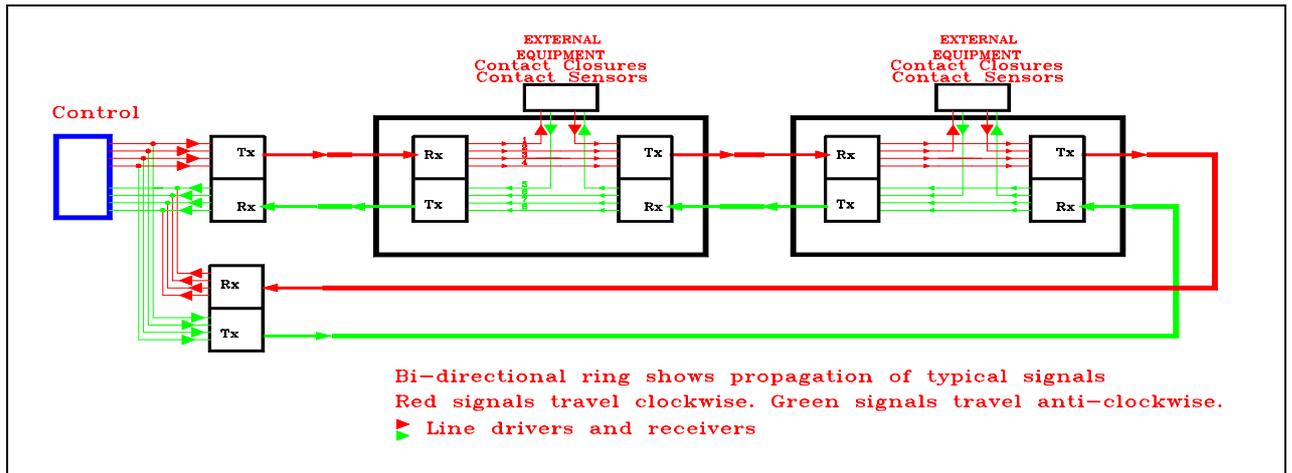


Figure 4. Two sets of External Equipment connected by a fibre optics ring.
Thick lines represent fibres; thin lines represent electrical signals.

As before the channels 1 and 5 are used to connect the control centre to first station on the left, where more equipment is located. Channels 2 and 6 link the second station to the control centre.

The mode of operation is selected by using means of links available on every channel.

4. Broadcast Mode.

A voice message may be broadcasted to all the locations by using a broadcast mode. In this mode a signal from the control centre is transmitted on one channel, in the clockwise direction, to all the stations. Another channel is use to send the same signal in the anti-clockwise direction round the ring. This is shown in figure 5.

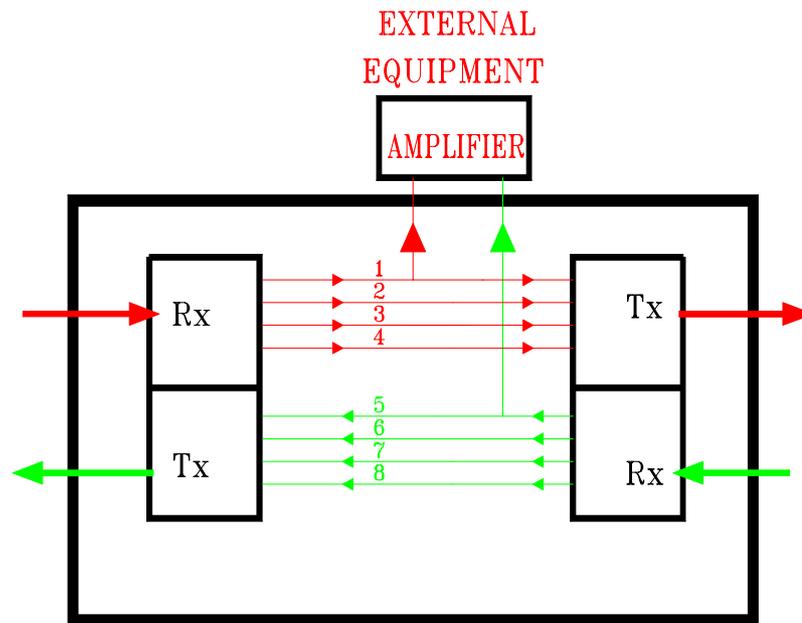


Figure 5. Broadcast Mode Transmission.

The signal number 1, from the left, is sent to the EQ as well as allowed to propagate further along the ring to the next station. The signal travelling on channel number 5 is handled in the same way as above.

5. Automatic Signal Switching. (Option)

Currently, if a fibre is broken carrying signals in the clockwise directions, *ALL* the multiplexers positioned *AFTER* the break, will require a *MANUAL* change over to receive signals from the anti-clockwise direction. This may involve moving both RS232 and VOICE connectors on all the multiplexers following the fault. If the fault occurs immediately after the Control Station *all 9 multiplexers* must be changed.

Although, as yet, not implemented the OPT 100 Multiplexer may be modified to combine the signals travelling clockwise and anti-clockwise by an exclusive OR gate. For example if the clockwise loop fails due to a broken fibre, the signals arriving from the anti-clockwise directions are then only sent to the EQ. If the fibre carrying signals in the anti-clockwise direction fails then only signals arriving on the clockwise direction will reach the EQ.

6. Standards.

The equipment supplied is of good commercial quality and of robust construction complying with the following regulations:

1. All relevant British Standards and Codes of Practice.
2. Factories Act including relevant Statutory Orders.
3. The Noise at Work Regulation 1989.
4. IEE Regulations.
5. Health and Safety at Work Act 1974.

Warranty

BMW CONSULTANTS assumes responsibility for the equipment sold hereunder to be free from defects in the materials and workmanship for a period of 12 (twelve) months from the date of delivery. We shall replace or repair, at our option, any equipment which in our judgement is defective, provided:

1. The equipment has been subjected to normal use and service.
2. The defect is not due to damage occurring after the original acceptance of the goods by the buyer.
3. The equipment has not been altered or modified by persons unauthorised by or not in accordance with instructions furnished by the Company.
4. All transportation and insurance charges for the return of the equipment to base have been prepaid by the buyer.

BMW CONSULTANTS will pay return shipping expenses, including the cost of insurance, provided the equipment proves to be defective and is within the limits of warranty. Otherwise the buyer is liable for all handling, shipping and insurance costs.

Liability

shall not have liability or responsibility to the customer or any other person or entity with respect to any liability, injury or loss caused or alleged to be caused directly or indirectly by products and equipment sold by the Company, including but not limited to any interruption of service, loss of business or anticipatory profits or consequential damages resulting from the use of operation of such. It is the responsibility of the buyer to determine the suitability of the products for their intended use.

Liability for breach of warranty under any contract or otherwise, shall not exceed the purchase prices of the specific product shipped and against which a claim is made.

This warranty is in lieu of all other warranties, expressed or implied, and no representative or person is authorised to represent or assume for BMW CONSULTANTS any liability in connection of the sale or our products other than set for herein.