E1 Fallback Switch (4-Way)

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Contents

Introduction

E1 Fallback Switch Features

- Solid state switching.
- Small 1U EMC proof 19" case.
- All the connectors are mounted on the front of the unit for ease of access and installation.
- Switches up to four G.703 unbalanced 2 Mbit/s tributaries.
- DC power supply of either polarity with nominal voltages from 24 to 48 volts.
- Weighted alarm inputs enable the user to configure the priority and gives flexibility to the switching criteria.
- Up to 6 opto-isolated alarm inputs for both A and B banks of tributaries.
- Hystersis delay between switch prevents switch chattering.
- Automatic detection of AIS or LOS on any tributary.
- Ability to disable tributary AIS/LOS alarms.

About the E1 Fallback Switch

The 2 Mbit/s switch is a universal solid state switch used to select between two banks of up to four 2 Mbit/s tributaries. It can be used for route selection or diversity systems in either radio, cable or optical systems.

There are three sets of ports;

1. Port M which is connected to the user's terminal equipment.
2. Port A which is connected to Path A of the user's transmission equipment.
3. Port B which is connected to Path B of the user's transmission equipment.

The switching criteria between the ports A and B can be manual or automatic operation. Manual operation is done by using the selection switch on the front panel. Automatic operation is based on internally generated alarms and/or a set of external inputs to select either the A or B ports. An example of this application is shown above.

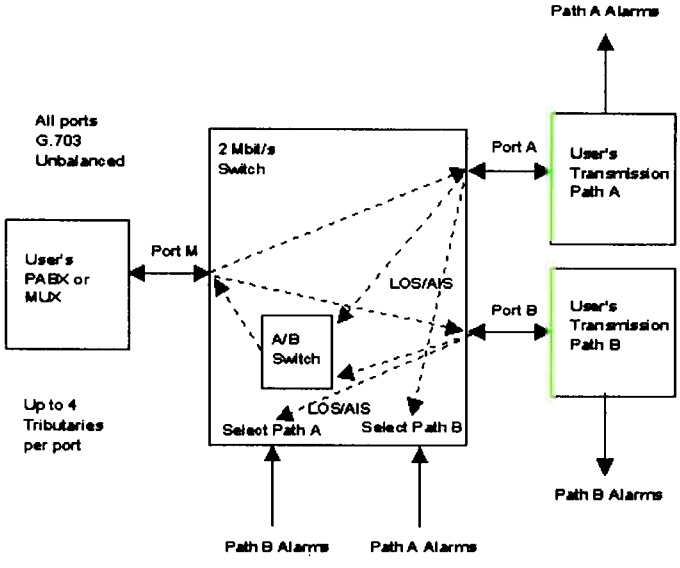


Figure 1 Single Ended Application

Provision has been made for the switch to change over on detection of either AIS or LOS alarms on any tributary. A set of switches is provided to disable this facility if required.

The switch can also be used at both ends of the transmission as shown below;

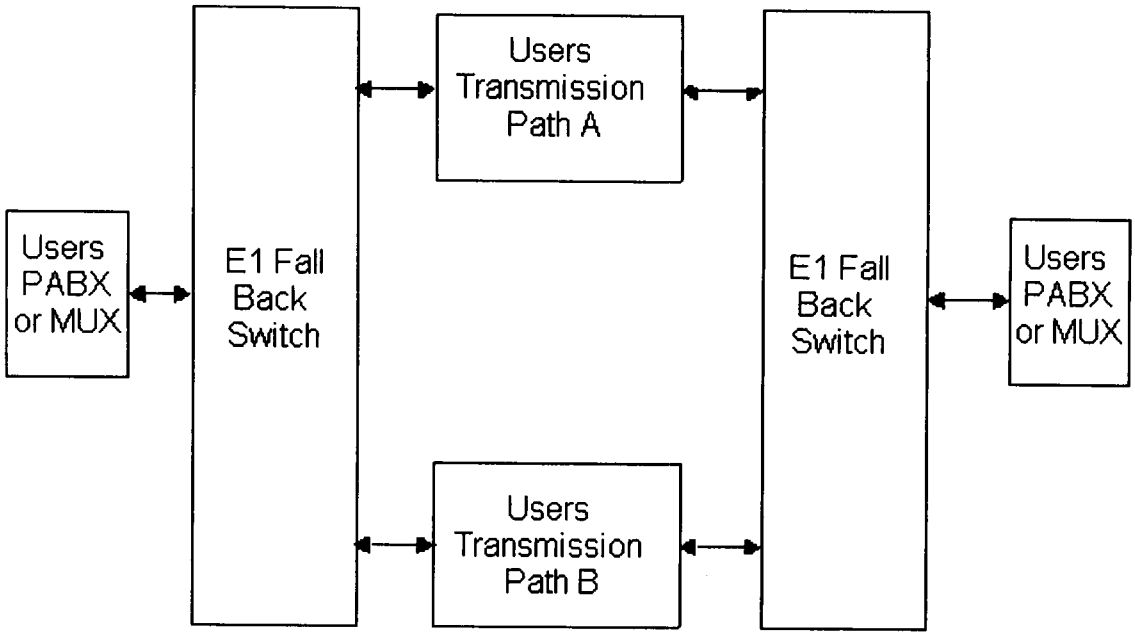


Figure 2 Dual Ended Application

The switch is powered from either a 24 or 48 volt nominal DC supply of either polarity. Each port has four inputs and four outputs. The traffic interfaces are G. 703 unbalanced 75 ohms. The inputs at port M feed the A and B ports via a buffer. The output at Port M is either from port A or port B, depending on the position of the internal A/B switch. For automatic operation each side of the switch is driven by six external inputs. The inputs are numbered from 1 to 8, with priority numbers 5 and 6 being reserved for AIS and LOS respectively. The input number is the priority of the input, 1 has the lowest priority and 8 has the highest. The manual selection will override the automatic selection. The selection inputs are opto-isolated from the main unit.

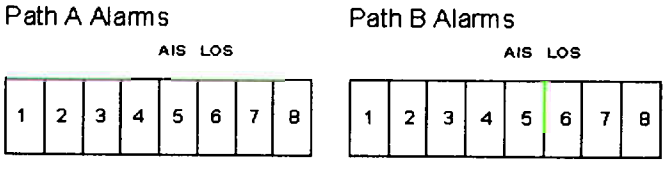


Figure 3 Alarm Input

With the occurrence of an alarm event (either AIS, LOS or a user input alarm) on the on-line path, the E1 Fallback Switch will attempt to switch to the off-line path. A switch will be made if the off-line path is clear of alarms or has alarms of lower priority than the current path. In the situation that the off-line path has alarms with equal or higher priority weighting, no switch will be made. If a switch is made, there will be a 5 (five) second delay before

another switch can be made automatically. Manual selection however will over-ride this 5 (five) second delay.

The E1 Fallback Switch can be used to implement a monitored hot standby system using either two radiolinks as a transmission medium as shown below.

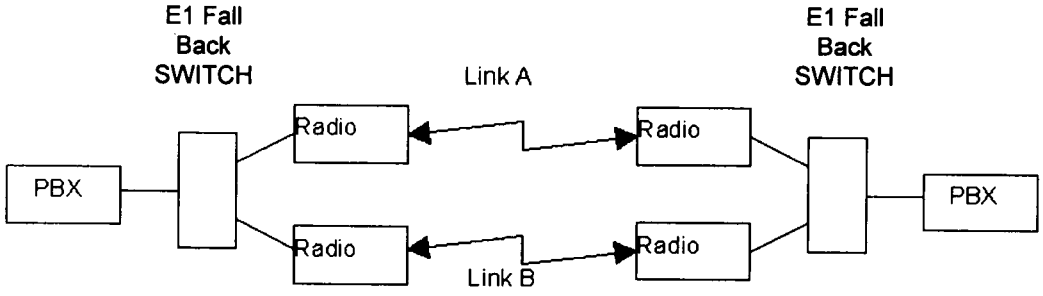


Figure 4 Radio Application

Or in a combined radio and optical fibre system, which draws on the advantages of both transmission mediums.

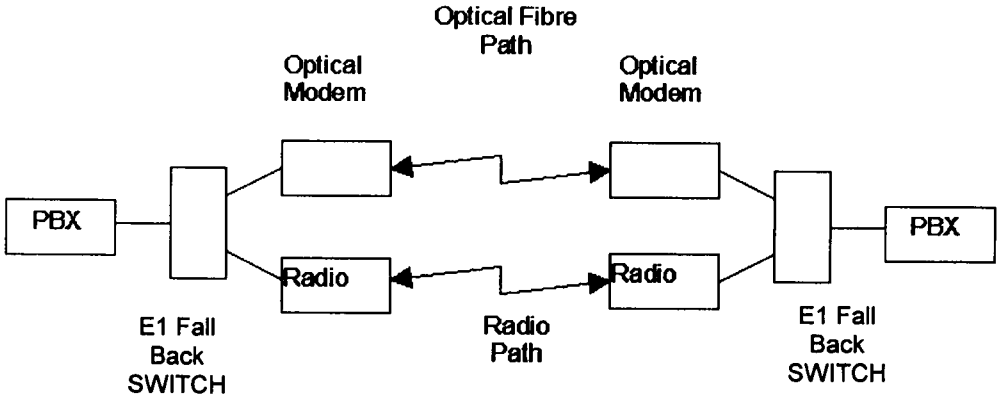


Figure 5 Optical Application

Front Panel

All connections, indications and switches are accessible on the front panel as shown below. The plastic cover in front of the connectors describes the front panel.

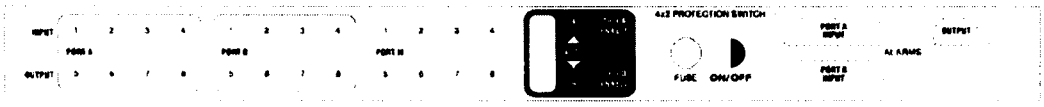


Figure 6 Front Panel

Connections

There are 3 main groups of connectors, they are:

- 2 Mbit/s Ports.
- Alarm Inputs and Outputs.
- Power Supply Input.

2 Mbit/s Ports

The 2 Mbit/s traffic ports are each presented on type 43 connectors, as shown in the diagram above, they are arranged as three groups for ports A, B and M. For connection to these ports it is recommended that right angled Type 43 connectors are used in conjunction with RG179 cable or its equivalent. The following diagram illustrates how the cables are connected to the transmission and terminal equipment. Only one tributary is shown for clarity.

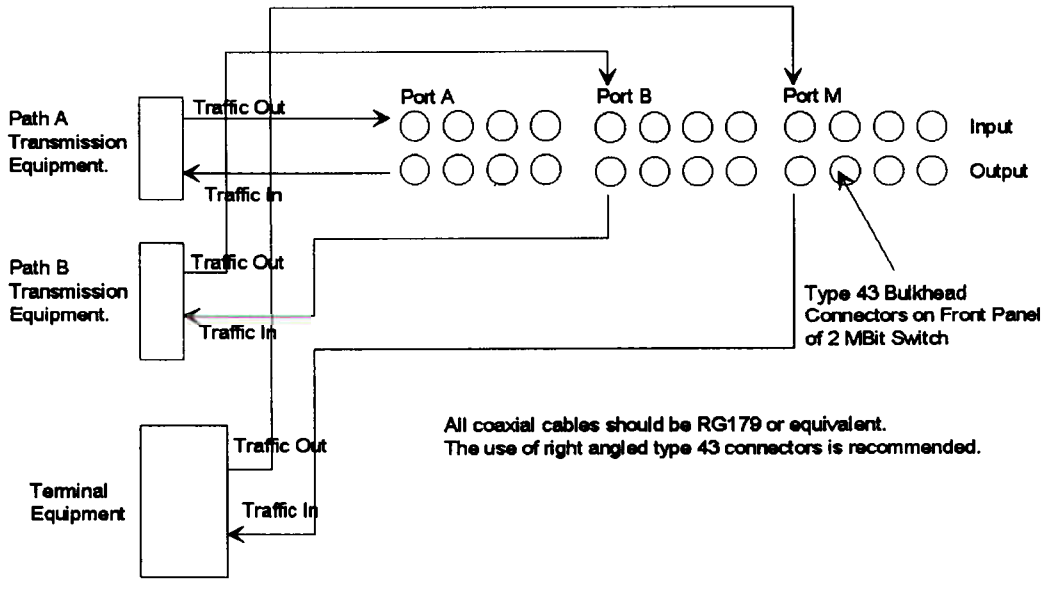


Figure 7 2Mbps / Wiring Details

Alarm inputs and outputs

The input alarms inputs for port A and B are presented as 25 way D-type connectors.

Each of the alarm inputs are opto-isolated, an input of 5 volts of either polarity will cause the input to be active.

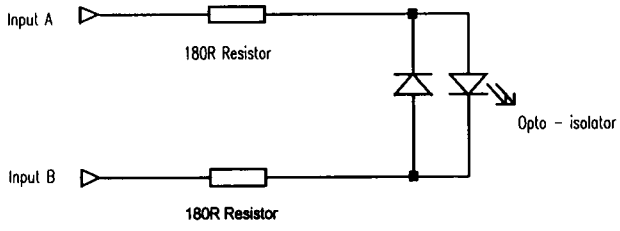


Figure 8 Alarm Input Circuit

AIS and LOS alarms are generated on each tributary and set to input 5 and 6 respectively.

Input 1 is the lowest priority and input 8 is the highest priority.

For example, an alarm on Port A input 5 will over-ride alarms on Port B inputs 2 and 3 as shown below.

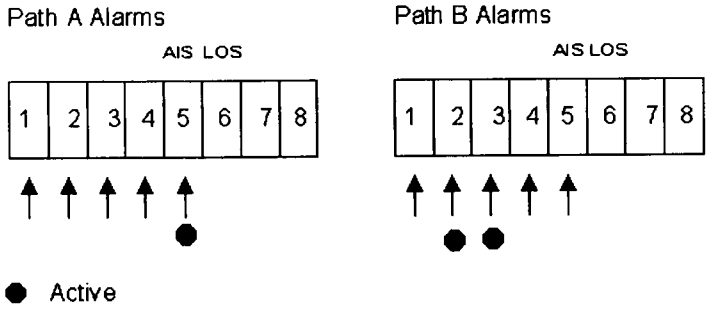


Figure 9 Example of Alarm Inputs

If both Ports alarm inputs have the same priority, for instance 6 and 6, then whichever occurred first will drive the switch. If the Port A alarm input occurs first then the switch will select Port B and vice-versa.

As shown below each alarm input comprises an A and B wire.

There are a total of 6 alarm inputs each with an A and a B wire, labelled 1A and1B, to 8A and 8B with 5 and 6 used for AIS and LOS respectively. Additionally +5 volts and GND are provided.

Designation	25 way D-type pin number
NC	25
NC	24
+5	23
GND	22
1A	9
8B	21
1B	8
8A	20
2A	7
7B	19
2B	6
7A	18
3A	5
4B	17
3B	4
4A	16

The +5 volt output on the alarm output connector is rated at 120 mA maximum per 25 way D connector.

Alarm outputs

The alarm outputs are presented on 9 way D-type female connector.

There are two outputs in the form of one relay output for each port, A and B. Active means closed contact.
Each output comprises;

For port A

Common		A off line	A on line	Unit DC unpowered
Normally open	inactive	active	active	
Normally closed	active	inactive	inactive	

For port B

Common		B off line	B on line	Unit DC unpowered
Normally open	inactive	active	active	
Normally closed	active	inactive	inactive	

The alarm outputs are presented on 9 way D - type female connector.

1	0 volts
2	Port A common
3	Port A normally closed
4	Port A normally open
5	Port B common
6	Port B normally closed
7	Port B normally open
8	+ 5 volts 100 mA maximum
9	Factory use, **must be left unconnected.**

Power supply inputs

There is one DC power supply input, the power supply input is not polarity sensitive. The fuse associated with the E1 Fallback switch is solely for the electronics within the E1 Fallback switch. It is strongly recommended that a fuse is fitted to the rack wiring to protect the power supply wiring.

The power supply can be 24/48 volts nominal DC of either polarity, connected using the red and white wires of a three-wire cable connected to the unit through a 3-pin LEMO connector. The drawing shows how the wires are connected to the plastic inner of the plug.

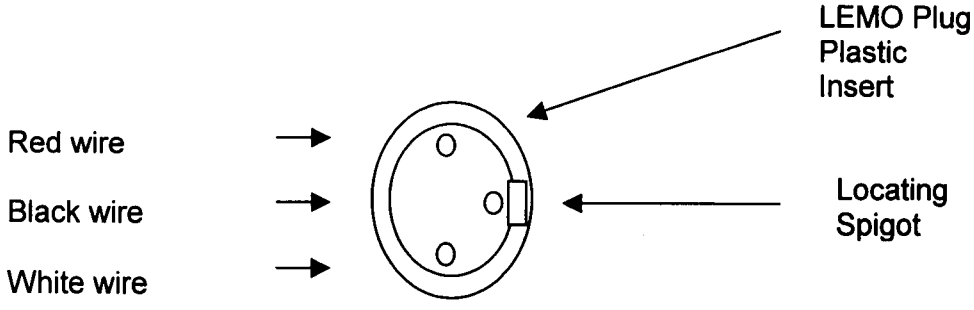


Figure 10a Front Panel Power Plug Connection

Indications

There are three LEDs on the front panel; they are arranged vertically with one representing the A port, one giving mode (either manual or automatic), and one representing the B port.

The possible states of the LEDs are as follows:

The green port LEDs display which side is currently selected.
The red port LEDs display if any errors occur on that port.
If the selected port has an error both the red and green LEDs will light giving an orange display.

Switches

There are ten switches on the front panel:

- A push button on/off switch.
- A system select switch to select either auto, A or B port to the M port.
- A bank of four switches to turn AIS/LOS alarms on/off on any tributary on the A port.
- A bank of four switches to turn AIS/LOS alarms on/off on any tributary on the B port.

For automatic operation controlled by the alarm inputs the system select switch is set to the middle position. To manually set the E1 Fallback switch, the system select switch is either moved up or down to select either the A or B port. It is recommended that the selection switch is left in the centre position.

The following figure shows the layout of the alarm enable switches. When neither the LOS or the AIS alarm is enabled the switches should be set to the 'ON' position. To enable the LOS and AIS alarms the switches should be set to the 'OFF' position. The upper bank of four switches are used to enable the internal alarms for tribs 1-4 on the A path. The lower bank of switches are used to enable the internal alarms for the tribs 1-4 on the B path.

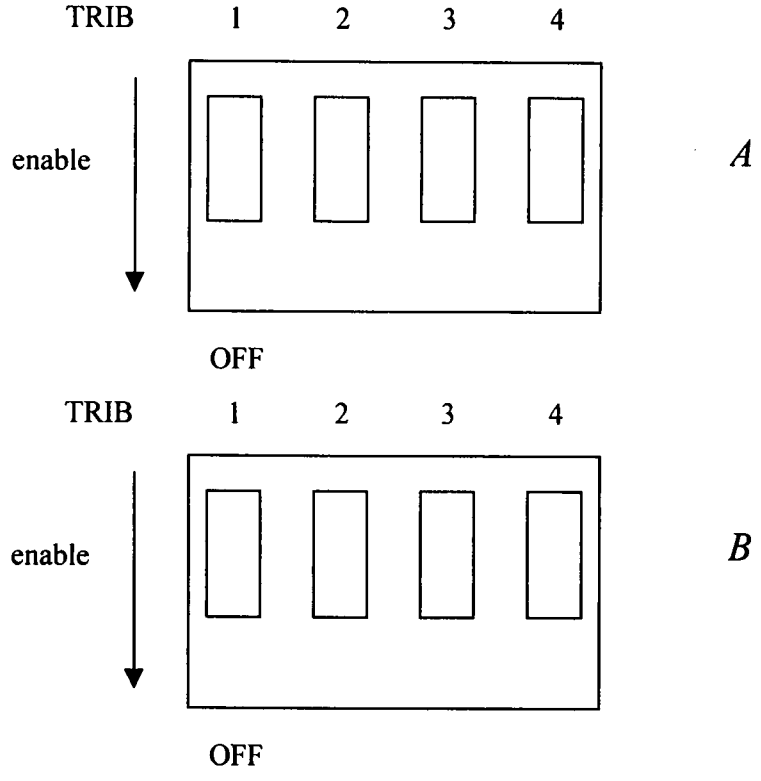


Figure 10b Front Panel DIP Switch Layout

Installing the E1 Fallback Switch

The E1 Fallback switch is complete and ready to be installed in a 19" rack.
The items which were shipped with the E1 Fallback switch are:

- Instruction Manual.
- 1 off 3 Way Power Connector.
- 2 off 25 Way D-Types for Alarm Inputs.
- 4 off M6 Pan Head Bolts and Plastic Washers.
- 4 off Cage Nuts.

Tools required

The tools required to install the E1 Fallback switch are:

- A large flat bladed screwdriver.
- A small flat bladed screwdriver.
- Wire stripper/cutter for the power supply and alarm connections.
- Wire stripper/cutter and specific tools for Type 43 connection termination, if the cables are not pre-supplied.

Connectors required

- 1 off 3 way power connector (supplied).
- 2 off 25 way D -type connector for the alarm inputs.
- 1 off 9 way D-type male connector.
- 6 off type 43 connectors per tributary used (cables can be supplied to suit specific customer applications).

Additional items supplied are four M6 bolts, plastic washers and cage nuts to fit a standard 19" rack cabinet.

Terminated cables can be supplied as an optional extra.

Installation

The E1 Fallback switch is designed to be horizontally installed in a 19" rack.

The alarm input and power connectors are supplied, and require no special tools except a wire cutter/stripper.

The alarms should be carefully considered, before wiring them to the alarm inputs on the unit.

Examples are given in the following diagrams.

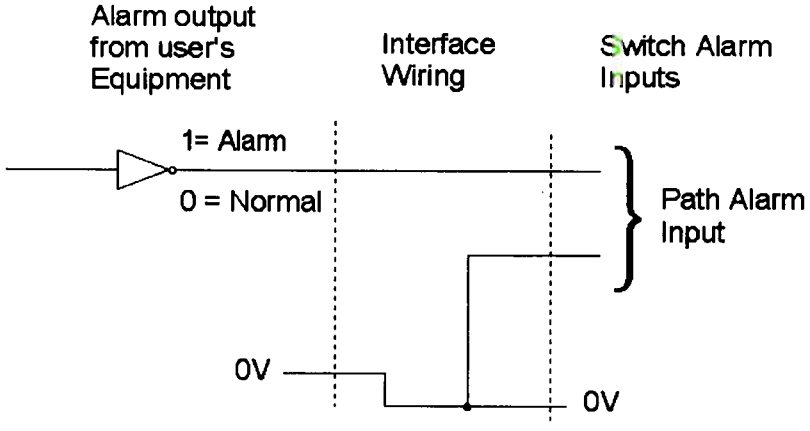


Figure 11 TTL Alarm Outputs from Transmission Equipment

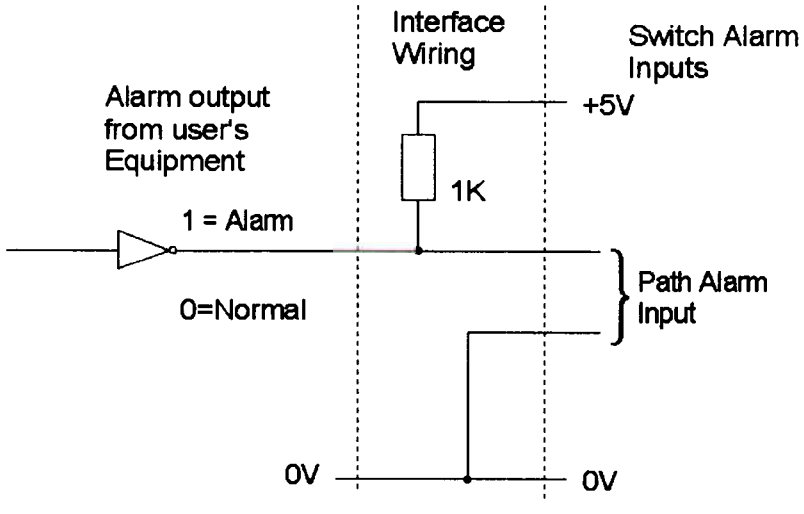


Figure 12 Open Collector Alarm Outputs from Transmission Equipment

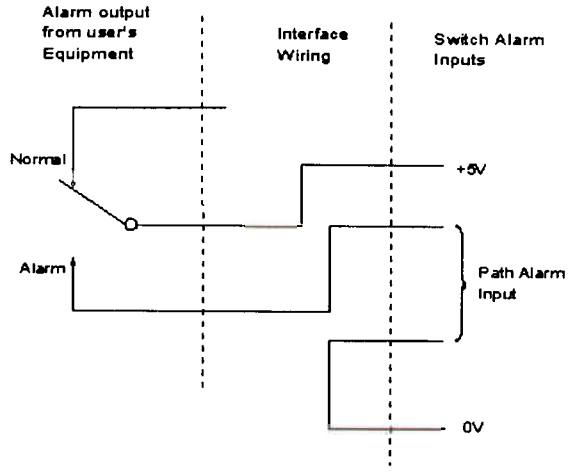
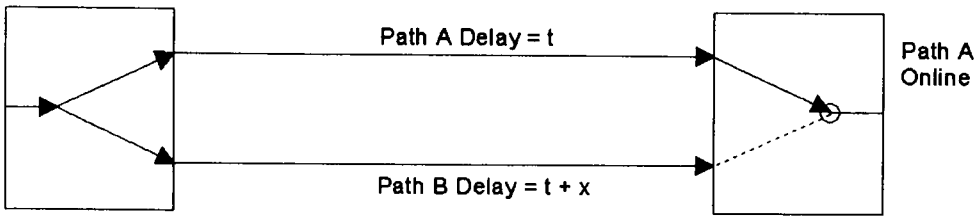


Figure 13 Relay Alarm Outputs from Transmission Equipment

Using the E1 Fallback Switch

The switch can be used with either a radio or cable transmission system. For minimum disturbance, the switching is solid state. If the path lengths are the same then none or very little disturbance will result from the switch.



Only one direction shown for clarity

Figure 14 System Arrangement

Considering the above diagram, if the time delay (propagation time) in path A is t and the delay in path B is t + x. If x is less than 120 ns, then generally no disturbance will occur.

When using the switch in conjunction with alarm outputs from the transmission system, it is advised that use is made of the alarms that indicate the problem before there is data loss. For example, in a radio or optical system where the received level has dropped below a pre-set level, the 10-6 threshold could be -80 dBm. The normal receive level could be -60 dBm therefore setting the transmission system to generate an alarm at -75 dBm this would enable the switch to change path whilst causing the minimum disturbance.

In the case of a radio system, allowance would have to be made for fading, a compromise between deep fades causing the system to switch with the minimum of errors, and not setting the threshold too high such that the switch is unable to identify the best signal. For example if the threshold is set for -70 dBm and the on-line path is A. The A radio could have a receive level of -75 dBm and the B path at -72 dBm; until there was a higher priority alarm on A, the switch would not switch to B. Other alarm outputs such as multiplex, hardware or power supply failure may, due to their configuration within the transmission system, occur only after a fault has happened. In the case of hardware failure the data signal may be gone by the time the alarm occurs. In this case the switch will minimise the disturbance.

An example of the priority setting could be as follows:

Input 1	Receive signal level.
Input 2	BER 10^{-3}
Input 3	Power supply failure or hardware alarm.
Input 4	Loss of external power.
Inputs 7 and 8	Other higher priority alarms.

Alarm input wiring

There are a total of 6 alarm inputs each with an A and a B wire, labelled 1A to 8A and 1B to 8B with 5 and 6 used for AIS and LOS respectively These inputs are presented on the 25 way D-type. Additionally +5 volts and GND are provided, although the maximum current that should be drawn is 120 mA per connector.

Designation	25 way D-type pin number
NC	25
NC	24
+5	23
GND	22
1A	9
8B	21
1B	8
8A	20
2A	7
7B	19
2B	6
7A	18
3A	5
4B	17
3B	4
4A	16

As an example if four alarms are connected to the alarm inputs, then the following connections would be used.

Designation	25 way pin	Customer designation
NC	25	
NC	24	
+5	23	+5V
GND	22	0V
1A	9	Alarm 1
8B	21	
1B	8	
8A	20	
2A	2	Alarm 2
7B	19	
2B	6	
7A	18	
3A	4	Alarm 3
4B	17	
3B	3	
4A	16	Alarm 4

With the above, any of the alarms activating would cause an alarm input. For a transmission system the alarms could relate to the following alarms;

Alarm 1	Receive level
Alarm 2	BER = 10^6
Alarm 3	Loss of receive signal
Alarm 4	System or hardware fault.

Black Box are able to assist our customers in the scheme which is most appropriate to their application.

Problem Solving

Maintenance

The switch unit is maintenance free.

Troubleshooting

- If the LEDs are not lit on the panel.

  1. Check the power connector is plugged into the panel.
  2. Check the fuse in front panel.
  3. Check the power supply to the unit

- If there are no alarm outputs.

  1. Check the 9 way D-type connector is plugged into the front panel.
  2. Check the 9 way D-type is wired correctly.
  3. Check the 25 way D-type connector are plugged into the unit and are configured correctly.
  4. Check the type 43 connectors are connected to appropriate tributaries.
  5. Check the AIS/LOS switches are set correctly.

Switching problems

- On failure to switch check the voltages on the alarm inputs and outputs.
- Check if the switch works in manual mode (using the select and enable switch).
- Test the switch with only one alarm input on each side at one time.

2 Mbit/s Interface

The switch is designed to operate with a standard G.703 2 Mbit/s unbalanced signal. Although the normal level input should be 0 dBm, the switch will function with levels down to -6 dBm. The output signal port expects to work into a 75 ohm input, other impedance's may cause problems. The switch carries out both clock recovery and regeneration of all 2 Mbit/s signal, both into and out of the switch.