ARITECH

900 Series

Installation Guide

Revision 5.1: February 2000

CONTENTS

1. INTRODUCTION

1.1. Scope

This manual explains how to install the Aritech Series 9xx range of analogue addressable fire monitors and Aritech Series 9xx monitoring controllers and input/output units. It includes some Aritech 900 Series, and all supported Aritech 950, 970 and 990 Series products.

Other manuals available are:

FP2000 Reference Guide

FP/FR2000 Installation and Commissioning Manual

FP2000 User's Manual

FP1200 Reference Guide

FP/FR1200 Installation and Commissioning Manual

FP1200 User's Manual

2. GUIDELINES

2.1. General

The FP1200/2000 Series analogue addressable fire panels can address up to 126 Aritech Series 900 devices on a two-wire ring circuit (loop) using digital communication.

The following sections describe the connection and addressing of Aritech Series 900 devices in a fire protection system.

2.1.1. Product overview – 9xx Series:

The following table lists the Aritech Series 900 devices described in this manual:

Table 1: Aritech Series 9xx products

Product	Series 900 Part Number	Series 950 Part Number	Series 950M Marine Part Number	Series 970 Intrinsically Safe Part Number	Series 990 Discovery Part Number
Fire monitors:					
Ionisation Smoke Monitor	Discontinued	DI950	DI950M	DI970	DI990
Optical Smoke Monitor	Discontinued	DP951	DP951M	DP971	DP991
Temperature Monitor	Discontinued	DT952	DT952M	DT972	DT992
Temperature Monitor (high temp)	----	DT953	----	----	----
Multi-Sensor (optical heat)	----	DP951T	----	----	DP991T
Isolator	Discontinued	IU950	IU950M	----	----
Manual Call Point	Discontinued	DM960	DM960M	DM970	DM990
Device bases:					
Base for Fire Monitor	Discontinued	DB950	DB950M	DB970	DB950

Product	Series 900 Part Number	Series 950 Part Number	Series 950M Marine Part Number	Series 970 Intrinsically Safe Part Number	Series 990 Discovery Part Number
Relay Base for Fire Monitor	----	DB950R	----	----	----
Base for Isolator	Discontinued	DB951	DB951M	----	----
Isolator Base (for 10 devices)	----	DB960	----	----	----
Isolator Base (for 20 devices)	----	DB961	----	----	----
Fire monitoring controllers:					
Loop Powered Beam Detector	----	FD950	----	----	----
Zone Monitoring Unit	Discontinued	II955	----	----	----
Loop Powered Sounder	----	AS950	----	----	----
Sounder Circuit Controller	Discontinued	IO956	----	----	----
Input/output units:					
1 Output	Discontinued	IO955	----	----	----
1 I/O	Discontinued	IO950	----	----	----
3 I/O	IU922	----	----	----	----
Mini Switch Monitor Unit	----	II950	----	----	----
Mini Switch Monitor with Interrupt	----	II951	----	----	----
Switch Monitor Unit	Discontinued	II952	----	----	----
Switch Monitor Plus	----	II953	----	----	----
Din rail mounted units:					
Duel Isolator	----	IU950D	----	----	----
Zone Monitoring Unit	----	II955D	----	----	----
Sounder Control Unit	----	IO956D	----	----	----
1 Output	----	IO955D	----	----	----
1 I/O	----	IO950D	----	----	----
Switch Monitor Unit	----	II952D	----	----	----
Switch Monitor Plus	----	II953D	----	----	----
Intrinsically safe accessories:					
Protocol Translator (1 Channel)	----	----	----	----	PT971
Protocol Translator (2 Channel)	----	----	----	----	PT972
Zener Barrier	----	----	----	----	GBX70

2.2. Addressing

Universal address cards are supplied with the mounting bases. A universal address card slides into a mounting base and the fire monitor, when fitted to the base, reads the address from the card.

A universal address card has seven removable pips that correspond to a seven bit binary value. Each pip has an associated value, which is shown on the card: 1, 2, 4, 8, 16, 32, 64 (see Figure 1). Removing a pip makes this value valid, and remaining pips have a value of “0”. The address is the sum of the values of all removed pips.

To remove the pips:

It is important to remove only the pips that produce the desired address, as removed pips cannot be refitted.

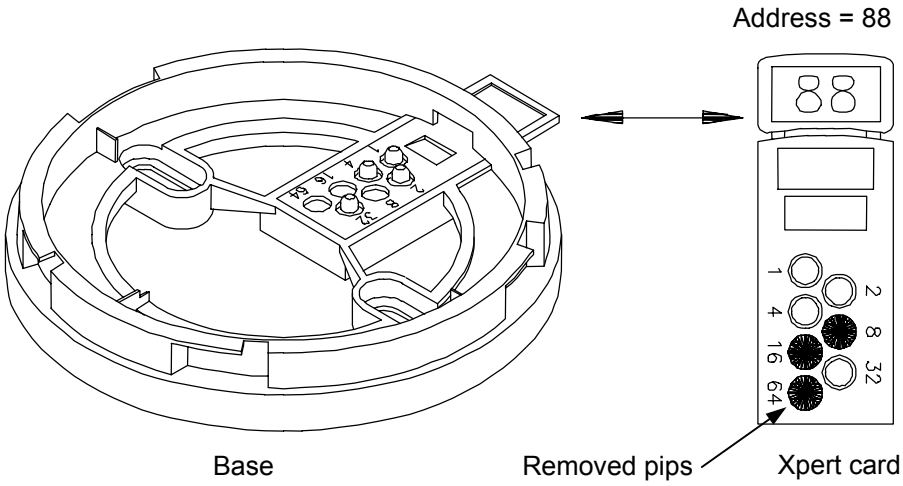
1. Lay the card flat on a table, pips down.
2. Insert a screwdriver into the slot of a to-be-removed pip.
3. Twist firmly.

When a card is coded, slide it into the slot on the side of the mounting base. Ensure that it locks into position.

As the fire monitor is rotated to fit into the mounting base, the remaining pips activate the address buttons on the fire monitor and the fire monitor's electronic circuits read the address.

Pre-printed and pre-punched Universal Address cards are available in sets that save time and increase accuracy during commissioning.

Figure 1: Address setting for 950/970/990 Series fire monitors



3. STANDARD PRODUCTS

3.1. Installing bases and manual call points

3.1.1. Mounting bases

3.1.1.1. Bases for the 950/990 Series fire monitors - DB950

The standard mounting base is a zero insertion force base with dual finger receptacles of stainless steel into which the detector terminals slide. You can connect cables up to 2.5 mm diameter using captive cable clamps.

There are four double terminals and one single terminal:

L1:	Line in and out, double terminal (recommended '-')
L2:	Line in and out, double terminal (recommended '+')
+R:	Remote indicator (LED) positive supply, double terminal
-R:	Remote indicator (LED) negative supply, double terminal
Single terminal:	An isolated terminal intended as a through connection point for cable shields or for an earth connection.

It is not necessary to observe polarity on terminals L1 and L2 although it is recommended that L1 is kept negative for consistency. All fire monitors, except isolators, are not polarity sensitive.

The standard mounting base is designed so that a fire monitor fits in only one way, without snagging, using a clockwise motion without insertion force.

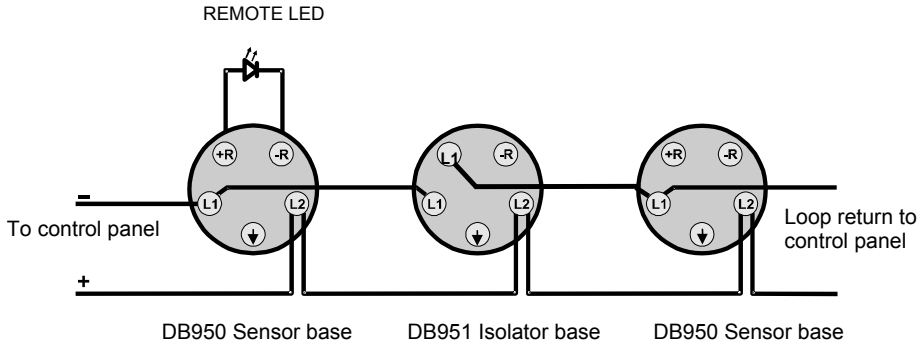
All mounting bases have a locking feature whereby a socket screw on each fire monitor can be turned to locate into a fixing hole in the mounting base. This prevents the unauthorised removal of a fire monitor

When installing fire monitors in confined spaces, allow 110 mm from the surface for fitting and removal.

The Aritech 950 Series mounting bases are designed such that the fire monitors do not fit the isolator mounting base and vice versa. The Series 900 range of fire monitors also does not fit the base of other Aritech range of monitors.

3.1.1.2. Bases for IU950 isolators - DB951

Figure 2: Wiring diagram for mounting base DB950 and isolator base DB951



— *The isolators are polarity sensitive, unlike the other 950/970 devices.*

The isolator IU950 is fitted into the isolator mounting base DB951.

The base has one double terminal and three single terminals:

L1 IN:	Line in, single terminal (negative DC supply)
L1 OUT:	Line out, single terminal (negative DC supply)
L2 IN/OUT:	Line in and out, double terminal (positive DC supply)
Single terminal:	An isolated terminal intended as a through connection point for cable shields or for an earth connection.

Isolators are polarity sensitive, unlike the other Series 950/970 devices.

According to the EN54 directive, isolators must be placed at least every 32 devices.

3.1.1.3. Isolator base for 950/990 Series monitors - DB960/DB961

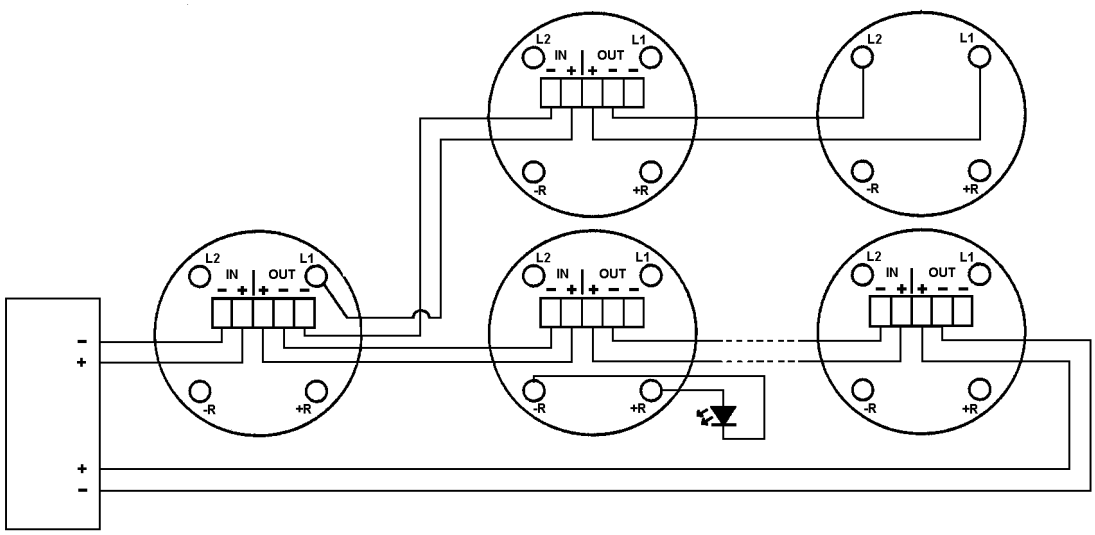
An isolator base comprises of a Series 950 addressable mounting base fitted with a printed circuit module for sensing and isolating a short-circuit between the conductors supplying power and the communications signals to the base. Mounted on the side of the base is a yellow LED that lights up when there is a short-circuit condition. There is a five-way terminal block with rising clamp connectors to terminate supply conductors.

There are nine terminals on the base:

L1 OUT:	Line out, four terminals (Positive and negative loop supply)
L2 IN:	Line in, three terminals (Positive and negative loop supply)
+R:	Remote indicator (LED) positive supply, one terminal
-R:	Remote indicator (LED) negative supply, one terminal

Isolator bases are polarity sensitive and can be damaged if connected to a reverse polarity supply capable that can deliver in excess of 1 amp. Observe the polarity markings indicated behind each supply terminal.

Figure 3: Wiring diagram for DB960/DB961



Isolating base	Typical loop wiring	Control panel loop driver
Series 950 base	Typical spur wiring	

According to the EN54-directive isolators must be placed at least every 32 devices.

3.1.1.4. Relay base for 950/990 Series monitors – DB950R

The DB950R relay base features a set of volt-free, form C (change-over) contacts controlled and powered by the remote output of an Series 950 or 990 detector. Low power operation and a high maximum operating frequency are achieved by using a latching relay coupled to an efficient drive circuit. The facility to drive a remote LED is retained by auxiliary output that mimics the detector's remote output.

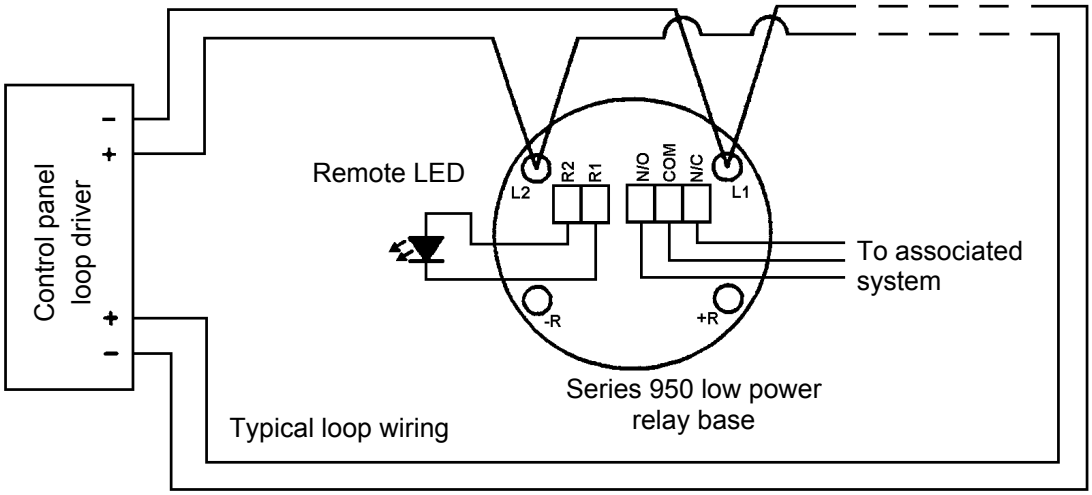
This product is used in fire detection and alarm systems that are required to provide volt-free control signals to associated systems, such as automatic door-closers. This relay is not supervised (monitored) and should not be used with high integrity applications where the associated system must be continuously monitored for faults in the wiring between the systems.

This base must not be connected to a mains supply. The maximum voltage applied to the relay contact terminals must not exceed the Extra Low Voltage limits of 50 VAC and 75 VDC.

It is important to recognise that the relay cannot be controlled unless the base is fitted with a fully functional Series 950/990 detector. Removing the detector or disconnecting its supply will cause an energised relay to reset.

Under no circumstances connect an LED or any other device to the base terminals marked -R and +R; instead use the terminals marked R1 and R2. R1 and R2 will have the same polarity as L1 and L2 respectively.

Figure 4: Wiring diagram for DB950R



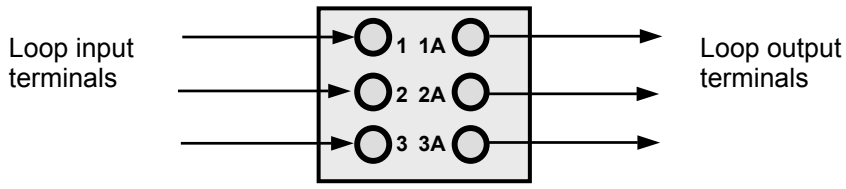
After installing the relay base and all other devices connected to the fire system, you need to in-situ smoke or heat test the associated detector. Check that the fire detection and alarm system and the system controlled by the relay operate correctly. Repeat this test with the fire panel supplied only by its standby battery.

If the product has been subjected to an excessive shock during transportation, you might receive it with the relay contacts in the 'set' position. Reset the relay by subjecting it to one operating cycle before commissioning the system.

In accordance with the applicable local rules, regularly subject the detector to an in-situ smoke or heat test and check that the relay and its associated system respond correctly. Annually check the supply voltage and the integrity of the wiring. This product is not field serviceable and must be replaced if any part is found to be defective. You can clean the external surface of the base with a damp cloth.

3.1.2. Manual call point - DM960/DM990

Figure 5: Wiring diagram for DM960/DM990



Terminal	Function
1 - 1A	17 – 28 VDC
2 - 2A	Non polarised
3 - 3A	Not used

3.2. Fire monitoring controllers

The address of a fire monitoring controller is set on a seven-segment DIL switch located on the device. Each segment of the switch must be set to “0” (ON) or “1” (OFF) using a small screwdriver or similar tool. Please refer to *Table 1: Aritech Series 9xx products* for address settings.

Table 2: DIL address settings

ADDR	1234567	ADDR	1234567	ADDR	1234567
1	1000000	43	1101010	85	1010101
2	0100000	44	0011010	86	0110101
3	1100000	45	1011010	87	1110101
4	0010000	46	0111010	88	0001101
5	1010000	47	1111010	89	1001101
6	0110000	48	0000110	90	0101101
7	1110000	49	1000110	91	1101101
8	0001000	50	0100110	92	0011101
9	1001000	51	1100110	93	1011101
10	0101000	52	0010110	94	0111101
11	1101000	53	1010110	95	1111101
12	0011000	54	0110110	96	0000011
13	1011000	55	1110110	97	1000011
14	0111000	56	0001110	98	0100011
15	1111000	57	1001110	99	1100011
16	0000100	58	0101110	100	0010011
17	1000100	59	1101110	101	1010011
18	0100100	60	0011110	102	0110011
19	1100100	61	1011110	103	1110011
20	0010100	62	0111110	104	0001011
21	1010100	63	1111110	105	1001011
22	0110100	64	0000001	106	0101011
23	1110100	65	1000001	107	1101011
24	0001100	66	0100001	108	0011011
25	1001100	67	1100001	109	1011011
26	0101100	68	0010001	110	0111011
27	1101100	69	1010001	111	1111011
28	0011100	70	0110001	112	0000111
29	1011100	71	1110001	113	1000111
30	0111100	72	0001001	114	0100111
31	1111100	73	1001001	115	1100111
32	0000010	74	0101001	116	0010111
33	1000010	75	1101001	117	1010111
34	0100010	76	0011001	118	0110111
35	1100010	77	1011001	119	1110111

ADDR	1234567	ADDR	1234567	ADDR	1234567
36	0010010	78	0111001	120	0001111
37	1010010	79	1111001	121	1001111
38	0110010	80	0000101	122	0101111
39	1110010	81	1000101	123	1101111
40	0001010	82	0100101	124	0011111
41	1001010	83	1100101	125	1011111
42	0101010	84	0010101	126	0111111

3.2.1. Loop powered beam detector - FD950

The Series 950 beam detector is designed to protect large open spaces such as atria, museums, churches, warehouses and factories. It has three main parts:

- The transmitter, which projects a beam of infrared light.
- The receiver, which registers the light and produces an electrical signal.
- The interface, which processes the signal and generates alarm or fault signals.

The transmitter and receiver are designed to be fitted on opposite walls approximately 30 cm to 60 cm below the ceiling. They can protect areas up to 100 m long and 15 m wide, a total of 1500 m². If it is difficult to fit the transmitter and the receiver to opposite walls, they can be fitted in retro mode, i.e., adjacent to each other on the same wall. A reflector needs to be fitted to the opposite wall to reflect the beam from the transmitter to the receiver.

The interface contains the electronic circuitry to control the beam detector and communicate with the control panel via the Series 950 loop.

In clear air the receiver registers all the light sent by the transmitter. If smoke from an incipient fire is present, it rises and obscures the light to a certain extent. The decrease in the amount of light registered by the receiver causes the beam detector to change to the alarm state.

The detector compensates for signal drift and, if the limit of compensation has been reached, a fault signal is generated. The detector can be optionally set to return a fault if the beam is totally and suddenly obscured.

The Series 950 beam detector has the following features:

Loop powered: The detector is loop-powered and needs no separate 24 V supply. This not only eliminates the need for additional equipment, it also saves both cost and time in installation.

Compatibility: It operates as a conventional detector in that it changes to the alarm state at a pre-set level of smoke obscuration, and can communicate with the control panel and return information when interrogated.

Selectable alarm levels: The detector has four levels of obscuration, determined with reference to the environment in which it is installed: 25%, 35%, 50% and 65%, where 25% is the most sensitive and 65% the least sensitive level. A DIL switch on the interface is used to set the obscuration level.

Drift compensation: The amount of light registered by the receiver can be decreased by factors other than incipient fires, such as contamination of the receiver lens. To minimise the risk of unwanted alarms, the detector checks its status at

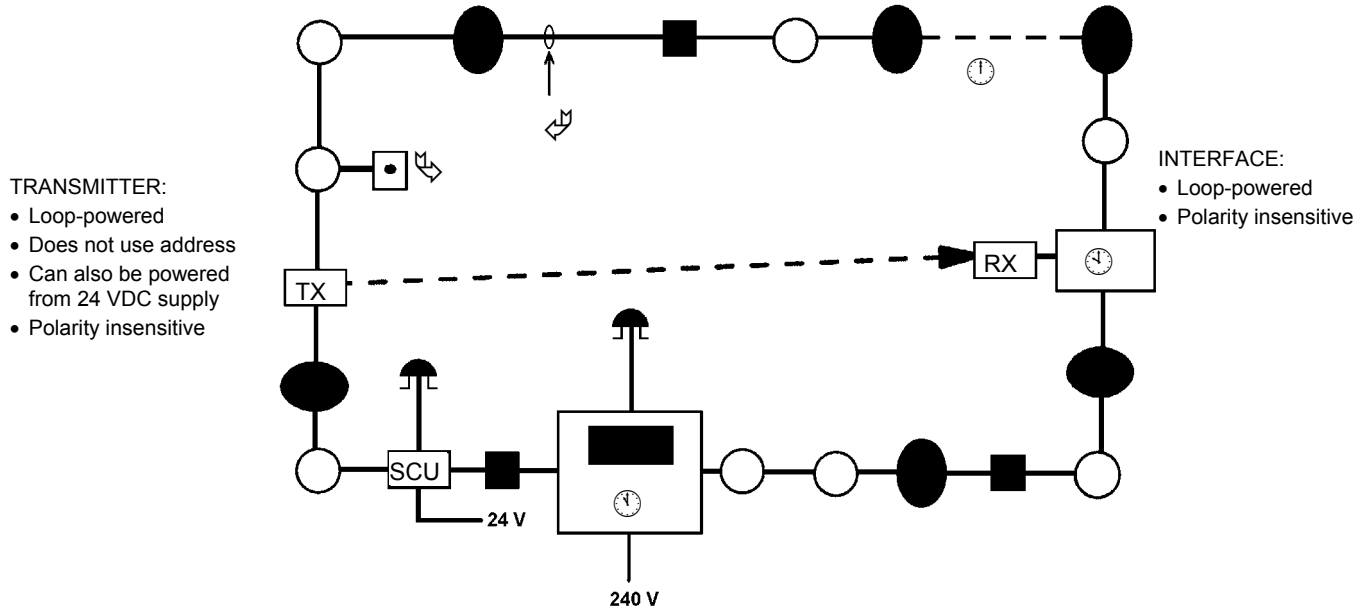
regular intervals and compensates for the positive drift of the signal.

Remote interface: The optical and electronic elements of the detector are separate from one another, with most of the electronics housed in the interface. Consequently the interface can be installed in an accessible position. You can easily service the electronics of the beam detector without using access equipment.

Simple wiring: The transmitter and the interface of the detector can be wired to the nearest point of the loop. No extra wiring is necessary.

Simple alignment: During commissioning it is necessary to align the transmitter and receiver so that the beam is correctly projected at the receiver. As the beam is invisible, the alignment procedure has been traditionally complicated. However, the detector makes alignment simple – a high-brightness LED behind the receiver lens flashes while the transmitter is being aligned. Once the alignment is correct, the LED stops flashing.

Figure 6: Wiring diagram for Series 950 beam detector

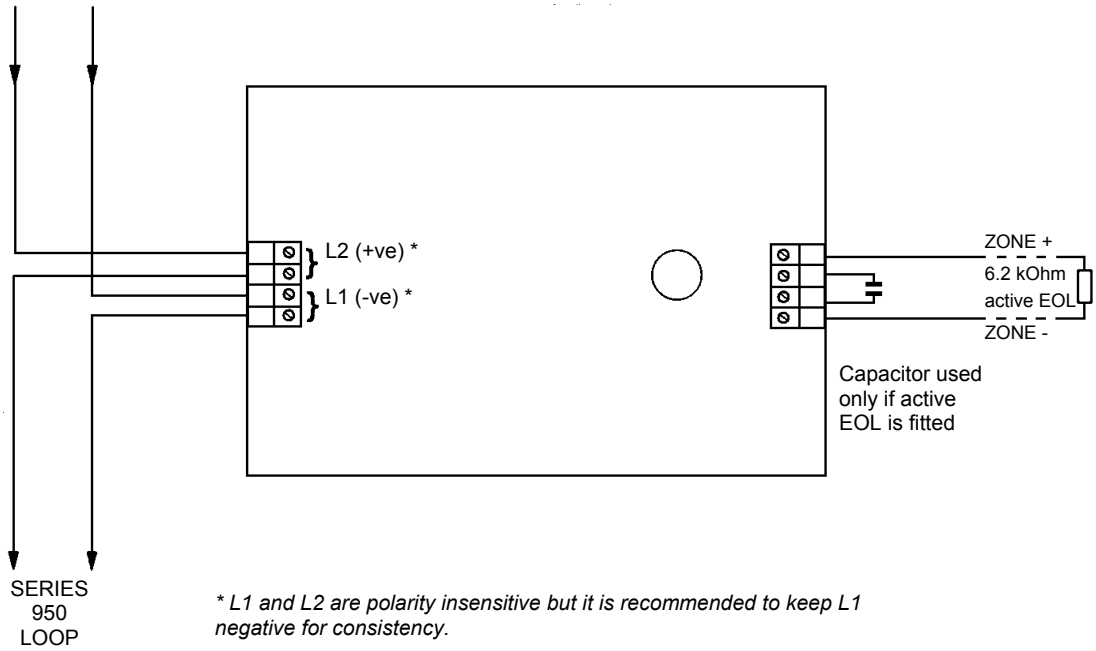


Beam detection interfaces
Control panel
Up to 20 devices

2-core
Remote LED

3.2.2. Zone monitoring unit - II955

Figure 7: Wiring diagram for zone monitoring unit



** L1 and L2 are polarity insensitive but it is recommended to keep L1 negative for consistency.*

A 6.2 kOhm resistor must be placed at the end of the line.

A Manual Call Point acts as a Manual Call Point warning.

Where (non-addressable) intrinsically safe detectors are used, you must place a 28 V/300 Ohm safety barrier inside the safe area adjacent to the hazardous area. When used in this configuration, the wire link adjacent to the LED must be cut to provide correct short-circuit monitoring (see chapter 4: Intrinsically Safe Products - 970 Series

Maximum number of conventional fire detectors: 20

Shielded cable is preferred but not compulsory.

The Series 950 Zone Monitor can be used with active end-of-line units that operate with diode bases with a capacitor to the zone output. The capacitor must not exceed 50 µF (nominal) and must be connected as shown.

3.2.3. Loop powered sounder - AS950

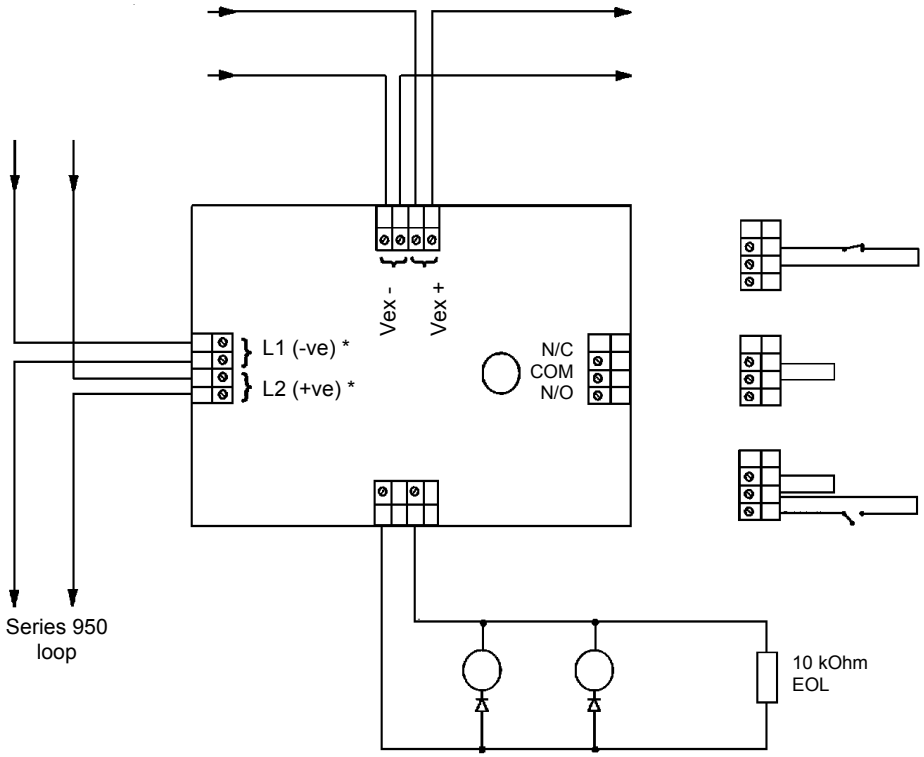
The Series 950 loop sounder has an output of 85 dB(A) at 1 meter. It is used with Series 950 analogue, addressable fire monitors. You can use 20 sounders on a Series 950 loop in 85 dB mode.

Series 950 loop sounders are designed to comply with BS5839, Part 1: 1988 and are particularly suitable for rooms, corridors and other confined spaces. They are supplied as a sounder base or a sounder base with a cap for use as a stand-alone sounder.

The control panel activates the sounders. The sounder can be switched on in pulsed mode, 0.5 s on, 0.5 s off, or switched to operate in continuous mode with an alternating tone, 0.25 s 500 Hz, 0.25s 550 Hz.

3.2.4. Sounder circuit controller - IO956

Figure 8: Wiring diagram for sounder circuit controller



Normally closed fault contact

Fault input not used (wire link must be fitted)

Normally open fault contact

Sounders with polarising diodes

Fault input

Fuse

Sounders +

Sounders –

Local power supply

** L1 and L2 are polarity insensitive but it is recommended to keep L1 negative for consistency*

To install a sounder circuit controller:

1. Mount the unit as required. Ensure that the earth continuity is maintained.
2. Connect the communication line to the L1 and L2 inputs. The inputs are polarity insensitive, but it is recommended that L1 is negative for consistency.
3. Connect the local supply (9 V – 32 VDC) to the supply 'V ex+' and 'V ex-' terminals. A 1.25 A fuse is fitted on the PCB in the supply line.
4. Connect the sounder loop to sounder 'Sounder +' and 'Sounder –'. The loop requires a 10 kOhm, 0.33 Watt end-of-line resistor. These terminals are monitored for open circuit and short circuit in the sounder wiring. Each sounder must be connected in series with a polarising diode, if this is not pre-fitted in the unit.
5. Connect the fault inputs to the contacts from the local power supply as shown in the Figure 8. If the fault input is not used, link fault 'COM' to fault 'N/C' as shown in the figure using a wire link.

   Do not connect the local supply directly to the fault supply inputs.

*To fault monitor the local supply, e*ither:

Normally closed voltage-free fault output contacts across 'COM' and 'N/C'

or

Normally energised voltage-free fault output across 'COM' and 'N/O' with a wire link across 'COM' and 'N/C'

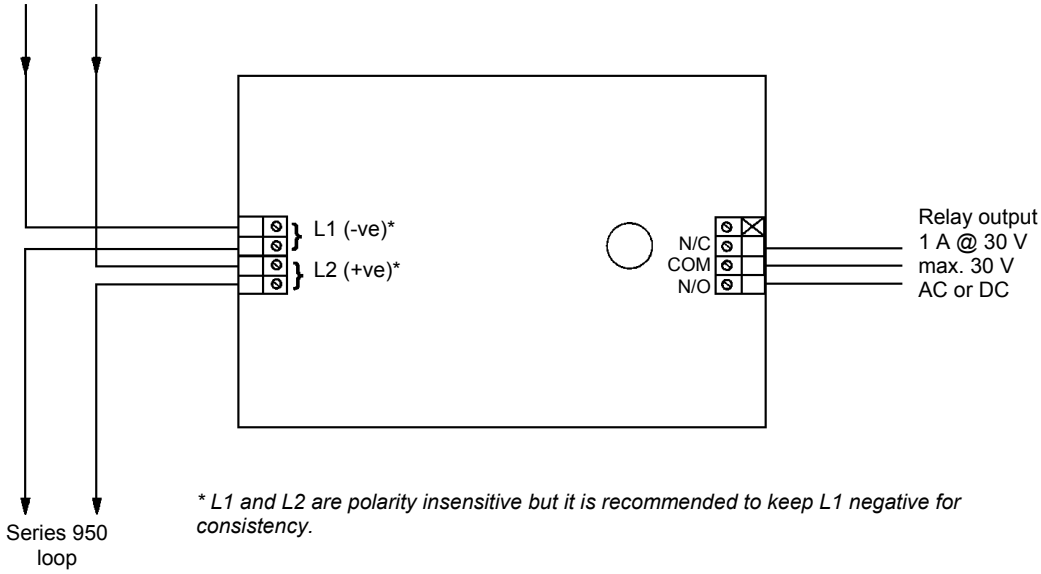
The cables connected to the sounder output must be able to power sounders, e.g. MICC.

3.3. Input/output units

Set the address of an input/output unit using the lower seven-segments of the DIL switch. Each segment of the switch must be set to “0” (ON) or “1” (OFF), using a small screwdriver or similar tool. Please refer to section 3.2.

3.3.1. Single channel output unit - IO955

Figure 9: Single channel output unit



** L1 and L2 are polarity insensitive but it is recommended to keep L1 negative for consistency.*

Eight terminals are provided:

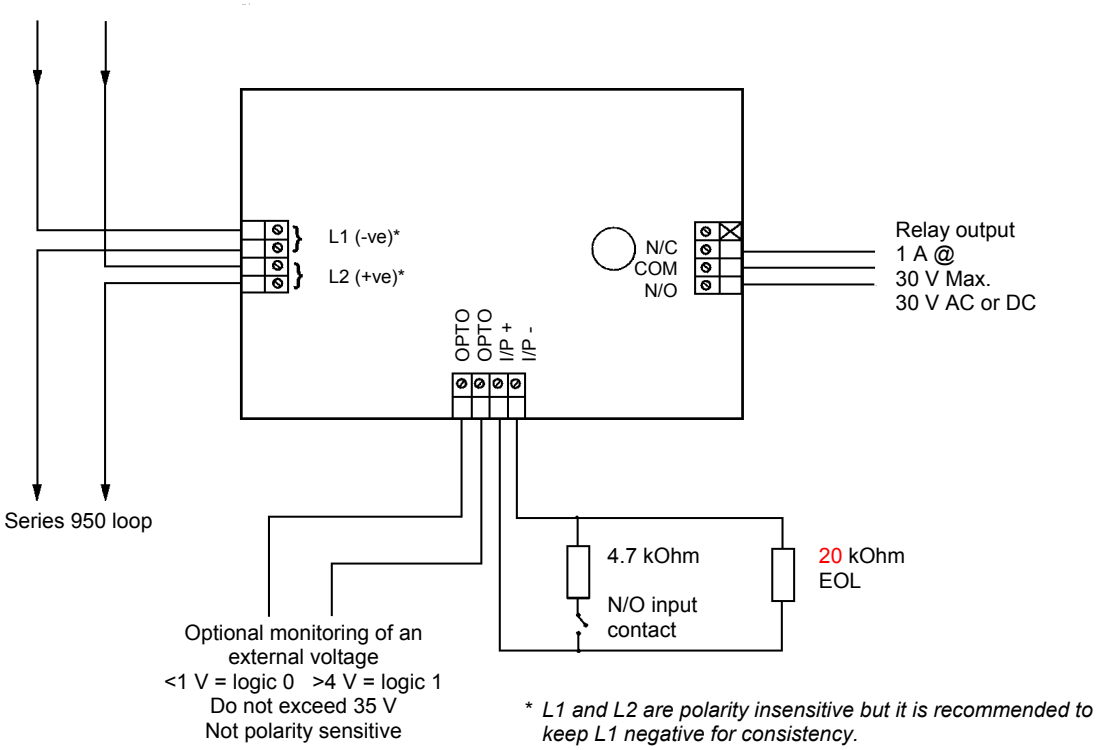
- Four for the loop connections (incoming and outgoing) with two for the positive supply
- One for the relay pole
- One for the normally open contact
- One for the normally closed contact
- One unused terminal

3.3.2. Single channel input/output unit - IO950

Twelve terminals are provided:

- Four for the loop connections (incoming and outgoing)
- Two for an opto-isolated external input
- Two for an end-of-line supervised input
- One for the relay pole
- One for the normally open contact
- One for the normally closed contact
- One unused terminal

Figure 10: Single channel input/output unit



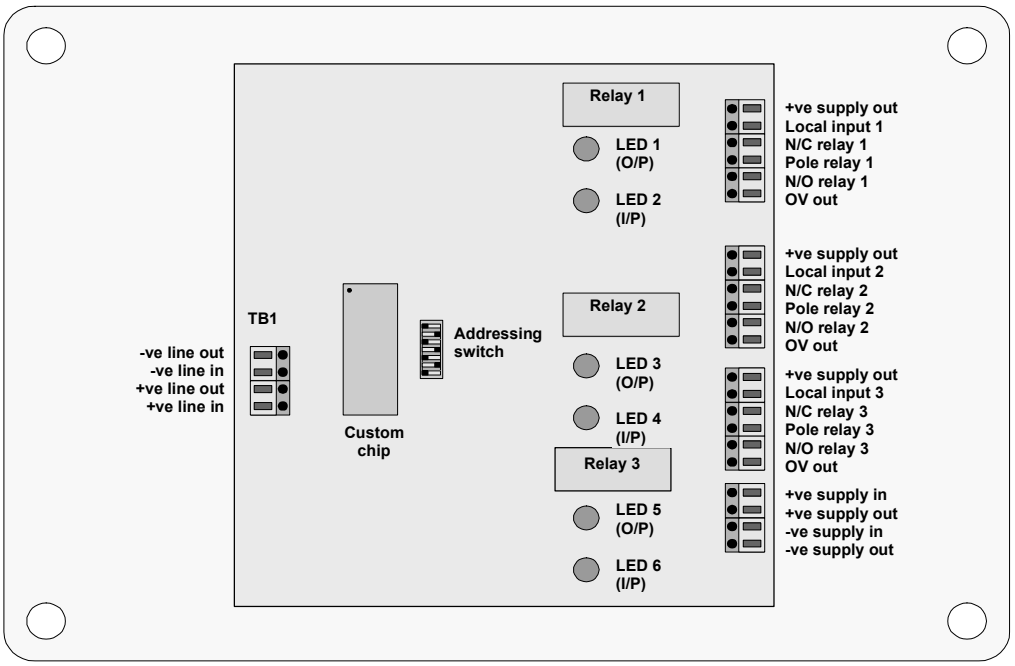
3.3.3. Three channel input/output unit - IU922

There are 26 terminals:

- Four for the loop connections (incoming and outgoing)
- Four for the power supply in and out
- Three sets of six terminals, each providing
  - One relay pole,
  - One normally open contact
  - One normally closed contact
  - One logic input
  - One supply out

- One unused terminal

Figure 11: Three-channel input/output unit



24 VDC is required to activate the inputs.

Connect '+Ve supply out' to local input 1,2 or 3.

A 24 VDC power supply is required to operate the I/O unit.

Maximum input resistance: 100 kOhm

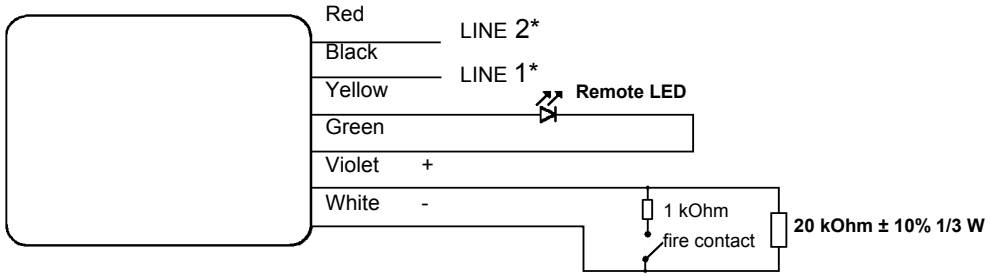
Maximum input capacitance: 200 nF

3.3.4. Mini Switch Monitoring Unit - II950

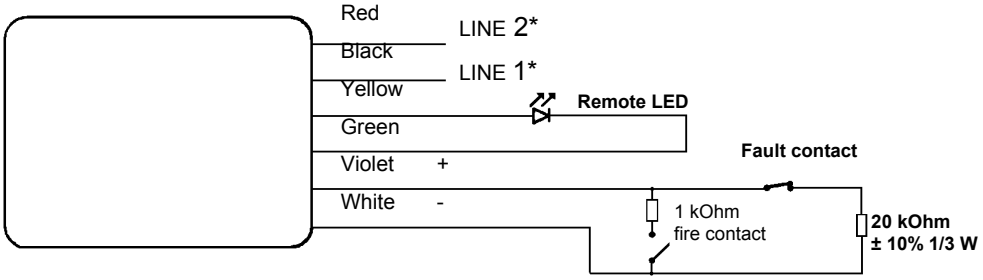
There are six wires for the loop connections, two for driving a remote indication and two for an external switch connection.

Figure 12: Wiring options for the Mini Switch Monitor

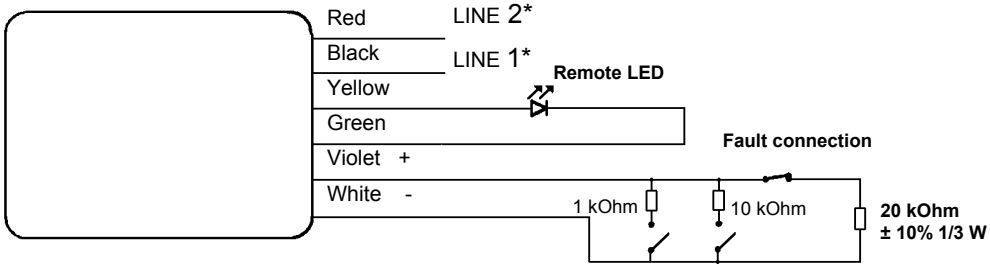
Fire contacts



Fire and fault contacts



Fire, pre-alarm and fault contacts



** L1 and L2 are polarity insensitive but it is recommended to keep L1 negative for continuity.*

To install a Mini Switch Monitoring Unit:

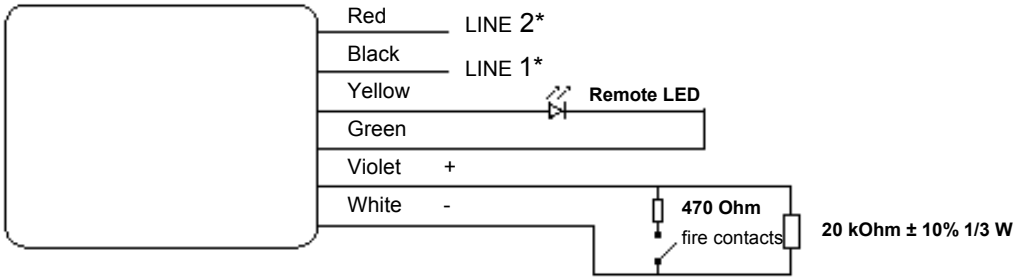
1. Mount the switch monitor unit as required.
2. Connect the communication line to the Line 1 and Line 2 inputs. Note that the inputs are unpolarised but it is recommended that Line 1 is kept negative for consistency.
3. There are three wiring options for the Mini Switch Monitor as shown in Figure 12. Connect the switch contacts to the switch inputs as desired. Installing the 20 kOhm end-of-line resistor enables the switch inputs to be monitored for open or short circuits.
4. A software controlled remote indicator (alarm LED) output is supplied. Connect an external LED to the remote outputs. During installation the device should be correctly orientated, if the LED needs to be visible. The LED output drives a standard Aritech remote indicator.

3.3.5. Mini Switch Monitoring Unit with an interrupter - II951

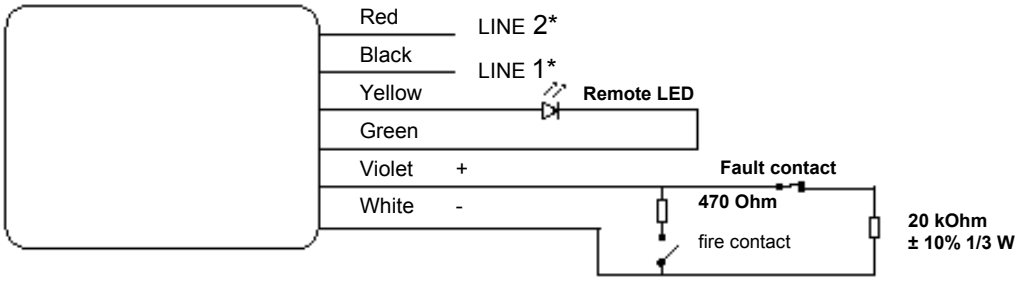
There are six wires, two for the loop connections, two for driving a remote indication and two for an external switch connection.

Figure 13: Wiring options for the Mini Switch Monitor Plus

Fire contacts



Fire and fault contacts



** L1 and L2 are polarity insensitive but it is recommended to keep L1 negative for continuity.*

To install a Mini Switch Monitoring Unit with an interrupter:

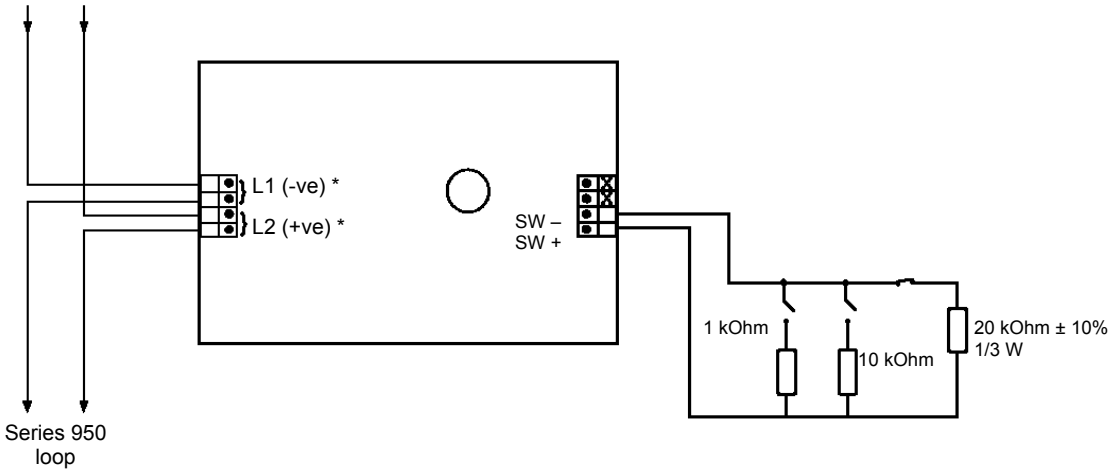
1. Mount the Switch Monitor Unit. Use suitable terminal blocks when connecting it to the flying leads. If a remote LED is fitted, a six-way terminal block is needed, otherwise four ways are enough.
2. Connect the communication line to the Line 1 and Line 2 inputs. The inputs are unpolarised, but it is recommended that Line 1 is kept negative for consistency.
3. There are two wiring options for the Mini Switch Monitor as shown in Figure 13. Connect the switch contacts to the switch inputs as desired. Installing the 20 kOhm end-of-line resistor enables the switch inputs to be monitored for open or short circuits.
4. A software controlled remote indicator (alarm LED) output is supplied. Connect an external LED to the remote outputs. During installation orientate the device correctly if the LED needs to be visible. The LED output drives the standard Aritech remote indicator.

5. Use a small screwdriver or similar tool to set the unit address on the address switch. Segments, numbered 1 to 7, must be set to 0 or 1 in accordance with the address table.
6. Fit the adhesive label provided over the aperture through which the DIL switch is accessed. This label must be fitted to ensure proper protection of the internal circuitry. Failure to fit the label invalidates the IP rating.

3.3.6. Switch monitor - II952

There are eight terminals, four for the loop connections (incoming and outgoing), two for the external switch connection, and two unused connections.

Figure 14: Wiring diagram for the Switch Monitor Unit



Normally closed fault contact Pre-alarm Fire resistor

** L1 and L2 are polarity insensitive but it is recommended to keep L1 negative for consistency.*

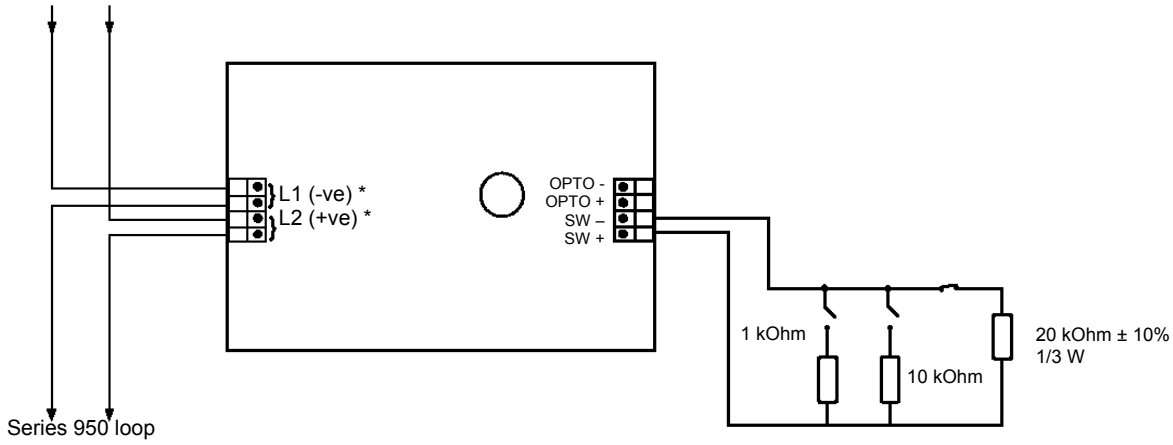
To install the switch monitor:

1. Mount the Switch Monitor Unit. The Series 950 switch monitor is not designed for outdoor use unless it is mounted in a suitable weatherproof enclosure.
2. Connect the communication line to the L1 and L2 inputs. The inputs are unpolarised, but it is recommended to keep L1 negative for consistency.
3. Connect the switch contacts to the switch inputs. The switch input is monitored for open or short circuits.

3.3.7. Switch monitor plus - II953

There are eight terminals, four for the loop connections (incoming and outgoing), two for an opto-coupled output and two for the external switch connection.

Figure 15: Wiring diagram for Switch Monitor Plus



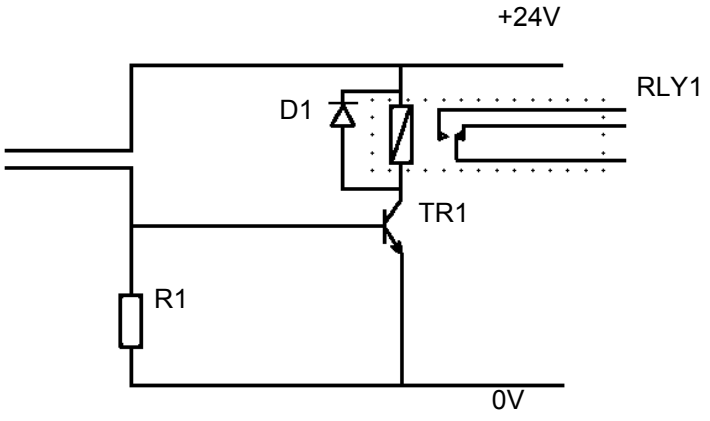
Normally closed fault contact	Fire alarm
Pre-alarm	The opto sinks 1 mA max. at 30 V max.

** L1 and L2 are polarity insensitive but it is recommended to keep L1 negative for consistency.*

To install the Switch Monitor Plus:

1. Mount the Switch Monitor Unit as required. The Series 950 Switch Monitor Plus is not designed for outdoor use unless it is mounted in a suitable weatherproof enclosure.
2. Connect the communication line to the L1 and L2 inputs. The inputs are unpolarised, but it is recommended to keep L1 negative for consistency.
3. Connect the switch contacts to the switch inputs. The switch input is monitored for open or short circuits.
4. A software controlled remote opto-isolated output is supplied. Before connecting a beam detector or similar device, first check to see if the device has a factory fitted Apollo-compatible connection for the reset. If not, you must devise a circuit for remote resetting of the beam detector. The circuit diagram (Figure 16) shows a typical method of connection.

Figure 16: Circuit for remote resetting



R1 = 10 kOhm ¼ W
D1 = 1N4007
TR1 – BC337
RLY1 = 24 VDC coil, 350 Ohm or greater

3.4. DIN rail mounted units

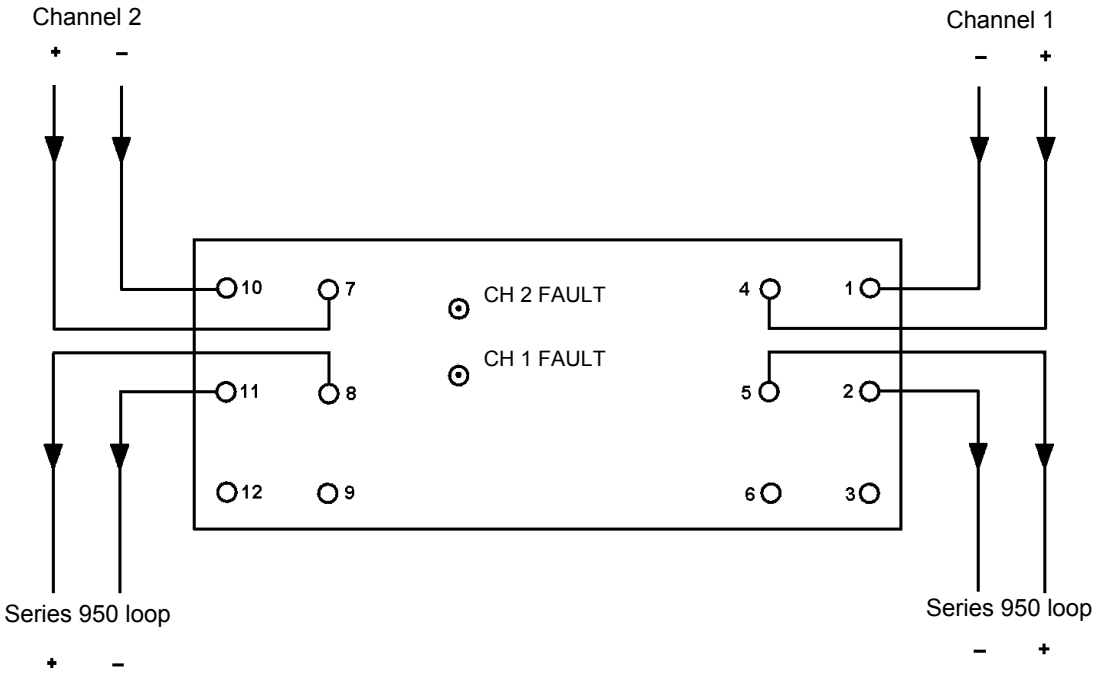
The Series 950 DIN rail-mounted units are supplied in a standard housing that is clipped on to a standard 35 mm DIN rail (DIN46277) or fixed directly to the enclosure using two 4 mm screws.

Connect the units by using plug-in terminal blocks that accept wires up to 2.5 mm² diameter.

3.4.1. Isolators

3.4.1.1. Dual isolator – IU950D

Figure 17: Wiring connections (Dual isolator – DIN mount)



Note: Polarity must be observed

The Series 950 DIN-rail dual isolator provides, in one housing, two independent isolators that sense and isolate short-circuits on Series 950 loops and spurs.

The isolators are loop-powered and are polarity sensitive. A maximum of 20 Series 950 detectors can be installed between isolators.

Under normal operating conditions, there is a low impedence between -IN and -OUT terminals of each isolator channel so that power and signals are passed to the next base in line.

If a short-circuit or abnormally low impedance occurs across the loop, the fall in voltage is sensed and the isolator isolates the negative supply in the direction of the fault. When this occurs, the yellow LED of the affected channel illuminates. The isolated section of loop is tested using a current pulse every five seconds. The power is automatically restored when the short-circuit is removed.

The two isolator channels are not interconnected internally, and operate completely independently of one another.

Two yellow LEDs - one per channel - are visible through the top cover of the enclosure. When a channel is in an isolating condition, the associated LED is illuminated continuously.

3.4.2. Fire monitoring controllers

3.4.2.1. Zone monitoring unit - II955D

The Series 950 DIN-rail zone monitor powers and controls the operation of a zone of up to 20 Series 860 Apollo fire detectors from a loop of Series 950 addressable monitors and ancillary devices.

The zone monitor latches in the alarm state.

Use a 6.2 kW end-of-line resistor to monitor cables for open- and short-circuit faults. Alternatively, you can use an active end-of-line monitor in conjunction with diode bases and a capacitor of up to 50 µF fitted at the zone monitor wiring terminals.

The zone monitor is fitted with a bi-directional short-circuit isolator and is unaffected by loop short-circuits on either loop input or output.

The Series 950 DIN-rail zone monitor is loop powered and operates at 14–28 VDC.

Figure 18: Wiring connections (Zone monitor unit – DIN mount)

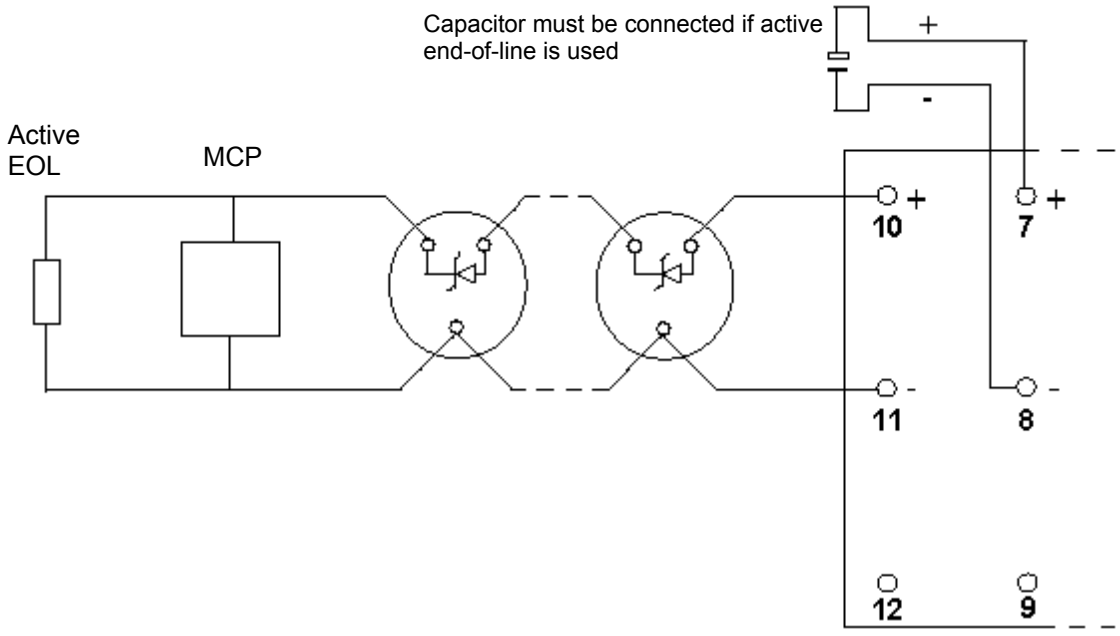
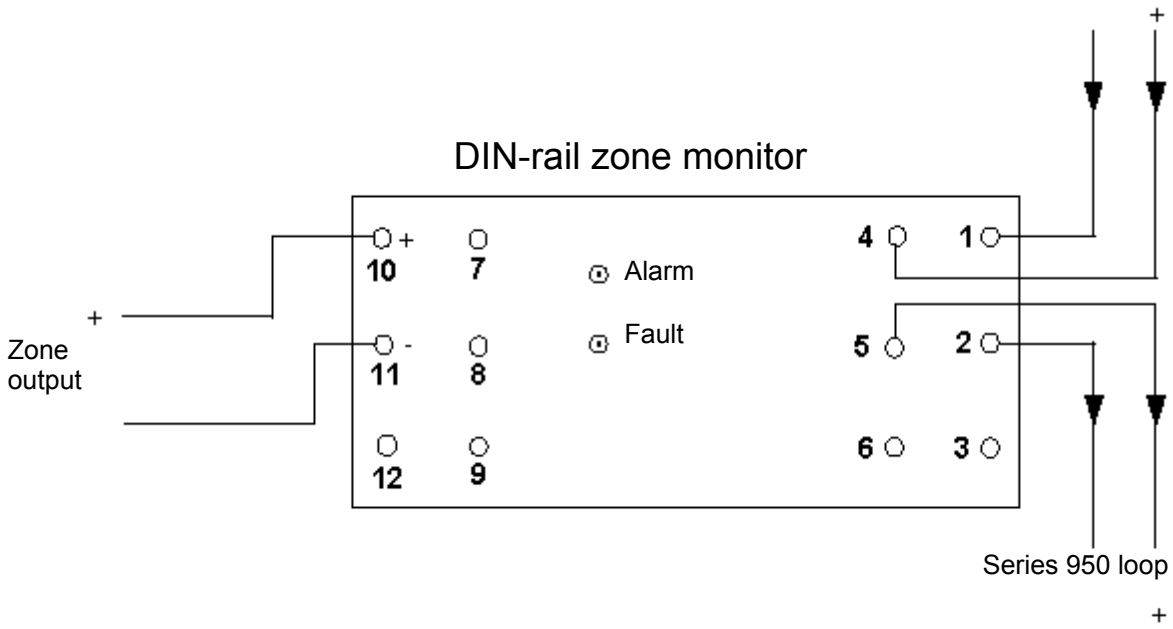
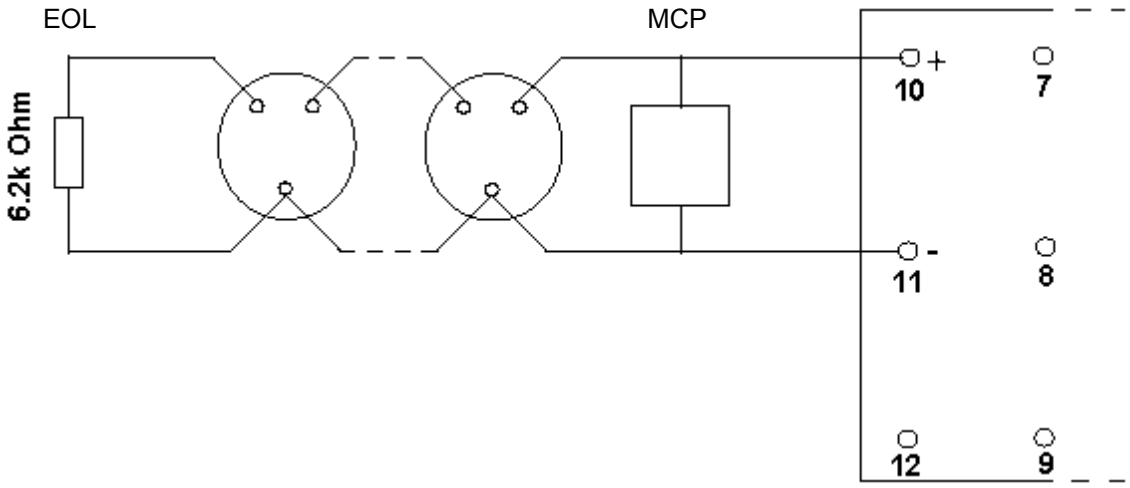


Figure 19: Zone connection – Standard bases with 6.2 kOhm monitoring resistor at end-of-line



Note: The zone monitor is polarity sensitive

Figure 20: Zone connection – Diode bases with active EOL device



Notes on usage:

1. *Zone voltage is regulated to 19 + 1 V for any loop voltage greater than 22 V. If the loop voltage falls below 22 V, the zone voltage is approximately 1.5 V below the loop voltage. It is important to ensure that under worst-case conditions, the zone voltage is above the minimum operating voltage for the conventional detectors.*

2. *Alarm conditions are latched internally by the zone monitor. You therefore must reset the alarm even if non-latching conventional detectors are used.*

3. *The zone monitor can be used to power and control intrinsically safe detectors via safety barriers with resistance values between 300 Ohm and 350 Ohm. To use the Zone Monitor with intrinsically safe devices, cut the wire link near the DIL switch (Refer to chapter 4: Intrinsically Safe Products - 970 Series).*

4. *Manual call points can be located at any point in the zone wiring if active end-of-line monitoring with diode detector bases are used. If a 6.2k Ohm 1/3 W resistor is used*

for monitoring, manual call points must be connected between the zone monitor and the first detector (see Figure 20*).*

5. *The zone monitor includes a bi-directional isolator. Consequently a single short-circuit on the loop wiring adjacent to the zone monitor does not affect the operation of the conventional detector zone.*

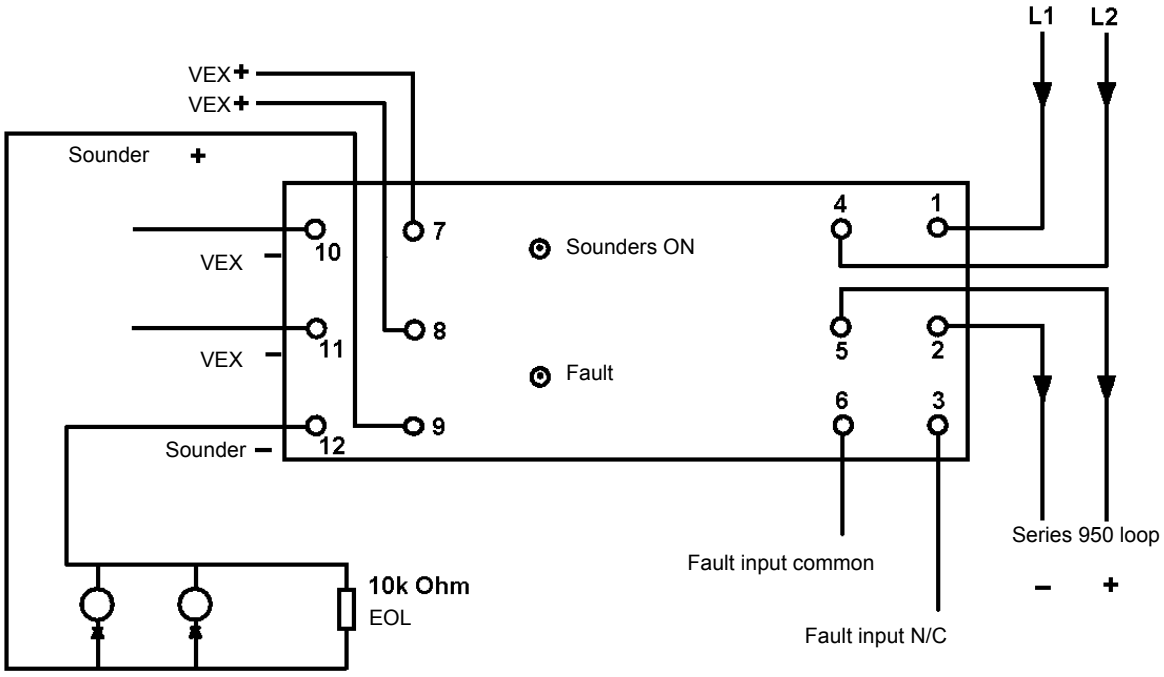
Two LEDs are visible through the top cover of the enclosure. The red LED illuminates when an alarm condition is detected. The yellow LED illuminates when the built-in isolator senses a short-circuit loop fault.

3.4.2.2. Sounder control unit – IO956D

Function:

The Series 950 DIN-rail sounder control unit is used to control the operation of a zone of externally powered sounders and to report their status to the analogue control equipment.

Figure 21: Wiring connections (Sounder control unit – DIN mount)



— *Line 1 and Line 2 are polarity insensitive but it is recommended to keep L1 negative for consistency.*

Features:

The sounder control unit allows sounders to be operated continuously or be pulsed, 1 second on, 1 second off. Sounders can be operated individually or in groups and, whichever address mode has been applied, can be synchronised when in pulsed operation.

An opto-coupled input is provided to monitor the state of the external power supply.

Electrical considerations:

The Series 950 DIN-rail sounder control unit is loop powered and operates at 14-28 VDC. It requires a local power supply of 9-50 VDC to power the external load, which can be up to 1 A.

Use a polarising diode with each alarm device (if not pre-fitted to the sounders), as sounders are operated by voltage reversal provided by a double-pole changeover relay. A miniature (TR5) fuse rated at 1 A protects the sounder circuit.

Addressing:

The Series 950 sounder control unit responds to its own individual address set with a 7-segment DIL switch. It also responds both to a group address, set by means of a 4-segment DIL switch, and to a pulsed-mode synchronisation address that is embedded in the unit.

Addresses 112 to 126 can be used as individual addresses but only if the 4-segment DIL switch is set to 127 – group addressing is then disabled. If the 4-segment DIL switch is set to any number other than 127, a fault is indicated.

In alarm conditions it might be desirable to switch more than one Sounder Control Unit simultaneously. To do this, link the units together to form a group and give them a group address that is common to all the units in the group.

Individual address setting: Set the individual address of the sounder control unit using seven segments of the eight-segment DIL switch. The eighth segment is set to 1 if it is required to disable the fault LED. Set each of the other seven segments to 0 or 1 using a small screwdriver or similar tool (refer to Table 2: DIL address settings).

Group address setting: In group mode, the Sounder Control Unit responds to an additional address, called the *group address*, which simultaneously activates groups of Sounder Control Units. Individual units continue to respond to their own addresses and report their own status from their address in the normal way. Set a group address on a four-segment DIL switch, which is factory set to 0000. A group address can be any spare address within - and only within - the range 112 to 126 inclusive. Moving one or more of the segments on the switch to 1 in accordance with the following table, sets the required group address:

Table 3: Group configuration for DIN mounted sounder controller

ADDR	1234	ADDR	1234	ADDR	1234
112	1111	117	0101	122	1010
113	0111	118	1001	123	0010
114	1011	119	0001	124	1100
115	0011	120	1110	125	0100
116	1101	121	0110	126	1000

Fault monitoring:

As well as monitoring open and short-circuit faults on the sounder wiring, the sounder control unit can also monitor the presence and polarity of the external power supply to the sounders. This is achieved by using a circuit that includes an input to monitor a volt-free, normally open contact. A wire link must be fitted if the fault contact is not used.

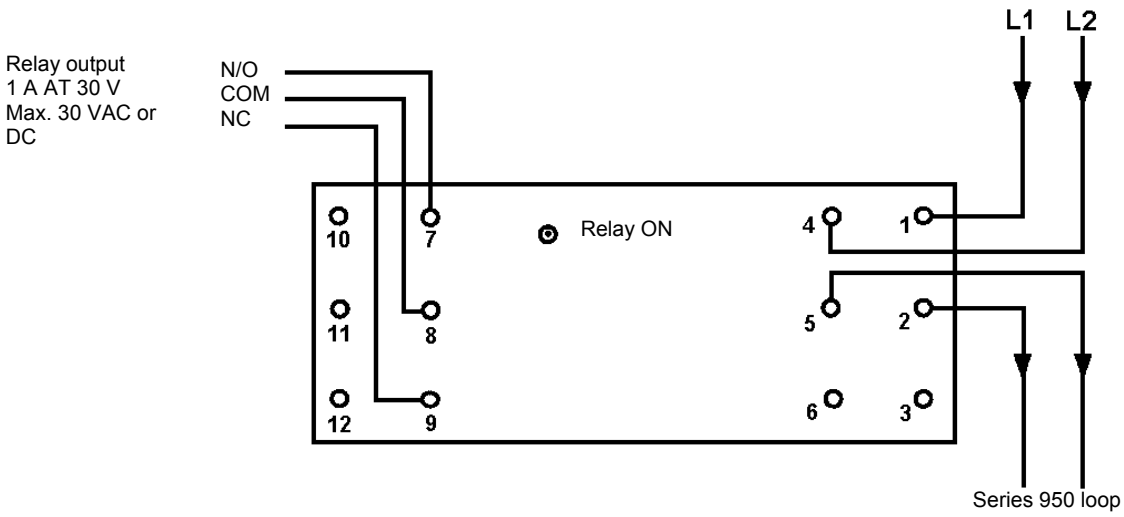
If the fault LED is not required, or the extra loop current to illuminate it, is unavailable it can be disabled by using the eighth segment of the DIL switch.

The red LED is powered from the external supply and is always enabled.

3.4.3. Input/output units

3.4.3.1. Output unit - IO955D

Figure 22: Wiring connections (output unit – DIN mount)



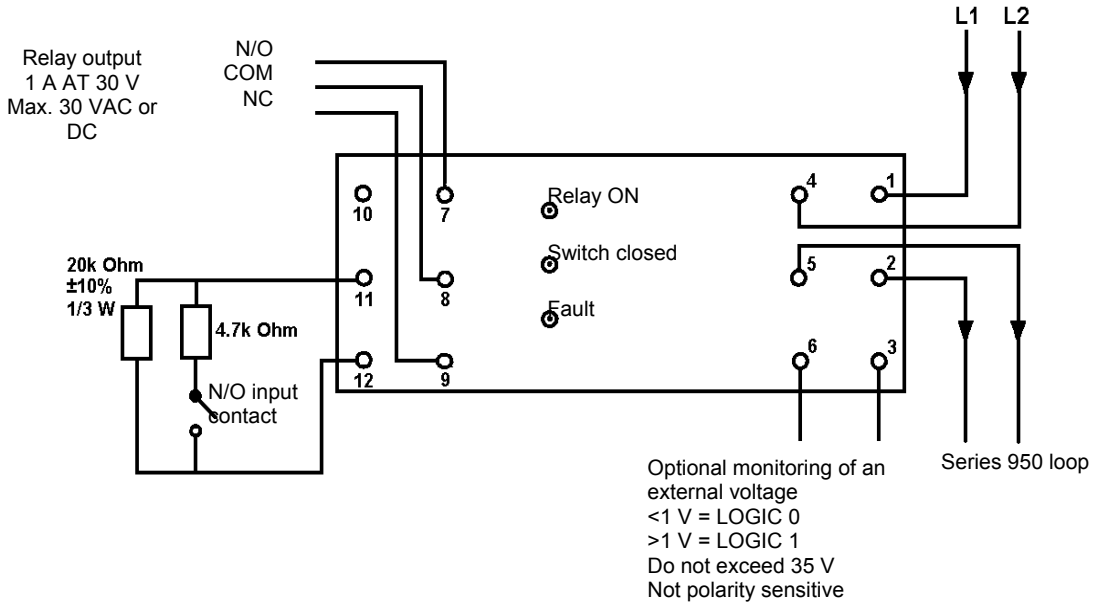
Note: Line 1 and Line 2 are polarity insensitive but it is recommended to keep L1 negative for consistency.

The Series 950 DIN-rail output unit provides a voltage-free, single pole, changeover relay output. The unit is loop powered.

One red LED is visible through the top cover of the enclosure. This LED illuminates when the relay is set. It can be disabled to reduce loop current by using the DIL switch.

3.4.3.2. Input/output unit - IO950D

Figure 23: Wiring connections (I/O unit – DIN mount)



— Line 1 and Line 2 are not polarity sensitive but it is recommended to keep L1 negative for consistency.

The Series 950 DIN-rail input/output unit provides a voltage-free, single pole, change-over relay output, a single, monitored switch input, and an unmonitored, non-polarised opto-coupled input. The unit supervises one or more normally open switches connected to a single pair of cables.

The Series 950 DIN-rail input/output unit is loop powered.

Three LEDs, two reds and one yellow, are visible through the top cover of the enclosure.

One red LED illuminates when the relay is set. The second red LED illuminates when the switch input is closed.

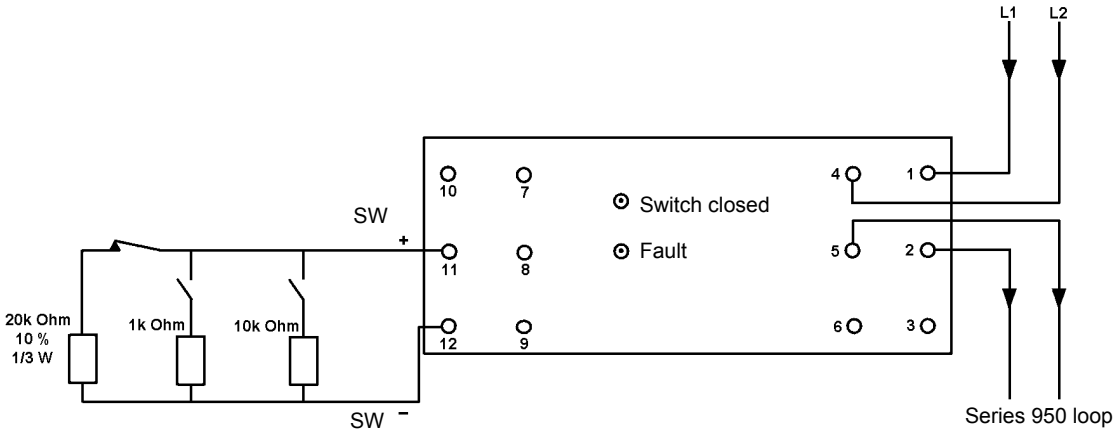
The yellow LED illuminates when a fault condition (open or short circuit) is detected.

If you do not need these LEDs, or the extra loop current to illuminate them is unavailable, they can be disabled by using the eighth segment of the DIL switch.

3.4.3.3. Switch Monitor - II952D

The Series 950 DIN-rail Switch Monitor monitors the state of one or more single pole, volt-free contacts connected on a single pair of cables, and reports the status to analogue control equipment.

Figure 24: Wiring connections (Switch Monitor – DIN mount)



Note: Line 1 and Line 2 are polarity insensitive but it is recommended to keep L1 negative for consistency.

Normaly open fault contacts
Fire contacts

Pre-alarm contacts

The Switch Monitor provides four input states to the control equipment: 'Normal', 'Fault', 'Pre-alarm' and 'Alarm'. These are derived from the switched resistive values shown in Figure 24. The switch monitor has a red LED to indicate an alarm and a yellow LED to indicate a fault condition.

The Series 950 DIN-rail Switch Monitor is loop powered and operates at 14-28 VDC. The switch monitor is designed to accept a maximum line resistance of 50 Ohm. The end-of-line resistor required is 20 kOhm.

Two LEDs, one red and one yellow, are visible through the top cover of the enclosure.

The red LED is switched by the control panel and can be illuminated when an alarm condition is detected.

The yellow LED illuminates when a fault condition (open or short circuit) is detected.

3.4.3.4. Switch Monitor Plus - II953D

Function: The Series 950 DIN-rail Switch Monitor Plus monitors the state of one or more single pole, volt free contacts connected on a single pair of cables, and reports the status to analogue control equipment. The Switch Monitor Plus has an output for resetting a remote detector and a selectable alarm delay, making it suitable for monitoring flow switches.

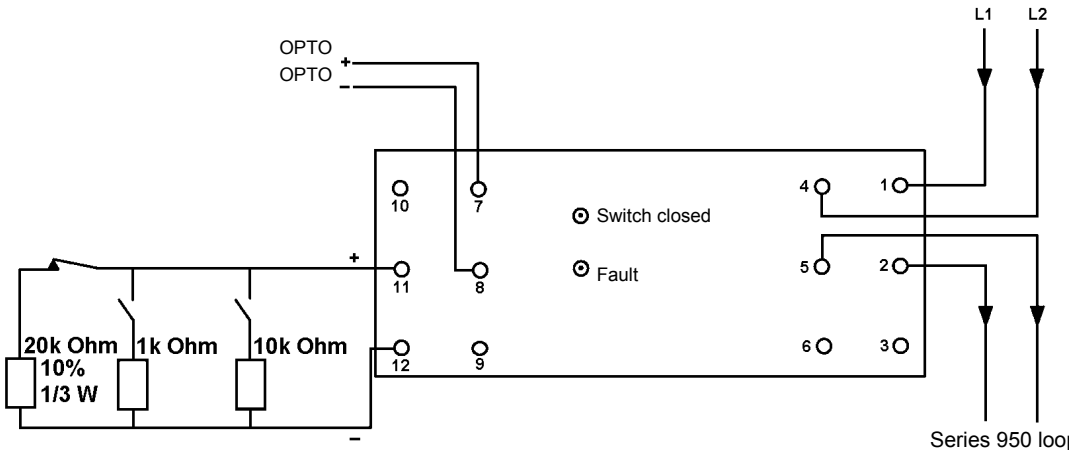
Features: The Switch Monitor Plus provides four input states to the control equipment: 'Normal', 'Fault', 'Pre-alarm' and 'Alarm'. It has a red LED to indicate an alarm and a yellow LED to indicate a fault condition. Select the 30 second delay by using the eighth bit of the DIL switch.

Electrical considerations: The Series 950 DIN-rail Switch Monitor Plus is loop powered and operates at 14-28 VDC. The Switch Monitor Plus accepts a maximum line resistance of 50 kOhm. The end-of-line resistor required is 20 kOhm. The opto-coupled reset takes the form of a current limited transistor output.

Mechanical construction: Two LEDs (one red and one yellow) are visible through the top cover of the enclosure.

The red LED is switched by the control panel and illuminates when an alarm condition is detected. The yellow LED illuminates when a fault condition (open or short circuit) is detected.

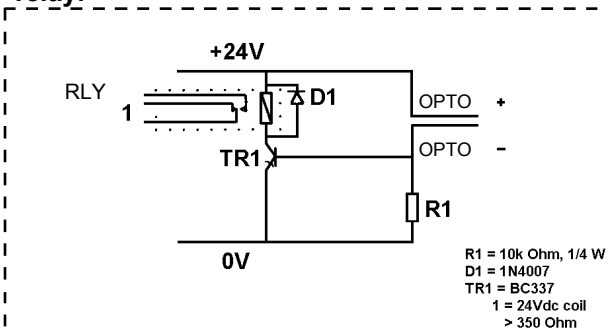
Figure 25: Wiring connections (Switch monitor plus – DIN mount)



Note: Line 1 and Line 2 are polarity insensitive but it is recommended to keep L1 negative for consistency.

Normally open fault contacts
Fire alarm contacts
Pre-alarm contacts

Typical circuit to interface opto output relay:



4. INTRINSICALLY SAFE PRODUCTS - 970 SERIES

4.1. System overview

4.1.1. System design

The design of an intrinsically safe fire detection system must only undertaken by engineers familiar with codes of practice for detection systems and hazardous area electrical systems.

The fire detection performance of the Series 970 Intrinsically Safe range is the same as that of its standard counterparts, the Series 950 range. Performance information given in the Series 950 installation section is therefore applicable to the Intrinsically Safe range.

The BASEEFA certification of the Intrinsically Safe devices covers their characteristics as components of an intrinsically safe system and indicates that they can be used with a margin of safety in such systems. The precise way to connect and configure the system is covered by an additional, "system'' certification. The system parameters, given below, detail cable parameters and permissible configurations of monitors, manual call points and safety barriers that are certified by BASEEFA. If you wish to install a system outside the parameters given, you cannot use the Apollo certification and must seek independent certification from a competent certification body.

The following points must be taken into consideration:

- Each barrier fed circuit must be a separate circuit and must not be interconnected with any other electrical circuit.

- The electrical circuit in the hazardous area must be capable of withstanding an AC test voltage of 500 V RMS to earth or frame of the apparatus.

- The installation must comply with national installation requirements.

- The capacitance and either the inductance or the resistance (L/R) ratio of the hazardous area cable must not exceed the parameters specified in the table blow.

  Table 4: Limits for energy stored in cables

Group	Capacitance (µF)	Inductance (mH)	Ratio (µH/Ohm)
II C	0.13	4.2	55
II B	0.39	12.6	165
II A	1.04	33.6	440

- The cable can be separate cables, a twin pare, a pair contained in a type ‘A’, or a type ‘B’ multi-core cable provided that the peak voltage of any circuit contained within the multi-core does not exceed 60 V.

- Special conditions might apply when using AC barriers.

- An external Light Emitting Diode (LED) can be fitted to terminals L2 and +R of a fire monitor. The surface area of the LED must lie between 20 mm² and 10 cm². The LED and its terminals must have a degree of protection of at least IP20, and must be segregated from other circuits and conductors.

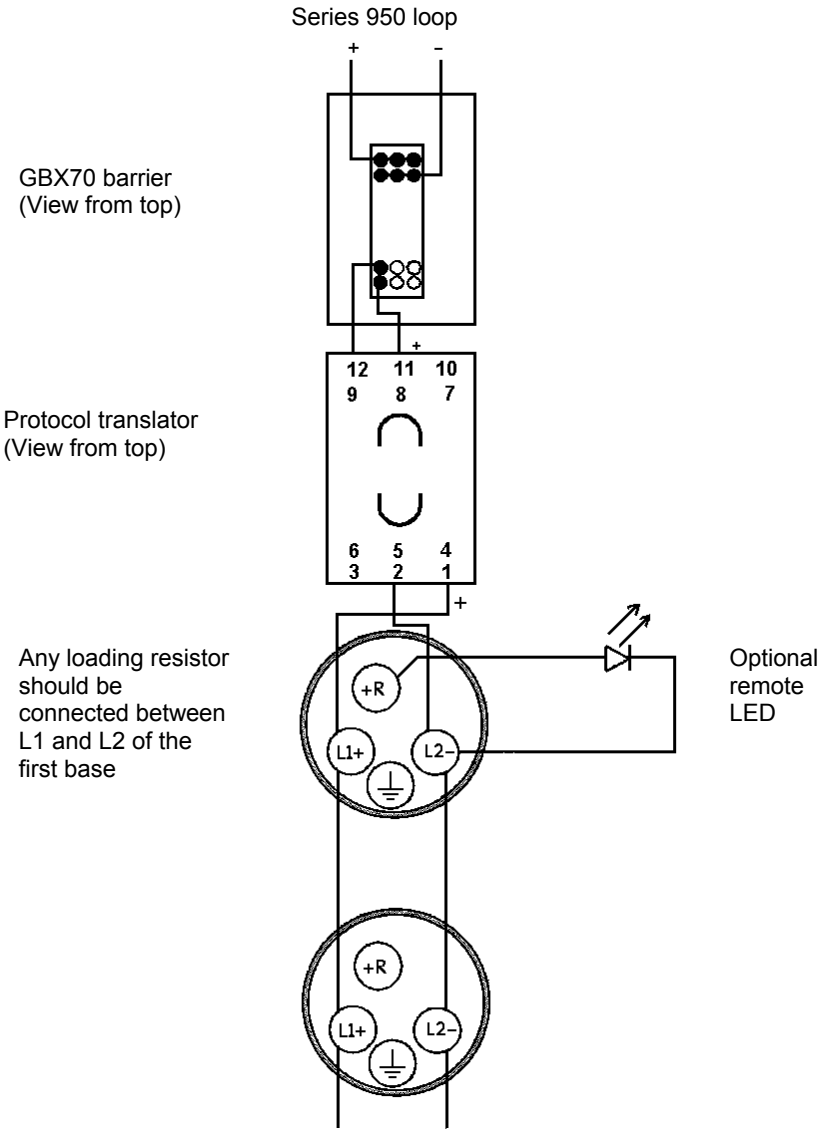
Any system installed within the parameters specified above must be marked in accordance with BS5501: Part9 (EN50 039). The marking must include at least "ApolloXP95 I.S. Fire Detection System, BASEEFA No. Ex94C2444SYST".

In safe area (standard) applications it is normal practice to connect the wiring as a loop, with both ends terminated at the control panel. In the event of an open-circuit fault it is then possible to drive both ends simultaneously. In a hazardous area ***you must not use a loop configuration*** because the potential to feed power from each end of the loop would double the available energy in the hazardous area and contravene the energy limitations of the Intrinsically Safe certification. All Series 970 Intrinsically Safe circuits must therefore be connected as spurs from the safe area loop or as radial connections from the control panel.

It is recommended, for the highest system integrity, that each Intrinsically Safe circuit is restricted to a single zone and that the connection from the safe loop to the Intrinsically Safe spur is protected on each side by Series 950 isolators. This configuration, shown in Figure 26: Schematic wiring diagram of Intrinsically Safe zone, conforms fully to the requirements of BS5839: Part I and with the draft European Guidelines prEN54: Part 14 as a single wiring fault will result in the loss of only one zone of detection.

This arrangement can include single or dual-channel translators, housed together with the critical wiring, in a robust mechanical enclosure. For further advice, please contact your local Technical Support Department at Aritech.

Figure 26: Schematic wiring diagram of Intrinsically Safe zone



4.1.2. Maximum loading

Due to the finite resistance of the safety barrier, there is a limit to the current drain that can be tolerated before the voltages on the circuit fall outside the specified limits for the Series 970 Intrinsically Safe devices. Two components of the current drain must be considered, namely the standing current of the devices themselves and the maximum drain caused by alarm LEDs being illuminated. The standing current of the devices can be calculated simply by taking the sum of the individual device currents on the circuit, as given in *chapter 6 "Loop Load Calculations"* for each product.

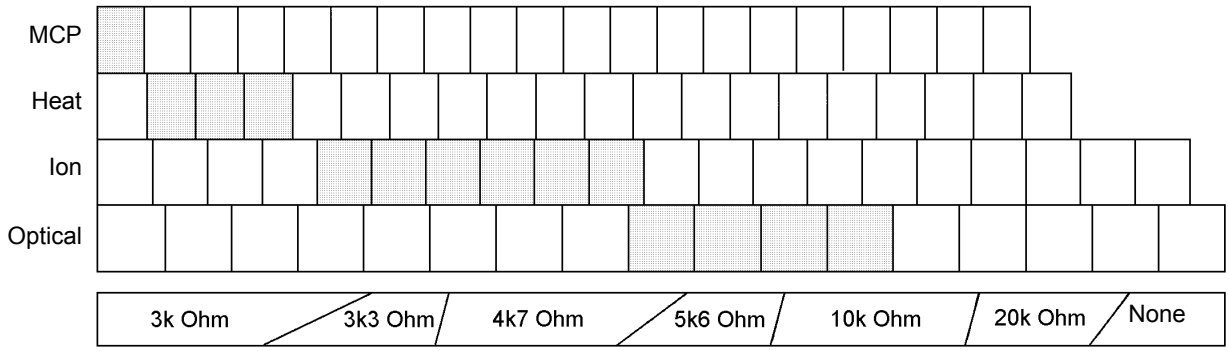
The panel software should limit the maximum number of LEDs that can be illuminated simultaneously and, in practice, it is this parameter that causes the real limit on circuit loading. The design of the LED drive circuits in the monitors is such that the addition of a remote LED will not increase the current drain on the circuit and remote LEDs can therefore be ignored in loading calculations.

Further restrictions apply when the GBX70 galvanic barrier is used with circuits having high cable capacitance. Under these conditions communication errors might occur, resulting in corrupt data or in devices failing to respond. In order to ensure reliable communication when capacitive loads are connected to these barriers, observe the following conditions:

- The total capacitive load on the barrier must not exceed 70 nF, even for systems used in gas groups.

- The total circuit (current) loading when operating at the maximum capacitive loading of 70 nF must be between 5 and 6 mA. To achieve this current on a lightly loaded circuit, a loading resistor can be used across the line in the hazardous area circuit. Choose a resistor value that gives a total current drain (Series 970 devices plus resistor current) of 5-6 mA at 14 V (See Figure 27). The system certification permits a minimum value of 3 kOhm for this shunt resistor.

Figure 27: Loading resistor diagram of an Intrinsically Safe zone



- When operating at the maximum capacitive loading of 70 nF and a current loading of 6 mA, the number of LEDs that can be illuminated simultaneously should be restricted to one. Any attempt to illuminate more than one LED when the standing current is 6 mA can result in communication errors.

- By adhering to these conditions it is possible to connect up to two intrinsically safe spurs to a loop, in addition to any safe area equipment. A spur can have up to 20 devices connected. However, the maximum number of optical detectors is restricted to 17 per spur.

- The above requirements are intended to ensure correct operation, even with long safe-area cables and below-average loop voltages. Aritech strongly recommends that these conditions are maintained wherever possible. If cable runs are short, or a small number of Intrinsically Safe spurs are involved, it will be possible to work with higher cable capacitance. Higher current loading will then be required to maintain pulse shapes. Further guidance on these cases can be obtained from your local Aritech Office.

4.1.3. Wiring and cable types

It is not permitted to connect more than one circuit in the hazardous area to any one safety barrier, and that circuit cannot be connected to any other electrical circuit.

Both separate and twin cables can be used. A pair contained in a type 'A' or 'B' multi-core cable (as defined in clause 5.3 of BS 550]: Pt 9: 1982/EN50 039) can also be used, provided that the peak voltage of any circuit contained within the multi-core does not exceed 60 V.

The capacitance and either the inductance or the inductance to resistance (L/R) ratio of the hazardous area cables must not exceed the parameters specified in Table 2. The reason for this is that energy can be stored in a cable and you must use cable where this stored energy cannot ignite an explosive atmosphere.

To calculate the total capacitance or inductance for the length of cables in the hazardous area, refer to *Table 7: Resistance, inductance and capacitance*, which gives typical per kilometre capacitance and inductance for commonly used cables

All series 950 Intrinsically Safe devices have zero equivalent capacitance and inductance.

4.2. Protocol translators

In order to enable the use of standard control and indicating equipment in Intrinsically Safe systems, you need to use a device to "translate" voltage levels from the loop driver, operating within the S950 limits, to levels compatible with the Intrinsically Safe requirements. The translator also "boosts" the current pulses returned by the Intrinsically Safe detectors, thereby ensuring compatibility with standard loop driver thresholds.

The translator is a loop-powered device that draws a low quiescent current and is therefore transparent to both the loop driver and the Intrinsically Safe detectors. As the translator is used within the safe area, i.e., before the safety barrier, no certification is necessary. Refer to Figure 26.

4.3. Safety barriers

The single channel 28 V 300 Ohm barrier is the most basic type of barrier and therefore the cheapest. The problem with these devices is that one side of the barrier must be connected to a high-integrity (safety) earth. The earth connection has no effect on the operation of the Series 970 Intrinsically Safe devices and is not needed for their correct operation. However, Aritech control and indicating equipment cannot operate with this earth connection as the control equipment incorporates earth-leakage monitoring and the earthing of the loop causes unwanted cross talk between loops. For Aritech Series analogue addressable fire panels the GBX70 (galvanically isolating barrier) must therefor be used.

Galvanically isolated barriers (also known as transformer isolated barriers) differ from conventional shunt zener barriers in that they provide electrical isolation between the input (safe area) and the output (hazardous area). This is achieved by the use of a DC-to-DC converter on the input side. This is connected to the hazardous area through a voltage- and power-limiting resistor-zener combination similar to a conventional barrier.

The galvanic isolation technique means that the circuit does not need a high integrity (safety) earth and that the intrinsically safe circuit is fully floating. By using this type of interface, you eliminate any earth problems to controling and indicating equipment.

Although galvanically isolated barriers are widely used with conventional fire detectors, the pulse response of standard products has always been too slow to be used in analogue addressable systems. However, the GBX70 has been developed as a special galvanically isolated barrier that freely transmits the Series 950 protocol pulses without introducing severe voltage drops.

This interface is available as single or dual channel versions and is recommended for all Intrinsically Safe applications. Both versions are BASEEFA certified under certificate numberEx95C2064 (the KFDO- types have replaced the earlier KHDO- types.)

The galvanically isolated barrier is a two-wire device that does not need an external power supply. Current drawn from the Series 950 loop by the barrier itself is less than 500 µA. The housing is a rail-mounted type identical to that used for the protocol translator. Refer to Figure 26 for details.

4.4. Fire monitors

4.4.1. Installation

It is important that the Series 970 Intrinsically Safe monitors are installed in such a way that all terminals and connections are protected to at least IP20 when the detector is in the base. You must take special care must with the rear of the mounting base where live metal parts (rivets) might be accessible. The required degree of protection is obtained by flush mounting the base on a flat surface.

If the base is mounted on a conduit box (e.g. BESA box or similar) whose diameter is less than 85 mm, the base must be fitted with a back plate. The use of the back plate prevents access to the metal parts and also protects the rear of the base from water ingress. A conduit box, available from Aritech, can also be used to mount Intrinsically Safe bases.

Note that the earth terminal in the base is provided for convenience where continuity of a cable sheaths or similar is required. It is not necessary for the correct operation of the monitor nor is it provided as a termination point for safety earth.

4.4.2. Mounting bases

The base for the intrinsically safe range is not identical to that for the standard range. This ensures that standard monitors cannot inadvertently be fitted to an intrinsically safe system. For full details of the Series 950 address mechanism refer to *section 3.2 Fire monitoring controllers*.

It has three double terminals and one single terminal:

L1:	Line in and out, double terminal (‘+‘)
L2:	Line in and out, double terminal (‘-’)
+R:	Remote indicator (LED) positive supply, double terminal
Single terminal:	An isolated terminal intended as a through connection point for cable shields or for an earth connection.

It is absolutely necessary to observe polarity on terminals L1and L2. L1 must always be kept positive. All intrinsically safe fire monitors are polarity sensitive.

The standard mounting base is designed so that a fire monitor fits in one way only, without snagging, using a clockwise motion with no insertion force.

All mounting bases have a locking feature whereby a socket screw on each fire monitor can be turned to locate into a fixing hole in the mounting base. This prevents the unauthorised removal of a fire monitor.

When installing fire monitors in confined spaces, 110 mm from the surface must be allowed for fitting and removal. Refer to Figure 26 “Schematic wiring diagram of Intrinsically Safe zone.

5. MARINE PRODUCTS – 950M SERIES

The Series 950 Marine range of analogue-addressable marine fire monitors offers the following:

- A low-profile design
- A high environmental performance
- Ease of installation
- Ease of cleaning and maintenance
- A continuous reporting of smoke/heat level
- Pre-alarm facility
- Alarm flag and address for fast alarm reporting
- Ease of addressing

These detectors are entirely based on the Series 950 Series fire monitors, and are installed in a similar fashion as described in the Series 950/990 installation.

6. LOOP LOAD CALCULATIONS

6.1. General

When designing a Series 900 system, it is important to ensure that the designed loop configuration continues to work within the minimum and maximum voltage parameters under worst case voltage and current conditions.

The low voltage limit is normally 20 VDC for systems that include zone monitoring units, and 17 VDC for systems without such units.

The voltages mentioned only refer to the minimum DC voltage level. The AC voltage level must be maintained at 5 V to 9 V above the DC level.

The calculation procedure and expressions shown in the following paragraphs give a rough method of checking whether the DC conditions are satisfied.

The calculations are for DC voltages only. It cannot be assumed that AC voltage levels are acceptable if the calculated DC voltage level is within specification. The attenuation of the AC voltage signals is theoretically proportional to that of the DC voltage and would in most cases be within the specification when the DC voltages are within specification limits — provided that the AC voltage levels are well above the minimum level (5 V) to begin with.

6.2. Calculation procedure for DC voltages

1. Calculate the total quiescent (standby) current for the loop devices, using *Table 5: Device quiescent current*.
2. Calculate the worst case condition for additional alarm and LED current, using *Table 6: Device alarm current*.
3. Determine the total loop resistance, using *Table 7: Resistance.*
    - The cable values given are "per core". For a two-core cable, multiply the resistance by two.

- The 10 Ohm source impedance is an approximate figure only and should be replaced by the actual impedance, if known.

4. Multiply the total current with the total resistance and subtract the result from the loop voltage. This gives the minimum voltage that a device in the worst possible position on the loop can experience.

6.2.1. Standby current

LOOP x

Table 5: Device quiescent current

STANDBY CURRENT				
Device	**Code**	**Quantity**	**Standby Current (A)**	**Total (A)**
Ionisation	DI950		0.00028	
	DI970		0.00028	
	DI990		0.00075	
Optical	DP951		0.00034	
	DP971		0.00034	
	DP991		0.00065	
Heat	DT952		0.00025	
	DT953		0.00027	
	DT972		0.00025	
	DT992		0.00075	
Multi-sensor	DP951T		0.0005	
	DP991T		0.00075	
Isolator	IU950		0.00012	
	IU950D		0.000047	
	DB960		0.000047	
	DB961		0.000047	
MCP	DM960		0.00023	
	DM970		0.00023	
	DM990		0.00060	
Loop powered beam detector	FD950 (TX)		0.010	
	FD950 (RX)		0.006	
Zone monitor	II955		0.004	
	II955D		0.004	
Loop powered sounder	AS950		0.00014	
Sounder circuit controller	IO956		0.0019	
	IO956D		0.0019	
1-Output	IO955		0.0012	
	IO955D		0.00072	
1-Channel I/O	IO950		0.0012	
	IO950D		0.0012	
3-Channel I/O	IU922		0.0001	
Mini switch monitor	II950		0.001	
Mini switch monitor with INT.	II951		0.00025	
Switch monitor	II952		0.0012	
	II952D		0.00073	
Switch monitor plus	II953		0.0012	
	II953D		0.00073	
TOTAL				

6.2.2. Alarm current

LOOP X

Table 6: Device alarm current

ALARM CURRENT Device	Quantity	Alarm Current (A)	Total (A)
Maximum number of LED's that can be switched on per loop in alarm		0.004	
TOTAL			

6.2.3. Loop resistance

Table 7: Resistance, inductance and capacitance

RESISTANCE Device	Code	Resistance				No.	Total (Ohm)
Panel source	FP1100 FP1200 FP2000	10.00				1	10.00
Isolators	IU950 IU950D DB960 DB961	0.2 0.2 0.2 0.2					
Cable		R	mH	µF		No.	Total (Ohm)
				Core to core	Core to sheath		
	2L1.0 MICC	0.017					
Note: Resistance in Ohm/m/core	2L1.5 MICC	0.011	0.534	0.19	0.21		
Inductance in mH/km	2L2.5 MICC	0.1168					
Capacitance in µF/km	FP200 1.0	0.0181					
	FP200 1.5	0.0121		0.08	0.15		
	FP200 2.5	0.0074					
(Paired by 2)	WS104	0.05					
(Paired by 2)	WC104	0.020635					
TOTAL							

6.2.4. Calculation

Table 8: Calculation formula

Calculation for minimum device voltage (v_{min}) under worst case conditions:		
Total current:	I	(sum of quiescent and alarm current)
Total resistance:	R	
Loop voltage:	V	(e.g. FP1100/1200/2000 : 27.6 V)
V_{min} = V — (I x R)		
V_{min} > = 17V — no zone monitoring units		
V_{min} > = 20V — with zone monitoring units		

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