Ditech Control Card Manual

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DI-951 Monitor Card

File reference: DI-951UN

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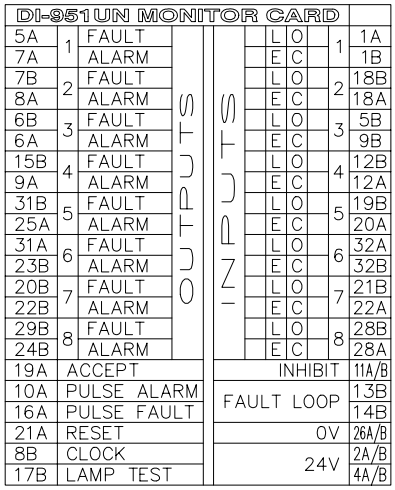
1. GENERAL

The DI-951UN monitor card is used to monitor the integrity of field cabling for input devices and powered output devices. It is used for digital inputs not immediately associated with fire detectors as these would be catered for by the DI-950 twin zone fire card. Typically it would be used to monitor simple dry contact input devices such as pressure switches, limit switches and status contacts, or it may be used to monitor powered output devices such as loops of bells, beacons and solenoids. The latter is achieved by using an external relay to handle the higher current switching required by these devices.

The unit may be set up for a number of input configurations and is capable of being used with any suitable 330 Ω shunt barrier when line monitoring in the hazardous area. The outputs are configurable to be either latching or non-latching, which ever is suitable for the type of input being monitored.

Logic input signals to the card are of the active low type and inputs must be pulled down to 0 V to signal a true condition. Outputs are also active low capable of sinking up to 500 mA.

2. CARD INPUTS AND OUTPUTS

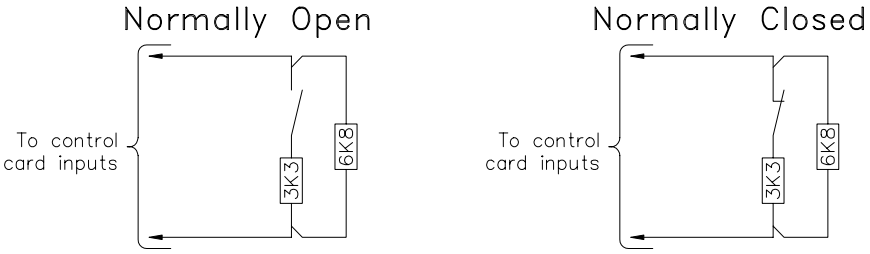


2.1 PRIMARY INPUTS

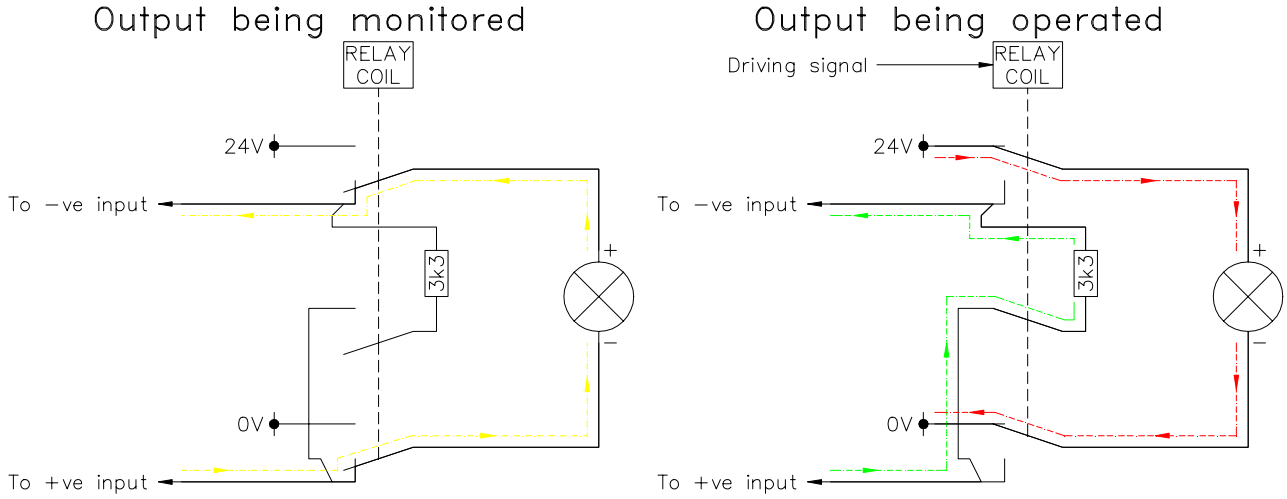
There are eight inputs to the control card. These may be selected as being normally open or normally closed. Each input is monitored for open circuit, short circuit and alarm conditions as a minimum. Optionally each input may be configured for detection of earth leakage faults.

The earth leakage detection is based on a differential current method for a closed loop system. When an input is wired correctly then the current going out into the field and the current returning from the field will match. There may be circumstances where water ingress or bad earth connections may cause some of the current to 'leak' away, thus making a differential. If the outward current differs from the inward current by more than 30 mA then an earth leakage fault is flagged.

The card may be used in two ways, either to monitor inputs or to monitor outputs. Monitoring inputs needs no additional circuitry and should be wired in the following manner:

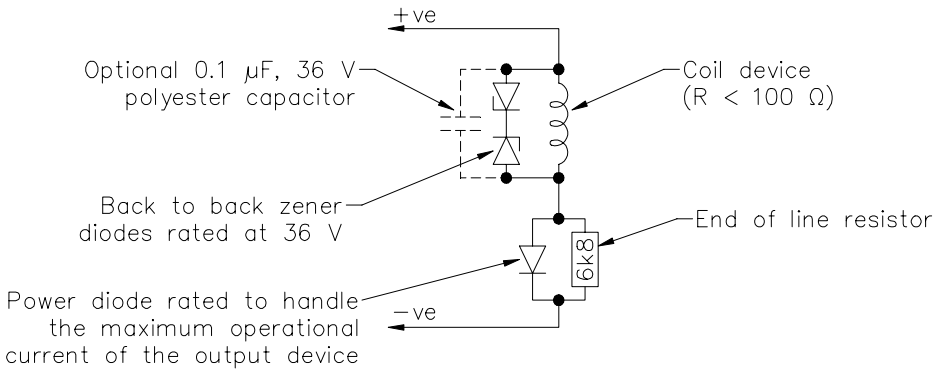


Monitoring of outputs needs to be done by using an additional relay, either on a DI-944 relay card or using rail mounted relays external to the rack if the switching current is more than 1 amp. The method of monitoring output devices relies on a polarity reversal scheme.



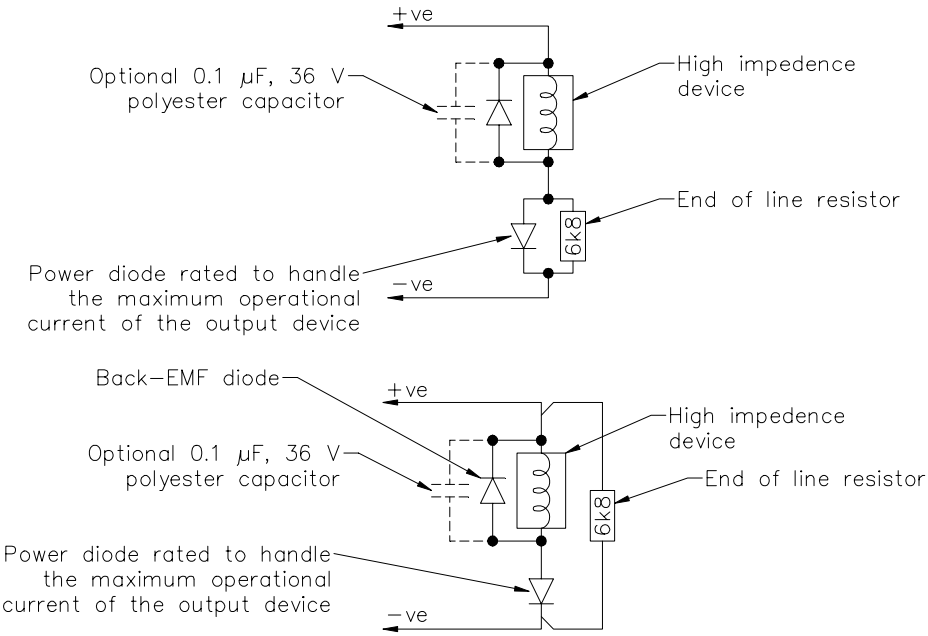
As can be seen from the diagram above, when the device is being monitored the monitoring signal goes through the field cabling and through the device. When the device is in use then the polarity reverses and the monitor card is put into alarm by switching in the 3.3 kΩ resistor.

There are two generic types of output device which can be monitored, those with a low resistance such as solenoids and bells, and those with a higher resistance such as piezo sounders and beacons with control electronics within them. With simple low resistance devices the integrity of the coil itself can be monitored whereas with high impedance devices only the cables up to the device can be monitored.

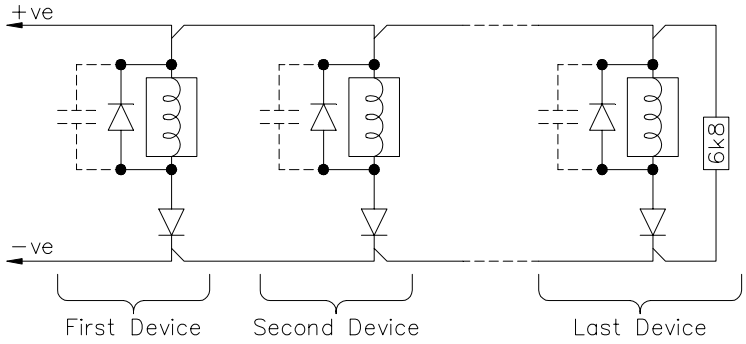


In the above diagram the optional 0.1 µF, 36 V capacitor need only be fitted as extra protection against RFI or EMF spikes which may harm the control card when high inductance items are being monitored. The pair of Zener diodes act as back-EMF diodes which will not conduct until the back-EMF voltage exceeds 36 V dc, thus forcing the 24 V monitoring signal through the coil. If

monitoring through the coil is not required or the device to be monitored is of high impedance then the either of the following circuits may be used.



If more than one of the devices to be monitored are on a loop then the following loop scheme must be employed.



Once again, the capacitors are optional and the power diode must be capable of handling the maximum operational current of the device. In this arrangement only the loop cabling can be monitored, not the devices themselves.

2.2 SECONDARY INPUTS

External Accept

When a new alarm occurs on the card, be it alarm or fault, the appropriate LED will flash. The new alarm may be acknowledged by pulling the external accept line low (0 V) which will stop the flashing and make the LED steady.

External Reset

The card may be reset either by pressing the reset button on the front (which will also do a lamp test) or by pulling the external reset line low (0 V). In either case all outputs from the card will reset to a healthy condition for one second and only return to an alarm or fault condition should the input still be in an alarm or fault state.

External Clock

When the LEDs flash for new alarms or faults they are synchronised to other flashing LEDs on other Ditech control cards within the same system. This synchronisation is controlled by the external clock input.

External Lamp Test
When this input is pulled low (0 V) it forces all front panel indicators on, thus allowing the condition of the LEDs to be confirmed.

External Inhibit
When this input is pulled low (0 V) all outputs are forced into a non-alarm state. If a channel alarm or fault is detected then the appropriate LEDs will flash but will not cause any alarm outputs to trigger. The flashing LEDs will not go steady when the external accept input is activated as would normally happen when the card is not inhibited. The inhibit LED on the front panel will illuminate to indicate the condition.

2.3 PRIMARY OUTPUTS

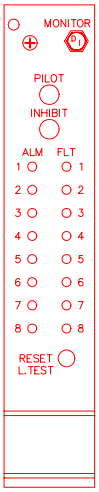
Channel Alarm Outputs
These outputs are active low and capable of driving up to 500 mA each. When a channel goes into alarm then this output will drop to 0 V. When the input returns to a normal condition the output will only reset automatically if the latching function has not been selected. If the alarms are latched then they will have to be reset before the output will return to normal. All outputs will be forced to an inactive state during the reset cycle regardless of the state of the input.

Channel Fault Outputs
These outputs are active low and, as with the alarm outputs, are capable of driving up to 500 mA each. When a channel goes into fault then this output will drop to 0 V. When an input comes out of fault the card will have to be reset as all these outputs latch their fault conditions. All outputs will be forced to an inactive state during the reset cycle regardless of the state of the input.

2.4 SECONDARY OUTPUTS

Fault Relay
The fault relay is normally energised and will de-energise on failure of card power input, onboard regulator or if any of the channels detects a fault. The fault output is most commonly used in conjunction with the system fault loop which gives a common indication of the operational state of the complete system.

2.5 FRONT PANEL INDICATORS



There are 18 indicators on the front panel. The large green pilot LED indicates that the card power is within tolerance and that the power regulation components are functioning correctly. The large yellow inhibit LED will illuminate whenever the external inhibit input is active.

The 8 smaller red and yellow LEDs reflect the condition of the eight channels. When a red channel LED is illuminated it indicates that the channel has gone into alarm, and when a yellow channel LED is illuminated then the channel is in fault.

If a fresh alarm or fault is detected then the appropriate LED will flash and a pulse signal (alarm or fault) is sent to the DI-952 audio card to trigger the panel audible alarm. The flashing will only stop when either the card receives an accept signal or the card is reset. With the latter, if the alarm or fault still exists after the reset is over, then the LED will flash again just as if the alarm was new.

2.6 FRONT PANEL CONTROLS

The only front panel control is the combined lamp test and reset button which illuminates the front panel LEDs and attempts a reset upon the card when depressed.

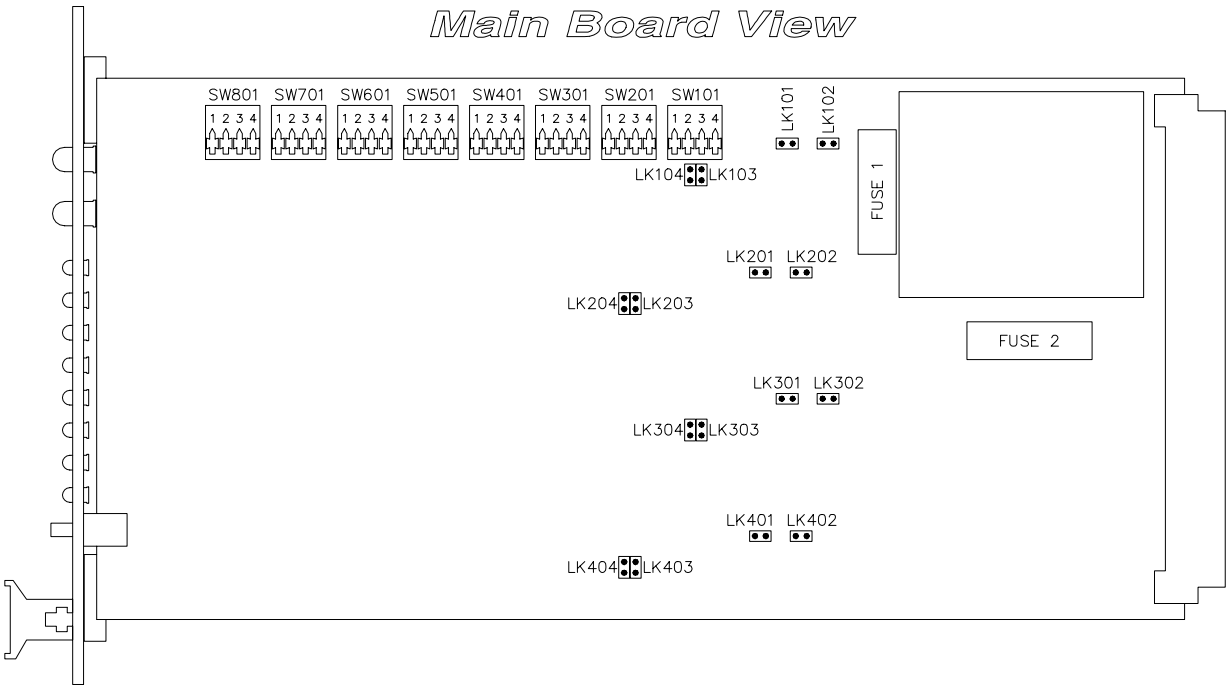
3. OPERATION

The card is programmed by means of eight 4 way DIL switches on the top edge of the card. The switches are numbered SW101 to SW801 and correspond to the 8 channels. These switches are used to disable the earth fault monitoring, disable the channel and to make the outputs non-latching. The fourth switch is not used. This is summarised in the table below.

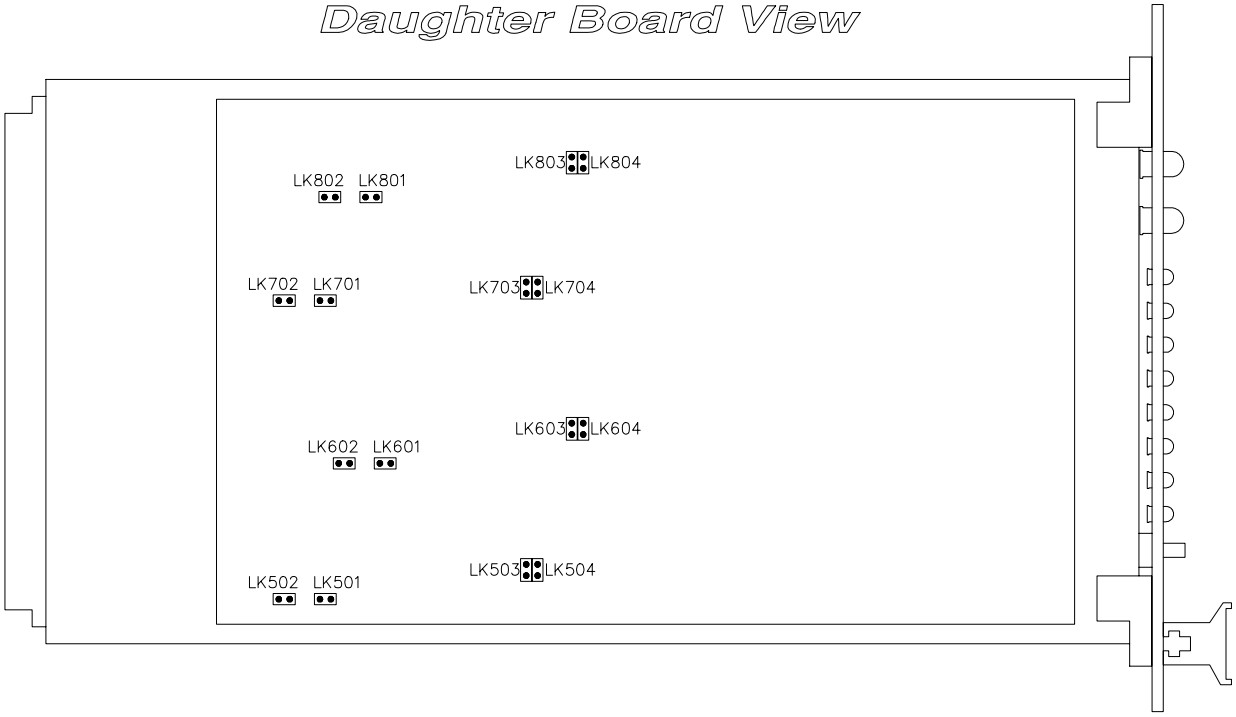
Switch no.	Switch up (on)	Switch down (off)
1	Disable earth fault detection	Enable earth fault detection
2	Disable the channel	Enable the channel
3	Alarm non-latching	Alarm latched
4	No function	No function

There are also a number of links on the card. These, as with the other components, are referenced in the general way, e.g. LK204. This references link 4 for channel 2 and so in a similar way link LK*n*0*y* would be link number *y* for channel *n*. The links are on both the main board and the daughter board. Channels 1 to 4 are on the main board and 5 to 8 are on the daughter board, which itself is mounted to the reverse side of the main board.

Main Board View

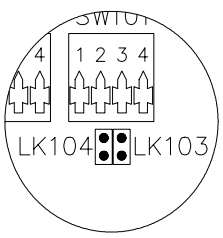


Daughter Board View

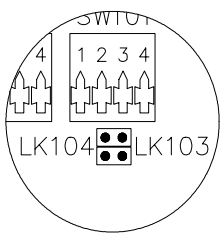


Links LK*n*03 and LK*n*04 are a pair and should be fitted vertically for normally open input circuits and horizontally for normally closed inputs, as shown.

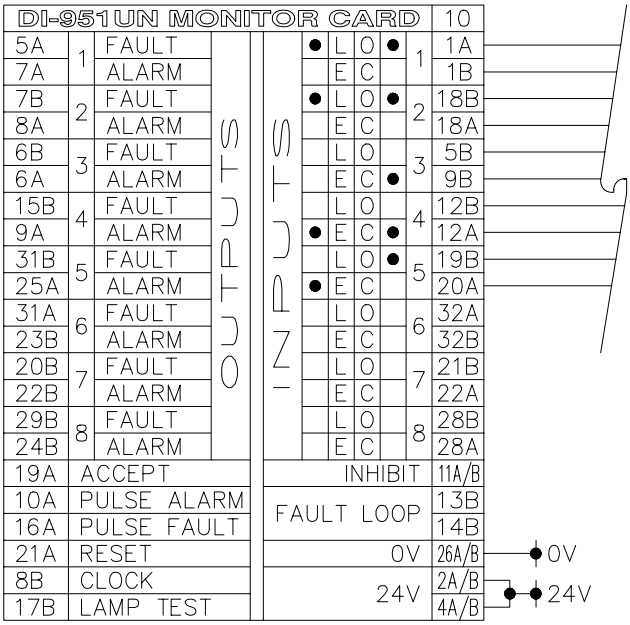
Normally Open



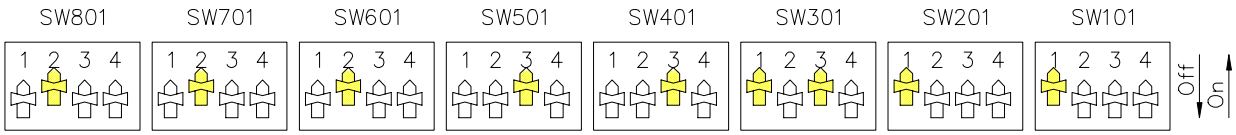
Normally Closed



To program the card, consult the diagram shown on the appropriate wiring drawing. An example extract is shown below.



The above shows a monitor card with channels 1 to 5 being used and so channels 6, 7 and 8 must be disabled (switch 2 on SW601, SW701 and SW801 moved up). It also shows a dot in some of the "L" boxes indicating that those channels are latched and so the remaining active channels must have their latching option deactivated (switch 3 on SW301, SW401 and SW501 moved up). A dot is shown in either the "O" box or the "C" box of each of the active channels indicating whether it ought to be set up for normally open (O) or normally closed (C) operation. Finally, some of the "E" boxes are filled so enabling the earth fault detection on those channels. To do this switch 1 on SW101, SW201 and SW301 must be moved up to disable this facility leaving it enabled on the correct channels.



NOTE: Before programming starts all the switches must be turned off to avoid unexpected operation.

There is another pair of links associated with each channel, LK*n*01 and LK*n*02. These are only fitted when the card input is being used with a shunt safety barrier for intrinsically safe circuits. The barriers may be of two types but it is recommended that the dual channel type is used, for example the MTL-779 or similar, which has a 300 Ω resistance in each channel. Some shunt barriers have the return connection electrically connected to the intrinsically safe earth point, for example on the MTL-728 or similar. This would cause the earth leakage detection to be continuously activated and so if single channel barriers have to be used then the earth leakage should be disabled. In addition, only LK*n*01 should be fitted when single channel barriers are being used.

The links are summarised below:

Link No.	Description	Fitted	Not fitted
LK*n*01	Positive input channel	Only when a 300 Ω barrier is in the positive channel	When no intrinsic safety barrier is being used
LK*n*02	Negative input channel	Only when a 300 Ω dual channel barrier is being used	When no intrinsic barrier is being used
LK*n*03, LK*n*04	Normally open/closed selection	**Vertically:** Input normally open **Horizontally:** Input normally closed	Input channel will not function and will be in fault

3.1 FAULT FINDING

There may be times that the card appears not to behave as expected. The most typical characteristic is that the fault on a particular channel will not go out:

1. Confirm that the channel is actually being used by consulting the rack wiring diagram. Check the setting of switch 2 on SW*n*01. It may have to be disabled. If a disabled channel still shows fault then the card is faulty.

2. If the channel is enabled correctly, move switch 1 on SW*n*01 up to disable the earth leakage detection. If the channel returns to normal when the card is reset then the problem lies with the field cabling. An earth fault has developed somewhere and should to be investigated.

3. If the channel is still in fault then fit a 6.8 kΩ resistor in the field wiring terminals in the equipment enclosure (disconnect the field wires first and leave switch 1 in the up position). If the channel goes normal when reset then the problem is with the field cabling. Measure the resistance of the cables with a meter and check for open and short circuit faults.

4. If the fault persists then there is either a problem with the card of with the cabinet wiring. Change the card for a new one and set the new one up to match the settings on the existing card. If the new card behaves normally then the card was faulty. Reset switch 1 on SW*n*01 back down to re-enable the earth fault monitoring.

5. If the fault persists then the cabinet or rack wiring is at fault.

Another common fault is that the card is permanently in alarm.

1. Remove the card from the rack and check that links LK*n*03 and LK*n*04 are fitted in the correct orientation - vertical for normally open inputs, horizontal for normally closed inputs.

2. Disconnect the field wires and check the resistance with a meter. If the resistance is in the region of 3.3 kΩ and the input is configured for normally open then either the device being monitored is actually in alarm or the end of line resistors have been fitted incorrectly. Similarly if the resistance is in the region of 6.8 kΩ and the input is configured for normally closed operation then the same is true.

3. If all the wiring is correct and the card is set up correctly then swap the card for one configured in the same way. If the problem goes away then the card is faulty.

4. If the problem remains then there is a rack or cabinet wiring problem.

4. SPECIFICATION

Mechanical

Width	25.4 mm (5 HP)
Height	128 mm
Depth	247 mm

Connections

DIN41612 64 way A/B male connector

Electrical

Logic outputs	500 mA sink to 0 V when active 12 V dc when inactive
Fault Relay	Single pole normally open (closed under healthy conditions) Normally energised, de-energising on fault, non-inductive
Power (Estimated)	18-35 V dc 132 mA maximum operation 102 mA during lamp test 41 mA minimum