

***Ditech Control Card Manual***

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***DI-950 Twin Zone Fire Card***

*File reference: DI-950*

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## 1. GENERAL

The DI-950 twin zone fire card is a single PCB which can decide the output from several different types of fire detectors (heat, smoke, UV, etc) and pass a valid alarm signal to executive logic which directly controls alarms and automatic fire extinguishing equipment.

The card contains two identical electrical circuits, permitting two zones to be monitored independently. Each half contains comprehensive line monitoring circuits and can be powered from two independent supplies, so reducing the likelihood of spurious alarms due to line faults or power supply failure.

System operation may be checked at any time from the front panel by isolating the card from the executive logic and simulating an alarm condition.

Alarm and fault conditions are latched and may be reset from the front panel or from the executive control logic.

All input and output connections are made to the card via a 64 way DIN41612 edge connector. This connector is a separate assembly giving superior reliability over an arrangement of gold plated 'fingers'. Logic signals received from and sent to other cards are active low; a logical 'one' being represented by a voltage of approximately 1 V and logical 'Zero' by a high output impedance or an open circuit.

## 2. INPUTS AND OUTPUTS

| DI-950 TWIN ZONE FIRE CARD |              |      |              |         |     |
|----------------------------|--------------|------|--------------|---------|-----|
| ZONE 1                     |              |      |              |         |     |
| 4/5A                       | 0V           | DET. | ALARM RELAYS | N/C     | 12B |
| 16B                        | 20V          |      |              | N/O     | 11B |
| 4B                         | 24V          |      |              | C       | 10B |
| 16A                        | TEST O/P     |      |              | N/C     | 14B |
| 5B                         | TEST ENABLED |      |              | N/O     | 15B |
| 17B                        | TEST I/P     |      | C            | 13B     |     |
| 7A                         | ACCEPT ALM.  |      | CONT. ALM.   | 14A     |     |
| 13A                        | PULSE ALARM  |      | FLASH ALM.   | 7B      |     |
| 12A                        | PULSE FAULT  |      | FLT          | C 9B    |     |
| 6B                         | EXT. RESET   |      | N/C          | 8B      |     |
| 6A                         | 1 SEC I/P    |      | 0V           | 3A/3B   |     |
| 8A                         | EXT. L. TEST |      | 24V          | 1A/2A   |     |
| 10A                        | MOD. INHBTD  |      |              | 1B/2B   |     |
| 11A                        | EXT. INHIBIT |      |              |         |     |
| ZONE 2                     |              |      |              |         |     |
| 28A                        | 0V           | DET. | ALARM RELAYS | N/C     | 19B |
| 24A                        | 20V          |      |              | N/O     | 18B |
| 29B                        | 24V          |      |              | C       | 20B |
| 25A                        | TEST O/P     |      |              | N/C     | 21B |
| 27A                        | TEST ENABLED |      |              | N/O     | 22B |
| 22A                        | TEST I/P     |      | C            | 23B     |     |
| 26B                        | ACCEPT ALM.  |      | CONT. ALM.   | 21A     |     |
| 20A                        | PULSE ALARM  |      | FLASH ALM.   | 23A     |     |
| 19A                        | PULSE FAULT  |      | FLT          | C 24B   |     |
| 28B                        | EXT. RESET   |      | N/C          | 25B     |     |
| 26A                        | 1 SEC I/P    |      | 0V           | 30A/30B |     |
| 27B                        | EXT. L. TEST |      | 24V          | 31A/32A |     |
| 17A                        | MOD. INHBTD  |      |              | 31B/32B |     |
| 18A                        | EXT. INHIBIT |      |              |         |     |

### 2.1 POWER SUPPLIES

There are two power inputs to the card, one for each zone. Both are protected against over voltage and reverse polarity to avoid damaging the card. Should the voltage exceed the 35 V threshold then the card fuse will blow.

## 2.2 PRIMARY INPUTS

Since both zones are functionally identical, only Zone 1 will be described. References to Zone 2 will be shown in brackets thus: Zone 1 (2).

There are four connections that may be associated with the field equipment. Most field equipment, however, will only use two of them *Detector +ve* and *Detector 0 V*.

### ***Detector +ve and Detector 0 V***

Most field equipment, typically smoke detectors, heat detectors and manual alarm call points, are loop powered. The *Detector +ve* output is a regulated 20 V nominal output, with reference to *Detector 0 V*.

The *Detector +ve* line is monitored for both open and short circuit faults. These are indicated on the front panel by small yellow LEDs.

### ***Optional 24 V Output For Three Wire Systems***

This output is used in conjunction with UV or IR detectors and provides these sensors with a power supply. The voltage is approximately 1 V lower than the supply and hence can vary between 17 V and 34 V depending on the supply.

The line is monitored and protected. Current is inherently limited to approximately 1.5 A but if it exceeds 700 mA, a short circuit condition will be flagged, and the supply shut down as though a short circuit had occurred on the detector line. A reset must then be applied to clear the condition. A reset applied at any time will cause the supply to shut down for the duration of the reset signal. The purpose of this is to clear down a UV detector if used. If Link 3 (14) is installed, this O/P will shut down in the 'Isolate' mode.

### ***OI Test***

This output is only used with UV detectors and, if suitably linked on the card, will sink to 0 V whenever the 'Test Fire' button on the front panel is depressed. The effect within the detector is to illuminate a small UV lamp, so testing all elements in the detector system. This output is not monitored for open or short circuit faults.

## 2.3 SECONDARY INPUTS

This group of inputs, repeated for both zones, are primarily associated with internal system logic functions. They are not normally directly accessible externally from the control rack. All inputs are active low and will rise to 12 V when inactive.

### ***External Reset***

This input is used to attempt a reset on the fire zone and the detector it is connected to. It will turn off all power to the connected field equipment and reset all alarm and fault latches in that zone. For the duration of the external reset, the zone being reset will be forced into a healthy condition, i.e. green pilot LED illuminates and the fault relay energises.

If, after the reset is over, the alarm or fault conditions still persist then the card will register them and activate its outputs as expected.

### ***Accept Alarm***

This input accepts a momentarily 0 V signal and is used as an acknowledgement that an alarm condition is present. In the event of an alarm condition, the red fire LED on the front panel will flash and the *flashing alarm* output will pulse in synchronism with the clock pulse signal. This will continue until the *accept alarm* input signal is received, then the red fire LED will remain steady and the *flashing alarm* output will be constantly active. This condition will remain until a reset is received.

### ***Clock Pulse***

The clock pulse is a nominal 1 Hz oscillating signal which is usually generated by the DI-952 Audio card. It is used to synchronise all flashing alarms on the control cards within a control system. The clock pulse input expects to be toggled continually between 0 V and 12 V dc. When required, the signal will be ANDed with the appropriate card logic to let the operators visually differentiate between alarms which have been acknowledged and those that have not.

### ***External Inhibit***

This input causes the card to operate as normal with respect to indications, but alarms and faults are not latched, and all alarm outputs are not activated for the duration of the inhibit condition. In addition to this the *module inhibited* output goes to 0 V to allow remote annunciation, or subsequent logic, as a result of the inhibit.

### ***External Lamp Test***

When this input goes active, all LEDs on the front panel relating to the zone illuminate, so verifying their operation. The same operation can be performed locally with the Reset button on the front panel.

### ***Fault Relay Output***

This relay output consists of a single pair of contacts electrically isolated from the rest of the card which under non-fault conditions are normally closed. If a fault or a power failure should occur, these contacts open. Once the fault condition has been cleared, the contacts can be closed again by resetting the card.

### ***Pulse Fault***

This output pulses active low once only when the fault relay de-energises. Normally the output is at a nominal 12 V dc. The pulse duration is approximately 1 second and is usually combined with other control cards and used to notify the DI-952 Audio card that a fault has just occurred.

**NOTE: The way by which the pulse fault output is generated relies on faults occurring at intervals of no less than two minutes.**

### ***Pulse Alarm***

This output pulses active low once only if an alarm condition is detected. The output is normally at a nominal 12 V in the non-alarm state. The pulse duration is approximately 1 second and is normally combined with other control cards to notify the DI-952 Audio card that an alarm has just occurred.

**NOTE: The way by which the pulse alarm output is generated relies on alarms occurring at intervals of no less than two minutes.**

## **2.4 PRIMARY OUTPUTS**

Outputs are of two types. Volt free outputs from relay contacts and active low current sinking transistor outputs. There are no differences between the two zones on the card and so the following description covers both sets of outputs.

### ***Fire Relay Output***

These relay outputs consist of a pair of change over contacts which change state when the card enters an alarm condition. These contacts are isolated from one another and the rest of the card, and are rated for 2 amps at 30 V dc, non-inductive.

When the zone goes into alarm, the contacts change state immediately. During a reset or inhibit function, however, they will revert back to a non-alarm (de-energised) state.

### **Flashing Alarm**

This is an active low output which pulses true in synchronism with the clock pulse input when an alarm condition is detected. Once the Accept Alarm input signal has been received, this output ceases pulsing and remains true (0 V) until the card is reset.

### **Continuous Alarm**

This is an active low output which becomes true (0 V) when the card detects an alarm condition and remains true until the card is reset. The output is rated at 500 mA and may be used to drive other logic functions within the system, or to directly drive output relays.

### **Module Inhibit**

This is an active low output which becomes true under any of the following conditions:

1. *External inhibit* input is active.
2. Three position front panel switch in *isolate* position.

### **Test Enabled**

This is an active low output which becomes true if the three position front panel switch is in the *Test* position.

## **2.5 ANALOGUE OUTPUT**

This facility will provide a voltage output which may be used for direct connection to a suitably configured A/D converter. The input impedance of such a device must not be less than 25 k $\Omega$ .

| CONDITION   | OUTPUT |
|-------------|--------|
| Normal      | 3.83 V |
| Alarm       | 7.14 V |
| Fault       | 1.05 V |
| Fault/Alarm | 2.75 V |

This facility is provided if the following components and links are fitted.

| ZONE 1 | ZONE 2 |
|--------|--------|
| R113   | R117   |
| R114   | R118   |
| R115   | R119   |
| R116   | R120   |
| L15    | L16    |

This feature uses the fault contact and first set of alarm contacts to generate the voltage signals and therefore only the second set of alarm contacts may be used for volt free operation. If the above components are removed all relay contacts become available.

## 2.6 FRONT PANEL INDICATORS



Each zone has 5 LEDs on the front panel which indicate card status. All indicators can be illuminated for test purposes by use of the associated Reset/Lamp Test button on the front panel or by activating the external lamp test input.

### Fire LED

This is a red LED which reflects the state of the *flashing alarm* output. When an alarm condition is detected, this indicator will flash until an *accept alarm* input signal is received. The indicator will then remain on until the card is reset.

### Fault LED

This is an amber LED which illuminates in the event of any one of the following conditions:

1. Short circuit fault.
2. Open circuit fault.
3. 3 position switch is in 'Isolate' position.
4. 3 position switch is in 'Test' position.

Once the fault condition has been removed, the LED may be extinguished by resetting the card.

### Short Circuit 's/c' LED

This is a small amber LED which illuminates in the event of a short circuit being detected on either the detector +ve line or the optional 24 V output line. Once the short circuit condition has been removed, the LED may be extinguished by resetting the card.

### Open Circuit 'o/c' LED

This is a small amber LED which illuminates in the event of an open circuit being detected on the detector +ve line. Once the open circuit condition has been removed, the LED may be extinguished by resetting the card.

### Pilot LED

This is a green LED which reflects the state of the fault relay. Normally the LED is on to indicate that power is applied and that the fault relay is energised. Any one of the following conditions, however, will cause the fault relay to de-energise and the pilot LED to extinguish:

1. Power failure of either A or B supply.
2. Open circuit detector +ve line.
3. Short circuit detector +ve line.
4. Short circuit optional +24 V output.
5. 3 position front panel switch in 'Isolate' position.
6. 3 position front panel switch in 'Test' position.
7. 'External Inhibit' input active.

## 2.7 FRONT PANEL SWITCH FUNCTIONS

The front panel switches are in two identical groups, each group consisting of three push buttons and one three position toggle switch, all controlling a single zone.

### Test Fault Push Button

This button only functions when the three position switch is in the *isolate* or *test* position. When operated, this button places a short circuit on the detector +ve line simulating a line short circuit fault.

### **Test Fire Push Button**

This button only functions when the three position switch is in the *isolate* or *test* position. When operated, this button can have one of two effects, depending on the position of links.

**1. Link 2 Fitted (Link 17 for Zone 2)**

Operating the Test Fire button will cause a resistor to be connected between the detector +ve and detector 0 V lines so simulating an alarm condition.

**2. Link 4 Fitted (Link 18 for Zone 2)**

Operating the Test Fire button will cause the OI Test line to be connected to 0 V, so operating the small UV lamp within the remote UV detector and so simulating the UV light given off in a fire.

### **Reset/Lamp Test Push Button**

This button has a dual effect of resetting the card and illuminating all the LEDs on the front panel associated with the zone, so permitting their operation to be verified. When the card is being reset all fault and alarm latches and relays will revert back to a healthy state and power will be removed from the detector inputs. Should an alarm or fault condition persist once the reset is completed then the card will react accordingly.

### **Test/Isolate Switch**

This is a three position toggle switch which facilitates testing of the card while connected into the system.

#### **Normal Position**

This is the normal operating position and should always be selected unless maintenance or tests are in progress which might cause the spurious generation of an alarm condition.

#### **Test Position**

In this position the 'Test Fault' and 'Test Fire' buttons on the front panel are armed, so permitting card operation to be verified. Selection of this position causes the following:

1. The 'Test Fault' and 'Test Fire' push buttons are armed.
2. The fault relay drops out and the Pilot LED is extinguished.
3. Fault LED illuminates.
4. The pulse fault output pulses active low.
5. The test enabled output becomes active low.

#### **Isolate Position**

The 'Isolate' position has all the effects of the 'Test' position plus the following:

1. The module inhibit output becomes active low.
2. The continuous alarm output is suppressed.
3. The pulse alarm output is suppressed.
4. The short circuit, open circuit and alarm latches are prevented from locking and only remain in their active state as long as the triggering condition remains present.
5. If link LK3 is fitted, the optional 24 V output will be shut down.

The purpose of the 'Isolate' position is to prevent the card from asserting pulse alarm output or continuous alarm output and also permitting it to be fully checked out without having to disable the entire system.

### 3. OPERATION

Each zone on the card has 5 wire links and 1 potentiometer, permitting it to be tailored to different sensors and systems.

#### 3.1 LINK SETTINGS AND OPTIONS

##### ***Link 1 (Link 7)***

This link must be fitted only when Zone 1 (Zone 2) is being used with a typical 330  $\Omega$  intrinsic safety shunt barrier. If no intrinsically safe equipment is attached to the zone then this link must not be fitted.

##### ***Link 2 (Link 17) And Link 4 (Link 18)***

When Link 2 (Link 17) is fitted, operation of the *test* push button will simulate a detector going into alarm directly at the card.

When Link 4 (Link 18) is fitted, operation of the *test* push button pulls the *oi test* output low. This output, used in conjunction with selected UV detectors, will trigger the detector itself to go into alarm. The card should respond as normal but with the added advantage of testing the detector and field cabling too.

Only one of either Link 2 (Link 17) or Link 4 (Link 18) may be fitted. The default is to fit Link 2 (Link 17). If the links are not fitted at all then the *test* push button will have no effect at all.

##### ***Link 3 (Link 14)***

The fitting of this link will cause the optional 24 V output to be shut down for the duration of a card isolate.

##### ***Link 21 (Link 9)***

Connects the common of the first pole of the double pole alarm relay to zero volts. This cannot be used if Link 15 (Link 16) is fitted.

##### ***Link 5 (Link 10)***

Connects the common of the second pole of the double pole alarm relay to zero volts.

##### ***Link 15 (Link 16)***

This link should be fitted when the analogue output is required. If it is fitted then Link 21 (Link 9) must not be fitted also, the first pole of the double pole change over alarm relay cannot be used, and neither can the fault relay for the selected zone.

**NOTE: The associated resistors must also be fitted before the analogue output will function correctly.**

##### ***Potentiometer RV1 (RV2)***

Factory set - **DO NOT ADJUST.**

##### ***Diodes D12 (D62)***

Removal of the above diodes will prevent optional 24 V output being inhibited by the reset and isolate facilities. However, a short circuit condition will disable the output.

### 3.2 TEST FACILITY

Test inputs are provided for each zone.

Zone 1 Pin 17B

Zone 2 Pin 22A

Each is an active low input with the following results when true.

A simulated alarm condition is presented to the detector input of the card. If, as a result, the detection circuits fail to flag an alarm within the correct period, a fault is flagged which remains latched until reset on the card. If an alarm is flagged, no fault occurs and the card returns to normal running when the test signal is removed.

The signal must be present at the test input for at least 100 ms for the correct operation of this function.

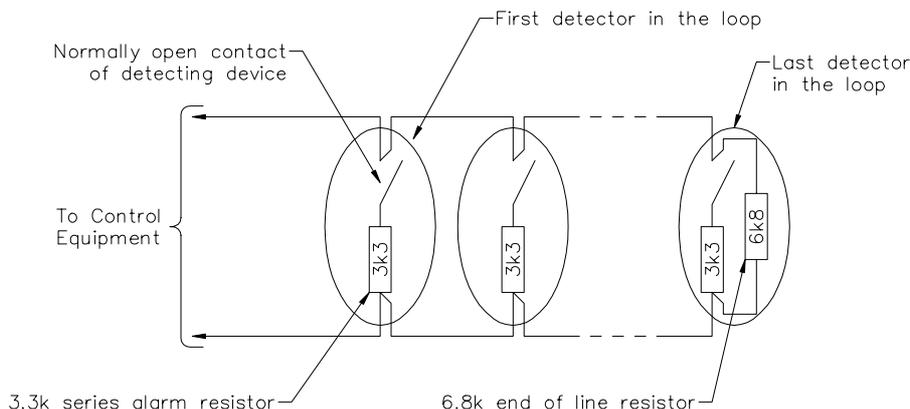
If an alarm is already present no test is initiated.

The following diodes and links provide the facilities described when fitted.

| ZONE 1  | ZONE 2  | FUNCTION WITH DIODE OR LINK FITTED                                                                   |
|---------|---------|------------------------------------------------------------------------------------------------------|
| D101    | D109    | Flashing alarm output inhibited<br>Card alarm inhibited                                              |
| D102    | D110    | Alarm relay operation inhibited<br>Continuous alarm output inhibited<br>Pulse alarm output inhibited |
| D103    | D111    | Reset of alarm and fault latches                                                                     |
| Link 20 | Link 19 | An unsuccessful test flags a fault condition                                                         |

### 3.3 FIELD DEVICES

The DI-950 is capable of being connected to many different types of field device, principally because most of them operate in one of two ways; either current limiting themselves when in alarm or simply by closing a contact. Contact closure has the drawback of not having any inherent form of current limit at a useful level. Therefore, current limiting resistors have to be added in series with the normally open contact to make it behave in a similar way to those units that achieve this in a more complicated way, smoke detectors for example. These current limiting resistors are sometimes known as *series resistors* or *alarm resistors* and must be fitted to each detector in a loop, as shown below.



Since the paralleled detectors have a high impedance (or infinite impedance in the case of switch inputs) then the DI-950 will see them as open circuit. To get around this an *end of line resistor* must also be fitted. This resistor, fitted in the last unit of the loop, allows a small but detectable current to flow around the loop which is monitored by the DI-950.

In the DI-950 the end of line resistor is nominally 6.8 k $\Omega$  and the series alarm resistor is anywhere between 510 $\Omega$  and 3.3 k $\Omega$ . It would be normal, however to use a 3.3 k $\Omega$  series resistor.

## 4. SPECIFICATION

### **Mechanical**

|        |                |
|--------|----------------|
| Width  | 25.4 mm (5 HP) |
| Length | 128 mm         |
| Depth  | 247 mm         |

### **Connections**

DIN41612 64 way A/B male connector

### **Electrical**

|                  |                                                                                                                                  |
|------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Output Relays    | 2 pole change over<br>1 amp, 30 V dc non-inductive<br>Normally de-energised                                                      |
| Logic Outputs    | 500 mA sink when active<br>12 V when inactive                                                                                    |
| Logic Inputs     | 0 V to activate<br>12 V when inactive                                                                                            |
| Fault Relay      | Single pole normally open (closed under healthy conditions)<br>Normally energised, de-energising on fault<br>0.5 A non-inductive |
| Power (per zone) | 18-35 V dc input<br>53 mA minimum<br>109 mA full alarm<br>122 mA maximum                                                         |