Ditech Control Card Manual

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DI-861/862 4-20 mA Gas Card

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1. GENERAL

The DI-861/862 4-20 mA control card is designed for use with the Crowcon range of 4-20 mA gas detectors, Gaslink, RGD90 and Cirrus. It supplies power to the three wire versions of these devices and is compatible with industry standard 2 and 3 wire transducers. The DI-861 is generally associated with flammable gas detection applications whereas the DI-862 is for use with toxic sensors. The two cards are functionally identical with only the front panels being different.

The card contains all the necessary circuitry required to monitor the field cabling for open and short circuit faults, to process and amplify the signal from the sensor, and to use that information to display a gas flammability or toxicity valve and to trigger alarm outputs if certain adjustable thresholds are exceeded.

The facility to calibrate the sensor to particular gases without tripping alarms is included, as is the ability to set two alarm levels over the range 5% FSD to 95% FSD, although the card is preset for 4 mA to correspond to 0 in the display and 20 mA to correspond to 99 on the display.

2. INPUTS AND OUTPUTS

DI-861 FLAMMABLE GAS CONTROL CARD						
12B	NO CONN	DETECTOR HEAD		24V DC I/P		2A/B
12A	+VE					4A/B
32A	SIGNAL			0V DC I/P		8A/B
28A	−VE					9A/B
29A						10A/B
3B	+	ANALOGUE				11A/B
7A/B	−			ALARM 1 RELAY	N/O	16B
24B	PULSE O/P	ALM. 1			N/C	17A
17B	CONT O/P				COM	15B
19B	FLASH O/P				N/O	20A
23B	PULSE O/P	ALM. 2			N/C	19A
18B	CONT. O/P				COM	18A
21B	FLASH O/P			ALARM 2 RELAY	N/O	22B
31B	ACCEPT I/P				N/C	21A
30B	PULSE FAULT				COM	20B
27B	RESET I/P				N/O	24A
32B	T/S I/P				N/C	23A
30A	L. TEST I/P				COM	22A
28B	INHIBIT I/P			FAULT	N/O	14B
14A	BEAM BLOCKED				N/C	16A
25B	MOD INHIBIT O/P				COM	13B

DI-862 TOXIC GAS CONTROL CARD						
12B	NO CONN	DETECTOR HEAD		24V DC I/P		2A/B
12A	+VE					4A/B
32A	SIGNAL			0V DC I/P		8A/B
28A	−VE					9A/B
29A						10A/B
3B	+	ANALOGUE				11A/B
7A/B	−			ALARM 1 RELAY	N/O	16B
24B	PULSE O/P	ALM. 1			N/C	17A
17B	CONT O/P				COM	15B
19B	FLASH O/P				N/O	20A
23B	PULSE O/P	ALM. 2			N/C	19A
18B	CONT. O/P				COM	18A
21B	FLASH O/P			ALARM 2 RELAY	N/O	22B
31B	ACCEPT I/P				N/C	21A
30B	PULSE FAULT				COM	20B
27B	RESET I/P				N/O	24A
32B	T/S I/P				N/C	23A
30A	L. TEST I/P				COM	22A
28B	INHIBIT I/P			FAULT	N/O	14B
14A	BEAM BLOCKED				N/C	16A
25B	MOD INHIBIT O/P				COM	13B

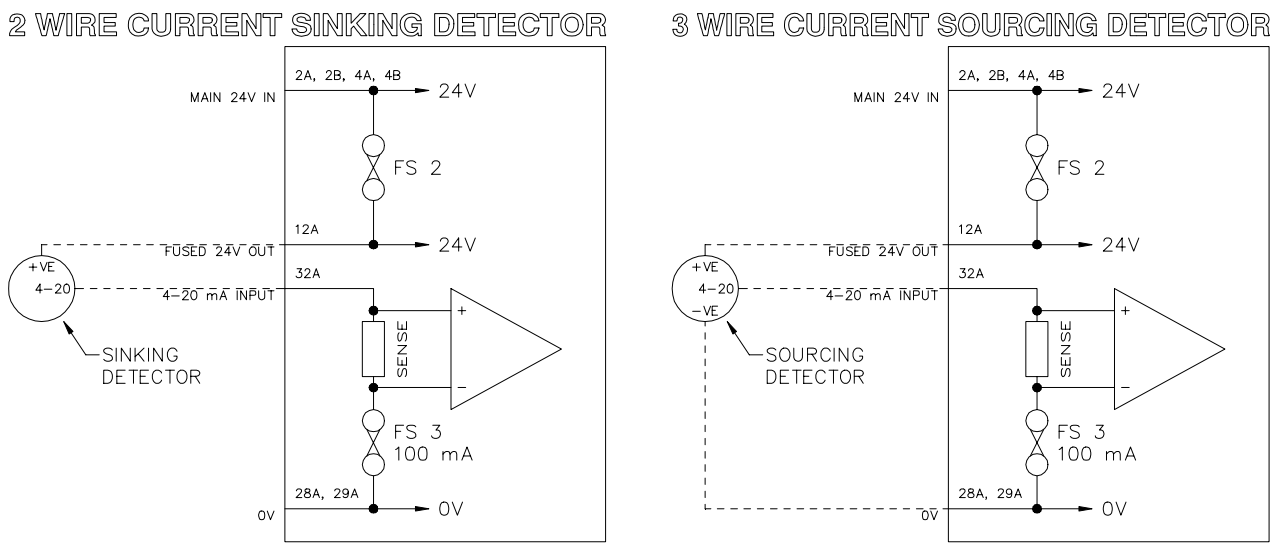
2.1 POWER SUPPLY

The unit is powered from a nominal 24 V dc supply and is internally regulated to 12 V to provide a stable reference for the internal components. The power input is protected against reverse voltage and over voltage situations, the latter causing the fuse to blow should the supply become greater than 35 V dc.

2.2 PRIMARY INPUTS

Detector input

The detector connections are different depending on if a three wire or a two wire detector is being used. The diagram below should be consulted for details of the differences between the two schemes. The positive connection is a permanent 24 V dc supply, fused at 1 amp, and the negative is a permanent 0 V connection. The signal line is monitored for open and short circuit faults and has a maximum input impedance of 220 Ω.



2.3 SECONDARY INPUTS

These 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 control card. If the gas concentration measured by the control card is above either of the preset alarm set points then the reset signal will have no effect. If the gas concentration is below a particular alarm set point then only that alarm level will reset. In a similar way, a fault condition may only be reset once the fault has been cleared.

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 alarm LED(s) on the front panel will flash and the *flashing alarm* output associated with the particular alarm level will pulse in synchronism with the clock pulse signal. This will continue until the *accept alarm* input signal is received, then the red alarm LED(s) will remain steady and the appropriate *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 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.

2.4 PRIMARY OUTPUTS

Outputs are of two types. Volt free outputs from relay contracts and active low current sinking transistor outputs. The transistor outputs can sink up to 500 mA each.

Alarm 1 Relay

This output is a double pole change over type which is de-energised in the normal state and energised when in alarm. It operates when the concentration displayed on the control card is greater than the set output for the first level of alarm. The contacts are isolated from all other circuits on the control card and are rated for 2 amps at 30 V dc, non-inductive. This output will latch until the measured concentration has dropped below the alarm set point and the card reset.

Alarm 1 Continuous Output

This is an active low output capable of sinking 500 mA to 0 V when the concentration shown on the control card is greater than the set point for the first level of alarm. The output will latch until the measured concentration has dropped below the alarm set point and the card reset.

Alarm 1 Flashing Output

This is an active low output capable of sinking 500 mA to 0 V. When the concentration shown on the display rises above the threshold for the first level of alarm then the output will oscillate on and off in synchrony with the *clock pulse* input. Once the card has received an accept pulse then the output will turn on and function in the same way as the Continuous Alarm 1 output.

Alarm 2 Relay

This works in exactly the same way as the alarm 1 relay output, only that it responds to the threshold set for the alarm 2 condition.

Alarm 2 Continuous Output

This is an active low output which operates in exactly the same way as the continuous alarm 1 output, but that it reacts to the second level of alarm rather than the first.

Alarm 2 Flashing Output

This is an active low output oscillation on and off in time with the clock pulse input when the second level of alarm is reached. As with the alarm 1 flashing output it will go steady when the alarm has been accepted.

2.5 SECONDARY OUTPUTS

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 1 and 2

This output pulses low once only when an alarm condition is detected. When the first level of alarm is recorded then the *pulse alarm 1* output operates. When the second level of alarm is reached then the *pulse alarm 2* operates. The pulse duration is approximately 1 second and is

normally combined with other control cards into a common alarm bus which notifies the DI-952 audio card that an alarm has just occurred.

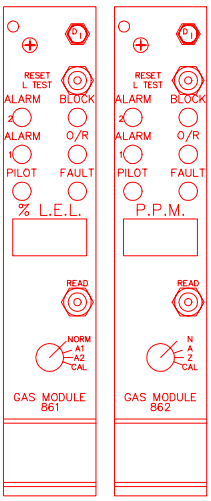
NOTE: The way by which the pulse fault output is generated relies on faults occurring at intervals of no less than two minutes.

2.6 ANALOGUE OUTPUT

The analogue output is a voltage output operating in the range 1 to 5 V dc. 1 V dc corresponds to 0% LEL and 5% corresponds to 100% LEL. During fault conditions the analogue output is clamped to 0 V. Negative drift on a sensor will result in a proportional drop in voltage. For example +10% LEL will equate to approximately 1.4 V and -10% LEL will equate to approximately 0.6 V on the analogue output. The analogue output is enabled by fitting link 1 and is trimmed to meet the parameters of the equipment being connected to by adjusting RV4.

2.7 FRONT PANEL INDICATIONS

Alarm 2 LED



When a second level of alarm is registered then the two alarm 2 LED will flash in synchrony with the *clock pulse* input. Once an accept signal has been received by the card, the LEDs will change from flashing to steady. They will remain illuminated until the measured gas concentration drops the second level of alarm set point and the card has been reset.

Alarm 1 LED

A second level of alarm cannot happen without there having been a first level of alarm. As with the second level LEDs, the first level LED will flash as soon as the measured gas concentration exceeds that set for the alarm 1 set point. Once an accept signal has been registered by the card the LED will turn on continuously. It can only be extinguished once the measured concentration of gas is below the level 1 set point and the card has been reset.

Block LED

If the 4-20 mA input to the card is at 2 mA then an inhibit condition will be induced. This is typically generated by more complicated sensors which have the capability of generating such signals. Usually this would mean that the optics of an infra red gas detector, for example, had become fouled or dirty, or that the detector needed to advise the panel of a condition which was not necessarily a fault, but would indicate that the readings had become erroneous.

Over Range LED

Should the gas concentration measured by the card continue to rise beyond 99% LEL (or 99 ppm) then the card will trigger an over range condition. The 100% LEL threshold represents a concentration of gas or vapour which is sufficiently high as to make the atmosphere at the point of measurement flammable, i.e. a spark or flame will cause an explosion. Under these circumstances the control card will trigger a fault to the system and turn off the power being supplied to the sensor. The “O/R” LED on the control card will be illuminated to indicate the over range condition and the fault light will turn on and the pilot light will turn off to indicate that the card is in fault. The over range condition can only be cleared once the card has been reset.

Pilot LED

The green pilot LED will normally be illuminated. The only circumstances that it should be extinguished, baring indicator failure, are if the card is in fault or if power has failed, for example a fuse failure. The operation of the LED, as with all the LEDs may be proved by pressing the reset/lamp test button.

NOTE: This button will also attempt to reset the card. Should the pilot have been extinguished as a result of a resettable fault, this action will clear it.

Fault LED

The yellow fault LED will illuminate under two circumstances. Firstly, if it is illuminated and the pilot LED is illuminated too, then this shows that the card is in its inhibit mode. Alarm LEDs will operate as described above, but no alarm outputs will operate. Secondly, if it is illuminated and the pilot LED is not illuminated, then the card is in fault. A fault condition may be caused by a number of conditions shown in the trouble shooting section. The inhibit condition may be induced by:

a) Card power up
b) Resetting the card after a fault
c) External inhibit input becoming active

Two Digit Display

This display shows that the measured concentration of flammable or toxic gas as detected by the remote sensing element. Below a preset threshold, typically ±5% FSD, the display is turned off to conserve power. Once the concentration has exceeded this limit, in a positive or negative direction, the display will turn on again. However, as the display rises beyond ±99% FSD the over range will be triggered and the display blanked again.

NOTE: Negative readings are indicated by a small dot in the bottom left of the display. Negative reading will not trip alarms.

Lamp Test / Reset Button

This button will illuminate all the LEDs on the card (excluding the display) and also attempt to reset the card. The card will only reset if the measured concentration has dropped below the thresholds (alarm 1, alarm 2 or over range) or in the case of faults, the fault has been cleared.

Read Button

When the display is less than the blanking threshold, typically ±5% FSD then it is turned off. The read button will force it back on again. When the display is blanked as a result of an over range condition the read button as no effect.

Rotary Mode Switch

This is a four position rotary switch. Its positions are labelled norm for normal, *A1* for *alarm 1*, *A2* for *alarm 2,* and *cal* for *calibrate*.

NORM	Display shows measured gas concentration all alarms outputs will operate as described above
A1	Allows visual check of the alarm 1 set point
A2	Allows visual check of the alarm 2 set point
CAL	Display shows measured gas concentration No blanking between ±5% FSD No alarm outputs will operate Inhibit condition induced Gas may be applied to a sensor without fear of inadvertently activating an alarm

3. OPERATION

3.1 LINK SETTINGS AND ADJUSTMENTS

Input Set-up (Links A and B)

These links are used for card set-up and factory testing and should not be adjusted. Link A should always be fitted between pins 2 and 3. Link B should not be fitted.

Analogue Output Option (Link C)

When the link is fitted between pins 1 and 2 the analogue output will be forced to 2 mA whenever the card is in the inhibit condition. If the link is between pins 2 and 3 the analogue output will continue to track the display on the card, 0-100% FSD = 4-20 mA.

Input Option (Link D)

When the link is fitted between pins 1 and 2 the detection of 2 mA on the input signal will cause the card to go into the inhibit condition. If the link is between 2 and 3 the presence of a 2 mA signal will merely be displayed as a negative reading.

Fault Condition Latch (Link E)

If the link is fitted between pins 1 and 2 then a fault condition will have to be reset manually by pressing the reset button. If the link is between pins 2 and 3 then the fault condition will disappear as soon as the fault itself disappears. If the Alarm Latching link is not set (2/3) then the fault condition will not latch.

Alarm Latching (Link F)

If the link is fitted between pins 1 and 2 then alarms and faults (note condition of link E) will have to be reset manually. Fitting the link between pins 2 and 3 will cause the alarm and fault conditions to reset as soon as the appropriate hazard has cleared below the alarm threshold, or the fault has cleared, whichever is appropriate.

Constant Display (Link G)

If the link is fitted then the two digit display will be permanently on. Otherwise it will automatically be blanked once the displayed value enters the blanking threshold, typically ±5% FSD.

Analogue Output - 2 mA adjustment (RV1)

The card has the facility of forcing the analogue output to 2 mA whenever an inhibit condition is in effect. This potentiometer is used to achieve this. It is factory set and should not be adjusted.

Zero Adjust (RV2)

This potentiometer adjusts the zero setting of the measured concentration display and is factory set. Do not alter this potentiometer.

Span Adjust (RV3)

This potentiometer adjusts the card to correctly interpret a 20 mA input signal as FSD. This potentiometer is factory set and should not be adjusted.

Analogue Output - 4 mA adjustment (RV4)

The analogue output is set for a 4-20 mA output when the display reads between 0% FSD and 99% FSD. The potentiometer is used to correctly scale the offset to read 4 mA when the display is reading 0. It is factory set and should not be adjusted.

Analogue Output - 20 mA adjustment (RV5)

The analogue output for the card is set to mirror the input 4-20 mA signal. This potentiometer is factory set to ensure that a display of 99% FSD will give 20 mA on the analogue output. This potentiometer should not be adjusted.

Alarm 1 Set Point (RV6)
With the card powered through a 64 way uncommitted extender card (stock no. C03233) allowing access to RV6, and the four position mode switch on the front panel in the "A1" position, the set point for the first level of alarm may be adjusted. As the potentiometer is altered so the display will change.

NOTE: The alarm 1 threshold must always be set lower than the alarm 2 threshold.

Alarm 2 Set Point (RV7)
With the card powered through a 64 way uncommitted extender card (stock no. C03233) allowing access to RV7, and the four position mode switch on the front panel in the "A2" position, the set point for the second level of alarm may be adjusted. As the potentiometer is altered so the display will change.

NOTE: The alarm 2 threshold must always be set higher than the alarm 1 threshold.

Blanking Threshold (RV8)
As standard the card is set up to blank the display when the reading is less than ±5% FSD. This may be adjusted by altering RV8. To set up accurately the zero setting must also be adjusted.

NOTE: This procedure must only be carried out by a qualified personnel.

1. Confirm there is 0 shown on the display.
2. Put the card onto a 64 way uncommitted extender card (stock no. C03233).
3. Put the four position switch into the "CAL" position.
4. Adjust the zero potentiometer, RV2, to whatever blanking set point is required.
5. Assuming this set point is below any alarm levels, move the four position switch rack to the "NORM" position.
6. Adjust RV8 until the display blanks.
7. Switch the four position switch back to the "CAL" position.
8. Adjust the zero potentiometer, RV2, back to read zero on the display.
9. Remove the 64 way extender card and re-fit the card.
10. Confirm that the display still reads zero before switching the four position switch back to the "NORM" position.

3.2 SETTING UP THE CARD

Before the card can be set up and the channel calibrated it is assumed that all field cabling for the channel has been completed, the sensor installed as per the relevant manual, and that power is available on the panel although it should be isolated to start with.

To complete this procedure a 64 way uncommitted extender card (C03233) is required. This will allow adjustments to be made to the card whilst it is powered up.

Before power is applied fit a 64 way uncommitted extender card in the rack. Fit the DI-861 or DI-862 to the extender and ensure all the connections are firm and suitably supported. Power may then be applied.

Depending on the type of detector connected to the card there may be a warm-up period that would have to be observed. Refer to the documentation accompanying the detector for details of any such delays.

Note: If a detector clamps its signal line to less than 2 mA at any time then the control card will interpret this as a fault although it may not actually be the case.

Turn the four position switch to the “A2” position and adjust RV7 until the correct valve for the second level of alarm. Turn the switch to the “A1” position and adjust RV6 until the desired set point is achieved.

NOTE: When setting the alarms the alarm 2 level must always be greater than the alarm 1 level.

Finally turn the four position switch to the “NORM” position. The card is now ready for calibration.

3.3 TROUBLESHOOTING

The format of this section is designed so that the user picks the description which matches the problem and then follows down the list of things to do until the problem goes away.

The blanking threshold cannot be set.

1. If the display will not go out, ensure that link G has not been fitted.

2. If the display will not come on ensure that the card is not in the over range condition.

3. Set the blanking as per the instructions under the *Link Settings and Adjustments* section.

The fault LED is on and the pilot LED is off, no other LED is illuminated.

1. Press the lamp test/reset button for one second and release.

2. Check that a head voltage is getting to the terminals that the field cables attach to. Assuming the problem is a cable problem a voltage should be observed here. If no voltage is observed then this would indicate either a card failure or in the connectors between the control rack and the terminals.

3. Remove the card from the rack and use a resistance meter to locate the cable fault. Once it has been rectified then use the meter again to confirm that the sensor is not damaged.

4. If the card is still in fault then confirm return current from the detector. This is done by disconnecting the signal from the field terminals and reconnecting the circuit with a milliammeter in series with the signal line. The current should be between 2 and 20 mA for the control card to be out of fault. If it is and the fault will still not reset when the cable is reattached then there is an internal card or rack fault.

The over range LED is on and will not reset.

1. Disconnect the signal line and insert a milliammeter in series with it. The observed current should be less than 20 mA. If it is above this then the detector or sensor may be at fault. If the signal current is within acceptable parameters then a card or rack fault is indicated.

The display will not come on and the card is not in over range.

1. If the display comes on when the read button is pressed then the blanking threshold is too high. Try turning resetting it by following the procedure in the *Link Settings And Adjustments* section.

2. If the display does not come on even when read is pressed but the LEDs illuminate when the card reset button is pressed, then the card is faulty and must be replaced.

No LEDs are illuminated and the display is not on.

1. If the problem is isolated to one card then check the fuse on the card. If it is more extensive than that then check the power to the control rack.

2. If the card fuse is intact and the power to the rack is within tolerance, the fault will lie either with the card or with the rack wiring.

All the LEDs are illuminated continuously.

1. If the green pilot light is not on then the card is in positive over range.

2. If all the LEDs are on, including the green pilot LED, then the card is receiving a permanent lamp test signal. The fault will lie with the rack wiring or with the lamp test circuit.

4. SPECIFICATIONS

Mechanical

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

Connections

DIN41612 64 way A/B male connector

Electrical

Alarm Settings	Alarm 1 and alarm 2 adjustable between 5% and 95% FSD
Sensitivity	4-20 mA corresponding to 0-100% FSD 220 Ω input impedance
Display	Two digit, seven segment, red LED Decimal point in bottom left of display indicates negative
Output Relays	2 pole change over 1 amp, 30 V dc non-inductive Normally de-energised
Logic Outputs	500 mA sink when active 12 V when inactive
Logic Inputs	0 V to activate 12 V when inactive
Fault Relay	Single pole normally open (closed under healthy conditions) Normally energised, de-energising on fault 0.5 A non-inductive
Power	18-35 V dc input 91 mA minimum 365 mA full alarm 429 mA maximum