CROWCON

INSTRUCTION MANUAL

DI-4000 MULTI POINT GAS DETECTOR

CROWCON DETECTION INSTRUMENTS LIMITED
2 Blacklands Way,
Abingdon Business Park,
Abingdon,
Oxon. OX14 1DY
England

Tel: 0235 553057
Fax: 0235 553062
Telex: 837688 Crocon G

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GROUP
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1) INTRODUCTION

1.1 The DI-4000 is an industrial standard, multi-point, flammable gas detector control unit designed to control up to four channels of flammable gas detectors of the pellistor type.

1.2 The unit is contained in a high impact, plastic wall mounted box fitted with a clear hinged lid and providing protection to I.P.54. The electronic control circuitry is contained on one common Mother Board permanently fitted into the base of the Box.and four plug-in Daughter Boards - one for each channel. This form of construction allows for extension from one channel to four channels by the purchase of additional Daughter Boards and Detector Heads.

1.3 The equipment is designed to operate a common alarm indicator and relay whenever any channel indicates a gas concentration higher than the pre-set Alarm 1 level, and to operate individual alarm indicators and relays whenever a particular channel indicates a gas concentration higher than the pre-set Alarm 2 level. Every alarm indication activates an audible alarm fitted in the unit which may be "ACCEPTED" from a front panel switch. All the relays contain volt free changeover contacts which are brought out to terminals for external use.

1.4 The bottom section of the DI-4000 is a terminal box with a separate removable cover. All external connections to the unit are made in this section and the bottom wall has knockouts for cable entry of 19mm diameter.

2) INSTALLATION

2.1 The DI-4000 is designed to be wall mounted and the rear of the box contains a boss with a keyhole slot to accept the head of a screw of up to 5mm shank diameter. A slotted hole at each end of the terminal chamber allows the box to be held firmly to the wall with two screws. For dimensions refer to figure 1.

2.2 When the unit has been secured to a wall or panel the external cabling can be connected. Remove the two screws which retain the terminal cover at the bottom of the box and remove the cover. The connector blocks for external cabling will now be accessible see figure 2. All common facilities are on the left hand side and individual channels to the right. Before connecting cables decide on the number to be used and where they will be connected on the connector blocks and remove the requisite number of knock-outs at the base of the terminal chamber for glands.

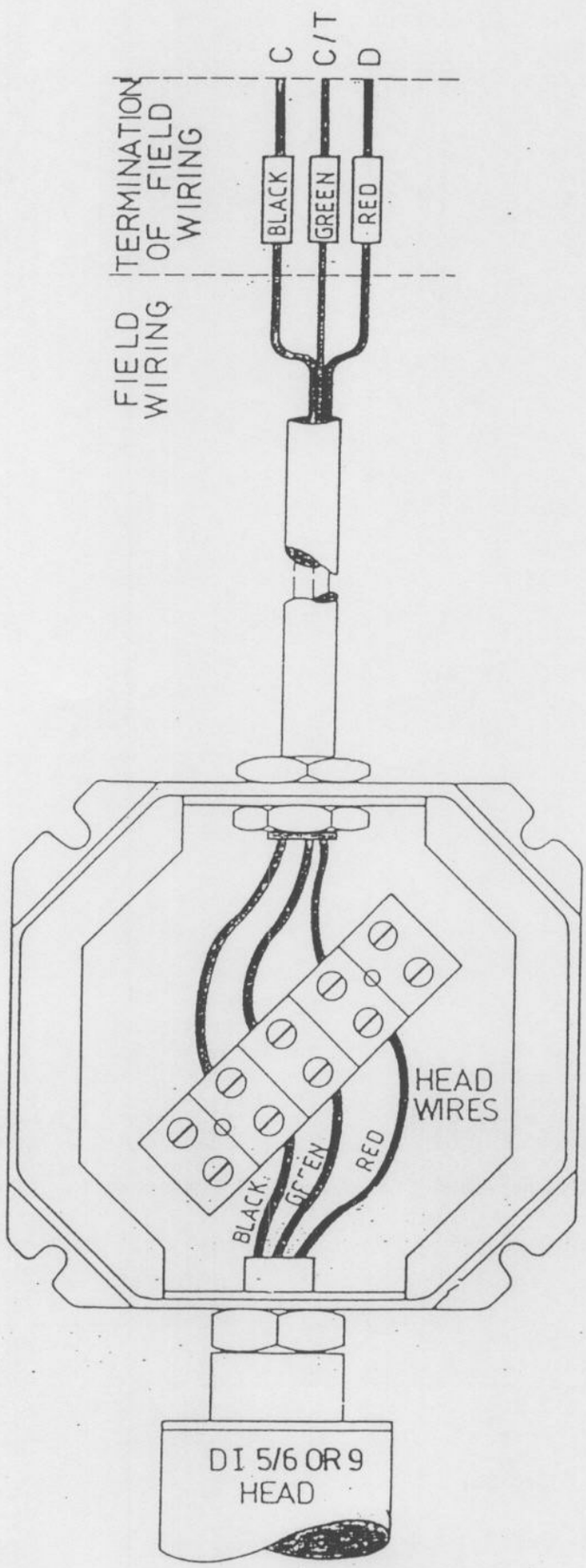
2.3 The unit may be powered by mains voltage or 24 volts D.C. Ensure that the supply to be used is connected to the correct polarity and if a mains supply is to be used, ensure that the unit supplied is for the correct voltage i.e. 240 volts or 120 volts. (link for requisite voltage is visible on main P.C.B. adjacent to transformer when main front panel is removed).

2.4 Before proceeding further isolate the power supply and then connect the remaining cables as required and dependant on the number of channels in use. Pay particular attention to the following points.

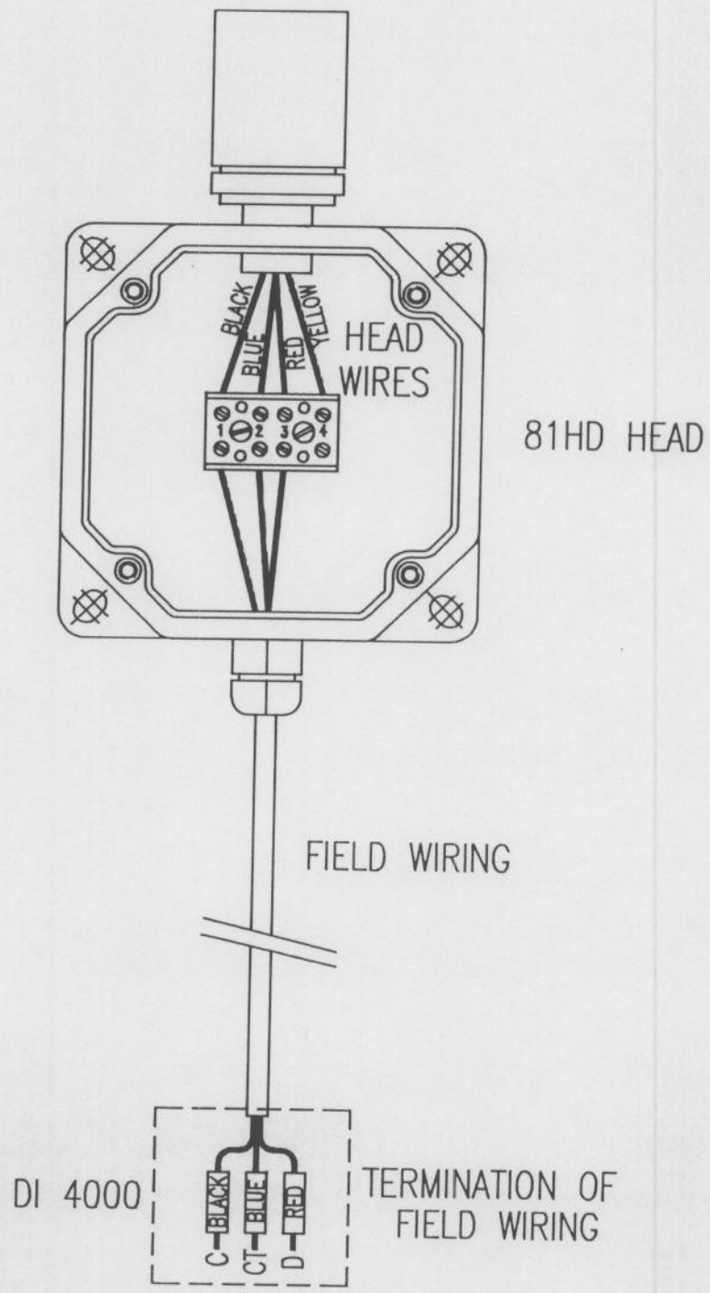
a) The detector Head Cables marked.
C, CT and D should be at least 1.5mm to avoid excessive voltage drop in the cable.

b) All connections should be firmly screwed down.

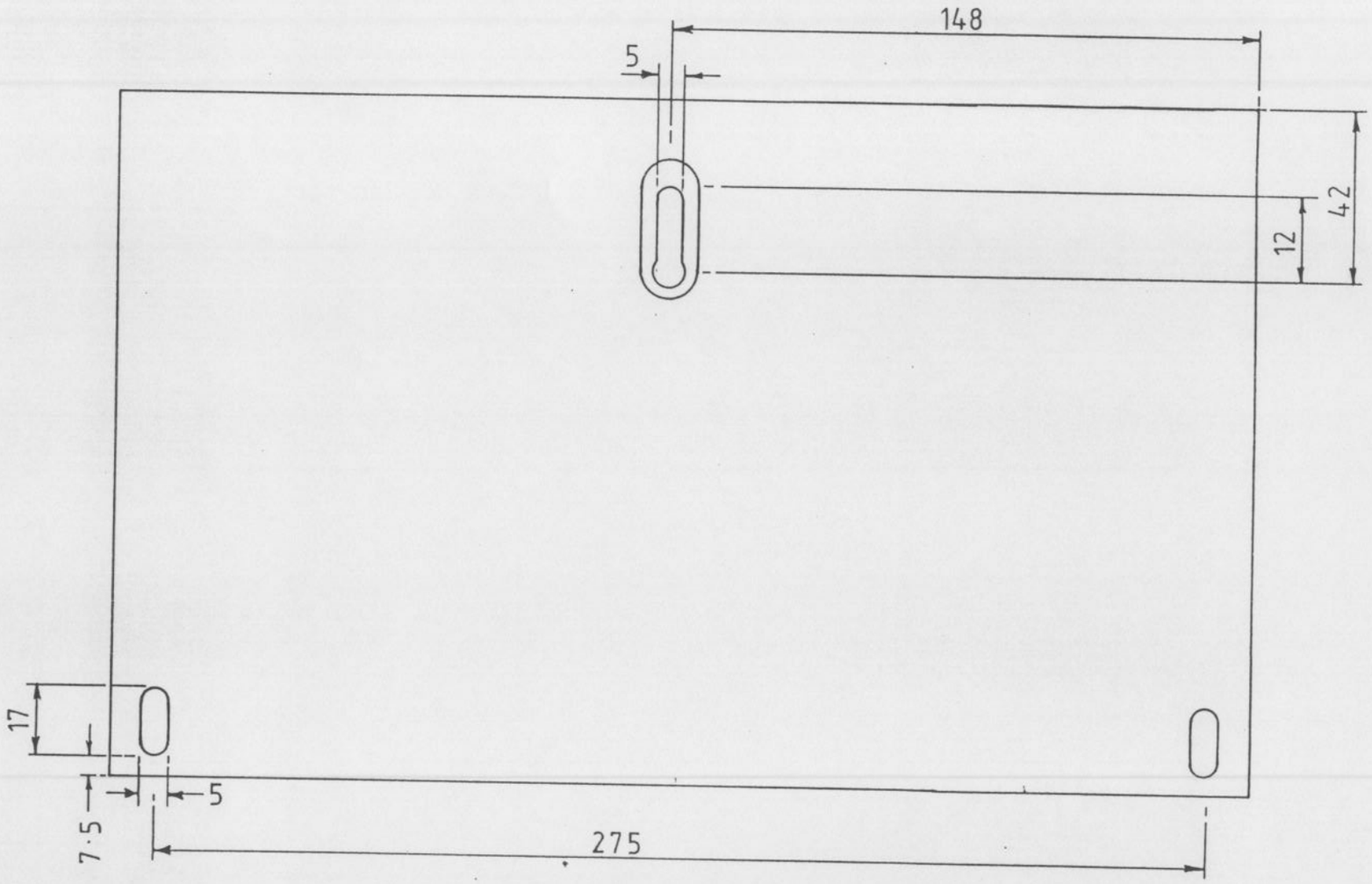
SP11 & DI.4000
CONTROL UNIT CONNECTIONS



CONNECTION DIAG. FOR D.I 5/6 OR 9 FLAMMABLE HEAD.

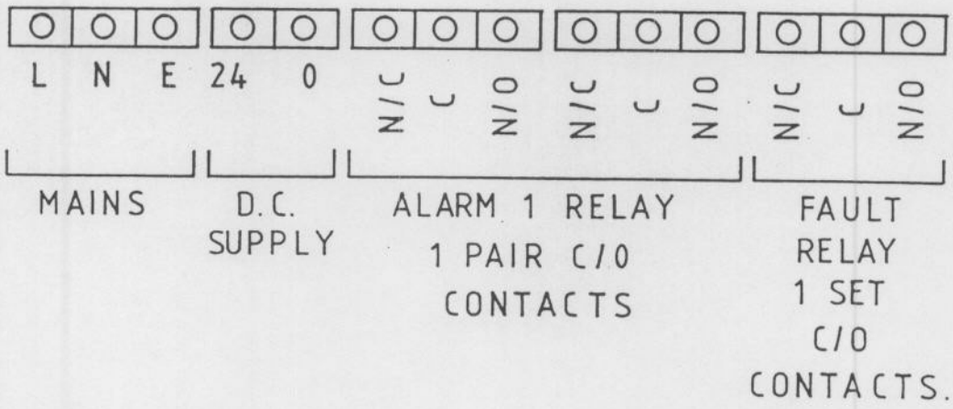


CONNECTION DIAGRAM FOR 81HD HEAD

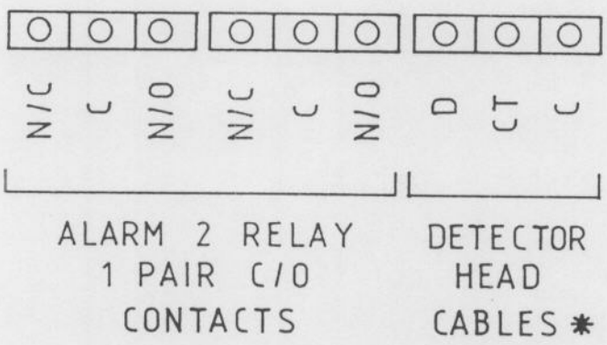


REAR VIEW OF BOX

FIG.1.



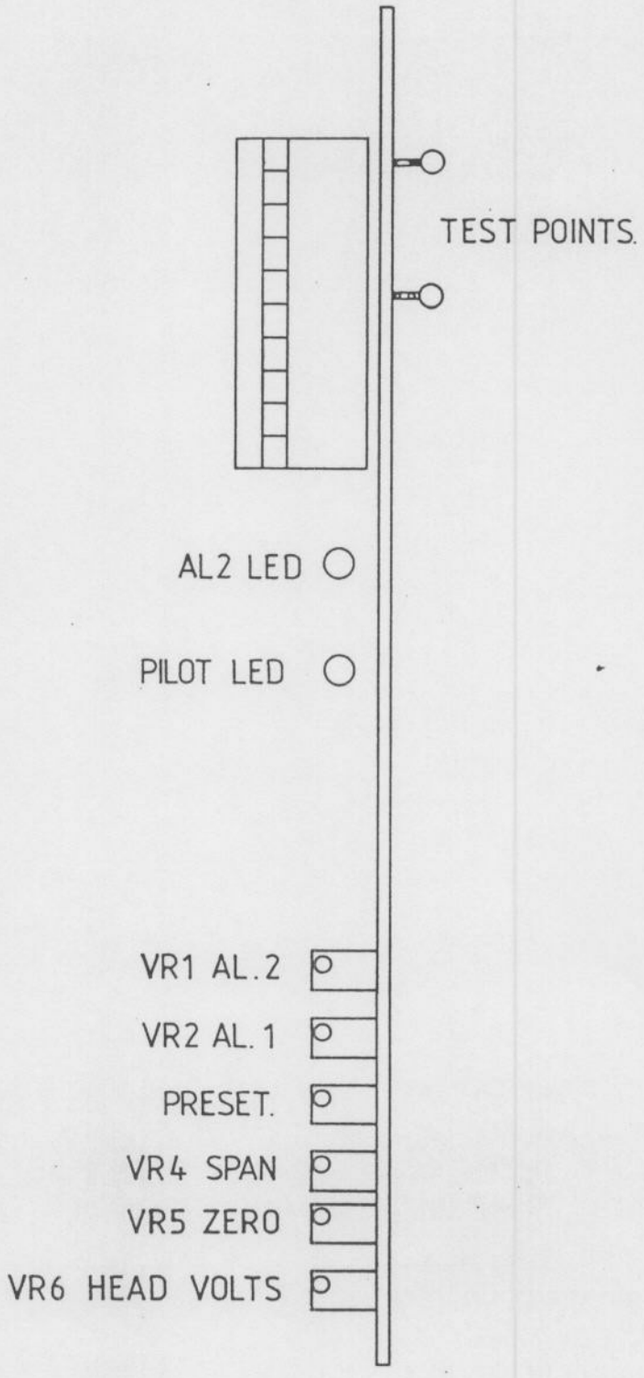
COMMON FACILITIES TERMINAL BLOCKS



CHANNEL TERMINAL BLOCKS
IDENTICAL FOR EACH
CHANNEL.

* = USE MINIMUM 1.5 SQ. MM.
CABLING.

D.I.- 4000 FIGURE 2.



D.I.-4000 FIGURE 3.

3) CONTROLS AND DISPLAYS

3.1 The normal operating controls are grouped in two boxed sections, on the left hand side of the front panel. L.E.D. indicators associated with these controls are adjacent to them. In addition each Daughter Board has a L.E.D. Bargraph which displays gas concentration in ten consecutive steps and two individual L.E.D. indicators. (see figure 3)

3.2 The Daughter Board display and indicators perform the following functions:

3.2.1 PILOT. This green L.E.D. will be ON whenever power is supplied to the Daughter Board and the circuits are working correctly. In the event of a FAULT on the Daughter Board the L.E.D. will switch OFF.

3.2.2 ALARM 2. This red L.E.D. will normally be OFF and will switch ON when the gas concentration rises above the pre-set ALARM 2 threshold on that particular channel. It will stay ON until the gas concentration drops below the threshold and the RESET switch is pressed on the main front panel.

3.2.3 % L.E.L. BARGRAPH. This is a series of ten red L.E.D. chips which switch on consecutively with increasing gas concentration. As the next segment switches ON the previous one switches OFF so that there is only ever one sector ON. The first sector will switch on when the concentration reaches 10% L.E.L, the second when it reaches 20% and so on up to 100%.

3.3 The main front panel switches and indicators perform the following functions:

3.3.1 ACCEPT switch. Pressing this switch will mute the audible alarm whenever an ALARM or FAULT condition occurs.

3.3.2 RESET switch. Pressing this switch will reset the ALARM L.E.D's and circuits after the alarm (s) have been triggered and provided the gas originally detected has cleared.

3.3.3 LAMP TEST. When this switch is depressed all main and daughter boards front panel L.E.D's will switch ON whilst the switch remains depressed. Note, the % L.E.L Bargraph displays are not included in this test.

3.3.4 NORMAL/INHIBIT. When this toggle switch is in the INHIBIT position the RELAYS INHIBITED LED will flash continously. The equipment will continue to operate normally with the exception that the alarm relays will not operate if any alarm is activated. The switch would normally be in the INHIBIT position when it is being commissioned or calibrated so as to avoid triggering external actions. When the switch is returned to the NORMAL position the RELAYS INHIBITED LED will stop flashing and the equipment will return to normal operation, after a delay of approximately 30 seconds to allow inhibited circuitry to warm up

3.3.5 ALARM 1 LED. Illuminates whenever any of the channels fitted detects gas at a concentration above the first pre-set alarm level (normally 20% L.E.L.). The channel that has gone into alarm will be recognised by a Bargraph reading of at least 20% L.E.L. The LED will remain lit until the gas concentration has decreased to below the pre-set 20% L.E.L. threshold and the RESET switch has been depressed.

3.3.6 FAULT LED. This is a yellow LED and it will be illuminated whenever the fault circuits on any of the Daughter Boards detect a fault. The channel that has gone into fault will be recognised by the PILOT light being OFF.

READ AND UNDERSTAND THIS SECTION BEFORE SWITCHING POWER ONTO THE EQUIPMENT

4) COMMISSIONING

4.1 In order to obtain accurate and reliable results from the DI-4000 it is essential that the steps below are carried by a competent and authorised person.

4.2 The equipment required for commissioning is:

a) Digital Multimeter with valid Certificate of Calibration.

b) Small screwdriver with fine blade, preferably of watchmakers type.

c) Cylinder or can of calibration gas, 2.5% (50% LEL) by volume methane in air complete with flow indicating device and length of suitable hosing.

d) Calibration Cap to suit Detector Heads used.

4.3 Remove each Daughter Board front panel by unscrewing the top and bottom attachment screws. Gently lift the front panel off. If the panel is reluctant to lift, then gently depress the PILOT and ALARM 2 LED'S so thay they retract from their bezels.

4.4 Locate the pre-set potentiometers at the bottom of the Daughter Board and identify their functions from figure 3 and the table below. Note, that VR3 is sealed - do not attempt to adjust it.

Adjustable Potentiometers

VR1	Adjust Alarm 2 set-point.
VR2	Adjust Alarm 1 set-point.
VR3	Do not adjust - see note above.
VR4	Span adjust.
VR5	Zero adjust.
VR6	Set Head Volts.

4.5 At the Detector Head remove the cover of the junction box and ensure that there is no gas present. IF THE DETECTOR HEAD IS IN A HAZARDOUS AREA ENSURE THAT YOU HAVE A PERMIT TO WORK. Using a digital voltmeter measure the voltage across the terminals to which the red and black wires of the Detector are connected. Using suitable communication to the DI-4000 location adjust VR6 until the reading on the voltmeter is 2 volts +/- 0.1. If a Detector other than the DI 5/6 or DI-9 is connected then refer to the Detector Manufacturers Handbook for the correct voltage. On completion replace the junction box cover making sure that all four retaining screws are tightly fastened.

4.6 Connect the D.V.M. to the two test points on the daughter board (see figure 3) and adjust VR5 until the D.V.M. reads zero. At this stage the Bargraph Display should not be illuminated.

4.7 Adjust VR5 so that the D.V.M. reading increases and check that the Bargraph Display segments switch on in succession as the voltage increases.

4.8 The equipment has been pre-set so that the Alarms on each channel operate at the following points:

AL1 - 20% L.E.L. - 0.25 volts at test points.
AL2 - 60% L.E.L. - 0.75 volts at test points.

The full scale deflection of the Bargraph Display is 1.25 volts which is equivalent to 100% L.E.L. If the Alarm set-points are to be changed then the Bargraph voltage for the set point must first be established. For an Alarm set point of X% LEL Bargraph voltage (Bv) = $\frac{X \times 1.25}{100}$

To check or re-set the Alarm set-points calculate the Bargraph voltage, connect the D.V.M. to the test points and adjust zero control, VR5 until D.V.M. reads Bv. Now adjust VR1 or VR2 as relevant until the alarm is activated. In order to get the setting as accurate as possible it is advisable to adjust VR1 (VR2) backwards and forwards through the tipping point, resulting between each excursion, several times before finally setting the control. On completion adjust VR5 until Bv is zero.

4.9 The final adjustment required is to calibrate the equipment with VR4, the span control, using a calibrated test gas at the Detector Head. As for 4.5 above some communication is required between the Detectors Head and the DI-4000 locations.

4.10 Check the concentration of the test gas and then calculate Bv for this concentration as in 4.8 above. Typically for 50% LEL calibration gas, the Bv will be 0.625v. Connect the DVM to the test points. At the Detector Head fit the Calibration Cap and connect the Test Gas bottle. Flow the Test Gas into the Calibration Cap at a flow rate of 1 litre per minute. At the DI-4000 allow 20-30 secs for the reading on the DVM to settle to a final reading and then adjust VR4 until DVM reads the calculated Bv value. Switch off Test Gas and remove the Calibration Cap.

4.11 Repeat 4.3 to 4.10 above for each Detector Head/Daughter Board.

4.12 Replace Daughter Board front covers taking care that green PILOT and red ALARM 2 LED's are located in panel holes.

5) ROUTINE MAINTENANCE

5.1 It is advisable to check the sensitivity of the Detector Heads every three months. To do this work refer to Section 4 - COMMISSIONING and carry out the procedures detailed in paragraphs 4,3, 4.5, 4.6, 4.9, 4.10, 4.11 and 4.12.

6) SPECIFICATION

Application	Combustible Gas Detection
Measuring Range	0-100% LEL
No of Channels	Extendable one to four
Power Supply	115, 220/240 v AC or 24 v DC
Power Consumption	Quiescent 2 watts per channel Alarm 4 watts per channel
Relay Contacts-Common	
Alarm 1	Two sets volt free change over contacts rated 4 amp
Fault	Two sets volt free change over contacts rated at 1 amp
Detector Control Card	Two sets volt free change over contacts rated at 4 amp per detector control card
Alarm Levels	Individual adjustable within 10% to 90% LEL
Dimensions	250mm H x 300mm x 110mm D
Protection	IP54
Sensor Cable	3 core 1.5mm per core mineral insulated copper sheathed (MICS) or steel wire armoured (SWA). This is adequate for 1 kilometre cable run
Sensors	The system is designed to operate in conjunction with the DI9 and DI 5/6 poison resistant sensor

7) REFERENCES

The following references are given which relate to either/or combustible Gas Detectors and Hazardous Areas.

BS 6959 Code of Practice for the selection, installation, use and maintenance of apparatus for the detection of combustible gases.

BS 5345 Code of practice for the selection, installation and maintenance of electrical apparatus for use in potentially explosive atmospheres (other than mining applications or explosive processing and manufacture).
Part 1 General recommendations
Part 2 Classification of hazardous areas.

BS 5501 Electrical apparatus for potentially explosive atmospheres.

BS 5925 Code of practice for design of buildings: ventilation principles and designing for natural ventilation.

BS 6020 Instruments for the detection of combustible gases.
Part 1 Specification for general requirements and test methods.