

## LDM-519-DDL LHDC MONITOR & LOCATOR Digital Line Heat Detector Interface with Distance Display



The module is designed to monitor a length of Digital Linear Heat Detecting Cable (LHDC) for both Fire condition, and Fault status (open circuit).

The unit is designed such that it may be configured to operate in a 'two wire' mode that emulates the operation of conventional smoke & heat detectors. The unit may therefore be directly interfaced with fire control panels by connection to fire zone trigger circuits or addressable interface modules.

The unit has a 3½ digit LCD which activates on fire condition and displays the distance into the zone that the alarm has occurred. Digital LHDC may be employed in lengths up to 2Km (1999m). The unit has an adjustment to accommodate interposing cables.

Signalling of fire and fault status by means of volt free contacts may also be realised when a separate supply is employed.

A 4 to 20 mA instrumentation current loop out put is provided for connection to PLCs etc.

The DIN rail modular form of the unit enables it to both be provided in a variety of discrete housings and readily integrated into multi zone control panels.

The primary features of the control units are:-

- ◆ **Operable from two wire fire panel Trigger Circuits. Line / Low Power.**
- ◆ **Analogue address loop interfactable - Loop Powered.**
- ◆ **Display of Alarm Location - Distance in metres.**
- ◆ **4 to 20 mA instrumentation current loop output.**
- ◆ **LHDC Hazardous Area use by means of Intrinsically Safe Zener Barrier.**
- ◆ **Fault monitoring of LHDC for open circuit conditions.**
- ◆ **LED indication of Fire, Fault & Supply status.**
- ◆ **Test & Reset push-buttons.**
- ◆ **Volt free contact outputs for Fire & Fault conditions - Selectable option.**
- ◆ **DIN Rail mounting.**

# LDM-519-DDL LHDC MONITOR & LOCATOR

## Digital Line Heat Detector Interface with Distance Display

### Principles

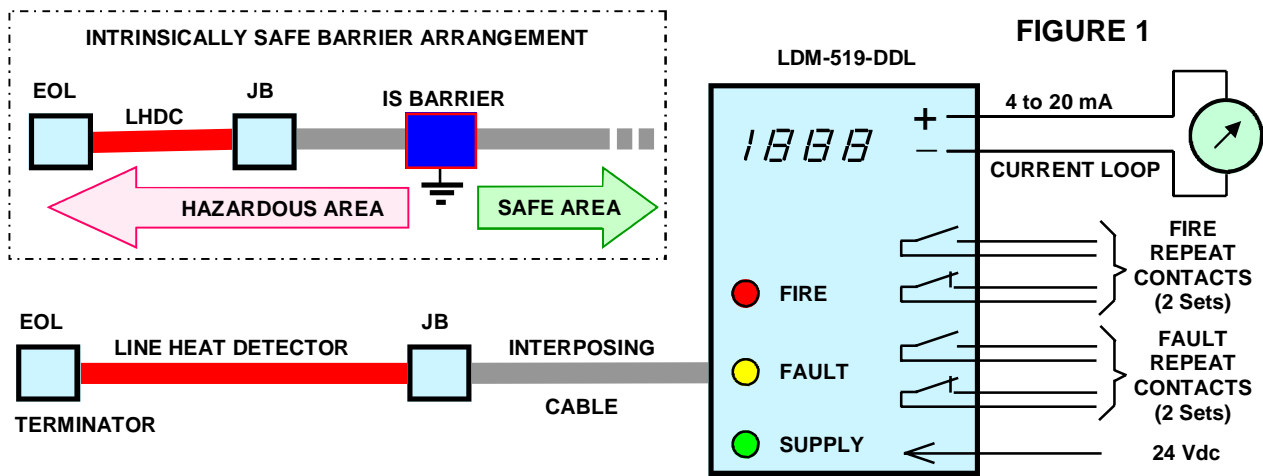
The unit is operated in conjunction with a length of Digital Line Heat Detector Cable (LHDC) and an 'end of line' (EOL) terminator. The LHDC is a twisted pair twin core cable. When the trigger temperature of the LHDC is reached these cores connect and a Fire alarm is registered. The LDM-519-DDL unit automatically determines the distance to the point of operation and displays this by means of an LCD. The current loop output provides an analogue of the 'distance'. This o/p is 0mA when normal, and scaled  $4mA = 0m / 20mA = 2000m$  on LHDC operation.

Reference should be made to the (separate) data sheet on the Line Heat Detectors for specification of their performance.

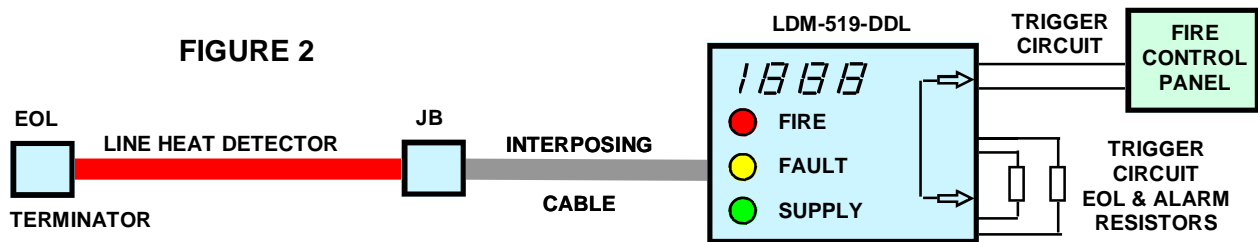
There are three principle modes of supply & signalling operation :-

**Figure 1** shows a typical minimum system where a discrete 24 Vdc supply is employed.

The repeat contacts may be employed to signal an alarm panel and/or initiate control systems.

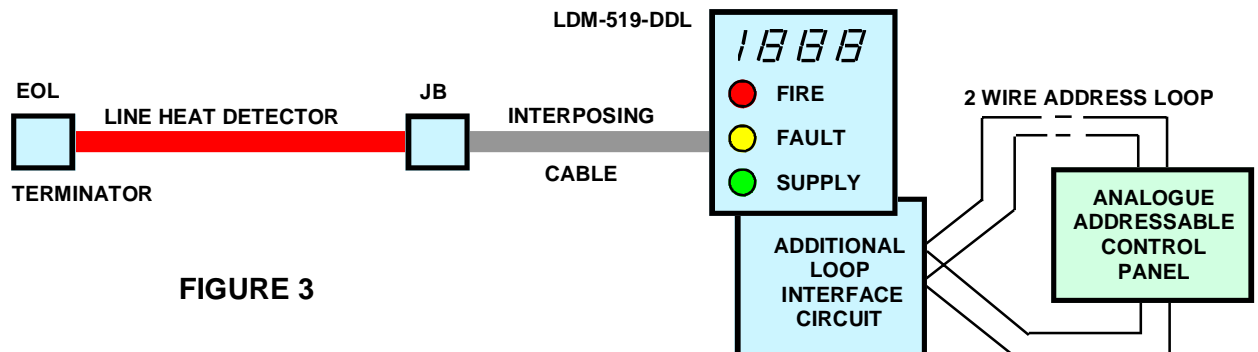


**Figure 2** shows a simple configuration with the unit directly connected to a fire panel trigger circuit.



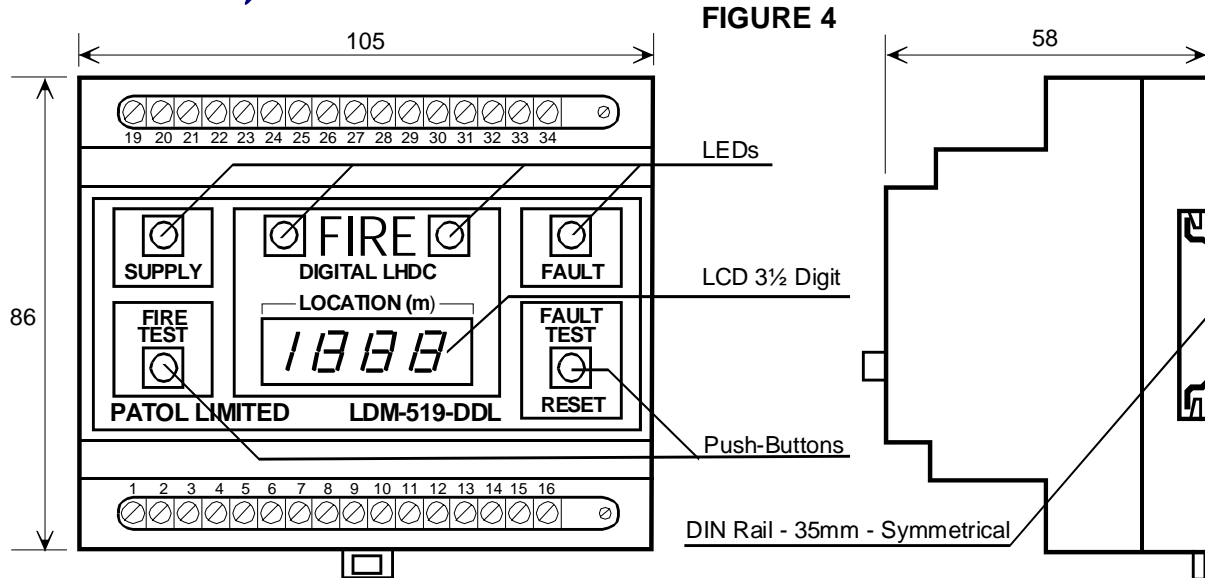
**Figure 3** shows the configuration when an integral ADDRESS LOOP interface module is fitted.

Connection between the LDM-519-DDL and the addressable loop module is as per the trigger circuit connection of Fig.2.



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*Module Arrangement*



*Enclosures*

The unit can be mounted in a variety of enclosures. For the example shown :-

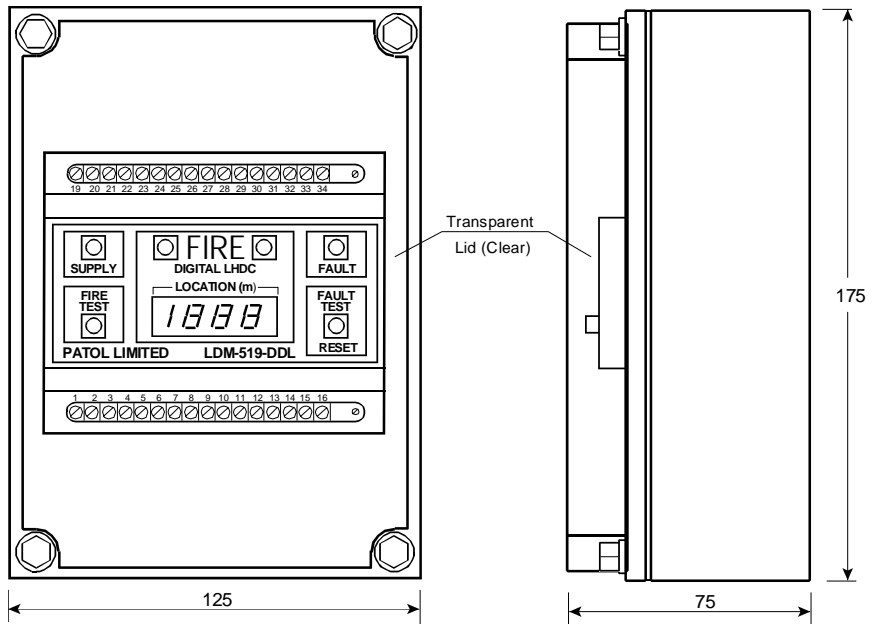
Rating :- IP 66

Lid :- Clear Transparent Material :- Polycarbonate

Base :- Grey RAL 7035 Material :- Polycarbonate

Optional Escutcheon

Versions available with integral address loop modules.



*Operational Specification*

Display: Four digit LCD : 0 to 1999m  
 Character height : 8.5mm  
 Unit accuracy : +/- 1% (+/- 1 digit)  
 LHDC tolerance : +/- 3%  
 Lock time : 3s

Voltage: 14-30 Vdc (2 wire Mode)  
 20-30 Vdc (Relay Mode)  
 > 10 Vdc - Latched Fire  
 < 6 Vdc - Reset

Current-Normal < 1.5 mA (2 wire mode) \*  
 < 11 mA (with fault relay)  
 \* Plus user defined monitoring current.

Current-Fire < 12 mA (2 wire mode) \*\*  
 < 22 mA (with fire relay) \*\*\*  
 < 29 mA (with both relays)\*\*\*

\*\* Plus user defined Fire (trigger) load.  
 \*\*\* Plus 4/20mA loop current if used.

Current-Fault < 700  $\mu$ A

Relay Contacts 1 A @ 24 Vdc / 120 Vac

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## Direct Powered Configuration - Relay Mode

In this mode both fire & fault relays are enabled by links at 7/8 & 9/10. The fault relay is energised in normal condition. A 24 Vdc power supply is required as the fault relay coil current requirement is greater than can be obtained from most trigger circuits whilst maintaining the required voltage.

Both fire & fault relays have twin contacts enabling both local control and repeat signalling.

The 4 to 20 mA analogue current loop output may be employed to signal to remote display equipment.

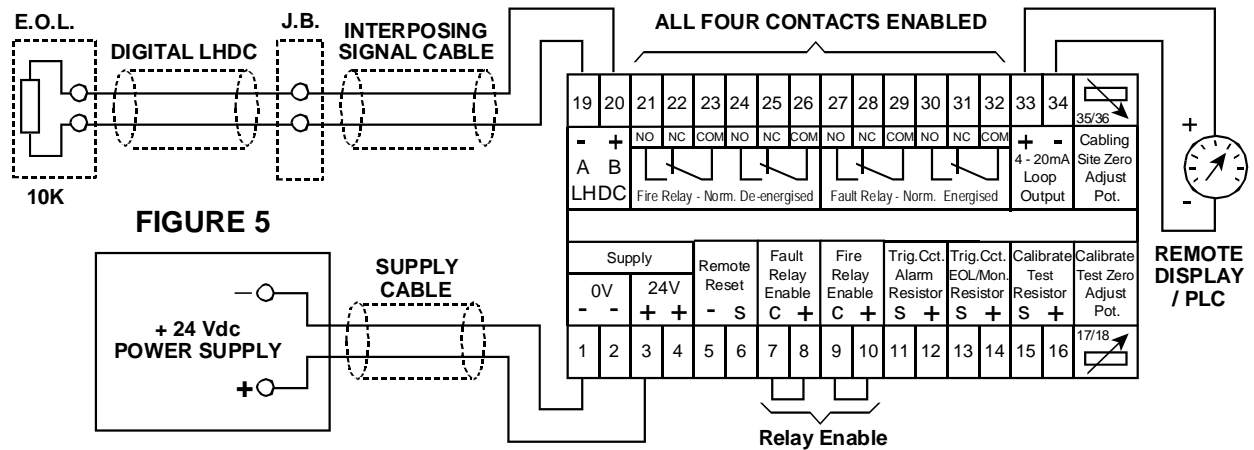


FIGURE 5

## Line Powered Configuration - Two Wire Mode

In this mode the relays are disabled and the unit's quiescent current is very low. By connection of appropriate value resistors at 11/12 and 13/14 the unit replicates the characteristics of smoke and heat detectors and may be directly connected to, and powered from, most fire system trigger circuits.

The resistor at 13/14 is presented to the trigger circuit when the unit is in normal condition. Should an LHDC open circuit fault or low voltage condition occur the resistor is "switched out" and the unit draws less than 700 uA from the trigger circuit. Systems employing end of line zeners should operate satisfactorily with the zener connected at 13/14 instead of a resistor. It may be necessary to use a lower value device than normal as there is a 0.7-1.0 V loss through the unit.

The resistor at 11/12 is presented to the trigger circuit on fire detection. The value should be chosen taking into account the trigger circuit characteristic, the increased unit current in alarm, and the voltage requirements.

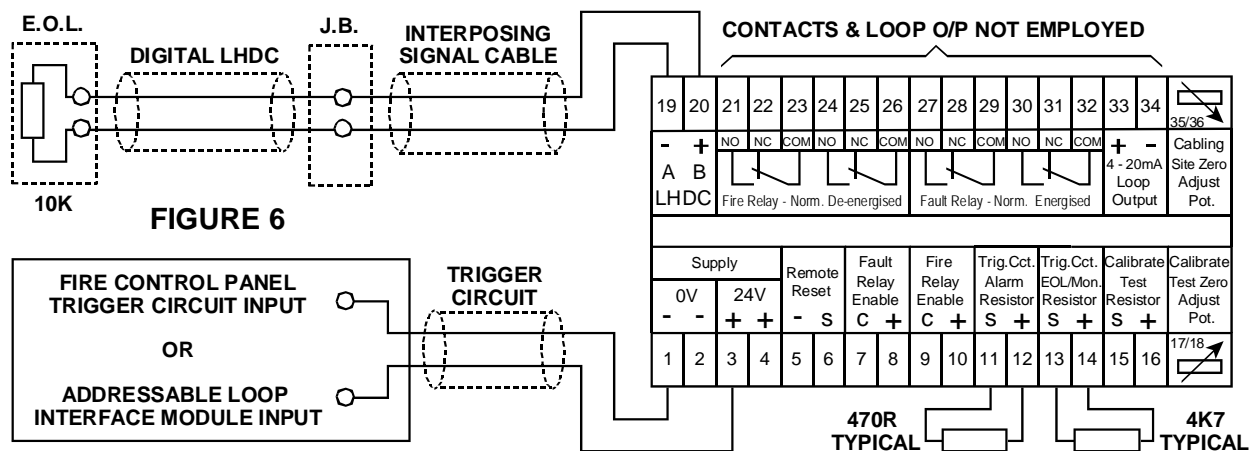


FIGURE 6

In certain circumstances it is possible to operate the fire relay in the two wire trigger circuit mode. This can only occur if the voltage at initiation is greater than 17 V and the subsequent alarm condition maintains the trigger circuit at 10V or greater. Contact Patol.

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## Hazardous Areas - IS Barriers

The LHDC may be installed in a Hazardous Area by employing an Intrinsically Safe Zener Barrier which ensures that even under fault conditions the LHDC circuit has insufficient electrical energy to produce a spark initiated explosion. Both Barrier and LDM-519-DDL module must be located in a 'Safe Area'.

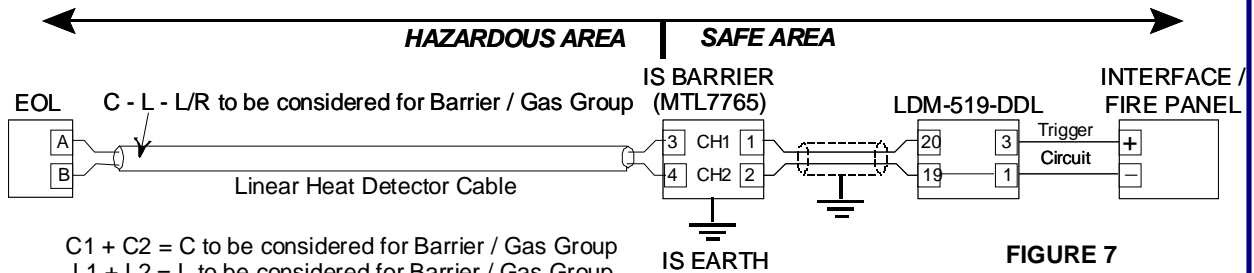
Each Barrier type specifies maximum parameters for cable located in the Hazardous Area. These parameters are:- Capacitance (C), Inductance (L) & Inductance to Resistance Ratio (L/R). The whole of the hazardous area circuit, both LHDC and interposing cable, must comply in all three aspects.

For use with the LDM-519-DDL Patol recommends a Dual Channel Shunt Diode AC Barrier, 15V - 150mA - 100R per channel. MTL 7765 by Measurement Technologies Ltd. is of this type.

The C-L-L/R parameters for the barrier depend on the configuration and 'gas group'. When considered together with the LHDC & interposing cable specification they will determine the compliance of an installation and/or define maximum cable lengths.

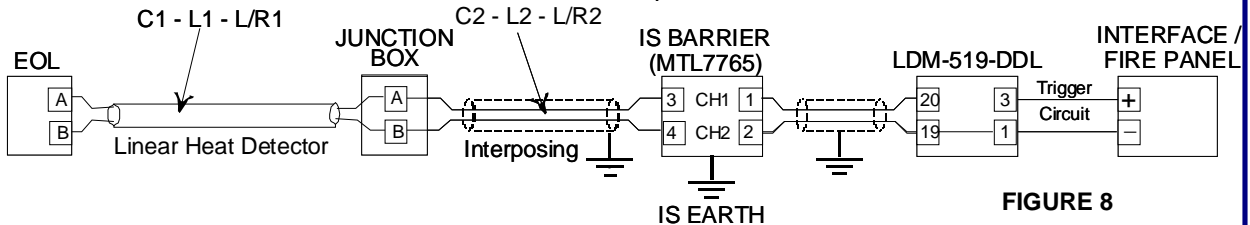
### COMBINED CHANNEL CONFIGURATION

Whilst the supply 0V must be maintained within 2V of earth, by employing both channels of the barrier (Figures 7 & 8) the circuit is isolated from earth at the IS Barrier, thus obviating 'multiple earth points' on Fire Panel signalling systems such as addressable loops.



**FIGURE 7**

$C1 + C2 = C$  to be considered for Barrier / Gas Group  
 $L1 + L2 = L$  to be considered for Barrier / Gas Group  
 Greater of  $L/R1 - L/R2$  to be considered for Barrier / Gas Group  
 $C1 - L1 - L/R1$        $C2 - L2 - L/R2$



**FIGURE 8**

EXAMPLE : The parameters for the MTL7765 in a combined channel configuration (Figs 7 & 8) for a group IIC gas are :-

Maximum Capacitance -  $C=0.58\mu F$

Maximum Inductance -  $L=0.32mH$

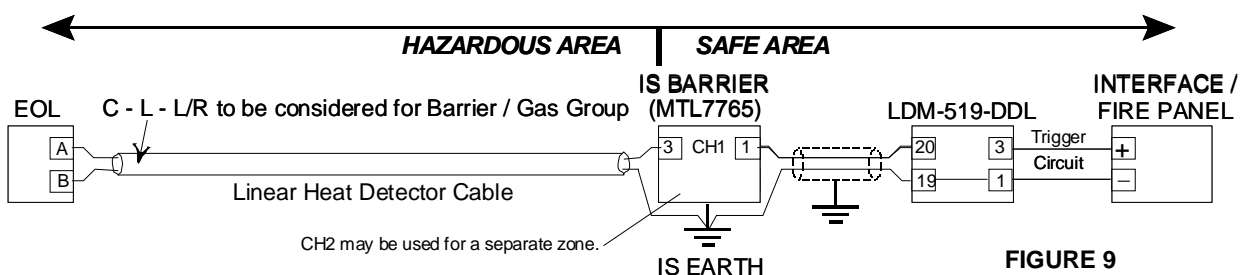
Maximum Inductance to Resistance Ratio -  $L/R=22\mu H/ohm$ .

Patol 70deg. Non-Armoured LHDC has  $C=120pF/m$  ,  $L=0.95\mu H/m$  ,  $L/R=5.5\mu H/ohm$ .

With no interposing cable the predominating factor in this case is inductance which limits the LHDC length to 336m ( $0.32 / 0.00095$ ).

### SINGLE CHANNEL CONFIGURATION

Another arrangement is a single channel circuit which permits greater lengths of LHDC to be installed.



**FIGURE 9**

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The configuration of fig.9 shows one side of the LHDC circuit "returned to earth".

EXAMPLE : The max parameters for the MTL7765 in a single channel configuration (Fig 9) for a group IIC gas are :-

Maximum Capacitance -  $C=0.58\mu\text{F}$

Maximum Inductance -  $L=1.45\text{mH}$

Maximum Inductance to Resistance Ratio -  $L/R=66\mu\text{H}/\text{ohm}$ .

Patol 70deg. Non-Armoured LHDC has  $C=120\text{pF}/\text{m}$  ,  $L=0.95\mu\text{H}/\text{m}$  ,  $L/R=5.5\mu\text{H}/\text{ohm}$ .

With no interposing cable the predominating factor in this case is inductance which limits the LHDC length to 1526m ( $1.45 / 0.00095$ ).

The LDM-519-DDL may be used with barriers other than the MTL7765 with the following restrictions:-

Minimum zener voltage 15V

Maximum total barrier resistance 260R

For further information including the full range of Patol Linear Detector C-L-L/R specifications refer:-

D1120 - APPLICATION NOTE - LINEAR HEAT DETECTION CABLE  
The use of LHDC in Hazardous Areas by means of Intrinsically Safe Barriers

The above information is a guidance note. National / Local Regulations, Standards and Barrier Specifications MUST take precedence in any system design and implementation.

### *Site Adjustments - Interposing Cable / IS Barriers*

When a fire condition is detected the distance in meters from the start of the LHDC zone to the "hot spot" is displayed by the LCD. The mechanism employed is the resistance characteristic of the LHDC.

In some circumstances the LHDC may be connected to the monitoring unit by fire proof interposing cables and/or IS Barriers.

An adjustment control is provided to negate the resistance of the cable / barrier. This control is also used to 're-zero' directly connected units. The procedure is as follows:-

- i) Place a short circuit at the start of the LHDC (at the JB or Barrier terminals). If no interposing cable is employed the s/c should be at the module terminals 19/20.
- ii) The LCD will show a figure which will stabilise after a few seconds. The decimal points between digits will appear if the reading is 'negative'.
- iii) The upper potentiometer control (at 35/36) should be adjusted for a zero reading.
- iv) When a zero reading is achieved the short circuit should be removed from the LHDC signal.
- v) Operation of the 'Fire Test PB' will simulate a fire condition with resultant LCD indication as (ii) by presenting any resistor connected to terminals 15/16 across the LHDC circuit. The display will only indicate during PB operation. On PB release, prior to Reset, the LCD will 'blank' (1 - - -).
- vi) The nominal calibration of this test resistor is 184 milli-ohms per meter. A value should be chosen such as to produce any required specific display on test PB operation.

For example this could be the actual zone length.

A 1300m zone would require a resistor of value  $1300 \times 0.184 = 239.2\text{R}$ .

In practice, for an installation without an IS Barrier, a 220R resistor could be fitted.

If an IS Barrier is employed then the total Barrier 'end to end' resistance must be added. For the MTL7765 used in combined channel mode (Figs. 7 & 8) the resistor value is:

$124\text{R} + 124\text{R} + 239.2 = 487.2\text{R}$ . In practice a 470R could be fitted.

The lower potentiometer (50R) is in series with the resistor fitted at terminals 15 & 16, and may thus be used to both trim to the required display and accommodate any interposing cable 'off-set'.

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*Operation* The module should have been 'set up' as detailed in the previous section.

It should be noted that in order for the unit to operate at very low supply currents, as is necessary for connection to Fire System trigger circuits, the Supply & Fault LEDs illuminate in a 'flashing' mode. The 'flash' cycle is approximately 2s (0.5Hz) with an ON : OFF ratio of approximately 1 : 5.

The relay & resistor o/p conditions described following are as is appropriate to the configured mode.

**NORMAL LHDC OK & Supply Voltage greater than 13 Vdc**

- Green 'Supply' LED - Flashing
- Liquid Crystal Display - Off / Blank
- 4-20mA output - 0 mA
- Fire & Fault LEDs - Off
- Fire relay & Trigger circuit Alarm resistor o/p (TM 11/12) - De-energised
- Fault relay & Trigger circuit EOL resistor o/p (TM 13/14) - Energised

**FAULT LHDC open circuit or Supply Voltage less than 13 Vdc.**

- Yellow 'Fault' LED - Flashing
- Fault relay & Trigger circuit EOL resistor o/p (TM 13/14) - De-energised
- Supply current - < 700 uA

The unit will automatically return to Normal on rectification of the Fault condition.

**FIRE LHDC Activated**

- Red 'Fire' LEDs - On
- LCD - Activated - Displaying distance to 'Alarm Point' in metres.
- 4-20mA output - Current gives distance to 'Alarm Point' - Scaled 4mA=0m 20=2km
- Fire relay & Trigger circuit Alarm resistor o/p (TM 11/12) - Energised

**FIRE TEST Module Fire Test push-button operated**

- Indications, fire relay and alarm resistor output operate as for Fire above.
- LCD - Display distance as defined by calibrate resistor (TM 15/16).  
Note : The Test push-button must be depressed until the LC Display stabilises (3s). On p-b release the unit will remain latched to 'Fire' but the LCD will be blank (1---).
- 4-20mA output - Loop current scaled to the value of the calibrate resistor.  
Note : The output is only valid during push-button operation. On push-button release before module reset the output will drive over scale - 40mA.

**FAULT TEST Module Fault Test & Reset push-button operated**

- An LHDC Fault condition is simulated during PB operation

**RESET Module Fault Test & Reset push-button operated**

- The unit is normalised after a 'Fire Test' push-button operation.
- On LHDC activation Reset PB operation causes refresh of the LCD indication.
- Reset after a true Fire can only occur subsequent to replacement of the 'operated' LHDC.

**Patol Limited**

**Rectory Road, Padworth Common,  
Berkshire, United Kingdom. RG7 4JD**  
**Tel: +44 (0) 118 9701701 email : info@patol.co.uk**  
**Fax: +44 (0) 118 9701700 Web: www.patol.co.uk**