



# ALARMLINE II

## Dual Zone Digital Location Control Unit Installation and Operation Manual

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**EU compliance** 



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# Important information

Kidde Products Ltd. has taken every care to ensure that Alarmline II Digital Linear Heat Detection systems are as simple to install as possible but in case of difficulty, please contact our Help Line to ensure trouble free installation and operation.

Kidde Products Ltd. takes no responsibility for damage or injury occasioned as a result of failing to install or operate the equipment in accordance with these instructions.

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Advisory messages alert you to conditions or practices that can cause unwanted results. The advisory messages used in this document are shown and described below.

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**WARNING:** Warning messages advise you of hazards that could result in injury or loss of life. They tell you which actions to take or to avoid in order to prevent the injury or loss of life.

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**Caution:** Caution messages advise you of possible equipment damage. They tell you which actions to take or to avoid in order to prevent the damage.

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**Note:** Note messages advise you of the possible loss of time or effort. They describe how to avoid the loss. Notes are also used to point out important information that you should read.

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# Introduction

## Overview

The Alarmline II Dual Zone Digital Location Control Unit is designed for monitoring Alarmline II Digital Sensor cables.

Most Alarmline II Digital Linear Heat Detection (LHD) systems use a standard monitored circuit (such as a conventional detection zone) or an addressable input module to monitor the status of the sensor cable, but these monitoring methods provide only simple two state operation (alarm or no alarm).

The control unit provides a number of additional features to a standard LHD system, including:

- Monitoring of two zones of digital sensor cable
- 3000 m (9842 ft.) of sensor cable per zone
- Independent or interlock zone operation
- Alarm distance location along sensor cable
- Modbus interface

Figure 1: Dual Zone Digital Location Control Unit

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## Regulatory information

The control unit is approved to UL864 (tenth edition).

Installations that are required to comply with UL must be installed in accordance with NFPA 70, NFPA 72, and NEC 760 (National Electric Code).

Non-UL installations must be installed in accordance with the relevant local standards and AHJ's (Authority Having Jurisdiction).

## Description

Alarmline II Digital Sensor Cable has an insulation designed to soften at a particular temperature (the cable alarm temperature) – when the cable reaches this temperature, it short circuits and activates an alarm condition.

The Dual Zone Digital Location Control Unit is an optional component for any Alarmline II Digital LHD system and offers enhanced monitoring and interfacing features, as well as simple status indications and controls for monitoring the LHD system.

Dual LHD zones are provided on the control unit, which enable the following features:

- **Two zones of sensor cable:** Two monitored inputs allow connection of two Alarmline II Digital Sensor Cables to one control unit. The sensor cables for each zone are independent and can be different alarm temperatures if required. The two zones of sensor cable can be used to protect two separate risk areas or can be used to protect the same risk area using two different temperature cables providing pre-alarm and alarm type system.
- **Independent or interlock modes of operation:** Each zone on the control unit has alarm and fault outputs for independent signaling to a main fire alarm control panel. The two zones can also be programmed in interlock mode – this provides a coincidence scenario where both zones must be in alarm before any alarm outputs are triggered.

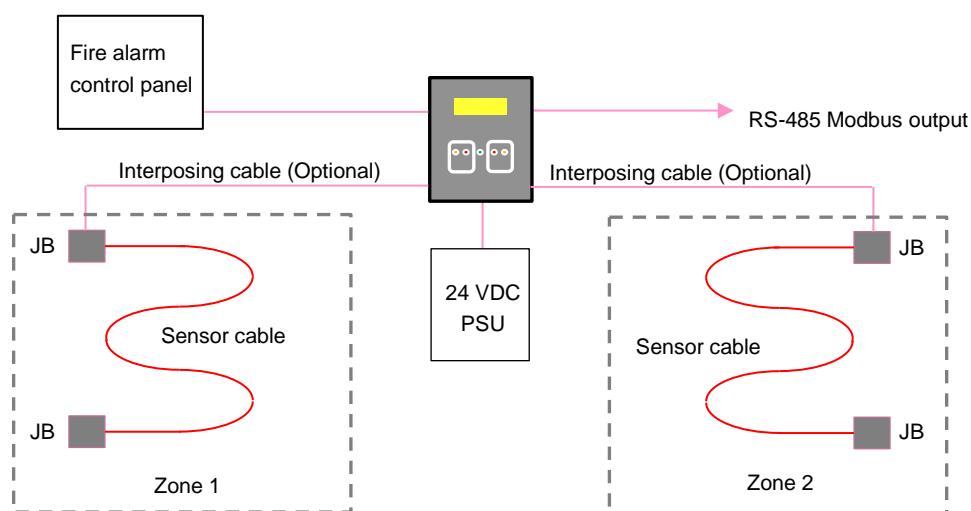
The control unit provides open circuit fault monitoring of the digital sensor cable with a short circuit on the digital cable activating an alarm condition.

Interposing cable can be used between the control unit zone input and the digital sensor cable allowing the control unit to be mounted remotely to the risk area. See “Interposing cable” on page 14 for more information.

Additional features provided by the control unit:

- **Alarm location:** Detecting the location of an overheat condition or flame within the risk area can help reduce the response time to an incident (thus minimizing the damage). The control unit can identify the point along the sensor cable where the fire has occurred.
- **Modbus interface:** In many applications it can be advantageous to link the LHD system to third party graphics or control systems. The Modbus output on the control unit provides the capabilities to do this for each zone.

**Figure 2: Alarmline II Digital LHD system**



## Technical specifications

### Electrical

Operating voltage	12-36 VDC (nominal 24 VDC)
Current consumption	
Standby	<7 mA at 24 VDC <15 mA at 12 VDC <5 mA at 36 VDC
Alarm	<40 mA at 24 VDC <23 mA at 12 VDC <15 mA at 36 VDC
Terminals	
Spacing	5 mm rising clamp
Current rating	16 A
Cable size	0.08 to 4 mm <sup>2</sup> (28 AWG to 11 AWG)
Zone inputs	
Number of zone inputs	2 supervised inputs [1]
Zone length	1 m (3.28 ft.) min. to 3000 m (10,000 ft.) max.
End-of-line resistor	1 k $\Omega$
Short circuit current	0.5 mA
Voltage	5 V max.
Ground fault impedance	0 $\Omega$
Alarm outputs	
Number of alarm outputs	2 form C volt-free relay contacts (1 per zone)
Current rating	2A at 30 VAC/42.4 VDC
Switching power	60 W, 62.5 VA
Fault outputs	
Number of fault outputs	2 opto-isolated phototransistor outputs (1 per zone)
Voltage	35 VDC max.
Current	80 mA max.
Power dissipation	150 mW max.
Communications output	Two-wire RS-485 Modbus RTU

[1] For up to two class B zones of Alarmline II Digital Sensor Cable



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**Physical and environmental**

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Enclosure	Plastic enclosure with clear plastic lid fitted with membrane label
Material	Polycarbonate
Colour	Light grey (RAL 7035)
Dimensions (H x W x D)	180 x 120 x 60.5 mm (7.1 x 4.72 x 2.38 in.)
Cable entries [1]	2 x M16 x 1.5 threaded gland holes 4 x M12 x 1.5 threaded gland holes
Operating temperature	-20°C to +50°C (-4°F to 122°F)
IP rating	IP65 (NEMA 4, 4X)

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[1] Cable glands not supplied

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**Status indications**

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Display	2-line, 16-character backlit display
LED indicators	
Power	1 x green LED
Alarm	2 x red LEDs (1 per zone)
Fault	2 x amber LEDs (1 per zone)
Internal buzzer	92 dB(A) at 10 cm, 2.4 kHz, pulsed signal (operates during alarm and fault conditions)

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## Operating modes

The control unit can operate in two different functional modes: Independent or Interlock, providing added flexibility to LHD system design. More information on each mode is provided below.

### Independent mode

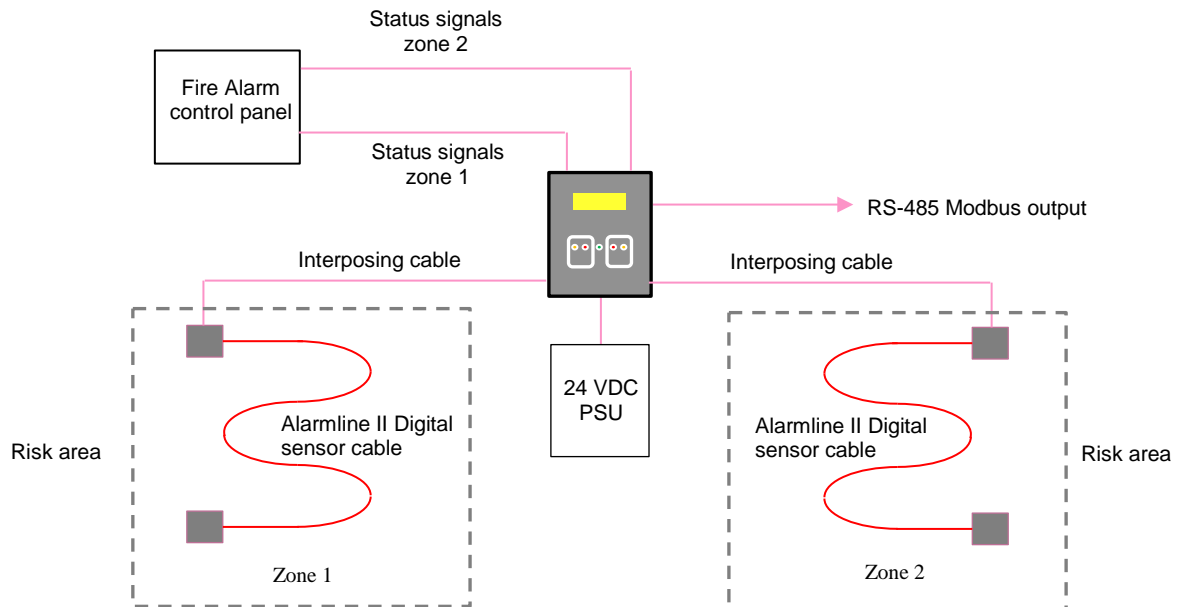
In this mode the control unit operates the two LHD zones as completely independent detection circuits with independent status outputs.

This provides the following advantages:

- Protection of two risk areas with two sensor cables through one control unit
- Protection of one risk area with two detection zones
- Protection of one risk area as one detection zone with two different temperature sensor cables providing a pre-alarm and alarm system

## Protection of two risk areas with two sensor cables through one control unit

Figure 3: Protection of two risk areas with two sensor cables through one control unit



This setup provides two independent zones covering two separate risk areas with each zone reporting its own status to the main fire alarm system.

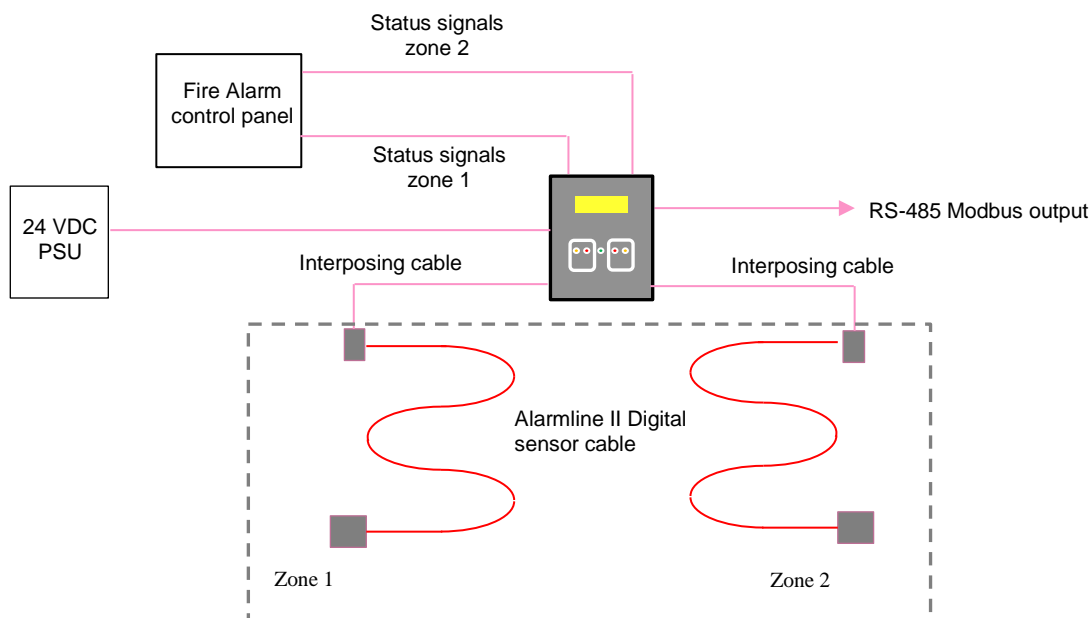
The sensor cables connected to each zone can have different alarm temperatures and different protective outer sheaths to suit the area they are protecting.

To report to the main fire alarm system, two separate conventional detection circuits or two addressable monitoring interfaces are required to monitor the status of each independent zone.

**Caution:** As the system uses one control unit, the total combined area coverage of both Digital LHD zones cannot exceed the maximum detection zone size as defined by local standards (refer to your local standards).

## Protection of one risk area with two detection zones

Figure 4: Protection of one risk area with two detection zones



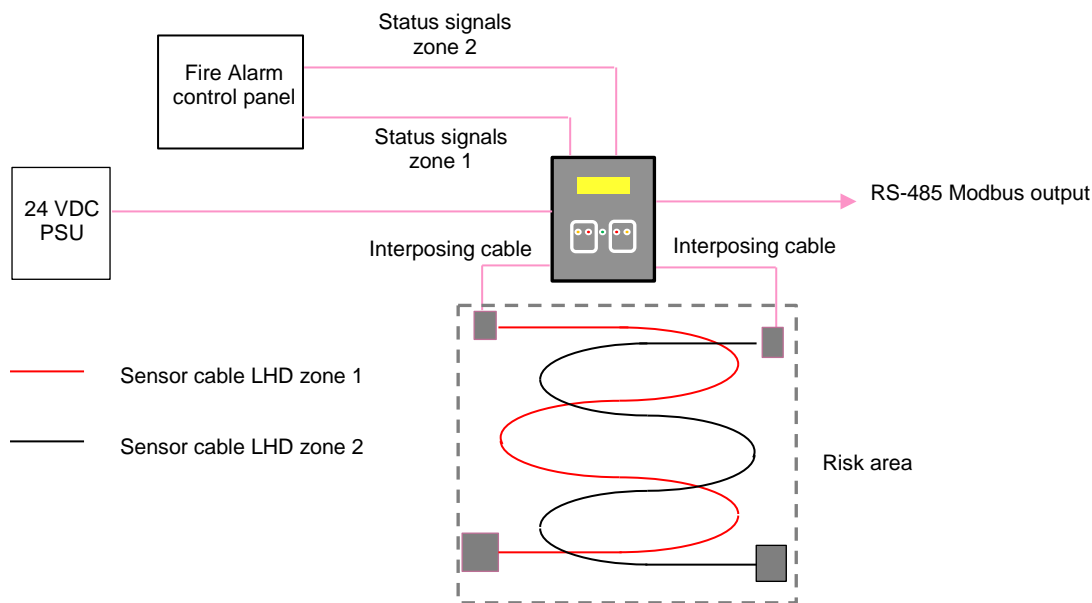
In a large risk area the control unit can be used to create two sub zones to reduce the search area should an alarm be generated.

To report to the main fire alarm system, two separate conventional detection circuits or two addressable monitoring interfaces are required to monitor the status of each individual zone.

**Caution:** As the system uses one control unit, the total combined area coverage of both Digital LHD zones cannot exceed the maximum detection zone size as defined by local standards (refer to your local standards).

## Protection of one risk area as one detection zone with two different temperature sensor cables providing a pre-alarm and alarm system

Figure 5: Protection of one risk area as one detection zone with two different temperature sensor cables providing a pre-alarm and alarm system



As the control unit can monitor two zones of sensor cable, it can cover a single risk area with two sensor cables of different alarm temperatures, effectively providing a two-stages alarm system.

Each zone has separate status outputs allowing the fire alarm control panel to determine which temperature cable has activated the alarm. Through the fire alarm control panel, different cause and effects can be programmed for each alarm activated by the control unit.

**Caution:** As the system uses one control unit, the total combined area coverage of both Digital LHD zones cannot exceed the maximum detection zone size as defined by local standards (refer to your local standards).

### Interlock mode

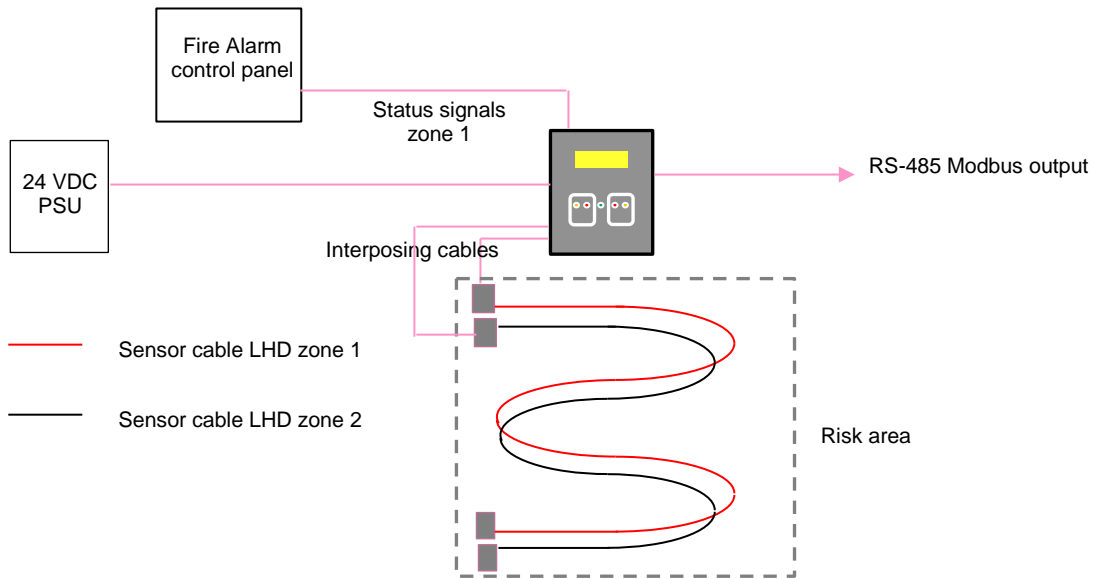
This mode configures the control unit as two LHD zones providing coincidence detection (that is, both zones of sensor cable must be in an alarm state in order to activate an alarm on the control unit, which is then signaled to the main fire alarm system). Interlock mode should be used in applications where a failsafe alarm is required.

The sensor cables connected to zone 1 and zone 2 of the control unit must have the same alarm temperature and must be installed in the same risk area, running parallel to each other.

**Note:** In interlock mode only one set of status outputs function, and these are the ones associated with LHD zone 1.

**Caution:** As the system uses one control unit, the total combined area coverage of both Digital LHD zones cannot exceed the maximum detection zone size as defined by local standards (refer to your local standards).

**Figure 6: Interlock mode**



# Installation

This manual describes the installation of the Dual Zone Digital Location Control Unit. Refer to the sensor cable installation manual for help installing the Digital LHD sensor cable.

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**Caution:** This product must be installed and maintained by qualified personnel adhering to all local or national installation requirements and any other applicable regulations.

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**Caution:** When handling any electric components or printed circuit boards, antistatic precautions must be followed. Failure to do so may result in component damage.

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## Mounting the enclosure

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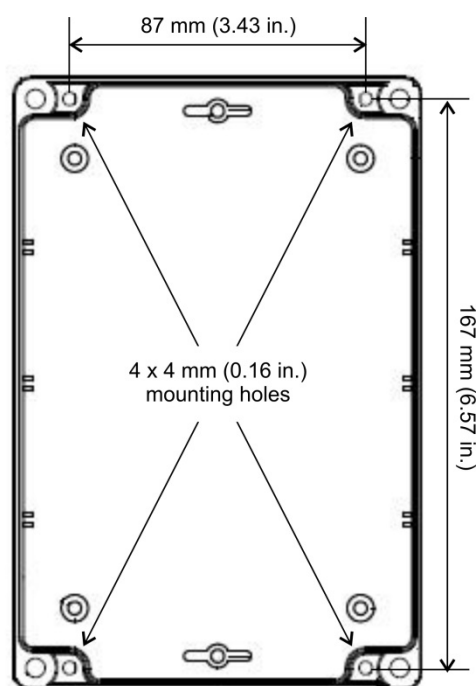
**Caution:** Use the mounting and gland holes provided to ensure the integrity of the IP rating.

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The enclosure has 4 x 4 mm (0.16 in.) mounting holes recessed in each corner (see Figure 7 below). Remove the front cover to access these.

**Figure 7: location of the mounting holes**

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Mount the enclosure on an even surface (an uneven surface can cause distortion of the enclosure and internal PCB).

If the anticipated mounting surface is uneven, mount the unit on stand-offs or a suitable framework to counter the uneven surface.

## Terminal connections

The control unit is provided with a number of fixed terminal connections to enable external wiring.

Terminal connections are provided for power supply, LHD zones, zone alarms, zone faults, and Modbus. See the table below for more information on each.

**Table 1: Terminal connections**

Connector	Description
Power supply	Polarity conscious positive and negative terminals to connect an external power supply (operating voltage range of 12 to 36 VDC).
LHD Zone 1	Supervised input to connect a zone of sensor cable. The cable can be connected directly or via an interposing cable.  The input requires a 1 kΩ EOL monitoring resistor.
LHD Zone 2	Supervised input to connect a zone of sensor cable. The cable can be connected directly or via an interposing cable.  The input requires a 1 kΩ EOL monitoring resistor.
Zone 1 Alarm	Volt-free changeover contacts to signal a fire condition on LHD ZONE 1 to the main fire alarm system. Three terminals are provided: C (Common), NO (Normally Open), and NC (Normally Closed).  In normal operation there is continuity between the C and NC terminals. In an alarm condition on zone 1 the relay contacts switch to provide continuity between C and NO.
Zone 2 Alarm	Volt-free changeover contacts to signal a fire condition on LHD ZONE 2 to the main fire alarm system. Three terminals are provided: C (Common), NO (Normally Open), and NC (Normally Closed).  In normal operation there is continuity between the C and NC terminals. In an alarm condition on zone 2 the relay contacts switch to provide continuity between C and NO.
Zone 1 Fault	An opto-isolated phototransistor output that changes state when a fault condition occurs on LHD ZONE 1. The output is failsafe: it is active when the unit is powered and de-activates when a fault condition occurs.  A failsafe fault ensures that a fault will be transmitted to the main fire alarm system in the event of a power failure.
Zone 2 Fault	An opto-isolated phototransistor output that changes state when a fault condition occurs on LHD ZONE 2. The output is failsafe: it is active when the unit is powered and de-activates when a fault condition occurs.  A failsafe fault ensures that a fault will be transmitted to the main fire alarm system in the event of a power failure.
Modbus RTU	A two-wire RS-485 Modbus output. This can output the status of each zone to third party control equipment or software.

## Interposing cable

In many applications it is not possible to install the control unit close enough to the location of the digital sensor cable, therefore an electrical connection needs to be provided between them.

An interposing cable can be used to provide an electrical connection between the control unit and the sensor cable.

Interposing cable should be suitably fire rated to maintain the integrity of the interposing cable in a fire condition until the sensor cable has triggered an alarm.

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**Caution:** A short circuit on the interposing cable activates a fire condition. Ensure that this does not contravene any applicable local standards. The risk of a short circuit on the cable can be reduced by selecting a suitably robust cable or by providing additional protection (for example, a conduit).

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The recommendations for interposing cable are as follows:

Cable size	Max. leader cable length
20 AWG	
Stranded copper 16 x 0.2 mm	1000 m (3281 ft.)
Single-core copper 0.8 mm diameter	
22 AWG	
Stranded copper 7 x 0.25 mm	600 m (1968 ft.)
Single-core copper 0.6 mm diameter	
24 AWG	
Stranded copper 7 x 0.2 mm	390 m (1280 ft.)
Single-core copper 0.5 mm diameter	



## Wiring diagrams

The following section provides details of how to configure the wiring for the detection zone circuits and relay outputs.

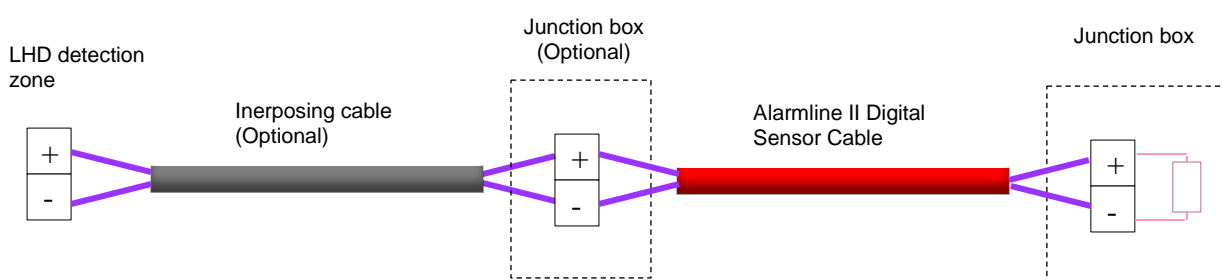
### Connecting Alarmline II Digital Sensor Cable

There are two LHD detection zones on the control unit, used to monitor two separate installations of sensor cable. These are monitored circuits which require an end-of-line monitoring resistor value 1 k $\Omega$ .

The maximum length of sensor cable that can be connected to an individual zone is 3000 m (9842.5 ft.) and the minimum length is 1 m (3.28 ft.).

Zone circuit wiring is shown in Figure 8 below.

**Figure 8: Zone circuit wiring**



The interposing cable and connecting junction box shown are optional. When using an interposing cable the control unit is calibrated to distinguish this from the sensor cable. Interposing cable is monitored by the control unit for open circuit fault conditions. See “Interposing cable” on page 14 for more information.

If the installation does not require an interposing cable, the sensor cable is connected directly to the control unit’s LHD zone terminals.

Any junction boxes used must be of a suitable specification for the area where they are installed.

### Interfacing with the main fire alarm system

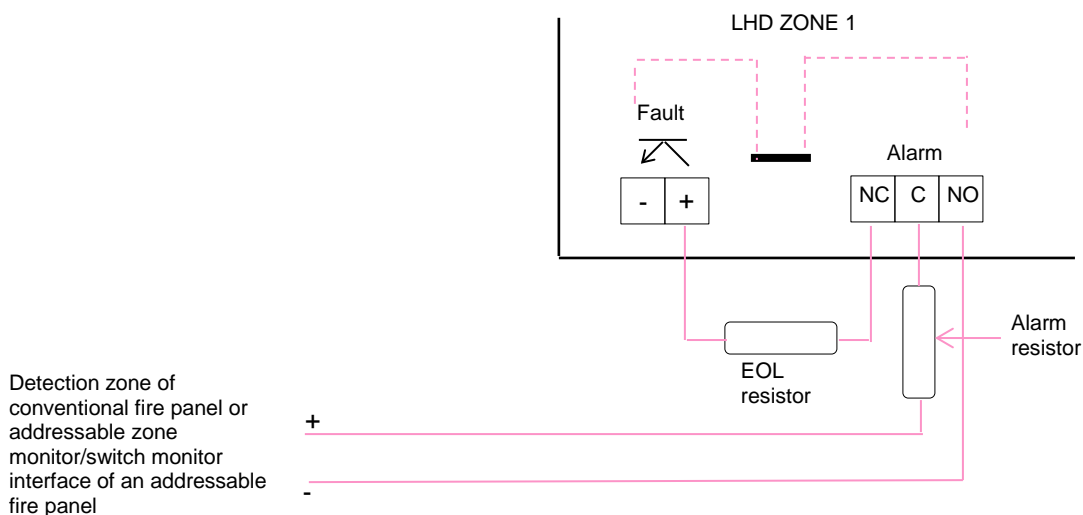
Outputs are provided to enable the control unit to signal status information to a fire alarm system. Each LHD zone on the control unit has its own status outputs (1 fire output and 1 fault output per zone) allowing individual reporting to the main fire alarm system.

The status outputs can be interfaced to any supervised input (for example, a detection zone on a conventional fire panel or an addressable loop interface on an addressable fire panel).

Cables for connecting the status outputs to the main fire alarm system must be suitably fire rated cable.

The wiring configuration to monitor the outputs is shown in Figure 9 on page 16.

**Figure 9: Wiring configuration to monitor outputs**



**Note:** The end-of-line (EOL) and alarm resistor values are not specified – these values are determined by the monitoring circuit.

# Configuration and operation

## Configuration overview

Configuring the control unit is straightforward and can be done without a laptop or dedicated programming software. The control unit has a structured menu to guide you through the set-up sequence.

Configure the control unit using the internal SELECT and SET buttons:

- Press SELECT to select the available options
- Press SET to confirm the selection

Before starting the set-up process, all sensor cables and leader cables must be connected to the control unit.

## Set-up process

On power up the control unit shows the start-up screen with the product description and firmware version. The firmware version is displayed as 4-digit number (for example, R1234).

```
ALARMLINE II  
ADLCU RXXXX
```

After a few seconds the main menu screen appears. There are three menu options (see “Menu options” on page 18). Press SELECT to scroll through the options and SET to confirm a selection.

```
MAIN MENU  
LOAD CONFIGS
```

If the control unit was previously configured and no menu option is selected within 10 seconds, then the current configuration settings are loaded. The LCD will scroll through the current settings and will continue to the status screen.

```
ZONE 1: OK  
ZONE 2: OK
```

If the control unit is being configured for the first time and no menu option is selected within 10 seconds, then the first configuration option is shown.

## Menu options

There are three menu options, as shown below. Press SELECT to scroll through the options and SET to confirm a selection.

MAIN MENU  
LOAD CONFIGS

MAIN MENU  
NEW CONFIGS

MAIN MENU  
SELF TEST

### Load the current configuration settings

Select LOAD CONFIGS to load the current configuration settings, and then press SET to confirm the selection.

When this option is selected, the LCD displays the following message.

LOADING SAVED  
CONFIGS...

The LCD then scrolls through the configured settings.

### Create a new configuration

Select NEW CONFIGS to configure new system settings, and then press SET to confirm the selection.

MAIN MENU  
NEW CONFIGS

The first configuration option (operating mode) is then displayed on the LCD.

OPERATING MODE:  
INDEPENDENT

The control unit guides you through the configuration options one at a time to ensure no settings are missed. See “Configuring the operating mode” on page 19.

If an error is made during the configuration process, press SET and SELECT at the same time for 10 seconds – the LCD returns to the first configuration menu option.

### Self Test

MAIN MENU  
SELF TEST

Performs a self test to check the functionality of the control unit. Select SELF TEST to start the test. See “Testing” on page 25.

## Configuring the operating mode

This option configures the operating mode (independent or interlock).

Press SELECT to toggle between Independent and Interlock, and then press SET to confirm the selection.

OPERATING MODE:  
INDEPENDENT

OPERATING MODE:  
INTERLOCK

See “Operating modes” on page 7 for more information on the two operating modes.

## Configuring the cable type

This option configures the sensor cable type (the alarm temperature). Both zones (Z1, Z2) must be configured.

Press SELECT to scroll through the available temperature values for Z1, and then press SET to confirm the selection.

Z1 CABLE TYPE:  
68C

Repeat the process for Z2.

## Configuring the leader cable

This option configures the leader cable (YES, NO). Both zones (Z1, Z2) must be configured.

Press SELECT to scroll between YES and NO for Z1, and then press SET to confirm the selection.

Z1 LDR CABLE:  
NO

Z2 LDR CABLE:  
NO

If no leader cable is used, select NO for both zones.

If either zone uses leader cable:

1. Select YES for zone leader cable for Z1, and then press the SET to confirm the selection.

Z1 LDR CABLE:  
YES

The control unit then asks if the LHD zone is ready to calibrate.

READY TO  
CALIBRATE?

**Important:** Before proceeding, place a short circuit across the end of the leader cable (where it connects to the sensor cable).

2. With the short circuit in place, press SET to start calibration. The screen then displays the voltage drop across the leader cable.

```
ZONE 1 CAL:  
109 MV
```

3. Remove the short circuit from the end of the leader cable.

Repeat the process for Z2.

## Configuring latching outputs

This option configures latching for the outputs (YES, NO).

Press SELECT to toggle between YES and NO, and then press SET to confirm the selection.

```
LATCHING OUTPUTS:  
YES
```

Note the following:

- If latching outputs is YES, then all status outputs will remain active until the unit is manually reset (by powering down the unit).
- If latching outputs is NO, then all status outputs will automatically return to their normal state once the condition (alarm or fault) has been cleared.

## Configuring the Modbus output

This option configures the Modbus output.

Press SELECT to toggle between YES and NO, and then press SET to confirm the selection.

```
MODBUS OUTPUT ON:  
YES
```

If the Modbus configuration is YES (Modbus enabled), then all of the following must be configured:

- The Modbus address
- Baud rate
- Data bits
- Stop bits
- Parity

Once all of the above have been configured, the Modbus output is enabled for use.

See “Modbus communications” on page 26 for more information on Modbus communications.

### **Configuring the Modbus address**

Press SELECT to scroll through the available address range (1 to 247), and then press SET to confirm the selection.

MODBUS ADDRESS:

1

### **Configuring the baud rate**

Press SELECT to scroll through the available options, and then press SET to confirm the selection.

BAUD RATE:

1200

Available options: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200.

The selected baud rate must match that of the Modbus equipment that you are connecting to.

### **Configuring the data bits**

Press SELECT to scroll through the available options, and then press SET to confirm the selection.

DATA BITS:

7

Available options: 7, 8.

The selected data bits must match that of the Modbus equipment that you are connecting to.

### **Configuring the stop bits**

Press SELECT to scroll through the available options, and then press SET to confirm the selection.

STOP BITS:

1

Available options: 1, 2.

The selected stop bits must match that of the Modbus equipment that you are connecting to.

## Configuring parity

Press SELECT to scroll through the available options, and then press SET to confirm the selection.

```
PARITY:  
EVEN
```

Available options: Odd, Even, None.

The selected parity must match that of the Modbus equipment that you are connecting to.

## Restoring the factory default settings

To delete the current configuration and restore the factory default settings, press and hold SET and SELECT at the same time for 10 seconds. The screen returns to the first configuration menu option.

```
OPERATING MODE:  
INDEPENDENT
```

## Diagnostics information

If the status of the LHD system changes (due to a fire or fault condition) information is displayed on the LCD.

### Alarm condition

If the sensor cable detects a fire in either zone:

- The corresponding zone alarm LED on the front panel illuminates
- An audible buzzer activates
- The corresponding zone alarm relay activates
- The LCD displays the location of the alarm (by distance along the sensor cable).

The displayed location alternates between metres (M) and feet (FT). The distance is measured from the start of the sensor cable and does not include any interposing cable lengths.

```
ZONE 1: 534M  
ZONE 2: OK
```

```
ZONE 1: 1751FT  
ZONE 2: OK
```

Press SELECT to silence the buzzer.

**Note:** An alarm condition short circuits the sensor cable and the system can only be returned to normal status when the short circuit section of sensor cable has been identified and repaired.



## Interposing cable short circuit

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**Caution:** A short circuit on the interposing cable activates a fire condition. Ensure that this does not contravene any applicable local standards.

---

Reduce the risk of a short circuit on the interposing cable by selecting a suitably robust cable or by providing additional protection (for example, a conduit).

A short circuit on the interposing cable activates an alarm for the corresponding zone and displays the alarm location on the LCD as <4M (<13FT), as shown below.

ZONE 1: <4M  
ZONE 2: OK

ZONE 1: <13FT  
ZONE 2: OK

The detection system can only be returned to normal status by repairing the damaged interposing cable.

### Fault conditions

The control unit indicates zone faults, relay faults, interference faults, and ground faults.

If a fault condition occurs:

- The corresponding Fault LED on the front panel illuminates
- An audible buzzer activates
- The corresponding zone fault relay activates
- The LCD displays a description of the active fault

See below for more details on each fault indication.

### Zone fault

A zone fault is indicated when an open circuit exists on the wiring of the zone – this can be an open circuit on the sensor cable itself or the interposing cable (if used).

ZONE 1: FAULT  
ZONE 2: OK

**Note:** A 1 k $\Omega$  end-of-line resistor is required at the end of the sensor cable to monitor the integrity of the circuit. If the EOL resistor is not present (or has an incorrect value), a zone fault is indicated.

## Relay fault

A relay fault is indicated when an alarm condition exists and the alarm relay state doesn't change.

```
ZONE 1: RLY FLT  
ZONE 2: OK
```

---

**Caution:** A relay fault cannot be repaired. In the event of a relay fault, a replacement control unit will be required.

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## Interference fault

EMC interference can cause problems with the monitoring of the cable – providing false values, intermittent faults/alarms, etc.

If the control unit registers a fluctuation in the monitored values, an interference fault is indicated by activating the zone fault LEDs and fault outputs.

```
ZONE 1: I/F FAULT  
ZONE 2: OK
```

If an interference fault occurs then the source of the interference must be investigated. Once the cause of the interference is discovered, then the issue can generally be resolved by moving the cable away from the source of the interference.

**Note:** If interference is likely to be an issue then it may be necessary to consider a stainless steel braided variant of the sensor cable and connect the outer braid to earth.

## Ground fault

The control unit monitors for ground faults caused by a section of the sensor cable or interposing cable that has been damaged and the cable core is in contact with bare metal (that is, a fixing point, etc.)

Should a ground fault occur, the control unit activates the relevant fault indications and outputs and displays the following message.

```
ZONE 1: GND FLT  
ZONE 2: OK
```

The most likely cause of a ground fault is a damaged cable, therefore an inspection of the sensor cable and any interposing cable attached to the zone is necessary (checking for any damage to the cable outer sheath, any contact with sharp metal edges, etc.)

## Testing

Self Test simulates the functionality of the control unit during an alarm or fault condition, enabling the testing of the signalling to the main fire alarm system.

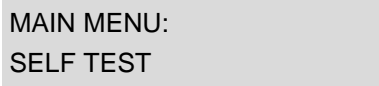
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**WARNING:** The zone or address for the control unit must be isolated at the main fire alarm control panel before initiating a test.

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### To perform a Self Test:

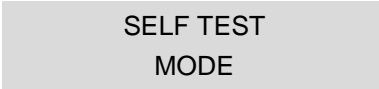
1. Go to SELF TEST in the main menu.



MAIN MENU:  
SELF TEST

2. Press SET to start the Self Test.

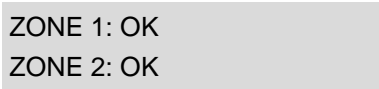
The control unit loads the saved configuration and then starts the test. During the test the LCD flashes SELF TEST MODE every few seconds.



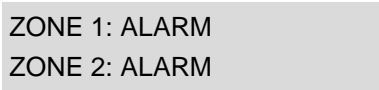
SELF TEST  
MODE

In self test mode, the control unit cycles between normal operation, alarm condition, and fault condition activating the relevant outputs for the LHD zones approximately every 8 seconds.

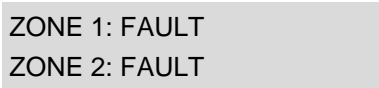
The LCD displays the zone test status as follows.



ZONE 1: OK  
ZONE 2: OK



ZONE 1: ALARM  
ZONE 2: ALARM



ZONE 1: FAULT  
ZONE 2: FAULT

The control unit will continue the test sequence until manually stopped.

3. To exit the test, press SET and SELECT at the same time until the unit resets (approximately 10 seconds).

## Modbus communications

The control unit includes a two-wire RS-485 Modbus output which (if enabled) provides status information to third party equipment.

The Modbus RTU and ASCII protocols are both supported by the control unit. Communications use the instructions and format shown below.

### Function 4 code (Read Input Registers)

Requests for reading the input registers are constructed as follows:

- The address of the first register to be read (16-bit)
- The number of registers to be read (16-bit)

The control unit responds as follows:

- The number of bytes of register values to be read (8-bit)
- The register values (16-bit register)

The information stored in the control unit for each LHD zone is shown in the table below.

**Table 2: Modbus register values**

Register	Description	Possible values
0	Zone 1 status	-1 or 65535 = fault on zone 0 = Zone OK 1 to 32767 = distance (in metres) to alarm point
1	Zone 2 status	-1 or 65535 = fault on zone 0 = Zone OK 1 to 32767 = distance (in metres) to alarm point
2	Zone 1 cable type	1 = 68°C 3 = 88°C 4 = 105°C 5 = 185°C
3	Zone 2 cable type	1 = 68°C 3 = 88°C 4 = 105°C 5 = 185°C

