SafeCable
Distance Locator Module
(DLM-Z2)

Installation Instructions

Contents:

Important Guidelines

Please read this instruction leaflet thoroughly before commencing installation.

- ✔ Install the Alarm Distance Locator Module (DLM-Z2) accordingly to meet local and country installation requirements.
- ✔ The DLM-Z2 must be installed in accordance with NFPA 70 & 72, NEC 760 (National Electric Code) and Authorities Having Jurisdiction and Manual
- ✔ Ensure the product is installed, commissioned and maintained by persons according to good engineering practices and who have received sufficient training on the unit.
- ✔ Only use SafeCable Digital Linear Heat Detection cable with the DLM-Z2.
- ✔ Test the Linear Heat Detection Cable before connecting it to the DLM-Z2 using a multimeter.
- ✔ Ensure the end of line resistor (Supplied with FACP) is securely connected at the end each linear heat detection cable.
- ✔ If only one zone is required install the end of line resistor (Supplied with FACP) connected across the terminals of the unused zone.
- ✔ Ensure any Strain Relief Connectors used are tightened to form a secure and moisture proof seal around the detection cable and any other cable in or out of the unit.

⚠ Do not exceed the maximum operating voltage of the DLM-Z2 (36Vdc).

⚠ Do not connect lengths of linear heat detection cable in 'T' connections or spurs.

⚠ In independent mode both fault outputs activate on an internal DLM-Z2 fault but only the corresponding fault output triggers if there is a fault on that LHD zone.

⚠ In cross zone mode, both fault outputs activate on any fault condition.

⚠ The Minimum Zone Length for the DLM-Z2 is 1 meter

General Description

Alarm Distance Locator Module

The SafeCable Alarm Distance Locator Module (DLM-Z2) is a Multi-Zone module for monitoring up to two zones of The SafeCable Digital Linear Heat Detection (LHD) Cable. If an overheat or fire situation triggers either zone of the LHD cable the unit automatically calculates and displays the distance along the cable, in feet and meters, to the alarm point. The two zones can operate independently of each other, or in (Cross Zone) Mode. A separate alarm and normally conducting fault output are provided for each zone. The unit is intended to be installed between the Digital Linear Heat Detection cable and a conventional or addressable fire alarm control panel. It has power, fault and alarm lights, as well as volt free outputs for fault and alarm, corresponding to each zone. It may also be connected to a industrial process control system using the two wire RS-485 Modbus RTU output.

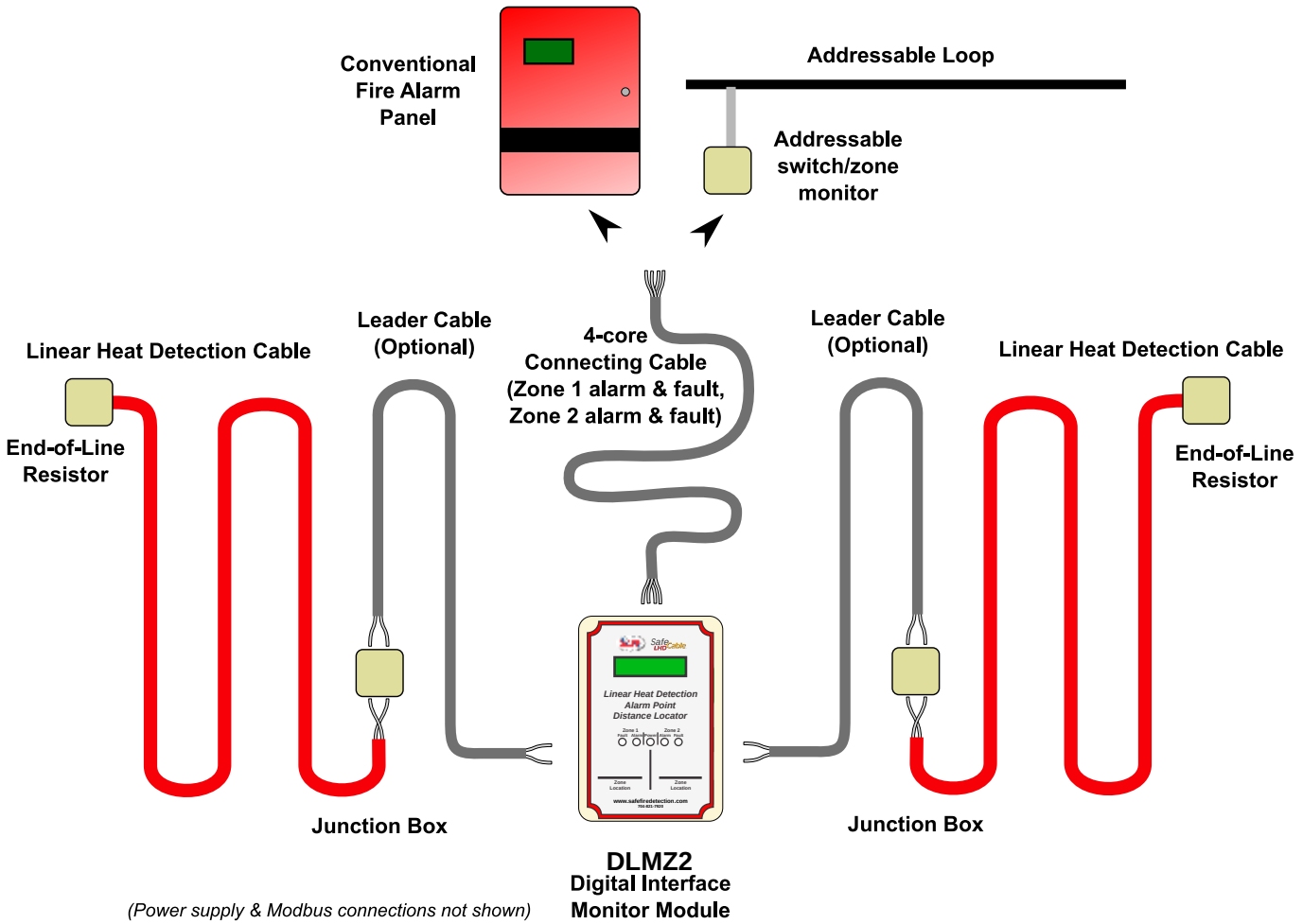


Figure 1: Typical Installation of the SafeCable Alarm Distance Locator Module

Specifications

Part No:	DLM-Z2
Description:	SafeCable Distance Locator Module (DLM-Z2)
Revision:	2.0
Enclosure:	
...Dimensions	H7.1in x W4.72in x D2.38in (H180mm x W120mm x D60.5mm)
...Rating	NEMA 4, 4X (IP65)
...Finish	Light Gray with clear lid
...Display	2 line, 16 character backlit display showing zone status
Approvals:	UL 864 10th ed., ULC S527-11
Power Requirements:	*All circuits power limited if powered from a power limited supply*
...Operating Voltage	12Vdc — 36Vdc
Current Consumption:	↓ ↓
...Normal Operation (standby)	<12mA <4mA
...Alarm	<40mA <15mA
...Sounder	2.4kHz 92dBa @ 10cm Buzzer
Operating Temperature Range:	-4°F – +122°F(-20°C – +50°C)
Terminal Blocks:	
...Spacing	5mm Rising Clamp
...Rating	16A
...Wire Size	28AWG to 11AWG
Supervised Circuits:	Power, Input Zone 1 & Input Zone 2
Detection Zones:	*Up to two zones of SafeCable Digital LHD Cable*
SafeCable Max Zone Length	10,000ft (3,000m)
SafeCable Min Zone Length	3ft.(1m)
...End of line resistor	1kohm (Included)
...Short circuit current	0.5mA
...Max Voltage	5V
...Ground fault impedance	0ohms
Power Supply:	For Use With Any UL Listed Power Supply
Outputs:	
...Communications	Two wire RS-485 Modbus RTU (field wiring limited to same room to comply with UL listing)
...Alarm	2x Form C volt-free relay contacts (resistive, common)
	Max V 30Vac or 42.4Vdc
	Max Current 2A
	Max Switching Power 60W, 62.5VA
...Fault	2x Optoisolated phototransistor output (resistive, common)
	Max V 35Vdc
	Max Current 80mA
	Max Power Dissipation 150mW

Leader Cable

The SafeCable DLM-Z2 can be connected via leader cable at the start of the Linear Heat Detection cable. During installation the voltage drop across the leader cable is calibrated out to give an accurate distance reading when an alarm is triggered (see page 9 for calibration procedure).

The maximum length of leader cable that can be used per zone is dependent upon the cable diameter. The following is a guideline for typical cable sizes and maximum length:

Cable Size	Max Leader Cable Length
20AWG	3000ft.
22AWG	1968ft.
24AWG	1280ft.

Static Discharge Warning

The following items are cautionary notes that will help prevent equipment damage or malfunction caused by static discharge:

CAUTION

Static charges produce voltages high enough to damage electronic components. Follow these precautions when installing, servicing, or operating the DLM-Z2:

- Work in a static-free area.
- Discharge any static electricity you may have accumulated.
- Discharge static electricity by touching a known, securely grounded object.
- Do not handle the printed circuit board (PCB) without proper protection against static discharge.

In the event that the DLM-Z2 malfunctions after encountering a static discharge correct operation of the unit can be restored by interrupting power to unit for a brief period (approximately 10s). Setup information can be verified by following the steps in the installation procedure section. In the event of the setup information being corrupted the unit should be reset following the *Resetting the DLM-Z2 procedure*

Mounting Dimensions

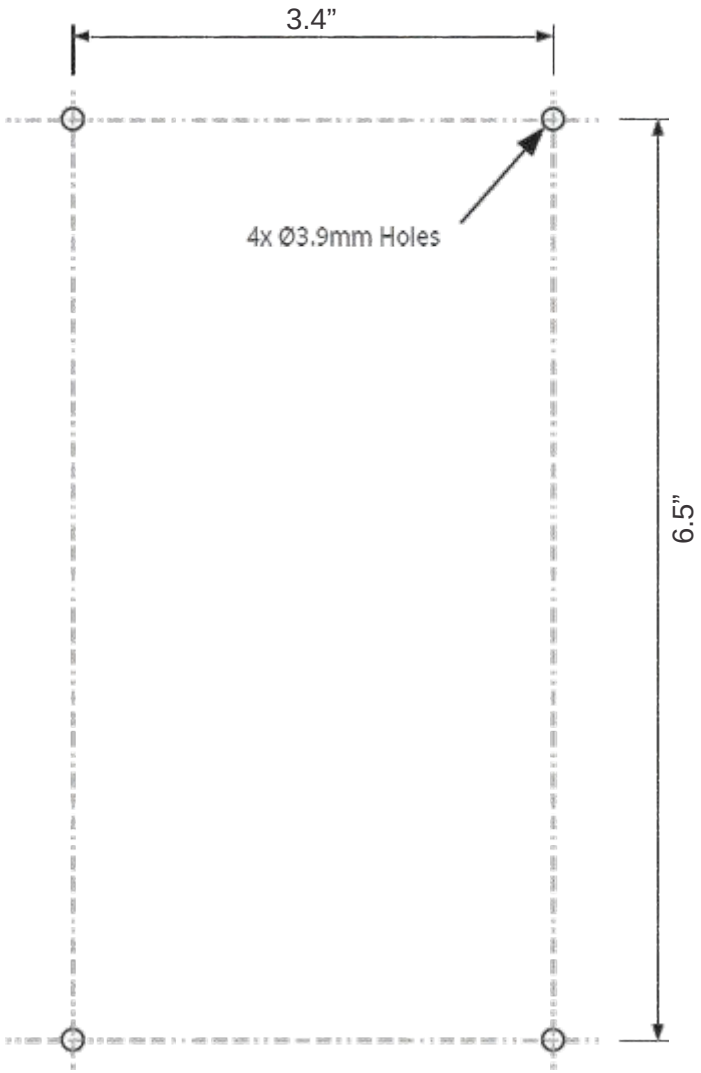


Figure 2: Mounting Dimensions for the SafeCable DLM-Z2

Installation

The DLM-Z2 allows accurate location of an alarm point along a length of SafeCable Digital Linear Heat Detection (LHD) cable. It continuously monitors up to two zones of LHD cable for a fault (open circuit) or an alarm (overheat or fire condition). Because of the wide range of applications that digital Linear Heat Detection cable can be used for, it may not always be possible, or be too time consuming, to locate where along the cable an alarm has occurred. Using the DLM-Z2, when an alarm occurs the distance to the overheat condition is immediately calculated and displayed on the integrated display.

If a fault is detected, the corresponding fault output opens, triggering a fault at the fire alarm control panel. If an alarm is detected, the corresponding alarm output changes state, triggering an alarm at the fire alarm panel. The fault outputs also open on power loss to the unit or microprocessor fault, triggering a fault at the fire alarm control panel.

The two wire RS-485 Modbus RTU output also outputs the current state of both zones. See the section "RS-485 Modbus Communications" for more detail.

There are two primary configurations of the DLM-Z2 (see figure 1):

1) The LHD cable can be connected directly to the DLM-Z2

2) The LHD cable is connected to a length of leader cable which is connected to the DLM-Z2. In this scenario the leader cable must be "calibrated out" during commissioning of the DLM-Z2.

Connections Diagram

Figure 3 shows the connections diagram for the DLM-Z2 unit. The unit is provided with a 1kohm end of line resistor in each zone input. If only one zone is required, leave the 1kohm resistor connected across the zone which is not in use. Otherwise the 1kohm resistor should be connected at the end of the Digital Linear Heat Detection cable.

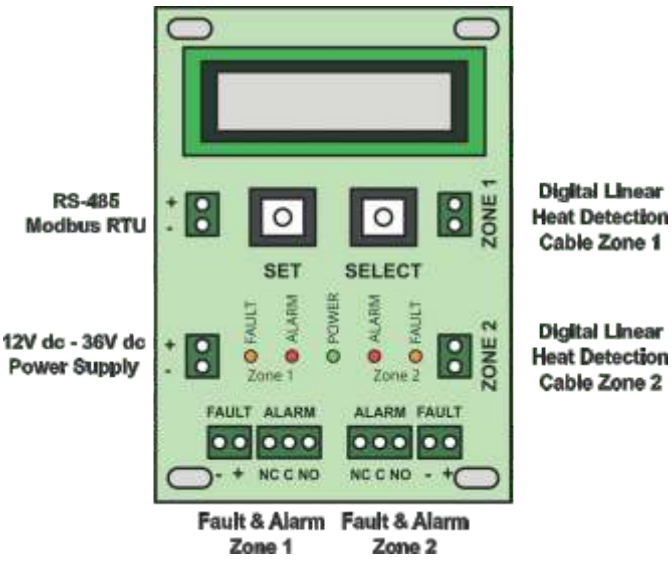
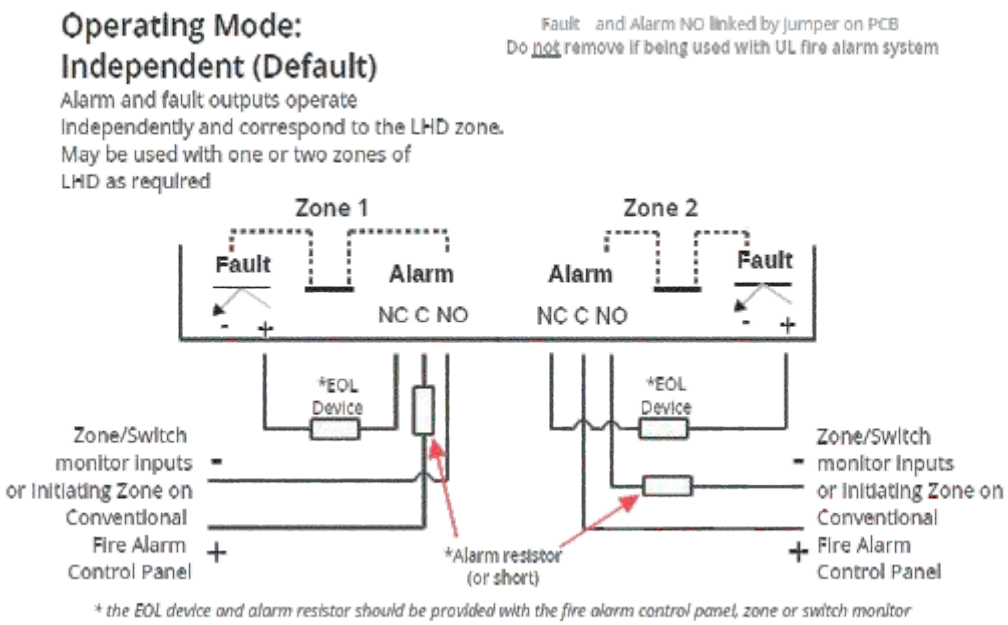


Figure 3: Wiring Diagram for the SafeCable DLM-Z2

Operating Modes Wiring Diagram Independent

There are two independent operating modes for the Alarm Distance Locator Module:

1. Independent – This is when the DLM-Z2 is used as a one or two zone system. When a fault or overheat condition occurs on an LHD zone, the corresponding fault or alarm output respectively is triggered. The two zones operate independently and both sets of outputs should be connected to a fire alarm control panel. If the zone is not required leave the End of Line resistor in the zone input terminals as supplied. In this mode, the two zones can either contain identical rated temperature LHD cables or two different rated temperature LHD cables, e.g. a 155degF in zone 1 and a 220 deg F in zone 2.



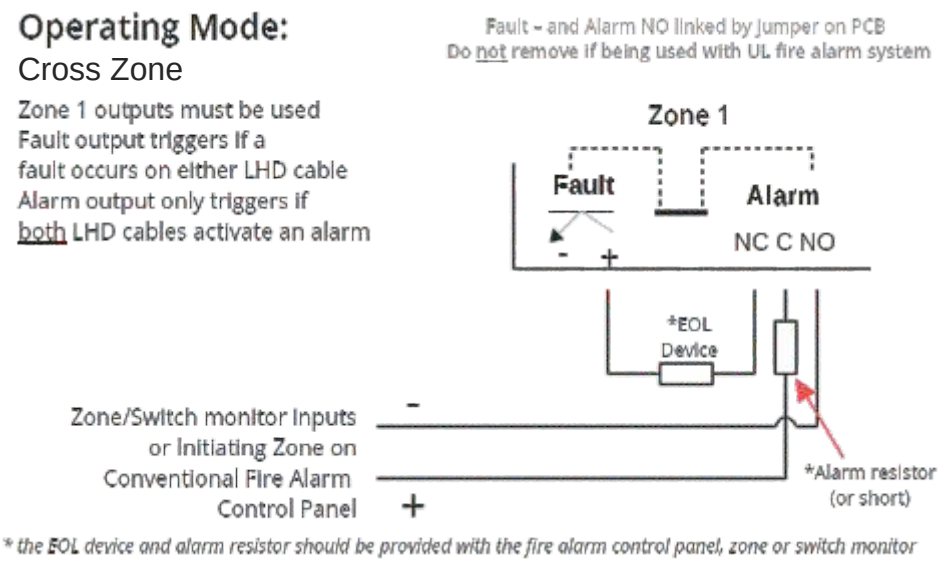
** the EOL device and alarm resistor should be provided with the fire alarm control panel, zone or switch monitor*

Operating Modes Wiring Diagram Cross Zone

2. Cross Zone – this mode is for applications which require a fail-safe guarantee that an alarm is only triggered when an overheat condition has been detected. In this case, the same rated temperature LHD cable should be attached to both zones of the DLM-Z2. The alarm output is only activated when both LHD cables trigger an alarm due to an overheat condition. If one LHD cable zone input registers an alarm but the second does not, the alarm output will not be activated. This is to prevent an alarm if a mechanical or other issue has triggered one LHD cable and not an overheat condition.

- Only use Zone 1 fault and alarm outputs in Cross Zone mode.
- Two linear heat detectors with the same temperature rating must be used and a minimum of two linear heat detectors must be installed in each protected space.
- The spacing between detectors should be less than 0.7 times the rated linear spacing, in accordance with National Fire Alarm Code, NFPA 72.

See the SafeCable Digital LHD Installation Instructions for the linear spacing specification.



Commissioning

1. After wiring the unit up (see wiring diagram) power up the device. Device will show screen including software revision number.

SafeCableTwo
Zone DLM-Z2 R1234

2. If the unit is being setup for the first time the following options will be shown. If the unit has previously been installed the display will automatically cycle through the options, showing the stored settings.

3. Select the operating mode. (see "Operating modes" (pages 7-8) for more detail.
Independent: the two zones operate independently of each other (default). ww
Cross Zone:Both fault outputs activate when a fault occurs on either zone 1 or zone 2. Both alarm outputs activate only when both LHD zones trigger an alarm.

Operating Mode
INDEPENDENT

4. Select the cable type connected to Zone 1 (155°F/172°F/190°F/220°F/365°F)

Z1 Cable Temp
155F

5. Select the cable type connected to Zone 2 (155°F/172°F/190°F/220°F/365°F)

Z2 Cable Type
155F

6. If leader cable is connected between the linear heat detection cable and the DLM-Z2 for this zone, press the Select button and select Yes. Press the Set button to continue.

Zone 1 ldr cable
Yes

7. The controller will then ask if the zone is ready to be calibrated. The leader cable must be connected to the DLM-Z2 and shorted out at the end where it connects to the START of the LHD cable. Once this is done press the Set button.

Ready To
Calibrate?

8. The DLM-Z2 will display the voltage drop across the leader cable. Remove the short from the leader cable and connect it to the START of the LHD cable as normal.

Zone0cal
109mV

9. If the Linear Heat Detection cable is connected directly to the DLM-Z2 then select No and press the Set button to continue.

ZONE 2 ldr cable
no

10. Select whether you would like the alarm outputs for both zones to be latching. If set to Yes, then if an alarm is triggered the unit will either require the power supply to be interrupted (min. 10s) or the Set button to be pressed to reset to normal once the alarm conditioned has been cleared.

Latching Outputs
No

Commissioning (Cont.)

11. Select whether the Modbus RTU output should be enabled. If this is not enabled then proceed to step 17.

Modbus Output On?
yes

12. Set the Modbus RTU address of this unit. (1 - 247)

Modbus address
1

13. Cycle through the possible Baud Rates for the Modbus RTU output. (1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200).

BAUDRATE
1200

14. Select the number of data bits for the Modbus RTU output. (7 or 8)

DataBits
7

15. Select the number of stop bits for the Modbus RTU output. (1 or 2).

Stop BITs
1

16. Select the parity for the Modbus RTU output. (even/odd/none).

Parity
Even

17. Once the unit has been commissioned the display will show the zone status. In normal operation the display will show OK for each Zone.

Zone1OK
Zone 2: OK

18. If an alarm condition occurs the DLM-Z2 automatically calculates the distance along the cable to the trigger point and first displays this value in metres.

Zone 1: 534 m
Zone 2: OK

19. The display alternates showing the distance along the cable to the trigger point in metres and in feet.

Zone 1: 1751 ft
Zone 2: OK

20. If a fault occurs (open circuit) on the Linear Heat Detection Cable the display will show FAULT on the corresponding line.

Zone 1: OK
Zone 2: FAULT

21. If a ground fault occurs on either zone the display will show a GND FAULT on the corresponding line.

Zone 1: OK
Zone 2: GND FAULT

Two-wire RS-485 Modbus RTU Communications

The SafeCable DLM-Z2 includes a two wire RS-485 Modbus output which can be enabled to output the status of each zone of Digital Linear Heat Detection Cable. The DLM-Z2 Modbus output supports the Modbus RTU protocol and the following functions:

- Function code 4 (Read Input Registers)

The request for reading the input registers should be constructed in the following manner:

- Address of first register to be read (16-bit)
- Number of registers to read (16-bit)

The DLM-Z2 will respond in the following manner:

- Number of bytes of register values to be read (8-bit)
- Register values (16-bits per register)

The DLM-Z2 stores the information for each zone of the LHD cable in the following format:

Register	Description	Possible Values
0	Zone 1 status	-1 or 65535=fault on zone 0=zone ok 1-32767=distance in metres to trigger point
1	Zone 2 status	-1 or 65535=fault on zone 0=zone ok 1-32767=distance in metres to trigger point
2	Zone 1 cable type	1=155°F, 2=172°F, 3=190°F, 4=220°F, 5=365°F
3	Zone 2 cable type	1=155°F, 2=172°F, 3=190°F, 4=220°F, 5=365°F

If the start address plus the requested number of registers exceed 4, the DLM-Z2 will return an ILLEGAL DATA ADDRESS error.

If the request contains a function code other than those supported the DLM-Z2 will return an ILLEGAL FUNCTION error.

Resetting the SafeCable DLM-Z2 Unit

WARNING: This procedure will erase ALL stored settings and reset the SafeCable DLM-Z2 unit back to its factory default state. The cable types, leader cable calibration, latching output selection and Modbus setup will all require selecting after this procedure.

To reset the SafeCable DLM-Z2 unit back to the factory state, when the unit is powered up and in normal operation (see step 15 in the Commissioning procedure), press and hold the SET and SELECT buttons for a minimum of 10 seconds continuously. While the SET and SELECT buttons are held down the power LED will flash quickly to confirm this procedure is about to take place. After approximately 10 seconds, the unit will restart and return to step 1 in the Commissioning procedure.

SafeCable Digital LHD Cables by Part No

Refer to SafeCable Digital Linear Heat Detection Installation Instructions and SafeCable LHD Application Guide for more information on installation and uses.

Part No	Description
TC155	SafeCable Digital LHD 155°F PVC
TC155N	SafeCable Digital LHD 155°F Nylon outer sheath
TC155P	SafeCable Digital LHD 155°F Polypropylene outer sheath
TC172	SafeCable Digital LHD 172°F PVC
TC172N	SafeCable Digital LHD 172°F Nylon outer sheath
TC172P	SafeCable Digital LHD 172°F Polypropylene outer sheath
TC190	SafeCable Digital LHD 190°F PVC
TC190N	SafeCable Digital LHD 190°F Nylon outer sheath
TC190P	SafeCable Digital LHD 190°F Polypropylene outer sheath
TC220	SafeCable Digital LHD 220°F PVC
TC220N	SafeCable Digital LHD 220°F Nylon outer sheath
TC220P	SafeCable Digital LHD 220°F Polypropylene outer sheath
TC365N	SafeCable Digital LHD 365°F Nylon outer sheath