The DEETER Group®

LKC-1500
Leak Detector

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1. Introduction

The Deeter LKC-1500 Leak Controller is designed for use with up to 1500m of leak-sensing cable. It can detect a leak anywhere along the cable and indicate the leak position as a distance from the Controller.

The Controller is housed in a DIN-rail enclosure. It has a display and three push-button switches to enable the user to access option menus and select from a variety of programmable features.

The Controller has the following process outputs:

- Two SPDT relays for direct control of pumps, valves or alarms
- An optically-isolated transistor output for connection to a programmable logic controller (PLC), building management system (BMS) or for indirectly driving further valves or pumps via an external relay.
- An RS485 serial communications port for remote setup and monitoring.

Three communication protocols are supported: Modbus RTU, Modbus ASCII and a simplified ASCII protocol.

The controller is capable of detecting a broken or improperly terminated leak-sense cable and relay and transistor outputs can be assigned to respond to a leak or to a fault.

The controller has a variety of power supply options, with separate inputs for mains-voltage supplies and low-voltage supplies. There are two versions of controller, one for 210-250Vac supplies (UK version) and another for 105-130Vac supplies (US version). Both versions can be powered from 10-24Vac or 12-32Vdc through the low-voltage supply terminals.

2. Controller

The Leak Controller is housed in a UL94-V0 flame retardant case that fits to a standard 35mm 'top-hat' section DIN rail.

2.1 Controller Electrical Connections

All electrical connections are via two rows of screw terminals – see Figure 1.

The bottom row, with screw terminals on a 5mm pitch, is used for extra-low-voltage (ELV) connections – less than 50V.

The bottom left group of four terminals connect to the sensing cable. Terminal labels are coded to match the wire colours in the sensing cable: B for blue or black, Y for yellow, G for green, and R for red.

The next group of two terminals are for the optically isolated transistor output, with open collector and open emitter connections provided. Collector-emitter voltage is limited to 26V and maximum current is 100mA.

The RS485 serial communications port is half-duplex, using the balanced-pair lines D+ and D-. A line-termination resistor can be enabled by linking the two connectors labelled TERM together. This will reduce data-line reflections and may be required for improved communications reliability. The 0V terminal should be connected to the 0V terminal of the other communicating device in order to limit common-mode voltages at the receiver and improve communications reliability.

See section 7 for details of the communications protocols, commands and responses.

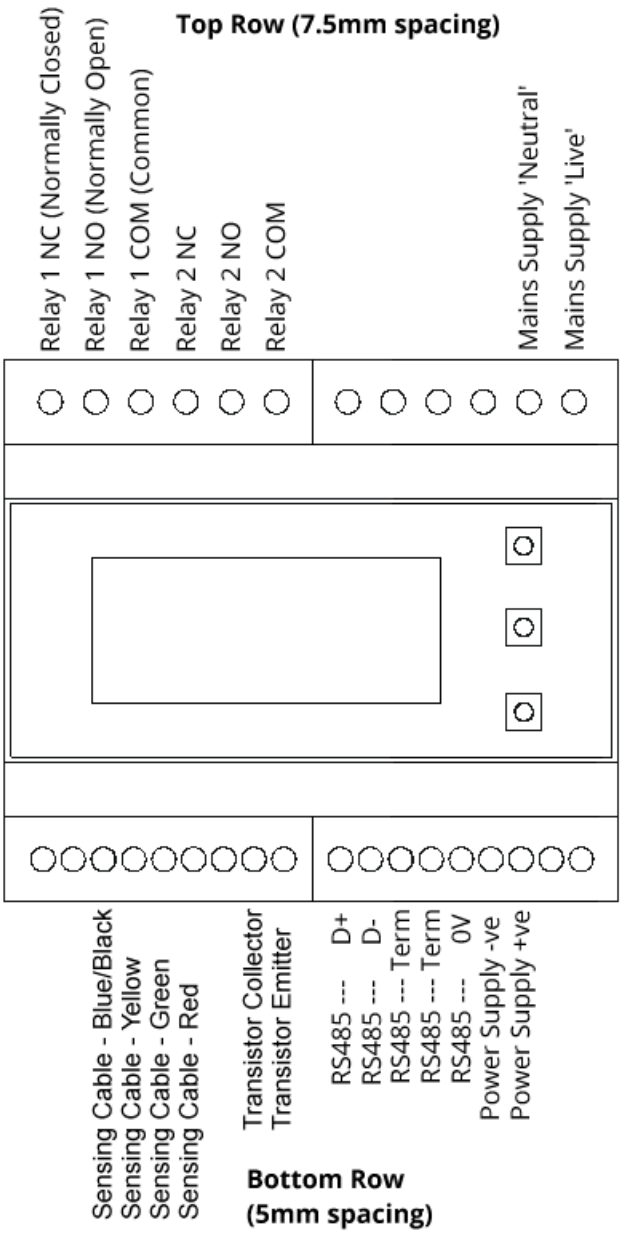


Figure 1

Terminals along the top row are on a 7.5mm pitch. The relay connections have a current rating of 6A at 250VAC and may be used for switching either mains voltages or lower voltages. When switching inductive loads at any voltage, an external transient suppressor must be fitted to protect the relay contacts.

There are two pairs of power supply terminals, a mains-voltage pair on the top row and an extra-low-voltage pair on the bottom row. Connect to one pair only**.**

Two versions of the Controller are available, one for 230VAC supplies, the other for 120VAC supplies. A 100mA anti-surge fuse limits the mains supply current and is accessible by removing the screw terminal cover for the mains supply terminals.

The ELV supply terminals will accept AC voltages from 10V to 24V, or DC voltages between 12V and 32V. The supply is protected by a 500mA anti-surge fuse accessible by removing the screw terminal cover. Normal maximum supply current is approximately 200mA.

Where mains voltages are used, either as power source or switched by the relays, the DIN rail enclosure of the controller must be fitted within another enclosure to prevent accidental exposure to mains voltages.

3. Sensing Cable

The controller is supplied with water-sensing cable cut to standard or custom lengths. Cables are terminated with locking 4-pin DIN plugs and sockets for easy-to-make and secure connections. Non-sensing jumper cables can also be supplied to link between sections of sensing cable. (The reported leak position is measured along the sensing cable only). The maximum total sensing cable length is 1500m

A non-sensing length of cable is required between Controller and the first length of sensing cable. The wires in this cable are colour-coded to match the terminals labelled on the controller: B for blue or black, Y for yellow, G for green, and R for red.

A terminating plug is also required at the end of the last sensing cable.

4. Operator Controls

The top panel of the controller has three push-buttons and a 2-line by 16-character display to enable the operator to perform setup tasks and observe system status.

The three buttons have the following symbols to indicate their function:

Table 1

SYMBOL	FUNCTION
^	UP
v	DOWN
↵	ENTER

The display has a backlight which comes on for 20 seconds after power-up and for 20 seconds after any button press. It will remain on while a leak is detected, while any outputs are latched or during a fault condition.

5. Operating States

5.1 Power-up

The display shows the firmware version for 5 seconds at power-up, then progresses to either quiescent, leak or fault states.

L E A K C O N T R O L L E R
L K C V 1 . 0 1

5.2 Quiescent State

If the cable is dry and connected correctly, the display will show the cable length. All outputs will be in their inactive state – open or closed depending on their normally-off and normally-on settings (see section 6.2.1)

S Y S T E M D R Y
1 0 0 m

5.3 Leak

When a leak is detected, the display shows the distance from the controller to the leak along the top line of the display. Distances less than 100m are shown to one decimal place.

Outputs assigned to leaks will change to their active state.

```
    L E A K    A T    9 . 9 m
               1 0 0 M
```

If there are two or more leaks, the distance shown will be somewhere between them but closest to the more significant leak (with lower electrical resistance).

5.4 Latched Outputs

Outputs can be assigned to follow or latch. An output set to follow will become active with a leak and return to inactive when the leak has cleared. Outputs set to latch will activate with a leak and remain active when the leak has cleared.

If any outputs are latched, a display similar to the following will be seen:

```
      S Y S T E M   D R Y
L A T C H E D :   R 1   R 2   T
```

The bottom row indicates which outputs are latched. In this example all three outputs, relay 1 (R1), relay 2 (R2) and the transistor (T) are active.

Latches can be reset by pressing the ENTER button or via a communications command. When latches are cleared the controller returns to the quiescent state.

5.5 Cable Fault

If the cable is broken, incorrectly connected, or not terminated properly, the controller will display the following fault screen:

```
      C A B L E   F A U L T
```

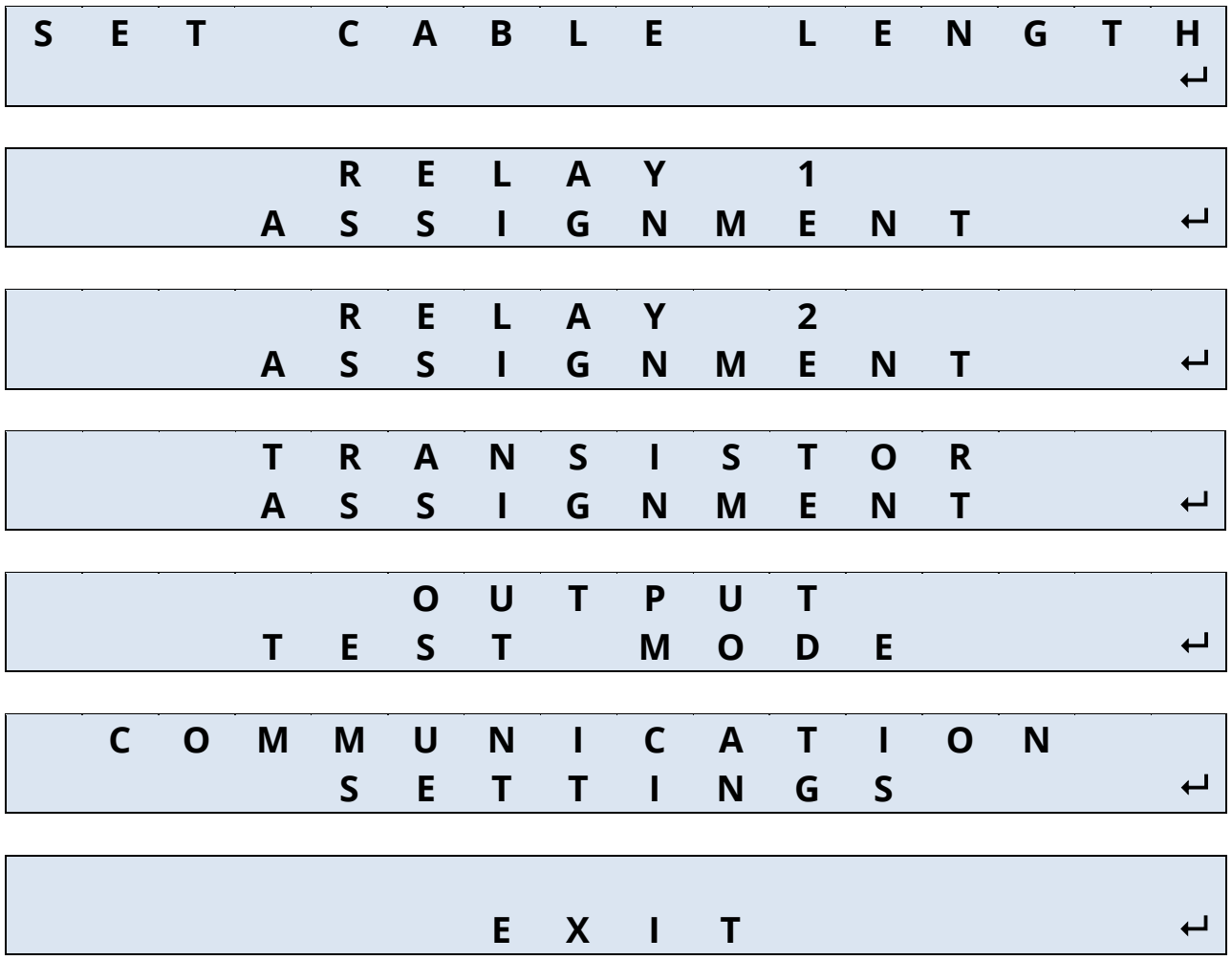
Outputs assigned to faults will go to their active state and outputs assigned to leaks will go to their inactive state.

This message will clear automatically when all faults are corrected.

6. Option Menus

Option menus are accessed from any operating state by pressing and holding the ENTER button for 3 seconds.

Menus are organised into levels, with all top-level menus indicated by the enter symbol ↵



Pressing UP or DOWN will cycle through the top-level menus and ENTER will select a sub-menu. ENTER pressed from the EXIT menu will return to normal operation.

6.1 Set Cable Length

```
    C A B L E   L E N G T H :    ^
              1 5 0 0 m          v
```

Press UP to increment the cable length and DOWN to decrement. Holding the button will gradually increase the rate of change. Press ENTER to save the new length and return to the top-level menu.

6.2 Relay and Transistor Assignments

All three outputs have the same set of assignment options. The following descriptions and examples are for Relay 1, but equivalent sub-menus are available for Relay 2 and the Transistor output. To help navigate multiple sub-menus, a sub-menu level indication is shown in the top left of the display.

6.2.1 Normally-Off/Normally-On Assignment

'Normal' refers to the inactive state when there are no leaks or faults detected.

```
1        R E L A Y   1
     N O R M A L L Y   O F F
```

```
1        R E L A Y   1
     N O R M A L L Y   O N
```

Press UP or DOWN to toggle between options and ENTER to advance to the next sub-menu.

Although both relays have normally-open (NO) and normally-closed (NC) terminals, this first sub-menu provides options for fail-safe operation when considering the relays will be off when power is removed from the controller. The full range of relay states is shown in Table 2.

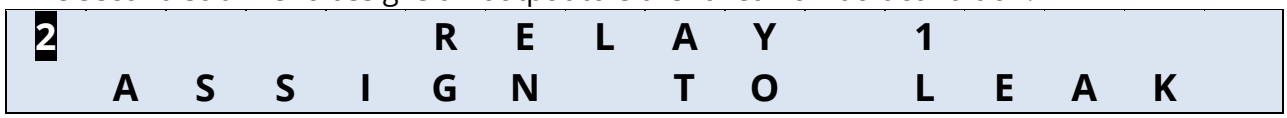
Table 2

Power	Output Setting	Active State	Output State	NO Contacts	NC Contacts
Off	-	-	Off	Open	Closed
On	Normally off	Off	Off	Open	Closed
On	Normally off	On	On	Closed	Open
On	Normally on	Off	On	Closed	Open
On	Normally on	On	Off	Open	Closed

Throughout this document the terms ‘active state’ and ‘inactive state’ refer to an output’s response to a leak or fault condition. The output state is not defined without knowledge of the normally-on/normally-off assignment.

6.2.2 Leak/Fault Assignment

The second sub-menu assigns an output to either a leak or fault condition.



Press UP or DOWN to toggle between options. If FAULT is selected, there are no further sub-menus and ENTER returns to the top-level menu. Otherwise, ENTER advances to the next sub-menu.

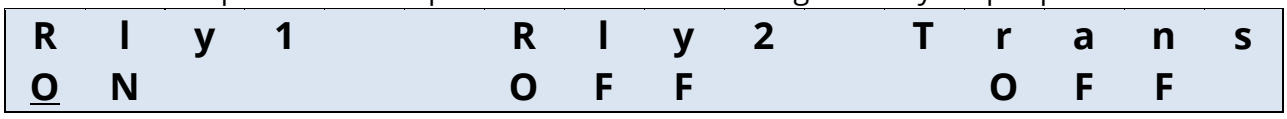
6.2.3 Follow/Latch Assignment

The third sub-menu enables the output to follow or latch. Latching outputs remain active after a leak has cleared and require a button-press or serial communications command to be reset.

Press UP or DOWN to toggle between options and ENTER to return to the top-level menu.

6.3 Output Test Mode

A test mode is provided to help with installation or to diagnose any output problems.



UP and DOWN buttons toggle the output indicated by the underscore cursor. ENTER selects the next output, and after the transistor output, exits back to the option menus.

6.4 Communication Settings

6.4.1 Baud Rate

Four baud rate settings are available: 2400, 9600, 19200 and 38400.

			B	A	U	D		R	A	T	E				^
					1	9	2	0	0						v

UP and DOWN buttons cycle through the available baud rates. ENTER changes the baud rate setting and advances to the Comms Protocol menu

Other serial port settings are fixed to 8 data bits, no parity bit and 1 stop bit.

6.4.2 Communications Protocol

Three serial RS485 communications protocols are available: Modbus RTU, Modbus ASCII and a proprietary protocol labelled DeeterLeak ASCII.

		C	O	M	M	S		P	R	O	T	O	C	O	L
D	E	E	T	E	R	L	E	A	K		A	S	C	I	I

		C	O	M	M	S		P	R	O	T	O	C	O	L
			M	O	D	B	U	S		A	S	C	I	I	

		C	O	M	M	S		P	R	O	T	O	C	O	L
				M	O	D	B	U	S		R	T	U		

UP and DOWN buttons cycle between options. If DEETERLEAK ASCII is selected, ENTER returns to the option menu. If a MODBUS option is selected, ENTER proceeds to the Modbus Address menu.

6.4.3 Modbus Address

M	O	D	B	U	S		A	D	D	R	E	S	S		^
0	0	5													v

UP and DOWN buttons are used to select an address within the decimal range 001 to 247. ENTER saves the Modbus address to non-volatile memory and returns to the option menu.

7. RS485 Serial Communications

The RS485 serial communications port is half-duplex, using the balanced-pair lines D+ and D-. A line-termination resistor can be enabled by linking the two connectors labelled TERM together. This will reduce data-line reflections and may be required for improved communications reliability. The 0V terminal should be connected to the 0V supply of the other communicating device in order to limit common-mode voltages at the receivers.

Serial port settings are: 8 data bits, no parity bit, 1 stop bit.
Baud rate options are: 2400, 9600, 19200 and 38400

Three communication protocols are currently supported: DeeterLeak ASCII, Modbus RTU and Modbus ASCII.

7.1 DeeterLeak ASCII

DeeterLeak ASCII is a simple proprietary protocol that uses ASCII characters in the displayable range 20h to 7Eh. This makes commands easy to generate and responses easy to view and interpret on a PC using readily-available terminal-emulation software.

There are only four recognised commands that allow for monitoring of activity and clearing of latches, but do not allow for remote setup.

Commands are all single, upper-case characters. Other characters in the range A to Z will be ignored. Characters outside this range will elicit the response:

B<CR>

All responses are terminated with the carriage-return character, 0Dh.

Table 3

Command Character	Command Name	Action	Example Response	Comments
R	Reset Latches	Resets all latched outputs	R<CR>	
N	Report Version Number	None	LKC V1.02<CR>	Example for firmware version 1.02
T	Status (Test) Report	None	T1A,17,03E8,1388<CR>	See description below
L	Status (Leak) Report	None	L1A1703E841388<CS><CR>	See description below

7.1.1 Status Reports

Status Reports start with the command character echoed back, followed by a series of 8- or 16-bit hexadecimal numbers sent as ASCII characters in the range 0-9 and A-F.

The two versions of status report return the same information but differ in several respects:

- Test Reports have commas separating each hexadecimal number
- Test Reports do not include a leak position if no leak is detected
- Leak Reports are a fixed length (16 bytes including the <CR> at the end)
- Leak Reports include a checksum before the carriage-return.

Table 4 lists the hexadecimal numbers in the order sent and their meaning.

Table 4

Number order	Example	Meaning
1	1A	Report number in hexadecimal. This will increment for every report, from 00h to FFh and back to 00h
2	17	Status code – see below for details
3	03EB	The cable length in metres shown in hexadecimal (3EBh = 1000)
4	1388	The leak position in units of 0.1m shown in hexadecimal (1388 = 5000 or 500.0m). It there are no leaks this will be zero for Leak Reports

Status codes are:

- 00 = system okay
- 0x = system okay, active outputs (latched outputs)
- 1x = leak(s) detected, active outputs
- 21 = cable fault detected.

Active outputs are represented in binary form:

- Bit 0 = relay1 active
- Bit 1 = relay2 active
- Bit 2 = transistor active

The checksum appended to Leak Reports is an 8-bit longitudinal redundancy check, formed from the hexadecimal numbers following the 'L'. To generate the checksum:

1. Convert pairs of ASCII characters to 8-bit numbers, e.g. 1 and A become 1Ah
2. Add together all 8-bit numbers in the message, discarding any carries, e.g. 1Ah+17h+03h+E8h+13h+88h = 1B7h -> B7h
3. Calculate the 8-bit two's-complement of this sum, e.g. 100h-B7h = 49h
4. Convert the resulting 8-bit checksum to two ASCII digits for transmitting most-significant-digit first, e.g. 4 and 9

The 8-bit sum of hexadecimal numbers in the message plus checksum will be zero, e.g. B7h+49h = 00h (truncated to 8-bits)

7.2 Modbus RTU

Modbus RTU is a de facto standard, having achieved wide acceptance for connecting industrial devices without rigid standardisation or formal acceptance by standards authorities.

The Leak Controller conforms to the Modbus RTU command and response framing standard as a slave device. Detailed descriptions of this standard are readily available on the world-wide web and Appendix A provides a brief description and some example commands.

7.2.1 Supported Function Codes

The supported functions will allow the monitoring of activity, clearance of latches and the remote setup of controller option settings.

Table 5 lists the function codes supported.

Table 5

Function Code	Function Name	Description
3	Read Holding Registers	Reads a set of 16-bit read/write registers
4	Read Input Registers	Reads a set of 16-bit read-only registers
6	Write Single Holding Register	Writes to a single 16-bit read/write register
16	Write Multiple Holding Registers	Writes to a set of 16-bit read/write registers

Commands containing other Modbus function codes will elicit an exception code response.

7.2.2 Register Assignments

There are 5 read/write registers, accessed by function codes 3, 6 and 16, defined in Table 6. Attempts to write values outside permitted ranges will elicit an exception code response.

Table 6

Register	Address	Description	Comments
40001	0000	Cable length	Valid range 15-1500
40002	0001	Output 1 settings	Relay 1. See bit assignment details below
40003	0002	Output 2 settings	Relay 2
40004	0003	Output 3 settings	Transistor
40005	0004	Latched outputs	See bit assignments below. Bits can be cleared but not set.

There are 3 read-only registers, accessed by function code 4, defined as follows:

Table 7

Register	Address	Description	Comments
30001	0000	Firmware version	e.g. V1.02 will be sent as 0102
30002	0001	Status code	See below for details
30003	0002	Leak position (x10)	

7.2.3 Bit Assignments

Output settings in registers 40002, 40003 and 40004 have the following bit-assignments:

Table 8

Bit	Description	Bit = 0	Bit = 1	Comments
0	Normally-off/Normally-on	Off	On	
1	Leak/Fault	Leak	Fault	
2	Follow/Latch	Follow	Latch	
3-15	Not used			Writes to here must be 0. Read as 0

The latched output settings in register 40005 are shown in Table 9. Bits in register 4005 can be read and individually cleared by writing a 0, but cannot be set by writing a 1.

Table 9

Bit	Description	Bit = 0	Bit = 1	Comments
0	Output 1	Unlatched	Latched	
1	Output 2	Unlatched	Latched	
2	Output 3	Unlatched	Latched	
3-15	Not used			Writes to here must be 0. Read as 0

The status code in register 30002 has the following bit-assignment:

Table 10

Bit	Description	Bit = 0	Bit = 1	Comments
0	Controller State	Inactive	Active	The controller is inactive in any setup menu
1	Output 1 state	Inactive	Active	Relay 1. The active state may set the output on or off depending on the normally-off/on selection.
2	Output 2 state	Inactive	Active	Relay 2
3	Output 3 state	Inactive	Active	Transistor
4	Leak detected	No	Yes	The position is reported in register 30003
5	Output 1 latch	Off	On	On if the output is active and there are no leaks or faults detected
6	Output 2 latch	Off	On	
7	Output 3 latch	Off	On	
8	Cable fault	No	Yes	
9-15	Not used			Read as 0

7.2.4 Broadcast and Exception Responses

If the Modbus broadcast address is received (address zero), the Leak Controller will act on the command without sending a response. This address is only meaningful for the write function codes 6 and 16.

If the Leak Controller detects another slave's address, it will ignore the command and not respond. If the received command is corrupted and a redundancy check error is detected, the Leak Controller will also ignore this command and not respond.

If the slave address is correct and there are no errors in the transmission, but the Leak Controller cannot action the command for another reason, it will reply with an exception response.

Exception responses include the slave address, the function code with the most-significant bit set and an exception code. The Leak Controller supports the following set of exception codes:

Table 11

Exception Code	Name	Description
01	Illegal Function	The function code is not supported by the Leak Controller
02	Illegal Data Address	Either the start address was beyond limits or the start address plus number of registers took the address beyond limits. (3 read-only registers and 5 read/write registers have been assigned)
03	Illegal Data Value	A value in the data field is not recognised by the Leak Controller. For example, attempts to write a number greater than 1500 to register 40001 will cause this response

7.3 Modbus ASCII

The Leak Controller conforms to the Modbus ASCII command and response framing standard, details of which are readily available on the world-wide web. Appendix A provides a brief description and some example commands.

Supported function codes, register assignments, bit assignments and exception responses are the same as those described above for Modbus RTU. These functions will allow for the monitoring of activity, clearance of latches and the remote setup of controller option settings.

8. Specifications

Controller dimensions:	90mm high x 106mm wide x 58mm deep 35mm 'top-hat' section DIN rail mounting
Mains power supply options:	210Vac – 250Vac at 20mA (UK version) 105Vac – 130Vac at 50mA (US version)
Low-voltage supply options: (UK and US versions)	12 – 32Vdc at 250mA 10 – 24Vac at 250mA
Mains supply fuse:	100mA anti-surge, 5x20mm cartridge
Low-voltage supply fuse:	500mA anti-surge, Omni-Blok® cartridge
Relay contacts:	6A at 250Vac
Transistor output:	NPN open-collector, open emitter Maximum collector-emitter voltage, 26Vdc. Maximum current, 100mA
Minimum sensing cable length: Maximum sensing cable length:	15m 1500m
Leak position accuracy:	± 0.5% or ±0.5m, whichever is greater

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Appendix A – Modbus Examples

Slave address range: 1-247 (01h – F7h)
Functions supported: 03, 04, 06 and 16 (03h, 04h, 06h, 10h)

Modbus RTU
Modbus RTU messages start and end with a pause of 3.5 times the character transmit time. Times between characters must not exceed 1.5 character times.

A 16-bit cyclic redundancy check of all previous message bytes is added before the end pause. The checksum is sent least-significant byte first.

Function 03
Command:

Start	Slave Address	Function	Start Address	No. of Registers (N)	CRC	End
	8-bit	8-bit	16-bit	16-bit	16-bit	

Response:

Start	Slave Address	Function	Data Byte Count	N* Register Data	CRC	End
	8-bit	8-bit	8-bit	N* 16-bit	16-bit	

Example:
Read all read/write (holding) registers, slave address 05.

Command Start_05_03_0000_0005_4D84_End
Response Start_05_03_0A_0064_0000_0001_0004_0000_F1CC_End

Interpretation:

Cable is 100m (64h),
Output 1 set to normally-off, leak and follow (0000)
Output 2 set to normally-on, leak and follow (0001)
Output 3 set to normally-off, leak and latch (0004)
No latched outputs (0000)

Function 04
Command:

Start	Slave Address	Function	Start Address	No. of Registers (N)	CRC	End
	8-bit	8-bit	16-bit	16-bit	16-bit	

Response:

Start	Slave Address	Function	Data Byte Count	N* Register Data	CRC	End
	8-bit	8-bit	8-bit	N* 16-bit	16-bit	

Example:
Read all read-only (input) registers, slave address 05.

Command Start_05_04_0000_0002_4F70_End
Response Start_05_04_06_0065_001F_02F3_B86E_End

Interpretation:

Firmware version 1.01 (0065h)
Active state, leak detected and all outputs active (001Fh)
Leak position is 75.5m (02F3h)

Function 06

Command:

Start	Slave Address	Function	Register Address	Data	CRC	End
	8-bit	8-bit	16-bit	16-bit	16-bit	

Response:

Start	Slave Address	Function	Register Address	Data	CRC	End
	8-bit	8-bit	8-bit	N* 16-bit	16-bit	

Example:
Set cable length to 15m (000Fh), slave address 05.

Command Start_05_06_0000_000F_4AC8_End
Response Start_05_06_0000_000F_4AC8_End

Function 16

Command:

Start	Slave Address	Function	Start Address	No. of Registers (N)	Data Byte Count	N* Data	CRC	End
	8-bit	8-bit	16-bit	16-bit	8-bit	N*16-bit	16-bit	

Response:

Start	Slave Address	Function	Start Address	No. of Registers	CRC	End
	8-bit	8-bit	8-bit	16-bit	16-bit	

Example:
Set Output 1 to normally-on and assigned to fault (0003)
Set Output 2 to normally-off, leak and latch (0004)
Set Output 3 to normally-off, leak and follow (0000)
Slave address 05

Command Start_05_10_0001_0003_06_0003_0004_0000_00BC_End
Response Start_05_10_0001_0003_4CD0_End

Modbus ASCII

Messages start with the colon character (3Ah) and end with <CR> (carriage-return – 0Dh) and <LF> (line-feed – 0Ah).

All data bytes are sent as pairs of ASCII characters in the ranges 0-9 (30h – 39h) and A-F (41h – 46h)

An 8-bit longitudinal redundancy check of all previous number bytes (excludes the colon start) is added before the end CR LF. This is sent as two ASCII characters.

There are no timing constraints between characters in a command; a start character will terminate any previous incomplete command sequences.

Function 03

Command:

Start	Slave Address	Function	Start Address	No. of Registers (N)	LRC	End
:	8-bit	8-bit	16-bit	16-bit	8-bit	CR LF

Response:

Start	Slave Address	Function	Data Byte Count	N* Register Data	LRC	End
:	8-bit	8-bit	8-bit	N* 16-bit	8-bit	CR LF

Example:

Read all read/write (holding) registers, slave address 05.

Command : 05 03 0000 0005 F3 <CR><LF>

Response : 05 03 0A 0064 0000 0001 0004 0000 85 <CR><LF>

Interpretation:

Cable is 100m (64h),
Output 1 set to normally-off, leak and follow (0000)
Output 2 set to normally-on, leak and follow (0001)
Output 3 set to normally-off, leak and latch (0004)
No latched outputs (0000)

Function 04

Command:

Start	Slave Address	Function	Start Address	No. of Registers (N)	LRC	End
:	8-bit	8-bit	16-bit	16-bit	8-bit	CR LF

Response:

Start	Slave Address	Function	Data Byte Count	N* Register Data	LRC	End
:	8-bit	8-bit	8-bit	N* 16-bit	8-bit	CR LF

Example:
Read all read-only (input) registers, slave address 05.

Command : 05 04 0000 0002 F5 <CR><LF>
Response : 05 04 06 0065 001F 02F3 78 <CR><LF>

Interpretation:

Firmware version 1.01 (0065h)
Active state, leak detected and all outputs active (001Fh)
Leak position is 75.5m (02F3h)

Function 06

Command:

Start	Slave Address	Function	Register Address	Data	LRC	End
:	8-bit	8-bit	16-bit	16-bit	8-bit	CR LF

Response:

Start	Slave Address	Function	Register Address	Data	LRC	End
:	8-bit	8-bit	8-bit	N* 16-bit	8-bit	CR LF

Example:
Set cable length to 15m (000Fh), slave address 05.

Command : 05 06 0000 000F E6 <CR><LF>
Response : 05 06 0000 000F E6 <CR><LF>

Function 16

Command:

Start	Slave Address	Function	Start Address	No. of Registers (N)	Data Byte Count	N* Data	LRC	End
:	8-bit	8-bit	16-bit	16-bit	8-bit	N*16-bit	8-bit	CR LF

Response:

Start	Slave Address	Function	Start Address	No. of Registers	LRC	End
:	8-bit	8-bit	8-bit	16-bit	8-bit	CR LF

Example:
Set Output 1 to normally-on and assigned to fault (0003)
Set Output 2 to normally-off, leak and latch (0004)
Set Output 3 to normally-off, leak and follow (0000)
Slave address 05

Command : 05 10 0001 0003 06 0003 0004 0000 DA <CR><LF>
Response : 05 10 0001 0003 E7 <CR><LF>