



Liquid Monitoring & Control

Bund Water Control Type 12000

Installation, Operation & Maintenance

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Bund Water Control Type 12000

Installation, Operation and Maintenance

➤ General Description

The standard system is supplied complete with a control unit together with a combined pump/probe assembly and a steel mounting stand. The control unit is capable of monitoring the probe unit to automatically empty the bund of water when the water level rises to the probe level, leaving any pollutant behind. The current status is displayed via a 16 x 2 liquid crystal display.

➤ General Operation

The control unit continuously monitors the condition of the connected probe assembly and the pump is operated when water is detected. The current status is displayed on the display located on the front of the unit. If an alarm condition is detected, a warning message is displayed, e.g. Failsafe probe activated. Operation will return to normal when the fault that caused the alarm has been corrected.

➤ Applicable Firmware

Firmware ID	Description	Version
FMW-1048	Bund-only	V1.16 and later
FMW-1053	Duty/assist	V1.16 and later
FMW-1054	Oil skimmer	V1.16 and later

➤ Detailed Operation

There are three variants of the bund water control unit; Bund Only, Duty/Assist and Oil Skimmer. The variant supplied being dependant on customer requirements.

- *Bund only* mode removes accumulated water from the bund. This mode only supports one pump.
- *Duty/Assist* mode adds a second pump that begins operating if the unit is currently pumping and water is encountered at start probe 2. The second pump *assists* the *duty* pump in emptying the bund so as to prevent the duty pump being overwhelmed. During normal pumping operation, the duty/assist pumps are alternated on successive operations to distribute the load on the pumps.
- *Oil Skimmer* mode, in addition to removing water from the bund, also uses a second pump to remove the oil into an IBC for later removal by a disposal company.

Bund Only Operation

After the initial screens have been displayed at power on, the control unit will normally display the screen below. Note, the number of pump operations shown may be different.

Pump Operations: 000042

When start probe 1 detects water, the pump is started and the number of pump operations is incremented. The screen is as shown below.

Pumping Water

The pump continues to run even when the water level lowers below start probe 1. The pump is stopped when the water level drops below the stop probe. The display then reverts to showing the number of pump operations.

Duty/Assist Operation

After the initial screens have been displayed at power on, the control unit will normally display the screen below. Note, the number of pump operations shown may be different.

Pump 1: 000042 Pump 2: 000023

When start probe 1 detects water, the pump is started and the number of pump operations is incremented on the relevant pump. The screen is as shown below.

Pumping Water

The pump continues to run even when the water level lowers below start probe 1. The pump is stopped when the water level drops below the stop probe. The display then reverts to showing the number of pump operations.

If the pump is running and water is detected on start probe 2, the *assist* pump will start to prevent the *duty* pump being overwhelmed. The assist pump will continue to run even when the water level lowers below start probe 2. When the assist pump starts running the screen is as shown below.

Pumping water with both pumps

On successive operations the duty and assist pumps will be swapped to distribute the load between the two pumps. So, if pump 1 is used to empty the bund the first time, the second time pump 2 will be used, pump 1 the third time, and so on.

Oil Skimmer Operation

After the initial screens have been displayed at power on, the control unit will normally display the screen below. Note, the number of pump operations shown may be different.

Pump 1: 000042 Pump 2: 000023

When start probe 1 detects water, the pump is started and the number of water pump operations is incremented. The screen is as shown below.

Pumping Water

The pump continues to run even when the water level lowers below start probe 1. The pump is stopped when the water level drops below the stop probe. The display then reverts to showing the number of pump operations.

If a high liquid level is detected and start probe 1 detects oil and the IBC is not full, the oil pump is started and the number of oil pump operations is incremented. The oil pump continues to run until water is detected on start probe 1 or the IBC is full or the oil pump timeout expires.

When oil is being pumped the screen is as shown below.

Pumping oil

When oil and water are being pumped at the same time the screen is as shown below.

Pumping oil and water

When the IBC is full the screen is as shown below.

IBC full Please empty

Failsafe Alarm

The failsafe probe in the probe unit is positioned lower than the start and stop probes. If, for any reason, the stop probe should fail to detect the water level dropping below the stop probe when the pump is running, the failsafe probe will detect when the water level drops below it and stop the pump. This will also raise a failsafe alarm, as shown below. Also, the global alarm relay, RL1, will be de-energised.

Failsafe probe activated

Once the fault has been cleared operation will automatically return to normal.

Note, failsafe operation is not supported in *Duty/Assist* mode.

High Liquid Level

In *Bund Only* and *Duty/Assist* modes, if the liquid level rises high enough that the high liquid level float switch is activated, one of two alarms will be raised depending on whether the relevant start probe detects oil or water. If oil is detected, the high level oil alarm will be raised after approximately 5 seconds to

prevent false triggering. If water is detected, the alarm will be raised only after the configurable delay time has passed. A high level oil alarm is shown below.

High level oil

Once the high level has been cleared the screen will no longer show this message.

Note, the high liquid level float is used to start the oil pump in *Oil Skimmer* mode.

Probe Fault

A possible fault condition may arise where an illegal probe combination is detected. This happens when the relevant start probe detects water but the stop probe detects oil. This combination should normally never happen so is detected as a fault. The screens shown below will be displayed.

Probe fault
Start in water Stop in oil

High Liquid Level Switch Fault

A possible fault condition may arise on an oil skimmer type of bund water control unit where the high liquid level float switch becomes stuck in the up position due to debris or other blockages. When the high level oil is detected and the oil pump starts, if the float is still in the up position after the oil pump time plus an hour has passed, the screen shown below will be displayed.

High level switch fault

Relay Operations

Table 1 – Relay output assignments

Relay	Contacts	Conditions
RL8 – Pump 1	Mains	Energised under any of the following conditions (assuming no alarm conditions exist): <ul style="list-style-type: none"> Energised when water level is above start probe 1. In <i>Duty/Assist</i> mode, use is alternated with RL7 and hence pump 2. De-energised when water level drops below stop probe
RL7 – Pump 2	Mains	Energised under any of the following conditions (assuming no alarm conditions exist): <ul style="list-style-type: none"> In <i>Duty/Assist</i> mode, energised on alternate cycles when water level is above start probe 2. In <i>Oil Skimmer</i> mode, energised when high liquid level is detected along with oil on start probe 1 and the IBC is not full. In <i>Duty/Assist</i> mode, de-energised when water level drops below stop probe In <i>Oil Skimmer</i> mode, de-energised when water is detected on start probe 1, the IBC is full or the oil pump timeout expires.
RL1 – Global alarm	Mains	Normally energised. De-energised under any of the following conditions: <ul style="list-style-type: none"> When the failsafe probe detects oil (<i>Bund Only</i> and <i>Oil Skimmer</i> modes only) When the high liquid level float switch is activated and oil is detected on the start probe (after the 5 second high liquid level float switch debounce time) (<i>Bund Only</i> and <i>Duty/Assist</i> modes only) When the high liquid level float switch is activated and water is detected on the start probe and the configurable delay time has passed (<i>Bund Only</i> and <i>Duty/Assist</i> modes only) When IBC is full (<i>Oil Skimmer</i> mode only) When a probe fault condition is detected When the high level float switch bobbin is stuck in the up position (<i>Oil Skimmer</i> mode only)
RL2 – High level alarm	Volt-free	This relay can be configured as active when energised or active when de-energised (default). Active when the high level float switch is activated and either of the following conditions: <ul style="list-style-type: none"> Oil is detected on the start probe (after the 5 second high liquid level float switch debounce time) (<i>Bund Only</i> and <i>Duty/Assist</i> modes only) Water is detected on the start probe and the configurable delay time has passed (<i>Bund Only</i> and <i>Duty/Assist</i> modes only) When IBC is full (<i>Oil Skimmer</i> mode only) When the high level float switch bobbin is stuck in the up position (<i>Oil Skimmer</i> mode only)
RL3 – Power fail alarm	Volt-free	Energised whilst power is present to the control board
RL4 – Oil alarm	Volt-free	<ul style="list-style-type: none"> Energised when the high level float switch is activated and oil is detected on the start probe (after the 5 second high liquid level float switch debounce time) (<i>Bund Only</i> and <i>Duty/Assist</i> modes only) Energised when the IBC is full (<i>Oil Skimmer</i> mode only) Energised when the high level float switch bobbin is stuck in the up position (<i>Oil Skimmer</i> mode only)
RL5 – Water alarm	Volt-free	Energised when the high level float switch is activated and water is detected on the start probe and the configurable delay time has passed

RL6 – Pump called	Volt-free	Energised when the pump is running
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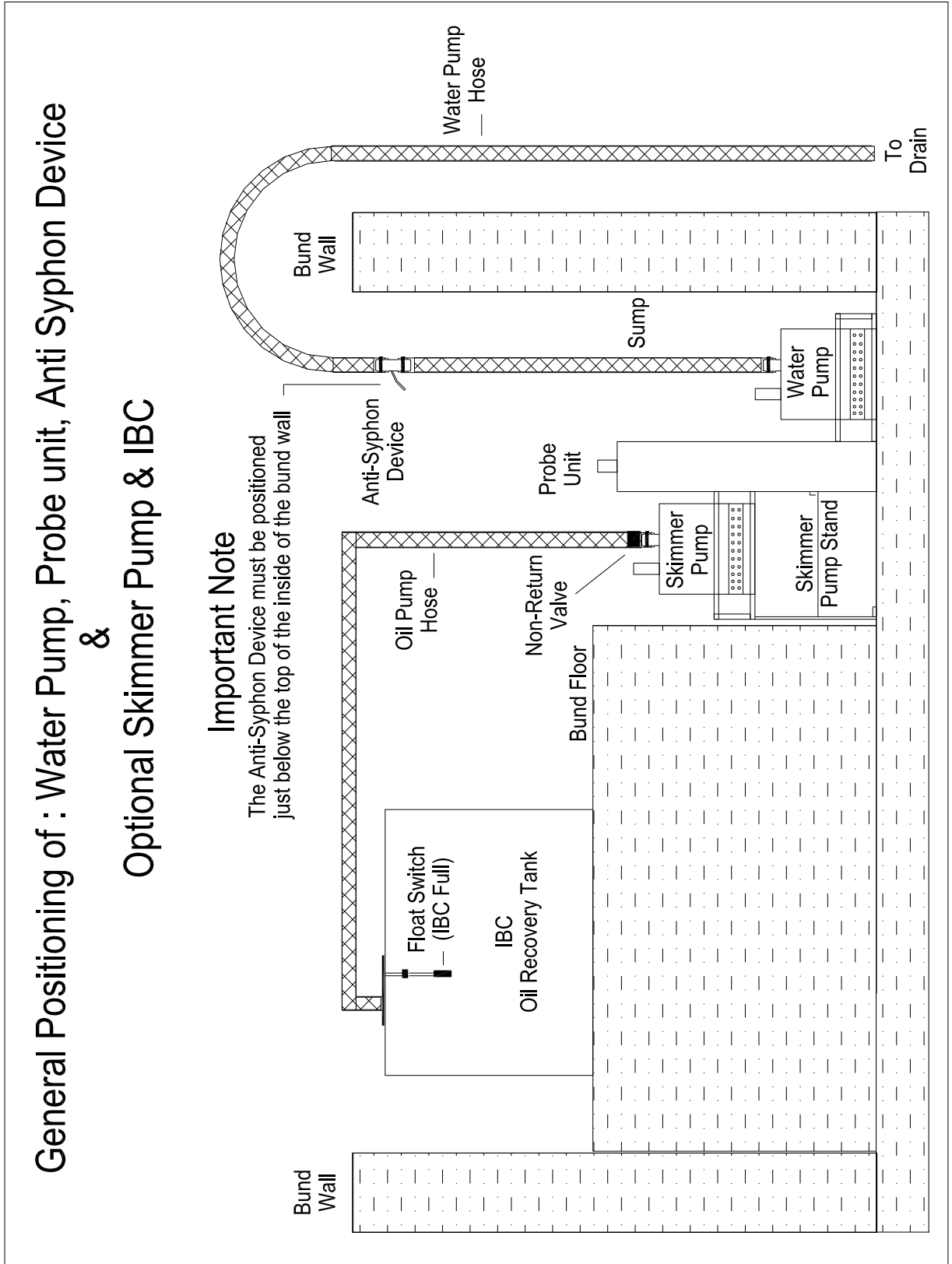


Figure 1 - General Positioning in Sump

Wire the mains supply to CN1 with reference to Table 2.

Table 2 – Mains input (CN1)

Terminal	Description
N	Mains neutral
L	Mains live
E	Mains earth

Wire the pump to CN2 with reference to Table 3. If a second pump is used, it should be wired with reference to Table 4.

Table 3 – Pump 1 wiring (CN2)

Terminal	Description
E	Mains earth
L1	Mains live out via RL8 NO contact
N	Mains neutral

Table 4 – Pump 2 wiring (CN2)

Terminal	Description
E	Mains earth
L2	Mains live out via RL7 NO contact
N	Mains neutral

Wire a mains beacon to CN3 with reference to Table 5. The beacon live should normally be wired to terminal L1.

Table 5 – Global alarm wiring (CN3)

Terminal	Description
L2	Mains live out via RL1 NO contact
N	Mains neutral
L1	Mains live out via RL1 NC contact

Wire any required signals to the signal relay outputs, CN5 – 9, with reference to Table 6. The commoning links can be inserted as needed if a common return path is required for two or more relay outputs.

Table 6 – Signal relay wiring (CN5 – 9)

Connector	Relay	Normal State	Commoning Link
CN5 – High level alarm	RL2	Configurable	LK1 (links COM on CN5 and CN6)
CN6 – Power fail alarm	RL3	Energised	LK2 (links COM on CN6 and CN7)
CN7 – Oil alarm	RL4	De-energised	LK3 (links COM on CN7 and CN8)
CN8 – Water alarm	RL5	De-energised	LK4 (links COM on CN8 and CN9)
CN9 – Pump called	RL6	De-energised	

Wire the probe assembly to CN11 with reference to Table 7.

Table 7 - Bund Only Mode - Probe assembly wiring (CN11)

Terminal	Wire Colour
Common	Not used
Common	Green
High level float switch	White
Failsafe probe	Red
Stop	Blue
Start 2	Not Used
Start 1	Yellow
Common	Black

Table 8 – Duty Assist Mode - Probe assembly wiring (CN11)

Terminal	Wire Colour
Common	Not used
Common	Green
High level float switch	White
Failsafe probe	Not Used
Stop	Blue
Start 2	Red
Start 1	Yellow
Common/Failsafe/Stop	Black

Table 9 – Oil Skimmer Mode - Probe assembly wiring (CN11)

Terminal	Wire Colour
Common	IBC Float Switch - Brown
Common	Green
High level float switch	White
Failsafe probe	Red
Stop	Blue
Start 2	IBC Float Switch - Blue
Start 1	Yellow
Common	Black

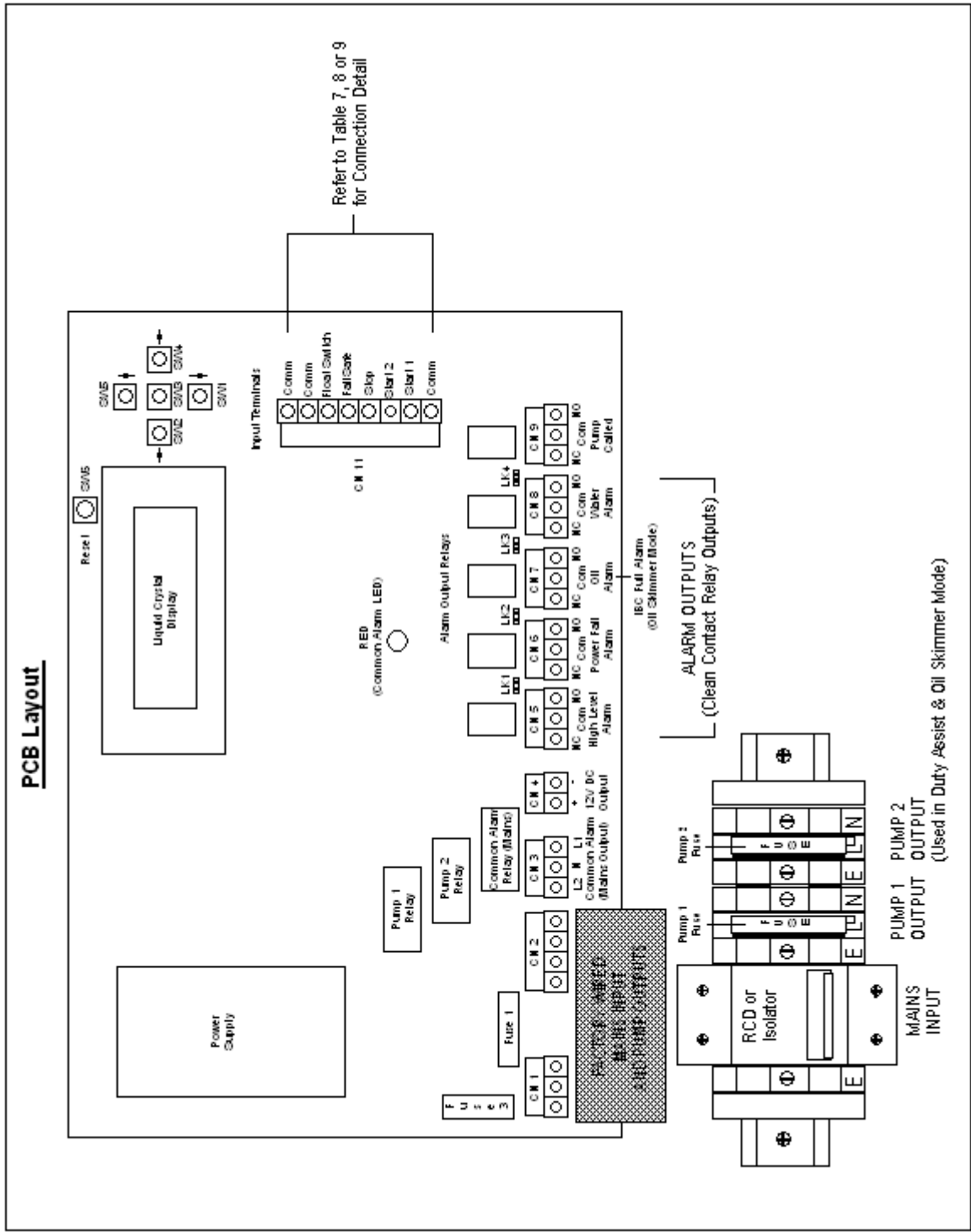


Figure 2 - PCB Layout for Bund Water Control

Darcy Bund Water Control Connection of Large Volume Duty Assist Pumps

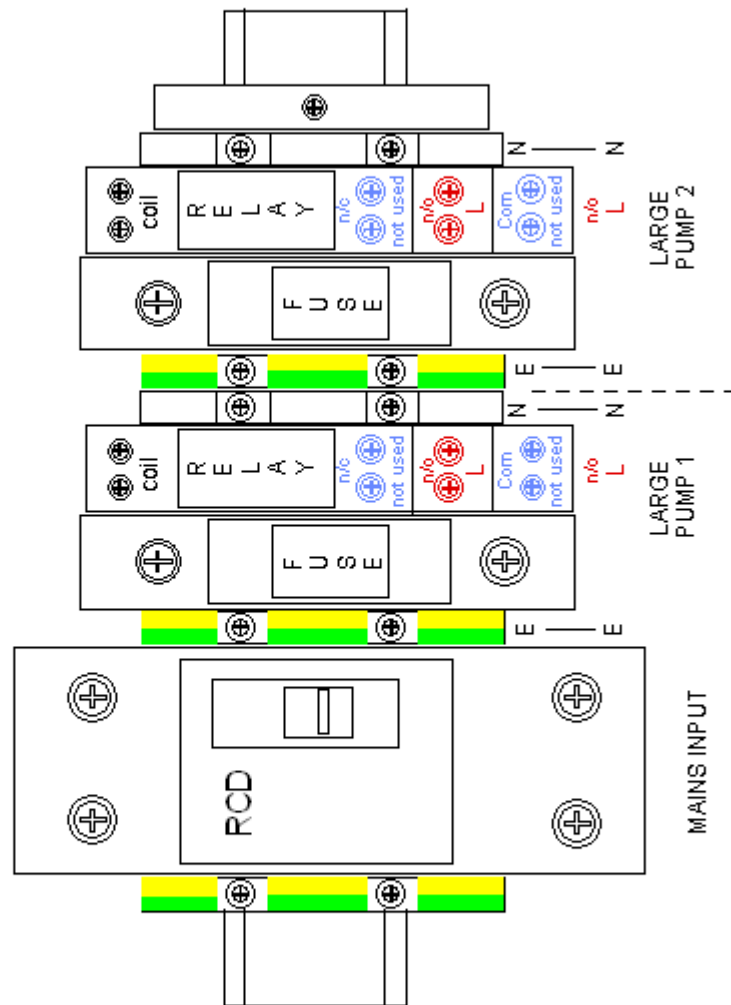


Figure 3 - Duty Assist Large Pump Connections

Changing Factory Settings

Various settings can be changed by entering diagnostics mode. To enter diagnostics mode, press and hold the “→” switch on the control unit board inside the cabinet whilst pressing and releasing the “RESET” switch. After a few seconds the screen will display “DIAGNOSTICS.” At this point release the switch. The display will then appear similar to that below.

O O O O
D D D D D D D D

Change High Level Float Switch Delay Time

This is the amount of time that the control unit will wait before raising a high level alarm when there is a high liquid level in the bund and water is detected on start probe 1 of the probe assembly. If oil is detected on start probe 1 when there is a high liquid level, the float switch delay time will be ignored and an alarm will be activated after approximately 5 seconds. To change the high level float switch delay time, press the “→” switch repeatedly until the display is shown as below. Note, the delay time shown may be different.

Float switch
00 minutes

Use the “↑” and “↓” switches to increase and decrease the float switch delay time in increments of 1 minute. Minimum delay time is 0 minutes, maximum is 60 minutes. The new value will be retained and used when normal operation is resumed.

Resetting Pump Operations to Zero

The number of pump operations shown on the display in normal operation can be cleared to zero if required. Press the “→” switch repeatedly until the display is shown as below.

This will be displayed if only one pump is enabled. Note, the number of pump operations shown may be different.

Pump operations:
000042

This will be displayed if two pumps are enabled. Note, the number of pump operations shown may be different.

Pump 1: 000042
Pump 2: 000023

Press the “ENTER” switch on the control unit board inside the cabinet to clear the number of pump operations to zero. The zero value will be retained and shown when normal operation is resumed.

Oil Pump Time

If the operating mode is currently set to Oil Skimmer, the oil pump time can be set.

Press the “→” switch repeatedly until the display is similar to that shown as below. Note, the bottom line may vary.

Oil Pump Time:
42 seconds

Use the “↑” and “↓” switches to increase and decrease the oil pump time in increments of 1 second. Minimum oil pump time is 10 seconds, maximum is 90 seconds. The default oil pump time is 40 seconds. The new value will be retained and used when normal operation is resumed.

Oil Pump Timeout

If the operating mode is currently set to Oil Skimmer, the oil pump timeout can be enabled or disabled.

Press the “→” switch repeatedly until the display is similar to that shown as below. Note, the bottom line may vary.

Oil Pump Timeout Enabled

Use the “↑” and “↓” switches to select between *Enabled* and *Disabled*. For special applications where the oil pump must be active all the time the high level probe is active and oil is still detected at the start probe, set Oil Pump Timeout to Disabled. The Oil Pump Time then becomes a run-on time for the oil pump after the high level probe is deactivated or water is detected at the start probe.

High Level Alarm Relay Active State

RL2, the high level alarm relay can be configured to be active when the relay is energised or active when de-energised (default).

Press the “→” switch repeatedly until the display is similar to that shown as below. Note, the bottom line may vary.

High Level Relay De-energised

Use the “↑” and “↓” switches to select between *De-energised* and *Energised*.

Testing Probes and Relay Outputs

During installation and for diagnostics purposes it is useful to be able to see an instantaneous display of the states of the individual probes within the probe assembly and manually energise individual relay outputs. On first entering diagnostics, the display will be similar to that below.

The following will be displayed in *Bund Only* mode. The top line of the display shows the current state of the inputs from the probe assembly. The first, second, third, fourth characters indicate the state of the start, stop, failsafe and high level probes respectively.

O O O O
D D D D D D D D

The following will be displayed in *Duty/Assist* and *Oil Skimmer* modes. The top line of the display shows the current state of the inputs from the probe assembly. The first, second, third, fourth and fifth characters indicate the state of the start 1, start 2, stop, failsafe (not available in *Duty/Assist* mode) and high level probes

respectively in *Duty/Assist mode*, and start, IBC full, stop, failsafe and high level probes respectively in *Oil Skimmer mode*.

O O O O O
D D D D D D D D

The start, stop and failsafe probes will show 'O' when the probe is in oil or air, and 'W' when in water. The high level probe shows 'O' for open and 'C' for closed. When a high level is detected the switch within the high level probe will be in the closed position.

The bottom line of the display shows the current states of the relay outputs. The eight characters relate directly to the eight relays along the bottom of the control unit board in the order RL8, 7, 1, 2 – 6. Each of the characters will show 'D' if the relay is currently de-energised or 'E' if the relay is currently energised. Use the “←” and “→” switches on the control unit board to move the flashing cursor over the relay output to be changed. Use the “↑” and “↓” switches to change the state of the relay between energised and de-energised.

↘ Maintenance and Repair

Due to the harsh environments which the probe unit can be subjected to, it is advised that it is inspected and cleaned at regular intervals.

The control unit does not contain user serviceable parts.

For all repairs, contact Darcy Spillcare Manufacture on 01732 441015.

↘ Technical Information

Pump Relay Outputs

The pump relay outputs on CN2 are intended for use up to 4.7A each. Suitably rated fuses **must** be provided for each pump external to the control unit board.

Global Alarm Relay Output

The global alarm relay output on CN3 supplies mains voltage via a 125mA fuse, therefore a maximum current consumption of 100mA is recommended from this output.

Signal Relay Outputs

The signal relay outputs on the PCB, CN5 – 9, are intended for use at 30VDC, 1A.

External Relays (Optional Fit)

If requested at the order stage, the panel can be fitted with extra external DIN rail mounted relays to supplement the standard on-board signal relays mentioned above and allow a higher voltage/current to be switched. See Figure 4.

The relays used are as shown below. See manufacturer's data sheets for details on contact ratings.

Relay Function	Relay Type
Common alarm output Energised by CN3 on PCB	Phoenix Contact PLC-RSC-230UC/21HC - 2967675
Signal relay outputs Energised by CN5 – 9 on PCB	Phoenix Contact PLC-RSC- 12DC/21HC - 2967617

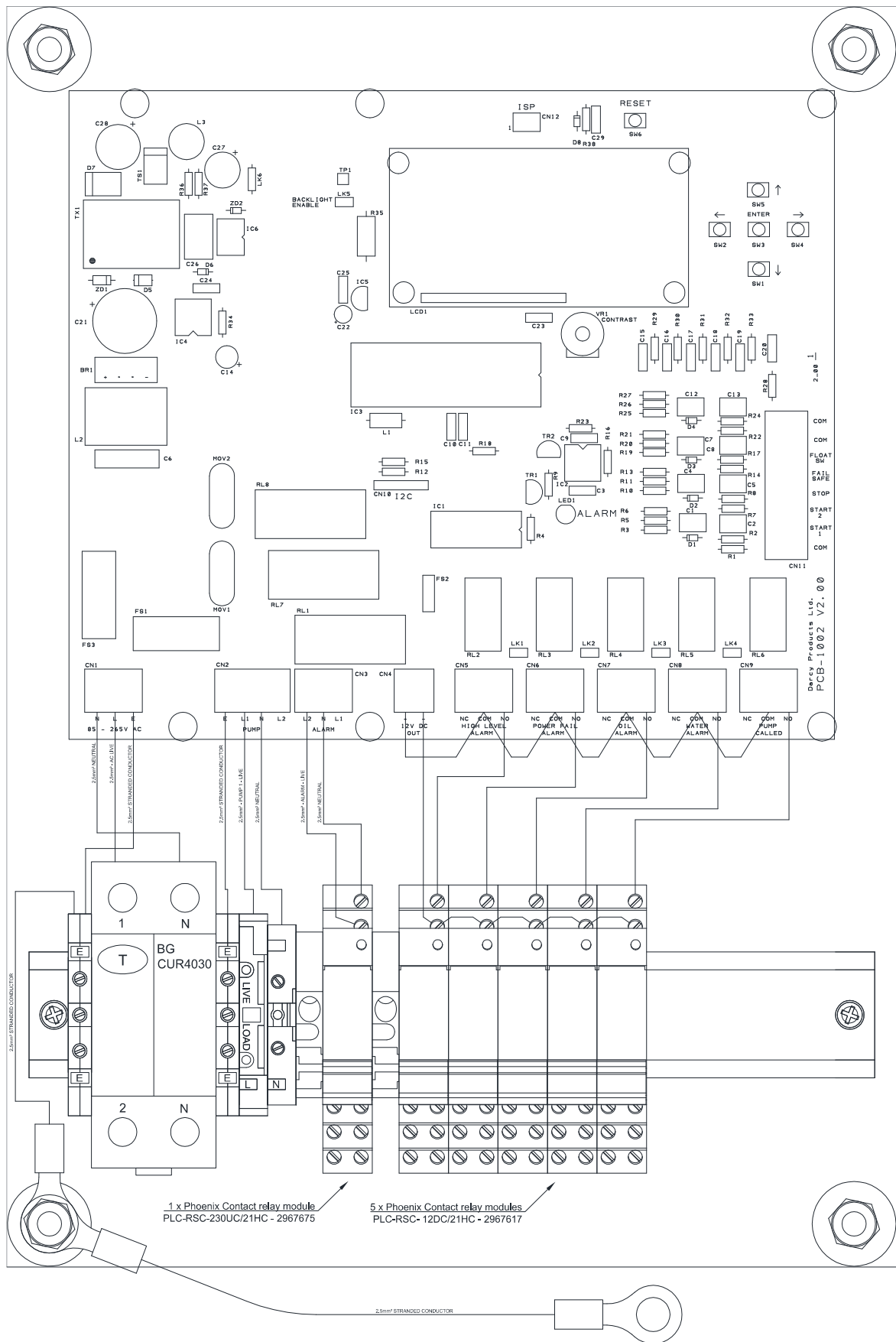


Figure 4 - Wiring of external relays

Specifications

Enclosure	Dimensions	430mm(H) 330mm(W) 200mm(D)
	Material	Body: Polyester reinforced with fibreglass. Door: Tempered glass.
	IP Rating	IP66
Supply Voltage		230VAC \pm 10%, 50Hz
Power Consumption	All relays energised	5.5W, 11.7VA, $\cos \phi = 0.46$ + pump current(s)
	All relays energised + optional external relays	8.6W, 18.7VA, $\cos \phi = 0.46$ + pump current(s)
Fusing	FS1 (common alarm relay)	T 125mA H 250V
	FS2 (AUX 12V, CN4)	300mA resettable fuse
	FS3	T 3.15A H 250V
Max probe cable length		100m
Signal Relay Outputs (CN5 – 9)		Volt-free SPDT contacts. 30VDC, 1A. Use optional external relays for higher voltage/current.
Pump Relay Outputs (CN2)		230V, 4.7A per output. External fusing must be provided. Usually on DIN rail in cabinet.
Global Alarm Relay Output (CN3)		230V, 100mA, DPDT contacts. Fuse: T 125mA H 250V

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Established in 1935, The Darcy Group is at the forefront of Environmental Protection and specialises in the manufacture and provision of solutions helping sites to achieve environmental and ISO compliance and care for the environment in increasingly demanding circumstances.