

Service/installation manual

DryRapid Controller

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M5031GB

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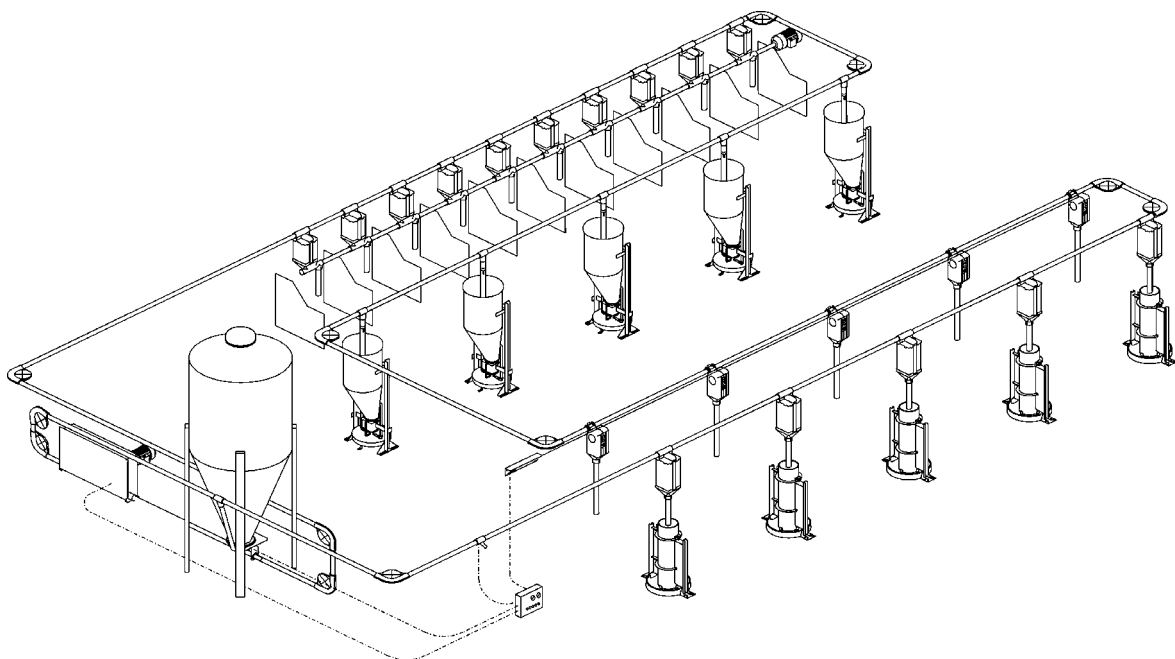
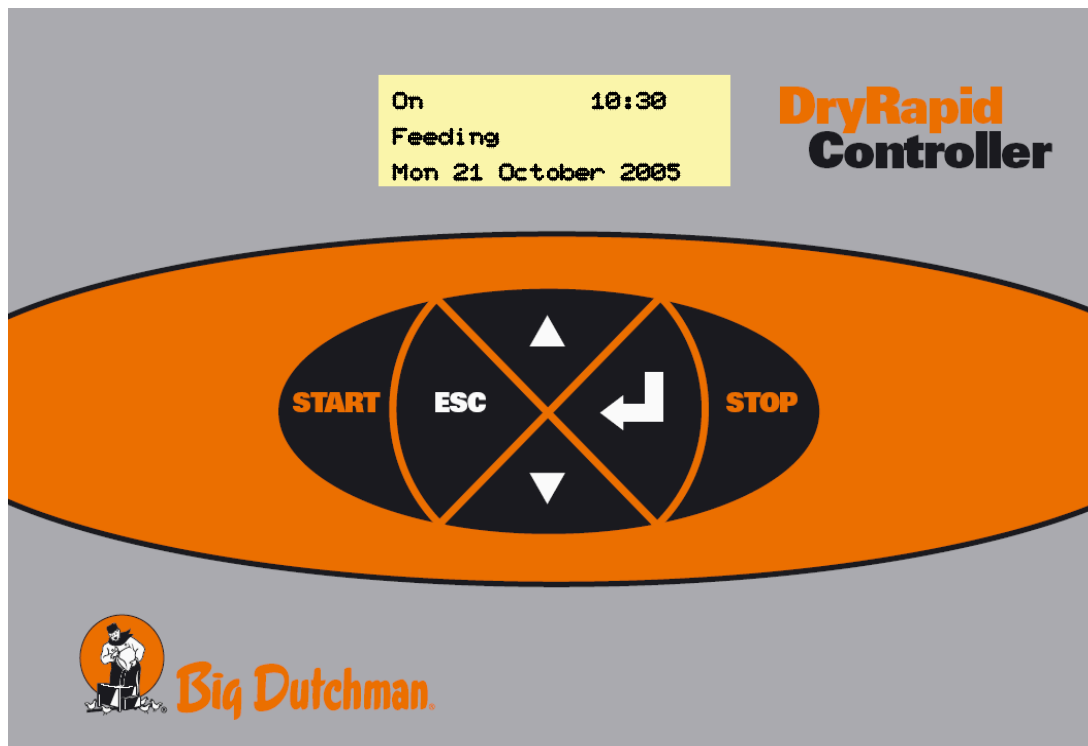
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1 General information

The **DryRapid Controller** is used for controlling and monitoring of tube feeding systems that are driven either by a conveyor cable or a conveyor chain.



The purpose of this document is to give technical information for the DryRapid Controller. This information may be utilized as reference when installing and operating the unit.

The document includes:

- Description of features
- Installation information
- Connector functions listing
- LED indicator functions listing
- Trouble Shooting information
- Specifications

Documentation concerning the application and test programs is not included in this document. Please refer to separate documentation for information regarding these issues.

The DryRapid Controller was designed to target competing similar products on the market.

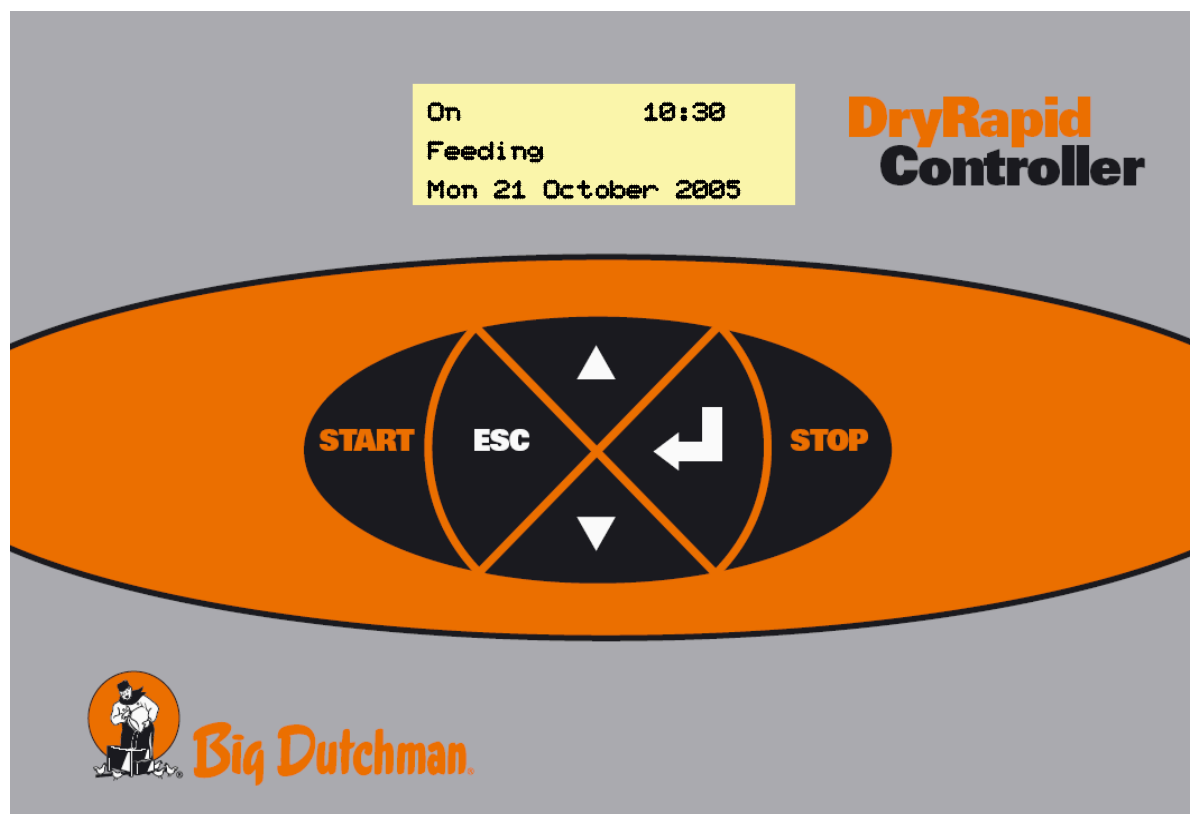
It is intended to be used as a dry feeder for pig farms, but due to its versatile design it could be used for a variety of other applications.

2 Features of the Dry Rapid Controller

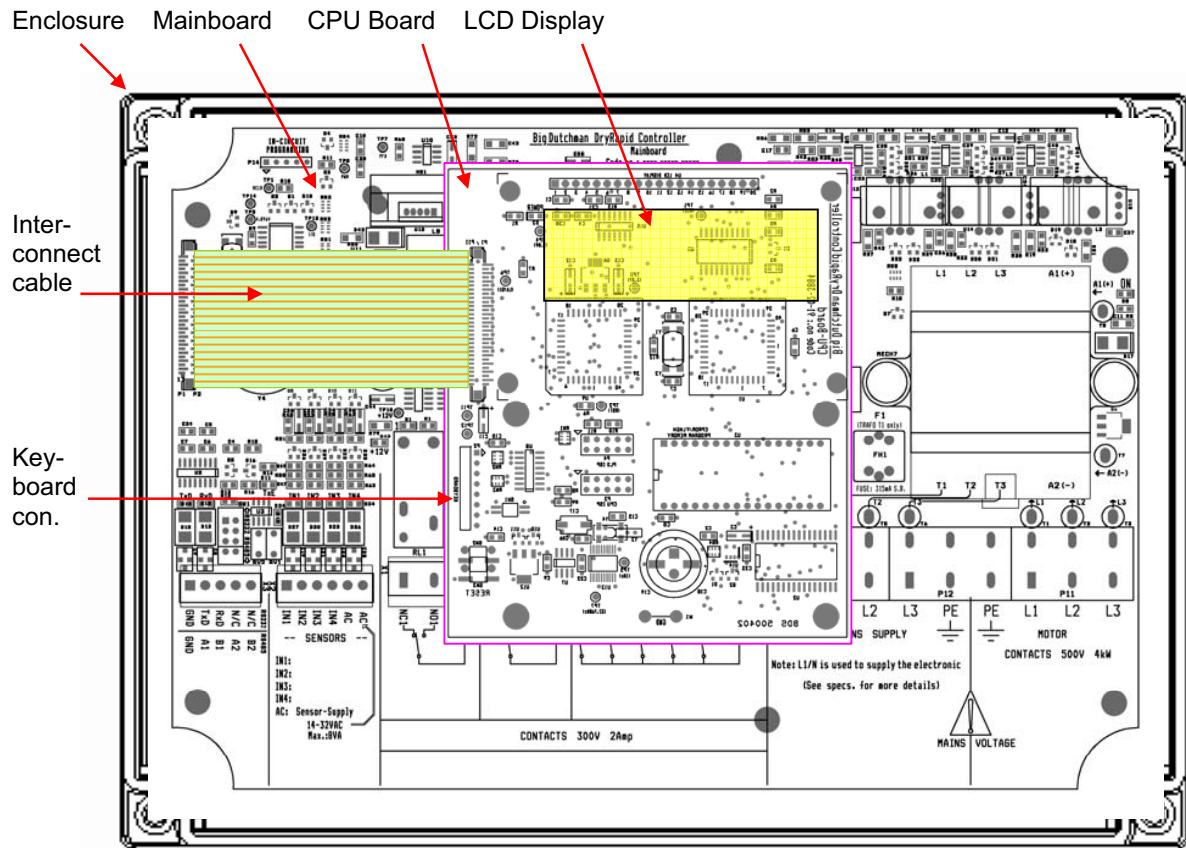
• Compact design:	250 x 180 x 100 mm (w x h x d)
• LCD Display:	3 lines with each 20 characters
• Sealed keyboard:	6 keys (see drawing below)
• High power output:	3 Phases ; Switching power 4kW at up to 500V
• Relay outputs:	7 relays x 275VAC 2A (5 n.o. contacts with shared common and 2 potential free n.o. / n.c. contacts)
• Digital inputs:	4 inputs designed for Big Dutchman low voltage MS-45R sensors or simple external switches.
• Wide Supply range:	90-130V / 170-270V AC (voltage selector - 115V / 230V)

• Microprocessor controlled - functional changes may easily be implemented by just updating the units software (EPROM/FLASH chip change)
• Real Time Clock with supply backup - maintains clock during a power down.
• Data memory with supply backup - maintains data during a power down.
• Current monitor for high power outputs L1,L2 and L3 (Range 0-14Arms, accuracy 5%)
• Serial Port (RS232 or RS485 - switch selectable) - for remote control, status print outs or connection to Big Dutchman MC99 RS485 network etc. (Support for serial ports is not a part of the current software)
• Reliable design using high quality components, and design with good margins.
• EMC designed to meet or exceed requirements.

2.1 Front view of the DryRapid Controller



2.2 Internal view of the DryRapid Controller

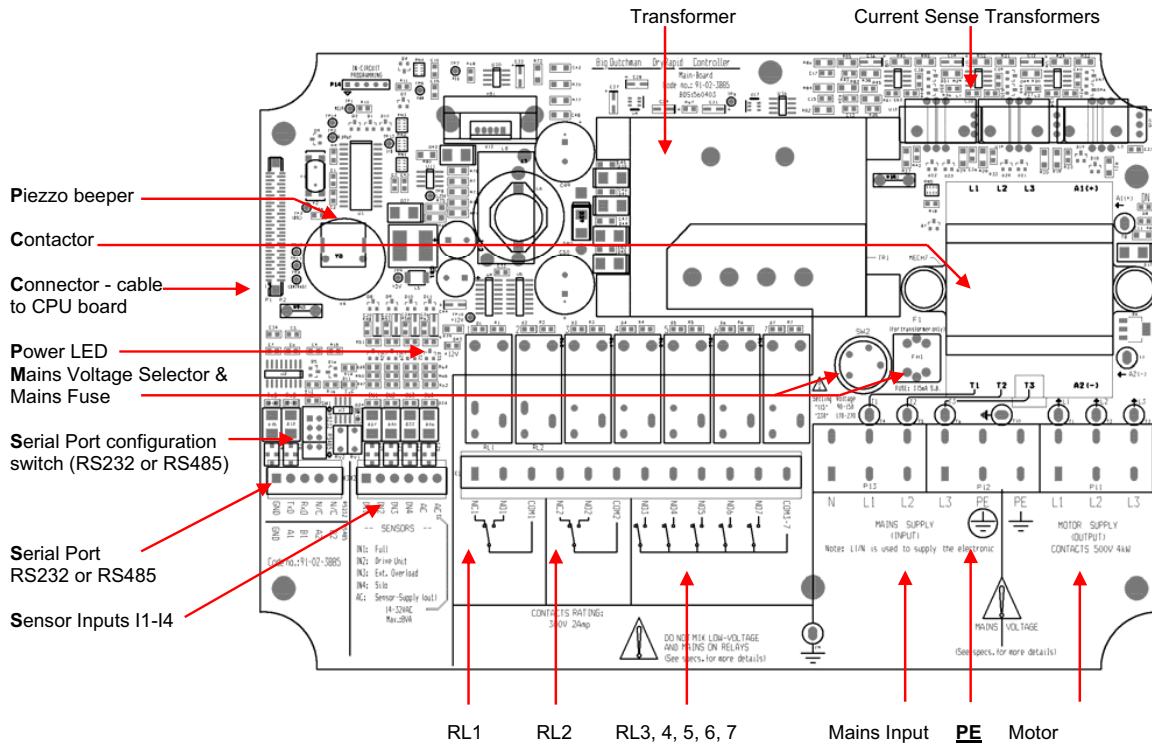


The Main board will be mounted on a metal mounting plate, which will be fastened to the bottom of the enclosure.

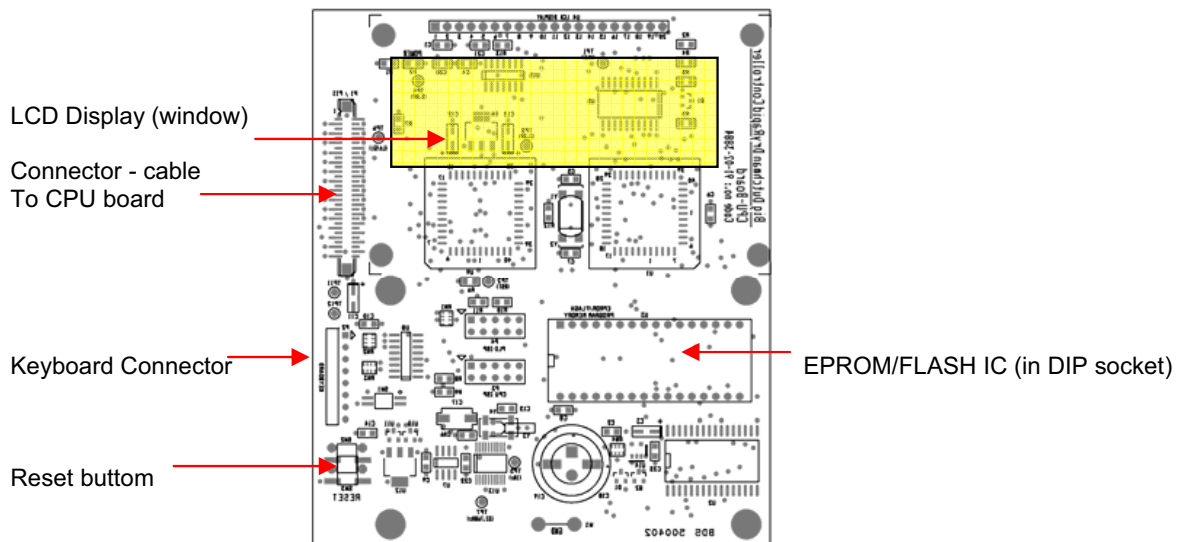
The CPU-board will be mounted onto the top cover of the enclosure.

2.3 Detailed view of the DryRapid Controller PCB's

2.3.1 The mainboard




2.3.2 The CPU or Display Board



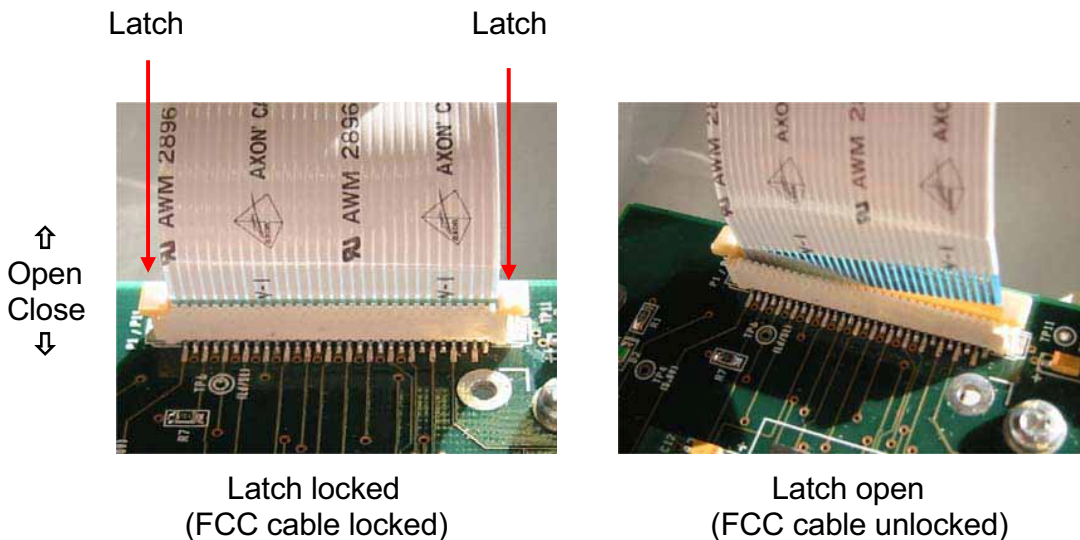
3 Installation


When installing the unit we recommend either removing the top or mounting it as shown on the picture below:



	<p>Securing top part during installation in order to prevent stressing the FCC cable and the FCC connectors. Never leave the top cover "hanging" in the interconnect FCC-cable !</p>
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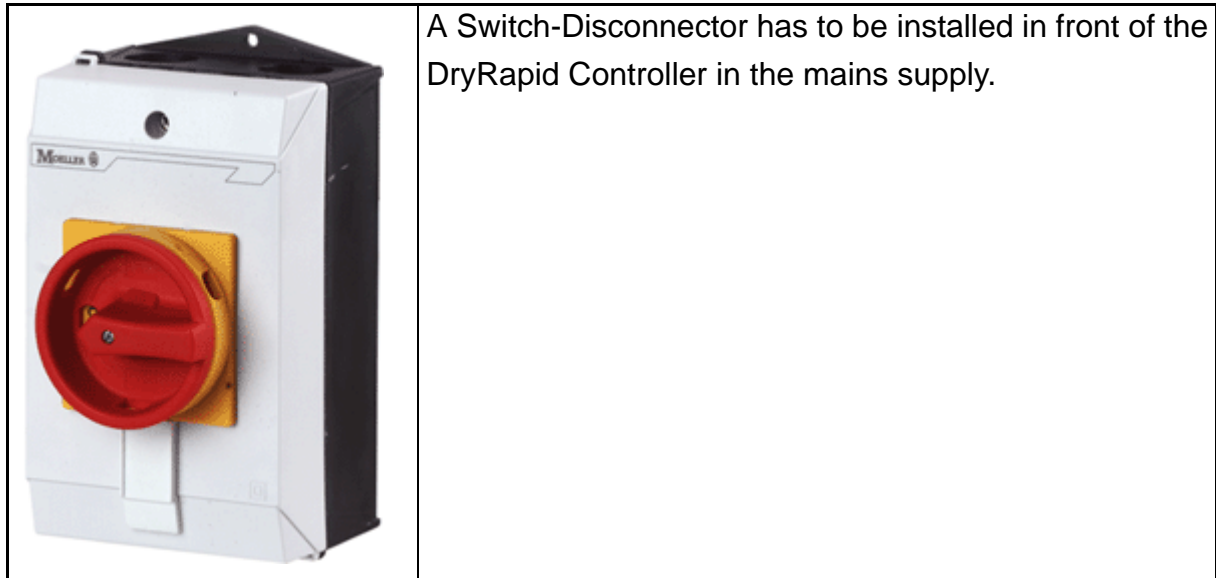
To remove top cover completely, unlock the FCC-connector on either the top board or on the mainboard by lifting the two lock latches. After this the cable can be pulled out. When reinstalling make sure the cable is properly inserted before pushing the two lock latches back.



	<p>Always make sure that the FCC-cable is properly inserted and that the latches are pushed down (cable locked) - see pictures above. Failure to do so may cause the system to become instable due to bad interconnection between the two boards !</p>
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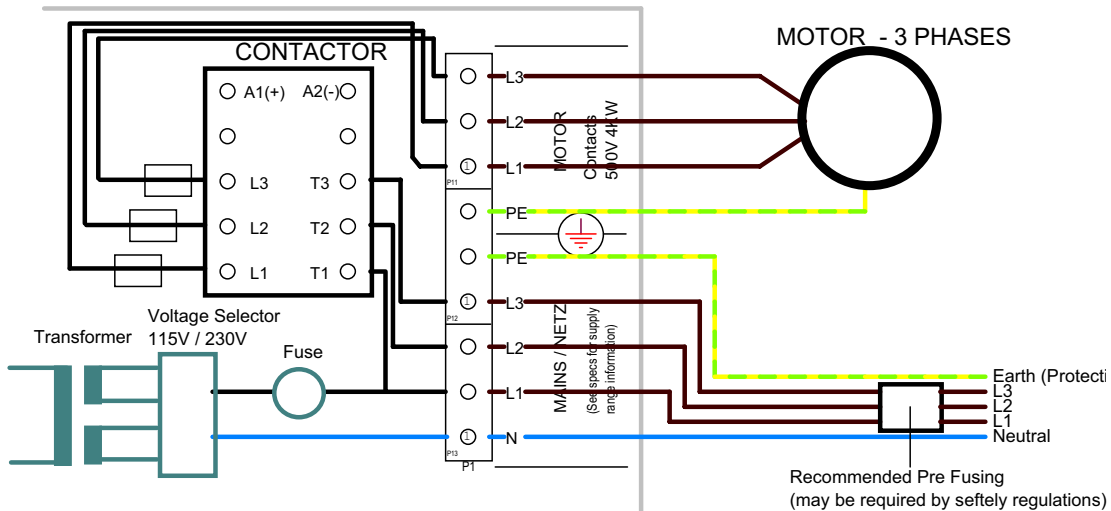
3.1 How to connect mains supply and motors

3.1.1 Switch-Disconnecter



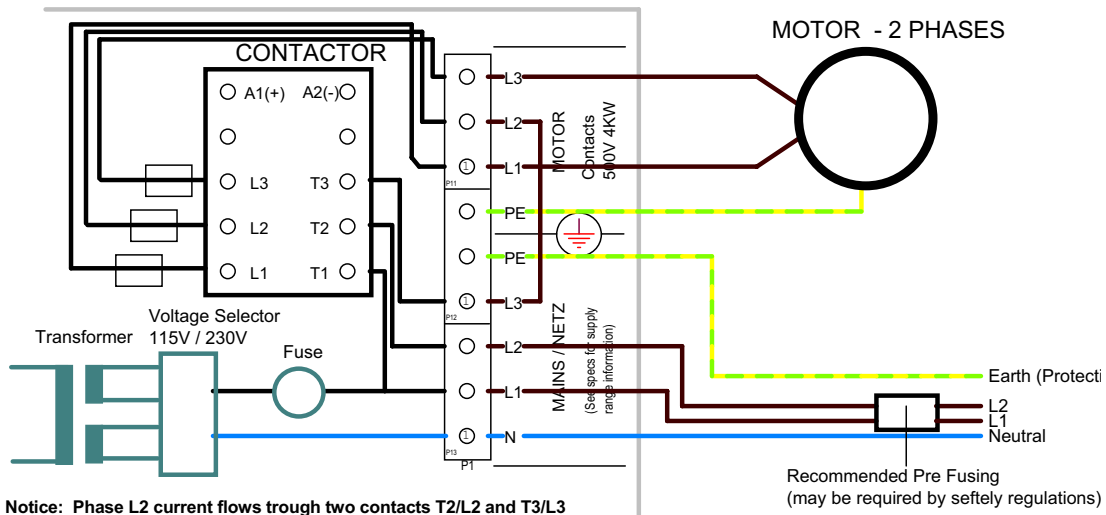
3.1.2 How to connect the DryRapid Controller

Example 1 - 3 phase with neutral




- Current must always flow through all three switches, or if less than three are required unused switches should be placed in series connection.
- Prefusing is recommended - may be required in local safety regulations.
- The on-board transformer used to supply the electronics are connected between the "N" and the "L1" terminals. Voltage between these terminals must always be present and within the specified limits. In some cases an external transformer may be required.

Example 2 - 2 phase with neutral




3.2 Mains Supply Setting


The mains selector must be set according to mains supply voltage:

	<p>For AC supplies between 90V and 130V 50/60Hz set voltage selector into position "115"</p> <p>For AC supplies between 170V and 270V 50/60Hz set voltage selector into position "230"</p>
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In position "115" supplies below **90V** AC may cause activation of power-fail circuit. This includes drop-out in the mains supply. Also exceeding **130V** may cause activation of overvoltage protection - which may cause the mains fuse F1 to blow.

In position "230" supplies below **170V** AC may cause activation of power-fail circuit. This includes drop-outs in the mains supply. Also exceeding **275V** may cause activation of overvoltage protection - which may cause the mains fuse F1 to blow.

	<p>Warning: Wrong setting may cause harm to the board - be sure always to set the switch correct. Do only operate the switch while power is OFF.</p>
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	<p>Notice: AC mains for supplying the board is connected via the "N" and "L1" terminals !</p>
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3.3 Prefusing

For safety reasons the mains supply for the DryRapid Controller should include a fuse in each used phase.

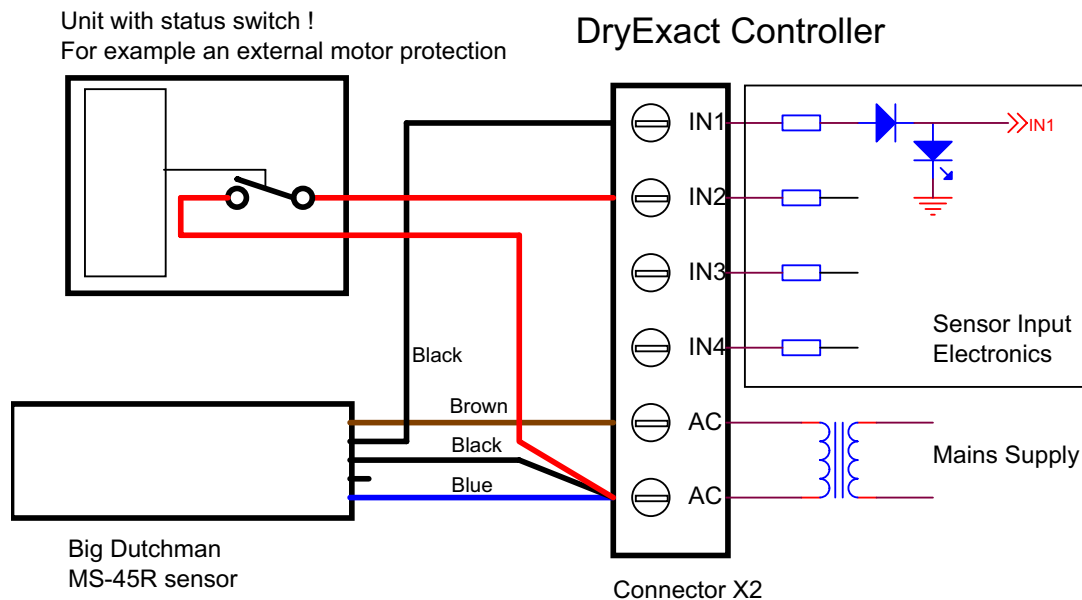
Fuse rating and type must be selected according to local regulations.

Cable used for internal wiring between the contactor and the PCB must be proper type according to local safety regulations. Also cable dimensions must be selected according to local regulation. Maximum outer dimensions will be limited by the size of the hole in the current sense transformers. For US/Canadian use of UL-approved cable is required.

Also in some countries the motor protection provided by the DryRapid Controller may not be sufficient (or allowed to use). In such cases an external motor protection unit must be used.

The status output of the external motor protection can be connected to the DryRapid controller via the "Ext. Overload" input.

3.4 How to connect Big Dutchman MS-45R sensors and passive status switches



3.5 Important note regarding Board Replacement


Since setup/calibration data is stored in the top board, it may be required to make new setup/calibration when replacing the boards. Extent of this issue has to be examined before final directions can be setup.

4 Connector Description

4.1 Relay - X1

Pin#	Name	Function
1	NC1	Relay #1 normally connected contact.
2	NO1	Relay #1 normally open contact.
3	NC1	Relay #1 common contact.
4	NC2	Relay #2 normally connected contact.
5	NO2	Relay #2 normally open contact.
6	NC2	Relay #2 common contact.
7	NO3	Relay #3 normally open contact
8	NO4	Relay #4 normally open contact
9	NO5	Relay #5 normally open contact
10	NO6	Relay #6 normally open contact
11	NO7	Relay #7 normally open contact
12	COM3-7	Relay #3 - #7 common contact.


(For information about relay functions please refer to application program documentation)

	<p>Do not remove the X1 connector while power is on. The Power should always be switched off before removing or inserting the X1 connector.</p> <p>Never mix low voltage (SELF) and mains voltage on the relay contacts - either use all relays for low voltage circuits or use all relays for mains voltage circuits.</p> <ul style="list-style-type: none"> • Low-voltage circuits are circuits which are isolated from the mains, and which are safe to touch. • Mains voltage circuits are circuits which are not isolated or whose isolation distances are insufficient when compared to the requirements. They are NOT safe to touch.
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4.2 Sensor - X2


Pin#	Name	Function	
1	IN1	Sensor input #1	Standard use: Full sensor
2	IN2	Sensor input #2	Standard use: Drive Unit
3	IN3	Sensor input #3	Standard use: External overload signal
4	IN4	Sensor input #4	Standard use: Full Sensor

(For information about sensor functions please refer to application program documentation)

	<p>The sensor inputs are not galvanically isolated. Inputs are designed for connection of Big Dutchman MS-45R low voltage sensors (10-30VAC/DC)</p> <p>Input signal should be applied between the input and one of the AC terminals.</p> <p>The two AC terminals should be used to supply the sensors only - no other loads should be connected.</p>
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4.3 Serial Port - X3

Pin#	Name	Function
1	GND	Ground/Shield
2	TxD/A1	RS232 Transmit Data / RS485 A1
3	RxD/B1	RS232 Receive Data / RS485 B1
4	NC/A2	Not used* / RS485 A2
5	NC/B2	Not used* / RS485 B2



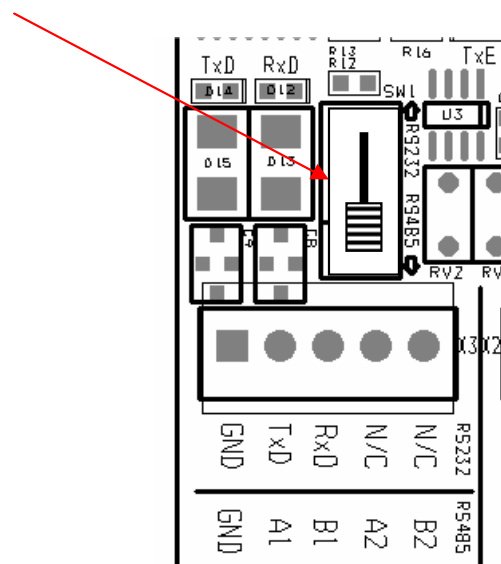
The serial port is not galvanically isolated. Interface may either be RS232 or RS485. Type is selected using SW1. Be sure to set the switch correct according to used interface standard.

When selecting RS232 interface pins 4 and 5 should always be left open (they are not floating)

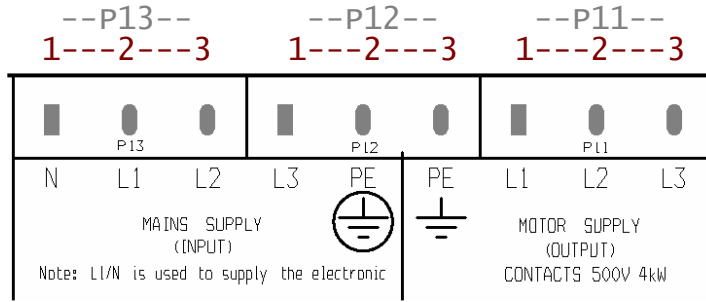
All signal pins are protected with overvoltage transient diodes.

It is recommended that a shielded cable is used. Connect cable shield to pin 1 - keep pig-tail, i.e. the connection to pin 1 as short as possible - preferable zero length. Alternatively clamp shield to mounting plate using a metal cable clamp.

Interface configuration switch: Select "RS232" or "RS485"



4.4 Mains connections P11-P12-P13





Pin#	Name	Function (connection for standard use)*
P11-1	L1	Switched output to motor - phase L1
P11-2	L2	Switched output to motor - phase L1.
P11-3	L3	Switched output to motor - phase L1
P12-1	L3	Mains supply - phase L3 (if three phases are required only)
P12-2	PE	Protective Earth - PE wire in power cable !
P12-3	PE	Protective Earth - PE wire in power cable !
P13-1	N	Mains supply - Neutral wire (always required*)
P13-2	L1	Mains supply - phase L1 (always required*)
P13-3	L2	Mains supply - phase L3 (if two or three phases are required only)

The electronics are supplied via neutral (P13 pin 1) and phase L1 (P13 pin 2). These two connections are always required. Voltage between these two pins must be within the limits specified (90-130VAC for position "115" and 170-270VAC for position "230").

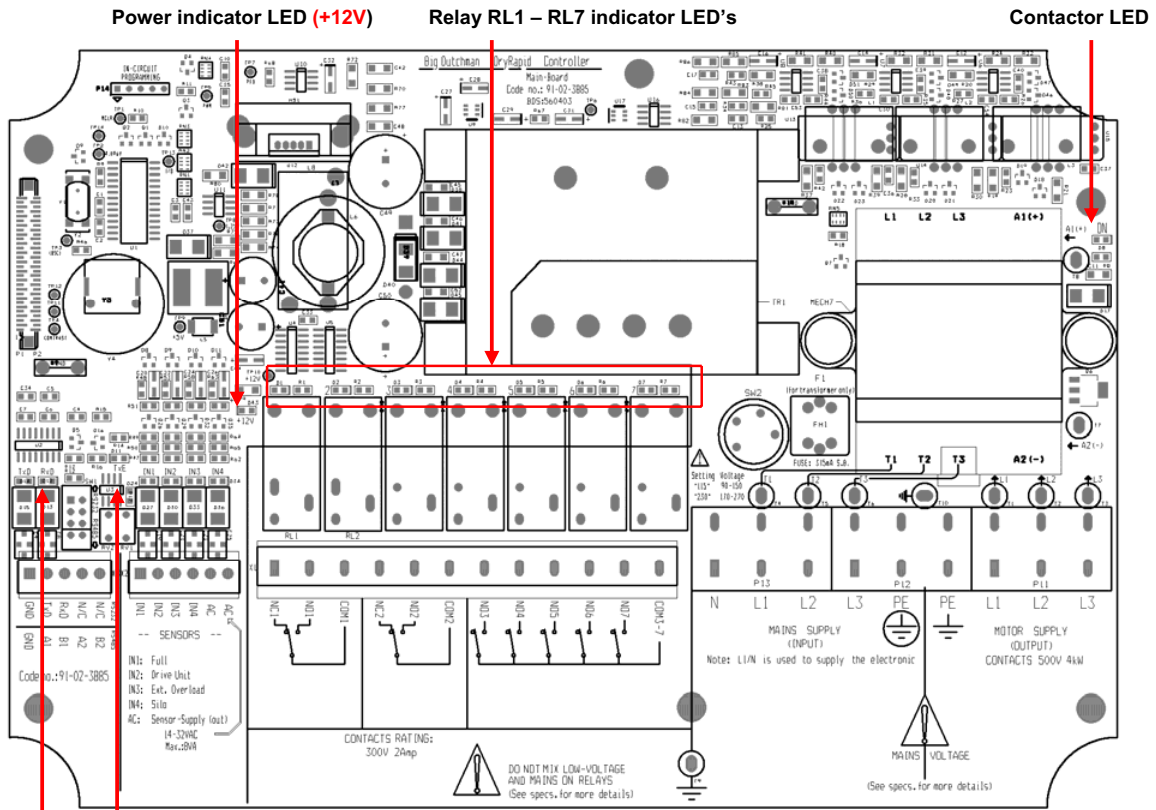
Be sure to set the mains voltage selection switch according to used mains voltage.

- For mains voltages between 90-130VAC select position "115"
- For mains voltages between 170-270VAC select position "230"

	<p>Always connect protective earth wire !</p> <ul style="list-style-type: none">• Connect earth wire (yellow/green wire) in mains power cable to PE terminal (P12 pin 2)• Connect earth wire (yellow/green wire) in motor cable to PE terminal (P12 pin 3) <p>PE terminals are also labeled with the earth symbol </p> <p>Always check that the earth wire (yellow/green wire) in the mains cable has a proper earth connection.</p>
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5 LED indicators

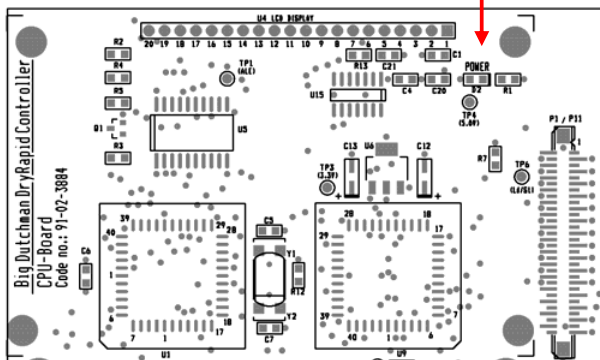
The System has a number of LED's.



LED indicating activity on RS485 interface (ignore unless RS485 communication is used)
(TxE = RS485 transmitter enabled when on)

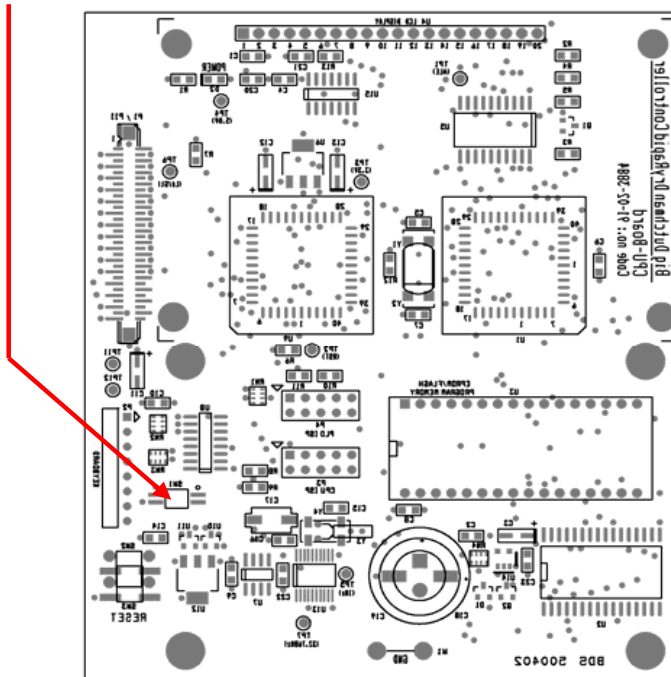
LED indicating activity on RS232 interface (ignore unless RS232 communication is used)
(TxD = RS232 transmission when blinks ; RxD = RS232 reception when blinks)

Power indicator LED (+5V)



6 DIP-Switch Setting

The CPU board has one dip-switch referenced "SW1".



SW1 is a two pole dip-switch. The use of the switch will differ depending on the used software. It is used for system setup and battery disable.

SW1-1	"1"	Software readable switch #1 The function of this switch is defined by the used software*)
SW1-2	"2"	Software readable switch #2 The function of this switch is defined by the used software*)

*) Keep dip-switches in OFF position for normal operation. Refer to software documentation for further details regarding function of the dip-switches.

7 Technical specifications

Operating temperature range	0°C...+50°C
Storage temperature range	-25°C...+70°C
Relative humidity (without dewing)	15%...95%
Dimensions enclosure (l x h x d)	255 x 180 x 103 mm

7.1 Power Supply Input

AC input voltage	Selector in position "115"	90 - 130 V AC. 50-60Hz ^{*)}
	Selector in position "230"	170 - 270 V AC. 50-60Hz ^{*)}

^{*)}Exceeding maximum may cause activation of transient protection, which again may cause the mains fuse (F1) to blow. Important: The upper limits do not take limits for MS-45R sensors into consideration.

Electronics power consumption (L1 / N)	5 - 30 VA ^{*)}
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^{*)} Actual power consumption will depend on mains voltage and board status (number of active relays etc.)

7.2 Relay Outputs

Seven relays in different configurations. Potential free. ¹⁾	
Switch rating Voltage/Current (ohmic and inductive loads)	275V AC / 2 A ²⁾

1) Mixing of low-voltage (SELV) and mains referred potentials on the relays is NOT allowed !!!

2) Refer to relay specification for more details about relay contact capabilities.

7.3 Contactor Outputs

Three pole contact for phases L1, L2 and L3.	
Switch rating: Voltage/Power (ohmic and inductive loads)	500V AC/4KW ¹⁺²⁾
Current per phase	16A max

1) Refer to relay specification for more details.

2) Blow fuses should be inserted in the cable supplying the DryRapid Controller. Use one fuse in each phase.

7.4 Current supervision (Phase L1, L2 and L3)

Current measuring range	0-14 _{RMS}
Current measuring accuracy (LEM sensor or calibrated Coilcraft sensor)	+/- 5% of full scale reading

7.5 Serial Interface

7.5.1 Serial Port - RS232 configuration (SW1 in position RS232)

Non insulated high Speed RS232 interface	
With Txd and RxD signal (no handshake signals)	
Max Differential input voltage (Input to GND)	+/- 15 V DC
Max Baud Rate	19200 Baud
Max Baud Rate (limited cable length)	115200 Baud
Input voltage range	+/-5 --- +/-12 Volt
Input Capacitive Loading (EMI filter)	2200 pF

7.5.2 Serial Port - RS485 configuration (SW1 in position RS485)

Non insulated high Speed RS485 interface	
Two wire interface - MC99 system network slave.	
Outputs are short circuit protected.	

Absolute Maximum Ratings	
Max Differential input voltage (A1,A2,B1,B2 to GND)	+/- 15 V DC *)

*) 15V is clamping level. Normally 0V --- +5V range should not be exceeded.

Operating Conditions	
Max Baud Rate	115200 Baud
Input voltage range (A to B)	0 --- +/-5 Volt
Input Capacitive Loading (EMI filter)	2200 pF

7.6 Sensor Inputs

The DryRapid Controller is designed for connection of up to four MS-45R (Big Dutchman) or compatible sensors. AC supply output for the sensors are provide (AC terminals).

The inputs are NOT galvanic isolated neither to the electronics nor between each other.

Absolute Maximum Ratings	
Max Potential to groundplane (GND)	+/- 68 V DC


Operating Conditions	
Input resistance	≈ 15KΩ
Max Baud Rate (limited cable length)	115200 Baud
Input voltage range	+/-5 --- +/-12 Volt
Input Capacitive Loading (EMI filter)	2200 pF

7.7 Miscellaneous specifications

Power backup interval	Minimum two days
Real Time Clock accuracy (@25°C)	Max deviation +/- min(month)

7.8 EMC compliance and safety

EMC standards	EN50081-1/-2 (emission) EN50082-1 (immunity) EN61000-6-2 (immunity) CISPR 22 Class B (emission) EN 61010-1:2001 (safety CE) ICE 61010-1:2000 (safety UL)
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	This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
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