Innovation In and
Out of Parlour

Variable Speed Milk Pump Control Manual

For MPC PCB (LLC208) Version 'K' onwards

Version 1.01

Date - March 2016

Part Number - 39-0036

Manual Versions

Version 1.00 - December 2015	First Version of Manual (Software v2.10)
Version 1.01 - March 2016	Second Version of Manual (Software v2.20)

About the Variable Speed Milk Pump Control

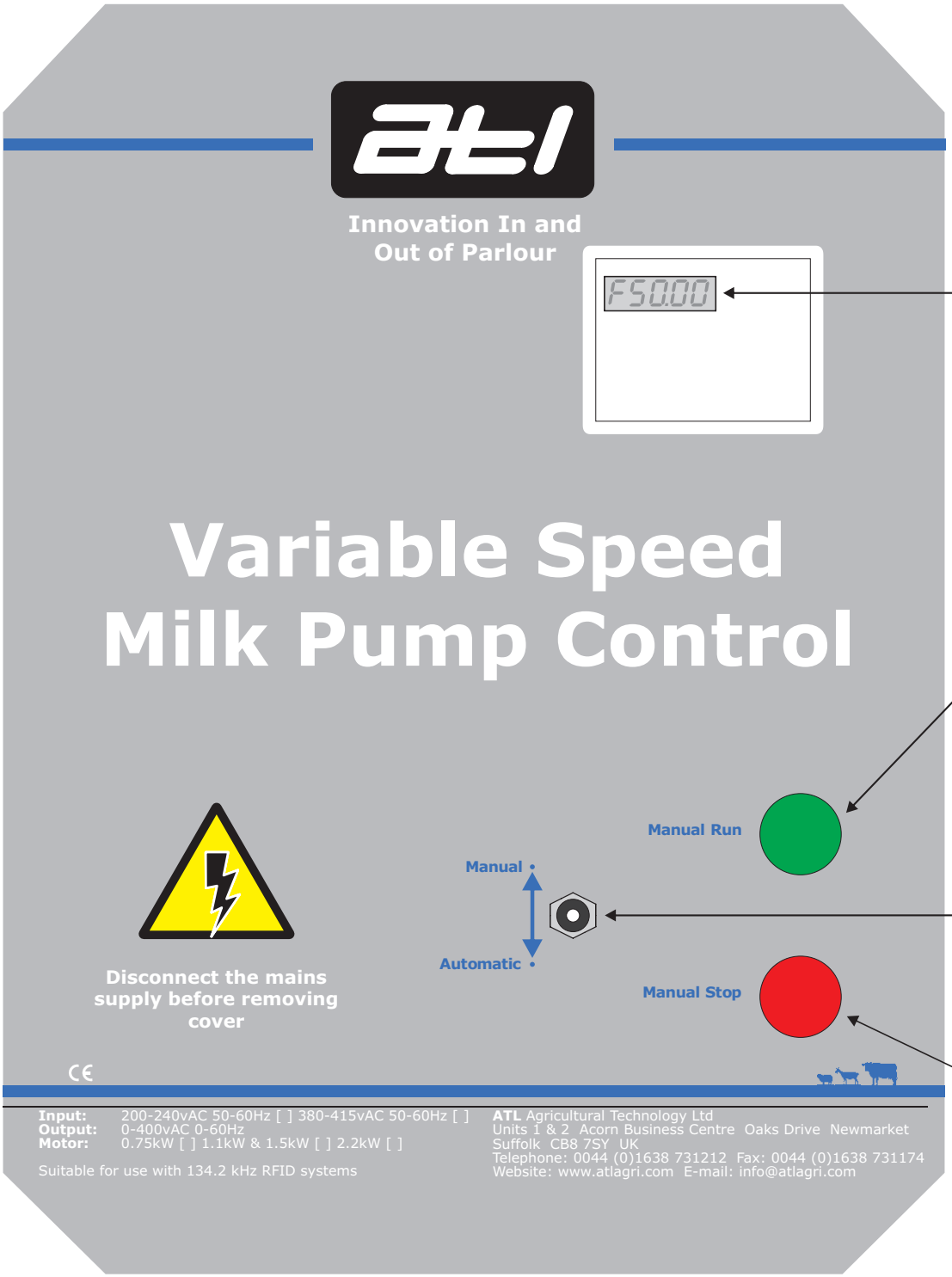
The ATL Variable Speed Milk Pump Control comprises receiving vessel milk level detection using a multi-step float switch, a 6 button control unit and the inverter unit. The 6 button control unit includes a plate cooler water valve delay to ensure that cold water flow is maintained through the cooler after the milk pump has stopped running and a plate cooler bypass valve delay to wash the plate cooler but then bypass it to maintain the wash fluid temperature. Plate cooler valves have separate potentiometer controls to fine tune the timings. The multi-step float switch is supplied with the control.

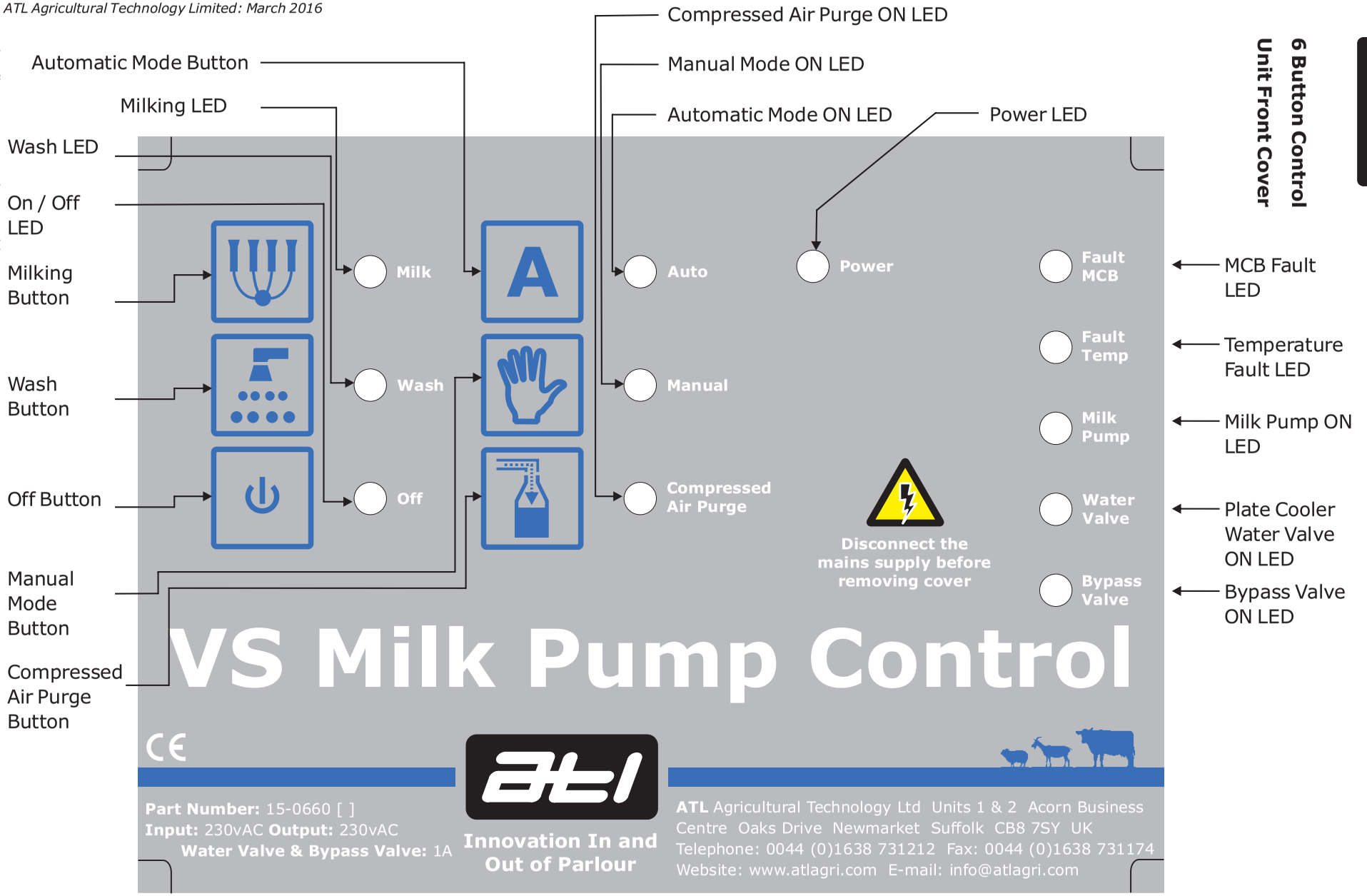
The Variable Speed Milk Pump Control operates the milk pump to ensure that milk is pumped through the plate cooler at a slow, constant speed. This ensures the plate cooler can extract as much heat out of the milk as possible before it reaches the bulk tank. Therefore, reducing the energy consumption and costs of cooling the milk in the bulk tank. Additionally, the system preserves the milk quality by eliminating the start and stop process with a slow, gentle and continual transportation of the milk.

Specifications

Control Input Voltage:	*200-240volts AC, 50-60Hz 1 Phase*
Milk Pump:	*Invertor driven with all protection features of standard inverter*
Milk Pump Options:	*0.75kW 1 phase in - 3 phase out*
	0.75kW 3 phase in - 3 phase out
	1.1kW & 1.5kW 1 phase in - 3 phase out
	1.1kW & 1.5kW 3 phase in - 3 phase out
	2.2kW 1 phase in - 3 phase out
	2.2kW 3 phase in - 3 phase out
Sensor Options:	*ATL Multi-Step Float - only float that will operate variable speed system*
Water Valve:	*230volts AC 1 Phase: 0.25A, 50 watts maximum*
Water Valve Protection:	*1A Fuse on incoming mains supply to control*
Bypass Valve:	*230volts AC 1 Phase: 0.25A, 50 watts maximum*
Bypass Valve Protection:	*1A Fuse on incoming mains supply to control*
Invertor Unit Display:	*Motor Running Frequency: Hertz (Hz)*
	Error Codes
6 Button Control LED's:	*Power*
	Mode: Off, Milk & Wash
	Milk Pump: Automatic & Manual
	Milk Pump On
	Water Valve On
	Bypass Valve On
	Compressed Air Purge On
	Inverter Drive Voltage Fault (MCB) Fault
	Inverter Drive Temperature Fault

Inverter Unit





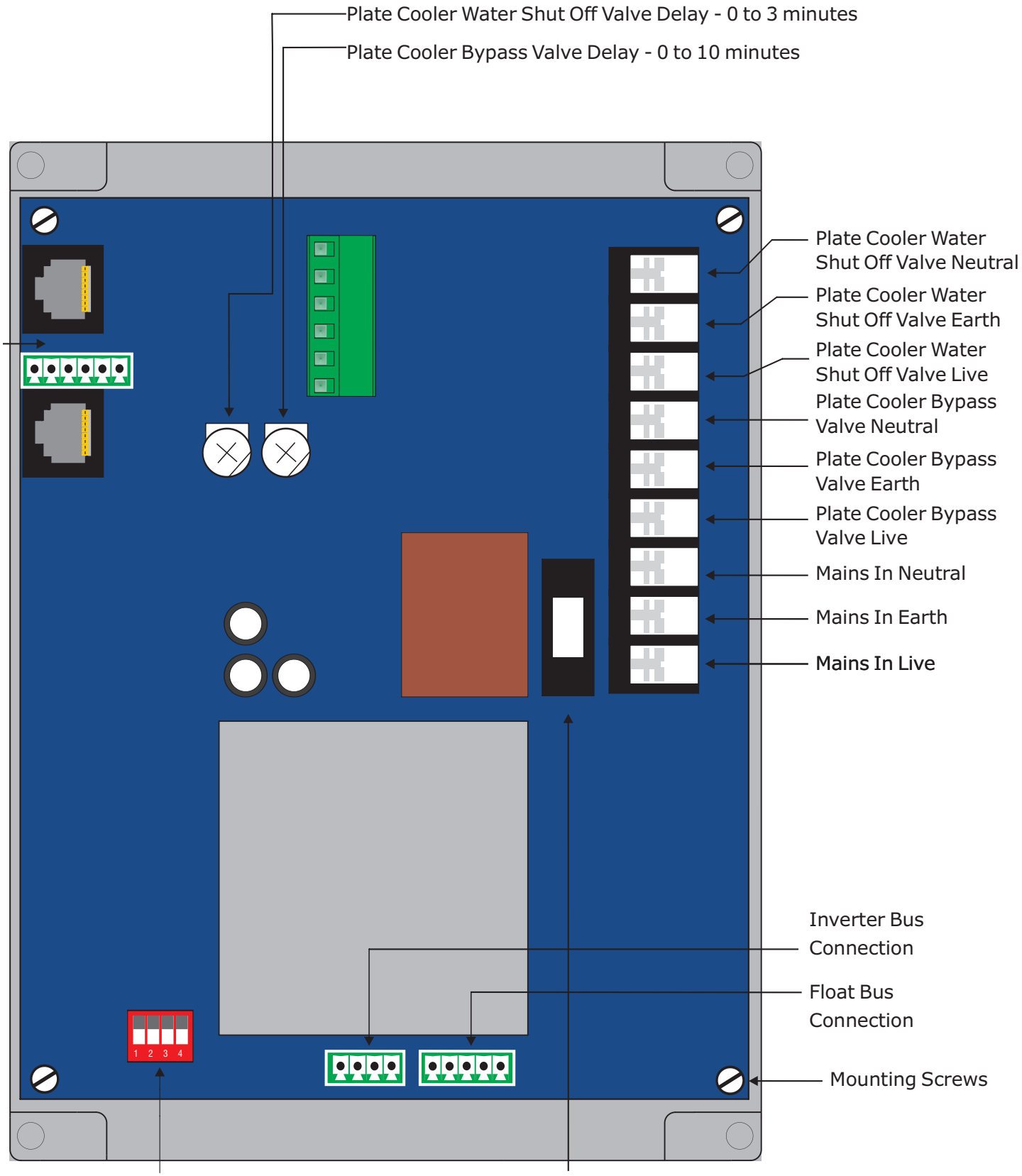
Installing the 6 Button VS Milk Pump Control

Firmly screw the enclosure to a vertical wall or onto the receiving vessel mounting plate with the cable glands facing downward. Avoid side cable entry and never use top entry. The 6 Button VS Milk Pump Control requires a 230volt AC 50/60Hz mains electricity supply derived from an accessible, switched, fused outlet fitted with an appropriately rated anti-surge fuse. Do not use a 13amp plug and socket. The Control is internally fused with a 20mm 1amp anti-surge fuse.

Good Installation Practice

- A separate mains supply and earth running directly from the consumer meter is essential.
- Avoid routing the mains cable to the milk pump control close to other supplies especially those providing intermittent current-motors that are starting and stopping continually or high power heaters with thermostatic control.

Wiring Connections



Notes

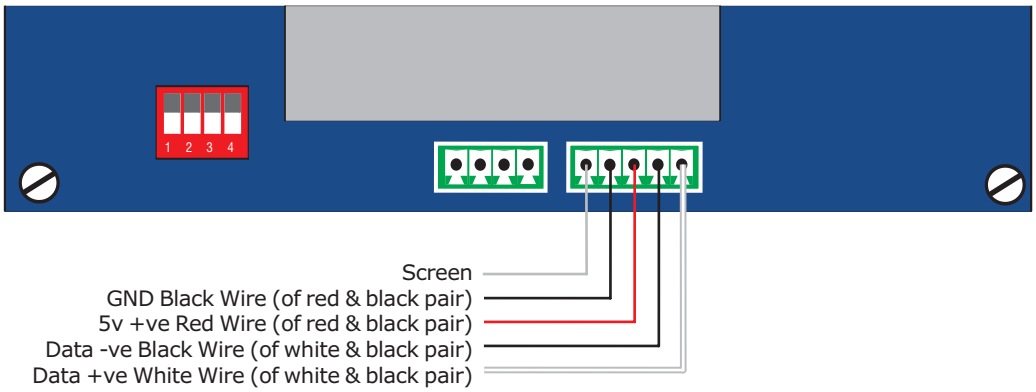
Mounting screws have plastic washers between printed circuit board (PCB) and lid mount. If not installed, the buttons will not function.

Setting up the Multi-Level Float

- Hold the float at the maximum level the milk should rise to in the receiver.
- Press the Off key to switch off the control.
- Press the Off and Auto Keys at the same time.
- The Off and Auto LED's will flash indicating the Milk Pump Control has set the maximum level.

IMPORTANT - The recommended maximum level should be just below (25-50mm) the milk line inlet to the receiver.

Float Wiring Connections into 6 Button VS Milk Pump Control



Setting up the Plate Cooler Water Valve Delay (optional)

- After the milk pump run time has been set, run the process again but this time check that the plate cooler water valve stays open after the milk pump has stopped. If the delay is too short, the milk remaining in the lines will not be cooled properly. If the delay is too long, the valve will stay open too long and waste water.
- If the delay is incorrect, turn off the mains supply, remove the cover and change the delay accordingly. Turning the potentiometer clockwise will increase the delay and turning anti-clockwise will reduce the delay.
- The plate cooler water valve delay adjustment range is 0 to 3 minutes.

Setting up the Plate Cooler Bypass Valve Delay (optional)

- After the plate cooler water valve delay has been set, run the process again but this time check that the plate cooler bypass valve opens after the milk pump has stopped during the washing process. This is designed to wash out the plate cooler and then, when the bypass valve opens, diverts the wash fluid around the plate cooler so the wash water is not cooled by the plate cooler. If the delay is too short, the plate cooler will not be washed out properly.
- If the delay is incorrect, turn off the mains supply, remove the cover and change the delay accordingly. Turning the potentiometer clockwise will increase the delay and turning anti-clockwise will reduce the delay.
- The plate cooler bypass valve delay adjustment range is 0 to 10 minutes. For correct operation, the bypass valve delay time should always be set to be longer than the milk pump run time.

Setting up the Manual Button

- Pressing the 'Manual' button turns the Milk Pump on and can be set to operate in two different formats. Either press and hold to turn the Milk Pump on or press once to turn the Milk Pump On and press again to turn the Milk Pump Off.
- To select Manual Mode 'Press and Hold', set switch 2 on the Set-up Switch to Off, to select Manual Mode 'On/Off, 'set switch 2 on the Set-up Switch to On.
- The Manual mode can be turned off by returning to automatic mode by pressing the 'Automatic' button or by pressing the 'Manual' button.

Wiring up the Yaskawa V1000 Inverter Drive

DANGER:

Electrical Shock Hazard: DO NOT CONNECT OR DISCONNECT WIRING WHILE THE POWER IS ON Failure to comply will result in death or serious injury.

WARNING:

Electrical Shock Hazard: Do not operate equipment with covers removed. Failure to comply could result in death or serious injury. The diagrams in this manual may show drives without covers or safety shields to show details. Be sure to reinstall covers or shields before operating the drives and run the drives according to the instructions described in this manual.

Always ground the motor-side grounding terminal: Improper equipment grounding could result in death or serious injury by contacting the motor case.

Do not perform work on the drive while wearing loose clothing, jewelry or without eye protection: Failure to comply could result in death or serious injury. Remove all metal objects such as watches and rings, secure loose clothing, and wear eye protection before beginning work on the drive.

Do not remove covers or touch circuit boards while the power is on: Failure to comply could result in death or serious injury.

Do not allow unqualified personnel to perform work on the drive: Failure to comply could result in death or serious injury. Installation, maintenance, inspection, and servicing must be performed only by authorized personnel familiar with installation, adjustment, and maintenance of AC drives.

Do not touch any terminals before the capacitors have fully discharged: Failure to comply could result in death or serious injury. Before wiring terminals, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. The charge indicator LED will extinguish when the DC bus voltage is below 50 Vdc. To prevent electric shock, wait at least five minutes after all indicators are off and measure the DC bus voltage level to confirm safe level.

FIRE HAZARD:

Tighten all terminal screws to the specified tightening torque: Loose electrical connections could result in death or serious injury by fire due to overheating of electrical connections.

Do not use improper combustible materials: Failure to comply could result in death or serious injury by fire. Attach the drive to metal or other noncombustible material.

Do not use an improper voltage source: Failure to comply could result in death or serious injury by fire. Verify that the rated voltage of the drive matches the voltage of the incoming power supply before applying power.

Always use a thermal overload relay or an over-temperature contact when using a braking resistor: Failure to comply could result in death or serious injury by fire.Power to the drive should be interrupted when the relay is triggered.

Wiring up the Yaskawa V1000 Inverter Drive

NOTICE:

Observe proper electrostatic discharge procedures (ESD) when handling the drive and circuit boards: Failure to comply may result in ESD damage to the drive circuitry.

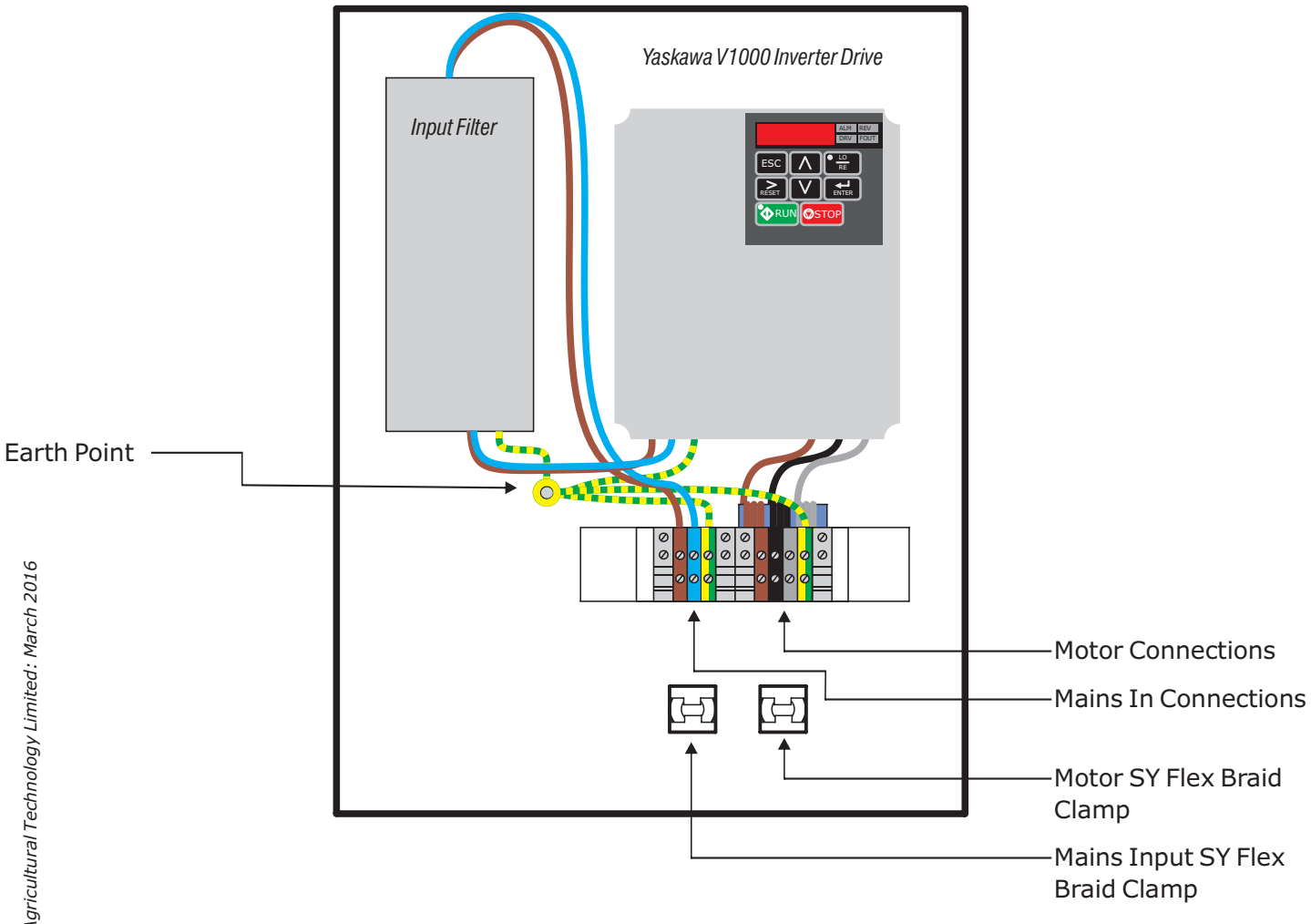
Never connect or disconnect the motor from the drive while the drive is outputting voltage: Improper equipment sequencing could result in damage to the drive.

Do not use unshielded cable for control wiring: Failure to comply may cause electrical interference resulting in poor system performance. Use shielded, twisted-pair wires and ground the shield to the ground terminal of the drive.

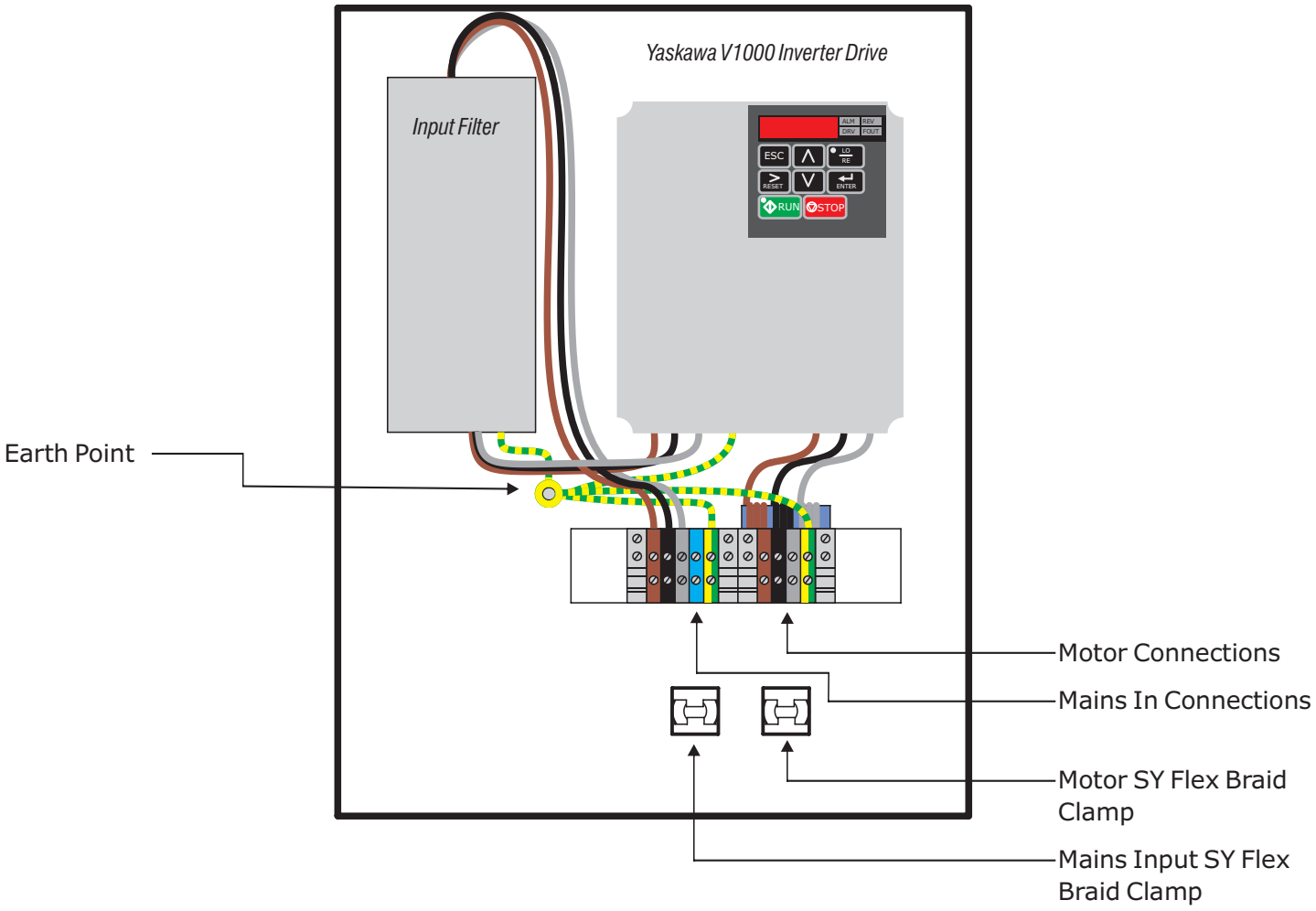
Check all the wiring to ensure that all connections are correct after installing the drive and connecting any other devices: Failure to comply could result in damage to the drive.

Do not modify the drive circuitry: Failure to comply could result in damage to the drive and will void warranty. ATL is not responsible for any modification of the product made by the user. This product must not be modified.

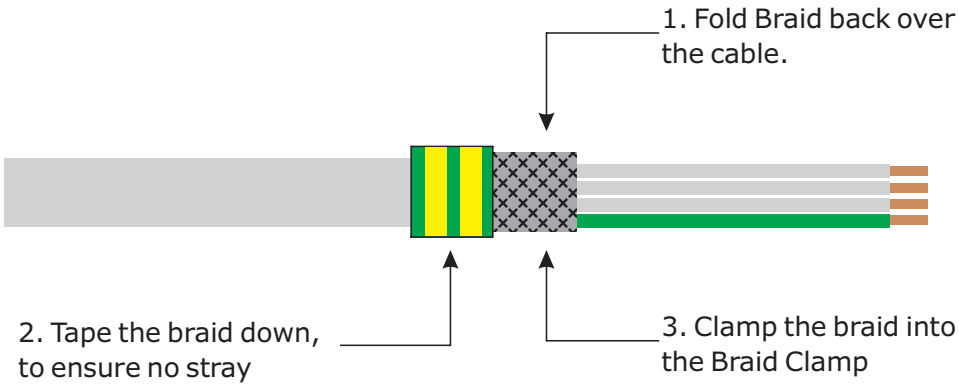
Inverter Drive Single Phase Box Wiring



Inverter Drive 3 Phase Box Wiring



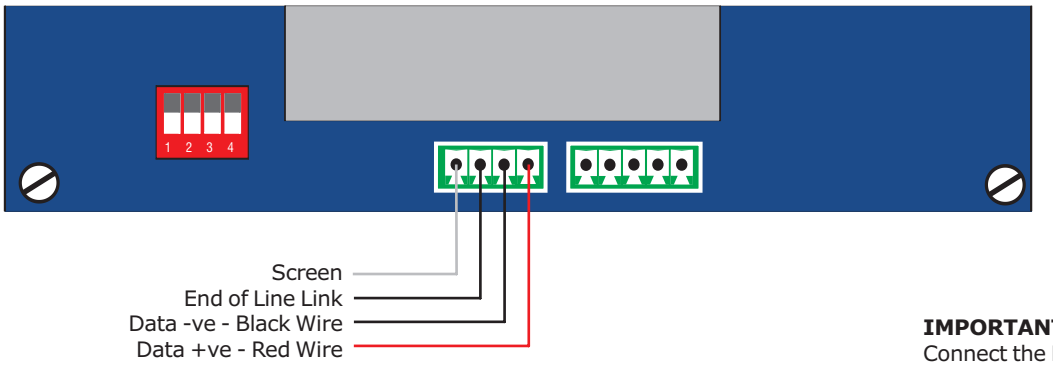
Properly terminating the SY Flex Input and Output Cables



Wiring the Modbus Twisted pair between the Milk Pump Control and Yaskawa V1000 Inverter

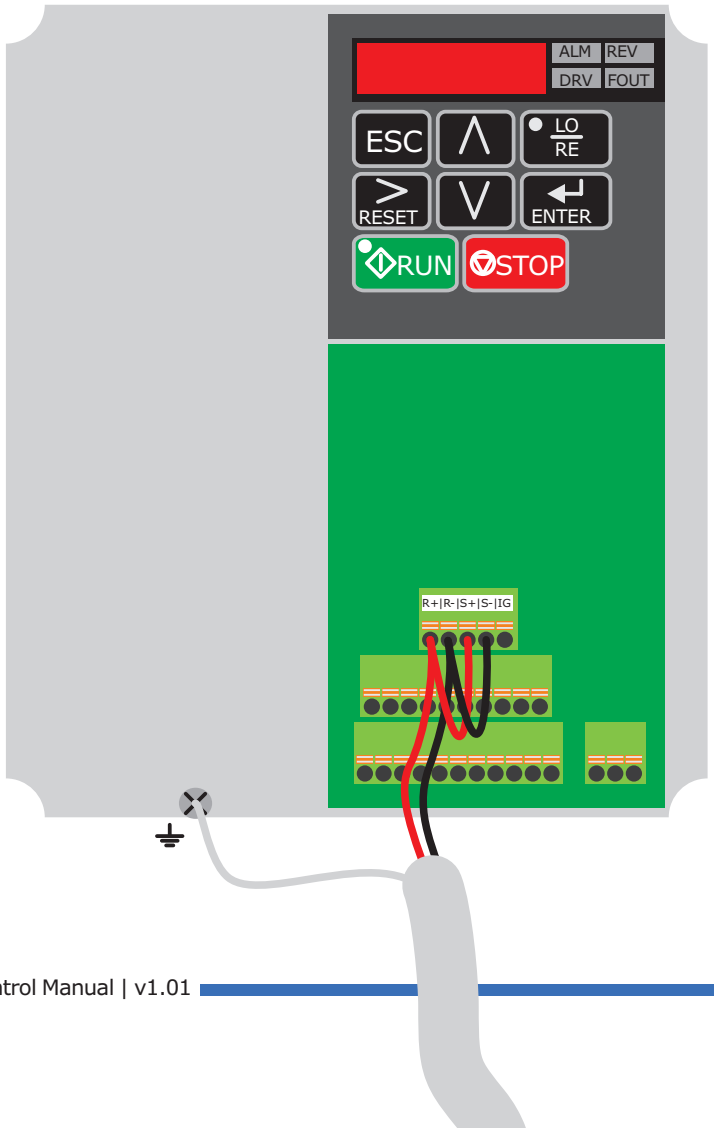
- See Appendix C in the Yaskawa V1000 Technical Manual for more information on the Modbus Communications for the Yaskawa V1000 Inverter.
- Use the provided twisted pair data cable to wire between the Yaskawa V1000 Invertor and the 6 Button VS Milk Pump Control.
- DO NOT ROUTE the Modbus twisted pair data cable alongside mains cables and cross at 90 degrees.
- The green wiring connections below on the Yaskawa V1000 Invertor are beneath the front cover.

6 Button VS Milk Pump Control PCB



IMPORTANT - Do Not Connect the End of Line Link Unless Instructed to by ATL

Yaskawa V1000 Inverter Modbus Wiring Connection



Twisted Pair Wire connects to VS Milk Pump Control

Wire Red to R+ and S+, Black to R- and R-, Connect Screen to Ground Connection

Setting up the Yaskawa V1000 Inverter Drive

- IMPORTANT: Auto Tuning of the motor will need to be carried when the motor is disconnected from the load (i.e. with the milk pump head removed), as it will run the motor for a period and it needs to be connected correct length of SY cable on the final installed system.
- SEE SECTION 4.7 of the Yaskawa Technical Manual for Auto Tuning of the Yaskawa Inverter Drive Manual for a detailed method for auto tuning the motor.
- Brief Summary of auto tuning the drive:

  Press the down arrow on the Yaskawa V1000 drive control panel until it displays `rune'.

  Press Enter, then change the `r1-01' to read 03.

  Enter the motor nameplate data for setting `r1-02' to `r1-07'.

  Ensure the motor can run unloaded.

  The display will say `run13', Press the green run key to auto tune.

  The motor will run and the drive will tune its capabilities.

- After tuning is complete; Enter the motor operating speeds;

  Change Parameter d1-01 for the override running frequency, this frequency is used when inverter drive box is put into manual and the green start button is pressed.

  Change Parameter d1-02 for the milking maximum output frequency.

  Change Parameter d1-03 for the milking minimum output frequency.

  Change Parameter d1-04 for the washing maximum output frequency.

  Change Parameter d1-05 for the washing minimum output frequency, if during washing the frequency should not be variable, set d1-04 and d1-05 to the same value.

  Change Parameter d1-06 for the manual button on the VS Milk Pump Control output frequency.

  The minimum, and maximum output frequencies are read by the milk pump control and used to determine the pump running speed.

Factory Settings for the Yaskawa V1000 Inverter Drive

Parameters are accessed by pressing the down key until the display reads `par' then pressing the enter key.

Frequency Reference and Run Command

See section 5.2 in the Yaskawa V1000 Technical Manual

Parameter b1-01 (Frequency reference selection 1): Set to 2 (MEMOBUS/Modbus)

Parameter b1-02 (Run command selection 1): Set to 2 (MEMOBUS/Modbus)

Parameter b1-15 (Frequency reference selection 2): Set to 0 (Operator Keypad)

Parameter b1-16 (Run command selection 2): Set to 1 (Terminals)

Input Terminal Functions

See section 5.7 in the Yaskawa V1000 Technical Manual

Parameter H1-01 (Digital Input S1 Function): Set to 40 (Forward Run Command)

Parameter H1-02 (Digital Input S2 Function): Set to 41 (Stop Command)

Parameter H1-03 (Digital Input S3 Function): Set to 00 (Three Wire Sequence)

Parameter H1-04 (Digital Input S4 Function): Set to 02 (External Reference 1 / 2 Selection)

Parameter H1-05 (Digital Input S5 Function): Set to 0F (Unused)

Parameter H1-06 (Digital Input S6 Function): Set to 0F (Unused)

MEMOBUS/Modbus Communications Settings

See Appendix C in the Yaskawa V1000 Technical Manual

Parameter H5-01 (Drive Slave Address): Set to 01 for 1st drive, 02 for 2nd drive and 03 for 3rd drive

Parameter H5-02 (Communications Bus Speed): 03 (9600 baud)

Parameter H5-03 (Communications Bus Parity): 00 (No Parity)

Parameter H5-04 (Stopping Method After Communications Error): 01 (Coast to Stop)

Parameter H5-05 (Communications Fault Detection): 01 (Enabled)

Parameter H5-06 (Drive Transmit Wait Time): 05 (5ms Wait Time)

Parameter H5-07 (RTS Selection): 01 (Enabled)

Parameter H5-09 (CE Detection Time): 5.0 (5 Second Maximum Time)

Parameter H5-10 (Unit Selection for Register 0025H): 0 (0.1 Volt Units)

Parameter H5-11 (Communications Enter Function): 01 (Command not necessary)

Parameter H5-12 (Run / Stop Method Selection): 00 (Forward / Stop, Reverse / Stop)

Motor Frequency Reference Settings

See Appendix B, part B.2 in the Yaskawa V1000 Technical Manual

Parameter d1-01 (Frequency Reference 1): 5000 (50.00 Hz - Override Manual Frequency)

Parameter d1-02 (Frequency Reference 2): 5000 (50.00 Hz - Milking Maximum Frequency)

Parameter d1-03 (Frequency Reference 3): 3500 (35.00 Hz - Milking Minimum Frequency)

Parameter d1-04 (Frequency Reference 4): 5000 (50.00 Hz - Washing Maximum Frequency)

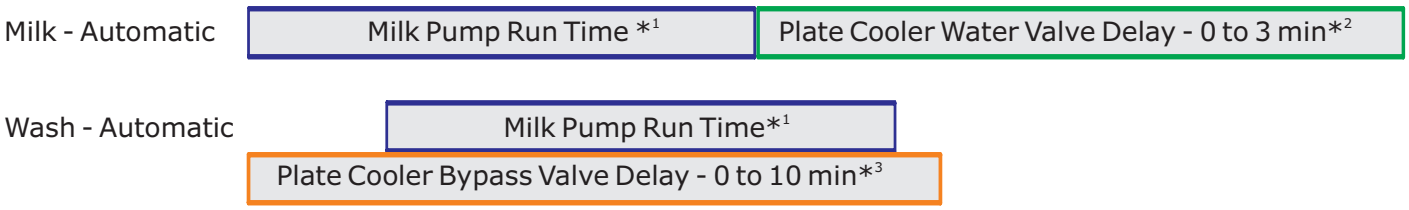
Parameter d1-05 (Frequency Reference 5): 5000 (50.00 Hz - Washing Minimum Frequency)

Parameter d1-06 (Frequency Reference 6): 5000 (50.00 Hz - Milk Pump Control Manual Frequency)

Operating the Milk Pump Control

- For milking, press the 'Milk' button before milking starts. This will turn on the automatic detection of the milk level in the receiving vessel. Press the 'Manual' button to select manual mode.
- For washing, press the 'Wash' button before washing starts. This will turn on the automatic detection of the wash fluid level in the receiving vessel. Press the 'Manual' button to select manual mode.
- The operation of the milk pump (i.e. when the milk pump is on), plate cooler water valve and plate cooler bypass valve are indicated by the LED's on the control front cover.
- The milk pump is connected to the inverter by a data link over RS485. This is allows the inverter drive to report faults to the milk pump control. If a voltage or current error occurs, the milk pump control will begin flashing the 'Fault MCB' LED. If a temperature fault occurs the milk pump control will flash the 'Fault Temp' LED in both cases the user will need to check the error code on the inverter drive for more information and the drive manual for resolution steps.

Timings Chart (3 Wire Probe or Float)



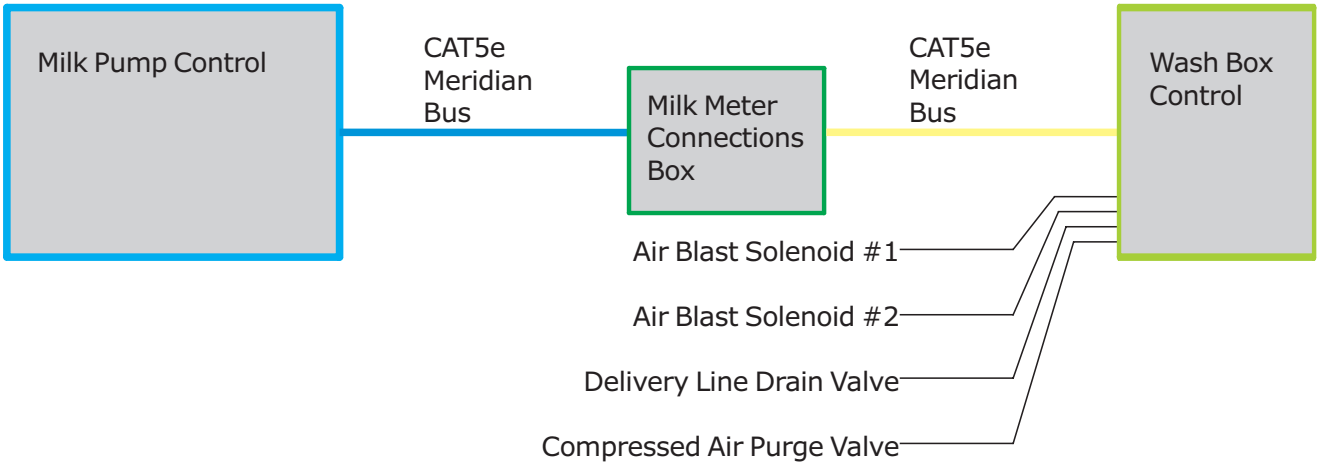
*1 Milk pump run time starts when milk touches the first level on the multi-level float and stops when the milk level falls passed the bottom level on the float;

*2 Water valve delay time starts when milk pump run time finishes;

*3 Bypass valve delay time starts from when wash key is pressed by user.

Connecting the Milk Pump Control to a Stand Alone Wash Box

- Meridian bus connection requires product model 15-0660.
- Connect the CAT5e cable into the Meridian Bus connection socket.
- Check the communications on the Milk Meter Wash Box (Requires Wash Box firmware version 2.13, See below).
- The ATL Milk Meter system and Milk Pump Control will now enter wash, milking or idle modes from either the Wash Box Control or the Milk Pump Control.
- Changing Milk Pump Control mode to Wash will set the Wash Box into Wash mode, close the Delivery Line Drain Valve output (if enabled) on the Wash Box, and then start the AirBlast operation.
- Changing the Milk Pump Control mode to Milk will set the Wash Box into Milking mode, close the Delivery Line Drain Valve output (if enabled).
- Changing the Milk Pump Control mode to Off will set the Wash Box into Idle mode, open the Delivery Line Drain Valve (if enabled) after the delay.
- Pressing the Compressed Air Purge button on the Milk Pump Control will close the Delivery Line Drain Valve (if enabled) and then open the Compressed Air Valve for the time specified in the Wash Box settings.



Testing the Milk Pump Control Communications (IDS) on a Stand-Alone System

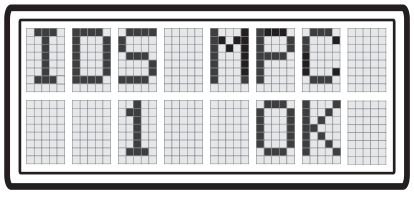
The communications between the Milk Pump Control and the Wash Box Control can be tested using this routine on the Wash Box Control. NB - This routine is only available on stand-alone systems.

Press and hold the IDLE, ✕ TICK, ✓ WASH and UP ↑ arrow keys to enter setup

Release the keys

Press the WASH key to select the Milk Pump Control

Step through all the Milk Pump Controls using the UP ↑ and DOWN ↓ arrow keys:

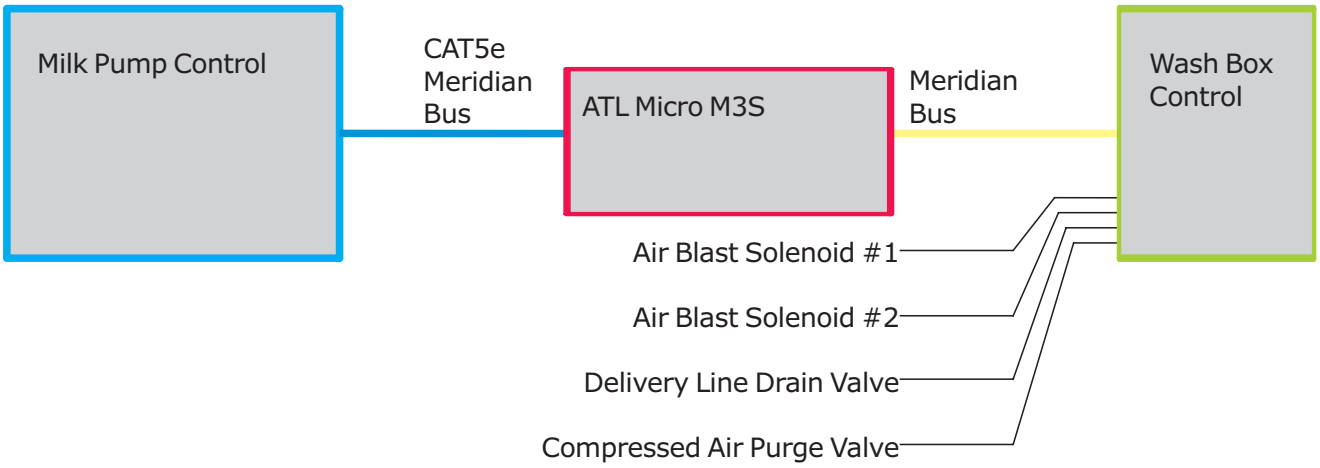


NB - The display will report OK if the communications are functioning correctly. ERR will be displayed if the communications are not functioning correctly.

Press the TICK ✓ key to exit the routine.

Connecting the Milk Pump Control to an ATL Micro M3S

- Meridian bus connection requires product model 15-0660.
- Connect the CAT5e cable into the Meridian Bus connection socket.
- Check the communications on the ATL Micro M3S control (Requires Micro software version 4.52 and Wash Box firmware 2.13, See below).
- The ATL Milk Meter system and Milk Pump Control will now enter wash, milking or idle modes from either the Wash Box Control or the Milk Pump Control.
- Changing Milk Pump Control mode to Wash will set the System into Wash mode, close the Delivery Line Drain Valve output (if enabled) on the Wash Box, and then start the AirBlast operation.
- Changing the Milk Pump Control mode to Milk will set the System into Milking mode, close the Delivery Line Drain Valve output (if enabled) on the Wash Box.
- Changing the Milk Pump Control mode to Off will set the System into Idle mode, open the Delivery Line Drain Valve (if enabled) on the Wash Box after the delay.
- Pressing the Compressed Air Purge button on the Milk Pump Control will close the Delivery Line Drain Valve (if enabled) and then open the Compressed Air Valve for the time specified in the Wash Box settings.



Enable the Milk Pump Control: Subroutine 420

This subroutine turns the link to the Milk Pump Control on or off.

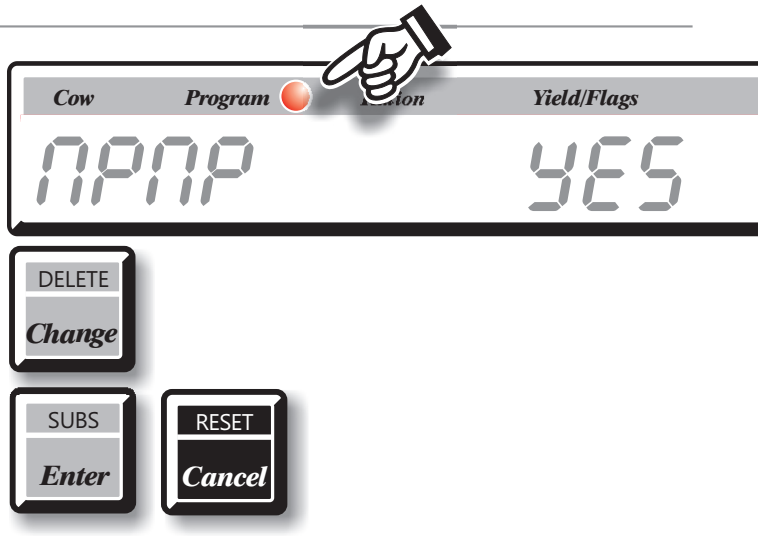
Check that Program Mode is selected.

Run the subroutine. The message 'nPnP' is displayed with 'yES' or 'no' in the Yield/Flags window.

Press Change to toggle between 'yES' and 'no'.

Press Enter to store the new setting.

Press Cancel to exit the subroutine.



Milk Pump Control TEST: Subroutine 609

The communications with the Milk Pump Control can be tested by running this subroutine.

Check that Program Mode is selected.

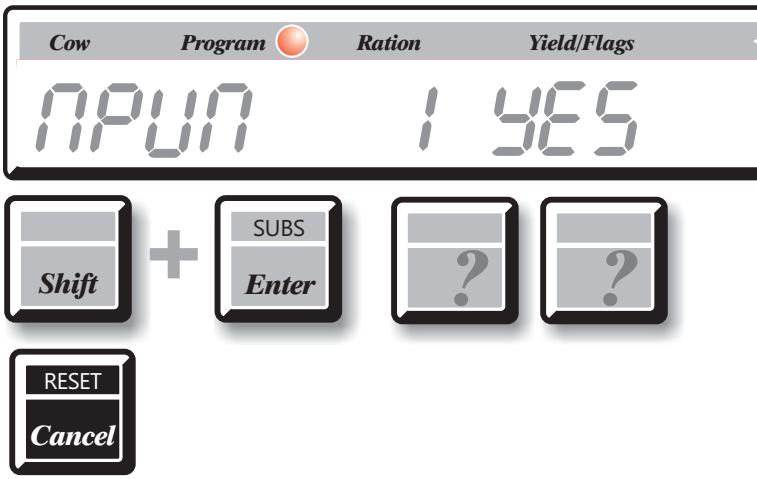
Run the subroutine 609. The message 'nPun' followed by '1 Yes' should be shown.

If a Milk Pump Control is not present, the message 'nPun' followed by '1 No'.

Press the 'STEP' key to step through additional Milk Pump Controls.

The software version of each Milk Pump Control present (i.e. '120') is displayed in the Cumulative Totals display.

Press Cancel to exit the subroutine.



Note: Please see the ATL Micro M3S operating manual for operating and instructions on running subroutines.

Connecting the Milk Pump Control to ATL AirBlast Controls

- RS485 bus connection requires product model 15-0665.
- Connect the CAT5e cable into the RS485 Bus connection socket.
- The AirBlast controls will now enter running and idle modes in accordance with the mode of the Milk Pump Control.
- Changing Milk Pump Control mode to Wash will close the Delivery Line Drain Valve on AirBlast #2, and start the AirBlast operation on AirBlast #1.
- Changing the Milk Pump Control mode to Milk will close the Delivery Line Drain Valve on AirBlast #2.
- Changing the Milk Pump Control mode to Off will open the Delivery Line Drain Valve after the delay on AirBlast #2.
- Pressing the Compressed Air Purge button on the Milk Pump Control will close the Delivery Line Drain Valve and then open the Compressed Air Valve for the time specified by the potentiometers on AirBlast #2.