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Important information - read this first

✓ Before installing or operating the equipment, this manual and the appropriate operating instructions must be read carefully.
✓ The equipment must be used only for the application described.
✓ Installation of the equipment must be carried out by skilled and authorized technicians only.
✓ Proper handling of the equipment is the basis for correct functioning.
✓ Never remove any covers or parts off the system before the electrical power is disconnected and isolated.
✓ Do not wash the electronic equipment with volume washers or high pressure hoses.
✓ It is the responsibility of the farmer to check his animals and the performance of the equipment. If, for any reason, the system is not operational or individual animals refuse to use the system, it is the responsibility of the farmer to make alternative arrangements to feed and milk the animals.
✓ To avoid injury to animals and equipment, check there are no projections (pipes or anything similar) protruding in the parlour on which transponder neck bands or leg bands can get caught.
✓ Calibration of milk meters/monitors and feed dispensers are of utmost importance in obtaining accurate milking and feeding results. If calibration is incorrect, or the wrong values have been programmed, milking results and feed distribution will remain adversely affected until calibration has been corrected.
✓ The manufacturers guarantee does not cover direct or subsequent damage caused by incorrect installation, incorrect usage, improper treatment, inadequate cleaning or servicing, or incorrect software parameter inputs or hardware settings.
✓ Incorrect operation of the milking or management system may seriously affect the animals in an adverse way. It is therefore necessary to double check all inputs and outputs of the system.

Icons

Icons are used in this manual to draw the reader’s attention to specific information. These icons have the following meaning:

⚠️ Failure to follow the instructions can result in severe injury to engineers, users, bystanders or livestock.

⚡ Indicates special precautions that must be taken to avoid damage to equipment.

💡 Gives important information to prevent potential problems.

💡 Gives advice or suggestions to make procedures easier or clearer.
1. Introduction

This manual is a guide to connecting services to The Fullwood Merlin; information is detailed on mounting Merlin, connecting services through the roofbox, electrical and earthing requirements, delivery line construction and roof connections.

Generic layout drawings for The Fullwood Merlin with revised detail are available from www.fullwood.com under The Fullwood Merlin Documentation.

2. Revision Control

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3. Safety

A risk assessment is an important step in protecting your workers and your business, as well as complying with the law. It helps you focus on the risks that really matter in your workplace – the ones with the potential to cause real harm. In many instances, straightforward measures can readily control risks, for example ensuring spillages are cleaned up promptly so people do not slip, or cupboard drawers are kept closed to ensure people do not trip. For most, that means simple, cheap and effective measures to ensure your most valuable asset – your workforce – is protected.

The law does not expect you to eliminate all risk, but you are required to protect people as far as ‘reasonably practicable’.

- There are many work situations which add to the hazards of welding. Each must be assessed carefully, since there may be added hazards such as falls or asphyxiation. This is particularly true of work in confined spaces, where there is a very real risk of death, and the employer should make a critical assessment of the work to be done, and how it may be carried out safely. There may be statutory requirements in these situations.

- Lifting and manual handling is one of the highest risks in work environments. It is essential to inform your staff about safe lifting and manual handling basics.

- Some form of dust extraction is also beneficial with heavy use as exposure to airborne particles can cause respiratory complaints.

- The main requirement of the PPE at Work Regulations 2002 is that personal protective equipment is to be supplied and used at work wherever there are risks to health and safety that cannot be adequately controlled in other ways.

- Power tools can be extremely dangerous if not used correctly. The correct techniques and personal protective equipment must be worn at all times.
4. Connection of Services to the Fullwood Merlin

4.1 Electrical Requirements UK Single & Three Phase

It is important to note that, ultimately, the responsibility for ensuring that the power supply is satisfactory lies with the purchaser/operator of the Merlin automatic milking system and the Power Supplier.

The information in this document is intended to provide guidance relating to the responsibilities of the Fullwood Installation Dealer and the Qualified Electrical Engineer responsible for connecting the Merlin automatic milking system to the farm's power supply.

The objective is to ensure a clean power supply to the Merlin,

- Minimise consequential loss of data and communications.
- Maintain high power factor thereby controlling operational costs.

The Installation Dealer and the Qualified Electrical Engineer have the responsibility for ensuring that a total risk analysis has been carried out in respect of the site, having particular regard for:

- Site preparation
- Planned installation
- Remedial work of the installation.

If Fullwood Ltd has to take action to inspect and test the installation to ensure that the power quality is correct, it must be understood that this service will be chargeable.

In order to ensure that The Fullwood Merlin milking system is installed to give optimum operational performance on all site locations, the following points are obligatory.

- All workmanship shall be carried out in accordance with national codes of practice.
- Industrial best practice shall be adopted when no codes are available.
- All current EU directives and national regulations shall be adhered to.

4.2 Scope of Electrical Requirements

The requirement applies to the fixed installation of the Merlin and shall apply to other equipment, which may affect the Merlin operation.
4.2.1 Electrical Design Stage

4.2.1.1 Site Survey

The Qualified Electrical Engineer shall be deemed to:

- Have inspected the Site
- Have satisfied themselves, as far as can reasonably be expected of the condition of all circumstances affecting the Site
- Have taken account of all issues that will have a lasting effect upon the operational performance of the Merlin.

4.2.1.2 Power Quality Survey

The Qualified Electrical Engineer shall carry out a power quality survey over a period of a minimum of eight (8) days. The logged data collated in a report shall have the information listed below and include the actions planned to rectify and provide a remedy where necessary.

- Voltage
- Amperage
- Sag and Swell
- KVA, KVAr, KArh
- KWh, KW
- Power factor
- Frequency
- THD voltage & current
- Harmonics
- Flicker

4.2.1.3 Lightning Strike Risk

The Qualified Electrical Engineer shall:

- Carry out a risk analysis of the site and produce a report
- Contact Meteorology Office or E A Technology Ltd for information including density of strike
- Determine that the risk is in accordance with BS 6651:1999
- Ensure that a surge arrester is installed upstream of the Merlin.

4.2.1.4 Health and Safety Issues

- Fire precautions and smoke alarm issues
- Luminance at the Merlin to be 350 – 500 luminous flux measured at the Merlin surface
- Temperature range + 4°C to + 30°C in the operational area
- Storage of chemicals & handling
- Wash-down areas
- Adequate operational access, ingress and egress from the operational area
- Earth continuity
- Electrostatic Discharge issues
- Effects of insect/rodent infestation within the installation
4.2.1.5 Total Risk Analysis

The Installation Dealer and the Qualified Electrical Engineer shall satisfy themselves that a risk analysis of the site covering all issues has been carried out. This analysis, in part or whole shall be used to influence the final Electrical Installation design.
4.3 Electrical Requirements

An electrical power survey must be done before a Merlin is sold in order to establish if there are any fundamental problems with the quality of the electrical supply. This must then be analysed and any remedial work undertaken before the Merlin’s are installed.

The power requirements will vary significantly, depending on the ancillary equipment specified in the sale.

The Merlin requires single phase 220V @ 16A at >0.8 power factor

The Merlin requires 3ph 415V @ 10A>0.8 Power Factor

You will have to calculate power consumption for:

- Air Compressor
- Vacuum pump
- Boiler
- Bulk Tank compressors and boiler
- Ice bank
- Lighting

Once the Merlin installation has been finished, but not commissioned, then the electrician must perform the relevant tests and certification before milking commences. This is to ensure that the electrical system has been installed, earthed and tested correctly and that there is a record of this having been done.
5. Physical Installation Considerations

The Fullwood Merlin dimensions and weights are:

Length – 4305 mm
Width – 1660 mm (arm inside crate) to 1880 mm (arm outside crate)
Height – 2200 mm
Weight – 1500 kg

- Care must be taken when lifting or transporting a Merlin to prevent damage and/or injury
- Ensure adequately rated lifting equipment is used and the load is well secured at all times
- Ensure ground surfaces are firm and level to avoid the unit toppling or dropping or swinging
- Carry at the recommended lift points only. **Do not** lift from the Arm side. **Do not** lift from the base due to the increased risk that the Merlin will topple over

When The Fullwood Merlin is delivered to the customer, it comes wrapped in plastic sheet, and all moving parts are secured using rope restraints.

Dimensional checks should be undertaken to ensure that the foundations for the Merlin are correct before placing the unit. Drawings are supplied for each installation.

Once the Merlin has been removed from the delivery vehicle and placed onto the designated location, external services can be connected.

### 5.1 Mounting and Levelling of the Merlin

The Fullwood Merlin needs to be bolted down level in the correct position, (see installation drawings supplied by Fullwood), using M16x125 SS through Bolt, (Part number 100007), which are supplied with the Merlin. The Merlin cow deck is to be level in all planes once the Merlin is in place. Shims can be inserted under the mountings to achieve this.
6. Connection of the External Services

The Fullwood Merlin is designed so that all the connections required for the correct function of the machine are on the roof of the main cabinet. Water, air, power and communication connections are provided.

6.1 Electricity Supply

6.1.1 Electrical Connections to the Merlin

This is to be assessed by the onsite electrician.

The onsite electrician must use 2.5mm² Steel Wire Armoured cable, CY rated cable from the main distribution panel and terminate in the power enclosure situated on top of the Fullwood Merlin with suitable isolation (Single Phase)
An isolator must be installed upstream of the above connection box to ensure the mains power to the Merlin can be isolated in the event of an engineer needing to open it.

Inside the Merlin cabinet is the electrical cabinet with an interlocked isolator switch on the front panel. The door of the electrical cabinet cannot be opened without first turning the isolator to 0 from 1, thus removing all electrical power from the Merlin.

When working on the electrical cabinet, ensure that it is left in a secure state with both halves of the enclosure securely fastened.

6.1.2 Lightning

The Merlin is fitted with a class 3 lightning protection device. This is rated for portable equipment and will provide protection for a single strike, having a replaceable fused element. This is the most basic level of protection and protects only the Merlin.

As of January 2010, it is the responsibility of the electrician to ensure that adequate lightning surge protection is installed to protect buildings and equipment from damage caused by lightning strike. For more information BS EN 62305 parts 1-4 should be consulted.

This would normally mean that the commissioning electricians have to install a Class 2 lightning surge protection unit that is positioned next to the main incoming electricity feed for the building(s) that the Merlin(s) are installed into.

When testing, adhere to the following warning
6.2 Roof Connections

On the roof of The Fullwood Merlin is a series of air and water connectors. These have various functions and can be identified from the labelling on the top of the crate.
6.2.1 Water Connection

The cold water supply to the Merlin is to be connected here using 15mm copper water pipe. This is normally taken from the mains water supply and then regulated to 1.5 BAR inside the main cabinet. The connections should be made with 15mm copper pipe and have isolation taps.

6.2.1.1 Water Pressure Regulator

The water pressure regulator gauge should be set to 1.5 bar. If set too high, then problems can be found with water 'hammer'; as valves are operated. This can have a detrimental effect on the longevity of the diaphragms in the Burkett water valves.

The regulator is set by the adjustment of the Allan key screw in the top of the regulator. To increase the indicated pressure, slacken the locknut then turn the top screw clockwise (in).
6.2.2 Hot Water Connection

The Merlin requires a separate hot water supply as the boiler is fitted externally. The boiler should be installed as close to the Merlin as possible, and then all water pipes require lagging.

For multiple Merlin’s, it is possible to still use a single boiler if the Merlin’s are next to each other.

If a boiler is installed more than 5 meters away from the Merlin, then additional time has to be allowed for in the Configurator program settings to allow sufficient time before the hot water required reaches the Merlin.
6.2.3 Compressed Air Connection

The compressed air in port on the roof of the Merlin allows a 12mm compressed air to be connected.

Removal of the 12mm air fitting allows the connection directly to the Merlin via the ½" BSP thread.

6.2.4 Separation Gate Cylinder Connections

These ports are connected to each end of the gate control cylinder only if the separation is to be controlled at the Merlin. If separation gates are further than 1 meter from the robot, then a dedicated separation gate controller is required. One set of ports is for the Reject milking passage, and the other set is for the Separation room. 6mm air tube is specified for the connection to the pneumatic cylinders.

6.2.5 Bulk Tank and Buffer Tank Air Connections

The bulk tank connection port is used to control the action of the milk tank valve in a standalone system. If milk is to be sent into the tank, then an air signal is given for the valve to be operated. If milk (or water) is to be sent to the drain in the dairy, then the air signal is removed, and the valve then returns to the default position (liquid straight to the drain).

The buffer tank connection is only used if a 2nd milk tank is to be controlled by the Crystal system. A Packo buffer tank does not require a connection to here.

In multiple Merlin installations, there would normally be a master and slave(s) setup for the delivery line. Only the master robot has control of the milk tank APV valve, the slave robots have their own APV valve that is tee’d into the delivery line. It is possible to allow each Merlin to have its own delivery line, which runs from the Merlin to the milk tank, and then there is an APV on the milk tank outlet for every Merlin.
6.2.6 Roof Mounted Connection Box

The Fullwood Merlin is designed so that all the connections to the outside world are already present in an enclosure mounted on the roof of the main cabinet. Having all the connections here ensures that every Merlin has identical wiring and routing of cables internally to reduce any potential for data errors.
6.2.7 Communication

The Ethernet cable runs from J27 of the UCC through to the roof box and terminates at the plug shown below.

6.3 Earth Connection

All internal earth connections are made at a single point in the bottom of the cabinet, a 6mm external earth must also be connected.
7. Milk Delivery Line

The Merlin milk delivery lines should be installed using 22mm stainless steel tube, connected with swaged unions and then insulated.

After performing several hot washes check the tightness of the unions with the supplied ‘C’ spanner.

All water and milk lines need to be insulated fully, using good quality pipe insulation.

There are 2 options used.

7.1 1 delivery line for up to 2 Merlin’s

This is called a Master/slave configuration. One Merlin is set as the Master, which means that the milk delivery line goes from this Merlin, all the way to the 3 way milk valves (APV) installed onto the buffer tank and bulk tank and then to a drain.

The subsequent Merlin is nominated as a ‘slave’. The delivery lines from this Merlin is Tee’d into the Master delivery line by using the 22mm stainless steel tee with the APV valve mounted off.
7.2 Multiple Delivery Lines

The other option is to have multiple delivery lines going directly to the milk tank.

On each 3 way APV valve there are three ports, two on the side and one on the base. Liquid enters from the Merlin to the bottom side connection, milk will then exit the connection on the base of the valve to the milk tank, and wash water will exit the valve from the top side connection.

Each 3 way valve used on the delivery line must be set so that if no compressed air signal is applied, then the plunger has sealed the port on the bottom of the valve. This is critical!
### 7.3 Sending the Milk to More than one Tank

It is possible to send milk to more than 1 bulk tank. For this you will require an extra 3 way milk valve for each delivery line. You will also need to supply a manual compressed air switch so that the milk / wash signal from the Master Merlin can be diverted by this switch to select the correct tank.

The switch should be a rotary selector type so that only Tank 1, Tank 2, Tank x can be selected, with no possibility of a ‘neutral’ position.

![Diagram showing milk sending to more than one tank](image-url)
7.4 General rules of thumb for delivery lines

2 Merlin’s is the maximum on one delivery line

Maximum distance of 100m linear on a delivery line, from Merlin to bulk tank including plate and tube coolers;

- A single tube cooler will add 20m to the overall length of the delivery line
- A single stage plate cooler will add 10m the overall length of the delivery line
- A two stage plate cooler will add 20m the overall length of the delivery line

The maximum height that the delivery line can be is 10m from milk pump.

| AT THE HIGHEST POINT WHERE THE DELIVERY LINE COMES VERTICALLY OUT OF MERLIN MUST BE THE OVERALL HIGHEST POINT! |
| THE DELIVERY LINE MUST NOT CLIMB AT ANY POINT BUT MUST STAY LEVEL OR FALL TO THE MILK TANK |

The length and height of delivery line also affects the pumping speed

7.4.1 Items for Installation of Milk Delivery Lines:

003360 - Din20 SS Expansion Union-22mm – Quantity site dependant
003704 - 22mm-Expanding Tool – Is required but only supplied on order
003119 - 22mm x 1mm S/S Tube [240 Grit] 3m length
003319 - 22mm Dia SS Bend - Quantity site dependant
007161 - 22id x 60od Pipe Insulation 3m length - Quantity site dependant
005110 - Cable Tie Nylon Black300x4.8mm - Quantity site dependant

7.4.1.1 Extra Installation Items:

If tank fittings have been ordered from Packo then no extra APV valves need to be ordered for a single Merlin setup.

3 way milk valve:

091089 - 20mm APV DeltaS23 C/O Valve-Closed - One of these is required for any Merlin’s that share a delivery line.

One for each slave Merlin:

193924 - 22mm Tee+Unions Assy (one of these is required for any Merlin’s that share a delivery line)
8. Buffer Tanks

Options with Packo buffer tanks.

8.1 Buffer tank with single milk inlet
8.2 Merlin to Packo buffer tank, Packo tank and interface box

Listed below are the various options for electrically connecting milk tanks with or without buffer tank options to the Merlin.
8.3 Merlin to Packo buffer tank, Packo Dolphin tank and interface box
8.4 Merlin to Non-Packo tank and interface box

[Diagram of Merlin to Non-Packo tank and interface box]
8.5 Merlin to Packo tank and interface box
9. Milk cooling

Cooling at Merlin assumes that you have either a plate or tube cooler close to the Merlin. That Merlin will then operate the milk cooling each time the milk pump activates to pump milk.
The cooling is automatically set in the Configurator program to have a 10 second ‘post-run time’ so that the water solenoid is left switched on after pumping has finished ensuring that the cooler remains chilled (this is adjustable).

Long delivery lines (up to 100m) will require careful setup with regard to milk and wash water temperature during cleaning. Slave Merlin’s will usually have a much shorter delivery line, yet take the same amount of water as the Master Merlin does for washing the entire delivery line.

You MUST achieve at least 72 degrees C at the drain point of every delivery line during the hot wash for a minimum of two minutes.

When using ice water in a tube or plate cooler, then you may have to drain or purge the cooling water during the hot wash in order to achieve correct temperature. Consult the Packo buffer tank manual for information on draining a tube cooler.

9.1 General Rules of Thumb Milk Cooling

- Chilling with mains water only – 1 plate cooler/tube cooler per delivery line
- Chilling with ice and mains water – two plate coolers/tube coolers per delivery line or a two stage plate cooler
- Cooling controlled by Merlin
10. Compressed airline specification

When installing an air compressor, ensure that a suitably sized one is supplied;

- 12 CFM of air is required for each Merlin. Screw type industrial compressors are the preferred type of compressor due to reliability and low noise.

- The compressor system must supply dry, oil free air with an activated carbon filter in the final stage to provide food quality filtration.

- Ensure suitable ventilation for the compressor and follow manufacturer’s instructions for placement and service.

- Ensure that a service contract is arranged between the end user (farmer) and a compressed air service agent.

- Ensure that the compressed air system is commissioned by an agent of the compressor manufacturer; otherwise many companies will not accept warranty claims and you will also be breaking compressed air regulations.

- Galvanised pipe and fittings is recommended although aluminium pipe is also an option.

- The Kaeser compressor system has the compressor, air dryer, first stage filtration and 200 litre receiver all built into the one unit. The second stage filters are then installed after the compressor.

- Construct the airline so that the filters can be bypassed for servicing, yet still leave the Merlin’s able to run. The filters should be located as close as possible to the compressor, but after the air dryer.

10.1 Filter Set up for Bypass

Use this for as shorter time as possible;

Alternatively use a filter with a built in bypass facility.
10.2 Compressed Air Setup for 1-2 Merlin

Use 25mm airline, straight from compressor, and then tee'd to each Merlin.

10.3 Compressed Air Setup for 3-4 Merlin

32mm rigid airline from the compressor, then a 25mm loop to all Merlin’s
An additional 500liter receiver is required for 3 to 4 Merlin’s.
10.4 General Rules of Thumb for Compressed Air on Merlin

- 12 CFM of air required per Merlin.
- 1 CFM = 28.32 liters.
- 1 CFM = 0.0283 Cubic Meters

Do not install more than 2 Merlin’s on an un-looped 25mm line. During the back flush or delivery line air purge modes, the system pressure in the supply airlines can drop significantly and can cause the low air pressure switch in the Merlin to operate and generate an alarm call.

Install an auto drain on lowest point of the loop
11. Washing: Boiler sizing and wash temperatures

The hot washing system on a Merlin uses an alternating acid / alkali boiling water solution. The washes will take place at user defined times during each day. The hot water provides the sanitization of the machine, whilst the chemicals used to remove any build-up from the milk lines.

Hot water is brought into the Merlin under vacuum at 93 degrees C. It is essential that the hot water boiler is located above the Merlin’s so that there is a sufficient head of water for efficient cleaning. The boiler must not be a constant fill type as this will affect the water temperature going into the Merlin.

The use of the correct washing chemicals is critical. Use only Fullwood Ltd recommended chemicals.

AMS Cleaner (acid) 113009 for 25 litres, 113010 for 200 litres.
Night wash (alkali) 113003 for 25 litres, 113004 for 200 litres.

During the hot wash, the farmer should be present whenever possible in order to change the milk filter elements after the wash has completed.

11.1 General rules of thumb

- Do not use constant fill boilers

- The boiler must always be fitted above the Merlin’s using at least 28mm pipe (for single and double Merlin sites) from the boiler outlet, before dropping down into 15mm for entry to the Merlin. 42mm must be used for 3 and 4 merlin sites before also dropping down to 15mm for entry into Merlin.

- 3 hot washes at 8h intervals are required, the farmer or farm worker must be present at least two of these in order to change the milk filters

- Water entry temperature must be 93° C. Any higher then you generate too much steam and you may have problems with poor washing.

- Water discharge temperature must achieve 72°C for 2 minutes at the delivery line finish point.

- At the moment, it is not possible to use less water on slave Merlin’s. Every Merlin will use the same amount of hot water during a wash.

- The quantity of chemicals used depends on the length of the delivery line. The default time for the pumps should deliver 500ml of chemical per wash. This figure will vary depending on the length of chemical tube used. The Merlin does not have the capability to store the wash chemicals within the cabinet, so an external chemical store must be provided. 1% chemical is the required amount.

- The chemical pumps must be calibrated. This is because the chemicals used have different viscosities and the quantity delivered varies considerably.
12. Vacuum systems

The vacuum system for the Merlin offers many different options, standard vane pumps, blower type pumps, and/or inverter control. The vacuum line has to be more than 10m in length and a minimum of 3” diameter vacuum line when using blower pumps.

12.1 Single vacuum pump for a single Merlin

This would normally be an FR2 monobloc, with a single or three phase 1.1kW motor, delivering a minimum of 350 litres of vacuum per minute at 1440 rpm.

12.2 Single vacuum pump for multiple Merlin’s

The vacuum system here depends on several factors.

For 2 Merlin’s, use a Q3 monobloc, running at 800? rpm. Minimum motor spec here would be 2.2Kw.
For 3-4 Merlin’s use a Q4 monobloc running at 1000? Rpm

Single Merlin installations require at least 40mm vacuum line. Most installations use a 2” (50mm) vacuum system.

For more than 1 Merlin then also use 3” vacuum line from the pneumatic butterfly valves on the Merlin roof all the way to the vacuum pump.

Depending on layout, it is recommended that the vacuum line be looped, with a minimum of 10m before the first Merlin.

Blower pumps have also been used on installations, along with inverter control systems. These are a lot more complicated to install and require contact with Fullwood Ltd for a specification.

All the vane type pumps have a minimum running speed below which the vanes do not form a good enough seal. Therefore, when an inverter is to be used, a Servac should be used to ‘bleed’ air into the vacuum system for when the system is at a minimum demand situation.

It is also recommended to fit a backup Servac set 2kPa above normal system vacuum level of 44kPa. We have had some cases in the severe cold where a Servac has frozen and caused teat damage due to 60kPa milking.

12.3 General rules of thumb:

- 44kPa vacuum level
- 350litres of vacuum per Merlin
13. Alarm unit and Autodialler

On all Merlin installations, it is a system requirement to have a Fusion alarm unit and an Autodialler

- 1 alarm unit is required for every 4 Merlin’s. 094410

The Autodialler is to provide an alert to the farmer if there is a failure on the Merlin system.

Fullwood Ltd provides a unit that requires a landline and a broadband connection; Fullwood Ltd will not start up a site without these items in place

13.1 Wiring connections on the UCC and the Fullwood Autodialler unit

When wiring the auto dialler, use a piece of 3 core 0.75mm flex and link the UCC to the auto dialler inputs as shown below in the two photographs.

The system operates with two levels of alarm: Minor alarm and major alarm.

The UCC uses the 2 on-board relay outputs which when working, are energized (closed). If the system detects an error, then one of the relays is de-energised, the auto dialler senses this and then alerts the user that there is a problem.

The relays on the UCC also have a visual indication, LED’s LR1 and LR2. These LED’s should be on as shown, which indicates no fault.

13.2 UCC wiring:

![UCC Wiring Diagram]

13.3 Auto dialler input wiring:

![Auto Dialler Input Wiring Diagram]
14. P.C Specification

PC Requirements for Crystal 2.6 systems

Recommended OS: Windows 7 32 bits.

- Other supported OS: Windows 7 64 bits, Windows XP 32 bits, Windows Vista 32 bits (although Windows Vista is not recommended)
- Minimum 1 GHz processor. 2.4 GHz or higher processor clock speed recommended; Intel Pentium/Celeron family, or AMD K6/Athlon/Duron family, or compatible processor recommended.
- RAM (Windows XP OS): Minimal 256 MB, 1 GB recommended.
- RAM (Windows 7 OS): Minimal 1 GB, 4 GB recommended.
- 1.5 gigabytes (GB) of available hard disk space. Actual requirements will vary based on system configurations, the applications and features chosen to install. Additional available hard disk space may be required if an office network is installed. Crystal needs about 4 MB per cow per lactation. So to store 5 lactations for 2000 cows 40 Gb is needed.
- Video: 1024 x 768 or higher is highly recommended.
- External drive, e.g. USB-stick or USB hard disc (for external backup).
- Keyboard and Microsoft Mouse or compatible pointing device.
- For connecting a Fusion Data Server: External serial RS232 channel: double buffered. (Or alternatively an USB to RS232 converter)
- For connecting a UCC: .... Ethernet port or serial?
- 2 x Ethernet ports;
  - 1 x broadband
  - 1 x dedicated network
- USB-port to connect the Crystal software dongle.
- Broadband internet is necessary for support purposes
- .Net 4.0 framework for Crystal 2.6 and later
- DVD-player, necessary for installing the software.
14.1 Connection from PC to Merlin

- Ethernet (099718 Ethernet cable – CAT5).

14.1.1 Ethernet

Have a dedicated network card installed in the PC, and set for a fixed IP address, and then use an Ethernet connection from that card to an Ethernet switch, from that switch to each UCC used on the system.

14.1.2 System Constraints

- Maximum 100m from the PC to a UCC
- Minimum number of ports for the Ethernet switch is 5.

14.1.3 Fusionet

Fusionet may also be used when runs are more than 100m
15. Start Up

15.1 Preliminary checks

Robot sited and bolted down with all services connected;
- Check level of crate y & x axis
- Check levels of arm
- Carry out Full Plant Test – If multiple Merlin site then each Merlin must be individually tested.
- Adjust water pressure gauge to 1.5 bar - If multiple Merlin site then each Merlin must be individually set.
- Ensure compressed air system has been commissioned and correct differentials set (cutting in at 8 bar out at 11 bar)
- Enter Test Tools in Configurator – check operation of every input & output

15.2 Testing of Arm

- Test all functions of the arm
  o Open/closes of vacuum valves
  o Vacuum sensors are working correctly
  o Check teat sprayer is working correctly
  o Operate teat roller
  o Put teat rollers onto cups and check speed and that it returns
  o Check turn in speed ( set to turn in slowly – 8 seconds, then return to normal operating speed of 5 seconds after milking in procedure
  o Check turn in sensor
    ▪ ‘OFF’ when turned in to crate
    ▪ ‘ON’ when outside of crate
  o Check that all ACRs work and ensure that the lengths of all the ropes are equal
  o Check that laser clean function operates both air and water
  o Check park/home position of arm and that shells are positioned in jetters centrally

15.3 Robot Arm Menu Alterations;

- Set Extra ‘Z’ Offset to 0
- Adjust height of cleaning cups – set so that there are no vacuum leaks and that it does not go out on pressure overload.
- Adjustment of angle of cleaning cups – adjust so that the shells sit perfectly in the jetters
- Home position of mothership – mothership should be central in the crate when turned in

15.4 Milking Menu Alterations;

- Cleaning height under tip – adjust to – 40 and work up to a final height of -20 over the first few days.
- Pulsetime Teat spraying – set to 100% for at least two weeks then down to 50%
15.5 Wash Settings;

- Carry out the following wash sequence;
  o Carry out a Merlin Rinse
  o Carry out a System Rinse
- Before carrying out the final wash programs, ensure water temperature does not exceed 92°C but above 85°C
  o Carry out a Main Clean
  o Carry out a Hypo Clean
- Make adjustments to wash settings to ensure water temperature is minimum 70°C at the drain for 2 minutes

15.5.1 Sample configuration of wash settings;

Note: this is a sample only as site dictates farm specific settings
16. Disclaimers

Fullwood Ltd assumes no liability for damage to any products resulting from disregard of information contained in this manual.

All mains electrical work should be performed by a suitably qualified electrician in accordance with the relevant national and/or local regulations, any other relevant regulations and any relevant local bylaws.

Fullwood Ltd will not accept responsibility for loss or damage caused by a force majeure e.g. lightning strikes.

Fullwood Ltd will not accept responsibility for milk contaminated by antibiotics.

Purchasers are advised to take out suitable insurance to cover electronic equipment such as equipment covered in this manual against lightning strikes.

Compressed air is extremely dangerous. Installers and Users of compressed air equipment should be familiar with any relevant safety regulations. Standards and recommendations are available from BSI or HMSO. **BS EN 1012-1:1997 - Compressors and vacuum pump.**

All owners or occupiers of premises are responsible for the water systems within the premises. The extent of these responsibilities is described in detail in section 73 of the Water Industry Act, 1991 or such other equivalent legislation.

An appropriate guide for agricultural premises is available from the Water Bylaws Scheme (Tel. 01495 248454 UK only)

Fullwood Ltd reserves the right to change the contents of this manual without notice. Whilst every precaution has been taken to ensure the information is correct, Fullwood Ltd does not except responsibility or liability for damage of any kind arising from the use of this