OPERATIONS MANUAL

for the

BERESFORD-GREY
FILL-MATIC-D
PRESSURISATION UNIT

Specifications for guidance only and subject to change without notice
For Technical Support, refer in the first instance to your installer.

If failure of device can cause damage, a safety backup should always be fitted.
Installation should be checked by qualified electrician before applying any voltage.

Observe all relevant safety precautions, regulations and electrical ratings

Observe all precautions for handling electrostatic sensitive devices

Errors or omissions should be notified to us at the address below.

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1. OVERVIEW

The “BG-Fill-Matic-D” is a full-feature microprocessor based pressurisation unit for both the monitoring and pressurising of closed loop heating, chilling or other plant. It is conveniently housed in a slim-line compact wall mounted all metal industrial enclosure.

The user interface is through an integral stylish but simple three-button keyboard with a backlit display that continually indicates the installation status in clear understandable text and with digital accuracy and precision.

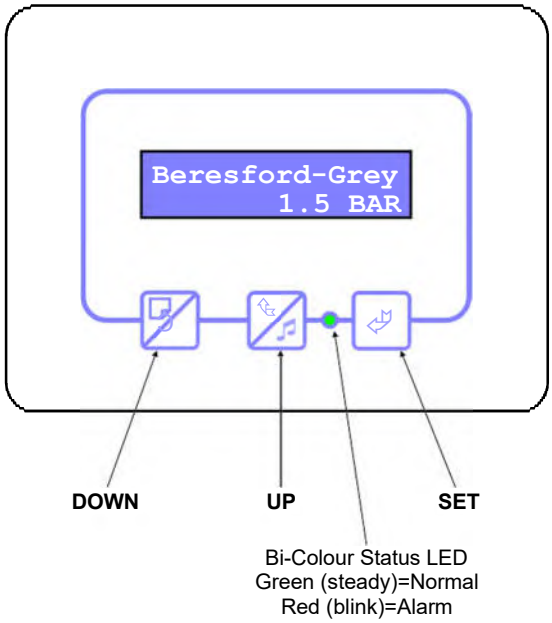

Figure 1
Control Panel Layout

The set-up and configuration is guarded against tampering through multi-level password-protected Menus.

Comprehensive test features are provided to aid installation, to speed engineering & maintenance and provide diagnostics to fault-find errors.

Features include:-

- High-Pressure with Control up to 4 Bar
- Digital Accuracy with 100mB (0.1Bar) Resolution
- Low Pressure Alarm
- High Pressure Alarm
- Leak Alarm
- Two Independently Programmable and fully customisable VOLT-FREE contacts
- ‘At-a-glance’ indication of possible problems or errors with a RED/GREEN STATUS LED
- Customisable Audible Alarm
- Fully Automatic or Manual Start options
- Service Due Reminder facility
- System Safety and Lock Features
- Adjustable Display Contrast and Brightness (to cater for all environments)
- Simplified set-up user facility
- Comprehensive Diagnostic and Test Features
- Password protected multi-level Setup Menus
- Low Noise
- Internal electronics protected
- Ultra-small Footprint in a slim, steel (255x230x80mm) wall-mounted enclosure
- Mountable at any angle
- Pipework to industry standard 1/2” BSPM
- Supply : 220/240vAC 50/60Hz ECO 3W

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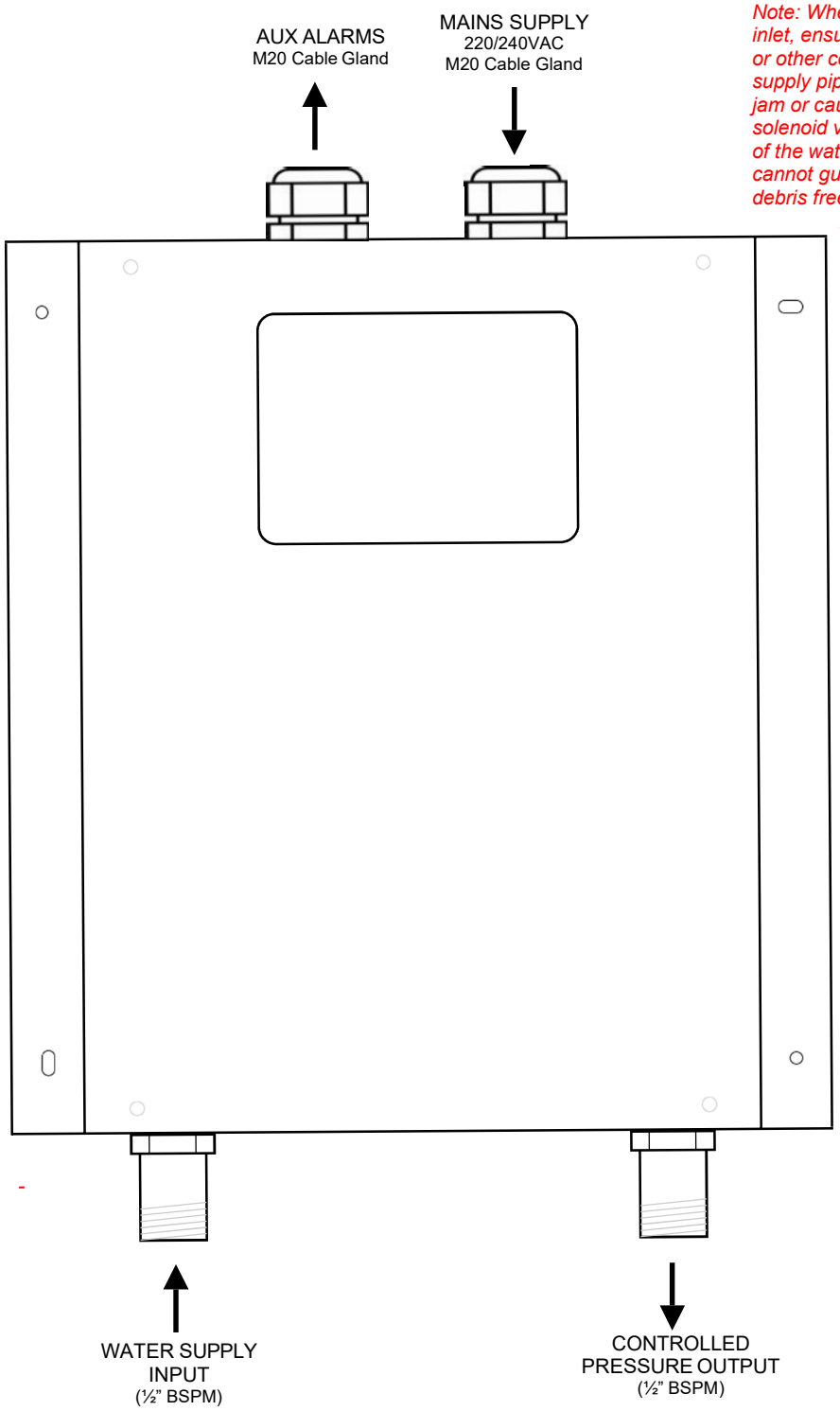
1.1 EXTERNAL CONNECTIVITY



1.1 BG-Fill-Matic-D (external) Connectivity

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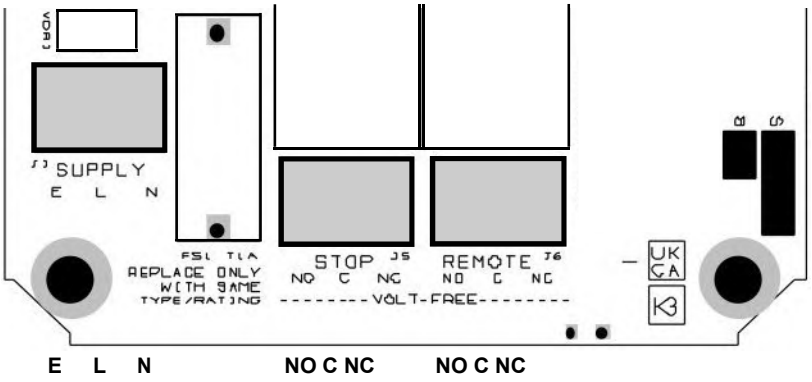
1.2 INTERNAL CONNECTIVITY



SUPPLY (J1)**
220/240VAC 50/60HZ
N-Neutral
L-Live
E-Earth

REMOTE RELAY (J6)*
2nd PROGRAMMABLE
VOLT-FREE
NO-Normally Open
C-Common
NC-Normally Closed

STOP RELAY (J5)*
PROGRAMMABLE
VOLT-FREE
NO-Normally Open
C-Common
NC-Normally Closed

Notes:

* Contacts Rated at 240VAC 10A (Resistive). Derate accordingly for Inductive Loads
** Recommended 3A external Fuse in Plugtop or Switched Isolator. Min. Supply Cable 0.75mm
J1, J5 & J6 are on PLUG-IN Connectors for your convenience of wiring. Grab the Green Plug, and PULL away from Board. Similarly for your convenience, the Display Ribbon Cable can be unplugged. When reconnecting, it is bump-polarised and only fits one way around. Before reattaching the Lid with the Display, ensure both ends of the Ribbon Cable are seated firmly, and you've not dislodged the cable from the Pressure Transducer - see Figure A.1 on Page 15.

DISCONNECT from SUPPLY and ensure all DOWNSTREAM EQUIPMENT (eg BOILERS or CHILLERS) are POWERED-OFF and there is NO POWER on any cables before attempting any wiring.

1.2 BG-Fill-Matic-D (internal) Connectivity.
Please note not all options shown here may be fitted in all models.

2. OPERATION

POWER-ON the Controller from the Supply. The Controller will first identify itself and then begin operation automatically. Upon initial POWER-ON the Controller may perform one of a number of tasks;

2.1 Display "Standby Mode"

This is a software ON/OFF switch… the Controller is actually 'Switched OFF' and is prompting you to turn it on. **Press and hold the rightmost (SET) Button for at least five Seconds and the Controller will switch ON** (or if it is ON, it will switch OFF). This is feature (called STANDBY MODE) can be turned ON or OFF in the software SETUP (see section 4.1). This option is useful where a fully automatic restart following a supply power failure is undesirable. **Please note that the Controller is actually POWERED and LIVE and is much like using the TV Remote OFF. Do not open the equipment or make any wiring changes unless you have completely disconnected the Supply.**

2.2 Start Working

The Controller displays the Company Name and Model with System Pressure. (3 second cycles)

2.3 Status Display

During normal operation a solid GREEN LED will be displayed

2.4 Errors Display

Any errors or conditions out of normal operation that are detected, will individually rotate through the lower (bottom) line of the two-line display. They will display in plain text, so take a moment, pause, and read what the Controller is telling you. If there is more than one error, then it will display in rotation interspersed periodically with the current Pressure. If an error is deemed serious, then the Company Name on the top line will be interspersed with a CALL SERVICE message and telephone number.

Below are some of the ERROR MESSAGES that may individually or collectively appear on the bottom line of the display…

2.4.1 PRESSURE LOW
2.4.2 PRESSURE HIGH

Simple enough – the current Pressure is outside the limits of the HIGH and LOW Pressure Alarms as preset in the SETUPs (see 4.5-4.8).

2.4.5 WATER LEAK *

FILL has run for more time than has been allowed in SETUP (see 4.10/4.11) and a LEAK may exist.

2.4.9 SERVICE DUE

Displayed if the SERVICE DUE time period preset in the SETUP has elapsed. This message is RESET through the MASTER SETUP.

2.4.10 SENSOR ERROR

The Controller doesn't like the signal from the Transducer (out of limits). Check the Transducer, it's cable and it's connections.

2.4.11 SYSTEM LOCK

Displayed only when the Control Unit has been manually or automatically LOCKED-OUT from use. This usually only happens for some safety reason or a major fault.

*Notes: * The Pressurisation Unit needs to be restarted to clear these errors. Simply POWER-OFF, wait a few seconds, and POWER-ON again. If these errors reappear/persist, then the reason should be investigated by a qualified professional.*

3. CONTROLS

When operating normally, if you press and hold any of the Buttons, the Controller will respond as follows…

3.1 DOWN Button.

3.1.1 MENU DECREMENT

When in any of the SETUP Menus, the DOWN Button will decrement any value on the display.

3.2 UP Button.

The UP Button has two functions:-

3.2.1 MUTE AUDIBLE ALARM BEEPER

Pressing the UP (centre) Button will cause the Controller to MUTE the ALARM audible BEEPER. If the Alarm BEEPER is running continuously and giving folks a headache, press this Button to toggle the BEEPER ON or OFF or back ON.

3.2.2 MENU INCREMENT

When in any of the SETUP Menus, the UP Button will increment any value on the display.

3.3 SET Button

The SET Button has three functions:-

3.3.1 SETUP ENTRY

Press and release within a Second or so will cause the Controller to prompt 'ENTER PIN:' in order to access the SETUP MENU. *If there is no Button Activity either in the ENTER PIN section, or thereafter in the SETUP's for 30 seconds or so, the Controller will automatically revert back into it's normal Operation Mode.*

3.3.2 STANDBY MODE TOGGLE

Press and hold this Button for FIVE SECONDS or so, and the Controller will switch OFF and display 'STANDBY MODE' (see section 2.1).

3.3.3 MENU SAVE or MOVE BACK

When in the SETUP Menus, pressing SET momentarily, will SAVE the current setting and move FORWARD to the next SETUP item.

Pressing and HOLDING the SET Button for about a second will allow you to go BACK to the previous SETUP item. This neat feature allows you to go BACK should an entry mistake having been made, rather than cycle through all the options to the end and then have to re-enter the SETUP from the beginning.

4. END USER & INSTALLER (OPERATIONS) SETUP

(Adjustable End User PIN Factory set at 1111)

END USER adjustments shown in BLUE

4.1 **Standby Mode :** If set to *NO (Factory Default)* will allow the Controller to start operating as soon as power is applied. If set to *YES*, will cause a '**STANDBY MODE**' message to appear on the LCD and the unit will remain in this mode until manually switched ON by a User. Press and hold the SET Button for at least FIVE SECONDS to switch ON. Similarly, to switch back to Standby Mode, press and hold the SET Button for at least FIVE SECONDS (until the '**STANDBY MODE**' message appears)

Caution: In STANDBY MODE the equipment remains LIVE - Don't try to change the Control Panel, Pumps (or any Solenoids) without completely isolating the equipment from the supply.

4.2 **Set Pressure :** This is the Operational Pressure the equipment is intended to maintain. *(Factory Default 1.0 Bar)*

4.3 **Differential :** This is the Pressure Differential at which the Unit will start re-filling *(eg: a Set Pressure of 1.0 Bar, and a Differential of 0.1 Bar, will cause the system will switch-on the filler at 0.9 Bar (Factory Default 0.1 Bar)*.

4.4 **Sol-Fail Period :** A value (in Minutes) wherein the Unit must increase system pressure (regardless by how little), otherwise the Solenoid is assumed faulty. Feature disabled if set to zero. *(Range 0-59 Minutes. Factory Default 0).*

4.5 **Pressure-Low Alarm ON :** The value at which the Pressure LOW Alarm activates. *(Factory Default 0.8 Bar)*

4.6 **Pressure-Low Alarm OFF :** The value at which the Pressure LOW Alarm deactivates. *(Factory Default 0.9 Bar)*

4.7 **Pressure-High Alarm ON :** The value at which the Pressure HIGH Alarm activates. *(Factory Default 2.4 Bar)*

4.8 **Pressure-High Alarm OFF :** The value at which the Pressure HIGH Alarm deactivates. *(Factory Default 2.3 Bar)*

4.9 **User PIN:** The value can be changed using the UP/DOWN & SET buttons otherwise just press SET to scroll past. *(Default 1111)*

4.10 **Alarm Delay :** Delays the start of any external ALARM reporting by a given number of seconds (0-9) to prevent possibility of false alarms. *(Factory Default = 5 Seconds).*

4.11 **Leak Alarm :** Flags an Alarm if the Unit has run for equal to or more than the total cumulative preset time (in MINUTES) in any one hour. *(Factory Default - Zero/Disabled)*.

4.12 **Stop on Leak :** Will cause the Controller to STOP all Filling operations if a Leak is Detected. Could stop a small crisis from becoming a major disaster.- requires operator intervention with a Power OFF/ON to restart. *(Factory Default - No)*.

4.13 **STOP Relay :** This relay would normally be connected (via connector J5) to STOP the operation of any connected plant (eg Boiler, chiller, etc). This option sets all the conditions that will enable the STOP Relay. Each option can be turned ON or OFF, so in this manner the Relay can be activated by multiple events (eg on PRESSURE LOW ***and*** PRESSURE HIGH ***and*** WATER LOW ***and*** ... etc, etc). By default the User will '*Skip Sub-Menu*' if SET is simply pressed, however by using the UP and DOWN Buttons to change this to '*Configure*' and then pressing SET, the User can then enable or disable all the multiple options that will trip this Relay. The **FAILSAFE** option reverses the operation of the STOP Relay. Failsafe allows for the provision of signaling an Alarm on Power-Failure. If set to FAILSAFE, the software will not indicate the Relay has been activated when NOT in Alarm Mode.

4.14 **REMOTE Relay :** This is the Relay that would normally be connected (via connector J6) to a REMOTE monitoring facility. Just as in the STOP Relay (4.12), this option sets the conditions that will enable the REMOTE Relay.

4.15 **Beeper :** Configured in a similar way to the the STOP Relay (4.12), this option sets all the conditions that will enable the Beeper to sound an Alarm condition. **KEYPRESS** is the audible feed-back 'bip' whenever you press a Button.

4.16 **Alarm LED :** Configured in a similar way to the the STOP Relay (4.12), this option sets all the conditions that will enable the Alarm LED to blink RED Alarm

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4. USER & INSTALLER (OPERATIONS) SETUP (cont'd)

4.17 **Set LCD Contrast :** Changes the LCD Contrast as required. *(Factory Default 3)*

4.18 **Set LCD Backlight :** Changes the LCD Backlight Level as required. *(Factory Default 5)*

4.19 **User PIN :** A 4 character Password/PIN. *(Factory Default set at 1111)*

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5. INSTALLER ONLY (ENGINEERING) SETUP

Sometimes referred to as *ENGINEERING* SETUP. (Entered through a VALID INSTALLER PIN)

5.1 **Service Due :** A value set here will trigger a SERVICE DUE message once the SERVICE HOURS have incremented to this value. *(Factory Default is 10200 Hours - approx 14 months).*

5.2 **Safety Stop :** A YES here *(Factory Default NO)* will shut-down the Controller 14 days after a SERVICE DUE message has started to be displayed. This will force the system to be serviced (as it will not continue to run) in those installations where due to Health and Safety or other security reasons periodic service is critical.

5.3 **System Locked :** When set to YES *(Factory Default NO)* will LOCK-OUT the installation from working. Prevents an installation from operating if discovered for whatever reason to be dangerous.

5.4 **Service Hours :** This is the rough cumulative HOURS COUNTER telling you how long a system has been running. You are able to RESET this counter to ZERO by using the UP/DOWN Buttons to display RESET and then pressing SET. This is the option to use when resetting from a Service Due Alarm.

5.5 **Sol-A Hours :** This a rough cumulative HOURS COUNTER telling you how long Solenoid-A has actually been running. You are able to RESET this counter to ZERO (for example when a Solenoid is replaced) using the UP/DOWN Buttons to display RESET and then pressing SET.

~~5.6 **Sol-B Hours :** This a rough cumulative HOURS COUNTER telling you how long Solenoid-B (if fitted) has actually been running. You are able to RESET this counter to ZERO (for example when a pump is replaced) by using the UP/DOWN Buttons to display RESET and then pressing SET.~~

5.7 **Sol Pulse Time :** This value sets the length of the Solenoid ON-Pulse. *(Adjustable between 10-2500mS, the Factory Default is 250mS).*

5.8 **Activation Delay :** A value (in Seconds) to delay the activation of the unit on an initial pressure drop. Prevents immediate activation (with a subsequent pressure-creep) when for example large system circulation pumps cause a momentary circuit pressure dip when starting. *(Factory Default 0 - off).*

5.9 **Transducer Type (Span) :** The maximum span of the Transducer fitted to the system. *(Factory Default 10.0 Bar).*

5.10 **Transducer Cal :** A factory trimmed value *(Factory Default 50)* that can be used to adjust for critical installations that require greater accuracy. Adjustment outside of the Factory is not recommended as it requires specialist equipment to calibrate. *Recommended as a special order item from the factory.*

5.11 **Master PIN :** A 4 character Password/PIN.

6. FACTORY SETUP

(Entered through a VALID Factory PIN)

6.1 **Name :** A 16 character alphanumeric NAME (usually Company or Organisation name) that is permanently displayed during normal operation.

6.2 **Telephone :** A 16 character TELEPHONE which will be circulated on the display prompting the viewer to call in case of any serious error.

6.3 **Restrict User Options :** A YES/NO option *(Factory Default is NO)*. There are an awful lot of USER SETUP options. Customers will play and tinker and can really screw things up in the field. If set to YES, it restricts the USER to just being able to change (assuming they have a valid USER PIN);

Set Pressure
Pump-A Differential
Pressure Low Alarm ON/OFF Settings
Pressure High Alarm ON/OFF Settings
User PIN Entry

6.4 **Numeric only PIN: NOT APPLICABLE**

6.5 **ECO Mode :** With the ECO model allows the Controller to operate in a special power-saving ECOnomy mode. When operating in this mode the most noticeable effect is that the LCD Display goes DARK (pressing any button from 'DARK' mode will re-enable the display for 30 seconds or so - unless there is an error in which case the display always remains lit). This option is enabled in the appropriate ECO model Controllers.

6.6 **Factory PIN :** A 4 character Password/PIN.

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7. MATFAC

MATFAC is a useful Factory and Field Diagnostic Tool to check that the entire Pressurisation Unit is Functioning.

MATFAC stands for **MA**nufacturing **T**est **FAC**ility.

Using MATFAC, you can instantly check the operation of all the SOLENOID, STOP, and REMOTE VOLT-FREE Contacts and display the current PRESSURE.

7.1 **MATFAC ENTRY**

In order to enter MATFAC, start with the Controller POWERED-OFF. Now POWER-ON whilst holding depressed the DOWN (left-hand) Button until the words MATFAC appear in the display (about five seconds).

The only way to exit MATFAC is either to POWER-OFF or use the EXIT option.

MATFAC (MAnufacturing Test FACility)

When in MATFAC mode, A, B and EXIT will appear on the 2nd line of the LCD. They represent the three Control Buttons underneath.

7.1 **PRESSURE DISPLAY** :
The top left-hand corner will display the current pressure from the Transducer (or **ERR** if there is a problem with the Transducer or it's connection).

7.2 A. (Left-hand DOWN) Button
Pressing this Button (and keeping depressed) will switch ON simultaneously **SOLENOID-A** and the **STOP** VOLT-FREE RELAY.

7.3 B. (Centre UP) Button
Pressing this Button (and keeping depressed) will switch ON simultaneously **SOLENOID-B** *(if fitted)* together with the **REMOTE** VOLT-FREE RELAY.

7.4 EXIT. (Right-hand SET) Button
Pressing this Button will prompt you for a **Y** (Yes - exit MATFAC and REBOOT the system), **N** (No) or **EXIT** both will return you back to MATFAC.

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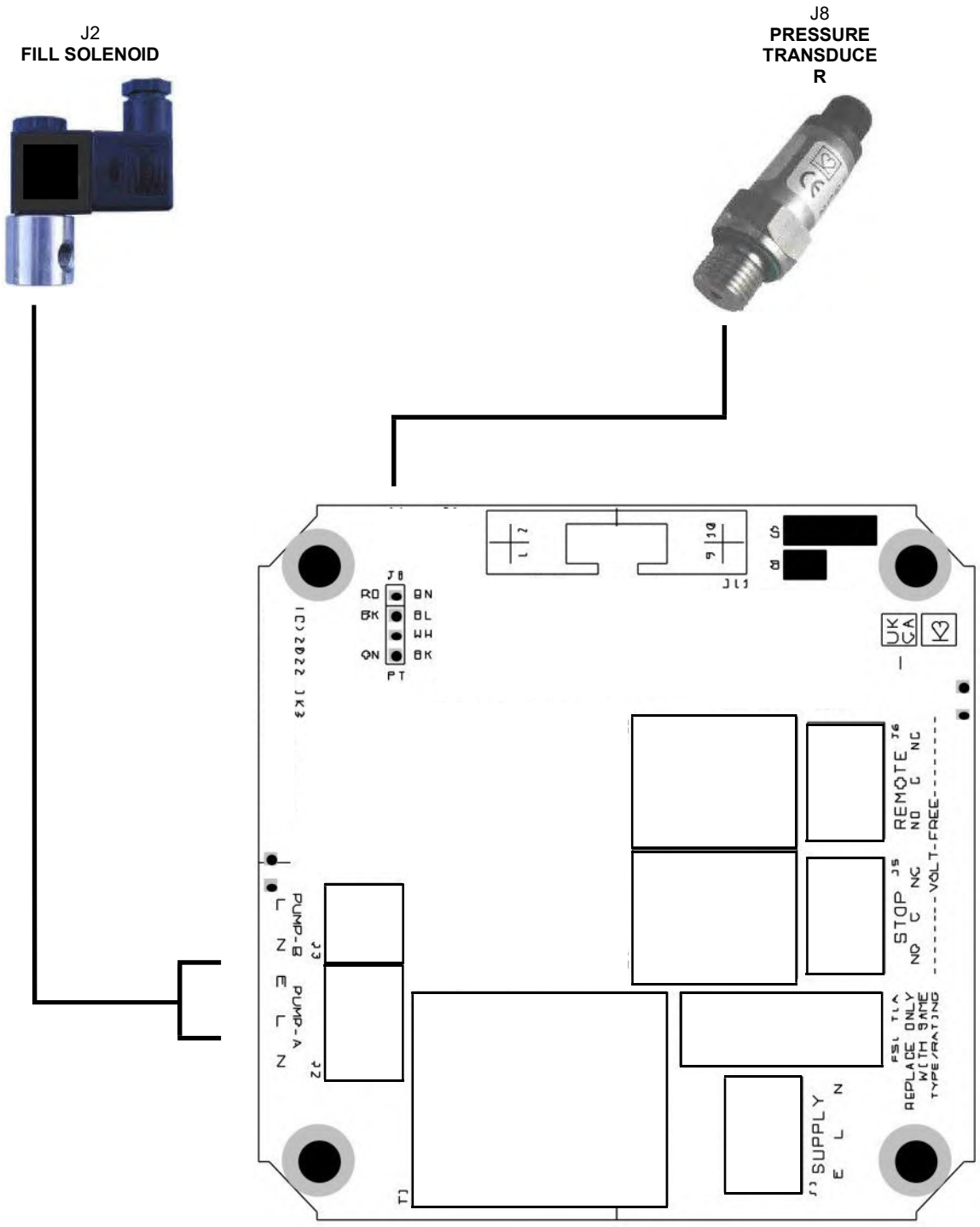
APPENDIX A.1 - INTERNAL CONNECTION



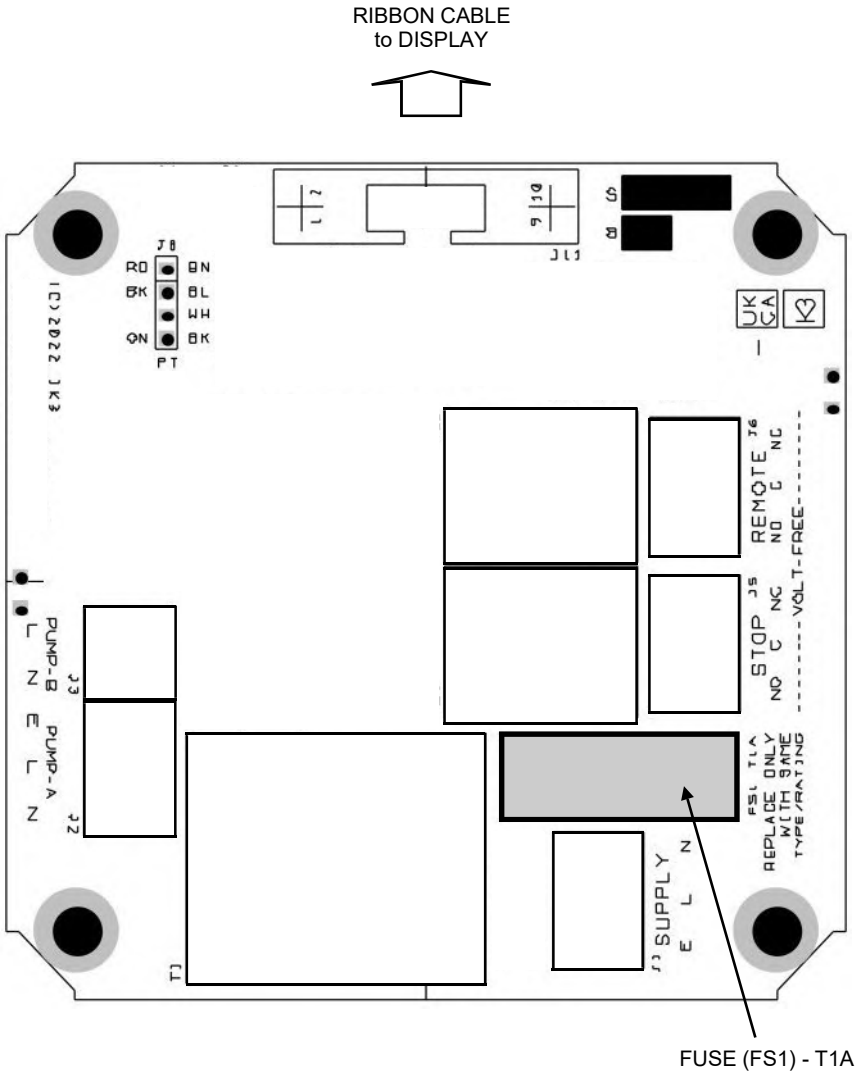
A.2 BG-Fill-Matic-D (internal equipment) simplified Connection.

APPENDIX B - FUSE PROTECTION

The entire equipment is protected by a single T1A (1A) Anti-Surge (Time-Delay) Fuse located at FS1 as shown below.

Should the circuit board or any of the solenoids critically malfunction, then this Fuse will open. Always replace any Fuse with one of the same type and rating.

To replace: **ENSURE equipment is POWERED-OFF at the SUPPLY**. Unscrew the four metal cabinet screws. Remove Lid. Unscrew the four plastic screws from the Controller face, prize-off the Transparent Fuse Cover, replace Fuse, replace Transparent Fuse Cover, replace the Controller face.



B.1 BG-Fill-Matic-D Internal Fuse Location.

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APPENDIX C - FACTORY DEFAULTS

	Default	*Enter your installation values here:-*
Service Due (Hours)	10200	
Safety Stop	N	
System Lock	N	
Service Hours (Elapsed Hours)	0	
Pump-A Hours (Elapsed Hours)	0	
-		
Solenoid Pulse Time (mS)	250	
Activation Delay (Seconds)	0	
Transducer Span (Bar)	10.0	
Transducer Calibration Factor	50	
END USER ADJUSTMENTS SHOWN IN BLUE		
Standby Mode	N	
Set-Pressure (Bar)	1.0	
Differential (Bar)	0.1	
Solenoid Fail Period (Minutes)	0	
End User PIN	1111	
Pressure Low Alarm ON (Bar)	0.8	
Pressure Low Alarm OFF (Bar)	0.9	
Pressure High Alarm ON (Bar)	2.4	
Pressure High Alarm OFF (Bar)	2.3	
Alarm Delay (Seconds)	5	
Leak Alarm (Minutes)	0	
Stop on Leak	Y	
STOP Relay Activation		
- Pressure Low	Y	
- Pressure High	Y	
- Water Leak	N	
- Service/Aux	N	
- System Fault	Y	
- Failsafe	N	
REMOTE Relay Activation		
- Pressure Low	Y	
- Pressure High	Y	
- Water Leak	Y	
- Service/Aux	Y	
- System Fault	Y	
- Failsafe	N	
Alarm Beeper Activation		
- Pressure Low	Y	
- Pressure High	Y	
- Water Leak	Y	
- Service/Aux	Y	
- System Fault	Y	
- Keypress	Y	

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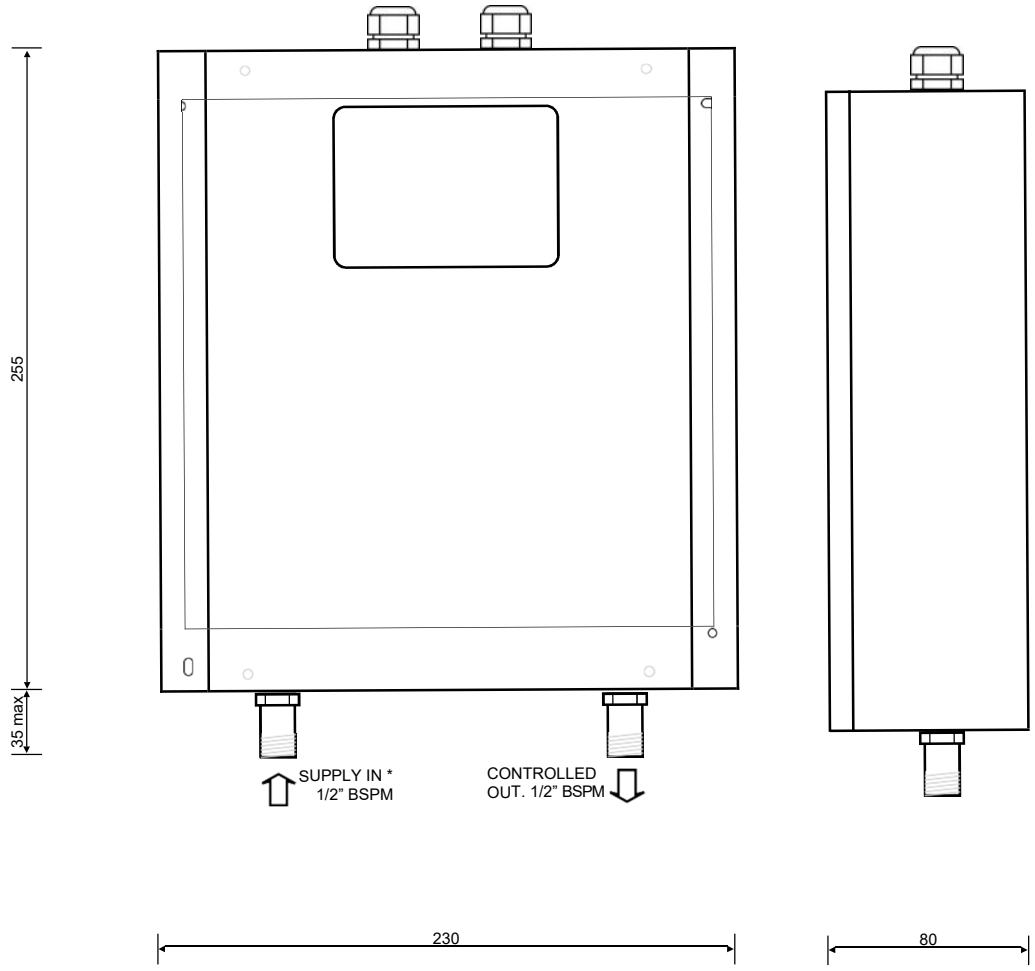
APPENDIX C - FACTORY DEFAULTS (cont'd)

		Enter your installation values here:-
Alarm LED Activation		
- Pressure Low	Y	
- Pressure High	Y	
- Water Leak	Y	
- Service/Aux	Y	
- System Fault	Y	
- System Lock	Y	

APPENDIX D - DIMENSIONS



All dimensions in millimetres (mm) unless otherwise indicated.
Dimensions & specifications subject to change without notice. E&OE.

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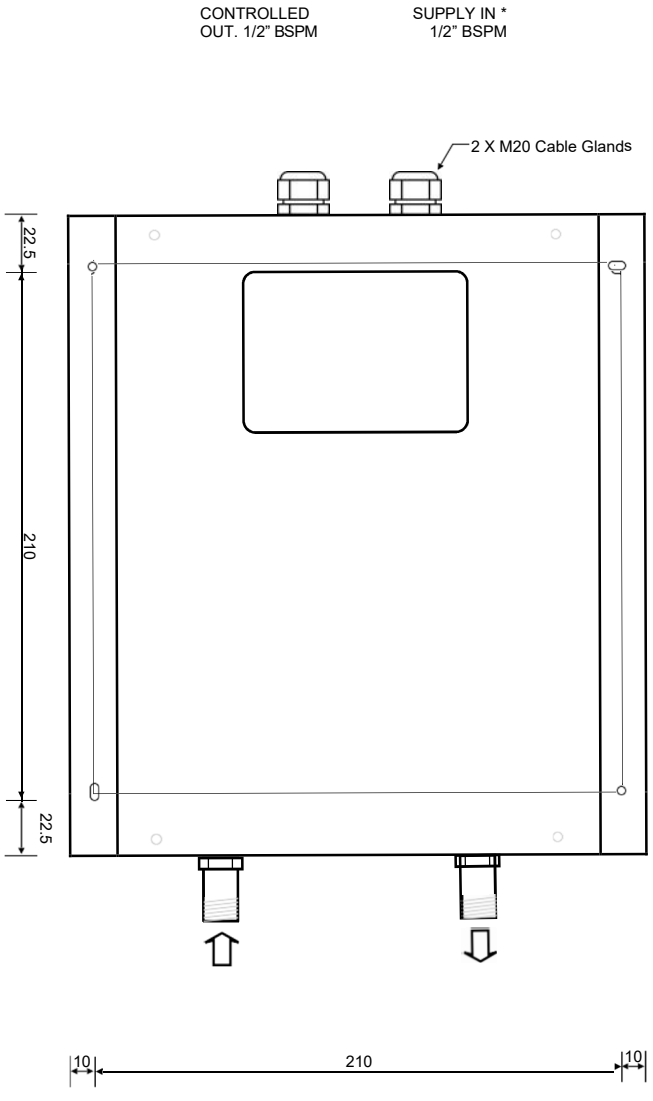
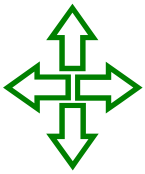
APPENDIX E - MOUNTING





**MOUNTABLE
AT ANY ANGLE**

*All dimensions in millimetres (mm). * approx. Mounting can be in any direction or at any angle)*
Dimensions & specifications subject to change without notice. E&OE.

APPENDIX F - SPECIAL FEATURES

This page can be removed for Security Reasons.

END USER PIN

The end user PIN is factory set at 1111

This can be changed by the end user or installer

INSTALLER PIN

The installer PIN is factory set at 7979

This can be changed by the installer but not the end user.

PIN CHANGES

After accessing the menu functions via the installer PIN, the installer can reset the end user or installer PIN numbers.

When the sub menus prompt for the appropriate PIN;

1. If the PIN is correct press the SET button four times to leave the PIN as shown. Each press of the SET button changes the flashing number to an asterisk ж until all four digits have been accepted

2. To adjust the PIN use the UP or DOWN arrows to select the desired PIN digit and press SET. The number changes to an asterisk ж and moves across to the next digit

3. When all digits are changed or kept the controller escapes the adjustment setting

4. **CAUTION** – Whilst the installer can change both the end user and installer PIN numbers, the end user cannot change the installer PIN if it is forgotten

5. **NAME & PHONE NUMBER** – These can only be changed using a factory PIN number. If you would like these units personalised please request at time of order – changes after delivery incur a manufacturer service / call out charge.

G. ORDERING INFORMATION & SPARES

Product Order Code:-

BG-FILL-MATIC-D

Spares Order Code:-

Fuse 1AT - Controller Fuse 1A Anti-Surge

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