

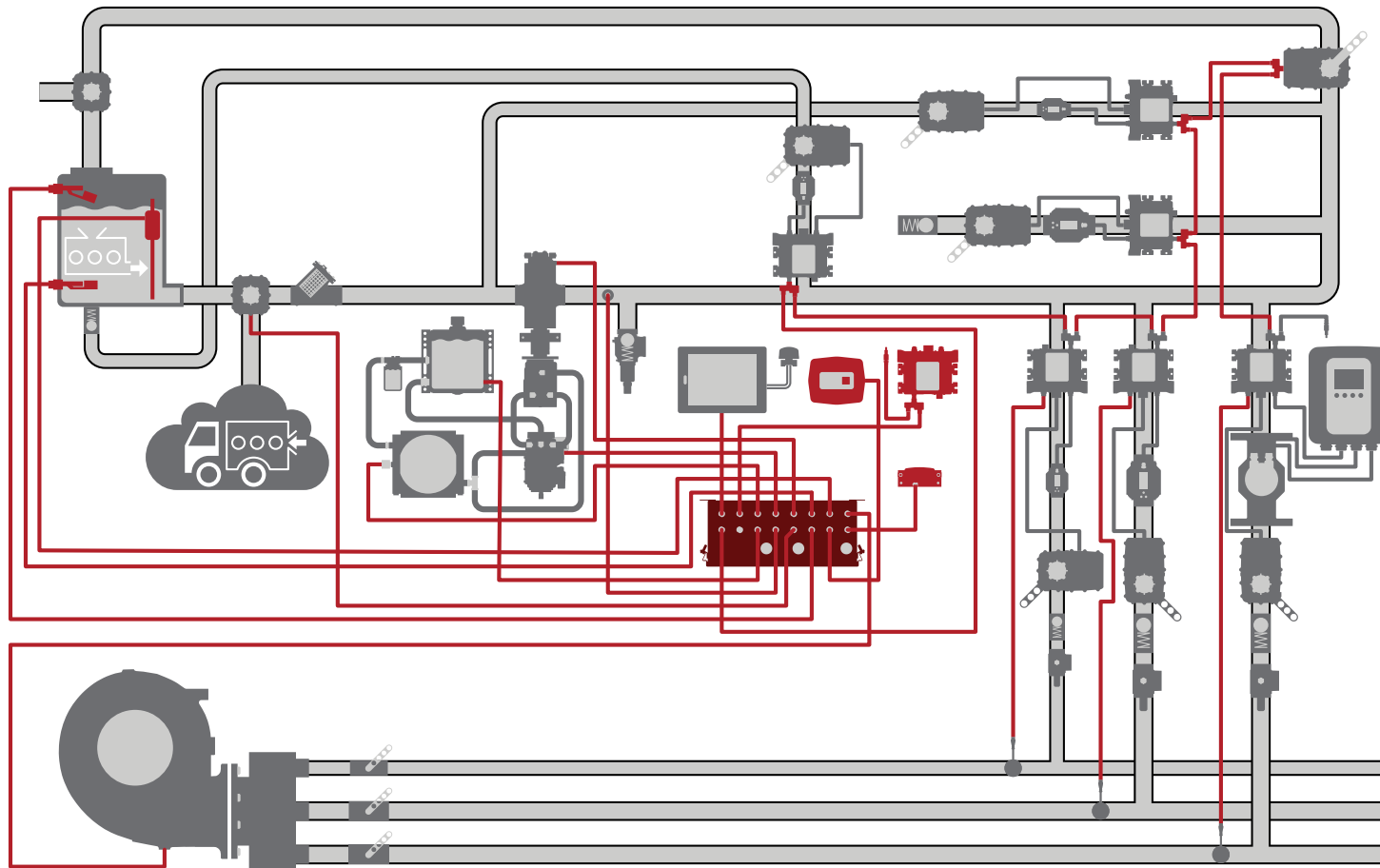
# WATEROUS

Form Number: F2927

Issue Date: Jun 29, 2021  
Revision Date: Aug 19, 2021

## AQUIS ULTRAFLOW—Control System

### Installation and Operation



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# Table of Contents

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<b>Safety</b>	<b>4</b>	<b>Installation</b>	<b>36</b>
Safety Precautions	4	Installation Overview	36
<b>Introduction</b>	<b>5</b>	Preparing for the Installation	36
Using this Document	5	Modifying the Equipment	36
Viewing the Document Electronically	5	Additional Documentation	36
Printing the Document	5	Optional Equipment	36
<b>Product Overview</b>	<b>6</b>	Determining the Control Box Location and Orientation	37
AQUIS ULTRAFLOW Industrial Foam Proportioner System	6	Determining Cable and Wire Routing	37
Control Box and Components	10	Electrical and Cable Connections—Overview	38
Discharge Line Assemblies and Valves	11	Plumbing Layout	40
Control Box	12	Connecting Power to the Control Box	42
Control Box Connectors	14	Installing the Optional Manual Override	43
Concentrate Supply Level Switch	16	Wiring the Source-Select Switch	44
Manual Override Switch	18	Connecting Pump Discharge Pressure Sensor	45
Manual Override Relay	20	Connecting the Node Controllers	46
Terminating Resistor	22	Connecting the Tellurus Display	47
Split CANbus Cable	23	Connecting the Concentrate Supply Level Sensors	48
2.0 Meter CANbus Extension Cable	24	Connecting the Concentrate Pump, Pressure Sensor, and Source Select Valve	49
0.5 Meter CANbus Extension Cable	25	Connecting the Hydraulic Fluid Reservoir Sensors, Suction Strainer, and Hydraulic Pump	50
3.0 Meter Sensor Cable	26	Connecting the Manual Override	51
0.5 Meter Sensor Cable	27	Connecting to a Node Controller	53
Manual Override Panel Cable	28	Connecting the 1-Inch DLA	55
Manual Override Power Relay Panel Cable	29	Connecting the 2-Inch DLA and Paddlewheel Flowmeter	56
Concentrate Pump Speed Sensor Cable	30	Connecting the Priming Valve	57
Concentrate Pump Speed Sensor Cable—Schematic	31	Connecting the Low-Flow Bypass Line	58
Hydraulic Pump Swashplate Control Cable	32	Connecting the Supply Tank Fill Line	59
Hydraulic Pump Swashplate Control Cable—Schematic	33	<b>Operation</b>	<b>60</b>
Supply Tank Level Cable—Installer Supplied	34	Enabling the Manual Override	60
Supply Tank Level Cable Schematic —Installer Supplied	35	<b>Maintenance</b>	<b>61</b>
		Maintenance Schedule	61

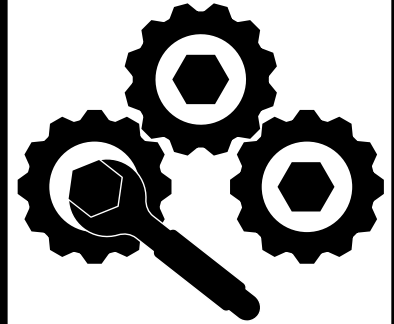
## Safety Precautions

- Read and understand all the associated documentation before you begin the installation.
- Read and understand all the notices and safety precautions.
- Be aware that these instructions are only guidelines and are not meant to be definitive. Contact Waterous when you have questions about installing, operating, or maintaining the equipment.
- Do not install the equipment if you are not familiar with the tools and skills needed to safely perform the required procedures—proper installation is the responsibility of the purchaser.
- Do not operate the equipment when safety guards are removed.
- Do not modify the equipment.
- Regularly check for leaks and worn or deteriorated parts.

## NOTICE

### Modification

- **Modifying the equipment can damage components and void your warranty.**
- **Do not modify the system or any of its components.**



## NOTICE

### Before Operation

- **Read and understand all the instructions provided.**
- **Check all fluid levels and replenish if necessary.**
- **Remove all shipping plugs and install the operation plugs or caps.**



Use this document to install and operate your Waterous equipment. Understand the following conditions before continuing with the document:

- The instructions may refer to options or equipment that you may not have purchased with your system.
- The illustrations in this document are intended to convey concepts. Do not use the illustrations to determine physical attributes, placement, or proportion.
- Understand that your application may require additional steps, that are not described in the illustrations or instructions, to perform the installation.
- The equipment described in this document is intended to be installed by a person or persons with the necessary skills and knowledge to perform the installation.
- The equipment described in this document is intended to be operated by a person or persons with the basic knowledge of operating similar equipment.
- The information in this document is subject to change without notice.

This document is divided into the following sections:

#### SAFETY

This section describes general precautions and alert symbols that are in this document.

#### INTRODUCTION

This section is an overview of the document.

#### PRODUCT OVERVIEW

This section describes the components that make-up the system.

#### INSTALLATION

This section describes the installation and initial setup procedures.

#### OPERATION

This section describes the equipment operation.

#### MAINTENANCE

This section describes any required maintenance.

## Using this Document

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Use the guidelines below when viewing this document.

### Viewing the Document Electronically

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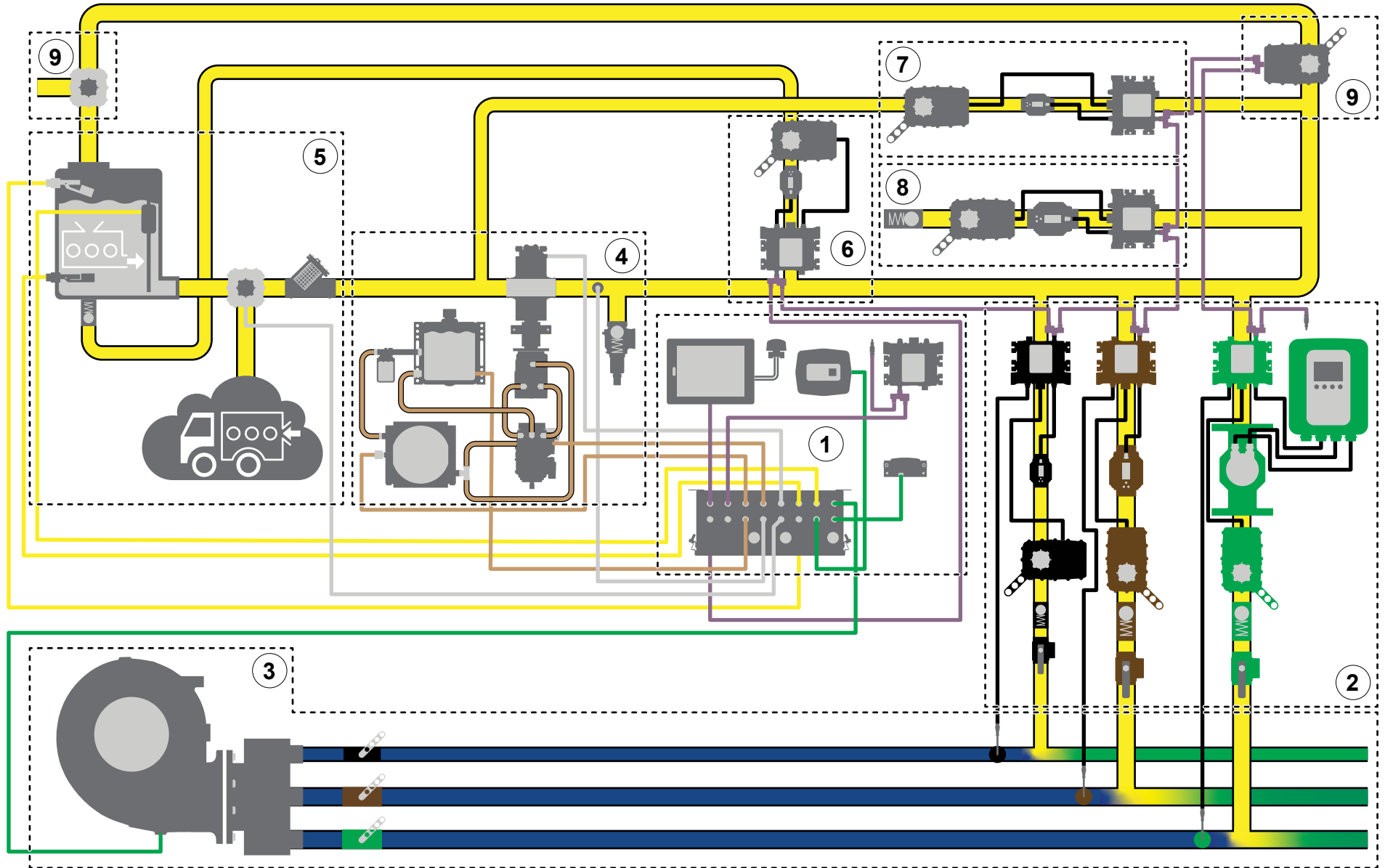
- View this document in landscape orientation.
- Use the table of contents to navigate directly to that section.
- Text **with this appearance** is linked to a reference.

### Printing the Document

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- The document is viewed the best when printed in color.
- The *print on both sides* and *flip on long edge* features can provide the best results.
- Use a 3-ring binder to store the document.

# AQUIS ULTRAFLOW Industrial Foam Proportioner System



## AQUIS ULTRAFLOW Industrial Foam Proportioner System

The AQUIS ULTRAFLOW industrial foam proportioner system supplies concentrate into a solution-capable discharge line. A Tellurus™ touchscreen display, or human machine interface (HMI), shows system activity, and provides control over the system using a CANbus protocol. Foam concentrate is sourced from an on-board supply tank or an auxiliary source. The concentrate pump distributes concentrate through the discharge line assembly (DLA) using hydraulic components, where it is measured, controlled, and introduced into the solution-capable discharge line to produce foam solution. Understand that your application will include all or portions of the components described.

Subsystem	Description
1 Control system	<p>This monitors and controls the foam proportioning system. The components in this subsystem include:</p> <ul style="list-style-type: none"> <li>• Tellurus display (HMI)—this displays system operation and provides control of the system.</li> <li>• Control box—this connects to various components in the system and contains the programmable logic controllers (PLC).</li> <li>• Manual override switch—this disables the automatic control of the concentrate control valves.</li> <li>• Power disconnect relay—this power relay enables and disables power to the DLA.</li> <li>• Remote I/O—this adds a node controller to the system for additional options required in your application.</li> <li>• Various cables—these provide communication and power to system components.</li> </ul>
2 Discharge line assembly	<p>This manages the concentrate injected into the solution-capable discharge. The system can control up to 19 DLAs. The components in this subsystem include:</p> <ul style="list-style-type: none"> <li>• Node controller—this connects to, and controls, the concentrate control valve, reads the flowmeters and the discharge pressure transducer.</li> <li>• Split CANbus cable—this connects the node controllers to one another and the control box.</li> <li>• DLA terminating resistor—this terminates the CANbus connection on the last node controller or valve in the CANbus chain.</li> <li>• Concentrate control valve—this controls the concentrate flow.</li> <li>• Magnetic flowmeter—this measures the concentrate flow.</li> <li>• Check valve—this prevents contamination of concentrate by preventing reverse fluid flow in the line.</li> <li>• Cal/Inject valve—this allows you to divert and collect water or concentrate when calibrating the your system.</li> </ul>
3 Solution-capable discharge	<p>This includes the installer-supplied water pump, distribution manifold, plumbing, and additional components that produce water flow. Additional components in this subsystem include:</p> <ul style="list-style-type: none"> <li>• Paddlewheel flowmeter—this measures the amount of water flowing in the discharge. <b>Note:</b> <i>You can install the paddlewheel flowmeter upstream or downstream of where the concentrate is injected into the waterway.</i></li> <li>• Water pump pressure transducer—this measures the pressure at the pump discharge. <b>Note:</b> <i>Some applications prohibit measuring discharge pressure at the pump, in those applications alternative measurement methods are used.</i></li> <li>• Solution discharge pressure transducer—this measures the pressure at the solution capable discharge.</li> </ul>

## AQUIS ULTRAFLOW Industrial Foam Proportioner System

Subsystem	Description
4 Concentrate pump	<p>These components support, control, and power the concentrate pump. The components in this subsystem include:</p> <ul style="list-style-type: none"> <li>• Concentrate pump—this circulates the foam concentrate through the system.</li> <li>• Hydraulic motor—this drives the concentrate pump.</li> <li>• Hydraulic pump—this drives the hydraulic motor.</li> <li>• Hydraulic fluid reservoir—this contains the hydraulic fluid supply.</li> <li>• Hydraulic fluid filter—this filters the hydraulic fluid.</li> <li>• Hydraulic fluid heat exchanger—this cools the hydraulic fluid.</li> <li>• Hydraulic fluid temperature sensor—this measures the hydraulic fluid temperature.</li> <li>• Hydraulic fluid level sensor—this monitors the hydraulic fluid level in the reservoir.</li> <li>• Pressure transducer—this measures the pressure in the concentrate discharge line.</li> <li>• Pressure relief valve—this limits the pressure in the concentrate discharge manifold by opening when the pressure reaches a predetermined level.</li> </ul>
5 Concentrate supply	<p>This contains components that contain or supply foam concentrate for the system. The components in this subsystem include:</p> <ul style="list-style-type: none"> <li>• Concentrate supply tank—this contains the on-board foam concentrate supply.</li> <li>• Tank-full sensor—this indicates a tank full condition to the system.</li> <li>• Tank-low sensor—this indicates a tank low condition to the system.</li> <li>• Tank level sensor—this is an installer supplied sensor and display that indicates the supply level in the tank.</li> <li>• Concentrate pump intake select valve—this is an installer supplied, 2 position valve, and additional components that sources concentrate from an on-board tank or an auxiliary supply. A signal is provided to the system to ignore the on-board tank sensors when sourcing concentrate from an auxiliary supply.</li> <li>• Concentrate strainer—this collects debris that would otherwise flow through the system and could damage the concentrate pump.</li> </ul>
6 Concentrate supply refill line	<p>This allows you to fill the on-board tank from an external source. The components in this subsystem include:</p> <ul style="list-style-type: none"> <li>• Node controller—this connects to the fill valve and flowmeters.</li> <li>• Fill line control valve—this controls the flow of concentrate.</li> <li>• Magnetic flowmeter—this measures the flow of concentrate.</li> <li>• Split CANbus cable—this connects the node controllers to one another and the control box.</li> <li>• Check valve—this prevents reverse fluid flow in the line.</li> </ul>

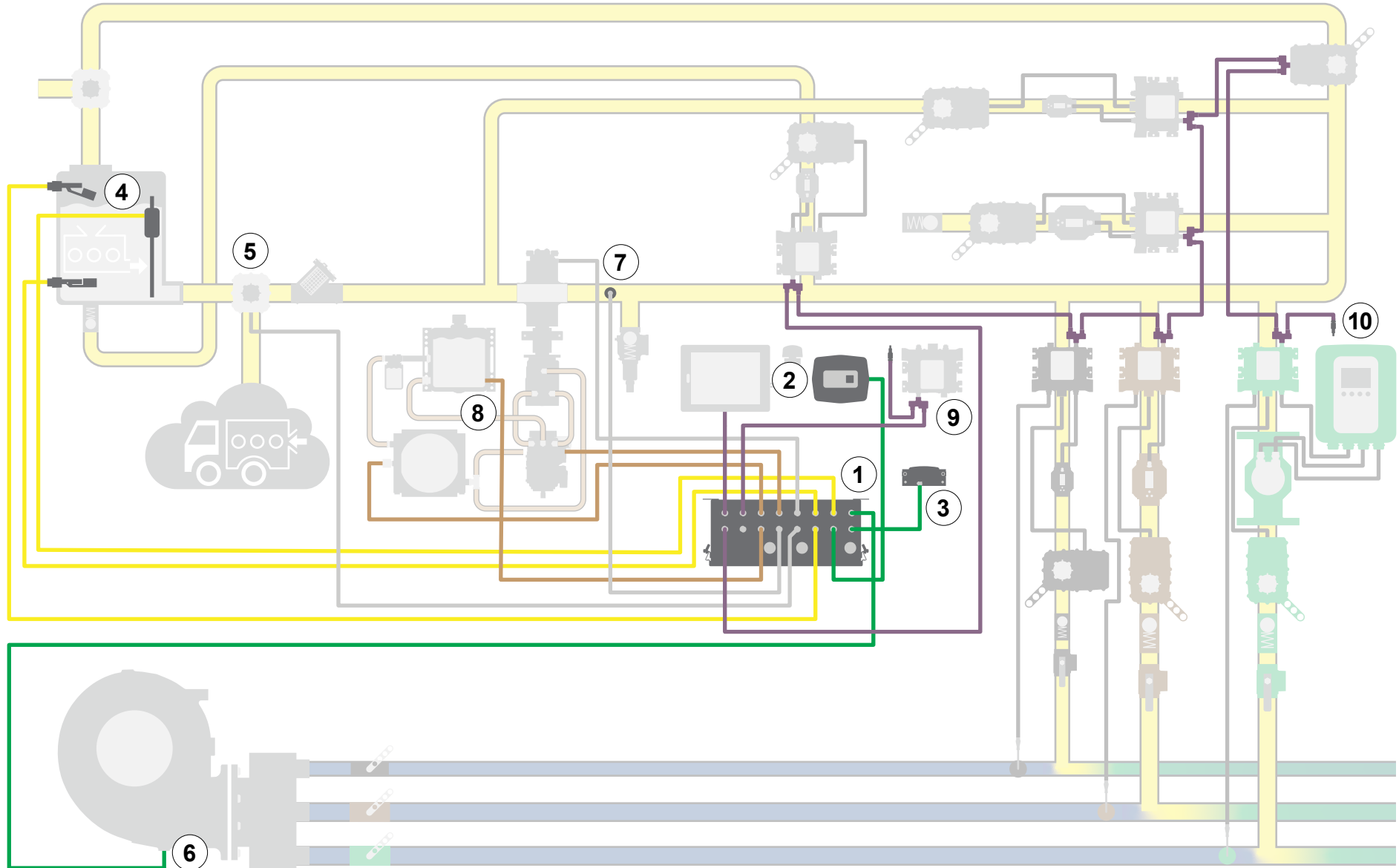


## AQUIS ULTRAFLOW Industrial Foam Proportioner System

Subsystem	Description
7 Low-flow bypass line	<p>This returns a portion of the pumped concentrate in the supply line back to the pump inlet when the desired concentrate output requires the pump to operate at an RPM that is lower than possible by the pump. The components in this subsystem include:</p> <ul style="list-style-type: none"> <li>• Node controller—this connects to the low-flow control valve, flowmeters.</li> <li>• Low-flow valve—this controls the concentrate return flow.</li> <li>• Magnetic flowmeter—this measures the flow of concentrate.</li> <li>• Split CANbus cable—this connects the node controllers to one another.</li> </ul>
8 Transfer line	<p>This allows you to transfer or relay concentrate from the apparatus to another location. The components in this subsystem include:</p> <ul style="list-style-type: none"> <li>• Node controller—this connects to and controls the concentrate control valve, flowmeters.</li> <li>• Split CANbus cable—this connects the node controllers to one another and the control box.</li> <li>• Concentrate control valve—this controls the concentrate flow.</li> <li>• Magnetic flowmeter—this measures the concentrate flow.</li> <li>• Check valve—this prevents reverse fluid flow in the line.</li> </ul>
9 Priming line	<p>This evacuates air from the concentrate pump inlet as the system primes before operation. The components in this subsystem include:</p> <ul style="list-style-type: none"> <li>• Priming valve—this opens to allow air to evacuate the line before operation.</li> <li>• Split CANbus cable—this connects the node controllers to one another and the control box.</li> <li>• Prime bypass line—this is an installer-supplied valve that prevents contaminating the concentrate during training. When water is substituted for concentrate during training or testing, and you have concentrate in the supply tank, this bypass valve prevents water from contaminating the concentrate supply. <b>Note:</b> <i>You must drain any remaining water in the line before priming the system with concentrate to prevent contamination.</i></li> </ul>

## Control Box and Components

The control system monitors and controls the foam proportioning system. It uses information from various sensors, inputs, and uses CANbus protocol to manage the transport of concentrate throughout your application. Refer to the illustration and the table to learn how the control system operates the foam proportioner.

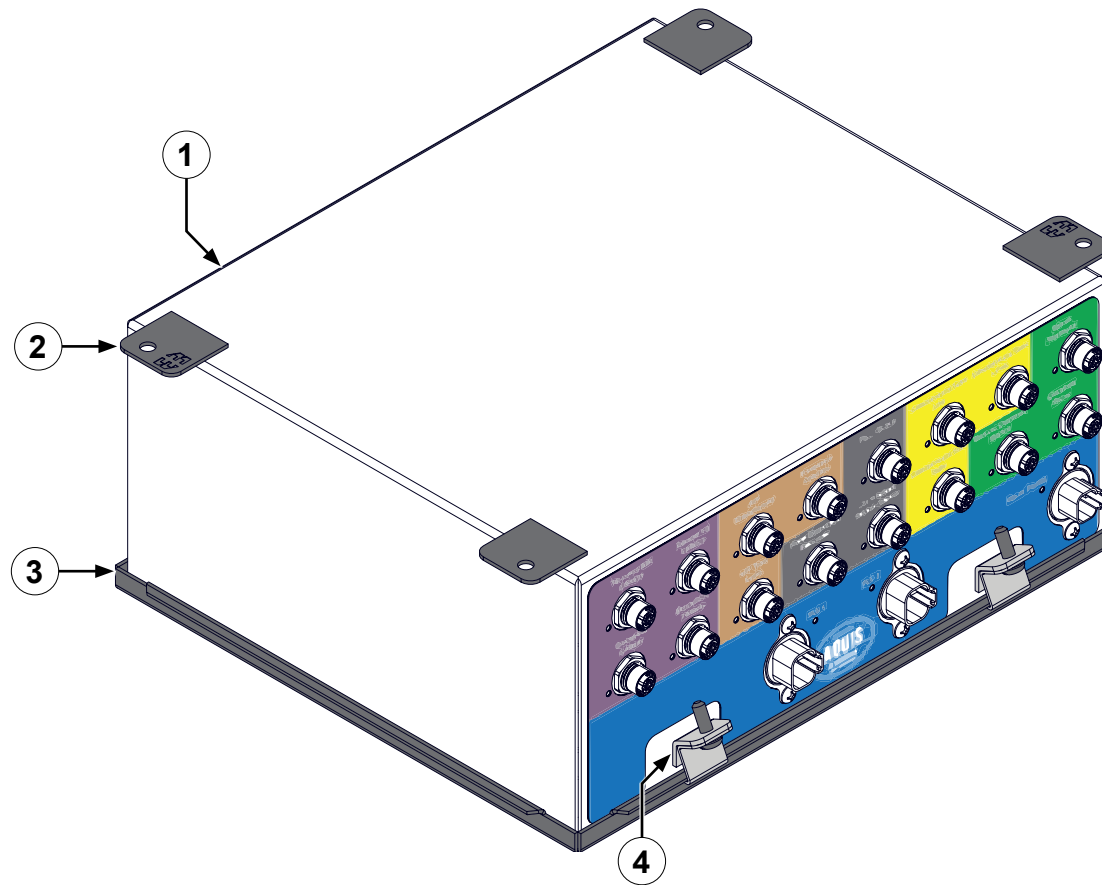


## Discharge Line Assemblies and Valves

Subsystem	Description
1 Control box	This connects to various components in the system and contains the programmable logic controller (PLC).
2 Manual override switch	This disables the automatic control of the concentrate control valves.
3 Power disconnect relay	This power relay enables and disables power to the DLA.
4 Supply tank level sensors	This signals to the control box whether the supply tank is at full or low. Alternatively, an installer supplied system can display an approximate supply level.
5 Concentrate pump intake select valve	This is an installer supplied, 2 position valve, and additional components that sources concentrate from an on-board tank or an auxiliary supply. A signal is provided to the system to ignore the on-board tank sensors when sourcing concentrate from an auxiliary supply.
6 Water pump pressure transducer	This measures the pressure at the pump discharge.
7 Solution discharge pressure transducer	This measures the pressure at the solution capable discharge.
8 Hydraulic control	This monitors and controls the hydraulic system.
9 Remote I/O	This adds a node controller to the system for additional options required in your application.
10 Terminating resistor	This connects to the split CANbus cable female socket connector on the last DLA in the system.

## Control Box

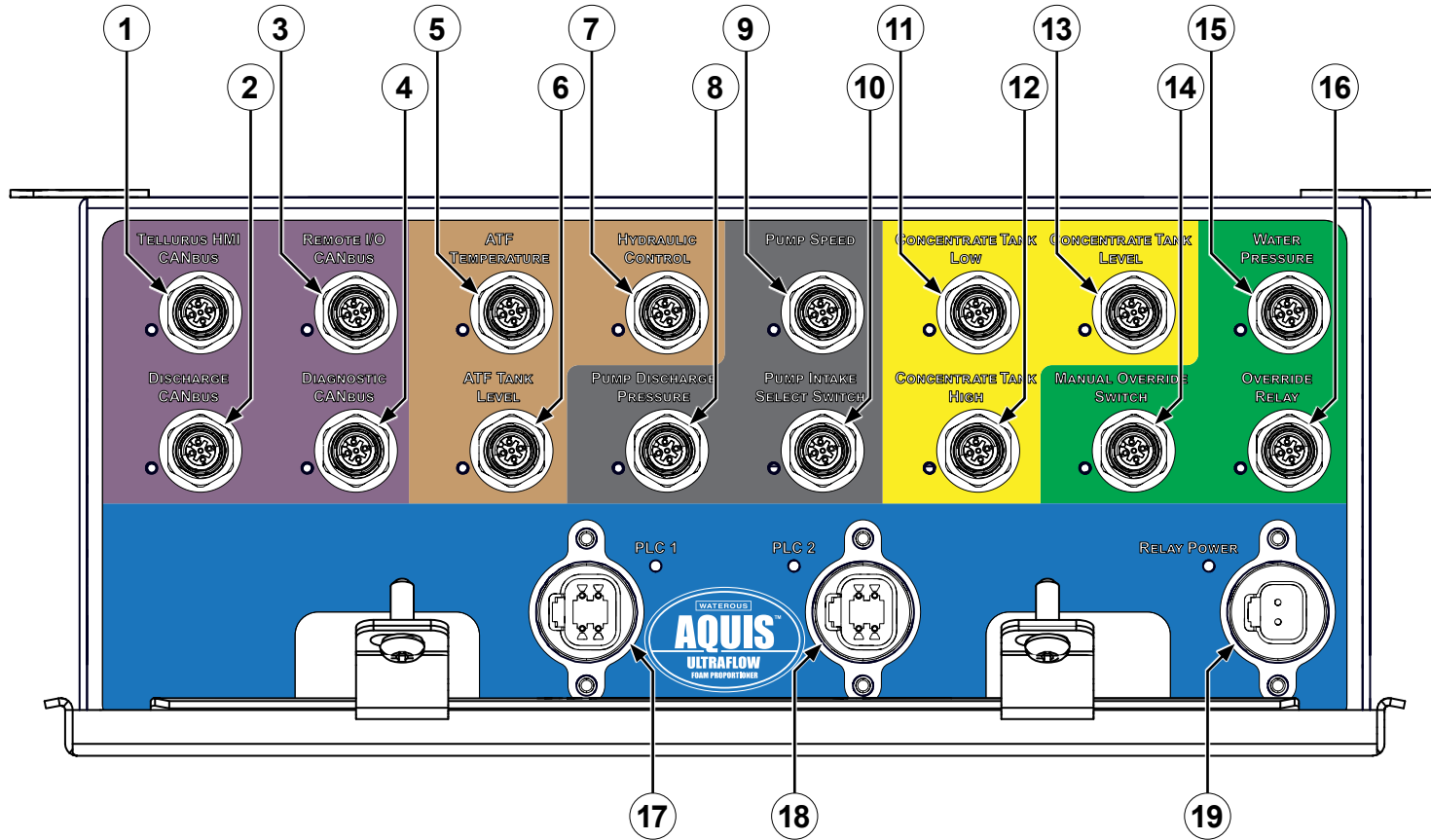
The control box connects to various components in the system to monitor and control the foam proportioning system. It contains a main PLC, with an option for a secondary backup PLC.



## Control Box

Feature	Description
1 Control box	This houses control electronics and PLCs.
2 Mounting tab	This mounts the box to the apparatus.
3 Cover	This is the sealed IP67 rated cover for the box.
4 Cover latch	This secures the cover to the box.

# Control Box Connectors

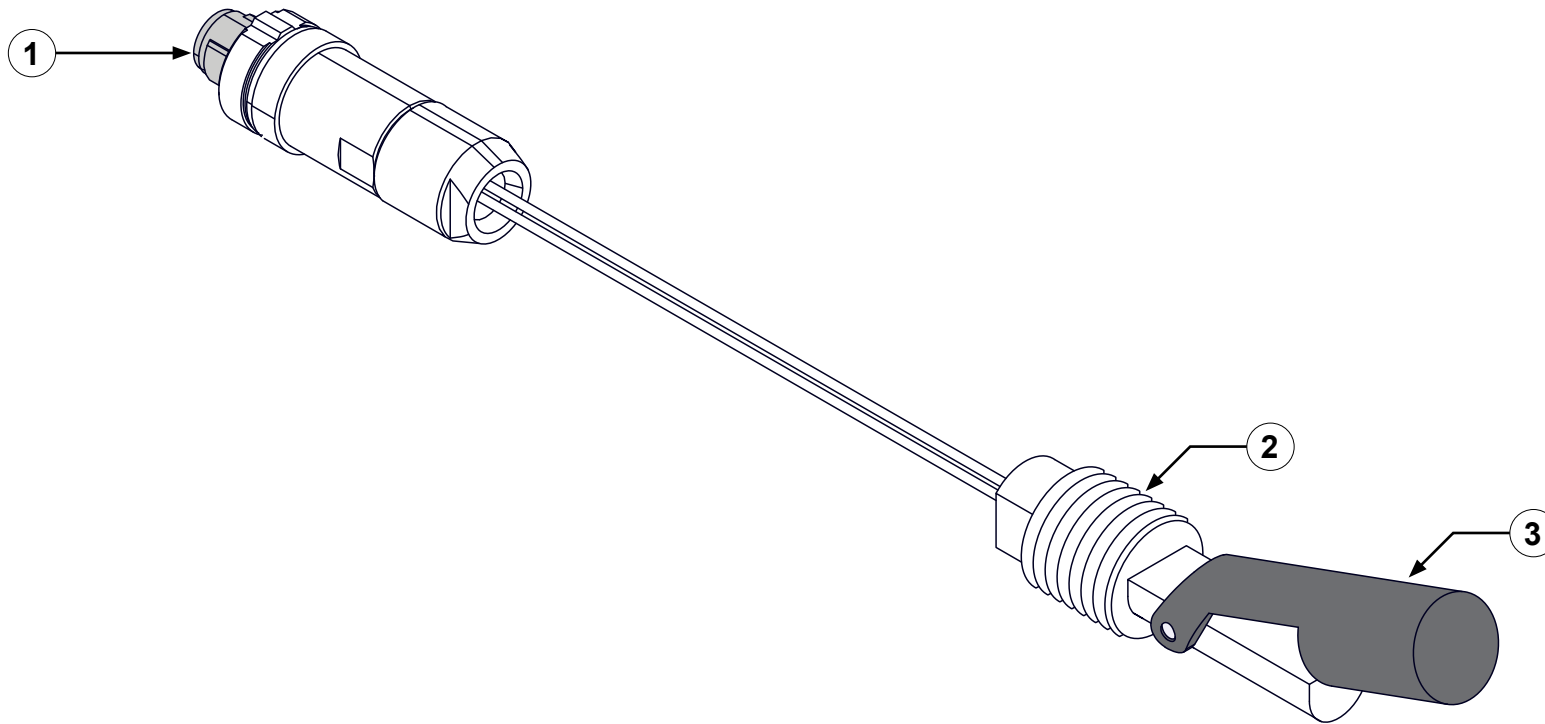


## Control Box Connectors

Feature	Description
1 Tellurus HMI CANbus	This communicates the CANbus signal to the Tellurus display.
2 Discharge CANbus	This communicates the CANbus signal to the node controllers on each DLA.
3 Remote I/O CANbus	This communicates the CANbus signal to an additional node controller for additional options required in your application.
4 Diagnostic CANbus	This communicates the CANbus signal to diagnostic equipment, or external CANbus truck control systems for remote monitoring or control.
5 Hydraulic fluid temperature sensor	This measures the hydraulic fluid temperature in the reservoir tank.
6 Hydraulic fluid tank level	This monitors the hydraulic fluid level in the reservoir tank.
7 Hydraulic control	This controls the hydraulic pump that powers the hydraulic motor.
8 Pump discharge pressure	This measures the pressure in the concentrate manifold after the concentrate pump.
9 Pump speed	This measures the concentrate pump speed.
10 Pump intake select switch	This signal is provided by the apparatus to determine if the concentrate is sourced from an on-board or auxiliary supply.
11 Concentrate tank low	This connects to a tank-level switch that indicates the concentrate supply in the tank is low.
12 Concentrate tank high	This connects to a tank-level switch that indicates the concentrate supply tank is full.
13 Concentrate tank level	This is an optional installer supplied sensor that indicates the concentrate supply level in the tank.
14 Manual override switch—optional	This disables the automatic control of the concentrate control valves.
15 Water pressure transducer	This measures the water pump discharge pressure.
16 Override relay—optional	This 200 A relay enables and disables power to the DLAs—disabling automatic control.
17 PLC 1—power input	This provides power to the primary PLC in the control box.
18 PLC 2—power input—optional	This provides power to the secondary PLC in the control box.
19 Relay power—input—optional	This provides control to the 200 A override relay for toggling between automatic and manual DLA valve control.

## Concentrate Supply Level Switch

The switch activates and deactivates as the concentrate level in the tank changes.



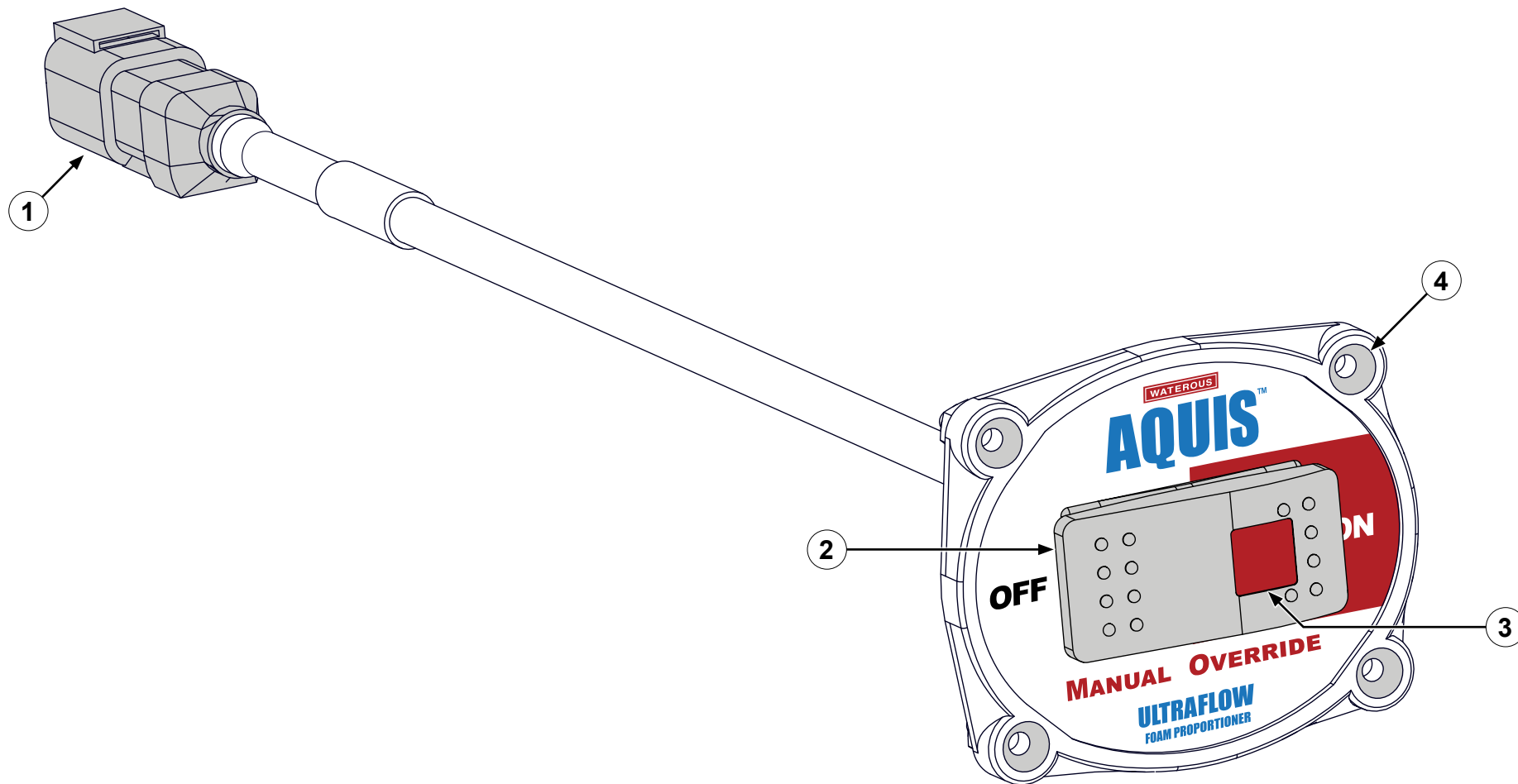


## Concentrate Supply Level Switch

Feature	Description
1 M12 connector	This connects to the sensor cable from the control box and power.
2 Body	This threads into the tank—1/4 NPT.
3 Float	This determines the concentrate level in the tank.

## Manual Override Switch

The manual override switch disables the automatic control of the concentrate control valves.

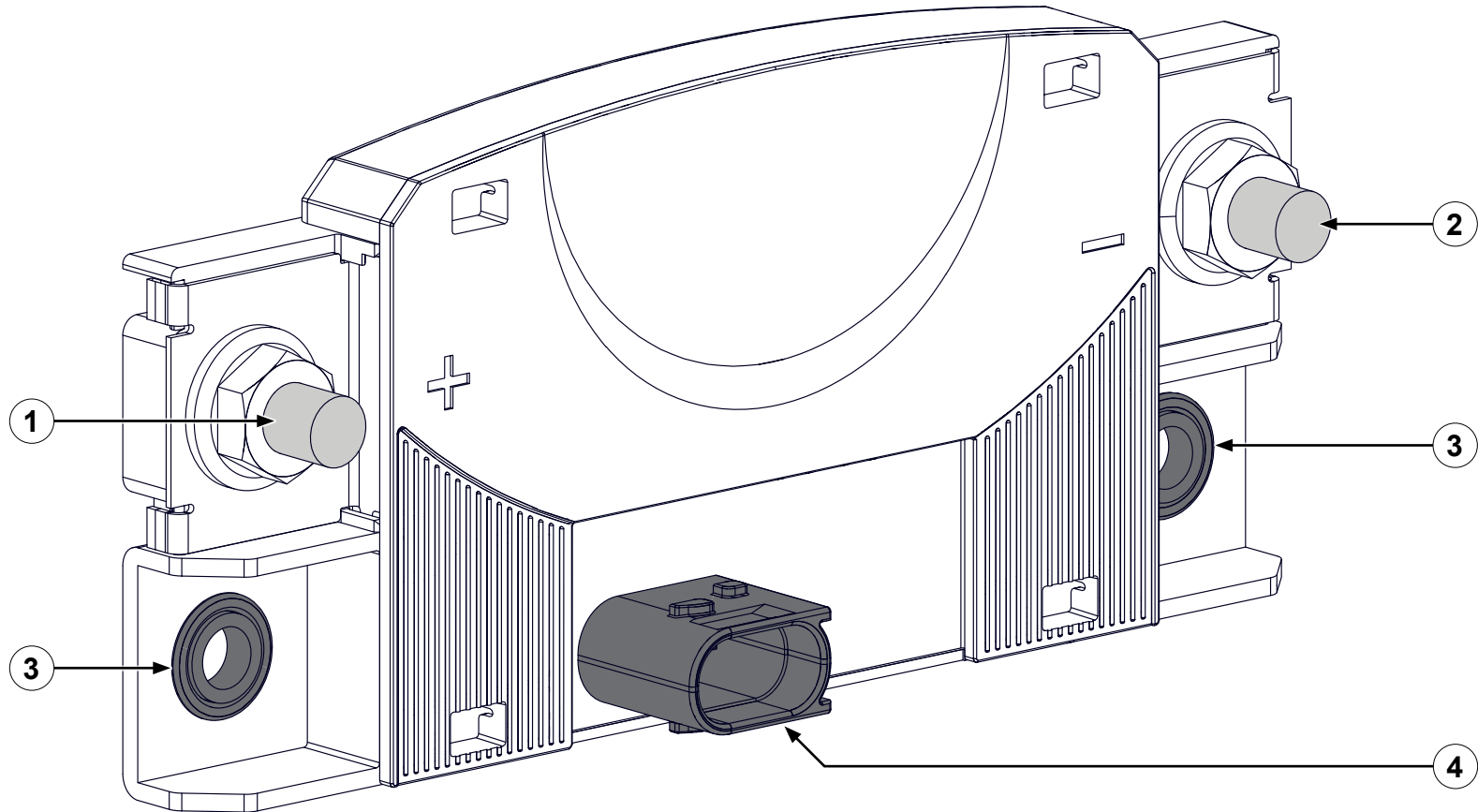


## Manual Override Switch

Feature	Description
1 Connector	This connects to the cable from the control box.
2 Switch	This switches the override <i>ON</i> or <i>OFF</i> .
3 Switch LED	This illuminates when the manual override is turned on.
4 Mounting hole	This mounts the manual override switch to the apparatus.

## Manual Override Relay

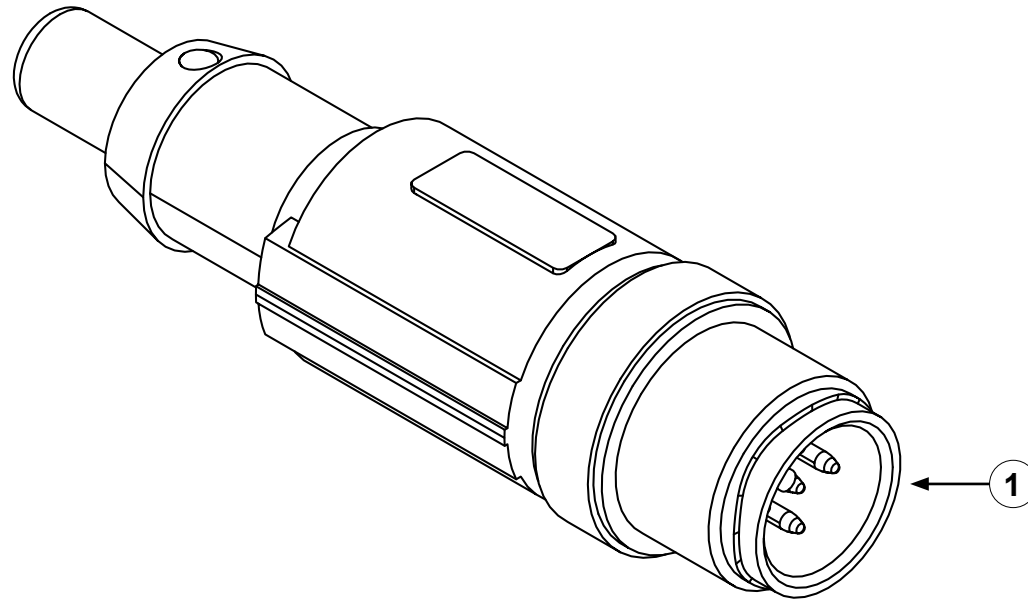
The power relay works with the optional manual override switch to disable automatic control of the concentrate control valves.



## Manual Override Relay

Feature	Description
1 Power input post (+)	This connects to the bus power.
2 Power output post (-)	This connects to the DLA power.
3 Mounting hole	This mounts the power relay to the apparatus.
4 Relay connector	This connects to the cable from the control box.

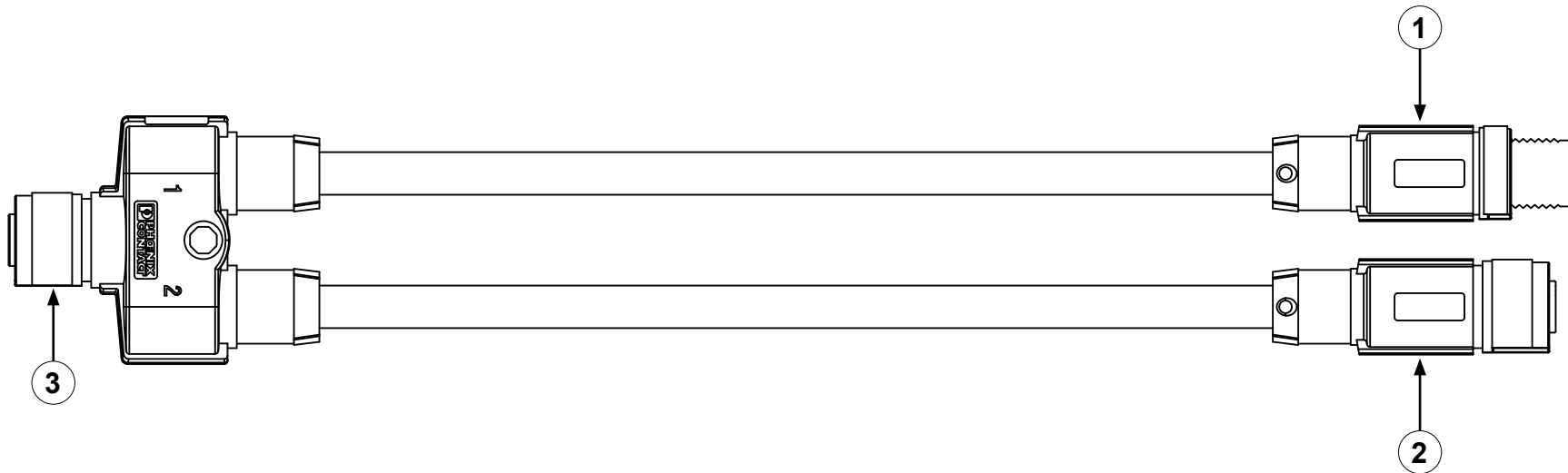
## Terminating Resistor



Feature	Description
1 Terminating resistor	This connects to the split CANbus cable female socket connector on the last DLA in the system.

## Split CANbus Cable

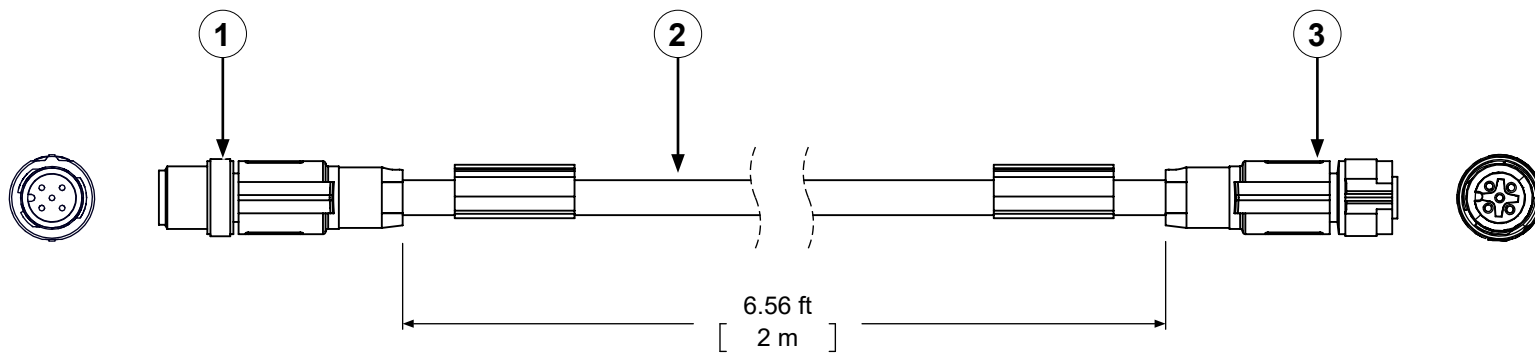
The split CANbus cable communicates data between the CANbus connections. It is typically a violet color.



Feature	Description
1 CANbus output	This connects to the next node in the chain or the terminating resistor—female plug.
2 CANbus input	This connects to the previous node in the chain or the control box discharge CANbus—male socket.
3 Node connector	This connects to the node controller—male socket.

## 2.0 Meter CANbus Extension Cable

The CANbus extension cable communicates data between the CANbus connections. It is typically a violet color. The CANbus extension cable is not interchangeable with the sensor extension cable. **Note:** You can connect 2 or more cables together to achieve a desired length.

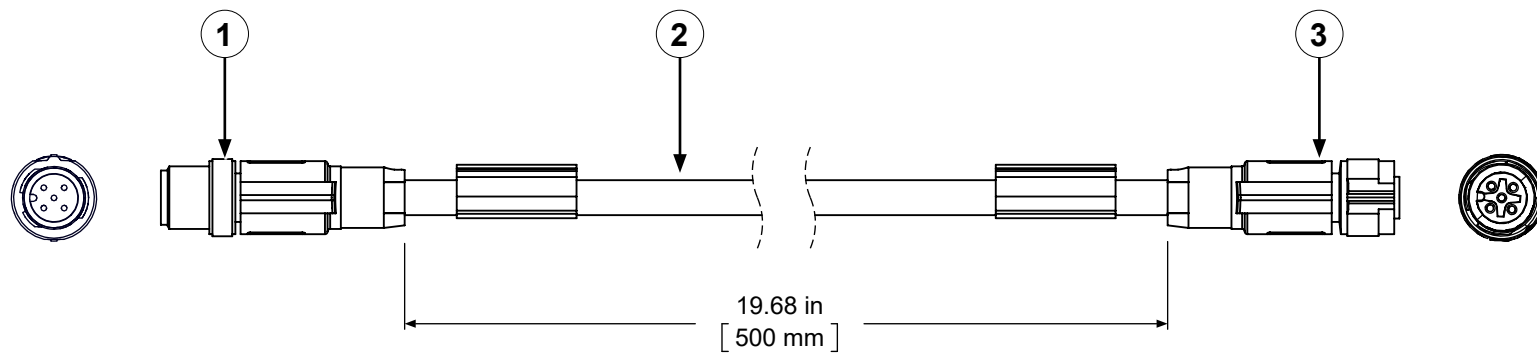


Feature	Description
1 M12 connector	This is a male connector.
2 Cable	This is a violet cable jacket.
3 M12 connector	This is a female connector.



## 0.5 Meter CANbus Extension Cable

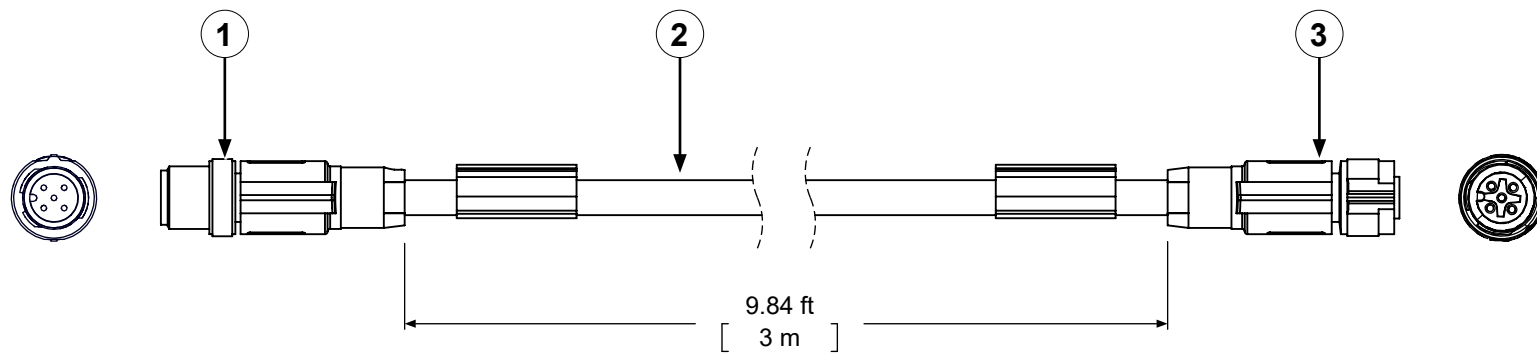
The CANbus extension cable communicates data between the CANbus connections. It is typically a violet color. The CANbus extension cable is not interchangeable with the sensor extension cable. **Note:** You can connect 2 or more cables together to achieve a desired length.



Feature	Description
1 M12 connector	This is a male connector.
2 Cable	This is typically a violet cable jacket.
3 M12 connector	This is a female connector.

### 3.0 Meter Sensor Cable

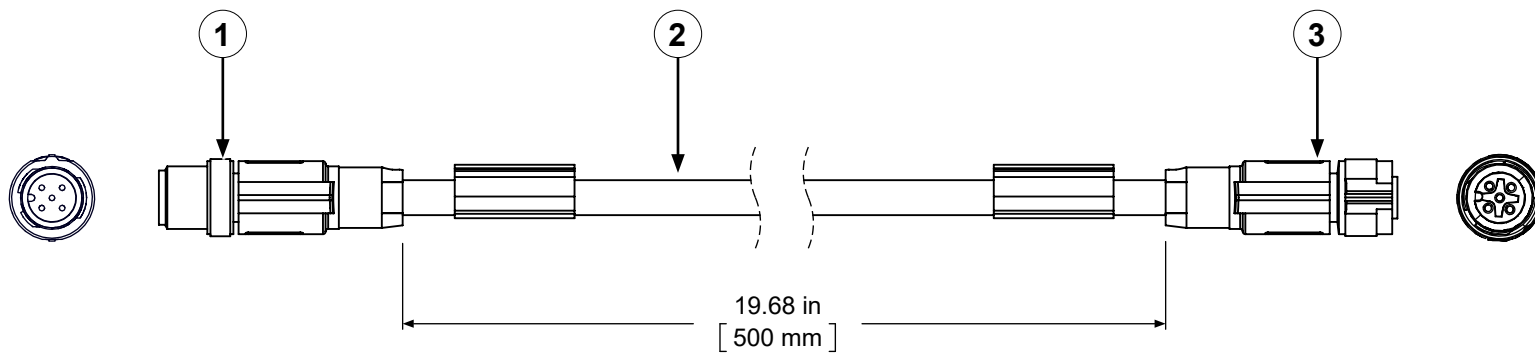
The sensor cable communicates data between the various connections. It is typically a yellow, gray, or black color. The sensor cable is not interchangeable with the CANbus extension cable. **Note:** You can connect 2 or more cables together to achieve a desired length.



Feature	Description
1 M12 connector	This is a male connector.
2 Cable	This is typically a yellow, gray, or black cable jacket.
3 M12 connector	This is a female connector.

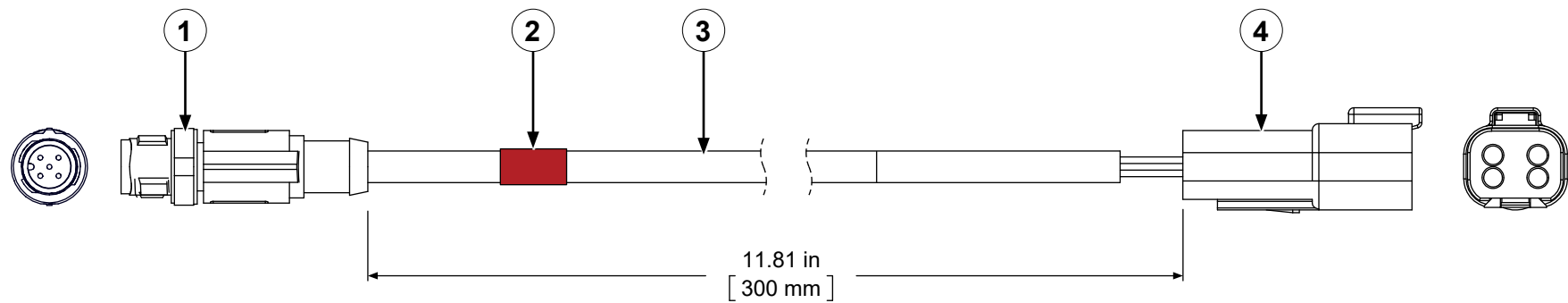
## 0.5 Meter Sensor Cable

The sensor cable communicates data between the various connections. It is typically a yellow, gray, or black color. The sensor cable is not interchangeable with the CANbus extension cable. **Note:** You can connect 2 or more cables together to achieve a desired length.



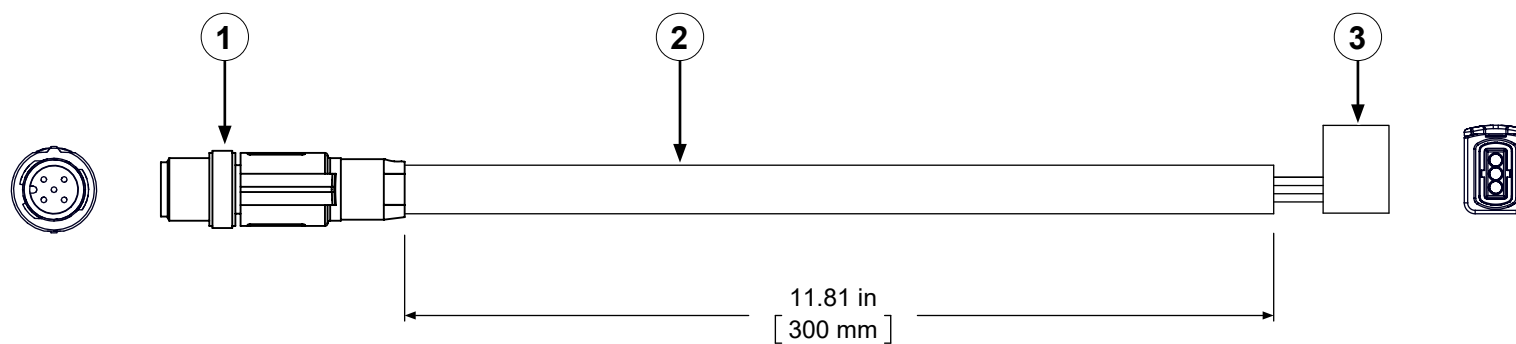
Feature	Description
1 M12 connector	This is a male connector.
2 Cable	This is typically a yellow, gray, or black cable jacket.
3 M12 connector	This is a female connector.

## Manual Override Panel Cable



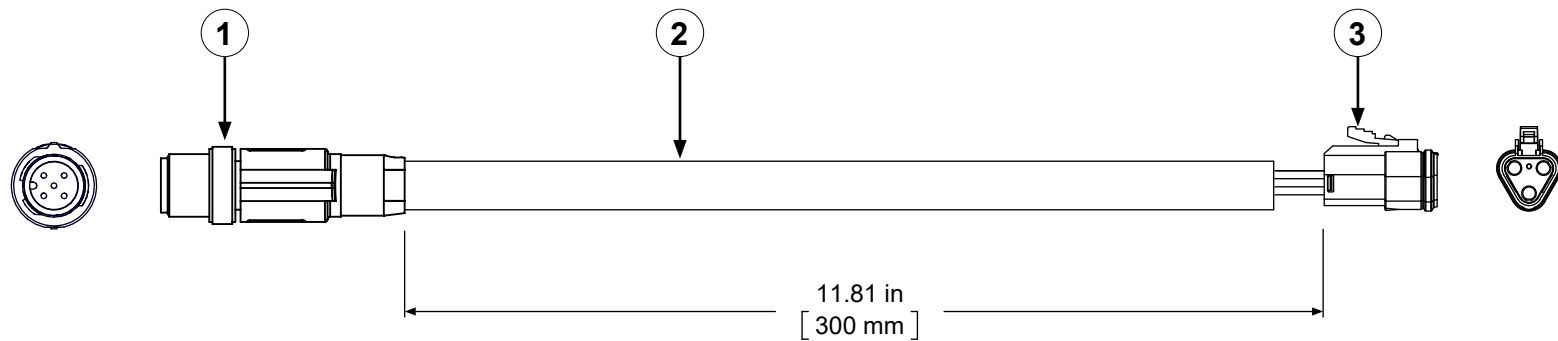
Feature	Description
1 M12 connector	This connects to the manual override switch connector on the control box, or an extension cable connected to the control box.
2 Red shrink wrap	This identifies the cable.
3 Cable	This is a yellow cable jacket.
4 Deutsch connector	This connects to the manual override switch.

## Manual Override Power Relay Panel Cable



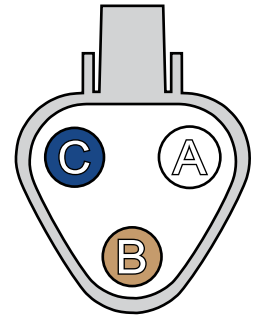
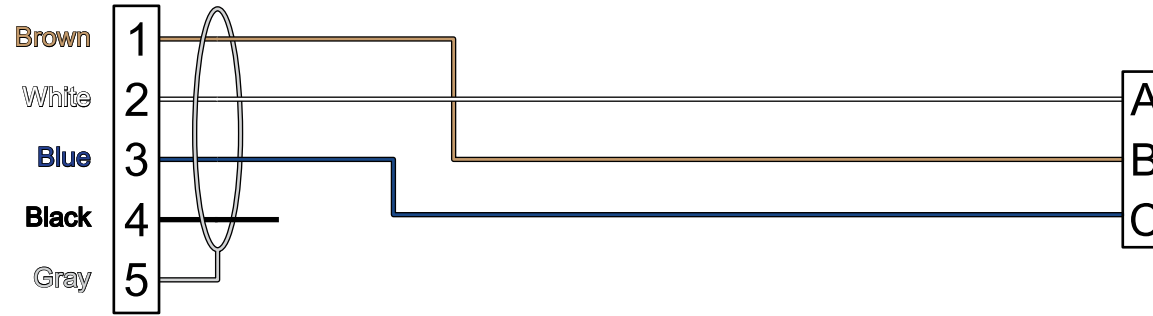
Feature	Description
1 M12 connector	This connects to the manual override relay connector on the control box, or an extension cable connected to the control box.
2 Cable	This is a yellow cable jacket.
3 Relay connector	This connects to the manual override relay connector.

## Concentrate Pump Speed Sensor Cable



Feature	Description
1 M12 connector	This connects to the concentrate pump connector on the control box, or an extension cable connected to the control box.
2 Cable	This is a yellow cable jacket.
3 Deutsch connector	This connects to the concentrate pump speed sensor connector.

## Concentrate Pump Speed Sensor Cable—Schematic



### M12 Connector

- |   |            |
|---|------------|
| 1 | Vcc, +24 V |
| 2 | Signal     |
| 3 | Ground     |
| 4 | N/C        |
| 5 | Shield     |

Phoenix Contact—1405879  
or equivalent

### Deutsch Connector

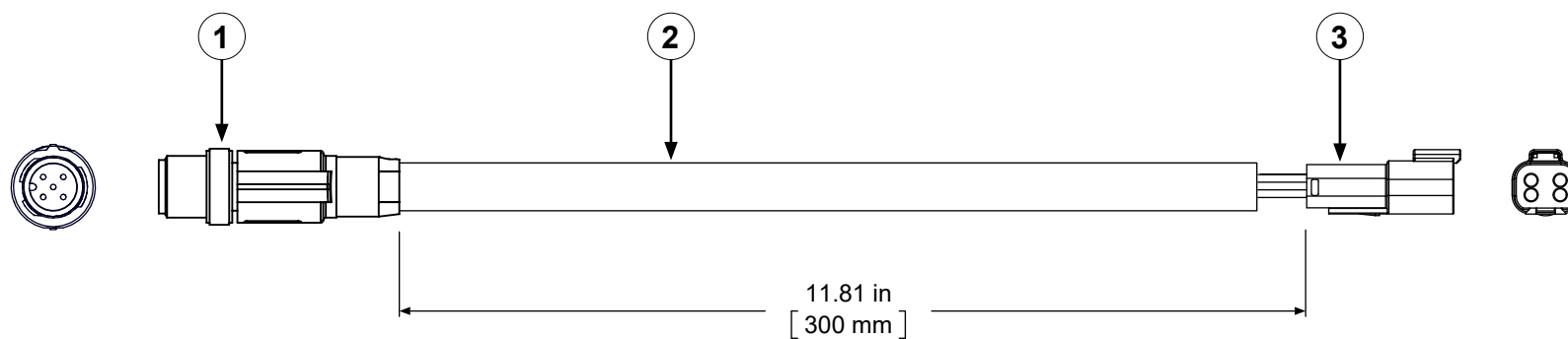
- |   |            |
|---|------------|
| A | Signal     |
| B | Vcc, +24 V |
| C | Ground     |

Shell—934452102 (1)

Wedge—934482003 (1)

Sockets—match to counterpart  
or equivalents

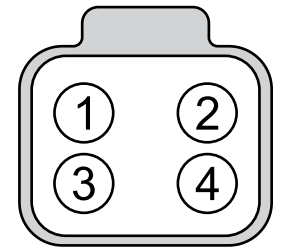
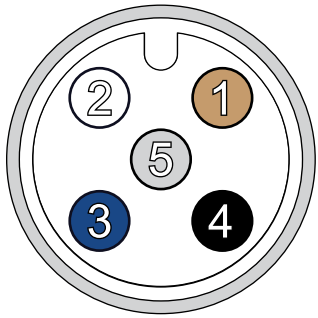
## Hydraulic Pump Swashplate Control Cable



Feature	Description
1 M12 connector	This connects to the hydraulic pump connector on the control box, or an extension cable connected to the control box.
2 Cable	This is a yellow cable jacket.
3 Deutsch connector	This connects to the hydraulic pump swashplate connector.



## Hydraulic Pump Swashplate Control Cable—Schematic



### M12 Connector

- |   |               |
|---|---------------|
| 1 | PWM out—AB    |
| 2 | PWM out—CD    |
| 3 | PWM return—AB |
| 4 | PWM return—CD |
| 5 | Shield        |

Phoenix Contact—1405879  
or equivalent

### Deutsch Connector

- |   |               |
|---|---------------|
| 1 | PWM out—AB    |
| 2 | PWM out—CD    |
| 3 | PWM return—AB |
| 4 | PWM return—CD |

Shell—934453102 (1)

Wedge—934483003 (1)

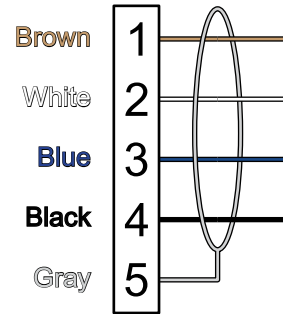
Sockets—match to counterpart  
or equivalents

## Supply Tank Level Cable—Installer Supplied



Feature	Description
1 M12 connector	This connects to the tank level connector on the control box, or an extension cable connected to the control box.
2 Tank level sensor connector	This connects to the installer supplied tank level system.

## Supply Tank Level Cable Schematic —Installer Supplied



Installer Supplied  
Tank Level Output  
4–20 mA

### M12 Connector

- |   |                |
|---|----------------|
| 1 | Vcc, +24 V     |
| 2 | Reserved       |
| 3 | Signal—4–20 mA |
| 4 | Reserved       |
| 5 | Shield         |

Phoenix Contact—1405879  
or equivalent

## Installation Overview

This equipment is intended to be installed by a person or persons with the basic knowledge of installing similar equipment. Contact Waterous with questions about installing the equipment. The installation may require the following tasks and abilities:

- Locating, drilling, and cutting features into the apparatus.
- Routing and securing the wiring.
- Calibration and final testing.

## Preparing for the Installation

Use the following guidelines before, during, and after the installation.

- Read and understand all the installation instructions before installing the equipment.
- Prepare a suitable, well-lit area, and gather all the necessary tools before you begin the installation.
- Make sure that you remove any shipping plugs or caps before installing the component.
- Make sure that you bring all fluids to operating levels before using the equipment.

## NOTICE

### Before Operation

- **Read and understand all the instructions provided.**
- **Check all fluid levels and replenish if necessary.**
- **Remove all shipping plugs and install the operation plugs or caps.**



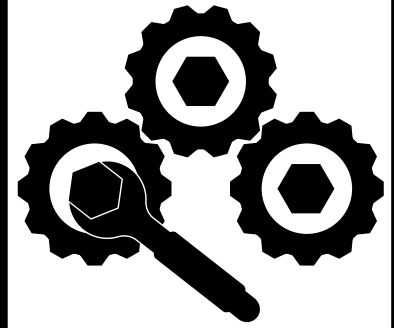
## Modifying the Equipment

This equipment is intended to operate as designed. Do not remove, modify, or change the components in the system. Doing so will void the warranty. Contact Waterous for more information.

## NOTICE

### Modification

- **Modifying the equipment can damage components and void your warranty.**
- **Do not modify the system or any of its components.**



*Do not modify the system or any components. Doing so will void your warranty.*

## Additional Documentation

Additional documentation is available through the MyWaterous login at [Waterousco.com](http://Waterousco.com). Use your serial number to gain access to the service parts list associated with your system. Dimensional drawings are available through the Waterous Service department.

## Optional Equipment

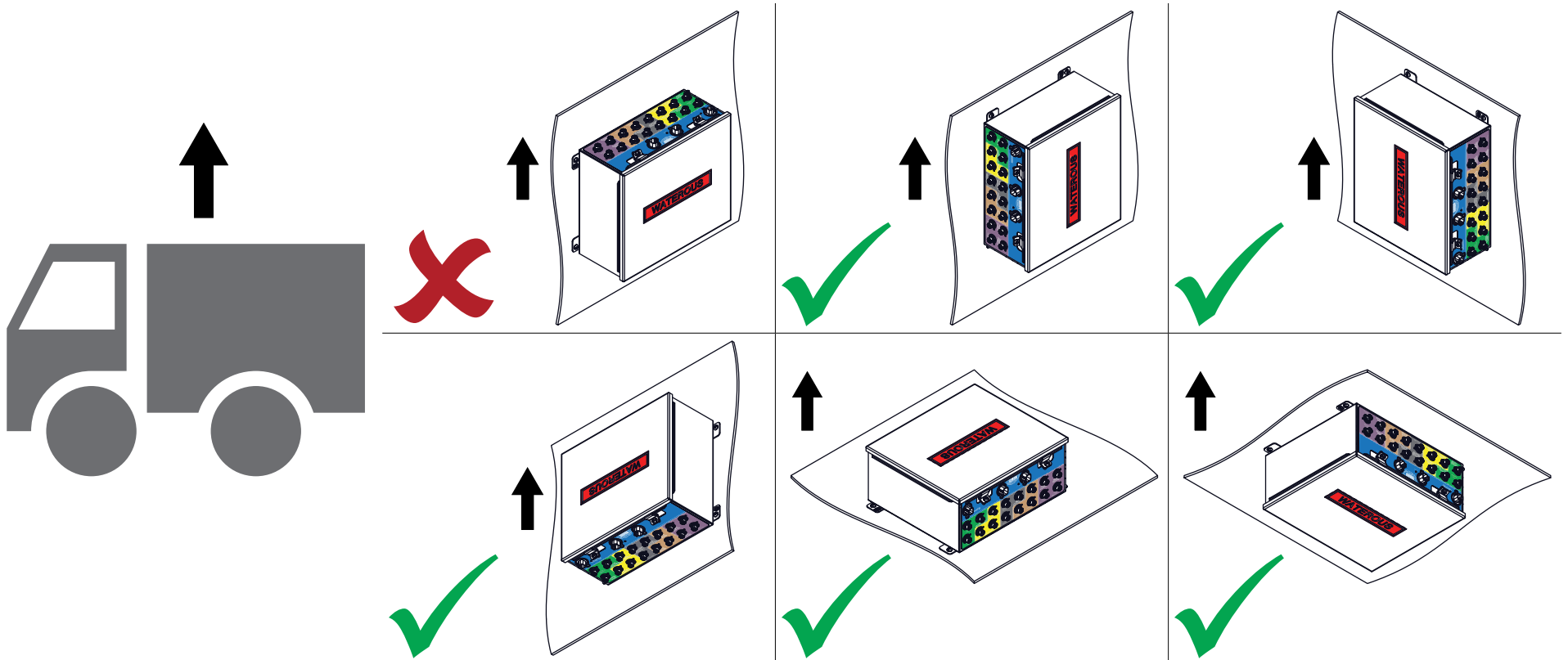
Be aware that the installation instruction may include optional equipment not included in your application.

## Determining the Control Box Location and Orientation

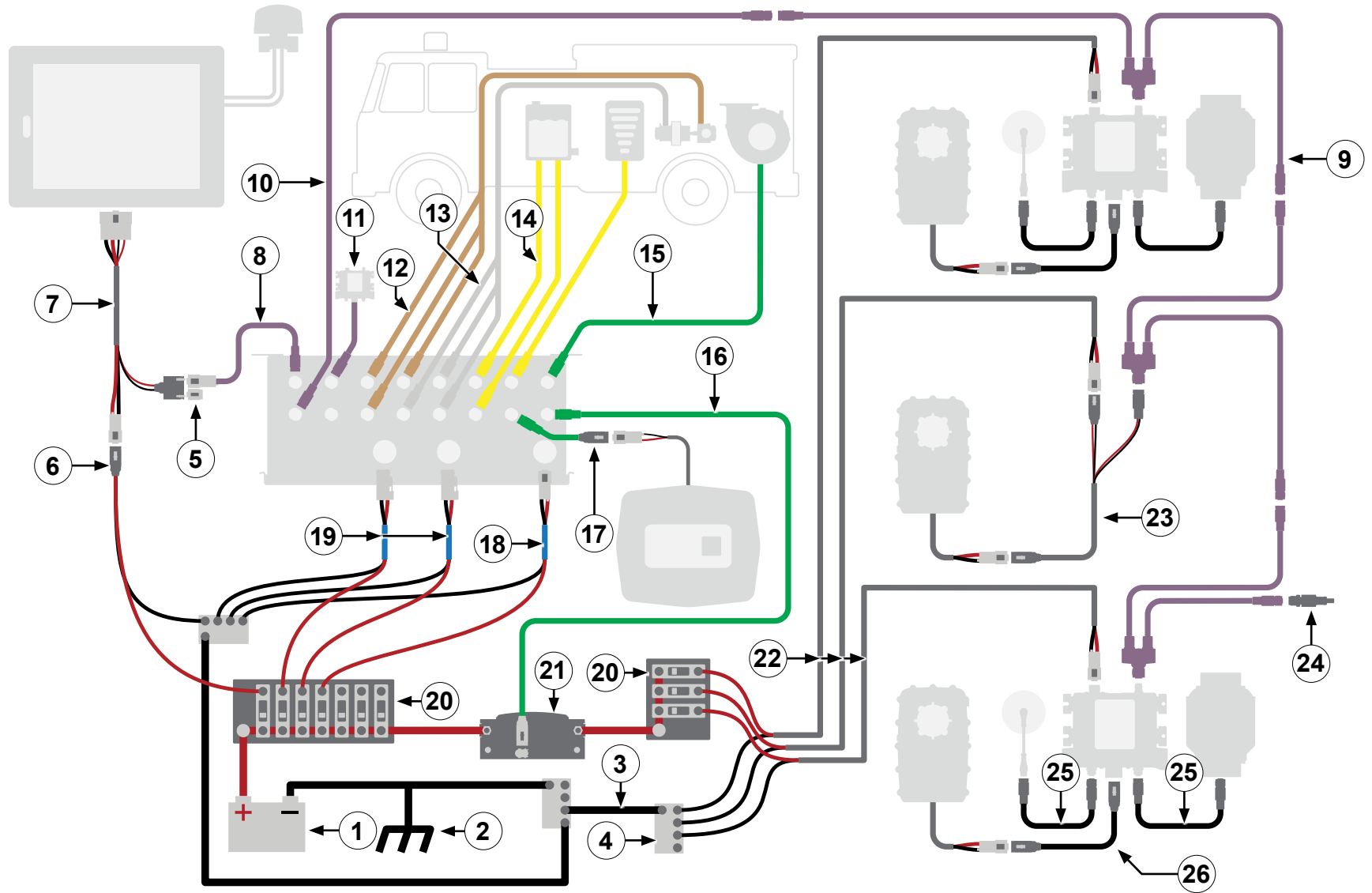
- Never mount the control box with the connectors facing upward.
- Consider the cable and hose routing.
- Consider accessibility during operation and maintenance.
- Consider the space required to remove the cover and access the box interior.

## Determining Cable and Wire Routing

Use the *Wiring Best Practices* document, available at [www.waterousco.com](http://www.waterousco.com), as a guide to select and route wiring for your application.



# Electrical and Cable Connections—Overview

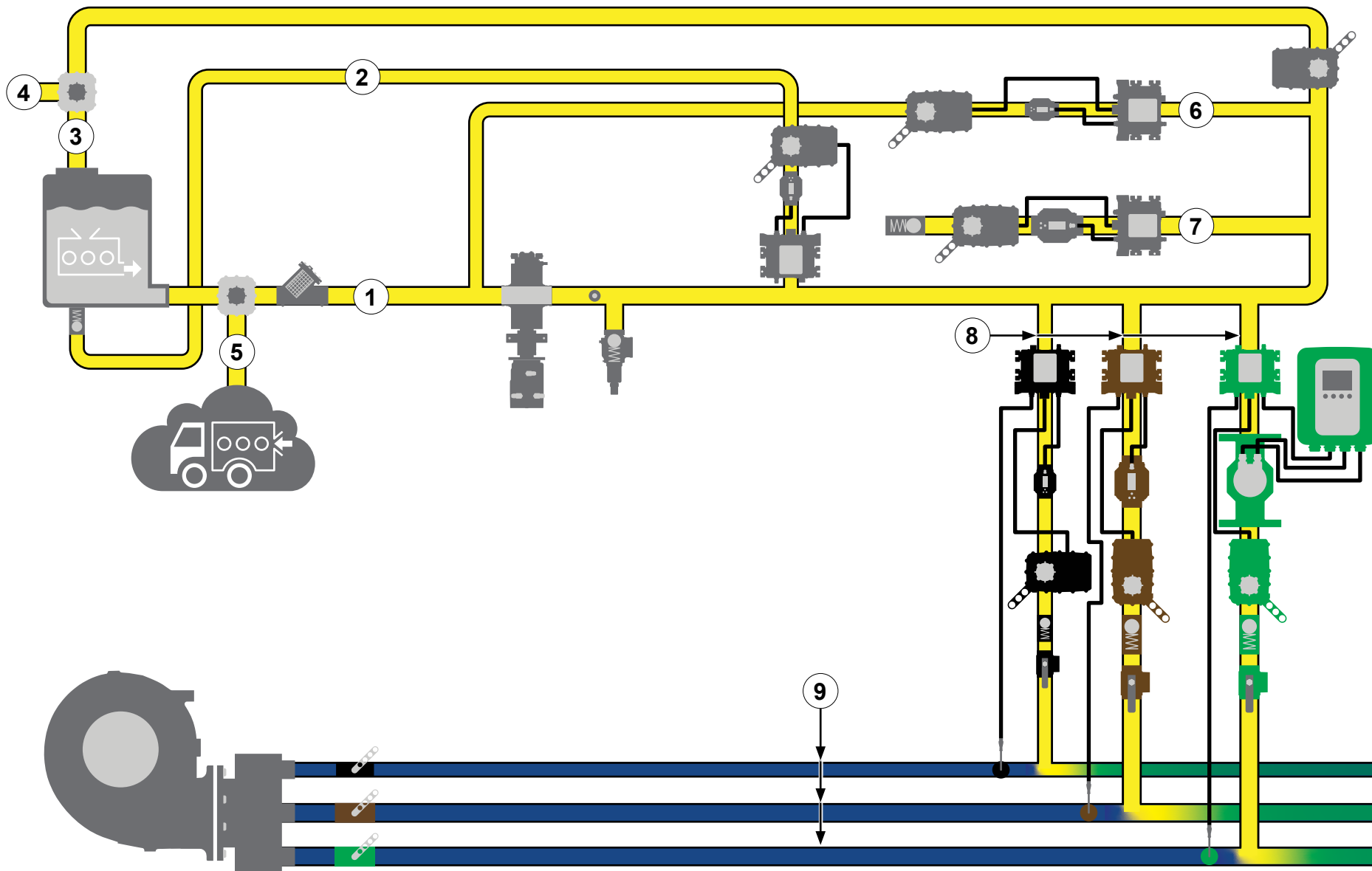


## Electrical and Cable Connections—Overview

Feature	Description
1 Apparatus power	This supplies power to the system—installer supplied.
2 Frame ground	This connects the negative (–) terminal to the apparatus frame—installer supplied.
3 Negative terminal wire	This connects to, or through terminal blocks, to the negative (–) terminal on the apparatus battery—installer supplied.
4 Terminal block	This allows you to distribute multiple power circuits from one supply—installer supplied.
5 HMI terminating resister	This terminates the CANbus connection on the HMI cable.
6 HMI power cable	This supplies power to the HMI and requires a 5 amp circuit breaker—installer supplied.
7 HMI cable.	This connects the HMI to power and connects to the CANbus.
8 HMI CANbus cable	This connects the HMI to the PLC.
9 Split CANbus cable	This connects the node controllers to one another.
10 CANbus extension cable	This provides an extension to the split CANbus
11 Remote I/O cable	This connects to any remote I/O components.
12 Hydraulic pump cable	These harnesses connect to sensors that monitor the hydraulic fluid level and temperature as well as control the hydraulic pump.
13 Concentrate pump cable	These harnesses connect to sensors that monitor the concentrate pump speed and discharge pressure as well as monitoring the pump intake select switch. The intake select switch is installer supplied.
14 Concentrate supply sensor cable	These harnesses connect the concentrate supply sensors. The sensing method is determined by installer and level sensor or high/low switches are installer supplied.
15 Water pressure cable	This connects to the water pressure sensor on the water pump.
16 Manual override relay cable	This connects to the power relay that disables power to the DLAs.
17 Manual override switch cable	This connects the manual override switch to the control box.
18 Relay power cable	This supplies power to the power disconnect relay and requires a 5 amp circuit breaker—installer supplied.
19 PLC cable	This supplies power to the PLC and requires a 5 amp circuit breaker—installer supplied.
20 Breaker box	This organizes the circuit breakers and distributes apparatus power—installer supplied.
21 Power disconnect relay—200A	This is a 200 amp power relay that enables and disables power to the DLAs.
22 DLA cable	This supplies power to the DLA and requires a 10 amp circuit breaker per DLA—installer supplied.
23 Priming valve cable	This connects the priming valve to power and CANbus control.
24 DLA terminating resistor	This terminates the CANbus connection on the last node controller in the CANbus chain.
25 Flowmeter cable	This connects the flowmeter, magnetic or paddlewheel, to the node controller.
26 Control valve cable extension	This connects the DLA control valve to the node controller.

## Plumbing Layout

Use the illustration as a guide to lay out the plumbing connections in your application.

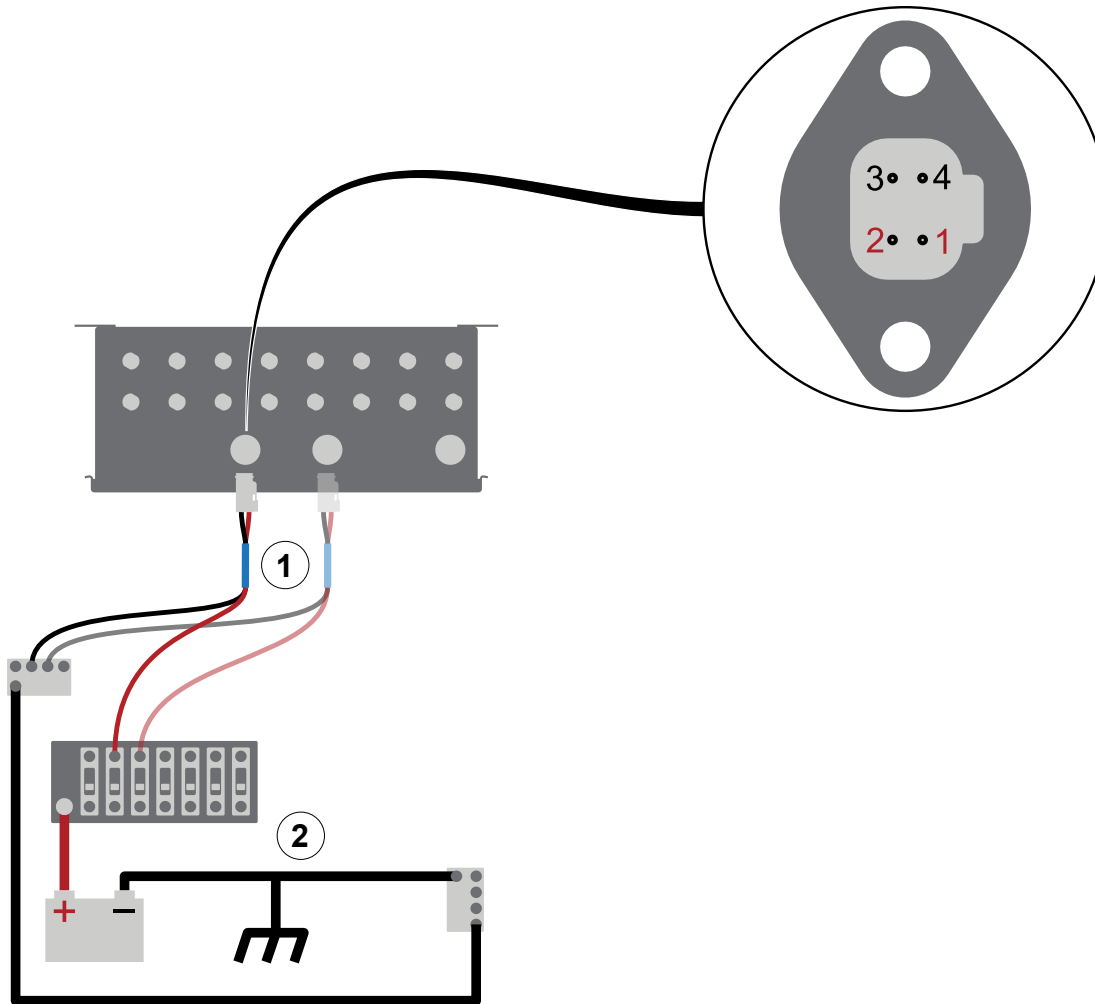




## Plumbing Layout

Description
1 Concentrate supply line—this transports concentrate around the system.
2 Concentrate supply refill line—this allows you to fill the on-board tank from an auxiliary source.
3 Priming line—this evacuates air from the concentrate pump inlet as the system primes before operation.
4 Priming bypass line—this prevents contaminating the concentrate during testing and training. When water is substituted for concentrate during training or testing, and you have concentrate in the supply tank, this bypass valve diverts water from the supply tank to prevent concentrate contamination. It is also very important to make sure that you drain any remaining water in the line before priming the system with concentrate.
5 Auxiliary concentrate supply line—this allows you to source concentrate from an external source.
6 Low-flow bypass line—this returns a portion of the pumped concentrate in the supply line back to the pump inlet when the desired concentrate output requires the pump to operate at an RPM that is lower than possible by the pump.
7 Transfer line—this line allows you to transfer or relay concentrate to another location.
8 Discharge line assembly—this manages the concentrate injected into the solution-capable discharge.
9 Solution-capable discharge—this transports clear water and is capable of creating a foam solution.

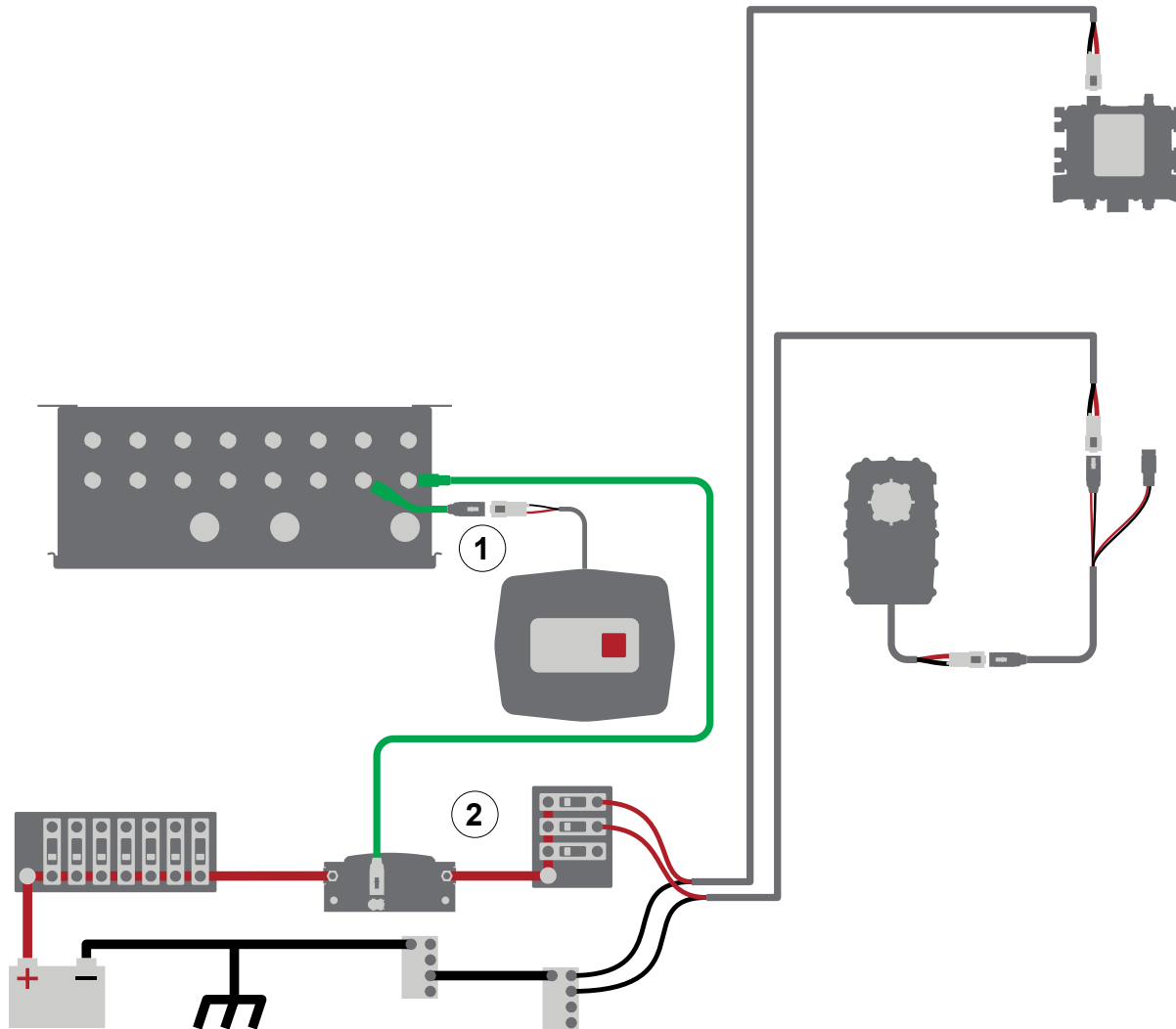
## Connecting Power to the Control Box



Use the illustration and instructions to power the control box. All hardware required to power the control box is provided by the installer. Before you begin, determine the number of PLCs within the control box and prepare a wire harness for each.

- 1 Locally source a compatible Deutsch connector (DT06-2S), its components, and the appropriate wire for each plug. Connect the 2 Vcc wires to pin 1 and pin 2. Connect the ground wires to pin 3 and pin 4.
- 2 Connect the Vcc wires from each PLC wire harness to a separate 5 A circuit breaker and the ground wires to chassis ground.

## Installing the Optional Manual Override



Use the illustration and instructions to connect the optional, manual override switch and power relay.

- To install the manual-override switch, do the following:
  - Install the manual-override switch into the operator panel.
  - Use the manual-override cable to connect it to the control box—the manual override switch connection.

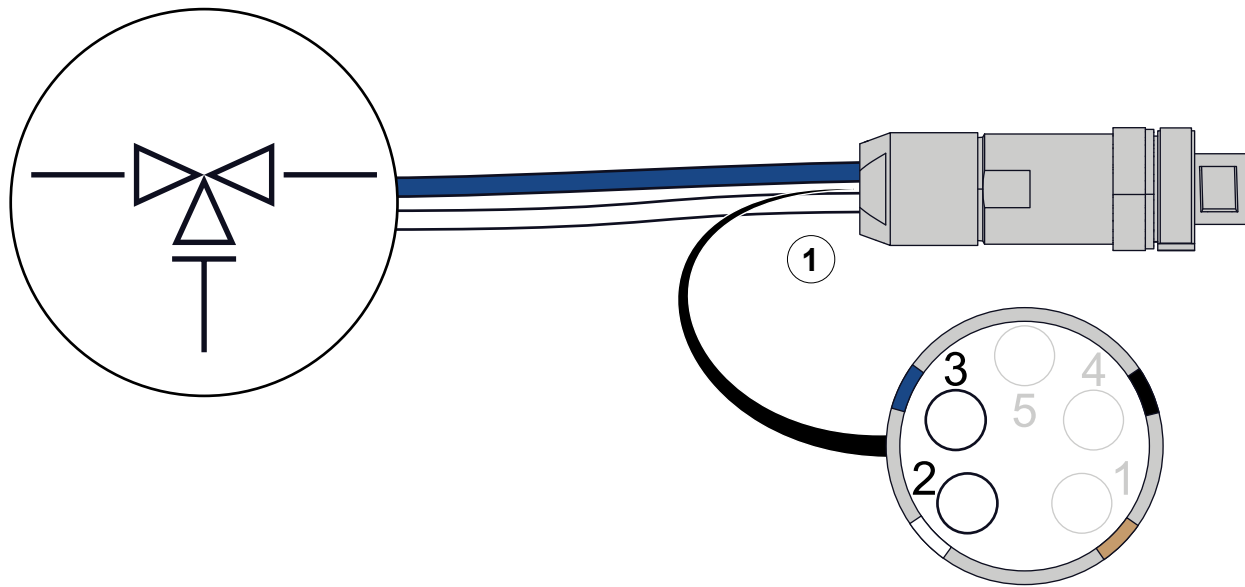
**Note:** Use an additional sensor cable if necessary.

- To install the manual override power relay, do the following:
  - Use the mounting holes to install the relay to the apparatus.
  - Connect the power input post to apparatus power.
  - Connect the power output post to the DLA breaker box.
  - Use the manual override relay cable to connect the relay to the control box—the override relay connection.

**Note:** Use an additional sensor cable if necessary.

**Note:** After overriding and manually repositioning the valve, you must recalibrate the valve actuator. Refer to the documentation provided by the valve manufacturer to recalibrate the valve actuator to a new home position.

## Wiring the Source-Select Switch



Use the illustrations and instructions to wire the M12 source select plug. It is the responsibility of the installer to incorporate a method for the system to determine the concentrate source—an on-board tank or an auxiliary supply. Any method of providing a dry-contact to the system that defines the supply source is acceptable. The default definition is as follows:

- In the *OPEN* position the concentrate is sourced from the on-board tank. This indicates to the system to monitor the tank-level sensors.
- In the *CLOSED* position the concentrate is sourced from the auxiliary supply. This indicates to the system that the supply level is monitored by the operator.

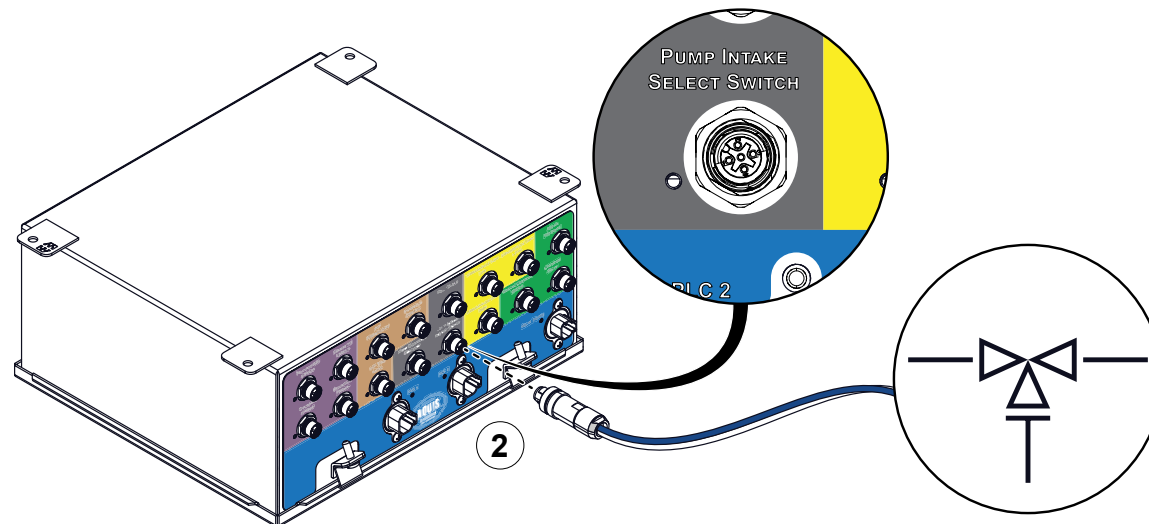
**Note:** By default, the system defines an open switch as an on-board tank. However, you can inverse the definition in the configuration settings.

Locally source an appropriate 2 position valve to source the concentrate between an on-board tank and an auxiliary supply, and a switch to indicate the valve position, and a length of M12 cable.

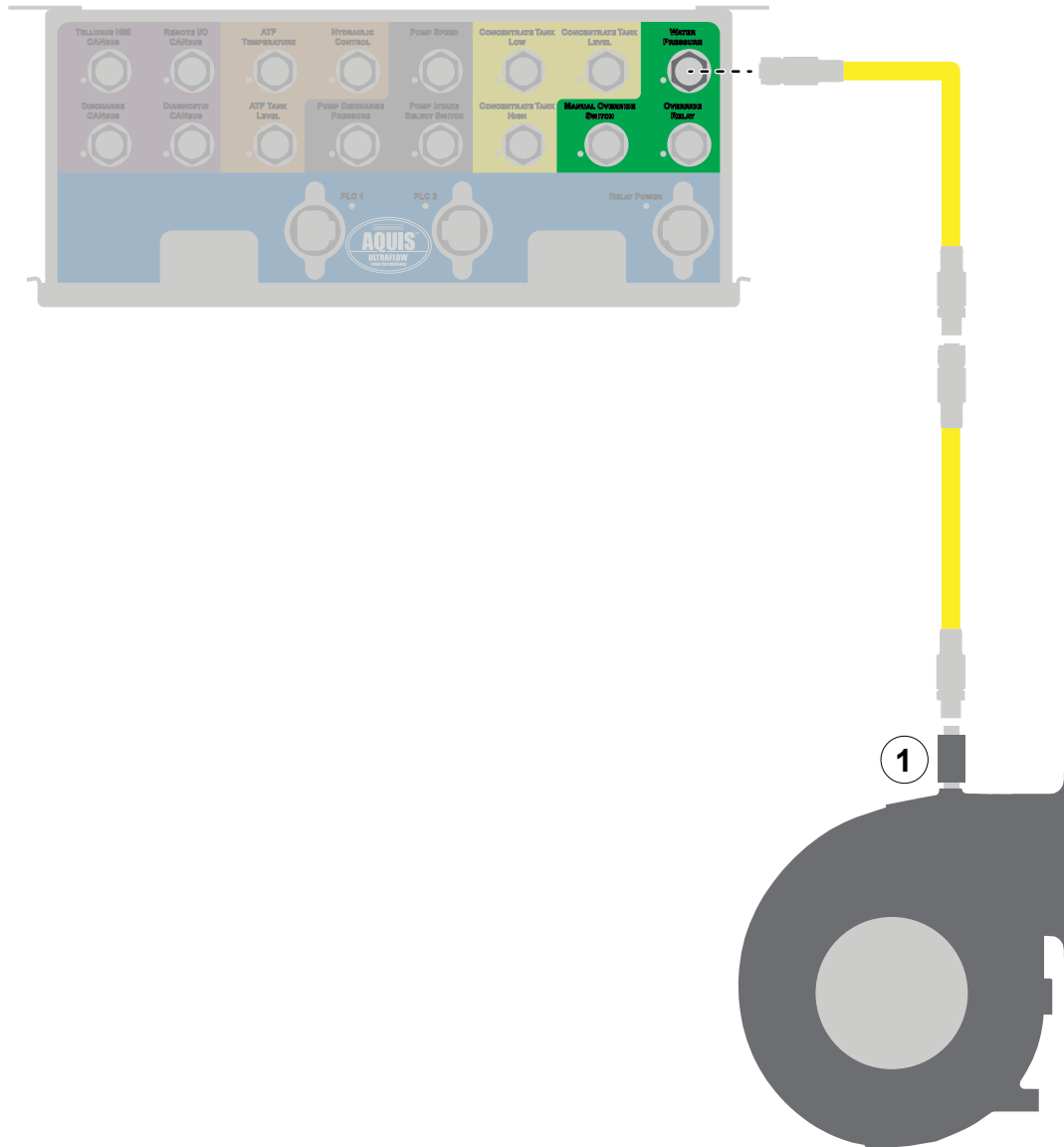
- 1 Connect one wire from the switch to pin 3 (blue) and the other wire from the switch to pin 2 (white) on the M12 connector.

**Note:** Seal the open end of the connector with RTV or adhesive lined heat-shrink to prevent water ingress.

- 2 Plug the cable into the M12 connector into the pump intake select switch connector on the control box.



## Connecting Pump Discharge Pressure Sensor

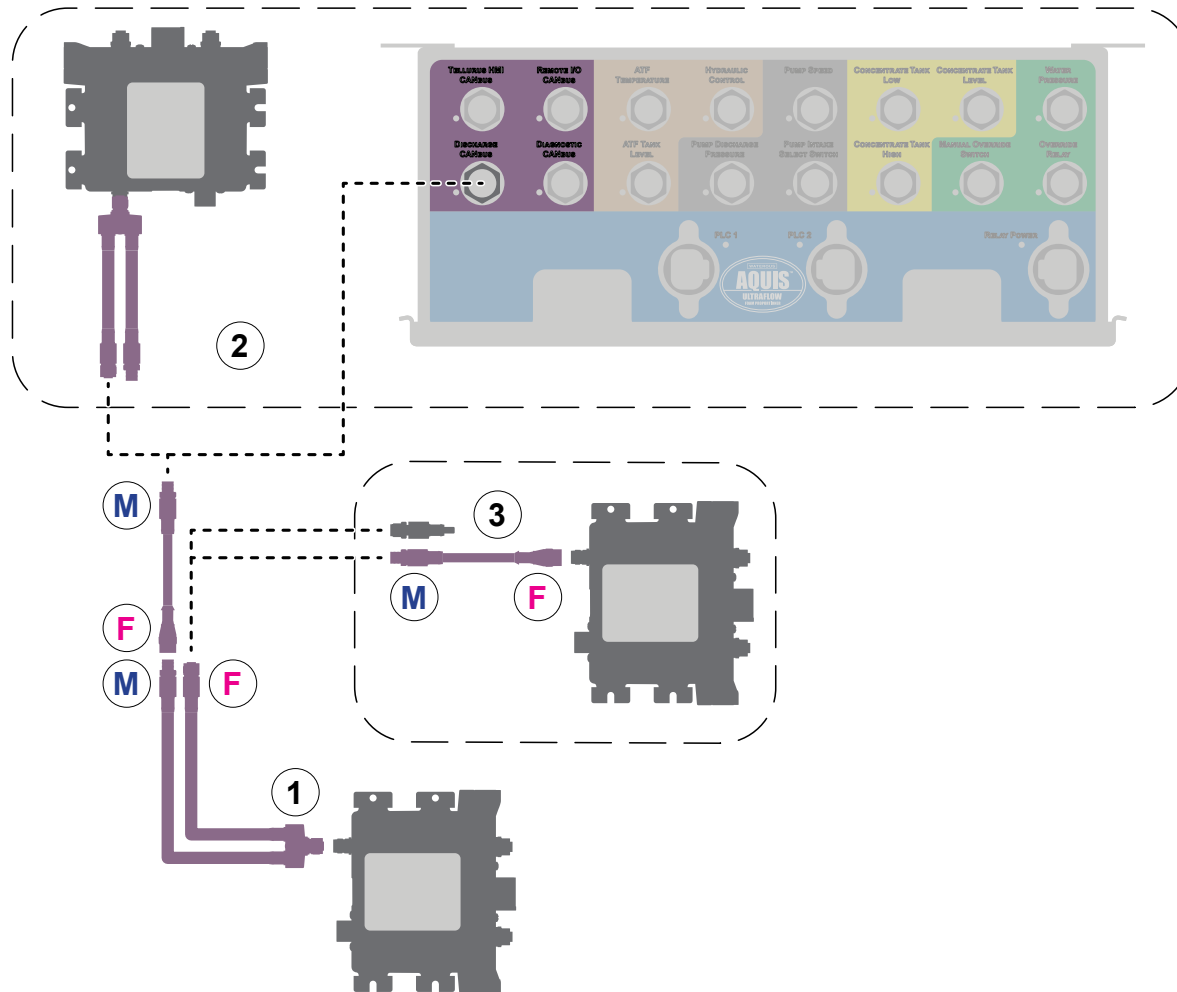


Use the illustration and instructions to connect the pump discharge pressure sensor.

- 1 Use a sensor cable to connect the pump pressure sensor to the control box—the pump pressure connection.

**Note:** Connect 2 or more cables together to achieve a desired length.

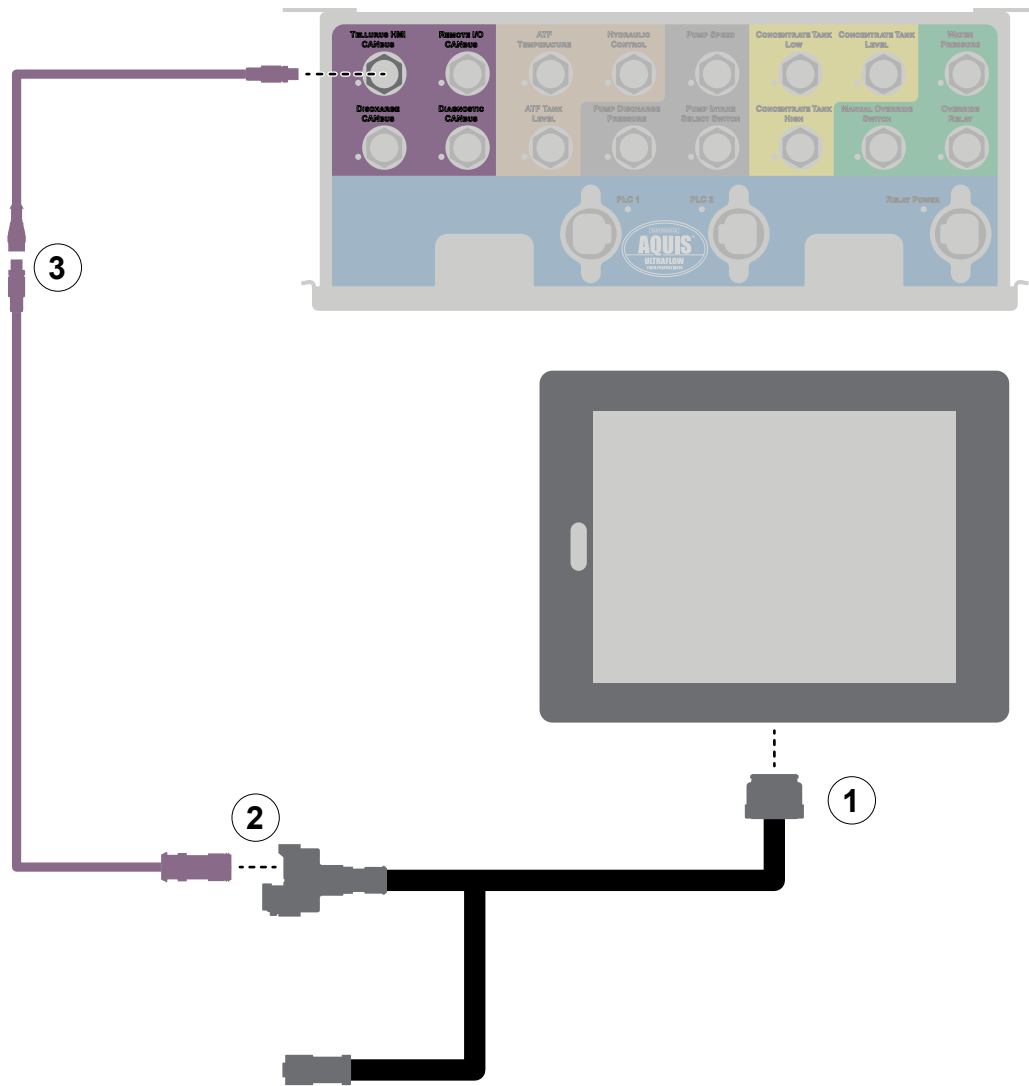
## Connecting the Node Controllers



Use the illustration and instructions to use the CANbus cables to connect the control box to the node controllers.

- 1 Connect the split CANbus cable to the CANbus connector on the node controller.
- 2 Connect the male end on the split CANbus cable to an upstream node controller, or to the control box—the discharge CANbus connection.  
**Note:** Connect 2 or more cables together to achieve a desired length.
- 3 Connect the female end on the CANbus splitter cable to next downstream node controller, or to a terminating resistor if this is the last downstream node controller in the system.  
**Note:** Connect 2 or more cables together to achieve a desired length.

## Connecting the Tellurus Display

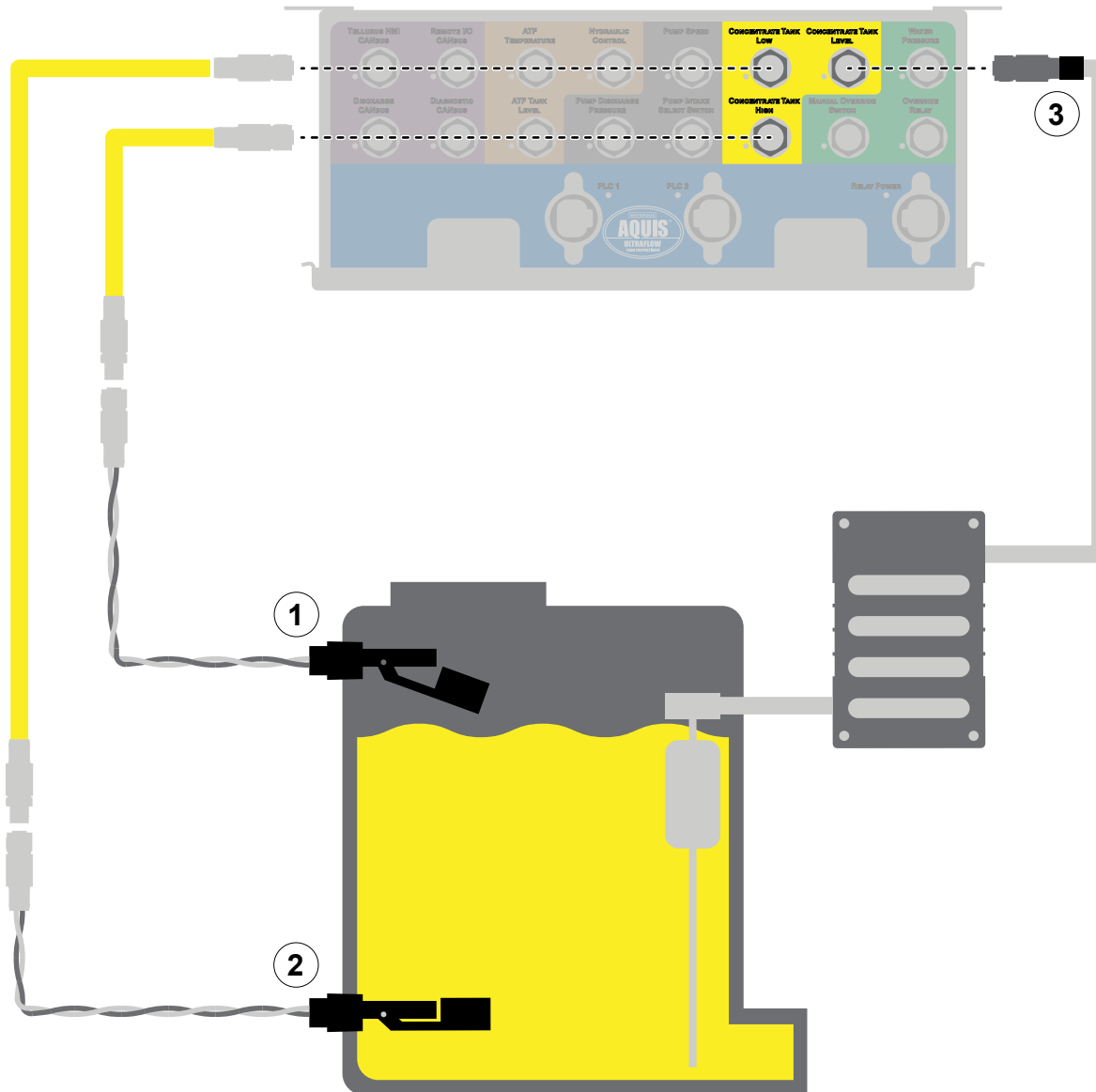


Use the illustration and instructions to connect the Tellurus display.

- 1 Connect the compatible connector on the Tellurus HMI cable assembly to the Tellurus display connector.
- 2 Connect the compatible connector on the Tellurus HMI cable assembly to the display extension cable connector.
- 3 Connect compatible connector on the display extension cable to the control box—the Tellurus HMI CANbus connection.

**Note:** Connect 2 or more cables together to achieve a desired length.

## Connecting the Concentrate Supply Level Sensors



Use the illustration and instructions to connect the concentrate supply level sensors.

- 1 Use a sensor cable to connect the tank high switch to the control box—concentrate tank high connection.

**Note:** Connect 2 or more cables together to achieve a desired length.

- 2 Use a sensor cable to connect the tank low switch to the control box—the concentrate tank low connection.

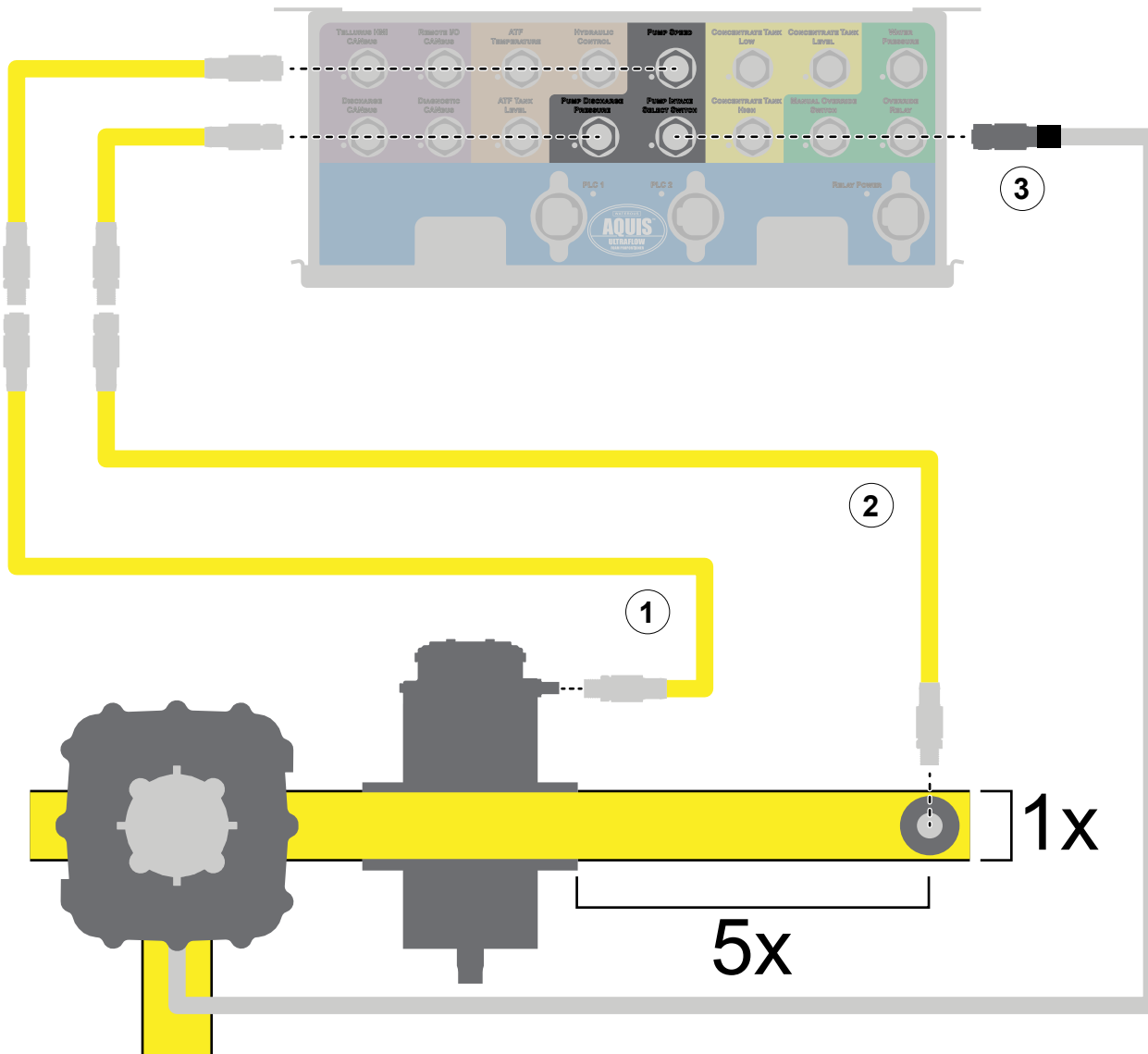
**Note:** Connect 2 or more cables together to achieve a desired length.

- 3 Optionally, you can install a locally sourced, tank-level sensor and panel indicator. Use the field wire-able, M12 connector and shrink wrap, supplied in the install kit, to provide an environmental seal between the connector and installer provided cable. Refer to: **"Supply Tank Level Cable—Installer Supplied"** on page 34 to assemble the cable.

**Note:** Follow the instructions from the tank sensor and panel indicator manufacturer to install those components.



## Connecting the Concentrate Pump, Pressure Sensor, and Source Select Valve



Use the illustration and instructions to connect the concentrate pump speed sensor, concentrate line pressure sensor, and source select valve.

- 1 Use a sensor cable to connect the concentrate pump speed sensor to the control box—the pump speed connection.

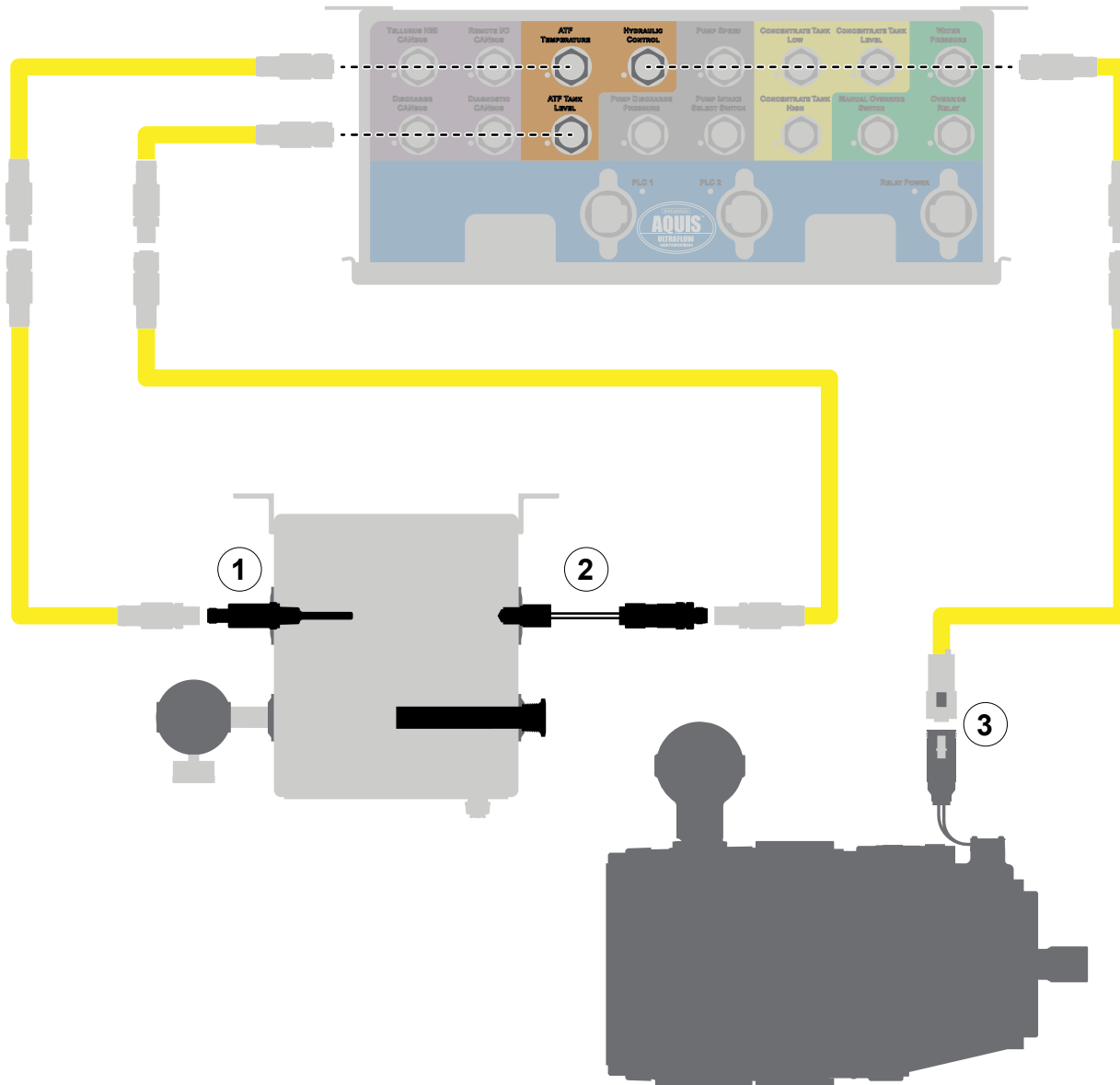
**Note:** Connect 2 or more cables together to achieve a desired length.

- 2 Use an M12 cable extension to connect the concentrate line pressure sensor to the control box—pump discharge pressure connection.

**Note:** Connect 2 or more cables together to achieve a desired length.

- 3 Install the installer supplied source select valve into the apparatus plumbing. Connect the valve to the on-board concentrate supply tank and the auxiliary supply line. Connect the valve position switch cable to the control box—the pump intake select switch connection.

## Connecting the Hydraulic Fluid Reservoir Sensors, Suction Strainer, and Hydraulic Pump



Use the illustration and instructions to connect the hydraulic reservoir sensors, reservoir sensor, and the hydraulic pump to the control box.

- 1 Use a sensor cable to connect the temperature sensor to the control box—the ATF temperature connection.

**Note:** Connect 2 or more cables together to achieve a desired length.

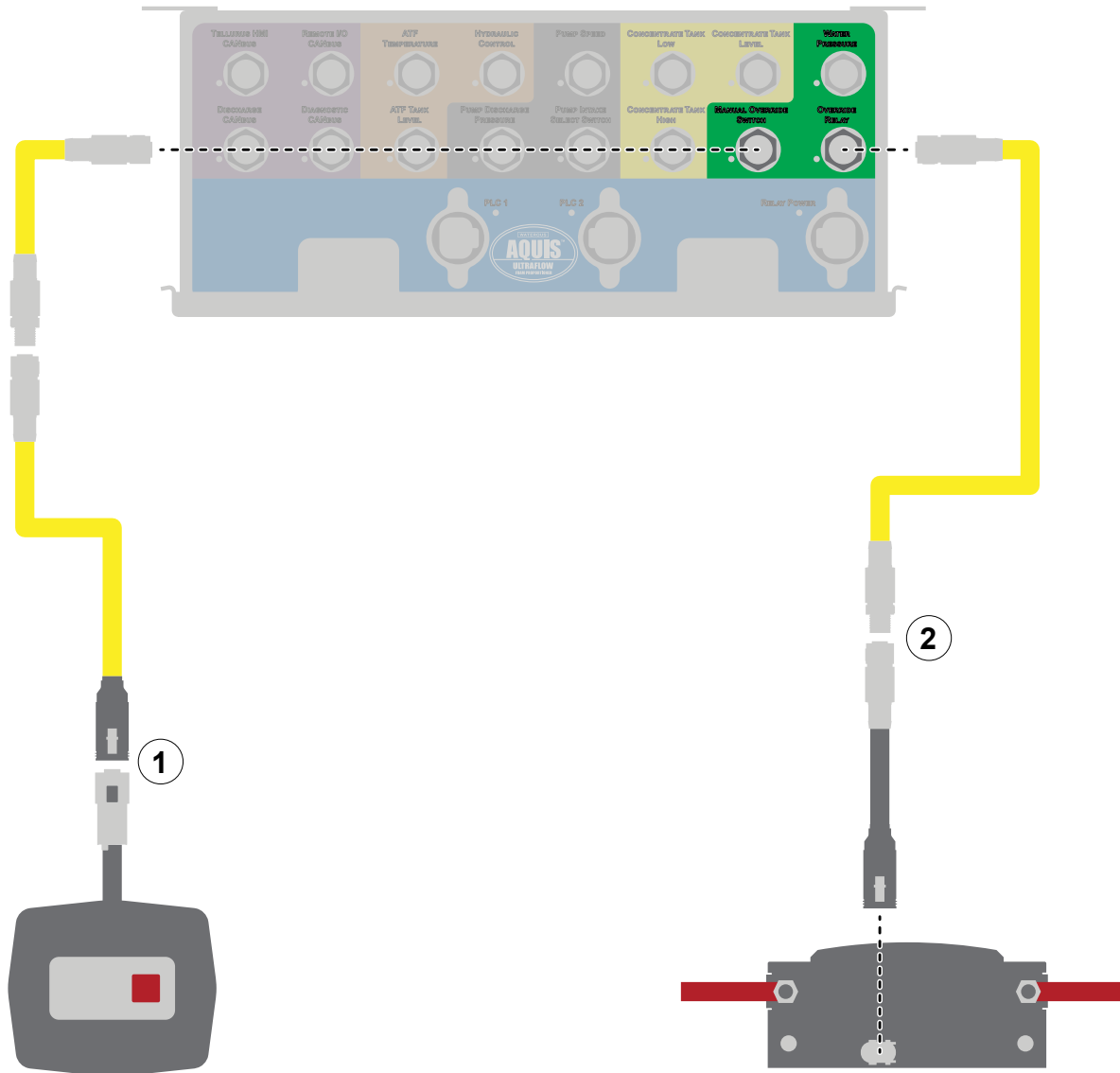
- 2 Use a sensor cable to connect the reservoir level sensor to the control box—ATF tank level connection.

**Note:** Connect 2 or more cables together to achieve a desired length.

- 3 Use the hydraulic pump swash plate control cable to connect the hydraulic motor to the control box—the hydraulic control connection.

**Note:** Connect 2 or more cables together to achieve a desired length.

## Connecting the Manual Override



Use the illustration and instructions to connect the optional manual-override switch and power relay.

- 1 Use the manual-override cable to connect it to the control box—the manual override switch connection.

**Note:** Use an additional sensor cable if necessary.

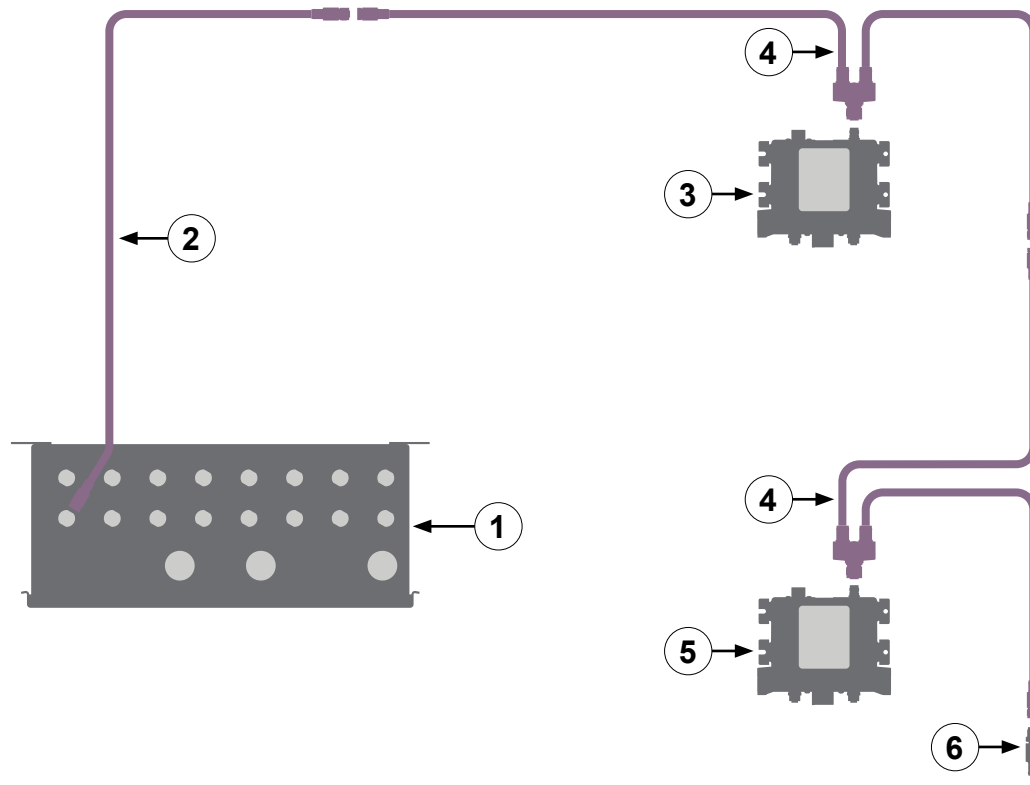
- 2 Use the manual override relay cable to connect the relay to the control box—the override relay connection.

**Note:** Use an additional sensor cable if necessary.

## Notes

## Connecting to a Node Controller

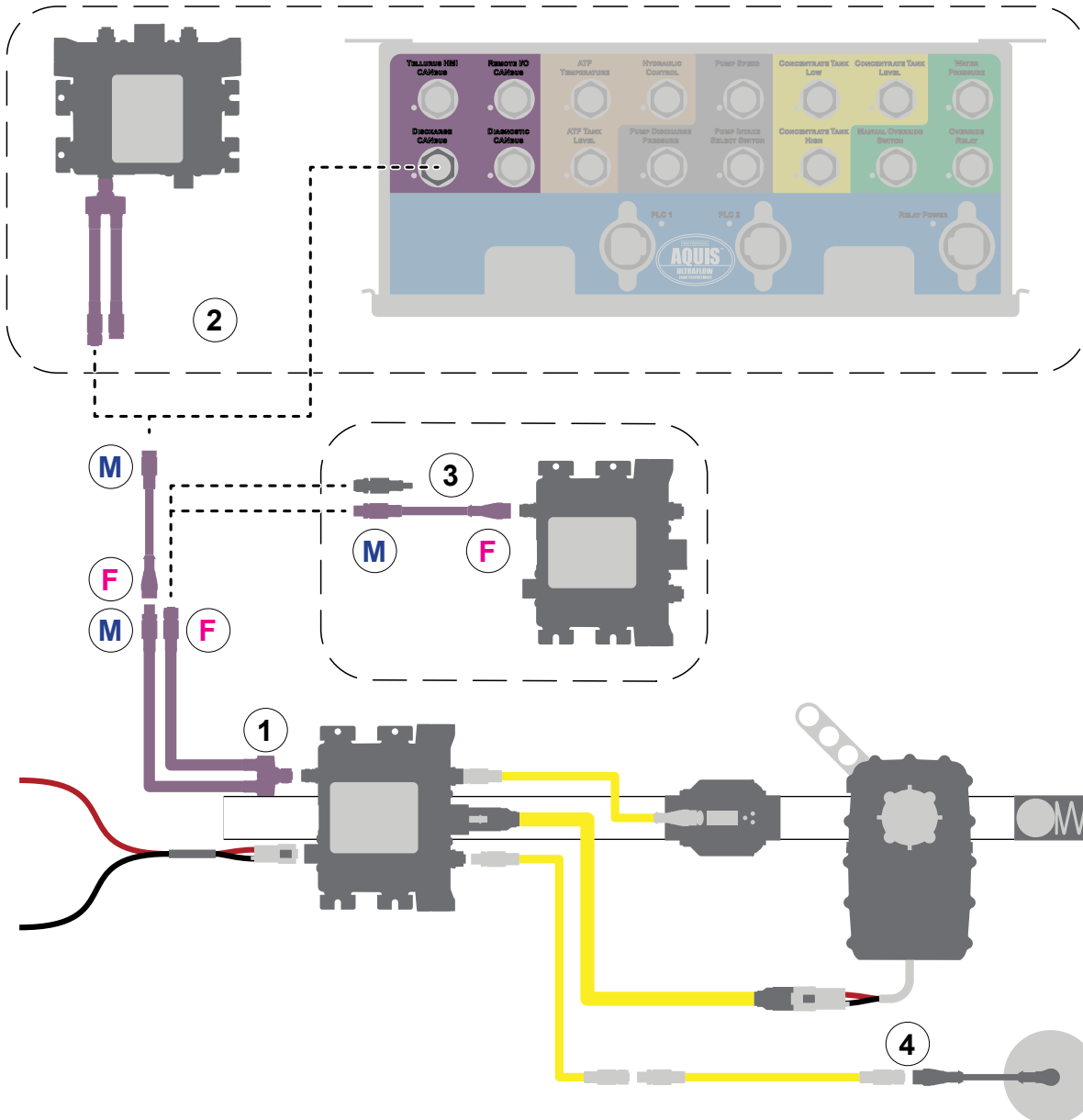
Use the illustration and table to understand the various cable connections between a node controller and the control box.



## Connecting to a Node Controller

Feature	Description
1 Control box	This connects to various components in the system and contains the programmable logic controllers (PLC).
2 CANbus extension	This connects the node controllers to one another and the control box.
3 Node controller	This connects to the concentrate control valve, flowmeters, and additional discharge line assemblies (DLA).
4 Split CANbus Cable	This passes CANbus bus commands to the next node controller in the chain.
5 Node controller—last in the system	This is the last node controller in the system, which would require a terminating resistor.
6 Terminating resistor	This terminates the CANbus signal and is installed on the last node controller in the system.

## Connecting the 1-Inch DLA



Use the illustration and instructions to connect the 1-inch DLA to the control box, and the paddlewheel flowmeter to the node controller.

- 1 Connect the split CANbus cable to the CANbus connector on the node controller.
- 2 Connect the male end on the split CANbus cable to an upstream node controller, or to the control box—the discharge CANbus connection.

**Note:** Use an additional CANbus cable if necessary.

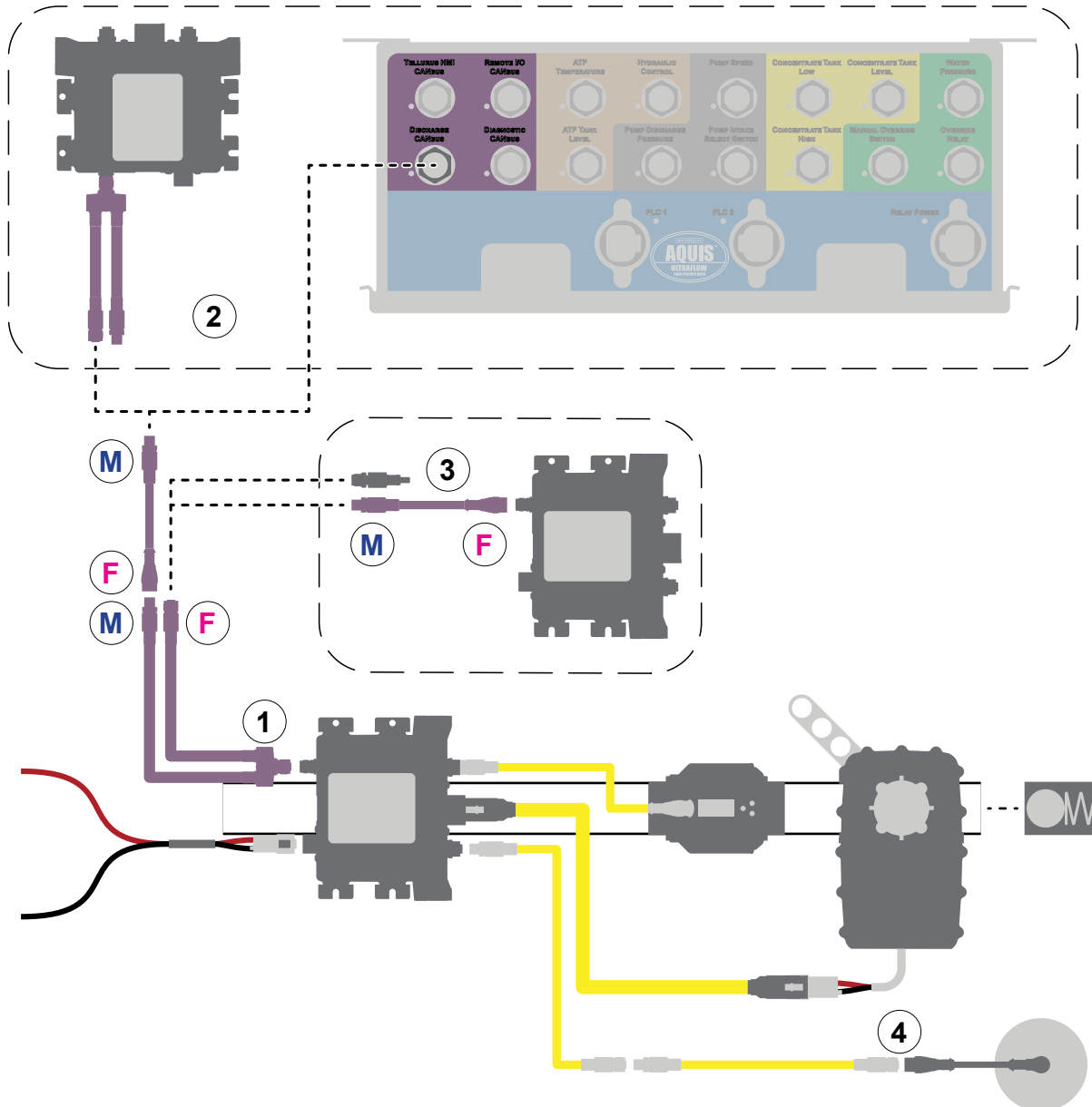
- 3 Connect the female end on the CANbus splitter cable to the next, downstream node controller, or to a terminating resistor if this is the last downstream node controller in the system.

**Note:** Use an additional CANbus cable if necessary.

- 4 Use a sensor cable to connect the paddlewheel flowmeter to the node controller.

**Note:** Use an additional sensor cable if necessary.

## Connecting the 2-Inch DLA and Paddlewheel Flowmeter

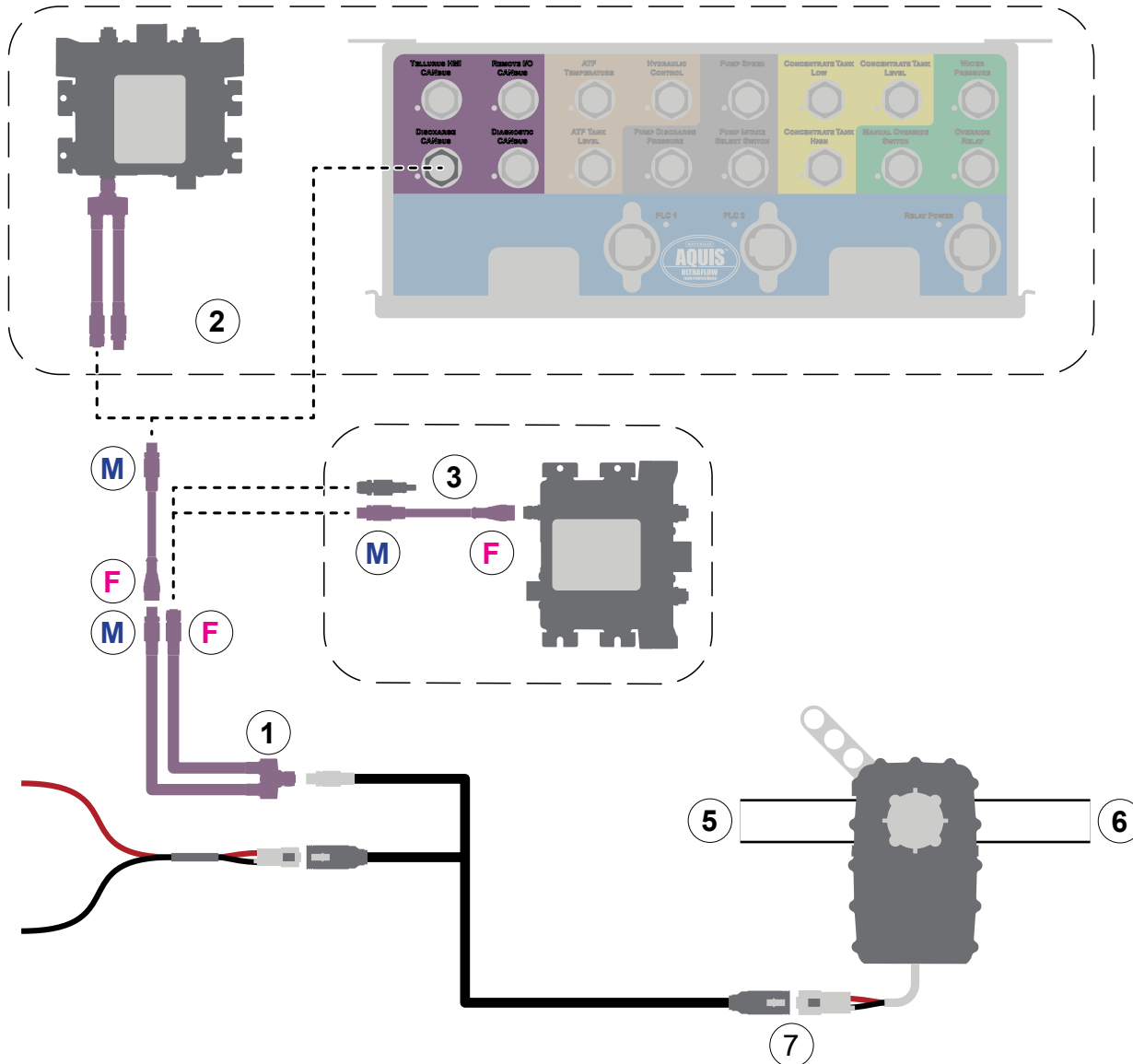


Use the illustration and instructions to connect the 2-inch DLA and the paddlewheel flowmeter to the control box.

- 1 Connect the split CANbus cable to the CANbus connector on the node controller.
- 2 Connect the male end on the split CANbus cable to an upstream node controller, or to the control box—the discharge CANbus connection.  
**Note:** Use an additional CANbus cable if necessary.
- 3 Connect the female end on the CANbus splitter cable to the next, downstream node controller, or to a terminating resistor if this is the last downstream node controller in the system.  
**Note:** Use an additional CANbus cable if necessary.
- 5 Use a sensor cable to connect the paddlewheel flowmeter to the node controller.  
**Note:** Use an additional sensor cable if necessary.



## Connecting the Priming Valve



Use the illustration and instructions to connect the priming valve to the control box.

- 1 Connect the split CANbus cable to the CANbus connector on the priming valve motor cable.
- 2 Connect the male end on the split CANbus cable to an upstream node controller, or to the control box—the discharge CANbus connection.

**Note:** Use an additional CANbus cable if necessary.

- 3 Connect the female end on the CANbus splitter cable to next downstream node controller, or to a terminating resistor if this is the last downstream node controller in the system.

**Note:** Use an additional CANbus cable if necessary.

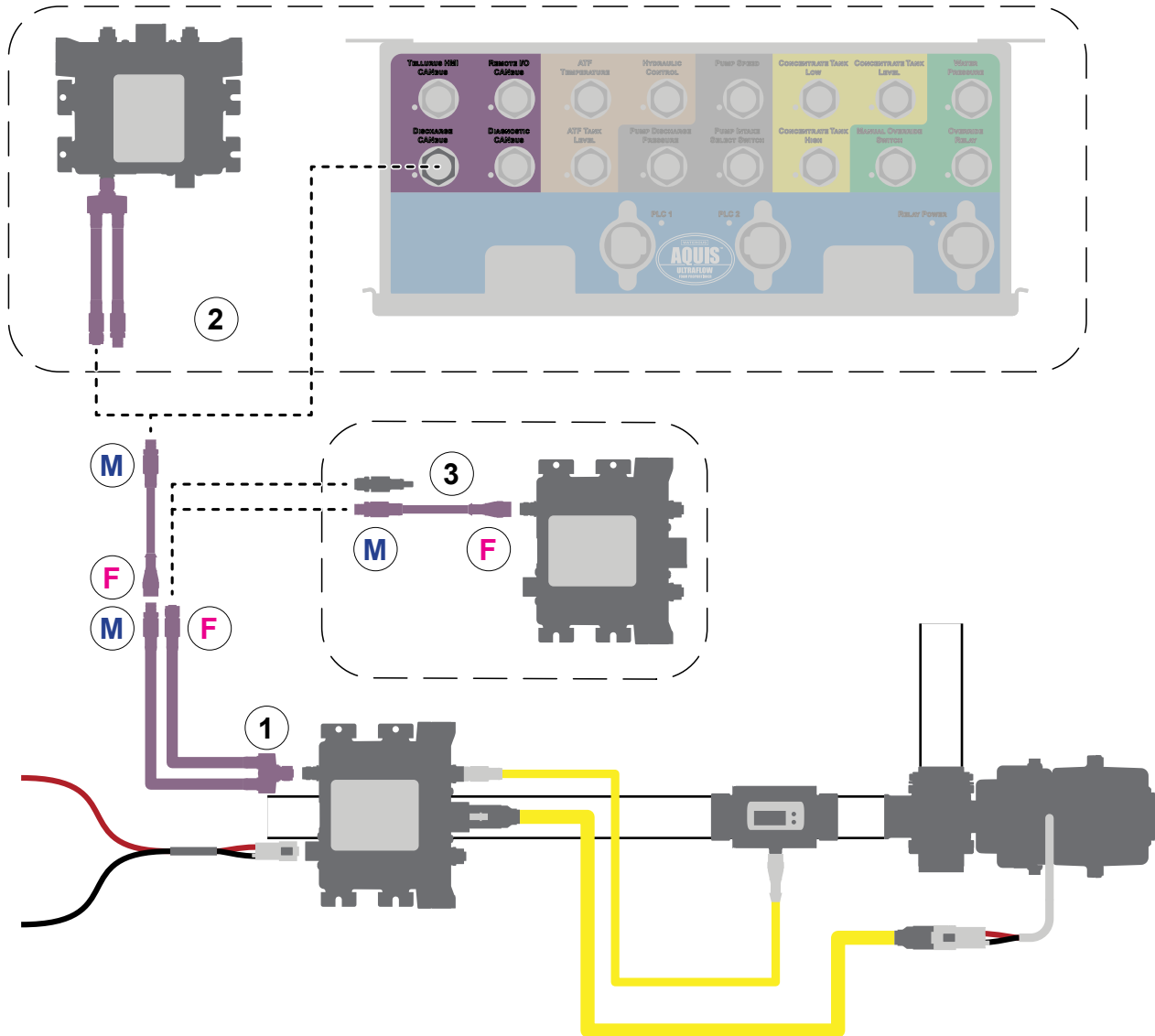
- 4 Locally source a Deutsch DT06-2S connector and an appropriate cable to connect apparatus power to the priming valve motor cable. Power the priming valve motor through a 10 A circuit breaker.

- 5 Connect the priming valve inlet to the discharge side of the concentrate pump.

- 6 Connect the priming valve outlet to the concentrate supply tank, through the installer supplied prime-bypass valve.

- 7 Connect the priming valve motor cable to the priming valve.

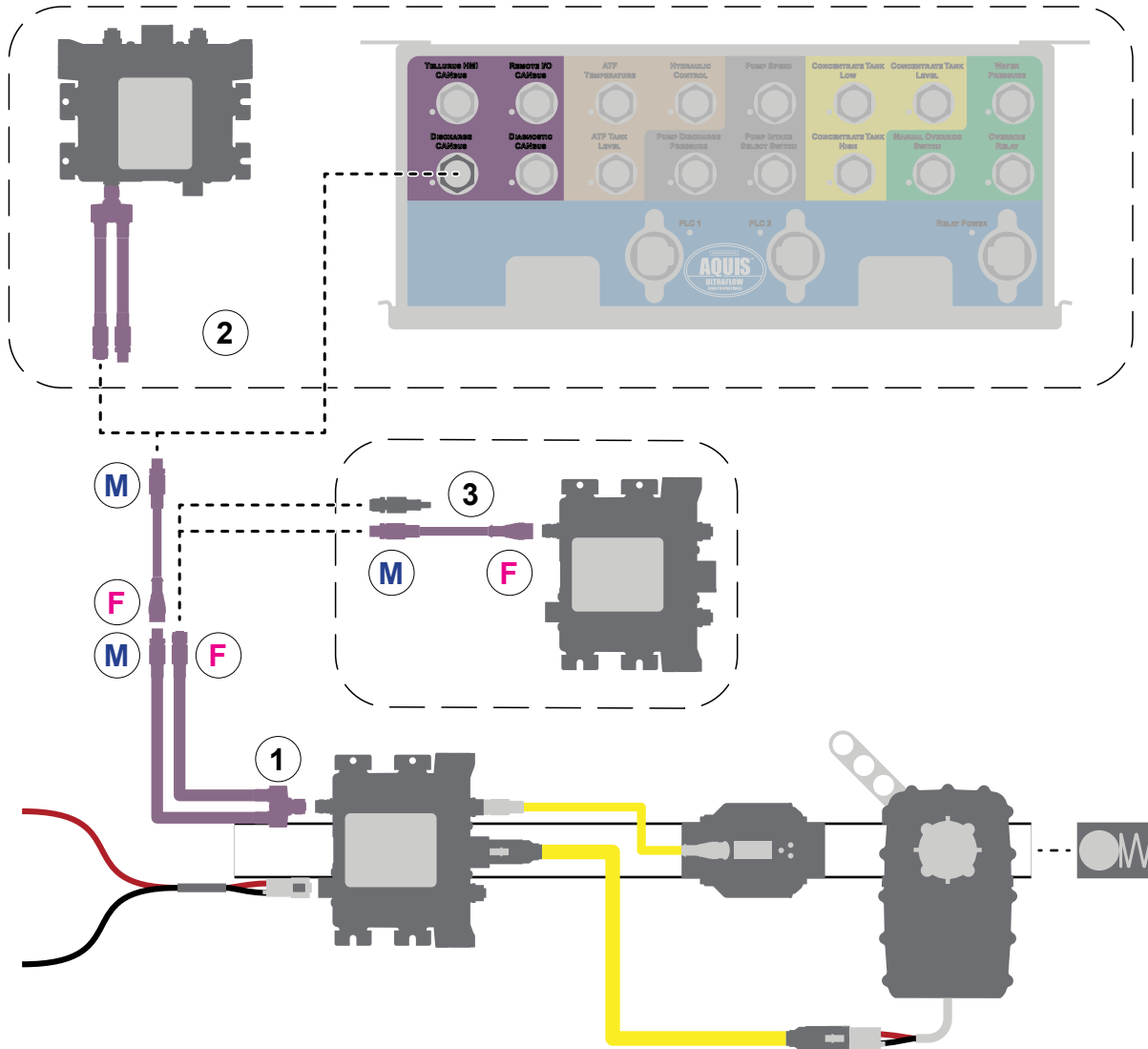
## Connecting the Low-Flow Bypass Line



Use the illustration and instructions to install the low-flow bypass line. To connect to the apparatus plumbing, refer to: "**Plumbing Layout**" on page 52.

- 1 Connect the split CANbus cable to the CANbus connector on the node controller.
- 2 Connect the male end on the split CANbus cable to an upstream node controller, or to the control box—the discharge CANbus connection.  
**Note:** Use an additional CANbus cable if necessary.
- 3 Connect the female end on the CANbus splitter cable to next downstream node controller, or to a terminal resistor if this is the last downstream node controller in the system.  
**Note:** Use an additional CANbus cable if necessary.

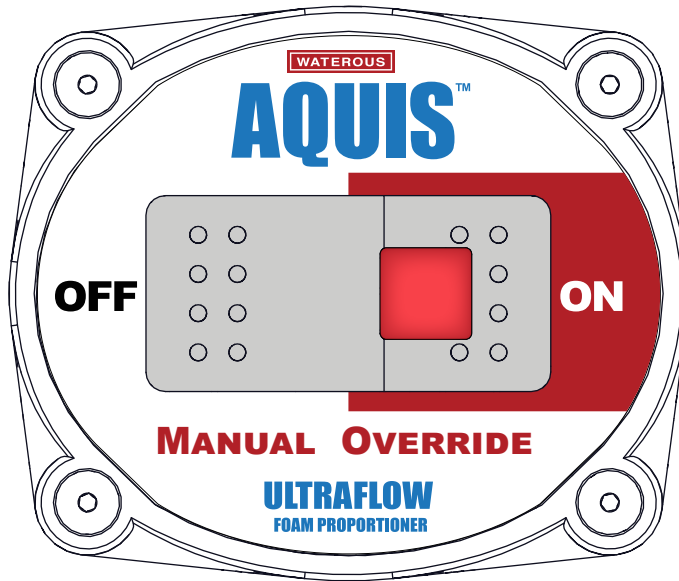
## Connecting the Supply Tank Fill Line



Use the illustration and instructions to install the supply tank fill line. To connect to the apparatus plumbing, refer to: "**Plumbing Layout**" on page 53.

- 1 Connect the split CANbus cable to the CANbus connector on the node controller.
- 2 Connect the male end on the split CANbus cable to an upstream node controller, or to the control box—the discharge CANbus connection.  
**Note:** Use an additional CANbus cable if necessary.
- 3 Connect the female end on the CANbus splitter cable to next downstream node controller, or to a terminating resistor if this is the last downstream node controller in the system.  
**Note:** Use an additional CANbus cable if necessary.

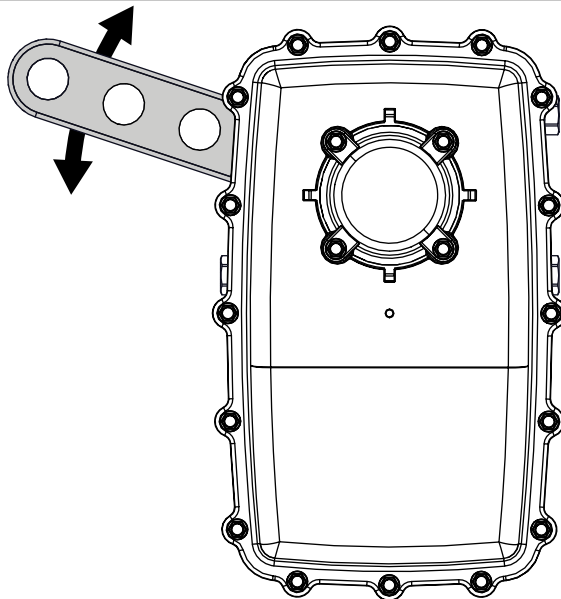
## Enabling the Manual Override



Use the illustrations and instructions to activate the manual override.

- 1 Use the switch to activate the manual override.
- 2 Slowly move the valve actuator to the desired position.

**Note:** After manually repositioning the valve actuator, you may need to recalibrate the valve actuator. Refer to the documentation provided by the valve manufacturer to recalibrate the home position for the valve.



## Maintenance Schedule

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No scheduled maintenance is required for the control system. However, it is recommended that you periodically inspect the system to reveal excessive debris buildup or worn components. Consider environmental conditions, hours of operation, and other factors specific to your application to develop a suitable inspection schedule.

## Notes

**WATEROUS**

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