



Proteus Industries Inc.

WeldSaver™ III

*A third generation of excellence in coolant control
of robotic welding systems*

9WS2G30-001

**A water control unit conforming to
GM Specification CC-049, 2005**

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Information in this document was correct at the time of printing; however, specifications are subject to change as Proteus Industries' continuous improvement processes establish new capabilities.

Section 1: Contacts & Cautions

Purpose:

This manual has been created to assist the installation and functional testing of the 9WS2G30-001 version of the Proteus WeldSaver™. Dimensional drawings, water and power connections are specific to this WeldSaver version.

If you are attempting to install a different WeldSaver version you may need wiring and connection information specific to that version. Contact weldsaver@proteusind.com or call (650) 964-4163 and ask for WeldSaver Support.



Technical Support:

Phone: (650) 964-4163
Fax: (650) 965-0304
E-mail: weldsaver@proteusind.com

In the Detroit, MI area, local support is available from MJM Sales at (248) 299-0525.


Important Safety Information:

NOTE and **CAUTION** statements are used throughout this manual to highlight important operational and safety information.

	NOTE statements provide details that are important to the successful understanding and application of the system.
	CAUTION statements identify conditions or practices that could result in damage to the equipment or other property. WARNING statements identify conditions or practices that could result in personal injury or loss of life.

Taking proper precautions to avoid damage to the WeldSaver during installation helps ensure consistent, error-free installations, which lowers costs and assists on-time completion of contracted work.

The **CAUTION** statements inserted in these instructions provide an alert to installers and operators to take sensible steps to allow the WeldSaver to operate correctly the first and every time.

NOTE	
	<p>Product warranty does NOT cover the repair of installation errors</p> <p>Proteus WeldSavers are manufactured by ISO 9001-registered processes and are warranted to be free from material and workmanship defects. The full text of the warranty is available on the Proteus Industries Inc. website at www.proteusind.com/warranty.</p> <p>The costs of cleaning flow sensors, recalibration or repair of mechanical damage incurred during installation of the product are NOT covered by the warranty.</p> <p>A Purchase Order will be required to allow recovery of such service costs.</p>

Section 2: What It Is & What It Does

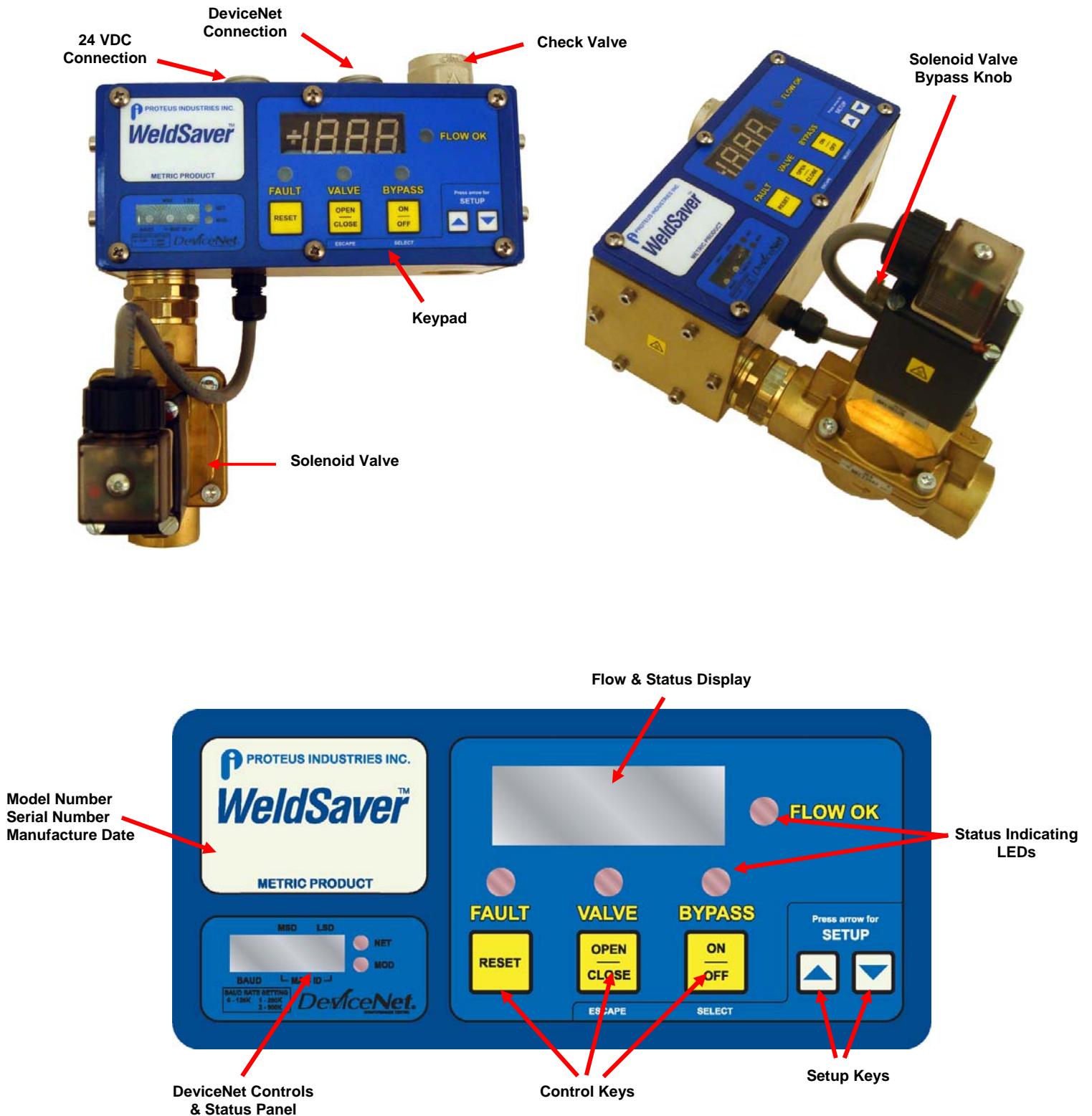


Figure 1: Overview of functional components and control panel of 9WS2G30-001

Section 2: What It Is & What It Does

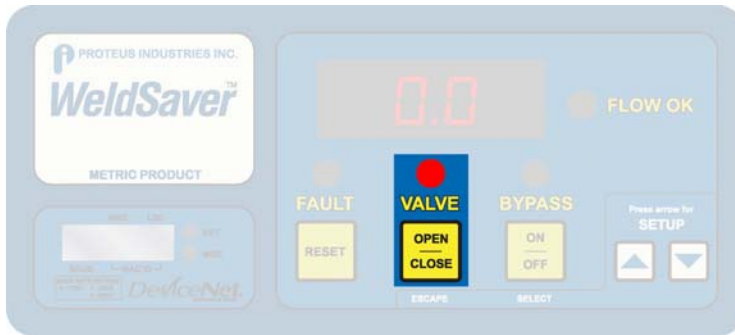
9WS2G30-001 is a water control unit designed and manufactured to comply with the requirements of GM Specification CC-049, November 2005. This unique instrument has several capabilities.

It's a Flow Meter



The large, bright LED display shows the actual flow rate through the system in GPM, or shows the flow relative to a user-selected alarm flow rate.

It's an ON/OFF Flow Valve

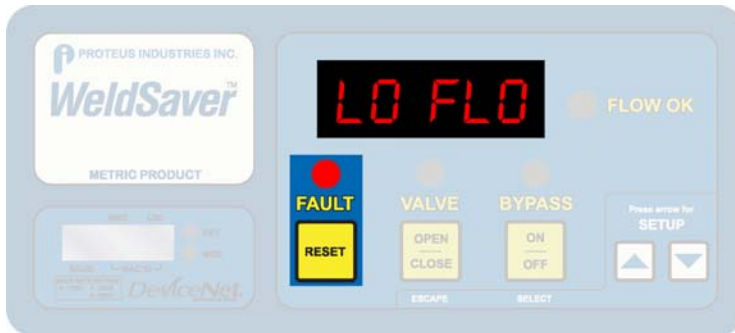


Water flow to the weld cell can be turned ON and OFF from the keypad or from the weld controller.

When the solenoid valve is OPEN, water is flowing and the VALVE status LED is OFF.

When the solenoid valve is CLOSED, water is not flowing and the VALVE status LED is **RED**.

It's a Flow Monitor

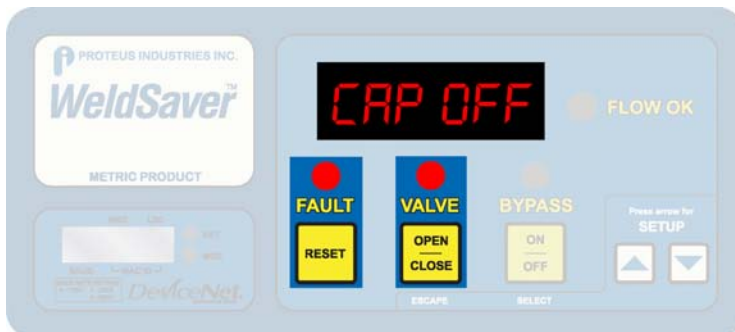


When the flow to the weld cell is greater than the alarm flow rate, the FLOW OK status LED is **GREEN**.

When the flow to the weld cell is less than the alarm flow rate, the FLOW OK status LED is OFF and the FAULT status LED is **RED**.

The **LO FLO** message appears and the weld controller is instructed to stop the weld program.

It's a Very Fast Leak Detector



When a weld cap is lost, the leak is detected and the water flow shut off in < 1 second.

The **CAP OFF** message is displayed and the weld controller is instructed to stop the weld program.

The FAULT and VALVE status LEDs are **RED**.

Section 3: How It Works

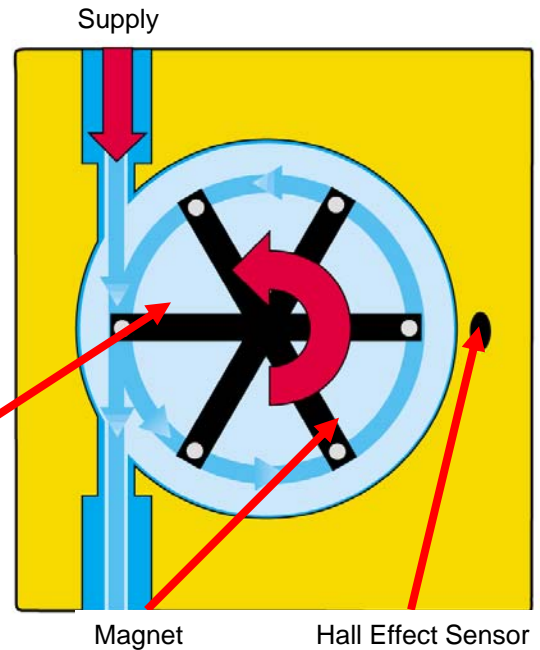
Flow sensing & measurement

A sensitive and rugged flow sensor is located in both the supply and return coolant lines.

A six-spoke rotor is mounted on a stainless steel shaft in the cylindrical turbine chamber. Coolant enters the turbine chamber through a precision-drilled orifice, causing the rotor spin at a rate that is directly proportional to the linear velocity of the liquid passing through the chamber.

Magnets located at the end of the rotor spokes turn ON and OFF a Hall Effect sensor located outside the turbine chamber. The frequency output by the Hall Effect sensor is measured by a microcomputer that calculates the flow rate of the liquid.

Rotor



2. Flow comparison

The measured inlet flow rate is compared with the Warning / Adequate (OK to Weld) and Alarm / Minimal flow rates selected by the operator.

When the measured flow rate is greater than the Warning / Adequate flow rate, the microcomputer sends the digital messages **DiG1WS_OktoWeld** and **DiG1WS_MinFlow** to the weld controller.

When the measured flow rate is greater than the Alarm / Minimal flow rate but less than the Warning / Adequate flow rate, the microcomputer sends only the digital message **DiG1WS_OktoWeld** to the weld controller.

When the measured flow rate is less than the Alarm / Minimal Flow Rate, the microcomputer stops sending the digital message **DiG1WS_OktoWeld**.

The weld controller makes decisions affecting weld operations based on the flow status reported by the WeldSaver.

3. Cap loss detection

The WeldSaver's microcomputer uses a patented algorithm to continuously monitor the output frequencies of both the supply and return sensors. This algorithm is able to detect a loss of a weld cap or other catastrophic loss of flow continuity in less than 0.3 seconds.

When a cap loss event is detected, the microcomputer shuts off water flow in both the inlet and return lines and sends the digital message **DiG1WS_CapLoss** to the weld controller.

The weld controller makes decisions to shut down weld operations.

Section 4: Installation & Testing

4.a Mechanical Installation and Water Connections


Tools required: Adjustable wrenches
Pipe wrenches
Teflon-based pipe sealant
Mounting bolts x 4 to fit #8-32 mounting holes*


Mechanical Installation

1. Refer to Figure 3 on page 20 for dimensions and fastening locations.

Flushing, Making & Testing Water Connections


1. Flush the inlet piping

	CAUTION!
	<p>Flush contaminants and accumulated construction debris from your upstream water pipe BEFORE connecting the WeldSaver.</p> <p>Failure to flush coolant lines may results in fouling of the WeldSaver's flow sensor and clogging of smaller orifices in the robot supply lines, manifolds and the weld gun.</p>

	CAUTION!
	<p>Flush contaminants and other debris from water lines connecting the robot, manifold, transformer, SCR and any other water-cooled components BEFORE connecting them to the WeldSaver.</p> <p>Failure to flush these lines may result in fouling of the WeldSaver's return flow sensor and clogging of smaller orifices in the robot supply lines, manifold, transformer, SCR, weld gun and any other water-cooled components.</p>

2. Lubricate Threads

Use a lubricating and non-hardening pipe sealant such as a Teflon paste on all pipe threads. This material will lubricate G ¾ straight threaded fittings to simplify their installation.

	CAUTION!
	<p>Do NOT allow excess pipe sealant to enter the flow sensors! Excess material may foul the sensors and cause clogging of smaller orifices in the robot's supply lines, manifold, transformer, SCR, weld gun and any other water-cooled components.</p>

Section 4: Installation & Testing

- Refer to Figure 2 to identify the water connection ports.

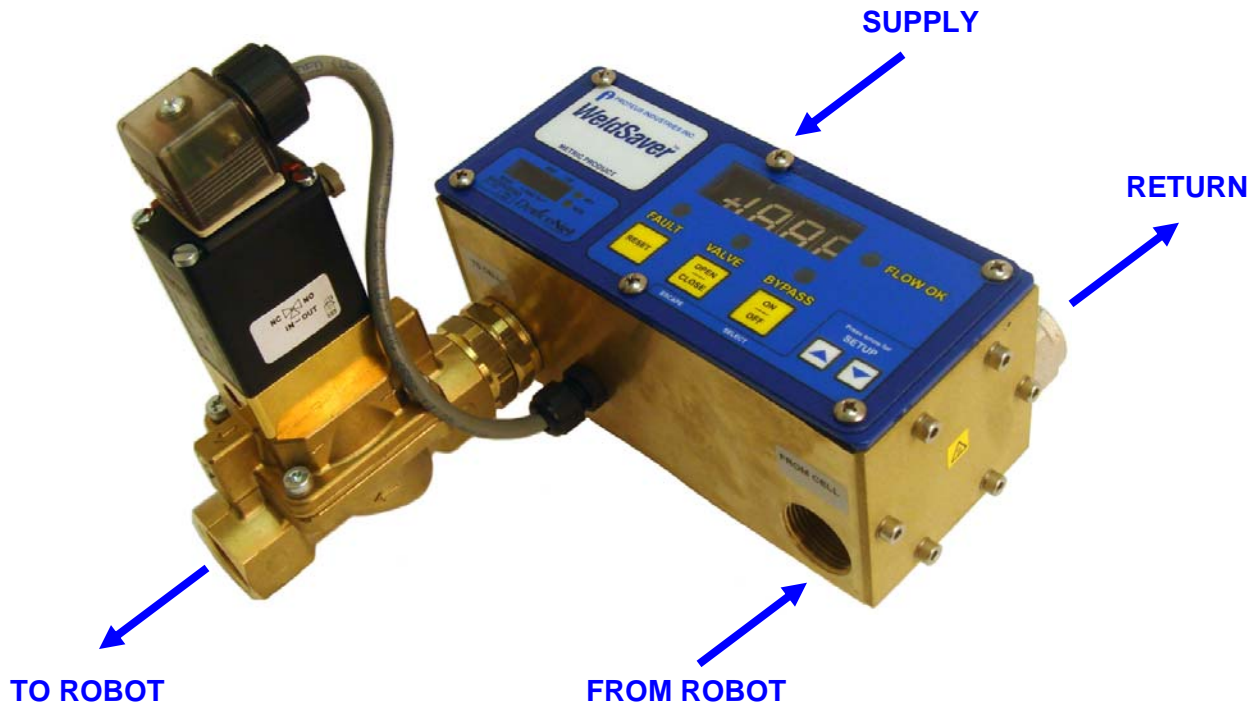


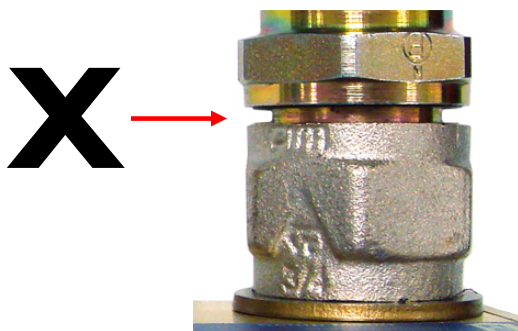


Figure 2: Connection locations of 9WS2G30-001

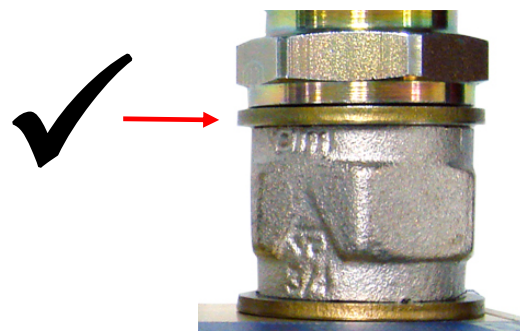
- Make connections to the Supply, Return, To-Robot and From-Robot connection ports on the WeldSaver using the appropriate pipe fittings and sealing washers.

	NOTE
	9WS2G30-001 requires G 3/4 metric plumbing connections.

	CAUTION!
	The provided o-ring sealing washer must be installed between the check valve on top of the WeldSaver unit and the hose fitting in order to ensure a leak-tight seal.




Without the washer in place, leakage is possible.




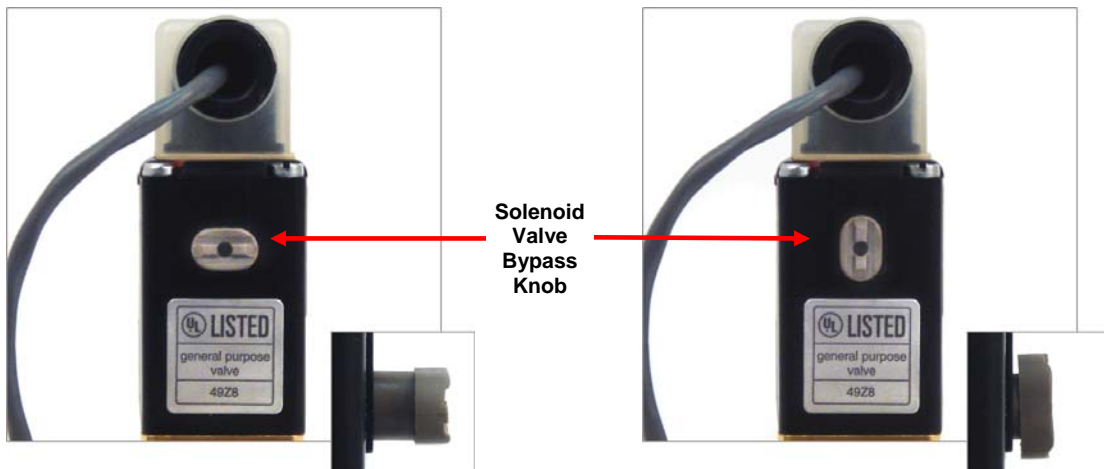
With the washer in place, the device is leak-free.

Section 4: Installation & Testing

	CAUTION!
	Ensure that the correct hoses have been connected to the To-Robot and From-Robot ports.
	Check hose labels or trace water flow to confirm that the WeldSaver is connected to include the water circuit cooling the weld gun.
If the hose connections are not correct, the WeldSaver may NOT be able to detect the loss of a weld cap.	

5. Adjust pipe connections as required for proper alignment of the WeldSaver.
6. Depress the solenoid valve bypass knob and turn it 90° clockwise to a vertical position to enable flow.

	NOTE
	The WeldSaver is equipped with a solenoid valve featuring a manual bypass function.



The solenoid valve is functional when the slot in the knob is in a **HORIZONTAL** position.

During normal operation, the solenoid valve enables the control of flow through the system, either locally with the WeldSaver keypad or remotely from the weld controller.

The solenoid valve can be bypassed by depressing the knob and turning it 90° clockwise to a **VERTICAL** position.

In the manual override state, water can flow through the system to allow leak testing without engaging 24 VDC electrical power.

7. Turn water ON slowly.

	WARNING!
	WeldSaver body is NOT insulated.
	When using the WeldSaver with hot liquids, use proper personal protective equipment.

Section 4: Installation & Testing

8. Check for leaks at all connections to the WeldSaver.
9. Eliminate all leaks before proceeding.
10. Turn the solenoid valve bypass knob 90° counterclockwise and return it to a horizontal position for normal operation.



NOTE

If the solenoid valve manual bypass knob is left in a vertical position, the valve will **NOT** function when power is turned on.

4.b Electrical & DeviceNet Connections



NOTE

9WS2G30-001 units must be connected to 24 VDC auxiliary power, DeviceNet 24 VDC power and a functional DeviceNet controller to perform correctly.

Proteus highly recommends connecting the WeldSaver to certified DC power supplies only.

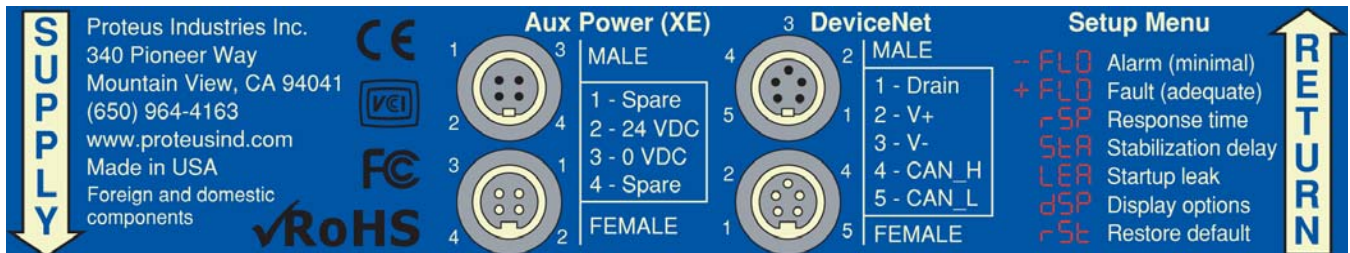


Figure 3: Wiring and Connection Diagrams

Connecting 24 VDC Auxiliary Power

1. Refer to Figure 3 to identify the 24 VDC power interface connections.
2. Check that the Auxiliary Power cable has 24 VDC present between pins 2 and 3.



CAUTION!

Connect the interface cables to the weld controller and the 24 VDC power source before connecting them to the WeldSaver.

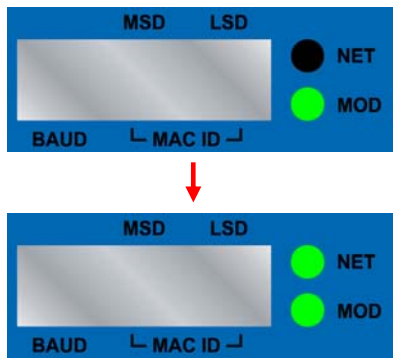
3. Connect the auxiliary power cable to the 4-pin connector on top of the WeldSaver.

Section 4: Installation & Testing





Connecting the DeviceNet Interface Cable

1. Refer to Figure 1 to identify the DeviceNet power interface locations.
2. Refer to Figure 3 to identify the DeviceNet power interface connections.
3. Confirm that the DeviceNet cable has 24 VDC present between pin 2 and pin 3.
4. Connect the DeviceNet cable to the bus leading to the weld controller.
5. Connect the DeviceNet cable to the 5-pin connector on the top of the WeldSaver.

Checking DeviceNet Functionality

	Action	Result
1	<p>Turn power ON to the DeviceNet bus</p> <p>The MOD status LED will be GREEN.</p> <p>The NET status LED will flash momentarily until the DeviceNet Master allocation sequence has completed, after which it will stop flashing and remain solid GREEN.</p> <p>When both the NET and MOD status LEDs are GREEN, the device is ready for normal operation.</p>	

Checking Flow Functionality












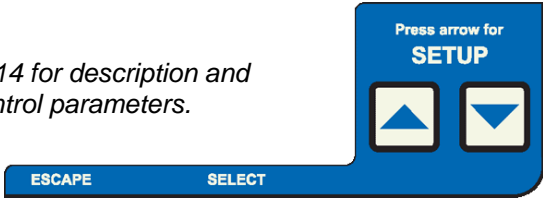
	Action	Result
1	<p>Turn 24 VDC power ON</p> <p>Confirm that DeviceNet controller is operating.</p>	 <p>If water is OFF, the display will alternately show 0.00 and the LO FLO fault message</p>
2	<p>Turn water ON</p> <p>Press the  key.</p> <p><i>Flow rates shown are for example only.</i></p>	<p>If flow rate is > Alarm / Minimal Flow Rate, the actual value will be displayed.</p>  <p>If the flow rate is < Alarm / Minimal Flow Rate, the display will alternately show the actual flow rate and the LO FLO fault message.</p> 

Section 4: Installation & Testing





4.c Perform Three Functionality Tests

To ensure that the WeldSaver is functioning correctly, check the Valve Shut-off function, the Bypass function and the Cap Off detection functions as described below.

Operational Keys





Desired Function	Action	Status LED	Restore to Normal	Status LED
Clear a FAULT <i>Restarts water flow and leak detection function.</i>	Fault detected Welding stopped		Press the  key	
Turn water OFF/ON	Press the  key		Press the  key again	
Select BYPASS mode <i>BYPASS disables leak detection only. Flow-monitoring is still functional</i>	Press the  key		Press the  key again	
Select Operating Parameters	<p>See pages 13-14 for description and selection of control parameters.</p> 			

Test the Valve Shut-off Function


	Action	Result
1	Press the  key	Water flow will be shut OFF. The VALVE status LED will be RED . 
2	Press the  key again	Water flow will be ON The VALVE status LED will be OFF. 




Section 4: Installation & Testing

Test the Bypass Function

	Action	Result	
1	Press the  key	Leak Detection is turned OFF The BYPASS status LED will be YELLOW .	
2	Press the  key again	Leak Detection is turned ON The BYPASS status LED will be OFF.	



Test the CAP OFF Detection Function

	NOTE
	The DeviceNet controller (weld controller) must be operating for this test to be performed.


	Action	Result
1	Remove a weld cap and confirm that the WeldSaver shuts off water flow.	<p>WeldSaver shuts off water flow and displays CAP OFF error message</p> 
2	Reinstall the weld cap Confirm that weld cap is properly secured to weld gun.	
3	Press the  key. <i>Flow rate of 12.9 shown for example only.</i>	<p>Water flow is restored. WeldSaver displays actual flow rate.</p> 


Section 5: Selecting Control Parameter Values


1 Select the SET UP Mode

Press the  or  key to select the **SET UP** mode

2 Select the Parameter to Adjust

Press the  key to go DOWN the stack to the parameter you wish to adjust






















Press the  key to go UP the stack to the parameter you wish to adjust.



Press the  **SELECT** key to select the control parameter you wish to change.

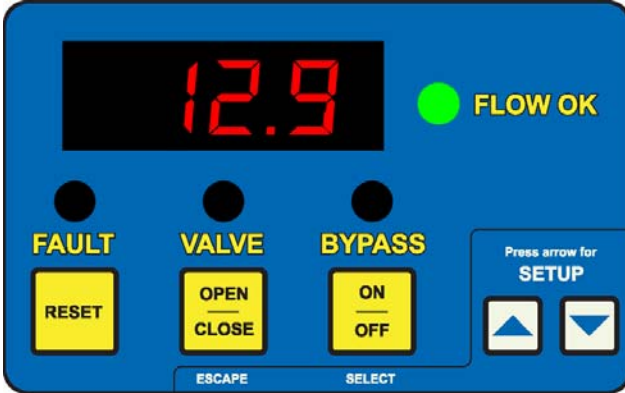
The current value of this parameter will be displayed.

The allowable values for each of these parameters are shown in Table 1 below.


Any parameter you are adjusting will appear at the top of the stack until it has not been changed for 30 minutes. After this time -FLO will appear at the top of the parameter stack.

		- FLO	
		+ FLO	
		r S P	
		S t A	
		LEA	
		d S P	
		r S T	


3 Press the  or  keys to decrease or increase the value of the selected parameter.



The diagram shows a control panel with a digital display showing '12.9' and a green 'FLOW OK' indicator. Below the display are three columns of buttons: 'FAULT' with a 'RESET' button, 'VALVE' with 'OPEN' and 'CLOSE' buttons, and 'BYPASS' with 'ON' and 'OFF' buttons. To the right of these is a 'SETUP' section with 'Press arrow for SETUP' text and two arrow buttons. At the bottom are 'ESCAPE' and 'SELECT' labels.




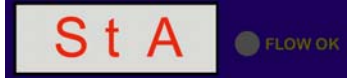



4 Press the  **SELECT** key to choose the selected value of the control parameter and return to normal operation

OR

Press the  **ESCAPE** key to return to normal operation WITHOUT making or saving any changes

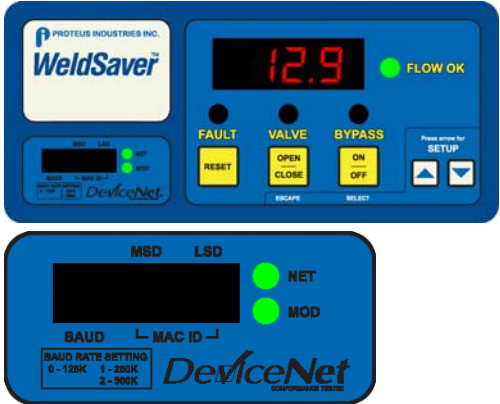
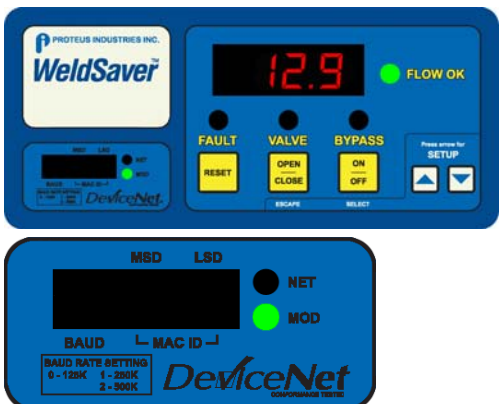
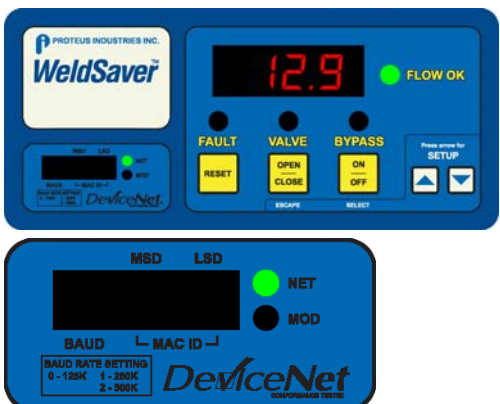
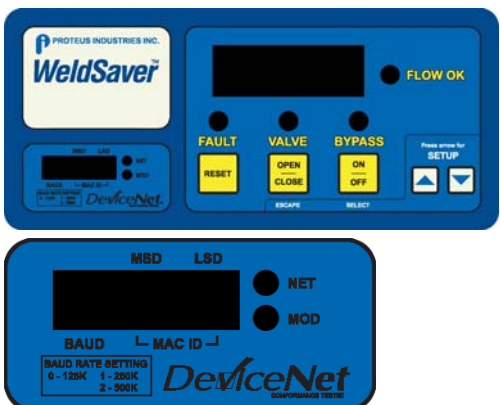
Section 5: Selecting Control Parameter Values

Parameter Values for 9WS2G30-001

	Control Parameter					Preset Value	Description and Notes
	Alarm / Minimal Flow Trip Point					7.6 LPM	This is the lowest flow rate at which the welding system should be operated. Coolant flow less than this rate does not provide sufficient cooling capacity to allow satisfactory welds to be produced.
			LPM				
	Range		0 ~ 30				
	Increments		0.76				
	Warning / Adequate Flow Trip Point					11.4 LPM	This is the flow rate at which the weld system should be operated. This flow rate provides sufficient cooling capacity to allow welds at the desired rate under all ambient temperature conditions
			LPM				
	Range		0 ~ 30				
	Increments		0.76				
	Leak Response					nOr	This setting determines how quickly a leak will be detected. Slowing the response reduces sensitivity to false cap loss events. Speeding the response increases sensitivity to false cap loss events.
	-SLO	SLO	nOr	FAS	+FAS		
	Startup Stabilization Delay Time					2 seconds	This setting selects the time required to purge air from the cooling system that could otherwise cause false cap loss events.
	1 S	2 S	4 S	8 S	16 S		
	Startup Leak Detection Threshold					3.8 LPM	This setting checks whether the weld cap is properly in place and is not ejected from the weld shank when water pressure is applied. A low setting gives the most sensitive response to the loss of a weld cap at start up. A high setting gives the least sensitive response to the loss of a weld cap at start up.
	LPM						
	1.9	3.8	5.7	7.6	9.5		
	Absolute or Relative Flow Display					AbS	The Absolute flow rate is normally used. The relative displays can be used to check the actual flow against the Alarm / Minimal or Warning / Adequate flow rates.
	AbS	Displays actual flow rate					
	- rEL	Relative to Alarm / Minimal flow rate					
	+rEL	Relative to Warning / Adequate flow rate					
	Restore parameters to factory setup values					NONE	This key allows all parameters to be restored to their specified default values.
	nO		yES				
Table 1: Parameter Descriptions, Ranges and Factory Setup Values for 9WS2G30-001							

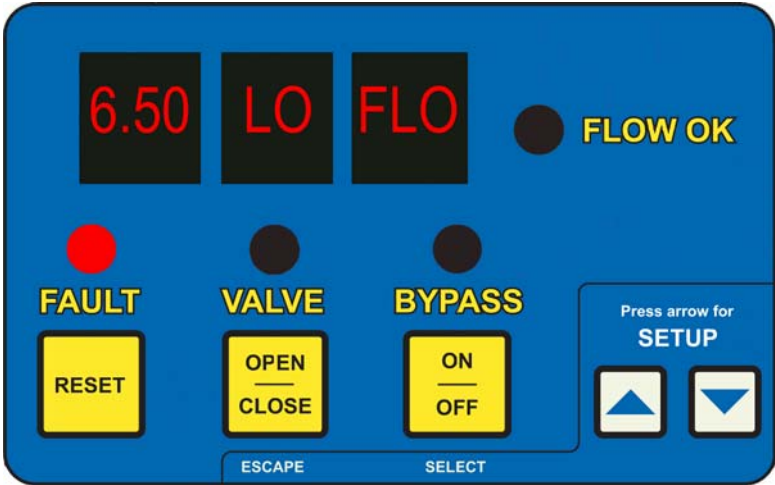


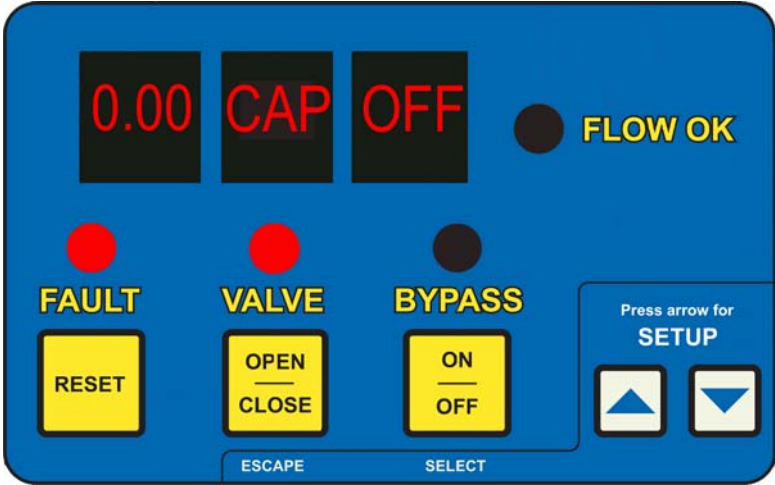
Section 6: Troubleshooting

1. STATUS FAULTS

<p>STATUS – OK TO WELD</p> <p>NORMAL OPERATING CONDITION</p> <p><i>Flow rate of 12.9 shown for example only.</i></p>	
<p>STATUS – NOT OK</p> <p>NET STATUS ERROR</p> <ol style="list-style-type: none"> 1. NOT a WeldSaver error 2. Check all network connections 	
<p>STATUS – NOT OK</p> <p>MOD STATUS ERROR</p> <ol style="list-style-type: none"> 1. Check and tighten all DeviceNet connections to the WeldSaver. 2. If problem persists, replace electronics board. 	
<p>STATUS – NOT OK</p> <p>KEYPAD IS DEAD</p> <ol style="list-style-type: none"> 1. Check 24 VDC at pins 2 & 3 of the 4-pin connector. 2. If 24 VDC is present and keypad is dead, replace electronics board. 	

Section 6: Troubleshooting

2. OPERATING FAULTS

<p>LO FLO FAULT</p> <p>1. Flow is less than Alarm / Minimal flow rate setting</p> <p>1.1. Check Alarm / Minimal flow rate setting. Correct if necessary.</p> <p>1.2. If Alarm / Minimal flow rate setting is OK, increase flow rate if possible.</p> <p>1.3. If flow rate cannot be increased, reduce Alarm / Minimal flow rate setting.</p> <p>2. Rotors slowed by wear or fouling</p> <p>2.1. Clean or replace rotors.</p>	
<p>CAP OFF FAULT</p> <p>1. Unit has detected loss of weld cap and water flow is shut off</p> <p>1.1. Replace weld cap.</p> <p>1.2. Press  to allow water flow and restart</p> <p>2. Welding has stopped but weld cap is still in place — False Cap Off condition</p> <p>2.1. Increase Leak Detection setting.</p> <p>2.2. Press  to allow water flow and restart.</p> <p>3. Frequent False Cap Off caused by fouled or worn rotors</p> <p>3.1. Clean or replace rotors.</p>	

Section 6: Troubleshooting

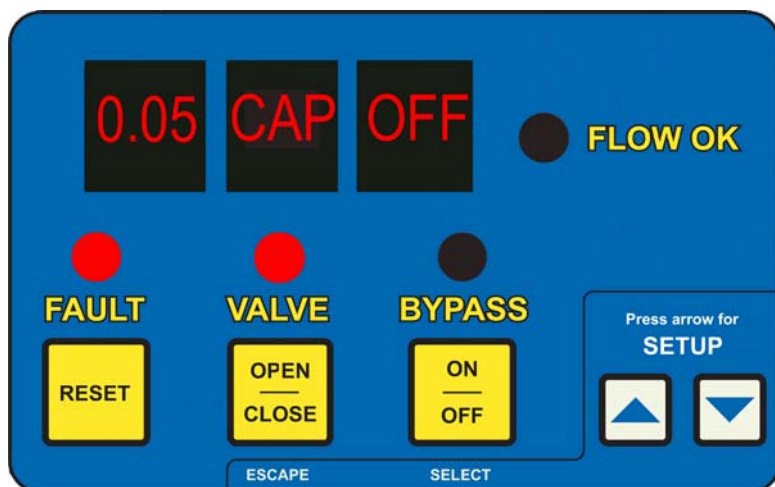
2. OPERATING FAULTS

JAMMED ROTOR FAULT

Flow rate is always 0.05 in this state.

1. Rotors are jammed or rotating too slowly because of fouling

- 1.1. Clean or replace rotors



VALVE FAULT

Flow rate of 2.72 shown for example only.

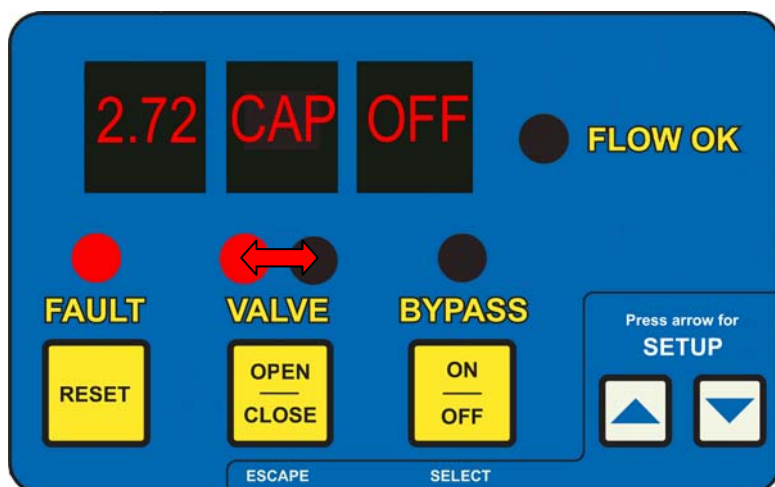
VALVE status LED flashes at 1-sec intervals, flow does not go to 0.00 as solenoid valve is not able to shut off water flow

1. Solenoid valve is fouled

- 1.1. Clean or replace solenoid valve

2. Not sufficient back pressure to close solenoid valve.

- 2.1. Increase back pressure to
> 50 kPa / 7.25 psi




Section 6: Troubleshooting

3. WELDSAVER FAULTS


PROBLEM: DOES NOT DETECT CAP OFF CONDITION


1. Unit is in BYPASS mode

- 1.1. Press  to return to normal operation

2. Leak Response setting is too SLOW

- 2.1. Select the  function

- 2.2. Press  to select a faster response.

- 2.3. Press  to select new value and return to normal operation.

3. Rotors slowed by wear or fouling


- 3.1. Clean or replace rotors

PROBLEM: DOES NOT DETECT CAP LOSS IMMEDIATELY AFTER RESET

1. Start Up Leak Detect Threshold is TOO HIGH

- 1.1. Select the  function

- 1.2. Press  to select a lower value

- 1.3. Press  to select new value and return to normal operation.

PROBLEM: **LO FLO** OR **CAP OFF** FAULT DETECTED IMMEDIATELY AFTER REPLACING WELD CAP

1. Startup Stabilization Delay setting is TOO SHORT

- 1.1 Select the  function

- 1.2 Press  to select a longer delay

- 1.3 Press  to store new setting.

PROBLEM: DOES NOT SHUT OFF WATER FLOW

1. Solenoid manual override is engaged.

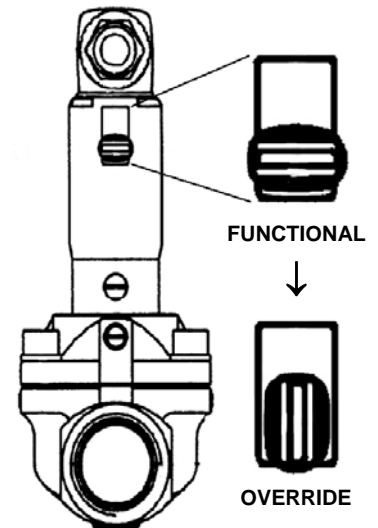
- 1.1. Turn solenoid bypass knob 90° counterclockwise to disengage.

2. Solenoid pilot flow is blocked

- 2.1 Clean or replace solenoid valve

3. Check valve is blocked or fouled

- 3.1 Clean or replace check valve



Solenoid valve is functional when slot in knob is horizontal.

Turn 90° counterclockwise to disengage manual override.

Section 6: Troubleshooting

3. WELDSAVER FAULTS

PROBLEM: LO FLO FAULT WHEN SUFFICIENT FLOW IS PRESENT.

1. Rotors are fouled

- 1.1. Clean or replace rotors

PROBLEM: FLOW DISPLAY IS ERRATIC

1. Rotors are fouled

- 1.1. Clean or replace rotors


PROBLEM: FLOW REDUCES OVER TIME

1. Filter is clogged


- 1.1. Clean filter

PROBLEM: FALSE CAP OFF FAULTS OCCUR REPEATEDLY AT SAME STEP IN WELD CYCLE WHEN RAPID ROBOT MOVEMENT OCCURS

1. Leak Response setting is too FAST

- 1.1. Select the  function

- 1.2. Press  to select a slower response.

- 1.3. Press  to select new value and return to normal operation.

PROBLEM: FALSE CAP OFF EVENTS

1. Rotors are fouled

- 1.1. Clean or replace rotors

PROBLEM: NO WATER FLOW. DISPLAY SHOWS 0.00 VALVE STATUS LED IS RED

1. VALVE is closed

- 1.1. Press  to open valve.

Section 7: Dimensional Drawings

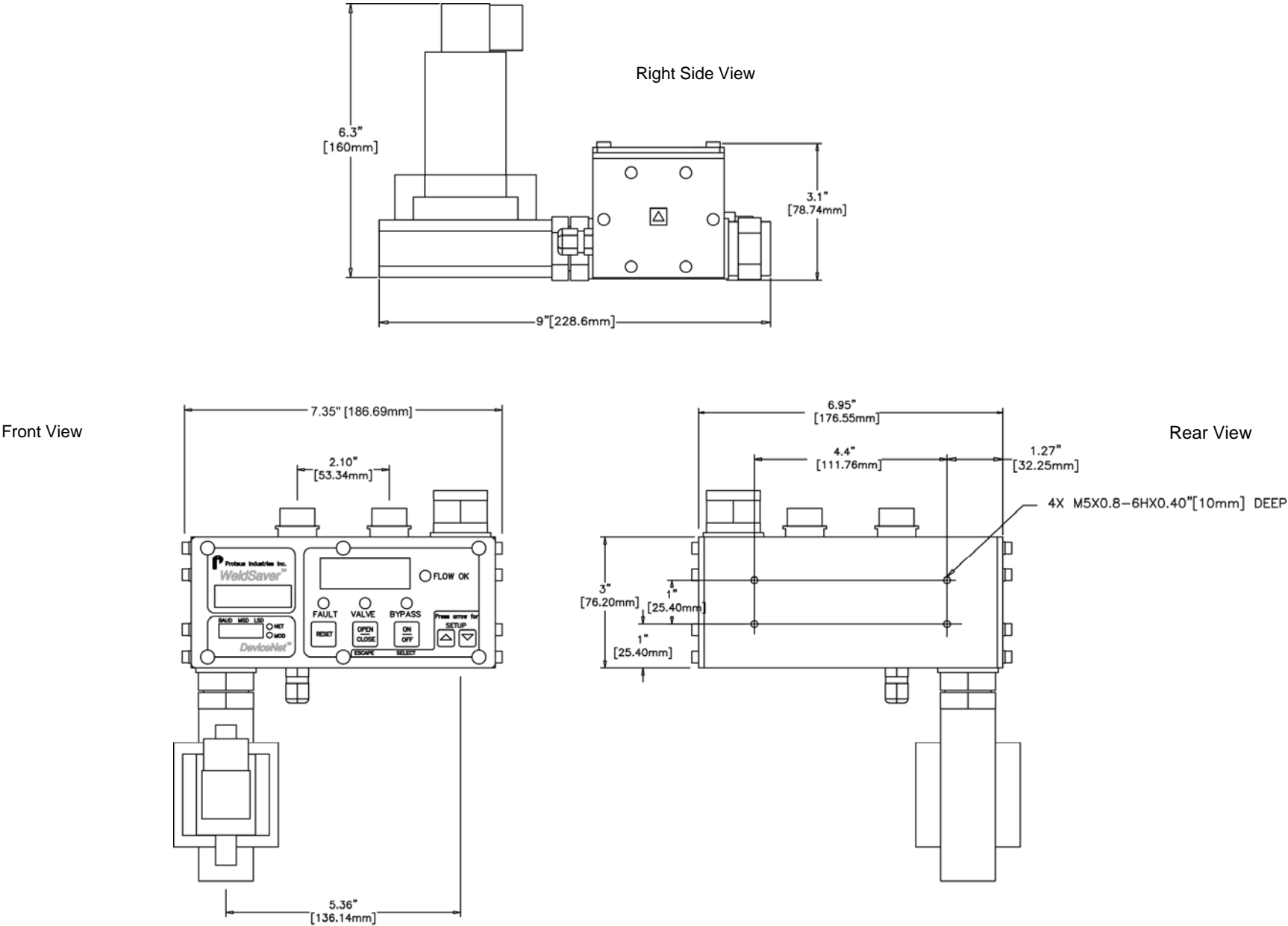


Figure 3: Dimensions of 9WS2G30-001