

LINEAR DC RESISTANCE WELDING CONTROL

UB-1500B

UB-4000B

USER MANUAL



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Revision Record

Revision	EO	Date	Basis of Revision
A	47920	12/25	None. Original edition
B	---	01/26	Updated Stop functionality, ship kit list, ,API, Administrative Functions, formatting
C	48086	03/26	Add quick start, updated security, added Test Pulse Measurement results and Stop Condition on I/O screen

UB-1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

Each configuration also includes Ship Kit # 4-81261 containing the following parts.

Amada Weld Tech Part Number	Description	Quantity
4-42280-01	USB Drive UB Power Supply Manuals	1 Each
4-42273-02	Assy Voltage Sense Cable #6 Ring	1 Each
4-42371-02	6' Voltage Pickup, Cable DC25	1 Each
4-42525-01	Cable, Adaptor, Valve. Legacy Weld Head, New PS	1 Each
625-932	Screw, Hex Head	2 Each
205-133	Cord, CE, 14-3. M/F Black	1 Each
755-393	Spring Lock Washer, Split	4 Each
160-063	Bolt, Hex Head, M8X12mm	2 Each
4-42526-01	50 pin I/O connector with STOP pre-wired	1 Each
755-420	Washer, M8, S/S, Flat Round	4 Each

UB-1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

FOREWORD

Thank you for purchasing the AMADA WELD TECH UB-1500B or UB-4000B Linear DC Resistance Welding Control. For the rest of this manual, both the UB-1500B and UB-4000B will be referred to simply as the **Power Supply**, except in those instances where unique descriptions are required (specifications, connections, etc.)

Upon receipt of your equipment, please inspect it thoroughly for shipping damage prior to installation. If there is any damage, please contact the shipping company immediately to file a claim, and notify us at:

**AMADA WELD TECH INC.
1820 South Myrtle Avenue
Monrovia, CA 91016-7133
Telephone: (626) 303-5676
FAX: (626) 358-8048
Email: info@amadaweldtech.com**

The purpose of this manual is to provide operating and maintenance personnel with the information needed to operate and maintain the Power Supply properly and safely.

We have made every effort to ensure that information in this manual is both accurate and adequate. The contents of this manual are subject to change without notice.

Should questions arise, or if you have suggestions for improvements to this manual, please contact us at the phone number or address above.

AMADA WELD TECH is not responsible for any loss or injury due to improper use of this product.

This manual covers the following models:

Legacy Models: The UB-500A and UB-1500A power supplies are replaced by the UB-1500B power supply. The UB-4000A is replaced by the UB-4000B power supply.

Legacy Model Name	Legacy P/N		Current Model Name	Current Model Numbers
UB-500A	1-335-05	→	UB-1500B	1-337-01-01
UB-1500A	1-336-05	→		1-337-01-02
				1-337-01-03
				1-337-01-04
UB-4000A	1-340-05	→	UB-4000B	1-341-01-01
				1-341-01-02
				1-341-01-03
				1-341-01-04

UB-1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

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Chapter 1 DESCRIPTION

Overview

The UB-1500B and UB-4000B are linear DC power supplies for resistance welding. Both models have the same functionality, differing only in output weld current range. The UB-1500B has a weld current output of 5 to 1500 Amps, allowing for greater accuracy at lower weld current settings. The UB-4000B has a current output of 200 to 4000 amps for those applications requiring more power.

The Power Supply is intended for use with AMADA WELD TECH force-fired manual weld heads, AMADA WELD TECH low force programmable electronic weld heads, or force-fired air-actuated weld heads for resistance welding metals in micro-joining applications.

The Power Supply provides precise, consistent welds with high productivity, low rejection rates, and long electrode life by delivering well-defined pulses of energy to the weld head at precise points during the weld process.

The Power Supply is a closed-loop system with internal and external sensors measuring the energy delivered to the weld head. This weld energy feedback is sent directly to logic circuits in the Power Supply, allowing the system to instantly change the pulse to compensate for any variation in part resistance.

The Power Supply uses only single-phase input power. The advanced linear control circuit provides instantaneous changes to the weld current output in response to changes in the resistance of the workpiece during the weld. This level of control is essential to achieving consistent welds in applications where the resistance changes dramatically.

The graphical display and intuitive weld monitor make the process of designing and optimizing a weld easy. Data output provides the necessary process documentation for critical applications and permits data logging for Statistical Process Control (SPC).

CHAPTER 1: DESCRIPTION

Features

- Programming time in increments of 100 μ sec provides shorter weld times, less part deformation, longer electrode life, and greater weld strength with more part ductility.
- The touchscreen display shows a graphic trace of weld current, voltage, power and resistance with alphanumeric peak and average values.
- Up to 128 individual weld schedules can be programmed and stored on the Power Supply.
- Weld schedules can be used individually or in sequence in a chain function.
- Easy-to-set limits allow the user to establish process windows for acceptable quality.
- Processes can be aborted if parameters exceed user-set limits.
- Calibration is traceable to NIST standards.

Uses

The Power Supply is ideal for micro-joining applications requiring exceptional control and the highest quality throughput.

Description

Hardware

The Power Supply is a stand-alone device (H 14.6" (371 mm) X W 10.3" (261 mm) X D 19.7" (501 mm)) with options for a touchscreen interface or a blank screen which can be operated through a remote tablet or a PC.

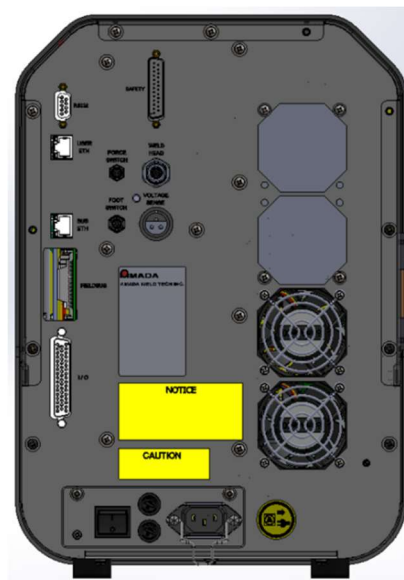
It connects to a weld head from the left side and to input/output and data communications devices via the back panel. For units without a display, an Ethernet port is accessible on the front panel.

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

CHAPTER 1: DESCRIPTION



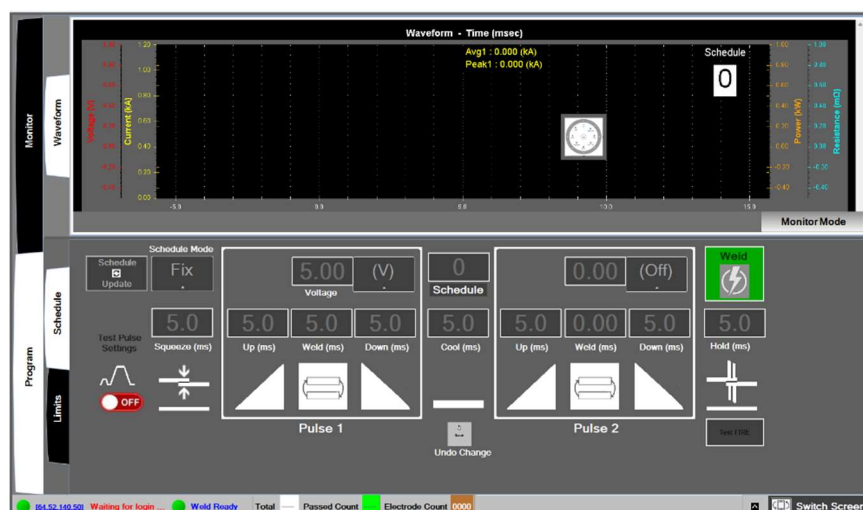
UB-1500B front and left side



UB-1500B back panel

Software

The Software for the touchscreen interface provides all the control and feedback necessary to program, store and monitor up to 128 stored weld schedules operated through the Power Supply. This software can also operate on a Windows PC. (See [Using UB-RW Software](#) for more information.)



Touch Screen Interface

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External Communications

The unit can be controlled by and interfaced with factory controls and data systems via External I/O using the standardized RW I/O set, via:

- REST API over TCP/IP
- MQTT over TCP/IP
- RS-232 serial communications
- Ethernet/IP (Optional, does not come standard)

MQTT and REST API are prioritized for weld data transfer. There is limited weld data reporting available over RS-232 due to transfer speeds.

Security

The system includes a logon screen for two types of users, Engineers and Operators. Engineers have access to all weld schedules and can change any weld/time parameters within a weld schedule, calibrate the system or reset defaults. Operators cannot access these functions.

Emergency Stop

Certain models can be configured with a Weld Head Safety Controller (WHSC) that meets ISO13849-1 safety standard and is in compliance with the CE Machinery. The emergency stop is controlled by a dual-channel Emergency Stop safety relay controller configured for PL_d performance level.

If an Emergency Stop is triggered, the Power Supply displays an Emergency Stop message, prevents welds, and cuts power to the valve output via the safety relay.

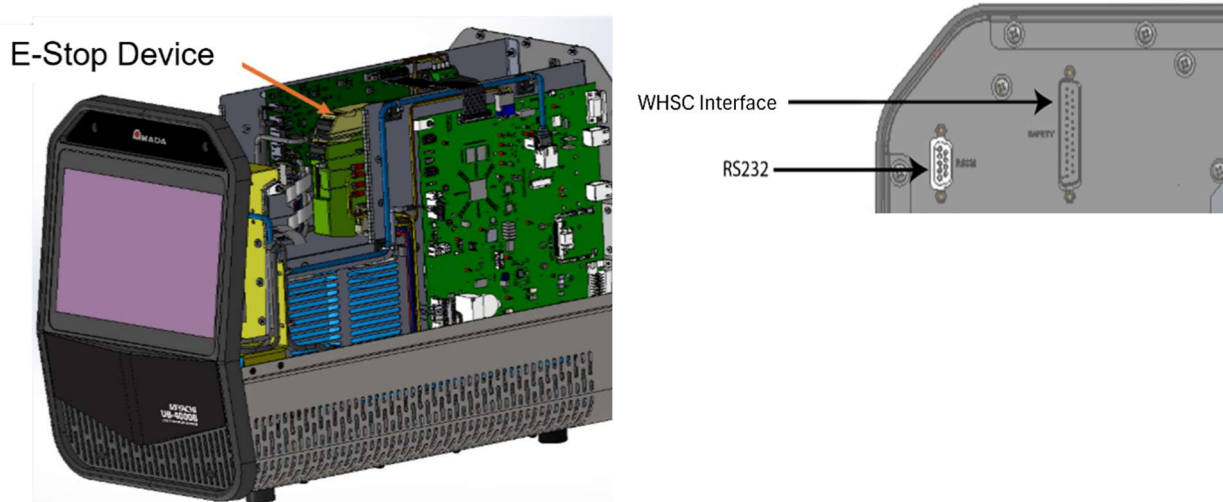
(To clear the alarm and allow unit operation to continue, the Emergency Stop input must be reconnected and either the RUN key must be pressed, or the digital RESET input must be switched. Other resets may be required for linked components.)

A dual-channel dry contact relay output is available for connecting to other devices.

CHAPTER 1: DESCRIPTION

If the system is configured with the optional Machinery Directive compliant weld head safety controller, the customer is responsible for wiring the emergency stop inputs and head connections to the unit before the first use.

The illustration below shows the position of the weld head safety controller inside the Power Supply and the position on the real panel device of the Safety input that connects to the E-stop.



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CHAPTER 1: DESCRIPTION

Options/Accessories

The options and accessories listed below are available; they are quoted as separate line items.

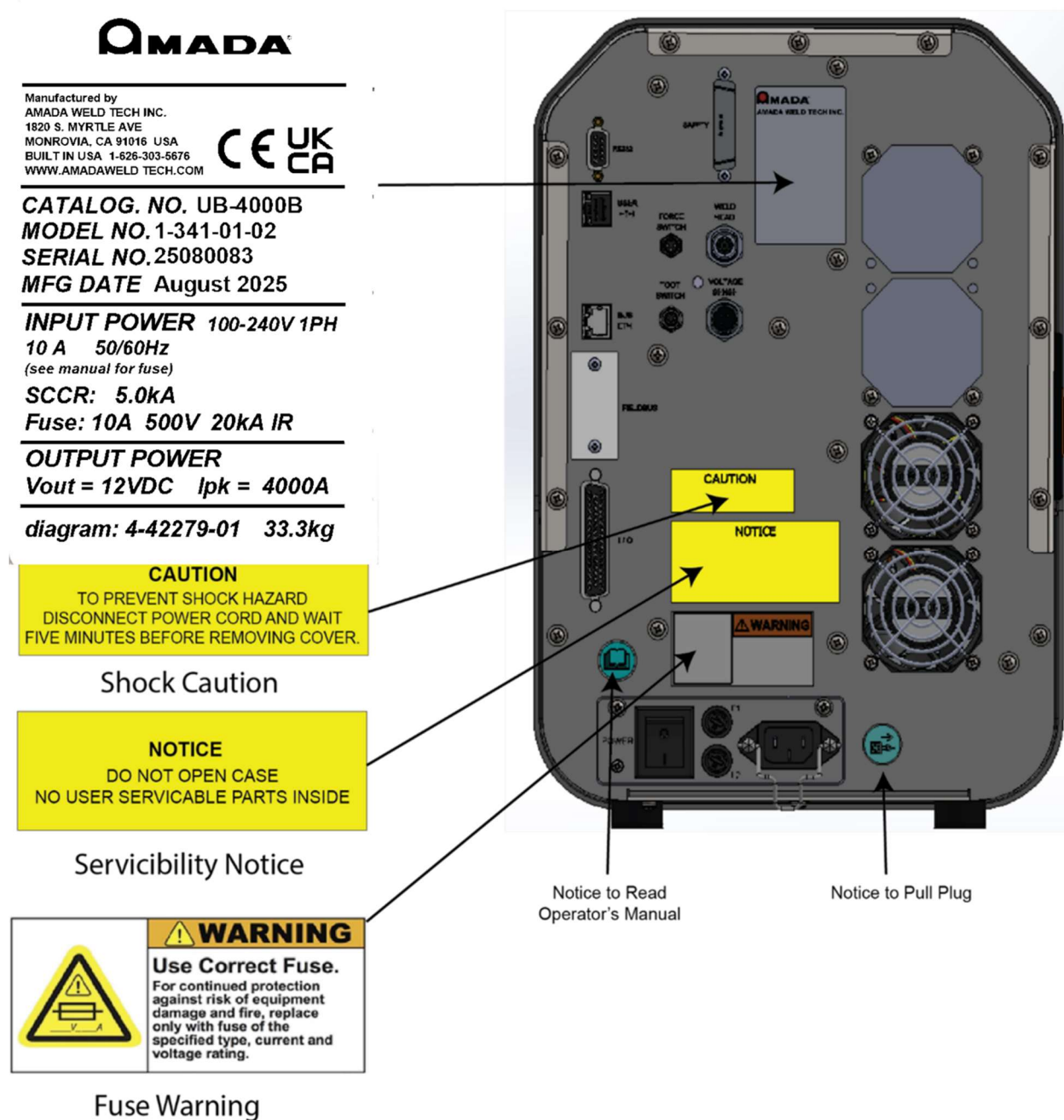
Part #	Component	Description
10-240-03	Footswitch – Line Master	2 level, Dry Contact M8 Connector - 6' length
18-20U-BB-12	Weld Cables	2/0 Weld cables, 18" length
205-629	Valve Drive Cable	AWTA weld head connector on one end, stripped wires on the other

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CHAPTER 1: DESCRIPTION

Labels

The image below shows the placement of the various labels on the device.



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Chapter 2 INSTALLATION AND SETUP

Planning for Installation

Space Requirements

The Power Supply is intended to be used on a work surface where it can be attached to a resistance weld head, allowing for sufficient space for the devices to be used safely in the manner described below.

- The Power Supply should be installed in a well-ventilated area that is free from excessive dust, acids, corrosive gases, salt, and moisture.
- Note that the Power Supply connects to the weld head from the left-hand side of the device as viewed from the front; position it accordingly.
- Allow sufficient clearance around both sides and the back for power and signal cable runs.
- Allow ample workspace around the Power Supply so that it will not be jostled or struck while welding.
- The work surface must be level, stable, free from vibration, and capable of supporting the weight of the total welding system.
- The Power Supply must be far enough from the weld head to avoid contact with weld splash.
- Ensure that there are no sources of high-frequency energy in close proximity.

Utilities

- The Power Supply requires 100 – 240V AC, 50 – 60 Hz single-phase power.

CHAPTER 2: INSTALLATION AND SETUP



- Note: The power input includes a wire frame extending out from the back of the unit to hold the power cable in place. The power cable for the Power Supply is equipped with a standard IEC-320-C13 connector for the **AC INPUT** plug (AWTA # 205-129). See [Appendix B, Electrical and Data Connectors](#) for more information.
- If compressed air and cooling water service are required, please refer to the weld head manufacturer's user manual for service specifications.

Unpacking

You will find the Shipping Kit List when you unpack the shipping container. Verify that the contents of the container agree with the kit list.

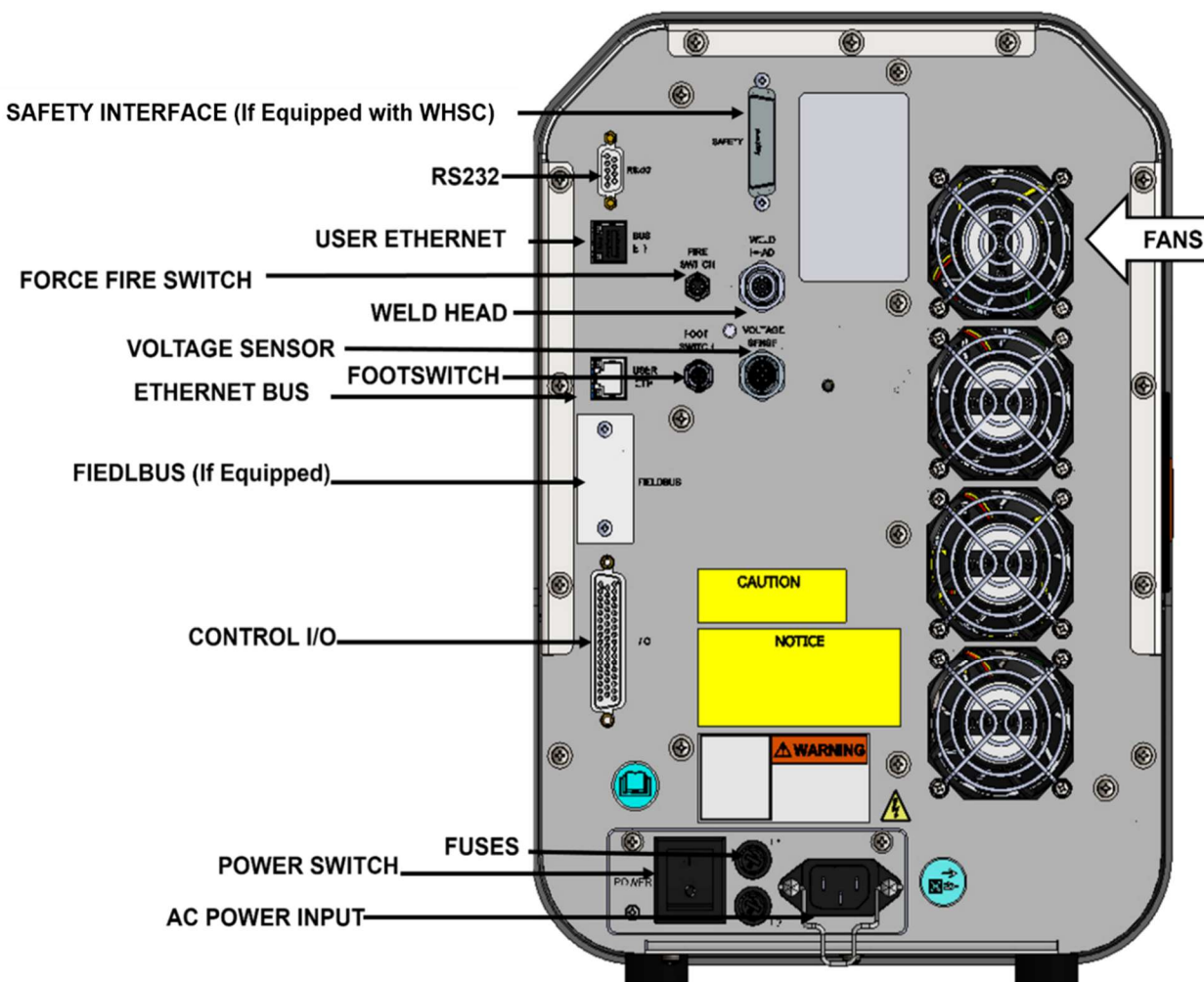
Also verify that the equipment shows no signs of damage. If you see any damage, please document the damage and contact the carrier and AMADA WELD TECH immediately to report it and to obtain further instructions.

NOTE: Save the packing material and carefully place it into the boxes for potential future shipping requirements.

CHAPTER 2: INSTALLATION AND SETUP

Back Panel I/O Connectors

See Appendix B Electrical and Data Connections for a description of the back panel connectors.



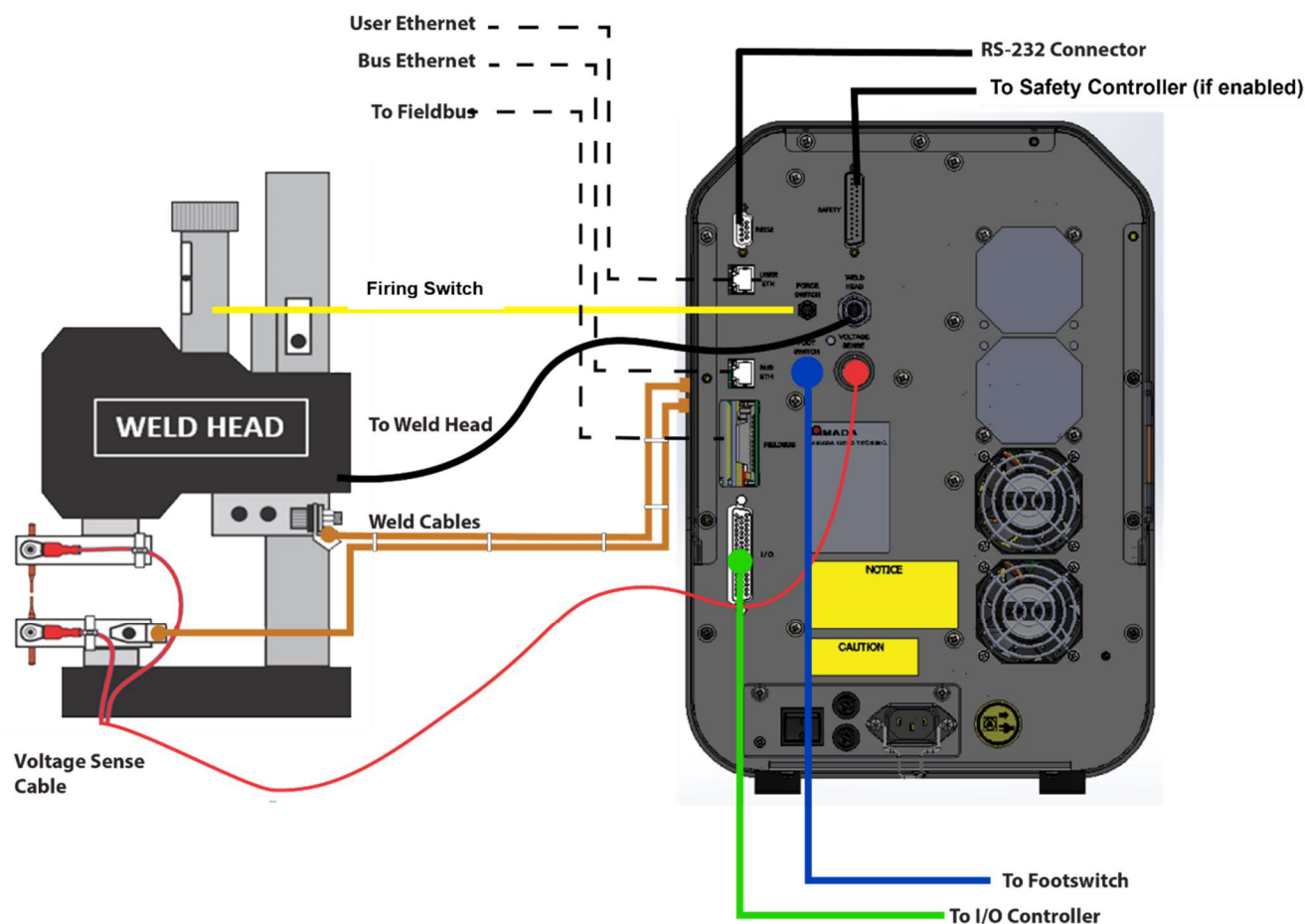
UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

Setup

Manual Weld Head Connections

1. Connect one end of a weld cable to the negative (-) weld terminal on the Power Supply.
2. Connect one end of the second weld cable to the positive (+) weld terminal on the Power Supply.

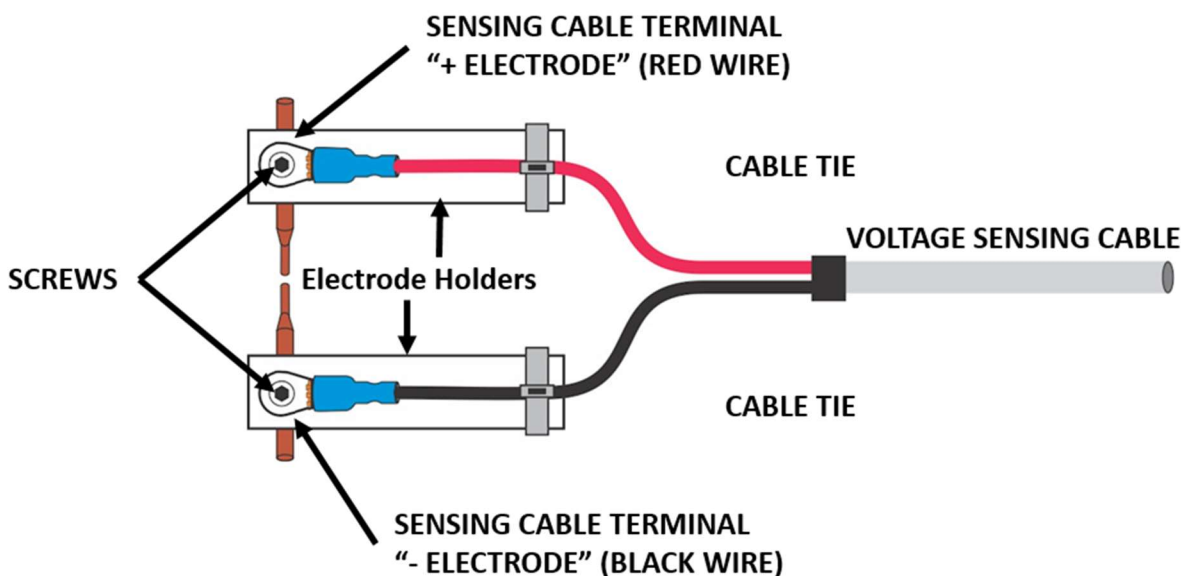
Note: Install weld cable washers between the screw heads and cable terminals, NOT between the cable terminals and Power Supply terminals. Thread length of the screws should be 12 mm or less. **Using longer screws may damage the Power Supply or provide incomplete fastening to the terminal.**



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CHAPTER 2: INSTALLATION AND SETUP

3. Connect voltage sensor cables to weld head elements.
 - a. Ensure that the electrode connected to the “+” terminal is connected to the red terminal of the voltage sensing cable.
 - b. Using a cable tie as a strain relief, attaching each voltage sensing lead to its corresponding electrode holder so that the lead terminals will not break away under heavy production operating conditions.
 - c. Attach the voltage sensing cable connector to the **Voltage Sensor** connector.
 - d. Install electrodes in the weld head electrode holders.
 - e. Attach voltage sensing cables to the screws on the electrode holders as shown.



Voltage Sensing Cable Installation - POLARITY SENSITIVE

4. Connect the weld head to the weld head connector on the power supply.
5. Connect the force switch on the weld head to the force switch input.
6. Connect the safety output to the machinery directive safety connector, if so equipped.
7. Connect the foot switch and I/O controller.

Connect data communications (RS-232 user Ethernet, bus Ethernet, Field Bus) as required and available.

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CHAPTER 2: INSTALLATION AND SETUP

Stop Condition: Disconnected Cable

Note: If a connector cable on the back of the Power Supply has been disconnected, a message will display in the error field of the [Status Bar](#) on the front screen. This will also be indicated the **Stop Condition** input on the **User Inputs/Outputs** screen of the [I/O Screen](#) on the **Diagnostic Screens** section of the Circular Menu.

All Models – Weld STOP connection (NOT Emergency Stop)

The power supply is configured with a software STOP input on the 50-pin I/O connector, pin 24. This input, normally closed, is used to stop welding and prevent head actuation for all systems but is not considered an Emergency Stop under IEC 13849-1 since it does not have the monitored hardware necessary for compliance.

Opening this signal will prevent the weld head drive signal from actuating and prevent the weld process from occurring. If the welder is currently busy and the STOP input is opened, the weld will be aborted, and the head valve drive signal will shut off. This is different from ABORT input in that STOP will also prevent actuation of the weld head valve driver whereas ABORT will only prevent the welder from firing a weld or stop a weld in progress.

The unit is shipped with the STOP input in a state where it will not function without user intervention. The user must determine how they want to integrate the STOP and they must take action or the machine will not activate the valve drivers or start a weld. A warning message will appear on the user interface.

The power supply is shipped with a 50-pin I/O connector pre-wired for STOP to function (P/N 4-42426-01). A flying lead cable extending from this connector contains two wires attached to the STOP pins. For the machine to function normally, it is necessary to wire these to a normally closed switch or short them together with a wire nut or similar device. If STOP is to be wired to a PLC or other control the flying leads should be desoldered at the connector and replaced as needed. Note that the I/O Input bias is set by a jumper soldered in 4-42426-01 and it may be necessary to change the polarity if the polarity of the input signal logic needs to be changed. See [Appendix B- Electrical and Data Connections](#) for details of how to wire the system I/O.

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Pneumatic and Electronic Head Integrations - Safety

Integration of the welding power supply with pneumatically or electrically actuated weld heads introduces additional requirements to protect operators from hazards inherent in these heads. The power supply can be ordered in multiple configurations with hardware designed to address these hazards.

The end user is ultimately responsible for performing a risk assessment and confirming that their hardware selection, configuration, and wiring is adequate to comply with all relevant safety regulations. Implementation of guarding, protection from weld spatter, protection from electromagnetic hazards, and other measures must be identified in a Risk Assessment and appropriately mitigated.

UB systems without an integrated WHSC

1-337-01-01	1-341-01-01
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1-337-01-03	1-341-01-02
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UB systems without an integrated safety controller

1-337-01-02	1-341-01-02
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1-337-01-04	1-341-01-04
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There are a few different configurations/scenarios that need to be considered by a user/integrator of this equipment.

Scenario 1: UB power supply without IEC 13849-1 compliant WHSC (Weld Head Safety Controller), integrated with manual head, handpiece, or similar human-powered mechanism

These configurations do not meet the definition of “machine” under the Machinery Directive. Perform a risk assessment and take appropriate measures to reduce other hazards.

CHAPTER 2: INSTALLATION AND SETUP

Scenario 2: UB power supply without IEC 13849-1 compliant safety WHSC integrated with pneumatic or electrical head without safety-compliant pneumatics/electronics

These configurations require a risk assessment to be performed and external integration of safety controls beyond the scope of this manual.

Scenario 3: UB power supply with IEC 13949-1 compliant WHSC integrated with AMADA WELD TECH head that includes IEC 13849-1 compliant pneumatics

These configurations have valves and controls that are compliant with the machinery directive. A risk assessment should be conducted to assess other hazards including guarding requirements, spatter, etc.

Scenario 4: UB power supply with IEC 13849-1 compliant WHSC integrated with head that does not include IEC 13849-1 compliant hardware

These configurations have controls that are compliant with the machinery directive but the motive power source of the head (pneumatics, servo, etc.) must be integrated with the power supply as described below as part of addressing safety risks inherent to the system. Perform a risk assessment and take necessary measures. For some weld heads a kit is available to retrofit compliant pneumatics onto heads that did not come equipped with such from the factory.

Achieving Safety Compliance

Please review the safety compliance information below before setting up the Power Supply and attaching it to a weld head. (Note: This information complies with Machinery Directive/IEC13849-1.)

The UB-B welding power supply is sold ready for its intended purpose with a declaration of conformity. When combined with a pneumatic, electronic, or motorized weld head the entire system must be brought into compliance with the Machinery Directive.

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

CHAPTER 2: INSTALLATION AND SETUP

The primary physical hazard associated with a resistance welding system such as the UB-B is that of puncture or crushing injury caused by the pneumatic, servo, or electromagnetic weld head used with the power supply. These systems can store and apply significant power to the workpiece, or anything placed in their way, and it is necessary that a means to control this energy is provided. Pneumatic systems present additional hazards due to the energy stored in the compressed gas (usually air) that drives them.

Weld head selection and integration require the careful consideration of these safety hazards. Integration must be performed in accordance with the instructions provided with both the power supply and the weld head to ensure that appropriate safety compliance is achieved for these hazards.

The power supply sends control output to the weld head which contains control signals that actuate the weld head and monitor the safety hardware built into the head that vents pneumatic energy. In the event of a safety circuit fault or emergency stop event, the weld head will vent pneumatic energy, releasing the welding cylinder force. The circuit is monitored against faults and has a lifetime of up to 1M e-stop/vent cycles. Preventative replacement of safety components before the expected end of life is recommended to reduce downtime.

With the correct installation of the power supply with an appropriate head and safety equipment, the system will comply with IEC13849-1 category 4. The PL of this system's emergency stop system is "PLd." Incorrect installation can defeat safety features, cause hazards to personnel, and invalidate compliance or cause compliance to be in a lesser category.

Compliance with IEC13849-1 is achieved using the installation instructions in the manual, which only applies to the power supply weld head stored energy protection. Any additional equipment, including the head, welding enclosure, automation controller, motion hardware, or other must be separately developed to be compliant with this specification or power supply compliance will be invalidated. If compliance with IEC13849-1 is a concern, the end user must validate their complete machine against the specification.

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Theory of Operation - Pneumatic Weld Head Integration with Pneumatic Vent Valves

To achieve the functional safety rating specified for the power supply it is necessary to integrate a weld head equipped with compliant safety hardware in the manner specified in this user documentation. This safety rating does not obviate the need for appropriate guarding and protection from other hazards.

The power supply input provides several signals on the Weld Head and Head Safety connectors. Each individual air supply to the pneumatic cylinder that could potentially create a hazard passes through a safety-rated residual pressure relief valve that will release air trapped in the cylinder when the emergency stop circuit is triggered under the control of a Pilz safety controller. When this occurs the low-force firing spring will cause the head to automatically retract with low spring force.

Since each cylinder in the Amada Weld Tech design is dual action, using both an “UP” and a “DOWN” drive solenoid, two safety-rated residual relief valves must be used for each cylinder. A single-cylinder model requires two valves, a dual-cylinder model requires four valves.

Under normal operation, when the safety circuit is satisfied and reset the 24V_Safe signal will become present. This action will cause the safety-rated residual pressure relief valves to connect the cylinder to the pneumatic output of the regular head welding solenoid, allowing the standard control circuit to regulate air to the cylinder and drive the head. When the safety circuit enters an emergency stop or fault state the residual pressure relief solenoids will release, blocking the air supply from the standard control circuit and connecting the cylinder to atmosphere.

The system monitors the safety controller and cannot be reset until the condition causing the fault is cleared. At this point, the system can receive a reset request via the HMI, fault reset request I/O bit, or request over the REST API/RS-232 control interface. The reset request will cause the system to issue a reset pulse that passes through the normally closed monitoring contacts on all safety devices before reaching the safety controller, at which point the safety controller is reset and the 24V_Safe signal occurs again.

CHAPTER 2: INSTALLATION AND SETUP

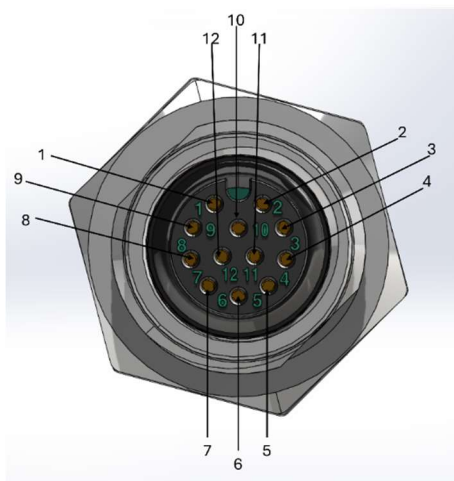
The Amada Weld Tech EZ-Air designs are best equipped with an additional, non-safety, on/off pneumatic valve at the head pneumatic input that only passes air in the presence of 24V_Safe. This valve disconnects the supply to prevent air leakage to atmosphere through the standard control solenoids when the safety circuit fault is active and the residual pressure relief solenoids are open. This is not a safety function.

Note: Depending on the head design, it may be necessary to cause the system to de-assert the valve driver signals before issuing a reset request to prevent movement of the head when the system pneumatics are re-energized. The UB-B performs this function automatically. Certain head designs may require additional controls to re-energize the head in a safe manner.

Weld Head Connector and Safety Functions

Note: Weld Head and Weld Head Safety functions are on separate connectors. The WHSC will not be present if safety controls are not included in the unit configuration. See part numbers earlier in this section to confirm how your unit is configured. All weld head and safety connections are detailed in this section to provide a complete view of head integration.

Weld Head Connector



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

CHAPTER 2: INSTALLATION AND SETUP

Pin #	Description	Comments
1	Head 1 Drive Signal	24VDC drive signal for Head 1 solenoids or other actuation (controlled by welding process) 1A max
2	Head Drive 1 Return	Return Drive for Head 1
3	N/C	Normally Closed
4	GND I/O	
5	GND I/O	
6	24V HEAD	Power Supply for weld head electronics
7	24V SAFE1	24VDC supply circuit for Head 1 controlled by safety circuit (1A max), if equipped with WHSC
8	Head Drive 2 Signal	24VDC drive signal for Head 2 solenoids or other actuation (controlled by welding process) 1A max
9	Fire	24VDC Force Fire signal input from equipped weld held (duplicates fire switch)
10	Fire Return	
11	Abort	24VDC Abort input from equipped weld head (duplicates Abort I/O input on 50 pin I/O Connector)
12	Abort Return	

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CHAPTER 2: INSTALLATION AND SETUP

WHSC Output



Pin #	Description
1	24V Safe
2	NC1
3	NC2
4	GND
5	Unused
6	Unused
7	Unused
8	Unused

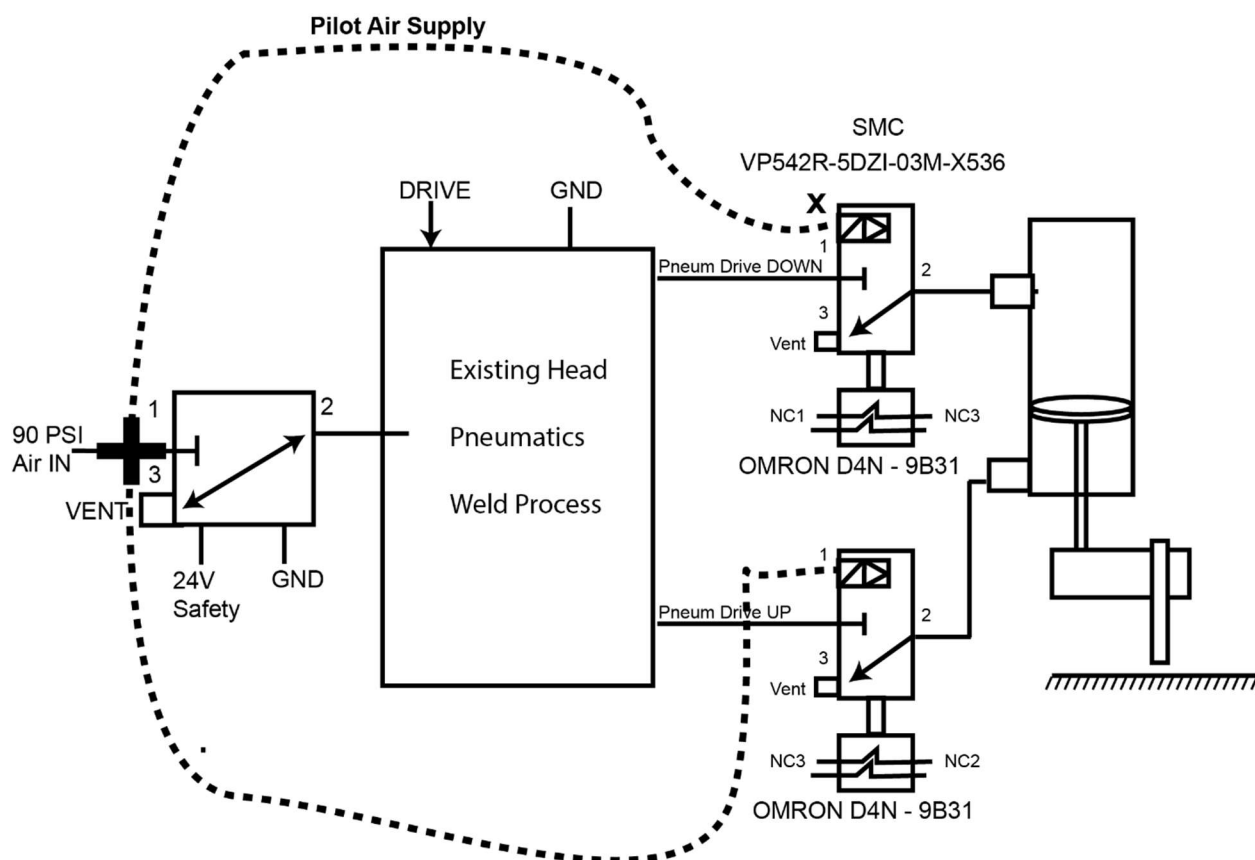
Example/Recommended Components:

Safety Residual Pressure Relief Valves: SMC model VP542R-5DZ1-03N-M-X536

Note: In a pneumatic head design like the AMADA WELD TECH TL-080 or TL-084 series EZ-Air series pneumatic heads, a safety valve with an external pneumatic pilot input must be used. Since these heads release cylinder drive pressure to atmosphere during each cycle, the dump valves must have an external pilot that provides pneumatic power to the valve at all times. Using a valve with an internal pilot will cause one dump valve to deactivate each time the head moves.

CHAPTER 2: INSTALLATION AND SETUP

Example/Recommended Connections – AMADA WELD TECH TL-080/TL-084 single weld head:



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

CHAPTER 2: INSTALLATION AND SETUP

Emergency Stop for Simple Systems – IEC13849-1 Compliant Versions

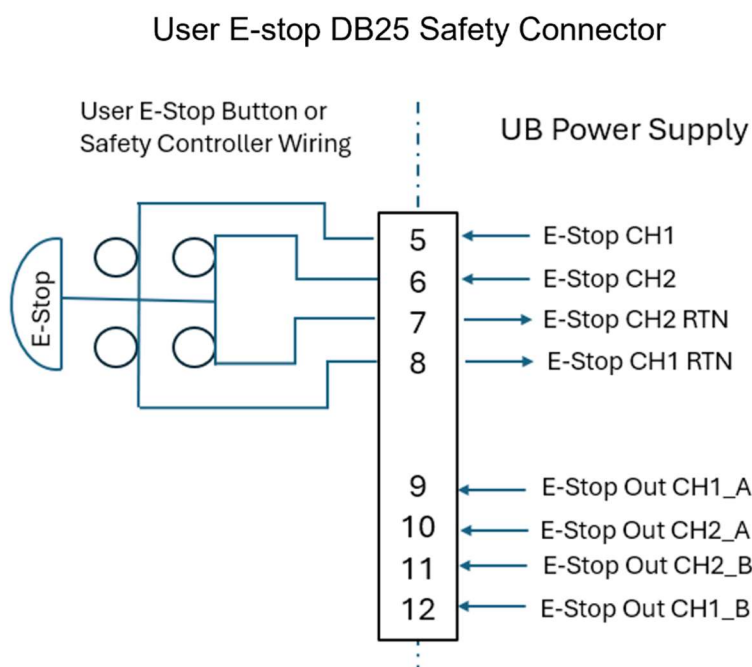
This connector is not present on versions without a safety controller

Interfacing with External Emergency Stop Circuitry

Before using the system, verify that the Emergency Stop circuitry is wired in accordance with the safety requirements listed below. Do not operate the machine without correctly integrating it into a workstation with the appropriate level of safety.

The diagram below shows the wiring for a system in which the power supply is in a workstation that includes one or more external E-Stop buttons. A safety controller capable of controlling a PL_d or better device can be used.

In this example, the dual-channel output Channel 1 and Channel 2 relays can be monitored to verify the status of the emergency stop circuit. In the case of an E-Stop, the system can be reset by clearing the fault window on the touch screen or via the fault reset input on the rear panel I/O connector.



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

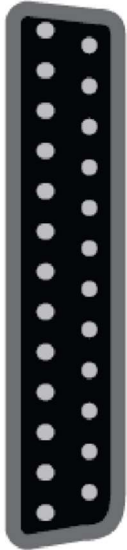
CHAPTER 2: INSTALLATION AND SETUP

Safety I/O Connector

This connector is only present when the unit is equipped with the safety controller.

Connect input channel A1 to A2 and B1 to B2 simultaneously via dry contact safety rated switch. Reset is required using Fault Reset input, operator GUI, or factory communications. When the E-stop circuit is satisfied the output contacts A1 to A2 and B1 to B2 will be closed.

E-STOP I/O 25 pin DB connector pinout		
5	E-STOP_IN_A1	E-STOP Channel A input 1
6	E-STOP_IN_B1	E-STOP Channel B input 1
7	E-STOP_IN_B2	E-STOP Channel B input 2
8	E-STOP_IN_A2	E-STOP Channel A input 2
9	E-STOP_OUT_A1	E-STOP Channel A output 1
10	E-STOP_OUT_B1	E-STOP Channel B output 1
11	E-STOP_OUT_B2	E-STOP Channel B output 2
12	E-STOP_OUT_A2	E-STOP Channel A output 2

1 Not Used		14 Not Used
2 Not Used		15 Not Used
3 Not Used		16 Not Used
4 Not Used		17 Not Used
5 E-STOP_IN_A1		18 Not Used
6 E-STOP_IN_B1		19 Not Used
7 E-STOP_IN_B2		20 Not Used
8 E-STOP_IN_A2		21 Not Used
9 E-STOP_OUT_A1		22 Not Used
10 E-STOP_OUT_B1		23 Not Used
11 E-STOP_OUT_B2		24 Not Used
12 E-STOP_OUT_A2		25 Not Used
13 Not Used		

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

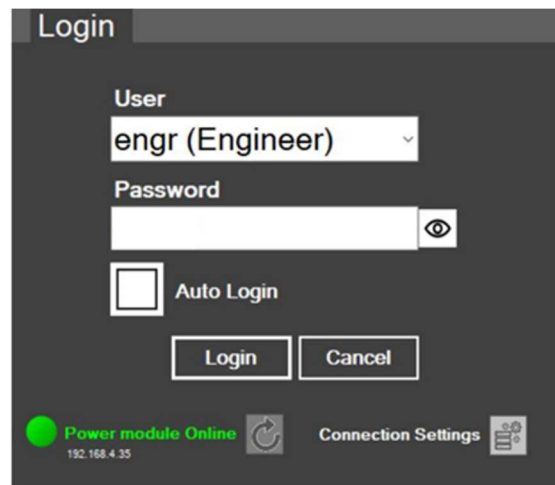
Chapter 3 LOGIN

First Time Login

The Login window displays when you turn on the Power Supply.

The first time you log in, the Password field will be blank, and the Auto Login box will be unchecked. Sign in either as an Engineer or an Operator (your System Administrator can tell you which) and enter a new password.

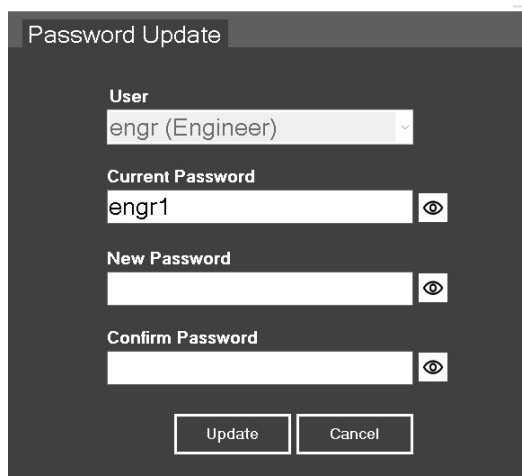
Check the Auto Login box to save your login for future sessions.



Login Window

Write down your password. No one else has access to it. If you forget it, the Power Supply will have to be reset, and you will lose any saved settings or data.

If the system is being configured for the first time, or it has performed a factory reset, the Password Update window will display.

A screenshot of a 'Password Update' dialog box. It has a dark gray background with white text and input fields. The title bar says 'Password Update'. There are four input fields: 'User' (a dropdown menu showing 'engr (Engineer)'), 'Current Password' (text field with 'engr1'), 'New Password' (text field), and 'Confirm Password' (text field). Each password field has a small eye icon to its right. At the bottom are two buttons: 'Update' and 'Cancel'.

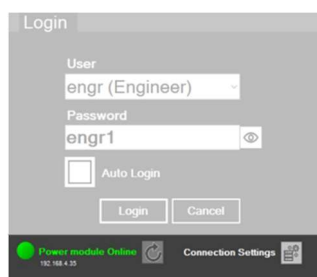
Password Update Window

Enter and confirm your new password and click **Update**.

If you checked the Auto Login box, the system bypasses the Login procedure the next time you use the Power Supply.

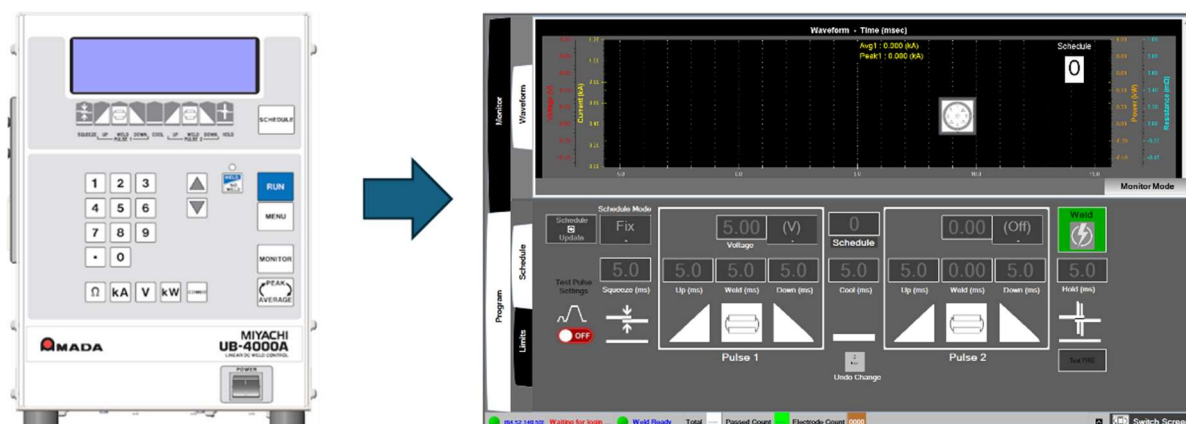
Note: The Green or Red **Power Module Online** circle indicates whether the device is connected to the power module.

Select **Connection Browser** to launch the **IP Discovery Tool**. A list of connected devices displays as well as current power module. Select the device to which you need to be connected. Click Refresh to update the list of devices. Select and click Connect.

A screenshot of a 'Login' dialog box. It has a light gray background. The title bar says 'Login'. There are two input fields: 'User' (a dropdown menu showing 'engr (Engineer)') and 'Password' (text field with 'engr1'). Below the password field is an 'Auto Login' checkbox, which is currently unchecked. At the bottom are two buttons: 'Login' and 'Cancel'. At the very bottom of the window, there is a status bar with a green circle and the text 'Power module Online', a clock icon, and a 'Connection Settings' button.

Chapter 4 QUICK START GUIDE

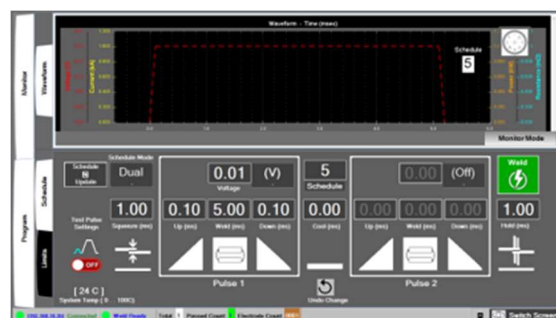
Users familiar with earlier versions of the Power Supply will find the UB-B software interface very familiar. The default Program Screen integrates the pushbutton interface and LED screen from earlier versions into a touchscreen, Windows-based interface.



This **Quick Start Guide** provides a brief overview of the software interface for those familiar with earlier versions of the Power Supply. For more information, go to [Chapter 5 Using UB-B Software](#).

Default Screen

The software launches in Program Mode upon login.



Program Mode (Default Screen)

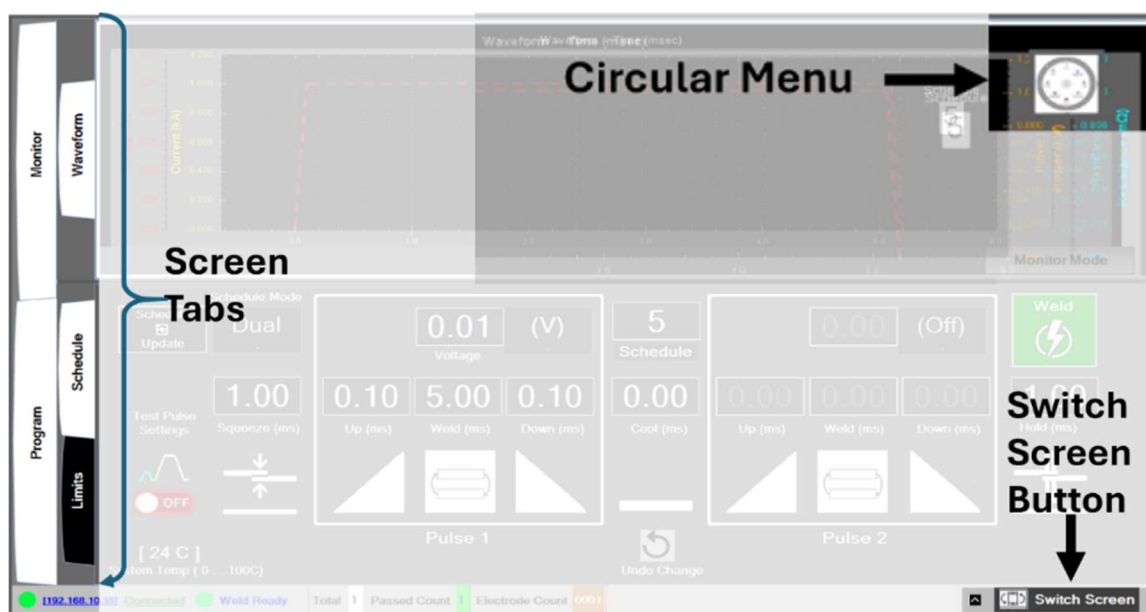
UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

CHAPTER 4: QUICK START GUIDE

- An Engineer has access to all the functionality available in Program Mode.
- An Operator cannot access any functionality in Program Mode, other than limited access to the Circular menu and the Screen Switch Button.

Screen Navigation

Use the Screen Tabs and the Switch Screen Button to navigate between screens. Use the Circular Menu to access to tools menus.

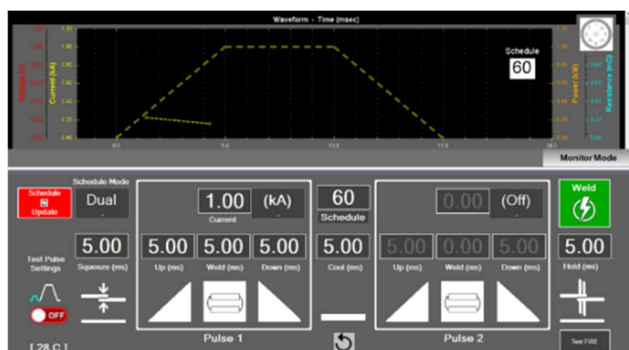


CHAPTER 4: QUICK START GUIDE

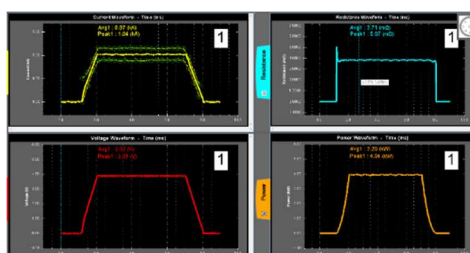
Screen Modes

UB-B RW includes three modes: Program, Monitor, and Run. Use the **Switch Screen Button** to toggle between them. (See [Modes](#) below for more information.)

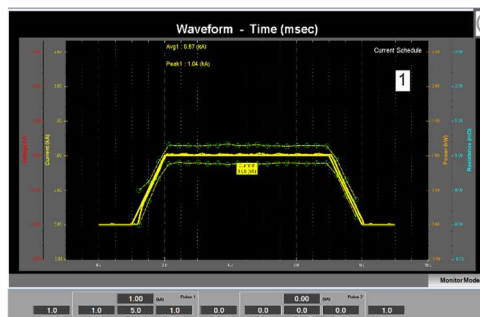
- Use **Program Mode** to create, edit, and store weld schedules (Engineer credentials required.)



- Use **Monitor Mode** to monitor each of the data types selected for display (i.e., Resistance, Voltage, Current and Power)



- Use **Run Mode** to focus on a single data type, typically for use during a production run.



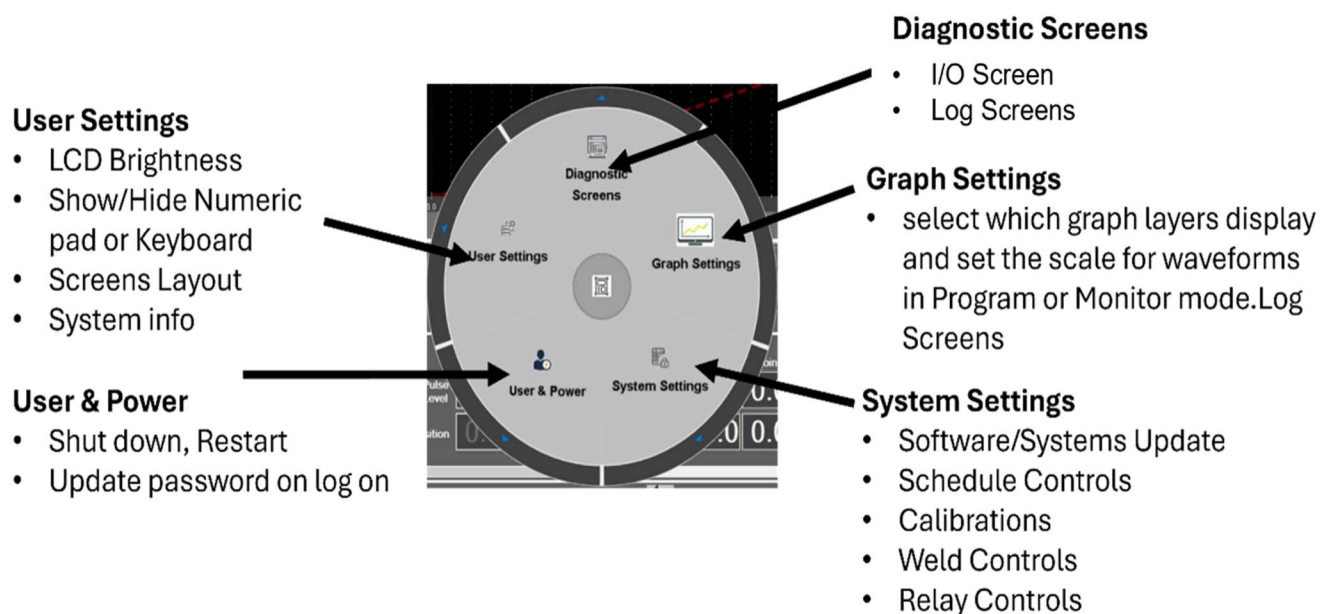
UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

CHAPTER 4: QUICK START GUIDE

Circular Menu

Use the **Circular Menu** icon to launch the menu and the five submenus and buttons used to access tools used to program, monitor and run the Power Supply (See [Circular Menu](#) below for a detailed description of each submenu and tool.)

- The Circular Menu expands when selected and can be repositioned on the screen.
- Engineers have access to all tools and submenus while Operators can only access the User Settings and Graph Settings submenus.



Screen Tabs

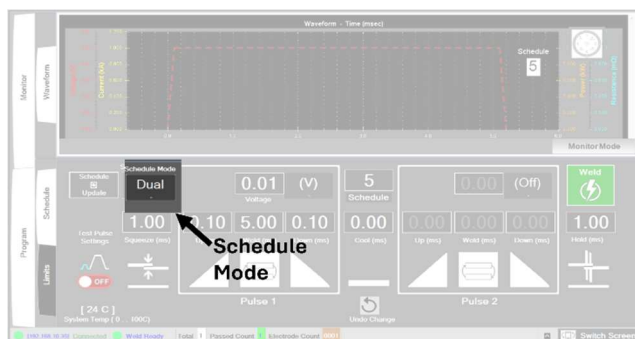
An Engineer uses the Screen Tabs to:

- Toggle between the Program and the Monitor Screen.
- Access the Schedule and Limits windows of the Program screen to create or modify weld schedules.

CHAPTER 4: QUICK START GUIDE

Schedule Modes

When developing a weld schedule on the **Program** screen, an Engineer can choose between two schedule modes: **Dual Pulse** or **Flex** mode. (See [Select Schedule Mode](#) below for more information.)



Dual Pulse Mode allows the user to set a single value for each segment in the weld sequence.



Flex Mode allows the user to set up to 20 data points to define a weld over time.



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

CHAPTER 4: QUICK START GUIDE

UB-B Schedule Setting

To develop a weld schedule, an Engineer sets values for each stage of a weld. (See [Developing Weld Schedules](#) below for more information.)

Squeeze Time: the length of time the pieces to be welded are squeezed together.

Energy Type to be monitored (Current, etc.) , Pulse 1

Schedule No. selected

Energy Type to be monitored (Current, etc.) , Pulse 2

Click **Weld** to test the weld. Toggles to **No Weld** (Red).

Click **Schedule Update** to save any changes to the weld Schedule

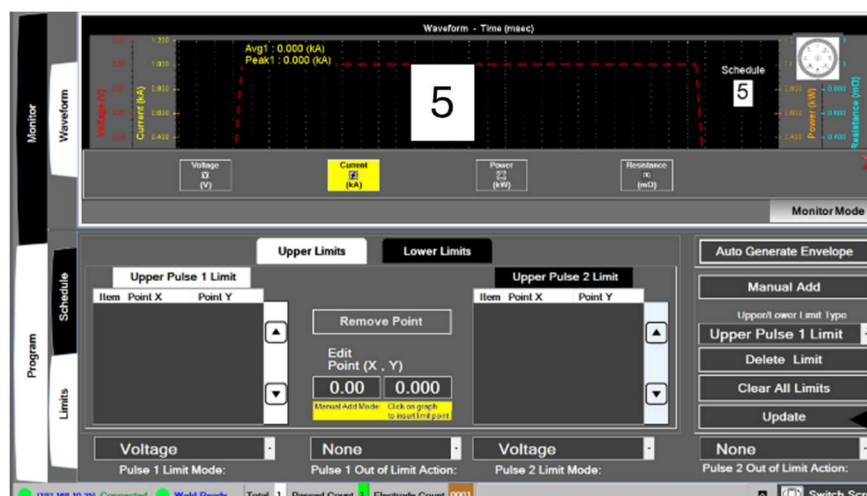
The interface displays the following settings:

- Schedule Mode:** Dual
- Squeeze (ms):** 1.00
- Voltage:** 0.01 (V)
- Schedule No.:** 5
- Energy Type (Pulse 1):** (Off)
- Energy Type (Pulse 2):** (Off)
- Upslope pulse 1:** 0.10 ms
- Weld Time pulse 1:** 5.00 ms
- Downslope pulse 1:** 0.10 ms
- Cool Time after Pulse 1:** 0.00 ms
- Upslope pulse 2:** 0.00 ms
- Weld Time pulse 2:** 0.00 ms
- Downslope pulse 2:** 0.00 ms
- Hold Time:** 1.00 ms

Arrows indicate the relationship between the text labels and the corresponding UI elements.

CHAPTER 4: QUICK START GUIDE

- 5) Click in the Waveform window to add limit points. The list of limit points will populate as points are added.



- 6) Select points in the list to edit. Click Update

Pulse 1 Upper Envelope				
Item	Point X	Point Y		
3	1.45	1.13	6	Edit Point (X, Y) 1.45 1.13
4	3.39	1.15		
5	4.28	1.16		
6	5.10	1.13		
7	6.11	1.17		

Chapter 5 USING UB-B SOFTWARE

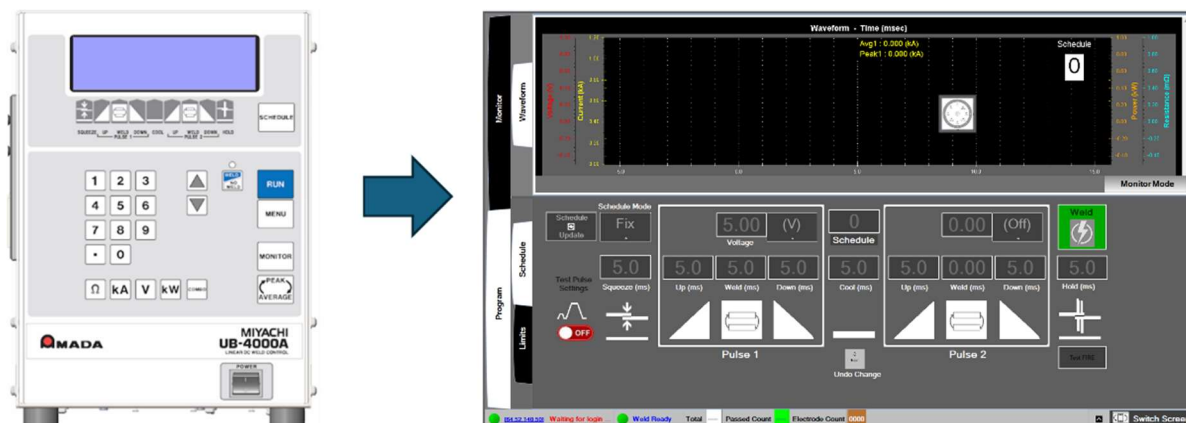
Overview

The touchscreen on the front of the Power Supply provides access to the UB-B software used to develop, modify, run, or monitor weld schedules. Optionally, this can be displayed on a PC running this software.

This section provides an overview of how to work with the UB-B software and detailed information on how to establish system settings and manipulate the interface.

Default Program Screen

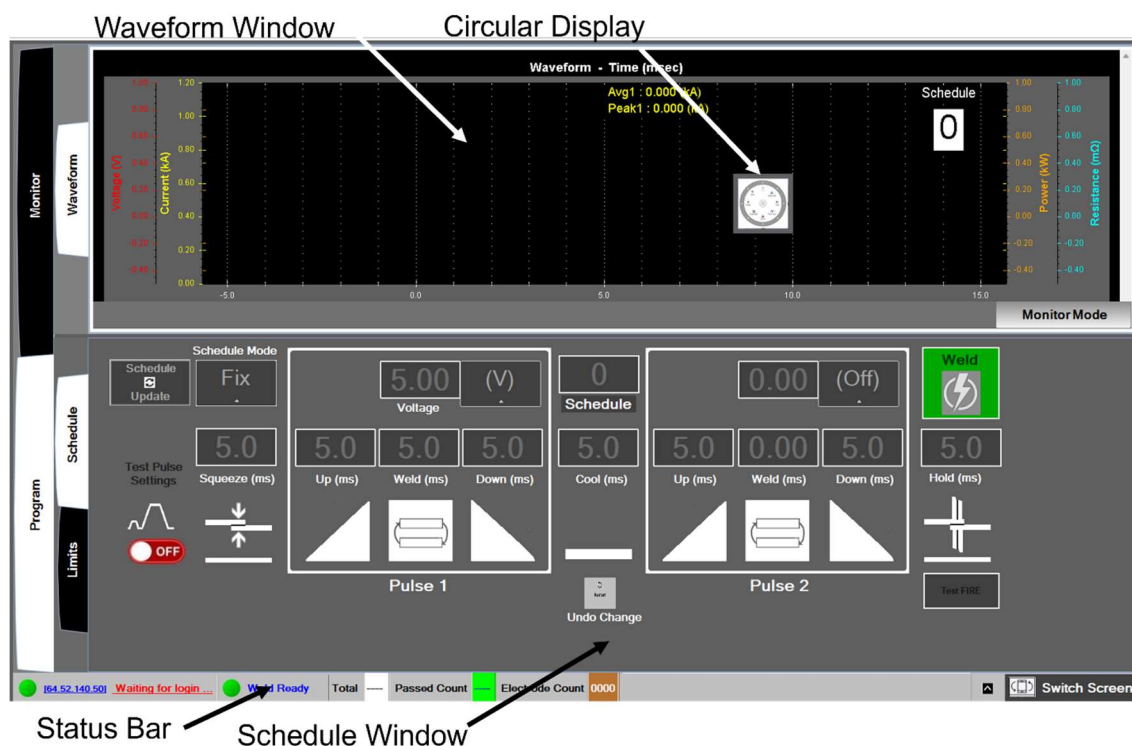
Users familiar with earlier versions of the Power Supply will find the UB-RW software interface largely intuitive. The default Program Screen transforms the pushbutton interface and LED screen from earlier versions into a touchscreen or PC-based interface.



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For users logged in as Operator, the Program Screen is locked as is the Security Functions menu on the Circular Menu. The program screen is active for Engineers. It has four primary elements:

1. Waveform Window
2. Schedule Window
3. Circular Menu
4. Status Bar

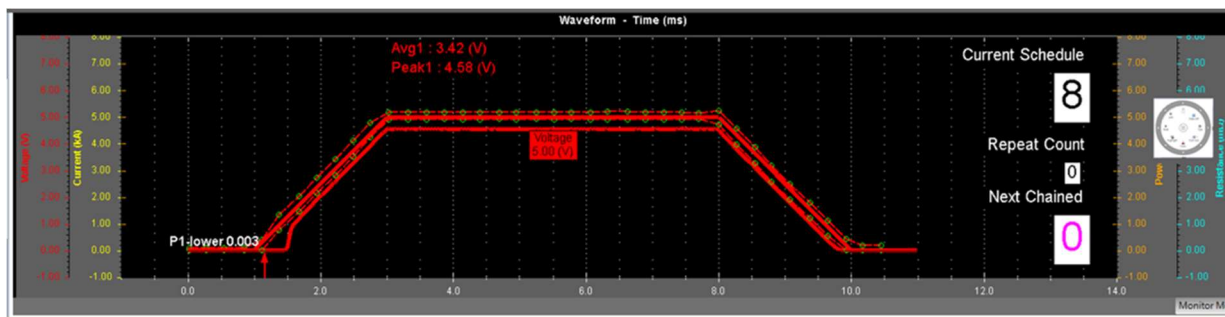


Waveform Window

The Waveform window displays both the scheduled waveform (the solid lines in the example below) and the waveform of the most recent weld (shown as jagged lines).

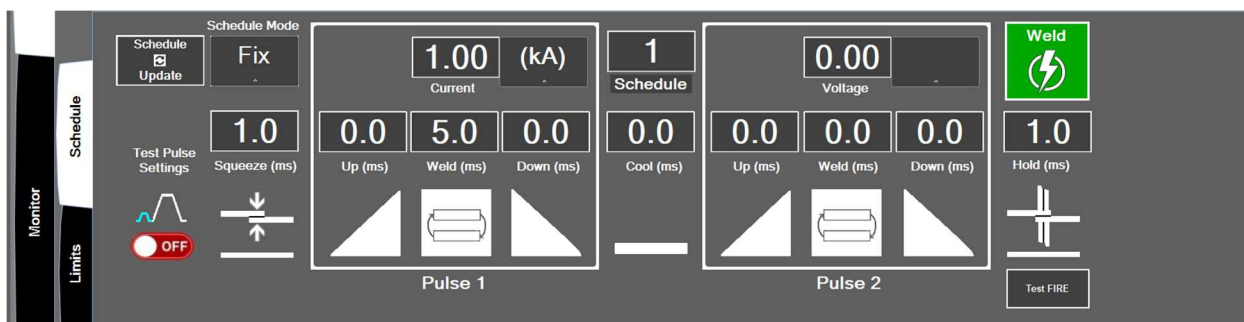
UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

CHAPTER 5: USING UB-B SOFTWARE



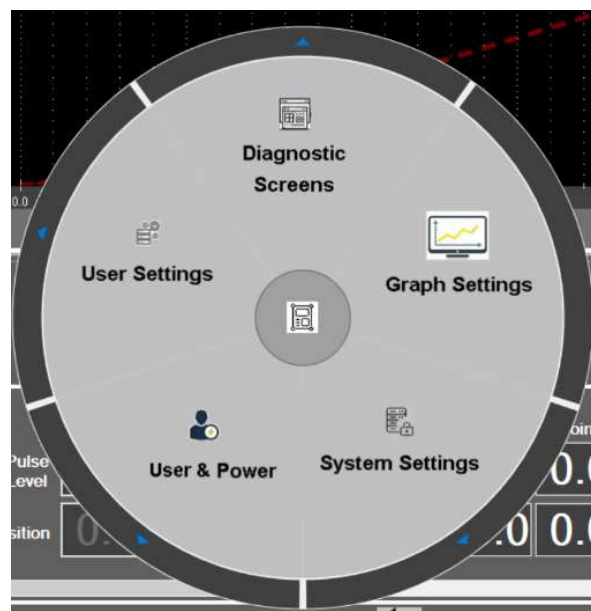
Schedule Window

The schedule window allows an engineer to select, create, and edit one of up to 128 weld schedules stored on the device. (Note that the white Schedule tab on the left is selected.)



Circular Menu

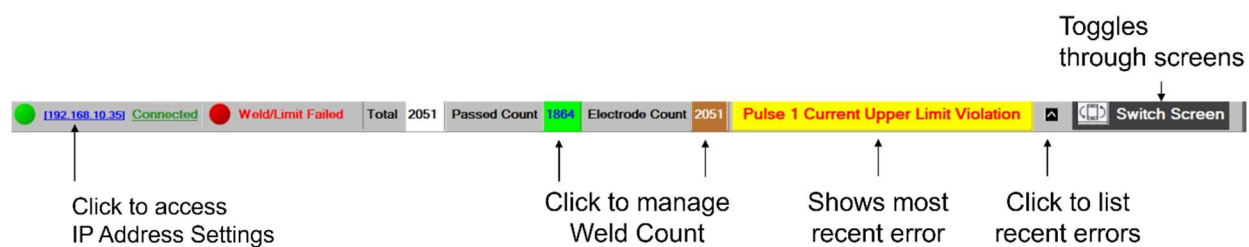
The circular menu provides access to the tools necessary to interact with the device. (The small version of the circular menu is a button that can be dragged to any location on the screen. The expanded version of the window displays center screen and reverts to the button once a selection has been made.)



Status Bar

The status bar provides continuously updated information about the status of a connected device, the most recent weld, etc. Each field in the Status Bar can be clicked to access additional information.

error

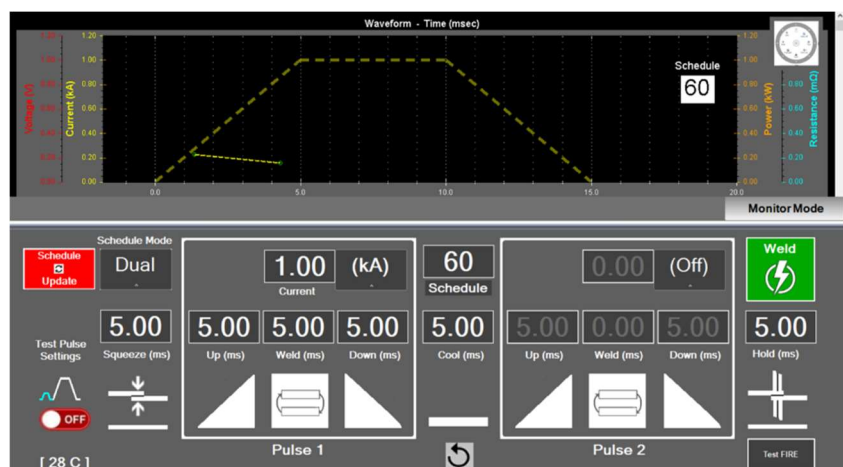


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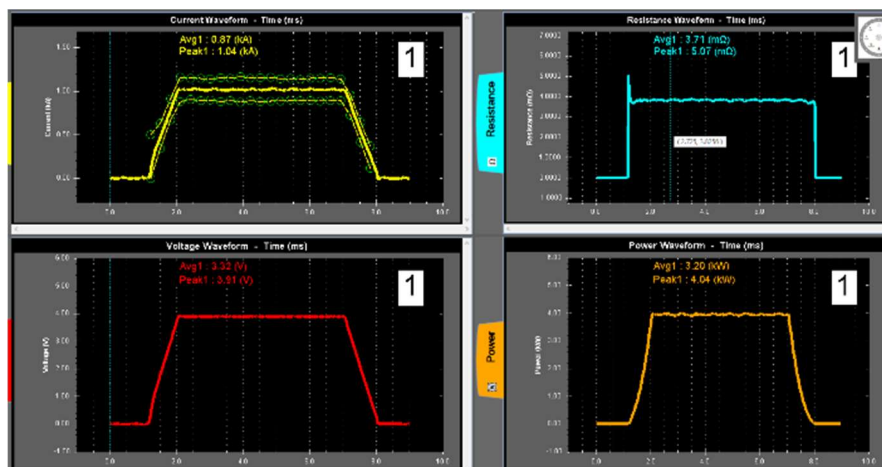
Modes

The left-hand side of the screen has two large buttons which allow the user to choose either one of the two primary modes – Program or Monitor Screen; click to select. (The active mode is highlighted in white.)

- Use the **Program screen** to create, edit and store weld schedules.



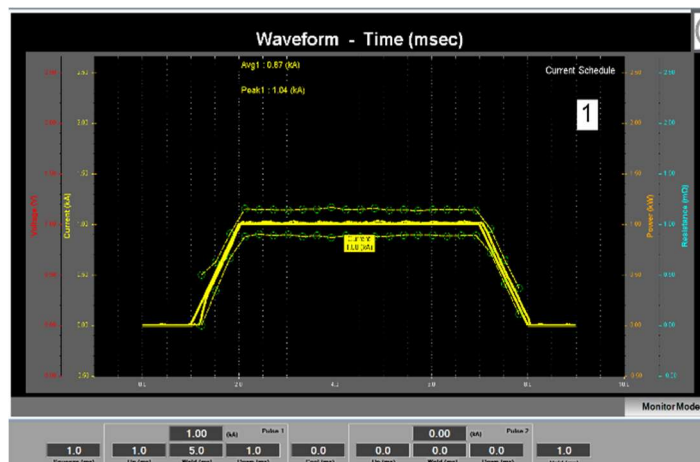
- Use the **Monitor Screen** to monitor each of the data types selected for display (i.e., Resistance, Voltage, Current and Power).



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

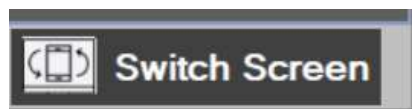
CHAPTER 5: USING UB-B SOFTWARE

- Use the **Run Screen** to focus on a single data type, typically for use during a production run.



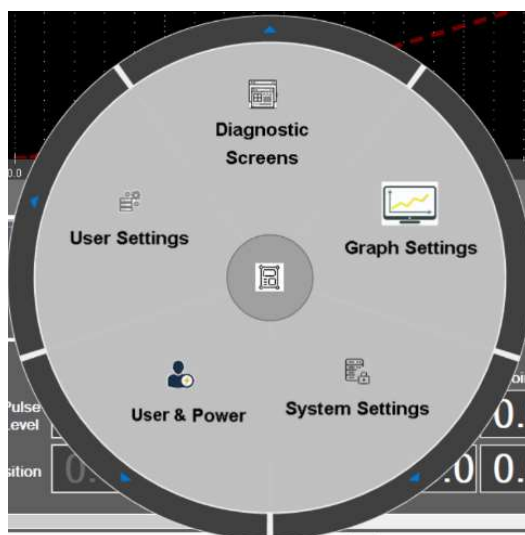
Switch Screen Button

The Switch Screen button on the far right-hand side of the Status Bar allows the user to toggle through the three types of screens.



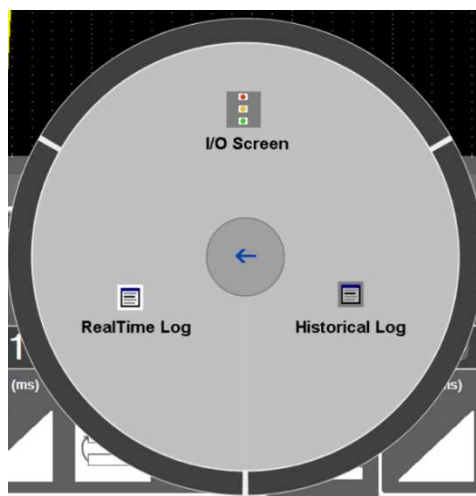
Circular Menu – Submenus and Tools

The Circular Menu icon is found on all three screens. Use it to launch one of five submenus and buttons to access the tools needed to program, monitor and run the Power Supply. This section circumnavigates the Circular Menu clockwise, describing each of these buttons and menus in more detail.



Diagnostic Screens

Select Diagnostic Screens to access the I/O Screen or the Log Screens.

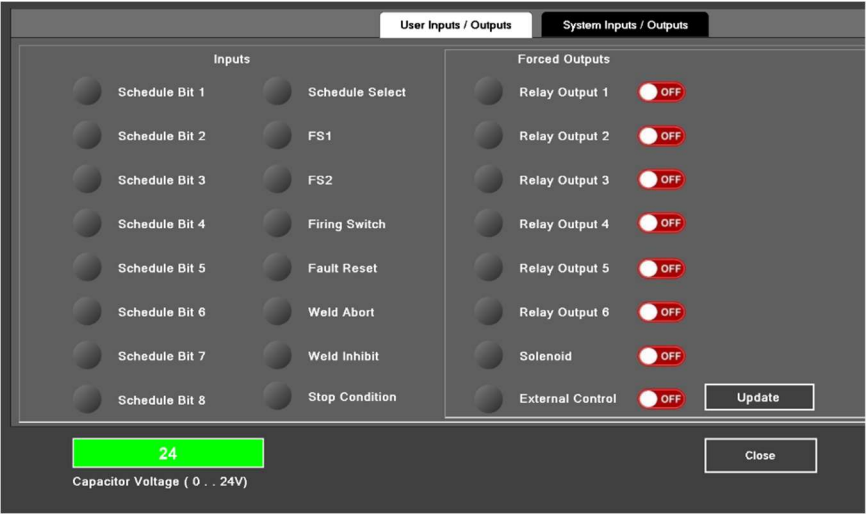


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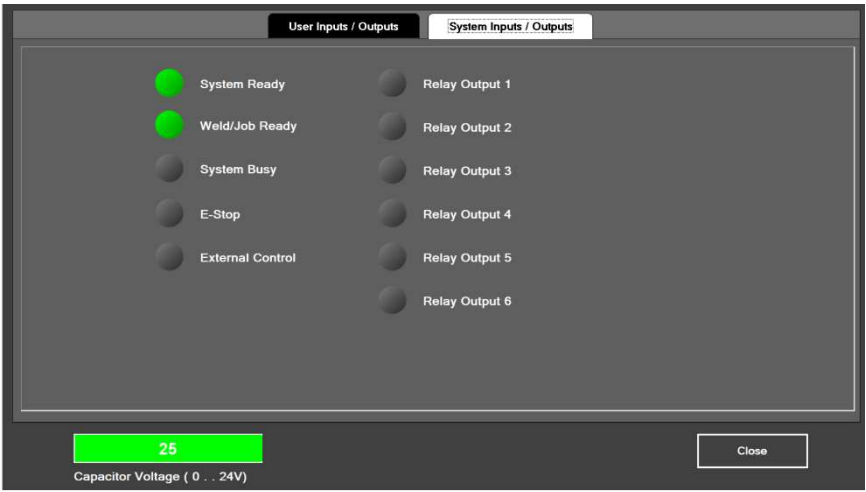
I/O Screen



The I/O screen shows the current state of the system, the active programmable outputs, the current capacitor voltage and the current system temperature. The tabs at the top of three screen toggle between User Inputs/Outputs and System Outputs/Inputs.



User Inputs/Outputs



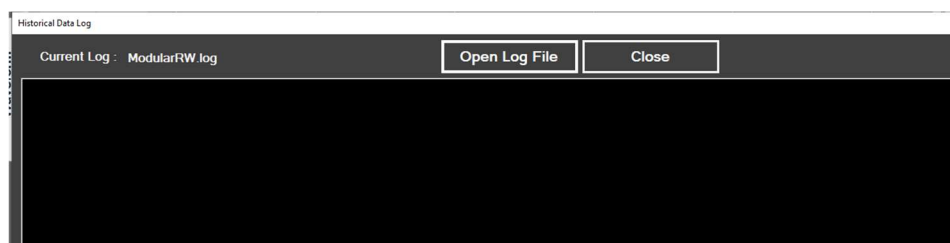
System Inputs/Outputs

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

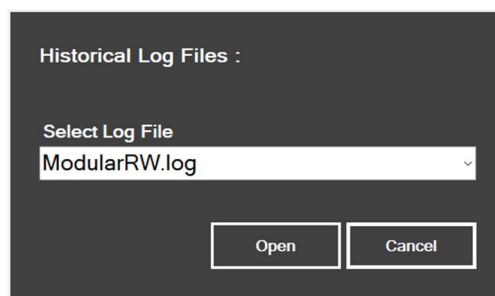
Historical Log



The Historical Log feature retains an ongoing log of the activity of the connected UB-B device. This log is stored in files up to 5 megabytes, each file designated by the time period covered. The Historical Log function allows the user to select a file to review. Click on the Historical Log link to launch the function. The function opens as a blank table.

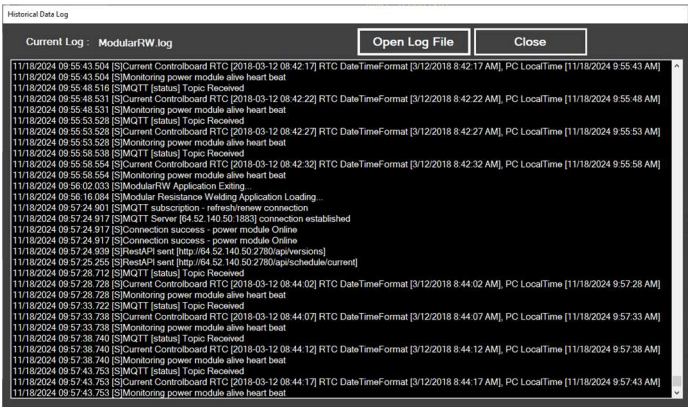


Click Open Log File, a list of available log files displays.



Select a log file from the dropdown list. The file displays.

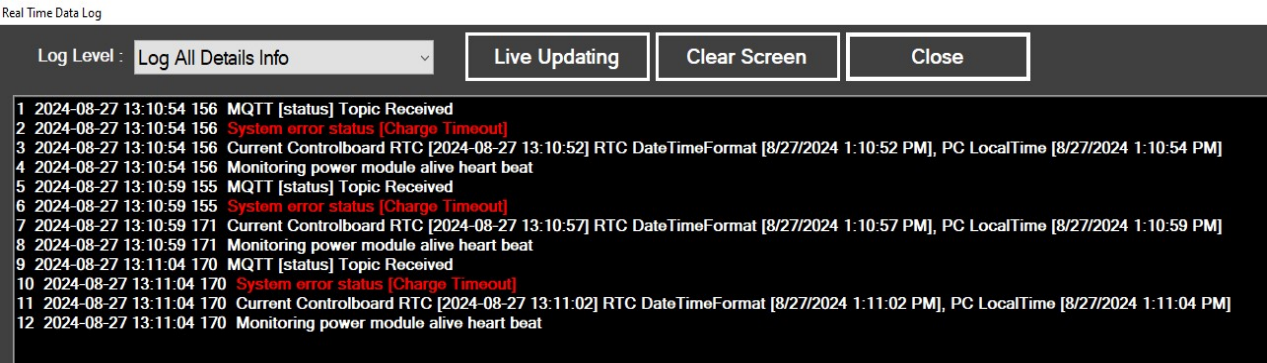
CHAPTER 5: USING UB-B SOFTWARE



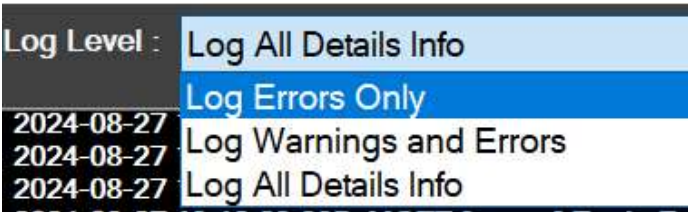
RealTime Log



The RealTime Log Screen provides a continuously updated log of power supply activity.



Use the Log Level dropdown menu to determine the type of information displayed. The user can also choose to have Live Updating or to clear the log screen. Click Close to exit the log screen.

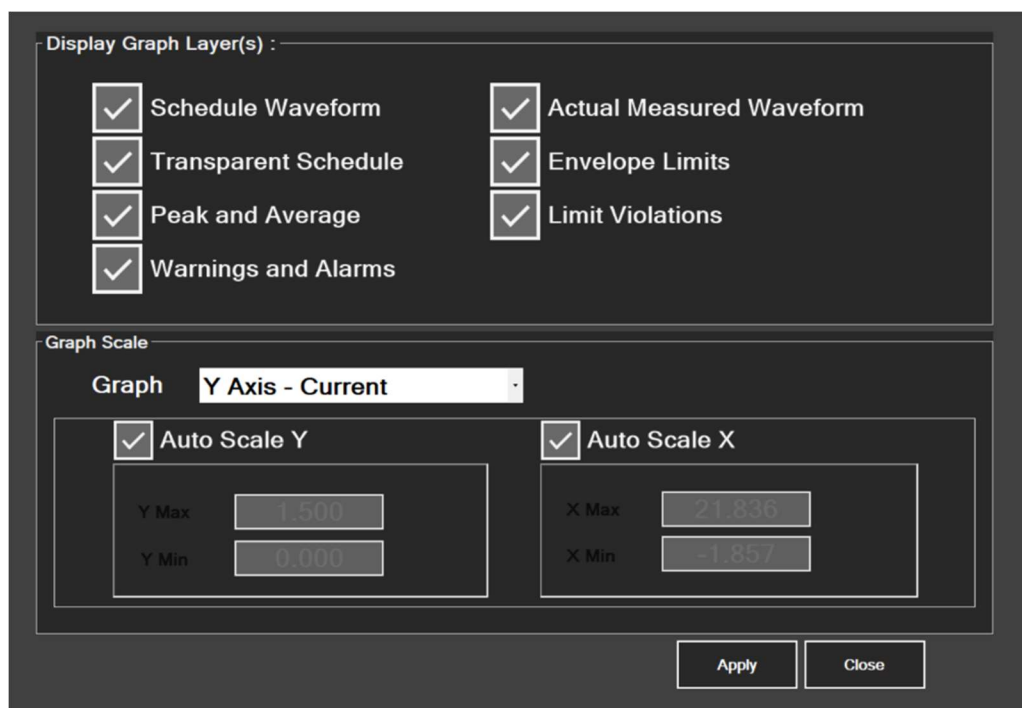


UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

Graph Settings



The Graph Settings link on the Circular Menu launches the Graph Settings interface where the user can select which graph layers display and set the scale for waveforms in Program or Monitor mode.

A screenshot of the Graph Settings interface. It has a dark background with white text and controls. The top section is titled "Display Graph Layer(s) :" and contains two columns of checkboxes, all of which are checked. The bottom section is titled "Graph Scale" and contains a dropdown menu for "Graph" set to "Y Axis - Current". Below this are two sub-sections: "Auto Scale Y" and "Auto Scale X", each with a checked checkbox and two input fields for "Max" and "Min" values. At the bottom right are "Apply" and "Close" buttons.

Display Graph Layer(s) :	
☒ Schedule Waveform	☒ Actual Measured Waveform
☒ Transparent Schedule	☒ Envelope Limits
☒ Peak and Average	☒ Limit Violations
☒ Warnings and Alarms	

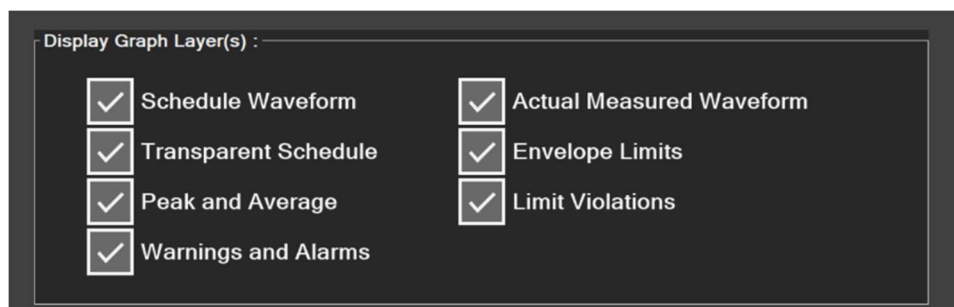
Graph Scale	
Graph: Y Axis - Current	
☒ Auto Scale Y	☒ Auto Scale X
Y Max: 1.500	X Max: 21.836
Y Min: 0.000	X Min: -1.857
[Apply] [Close]	

Select one or more graph layers to be displayed.

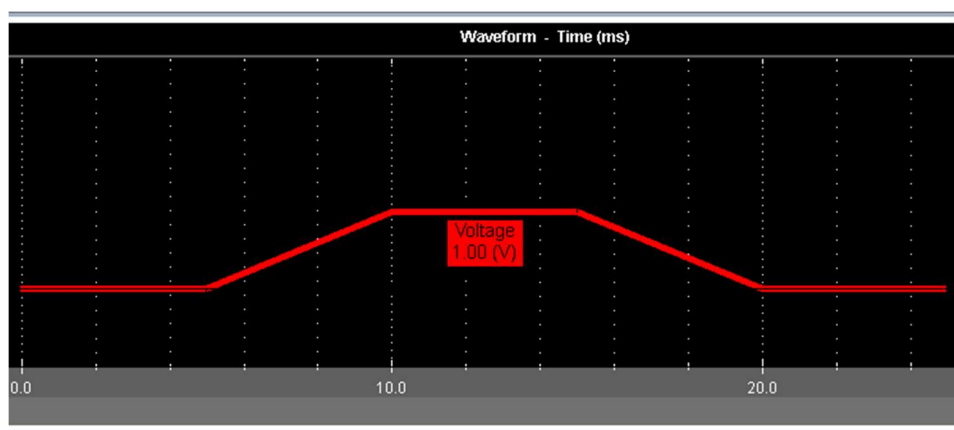
Display Graph Layer(s)

Select the graph layers to be displayed in the Waveform Window.

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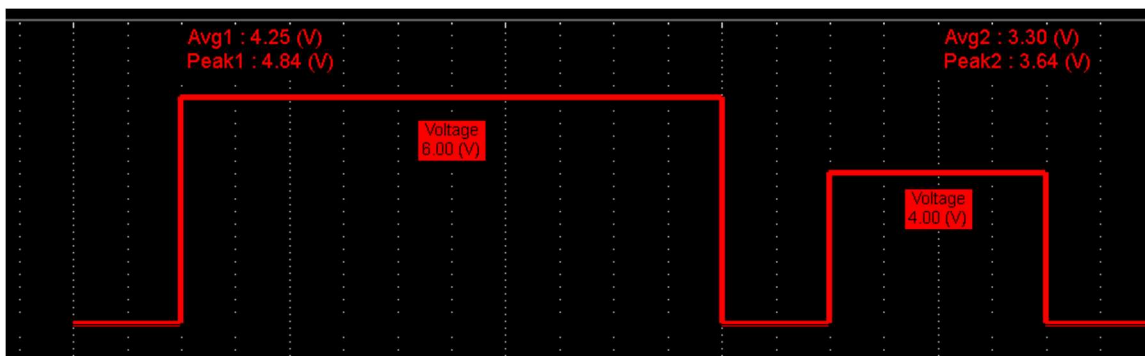


Select **Schedule Waveforms** to display the waveform created in the Schedule Window.



Pulse Waveform

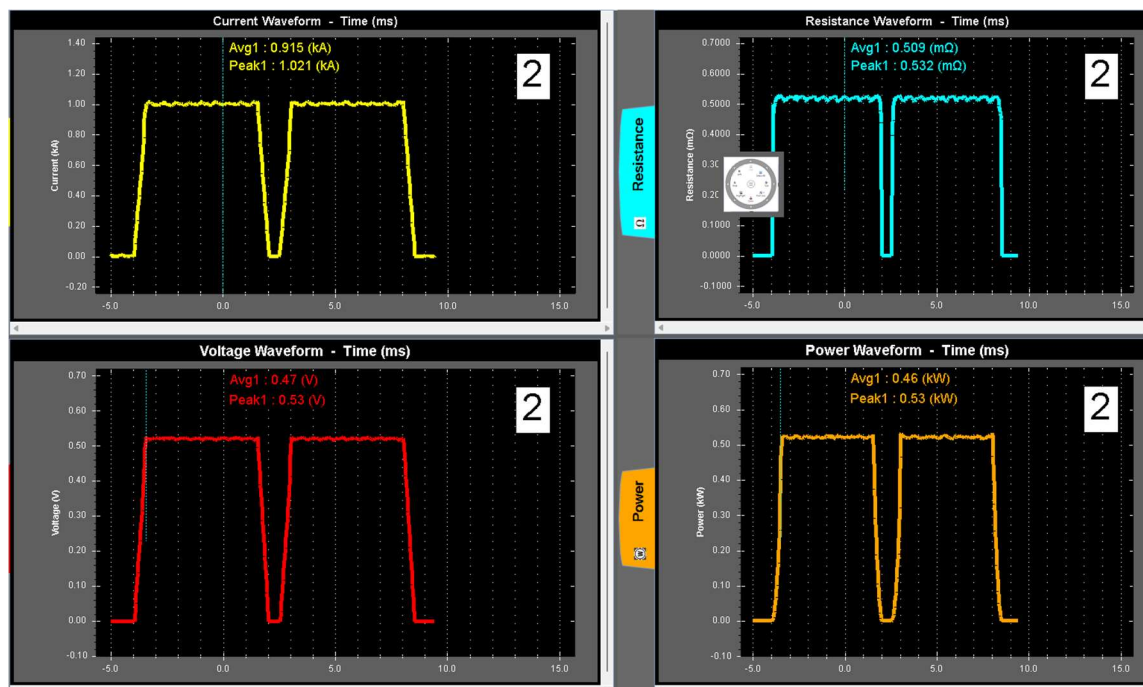
Select **Actual Measured Waveform** to display the waveform generated by the weld, displayed above the waveform for each pulse.



Actual Measured Waveform

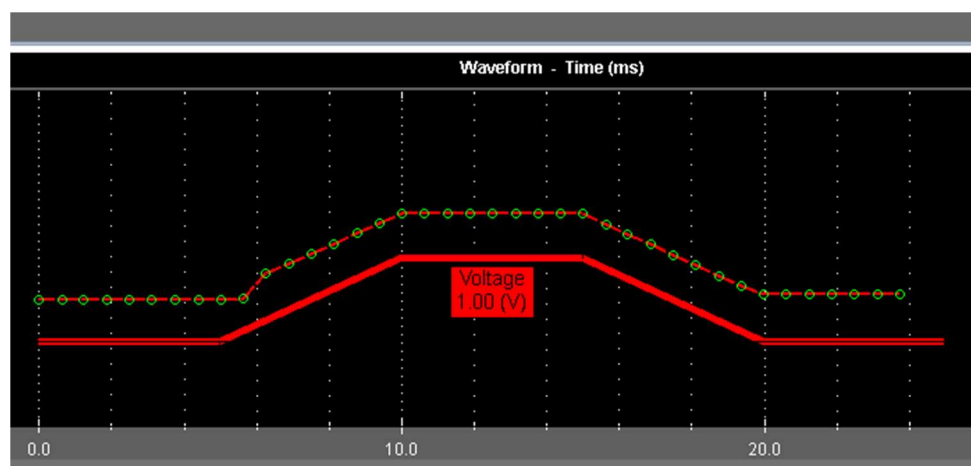
CHAPTER 5: USING UB-B SOFTWARE

Select **Peak and Average** to show the peak and average values for each of the waveforms displayed.



Peaks and Average Displayed

Select Envelope Limits to display the Envelope Limits.



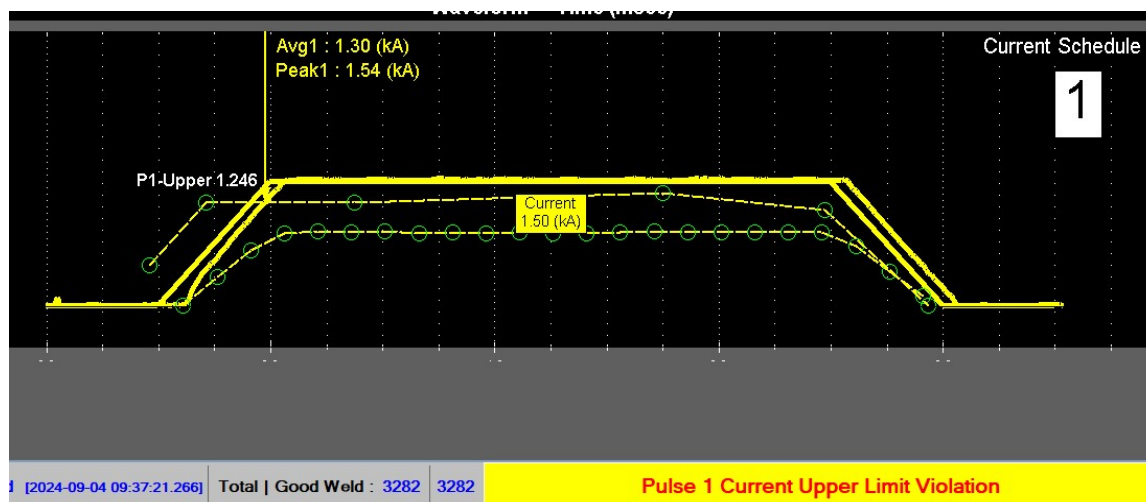
Display Envelope Limits

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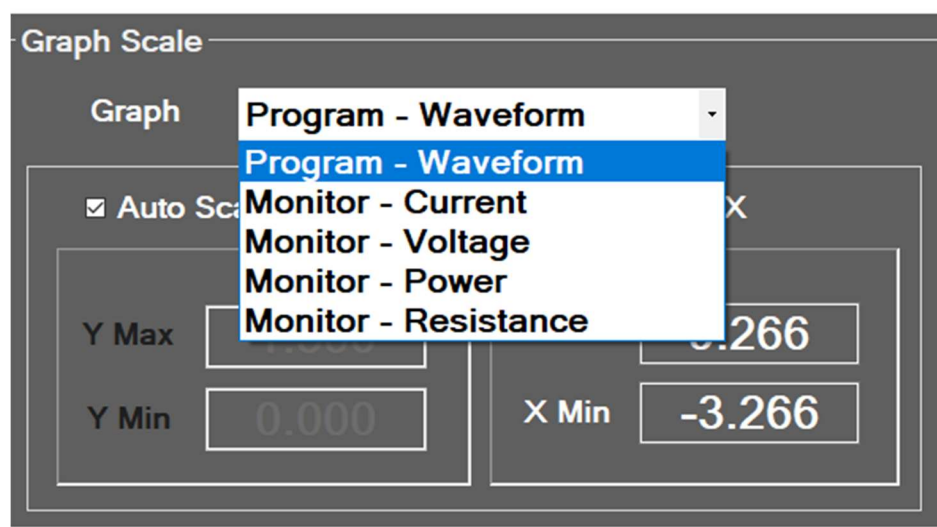
Select **Warnings and Alarms** to display warnings and alarms.

Select **Limit Violations** to display limit violations. When selected, upper/lower limit violations appear on the Status Bar. (In the example below, the pulse exceeded the upper limit (1.246) and the limit violation appeared on the Status Bar.)



Graph Scale

The Graph Scale tool allows the user to determine the scale of graph in the Monitor or Program screen by selecting a graph and either choosing to auto scale both the X and Y axes or setting a range for each.

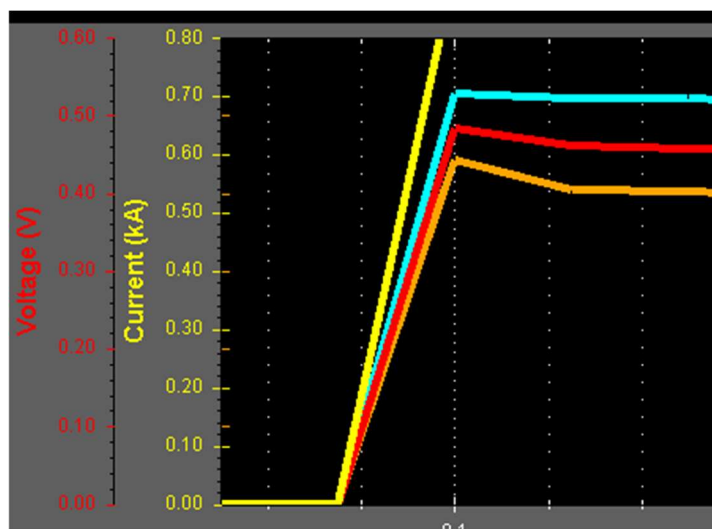


CHAPTER 5: USING UB-B SOFTWARE

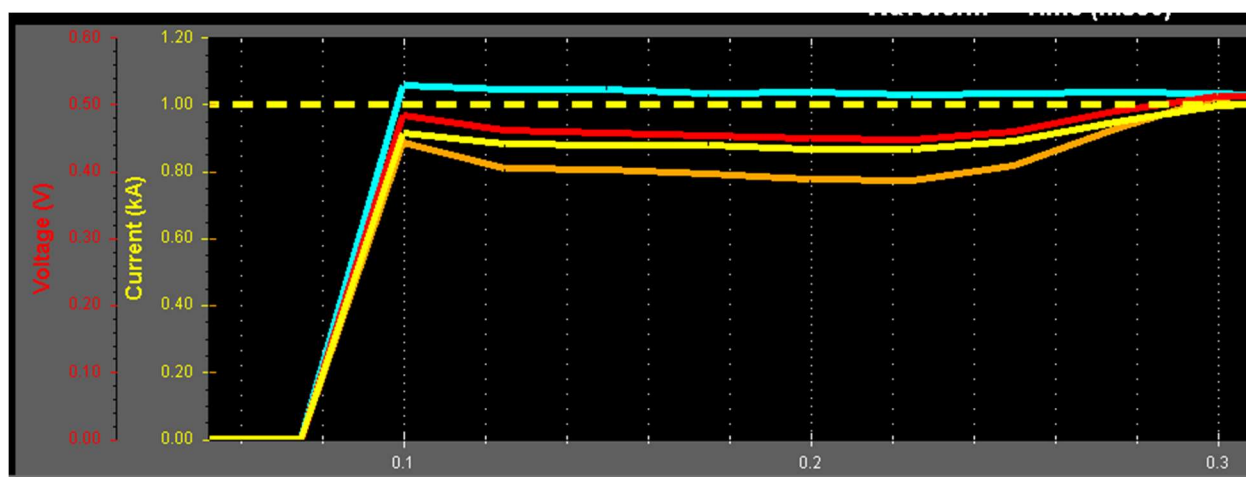
Auto Scale

By default, all four graphs are shown on the same scale. In some cases, the scale for one or more graphs may include spikes that exceed the range of the other graphs so much that showing them on the same scale would make some graphs either too small or too large.

For example, the Current waveform in this graph peaks above the graph window.



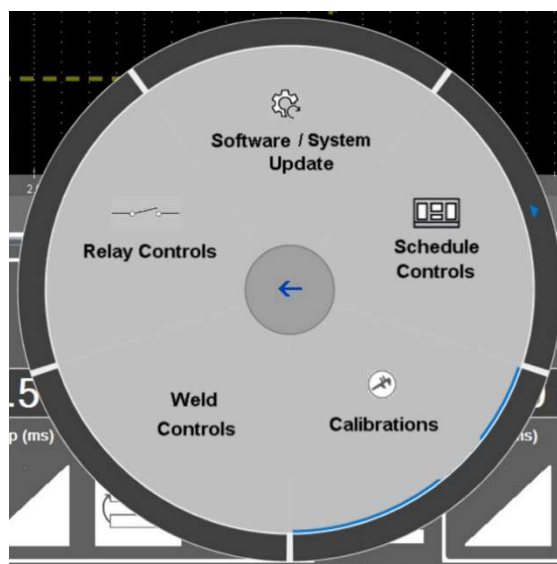
Setting the Auto Scale Y Axis for Current to 0.800 brings it more in line with the other graphs, allowing the user to see the proportional results for each.



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System Settings

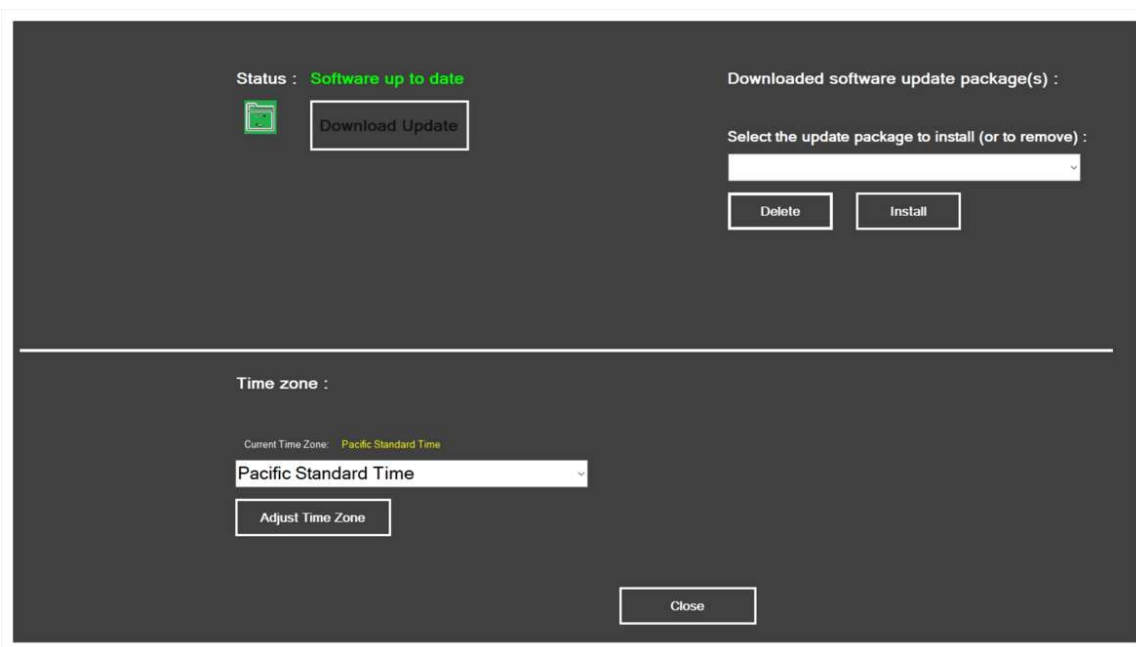
The System Settings icon launches the control tools.



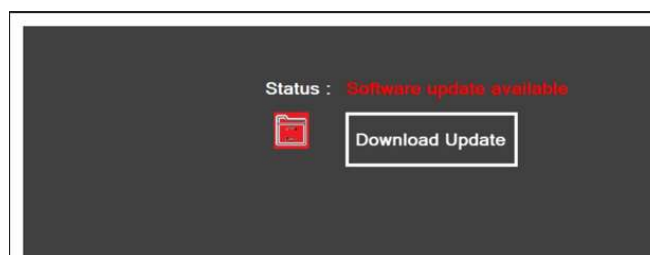
Software / Systems Update

Click the icon to launch the Software Update window. This window tells the user whether the software is currently up to date and provides a link to download the latest software if needed. It then allows the user to select and install the update package.

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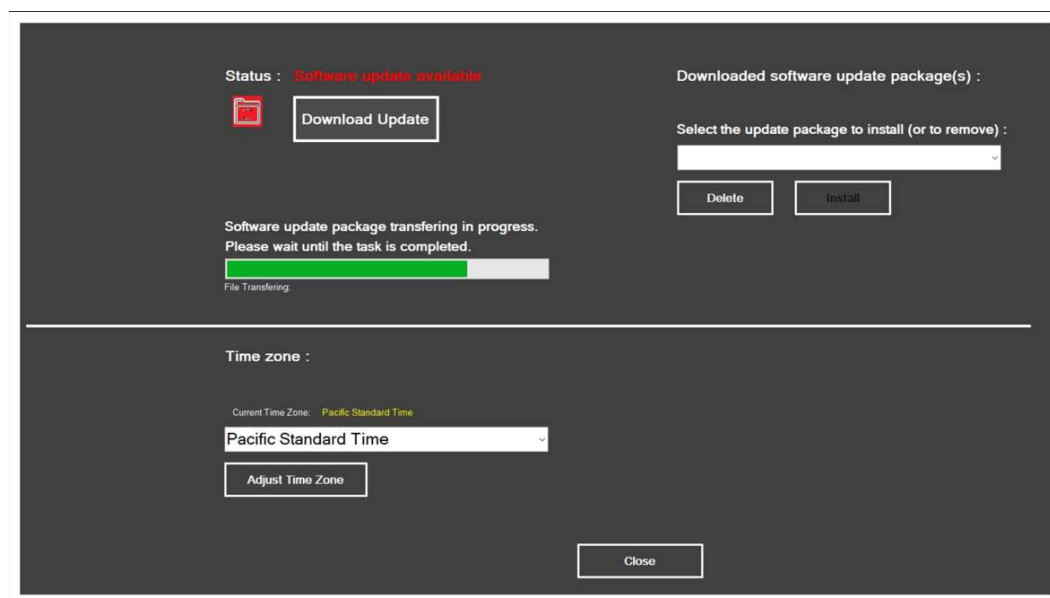
This window shows whether the installed software is current (as shown above). If it is not current, it will show that a Software update package is available (as shown below).



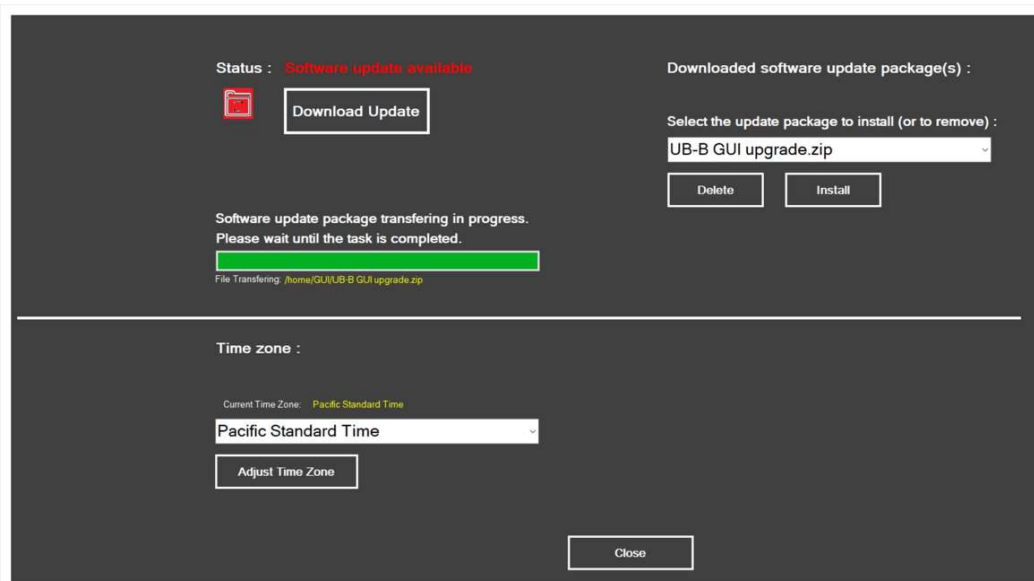
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Software Update Procedure

1. If the Software / Systems Update window shows that a software update package is available, click on the Download Update button to download the package.



2. Once the package has been completely downloaded, the zip package name will be shown on the File Transferring label and on the update package to install dropdown selection list.



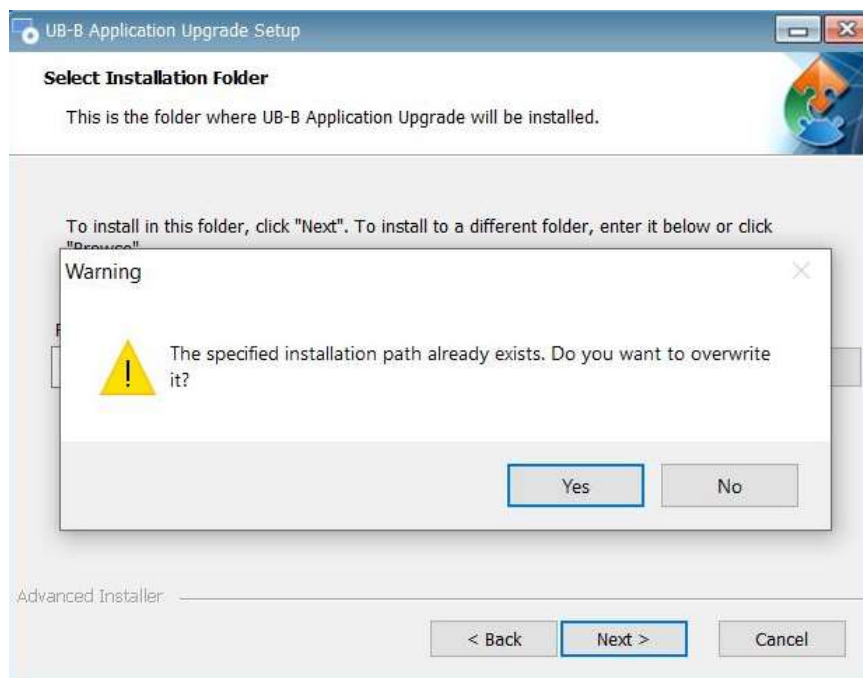
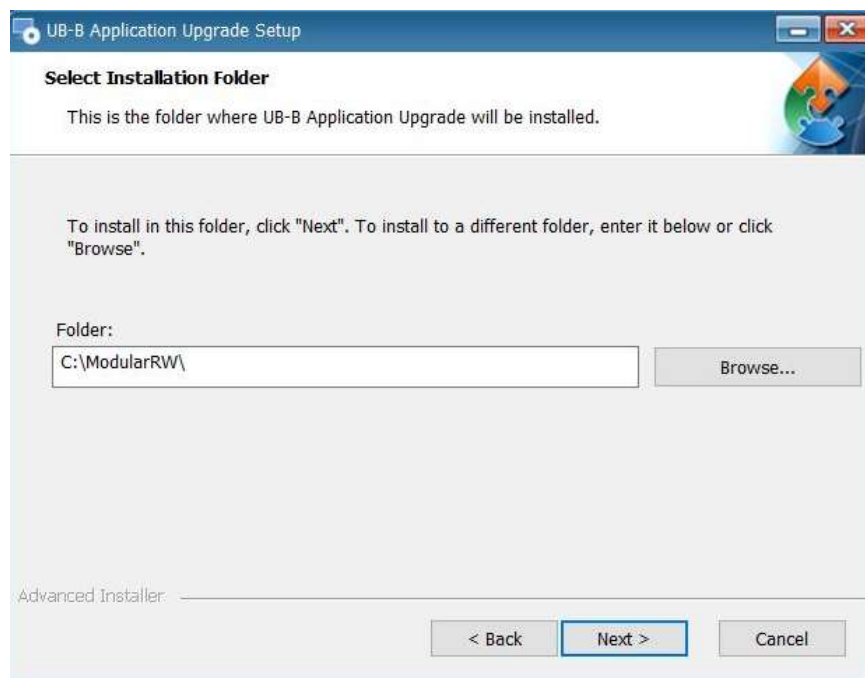
UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

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3. Select the correct upgrade zip package to update and click on the Install button
4. Continue to upgrade.

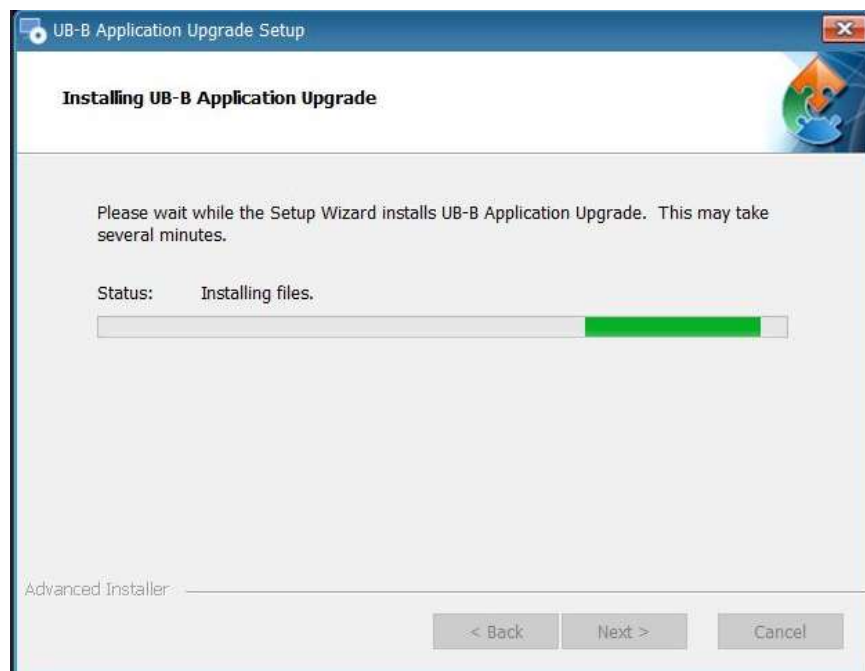
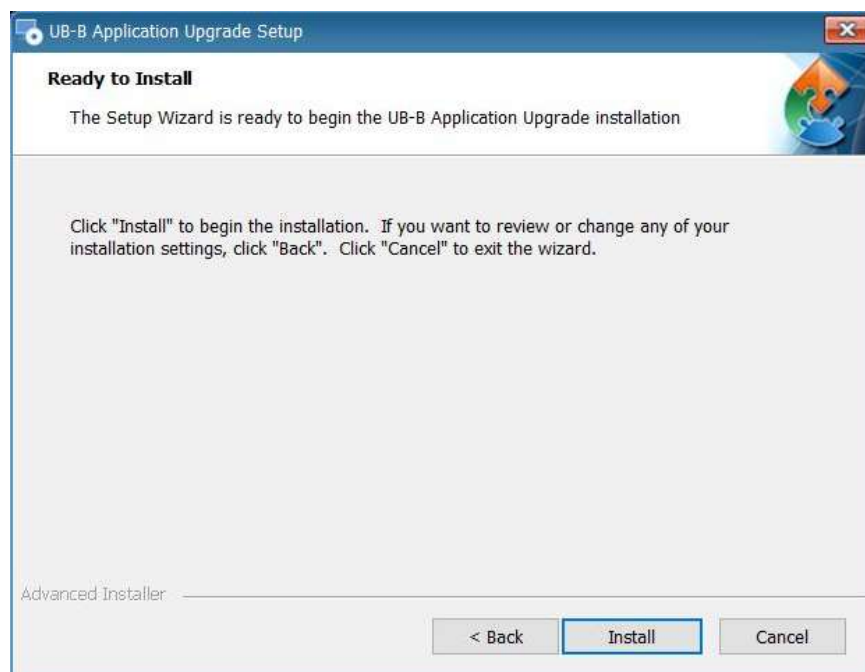


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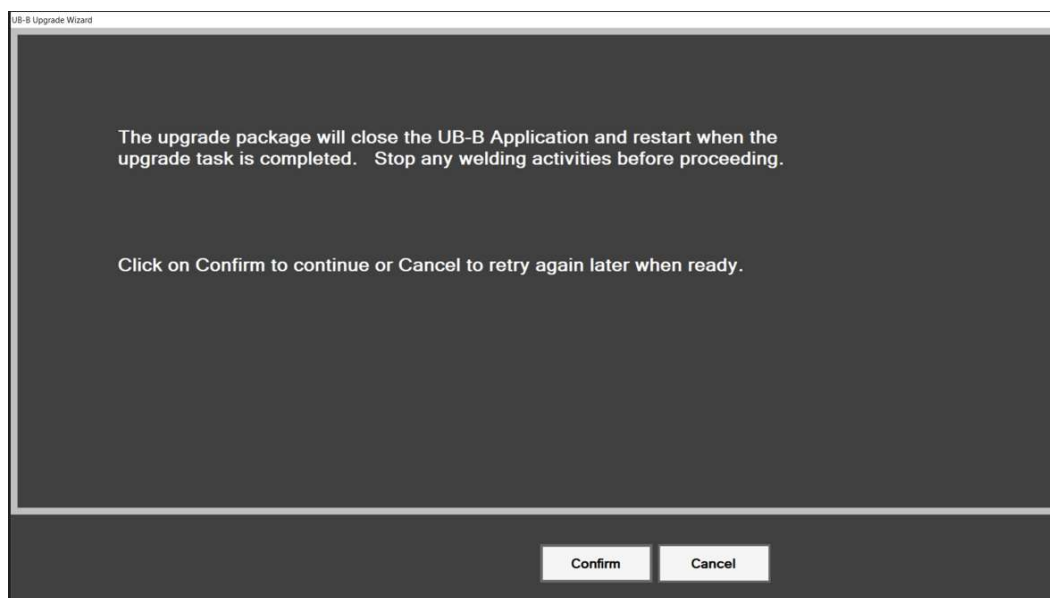
CHAPTER 5: USING UB-B SOFTWARE



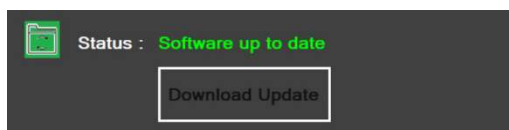
5. Click the Confirm button.

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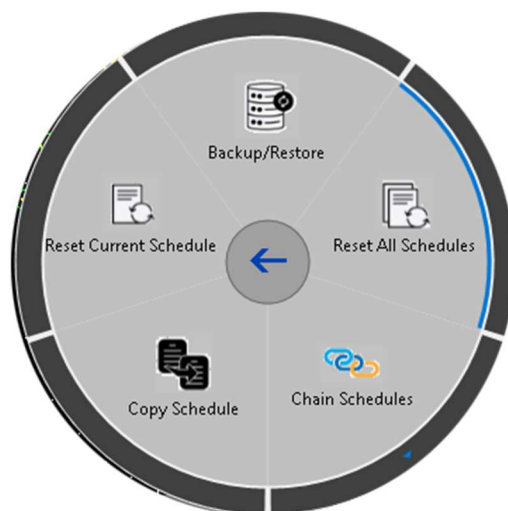
6. UB-B GUI will restart with the new update UB-B GUI version. Clicking on the Software / Systems Update icon again will show that the software is up to date.



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Schedule Controls

The Schedule Controls function on the System Settings Menu links to tools which allow you to backup or restore a schedule, copy a schedule into another location, reset all schedules or chain schedules into a series.



Backup/Restore Schedule

Selecting Backup/Restore Schedule launches a set of tabs, each with checkboxes for 32 schedules. Select the tab/checkbox for a particular schedule and click Backup or Restore.



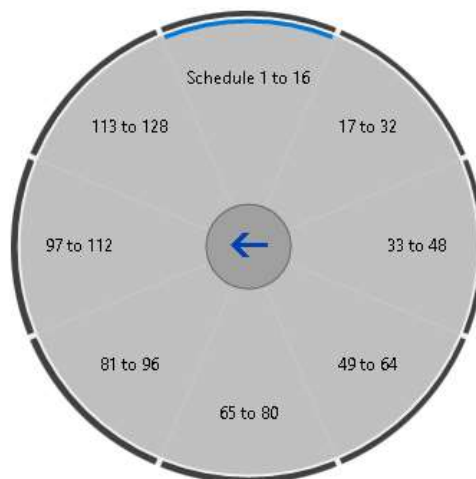
Reset All Schedules

Click Reset All Schedules to automatically reset all schedules.

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Chain Schedules

The chain schedules function on the Security Functions Menu divides the list of 128 available schedules into eight sets of sixteen schedules. (See [Chain Schedules](#) below for more information.) This function does not apply to PLC applications where only one schedule can be chosen.



Copy Schedule

Click Copy Schedule to launch the Copy Schedule window. Input the schedule to be copied and the schedule number to which it is to be copied and select copy.

Copy Schedule

Copy Schedule

Copy Schedule To Schedule

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Reset Current Schedule

Click to Reset the current schedule. An alert displays indicating that the current schedule has been reset.

Calibrations

(**Note:** This tool is only accessible to those users who have logged in an Engineer.)

The Calibration icon on the System Settings Menu launches the Calibration window which consists of two tabs, **Control Loop Calibration**, used for the calibration of Current, Voltage, Power, Offset and Gain, and **System Calibration**, used for calibrating the system. See [Chapter 9: Calibration](#) for more information.

System CalibrationControl Loop Calibration

Calibration Parameters

	Cal Offset	Cal Gain	
Voltage	0.0000	1.0000	Calibration
Current	0.0000	1.0000	Calibration
Power	0.0000	1.0000	Calibration
Resistance	0.0000	1.0000	Calibration

Reset DefaultBackupRestoreUpdateCancel

System CalibrationControl Loop Calibration

Control Loop Parameters (Last Calibrated Date/Time: 2024-7-16 11:27:5)

Loop Current	80
Loop Voltage	0
Loop Power	128
Loop Power Offset	128
Loop Offset	128
Step Up Current	240
Step Up Voltage	240
Step Up Power	128

Reset DefaultBackupRestoreUpdateCancel

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Weld Controls

The Weld Controls function on the System Settings Menu includes two tabs, Weld Controls and Data Communication.

The screenshot shows the 'Weld Controls' tab of a software window. The window has two tabs: 'Weld Controls' (active) and 'Data Communication'. The settings are organized into two columns. The left column includes: Buzzer Volume (ON), Buzzer Duration (OFF), Firing Switch Debounce Time (50 msec), Firing Switch (EZ Air Head), Weld Fire Lockout (OFF), Eco Mode (OFF), Limit Passed Count (5447), Total Welds Count (5585), and Electrode Count (1848). The right column includes: Buzzer Settings (Selections), Foot Switch Weld Abort (OFF), Weld Fire Lockout Charge % (0), Capacity Value % (60), Eco Mode Floor Range (71), Welds Counter Limit (1000000), and Electrode Count Limit (400000). At the bottom right are 'Update' and 'Cancel' buttons.

Setting	Value
Buzzer Volume	ON
Buzzer Duration	OFF
Firing Switch Debounce Time	50 msec
Firing Switch	EZ Air Head
Weld Fire Lockout	OFF
Eco Mode	OFF
Limit Passed Count	5447
Total Welds Count	5585
Electrode Count	1848
Buzzer Settings	Selections
Foot Switch Weld Abort	OFF
Weld Fire Lockout Charge %	0
Capacity Value %	60
Eco Mode Floor Range	71
Welds Counter Limit	1000000
Electrode Count Limit	400000

The Weld Controls Tab

allows the user to define the settings for various system level weld controls and tracks welds.

Remember to select Update to save any changes made in the Weld Controls window.

Buzzer Volume

If you have set a buzzer alert (e.g., Buzzer on Wed Stop), set the buzzer off or on.

Buzzer Duration

Set how long you want the buzzer to sound.

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Buzzer Settings

The Buzzer Settings drop down menu allows the user to select the event which will cause the buzzer to sound.



Firing Switch Debounce Time

The contacts of mechanical firing switches "bounce" when they close. The switch debounce time function allows you to specify that the initiation switch contacts must remain closed for 10, 20, or 30 mms before the weld period can be initiated, thereby avoiding false starts caused by the switch contact bouncing. In addition to the debounce time, there is a delay of no greater than 5 - 7 mms before the start signal is recognized by the Power Supply.

NOTE: The factory default debounce time is 10 mms.



Foot Switch Weld Abort

When **ON**, the foot switch during a weld aborts process.

When **OFF**, the weld process will complete regardless of the foot switch position after initiation.

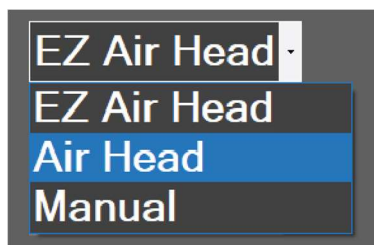
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Firing Switch Timeout

This dropdown list allows the user to set the value for the firing switch timeout from 0 to 500 milliseconds.

Firing Switch

This dropdown list allows the user to set the firing switch input mode.



State	Description
EZ AIR HEAD	This mode requires that the user activate Footswitch 1, then Footswitch 2 and then Fire to start the weld process
AIR HEAD	In this mode, Footswitch1 lowers the head. Footswitch 2 fires the weld head.
MANUAL	In this mode, when Fire input is detected, the device runs in Handpiece mode, compatible with manual heads and handpieces.

Weld Fire Lockout and Charge %

The weld fire lockout function ensures that the capacitor bank is charged to a user-defined percentage before the power supply is allowed to fire. This prevents poor welds that can result when the capacitor bank's charge is depleted because the repetition rate is too high.

- To set this function, set Weld Fire Lockout on the Weld Controls tab to ON.
 - Click in the **Weld Fire Lockout Charge %** field, the Numeric Pad displays
 - Enter a value from 70 to 90 (the minimum percentage to which the capacitor bank should charge before the next weld). The system does not accept a value outside this range.

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- The **Energy Capacity Limit** field sets the minimum amount of energy that should be allowed in a capacity bank after a weld. The settable range is 0% to 50%
- Click Update to save the change.

Weld Fire Lockout	ON	Weld Fire Lockout Charge %	70
		Capacity Value %	0

(In this example, the Weld Fire Lockout Function has been set to ON, ensuring that the capacitor bank has been charged to 70% capacity before the power supply is allowed to fire and that the capacitor bank's charge should be depleted to 0% after a weld.)

ECO Mode/Eco Mode Floor Range

ECO Mode provides a means of reducing power consumption by limiting the amount the capacitor charges between welds.

Eco Mode	OFF	Eco Mode Floor Range	00
----------	-----	----------------------	----

The user sets ECO Mode by toggling it on and setting the Floor Range

When ECO Mode is on, the capacitor charges to 100% capacity for the first weld. The system records the percentage charge required for that weld. For each subsequent weld, the capacitor will only recharge enough to deliver the required charge. The user-set ECO Mode Floor range is the lowest percentage to which the capacitor can be depleted before it is recharged.

Example: ECO Mode ON with Floor Range at 60

First Weld: Capacitor charges to 100% and system welds. System records capacitor depleted to 70%, indicating that the weld required 30% capacity.

Second and subsequent weld: A new weld is made, the capacitor depletes to 30%, recharges to 60% and the system welds again

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Note: ECO Mode settings do not reset when the weld schedule is changed. They are applied to the new schedule.

Weld Counts

This window reports the number of welds which exceeded the set limit and the total weld count.

It also displays the weld counter limit, the electrode count and the electrode count limit.

Limit Passed Count	1		
Total Welds Count	1	Welds Counter Limit	200000
Electrode Count	0000000	Electrode Count Limit	0000000

Weld Control Data Communications

The **Weld Control Data Communications** window allows the user to enable RS-232 Communication, set the Device ID number, and set RS-232 communications role and baud rate.

Weld Controls

Data Communication

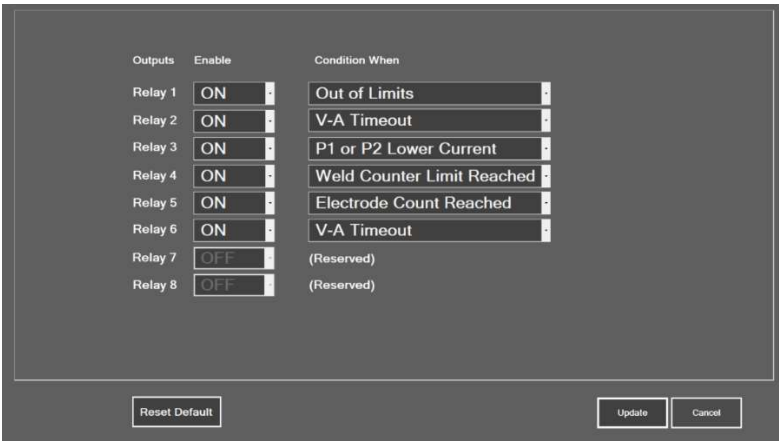
Device ID Number	1
RS-232 Communication Role	Master
Baud Rate	9600
RS-232 Communication	☐ OFF

Relay Controls

The Relay Controls function on the Security Functions Menu allows the user to define the conditions which would cause a signal to be sent through the relay outputs to trigger alarms to signal operators of weld faults, or to signal automation equipment to perform pre-programmed

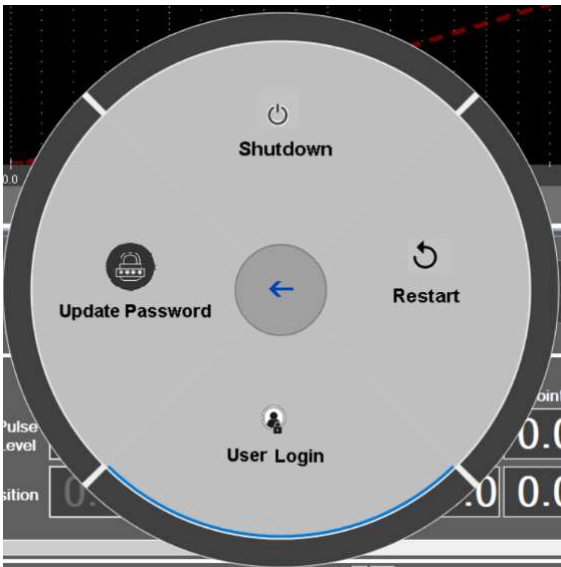
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actions, such as stopping the production line to allow a faulty weld piece to be removed. (See [Relay Outputs](#), below, for more information.)



User & Power

The User and Power menu provides access to basic functions such as shutting down or restarting the program, updating the user password or logging in.



User Settings



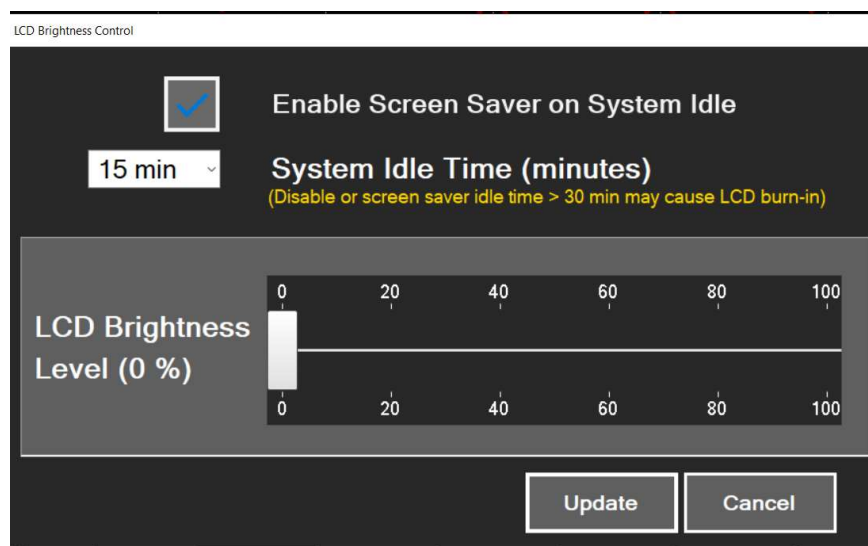
The User Settings tab launches the User Settings menu.



LCD Brightness

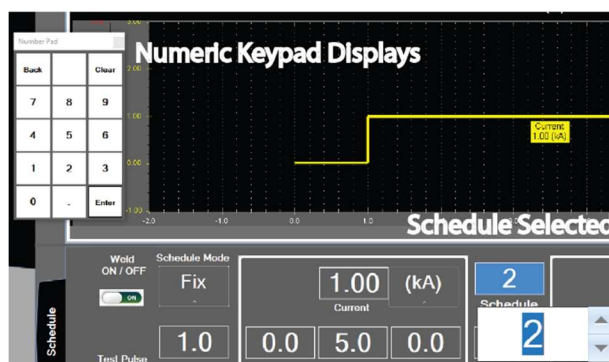
The LCD Brightness tool allows the user to vary the brightness of the interface window. The user can:

- Enable the Screen Saver on system idle
- Set Idle time
- Set LCD Brightness level
- Update new settings.



Use Numeric Keypad

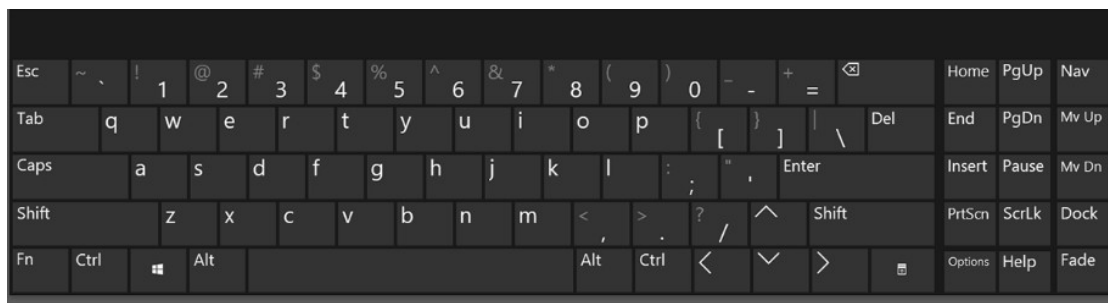
The Use/Hide Numeric Pad function allows the user to toggle between using and hiding the Numeric Keypad on the touchscreen interface. If Show is selected, the Numeric Keypad appears when the user selects a numeric field (e.g., Schedule). Click the X in the upper right hand corner of the keypad or use this function to close/hide the keypad.



Touch Keyboard

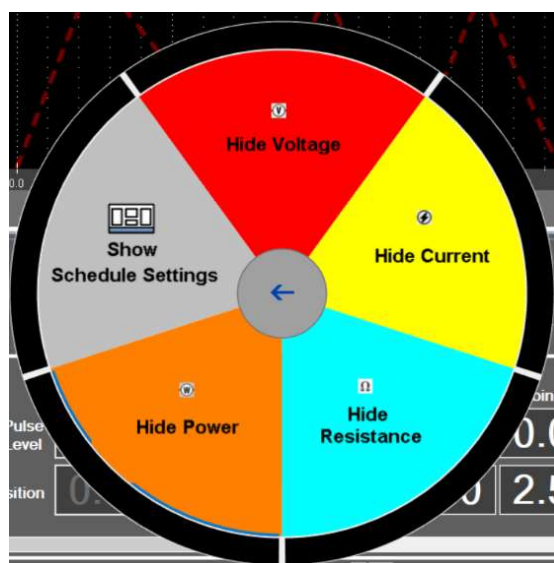
Opens the touch keyboard for full keyboard entry.

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Screens Layout

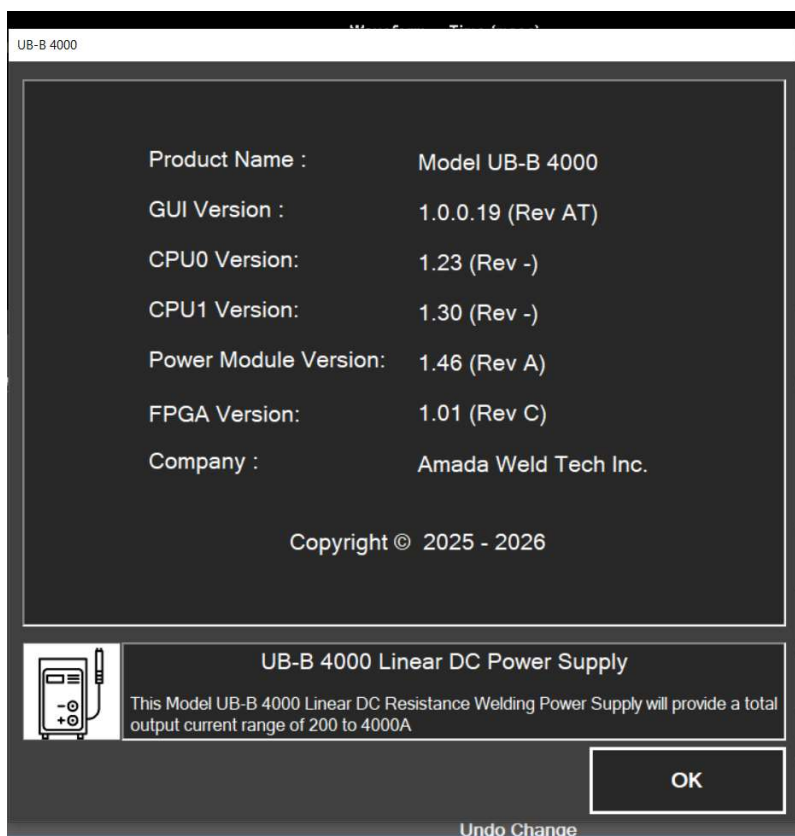
Select the Screens Layout icon to open the Screens Layout tool. The user can select which elements to show or hide in Monitor View. Click on an item to toggle between *show* and *hide*.



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System Info

Displays essential information about the system.



Chapter 6 DEVELOPING WELD SCHEDULES

Scheduling and Monitoring Modes

The Power Supply allows the user to choose from four feedback modes for creating weld schedules and monitoring welds - **Constant Current**, **Constant Voltage**, **Constant Power**, and **Combo Mode** (a control mode which first controls voltage and then switches to control current). These modes offer different advantages for different welding applications.

Constant Current Mode

This mode allows the user to control the current flowing through the work piece during welding.

Application: Used on flat parts where the part-to-part and electrode-to-part contact is controlled and consistent.

Description: Constant Current Mode delivers the programmed current regardless of changes in work piece resistance. This compensates for slight variations in part thickness without affecting weld quality.

Constant Voltage Mode

This mode allows the user to control the voltage across the work piece during welding.

Application: Ideal for welding round or non-flat parts.

Description: Constant Voltage Mode controls the voltage across the work piece during welding. It helps to compensate for part misplacement and force problems and automatically reduces weld splash (often associated with non-flat parts and wire welds).

Constant Power Mode

This mode allows the user to control the power applied to the work piece during welding.

Application: Breaking through surface oxides and plating, this mode is used in automated applications where part or electrode surface conditions can vary over time.

CHAPTER 6: DEVELOPING WELD SCHEDULES

Description: Constant Power Mode precisely varies the weld current and voltage to supply consistent weld energy to the parts. This mode has been shown to extend electrode life in automated applications.

Combo Mode (V-A Mode)

Application: Where there is a possibility of sparking due to variability of part surface conditions or part positioning.

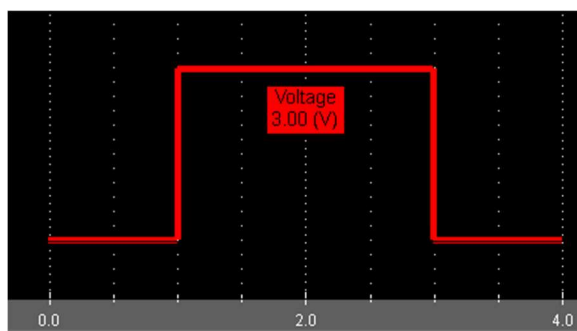
Description: This mode ramps up voltage until a set current level is reached and then delivers a programmed current.

Weld Schedule Types

The Power Supply allows the user to create different types of welds for a wide range of applications. The most common weld schedules are described below, as well as a step-by-step guide to using the Power Supply's touchscreen to develop weld schedules with sample weld schedules. This section also describes how to use envelope limits for weld monitoring.

Single Pulse

A weld with a single weld pulse and no upslope or downslope. This type of weld can be used for many types of spot-welding applications. Use it on flat parts without plating, or on conductive parts such as those made of copper or brass.



CHAPTER 6: DEVELOPING WELD SCHEDULES

Sample Single Pulse Weld Schedule

(For Current, Voltage, and Power Feedback Modes)

After selecting the weld schedule, schedule mode and squeeze time, set the following values.

Pulse 1 Upslope: 0.1 mms

Pulse 1 Energy Level

- **Current:** from **0.200** → **4.000** kA for UB-4000B,
0.005 → **1.500** kA for UB-1500B
- **Voltage:** from **0.100** → **9.9** volts for all models
- **Power:** from **0.100** → **25.00** kW for UB-4000B,
0.070 → **9.999** kW for UB-1500B

Pulse 1 Energy Level: Enter a time between 0 and 99 mms.

Feedback Mode: (Current, Voltage, or Power)

Pulse 1 Downslope: 0.1 mms

Cool Time: 1.0 mms

Pulse 2: Enter 0 for all Pulse 2 values

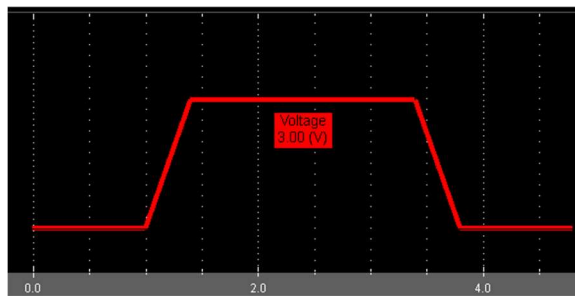
Hold Time: Enter a time between 0 and 999 mms. We recommend at least 50 mms; weld strength is formed during hold time.

Upslope/Downslope

A weld with a single weld pulse, an upslope and a downslope. This type of weld should be used for most spot-welding applications such as welding round parts, parts that are not flat, spring steel parts, or heavily plated or oxidized parts.

Note: Minimum upslope/downslope values for all schedules: **0.1 mms**.

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Upslope/Downslope Weld

- **Upslope** allows a gradual application of weld energy which permits the parts to come into better contact with each other, reducing the electrode-to-part contact resistances. Upslope welding allows for a lighter force on the electrode, reducing electrode indentation, electrode deformation and material pickup, resulting in a cleaner appearance. It can also be used to displace plating and/or oxides, reduce flashing and spitting, or reduce thermal shock when welding parts containing glass-to-metal seals.
- **Downslope** (annealing) assists in the grain refinement of certain heat-treatable steels and prevents cracking in aluminum and other materials by reducing the cooling rate. Annealing is not typically used for welding small parts.

Sample Upslope / Downslope Weld Schedule

(For Current, Voltage, and Power Feedback Modes)

After selecting the weld schedule and schedule mode, set the following values.

Squeeze Time: Enter a value between 0 and 999 mms. Recommended value: 150 mms

Pulse 1 Upslope: Set a value between 0.1 and 99 mms. Recommended value: 5 mms

Pulse 1 Energy Level

- **Current:** from **0.200** → **4.000** kA for UB-4000B,
0.005 → 1.500 kA for UB-1500B
- **Voltage:** from **0.100** → **9.9** volts for all models
- **Power:** from **0.100** → **25.00** kW for UB-4000B,
0.070 → 9.999 kW for UB-1500B

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Pulse 1 Weld Time: Set a value between 0 and 99 mms.

Feedback Mode: (Current, Voltage, or Power)

Pulse 1 Downslope: Set a value between 0.1 and 99 mms. Recommended value: 5 mms

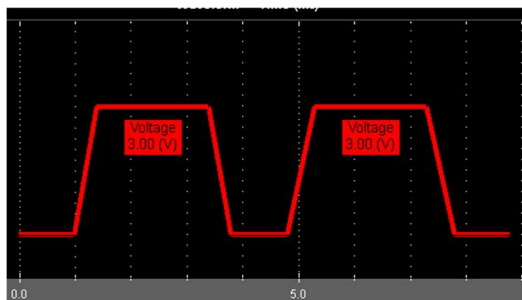
Cool Time: 1.0 mms

Pulse 2: Enter 0 for all Pulse 2 values

Hold Time: Enter a time between 0 and 999 mms. Recommended value: 50 mms.

Dual-Pulse

A weld with two weld pulses, each with an upslope and a downslope. This type of weld is for spot welding flat-to-flat parts, round-to-round parts, and round-to-flat parts that may or may not be plated. The first pulse is generally used to displace plating or oxides, and the second pulse achieves the weld.



Dual-Pulse Weld

In the normal application of dual pulse, the Pulse 1 weld period provides sufficient heat to displace the plating or oxides, seat the electrodes against the base metals, and force the parts into close contact. The cool period provides time to dissipate the heat generated during Pulse 1.

The Pulse 2 weld period completes the structural weld. The Pulse 2 weld current is typically greater than the Pulse 1 weld current by a factor of 3, as the first pulse significantly reduces the resistance of the interface between the parts.

CHAPTER 6: DEVELOPING WELD SCHEDULES

The purpose of the downslope period following either welding pulse is to control grain refinement in brittle parts by slowly reducing the weld current to zero during the downslope period.

Sample Dual-Pulse Weld Schedule

(For Current, Voltage, and Power Feedback Modes)

After selecting the weld schedule and schedule mode, set the following values.

1. **Squeeze Time:** Enter a value between 0 and 999 mms. Recommended value: 150 mms.
2. **Pulse 1 Upslope:** Set a value between 0.1 and 19 mms.
3. **Pulse 1 Energy Level**
 - **Current:** from **0.200** → **4.000** kA for UB-4000B,
0.005 → **1.500** kA for UB-1500B
 - **Voltage:** from **0.100** → **9.9** volts for all models
 - **Power:** from **0.100** → **25.00** kW for UB-4000B,
0.070 → **9.999** kW for UB-1500B
4. **Pulse 1 Weld Time:** Set a value between 0 and 99 mms.
5. **Feedback Mode:** (Current, Voltage, or Power)
6. **Pulse 1 Downslope:** Set a value between 0.1 and 99 mms.
7. **Cool Time:** Set a value between 0 and 99 mms. At least 2 mms.
8. **Pulse 2 Upslope:** Set a value between 0.1 and 19 mms.
9. **Pulse 2 Energy Level**
 - **Current:** from **0.200** → **4.000** kA for UB-4000B,
0.005 → **1.500** kA for UB-1500B
 - **Voltage:** from **0.100** → **9.9** volts for all models
 - **Power:** from **0.100** → **25.00** kW for UB-4000B,
0.070 → **9.999** kW for UB-1500B
10. **Pulse 2 Weld Time:** Set a value between 0 and 99 mms.
11. **Feedback Mode:** (Current, Voltage, or Power)
12. **Pulse 2 Downslope:** Set a value between 0.1 and 99 mms.

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CHAPTER 6: DEVELOPING WELD SCHEDULES

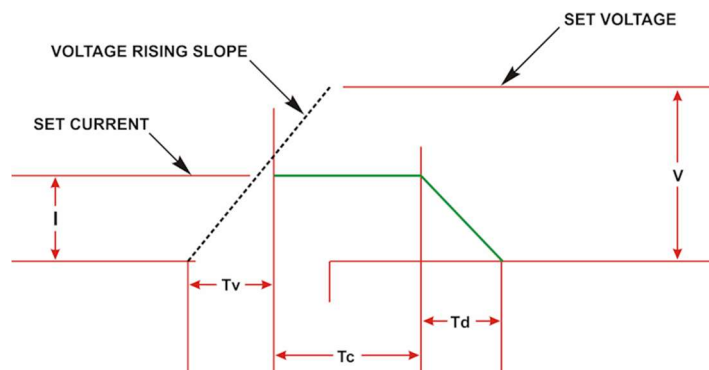
13. **Hold Time:** Enter a time between 0 and 999 mms. Recommended value: 50 mms.

Combo Mode [Dual Pulse Only]

Combo Mode allows the user to start a weld with a controlled ramp up of the voltage. As illustrated below, the slope of the ramp is calculated by the Power Supply based on user set time value, T_v , and the user set voltage value, V . When the current reaches a user set current value, I , the unit switches to a current control mode. Current is first controlled to a fixed current level for a user set period, T_c , an optional downslope of current can then be executed.

If the current fails to reach the user-selected current level I after the voltage control time T_v ends, an error message will display, and an alarm will sound. Also, the combo pulse will be terminated and a second pulse will not be executed.

The actual time of the voltage control portion of Pulse 1 will typically be less than the user set time, T_v , for the voltage ramp up time.



Set voltage waveform		
Controlled Current waveform		—————
T_c	Constant current control time period (milliseconds)	
T_v	Maximum allowable time for Voltage Ramp up (milliseconds)	
V	Maximum allowable voltage during Voltage Ramp up (<i>volts</i>)	

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I	Constant current control level (amperes)
Td	Current downslope period (milliseconds)

After **Tv** or **I** is entered, the unit will calculate current ramp up rate; an error message displays if the calculated current ramp is greater than 500 amps/msec. If the calculated rate is greater than 500 amps/mm then change the **Tv** setting so that the calculated current ramp up rate will be 500 amps/mm or less.

Note: In a dual-pulse weld profile, Combo Mode can only be used for the first pulse.

Note: In Combo Mode Pulse 1 ***must*** be in Current Feedback Mode.

Sample Combo Mode (V-A) Single-Pulse and Dual-Pulse

After selecting the weld schedule and schedule mode, set the following values.

1. **Feedback Mode:** Combo Mode
2. **Squeeze Time:** Enter a value between 0 and 999 mms. Recommended value: 150 mms.
3. **Pulse 1 Upslope:** Set a value between 0.1 and 99ms.
4. **Pulse 1 Current Setpoint (I):** From 0.200 to 4.000 kilo amps. (UB-4000B)
5. **Pulse 1 Voltage Setpoint (V):** From 0.100 to 9.9 volts.
6. **Pulse 1 Weld Time:** Enter a value between 0 and 999 mms.
7. **Pulse 1 Downslope:** Enter 0.1 mms.
8. **Cool Time:** Enter 1.0 mms.

(If Pulse 2 is required)

9. **Pulse 2 Upslope:** Set a value between 0.1 and 19 mms.
10. **Pulse 2 Energy Level**
 - **Current:** from 0.200 → 4.000 kA for UB-4000B,
0.005 → 1.500 kA for UB-1500B
 - **Voltage:** from 0.100 → 9.9 volts for all models

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- **Power:** from 0.100 → 25.00 kW for UB-4000B,
0.070 → 9.999 kW for UB-4000B

11. Pulse 2 Weld Time: Set a value between 0 and 99 mms.

12. Feedback Mode: (Current, Voltage, or Power)

13. Pulse 2 Downslope: Set a value between 0.1 and 99 mms.

14. Hold Time: Enter a time between 0 and 999 mms. Recommended value: 50 mms.

The dual-pulse weld profile is valuable for pre-checking gross parts positioning problems and reducing parts scrap.

Use the Pulse 1 weld at 0.100 kA and 2.0 ms as a pre-check pulse. Experiment with upper and lower limit values that you can use to inhibit the Pulse 2 weld if the test conditions measured by the Pulse 1 weld are out of limits.

Notes

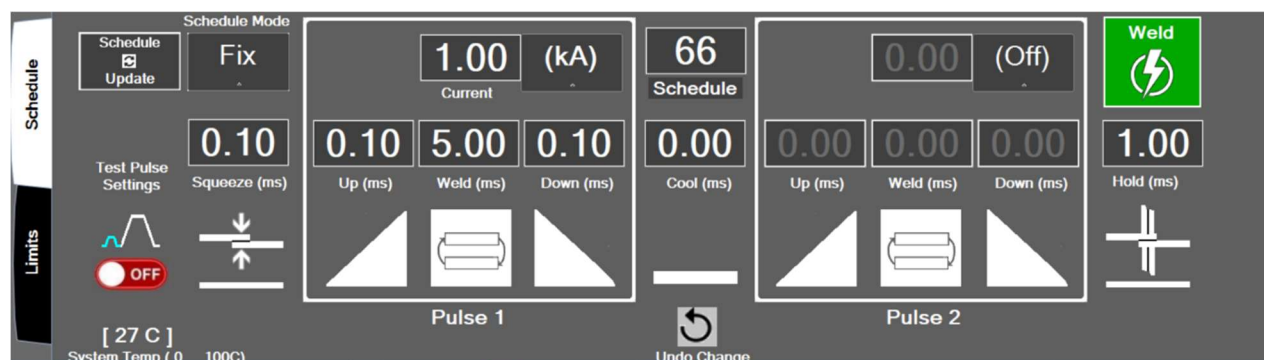
- Upslope is required when a lower limit value is programmed.
- If the weld time parameter of Pulse 1 is set to 0.1 mms (upslope only or triangular waveform for Pulse 1) then the weld time parameter of Pulse 2 must be greater than 0 mms.
- In a dual-pulse weld profile, a different feedback mode can be used for the second pulse with the limitation that **combo** mode can only be used for the first pulse.

Developing Weld Schedules

The Power Supply ships with 128 numbered weld schedules programmed to the default settings.

Default Settings

- **Schedule Mode:** Dual Pulse
- **Squeeze:** 1 mms.
- **Pulse 1:** with 1.00 kA of Current for 5.0 mms, no up or down slope
- **Pulse 2:** Not active
- **Cool:** 0.0 mms.
- **Hold:** 1.0 mms.



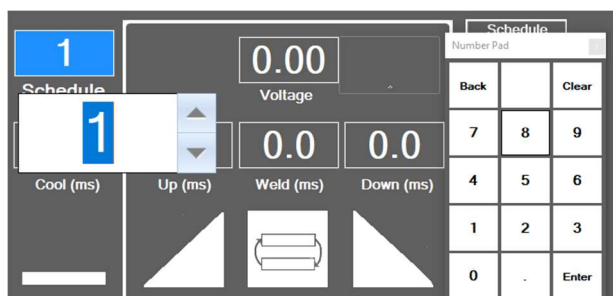
Default Weld Schedule

Follow the steps listed below to change those settings.

1. Select a Weld Schedule

Select a schedule from the Schedule Box in the center of Weld Schedule interface. The system will display a box with up/down arrows and/or the Numeric Keypad (depending on whether you have chosen to show or hide the keypad in System Settings.)

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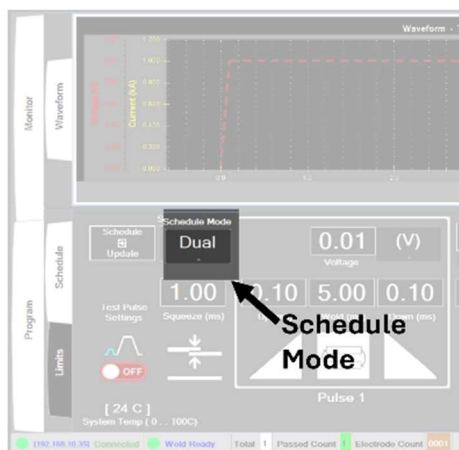


Click in the box and use the ▲▼ (up/down) arrows or the keypad to enter the number of the schedule you want to program. The current settings for the selected schedule will display. (In the example above, Schedule 1 is still in the default schedule configuration.) This method applies to most fields in the weld schedule.

Note: We advise maintaining a written list describing programmed weld schedules as they are developed.

2. Select Schedule Mode

Click on the Schedule Mode box to select the Schedule Mode, Dual Pulse or Flex (With Data Points).



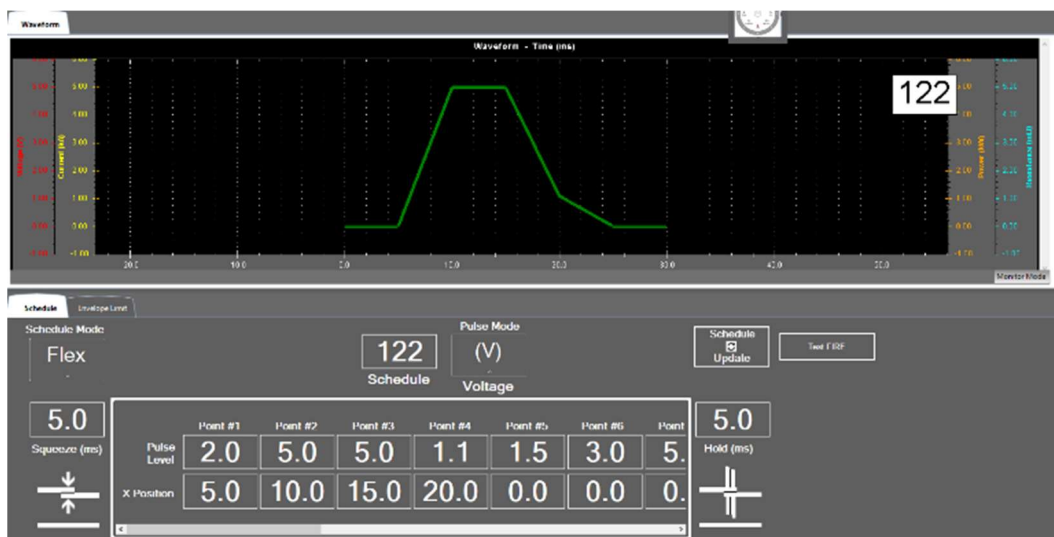
Dual Pulse Mode allows the user to set a single value for each segment in the weld sequence.

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Dual Pulse Mode

Flex Mode allows the user to set up to 20 data points to define a weld over time.



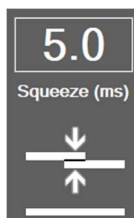
Flex Mode Pulse

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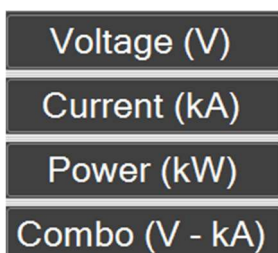
3. Set the Squeeze Time

Squeeze Time is the length of time the pieces to be welded are squeezed together before energy is applied to the weld to allow the electrodes to settle. Click on the Squeeze (mms) field and enter a time between **0** and **999** mms. We recommend a setting of 150 mms to start.



4. Select the energy type to be monitored (Current, etc.) in Pulse 1 and set the value for that energy.

- a. Select the Units field (in this example “(kA)” for Current) and select either Voltage, Current, Power or Combo Mode.)



- b. Select the Value field for the designated energy and set the duration for Pulse 1.

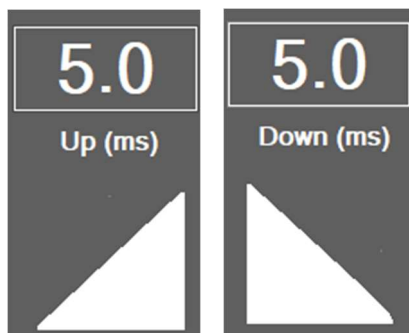


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5. Set any upslope and/or downslope times for that pulse.

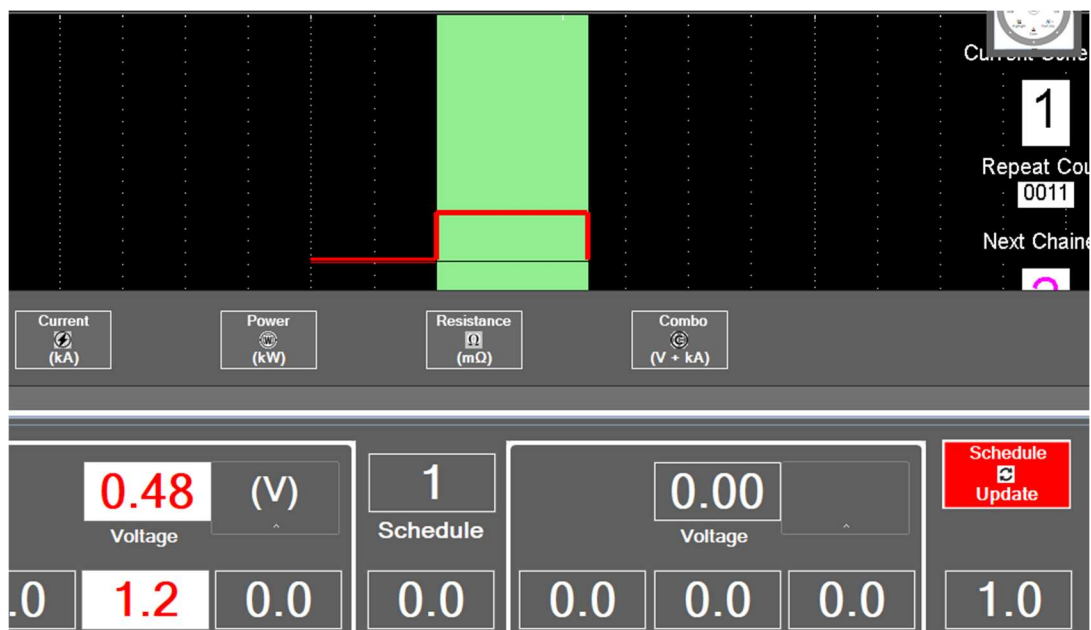
- a. Select the Value field for Up (mms) and Down (mms) to set the upslope and downslope times.

Note: Minimum value for Upslope or Downslope is 0.1 mms.



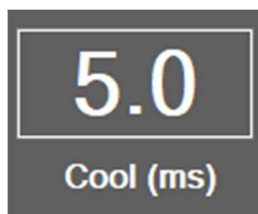
6. Click on Schedule Update to save any changes.

- a. **Note:** As you develop a weld schedule, a graphic representation of its waveform will form in the Weld Waveform window. If you select Waveform Show Fills (in the Graph Settings window) and then modify a given part of a weld schedule, that part will be highlighted in green in the Waveform window and the Schedule Update button will turn red. Click on the Schedule Update button whenever you want to save the modifications you have made to the schedule. The button will return to gray.



7. Set the Cool Time.

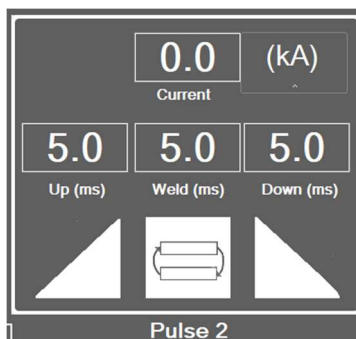
Select the Cool (mms) field to set the cool time.



Note: If the same energy parameters are entered for Pulse 1 and Pulse 2 (e.g., both Pulse 1 and Pulse 2 are set to current feedback mode), the Power Supply can be set to 0 mms Cool Time. If different energy parameters are entered for Pulse 1 and Pulse 2, the Power Supply will require a minimum of 1.0 mms Cool Time. If a Cool Time is set lower than 1.0 mms, but not zero, the Power Supply will default to 1.0 mms Cool Time.

CHAPTER 6: DEVELOPING WELD SCHEDULES

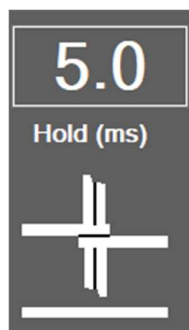
8. If Pulse 2 is required, select the energy type, duration, upslope and downslope for Pulse 2.



Note: Pulse 2 will appear in a different color than Pulse 1 in the Waveform window.

9. Set the Hold time.

Select the Hold (mms) field and set a time value for Hold time.



10. Click Schedule Update to save the modified schedule.

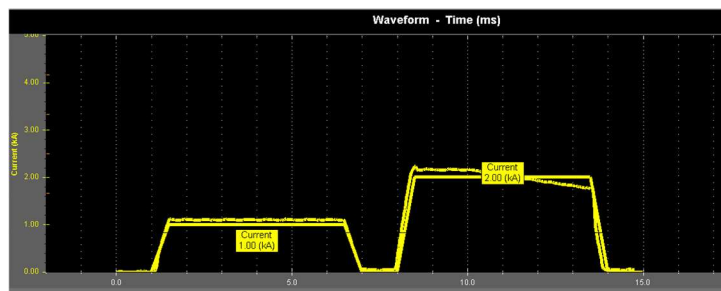
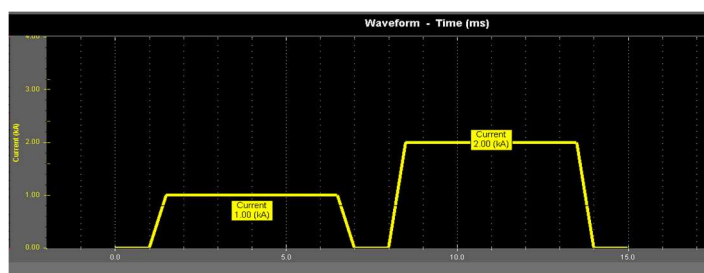
The Waveform Window should now display a graphic representation of the saved weld schedule.

CHAPTER 6: DEVELOPING WELD SCHEDULES



11. Fire to compare the weld schedule to a test weld.

In the sample below, the solid yellow line in the first image shows the form of the weld as scheduled. The second image shows the scheduled weld; the irregular yellow line shows the form of the test fired weld.



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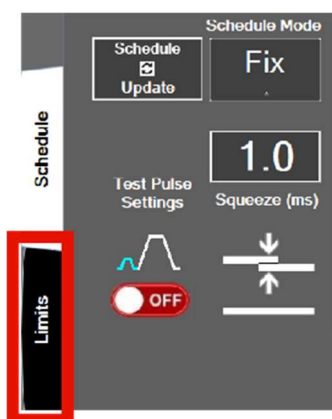
Working with Envelope Limits

Envelope Limits is a quality control tool that employs statistical methods to monitor and control processes. The system compares a select number of the most recent welds to create an envelope which sets upper and lower limits within the standard deviation established by the user. This makes it possible for the user to monitor the efficiency of the weld schedule over time, helping to ensure that the process operates efficiently, producing more specification-conforming products with less waste. (Note: AMADA WELD TECH's WM-200A Networked RW Monitor System employs envelope limits in a similar manner.)

The Limits Tab in the Weld Schedule Interface allows an engineer to create envelopes with upper and lower limits for one or both pulses in a weld schedule. These limits can be used to generate out of limit (OOL) messages or to abort a process if a limit has been exceeded. (See Alarm Messages for descriptions of these messages.)

Users familiar with earlier versions of these power supplies will find the same envelope limit functions and tools found in earlier models; accessing those functions and tools is now simpler and more intuitive. For example, limits are programmed from the Program Screen rather than switching to the Run state.

1. From the Program Screen, select a schedule from the Schedule Box in the center of Weld Schedule interface.
2. Click on the Limits button on the left hand side of the Program Screen to open the Envelope Limit Tab



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The Limits Window displays.

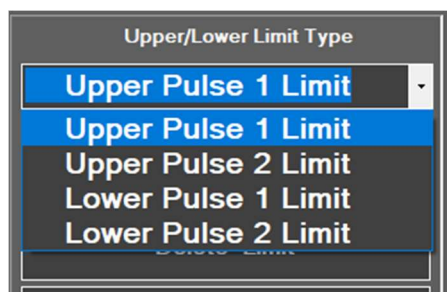
The Limits Window interface is divided into several sections. At the top, there are tabs for 'Upper Limits' and 'Lower Limits', and a 'Test FIRE' button. The main area is split into two columns for 'Pulse 1 Upper Limit' and 'Pulse 2 Upper Limit'. Each column contains a table with 'Item', 'Point X', and 'Point Y' columns. Pulse 1 has 6 items, while Pulse 2 is empty. Between the tables is an 'Edit Point (X, Y)' section with input fields for '0.00' and '0.000'. To the right of the tables are vertical scroll bars. On the far right is a 'Limits Controls' panel with buttons for 'Auto Generate Envelope', 'Manual Add', a dropdown for 'Upper/Lower Limit Type' (currently set to 'Upper Pulse 1 Limit'), 'Delete Limit', 'Clear Limit Undo Last Action', and 'Update'. At the bottom, there are four dropdown menus for 'Pulse 1 Limit Mode', 'Pulse 1 Out of Limit Action', 'Pulse 2 Limit Mode', and 'Pulse 2 Out of Limit Action', with 'Voltage' and 'None' selected respectively.

Item	Point X	Point Y
1	0.03	0.101
2	0.28	0.104
3	0.55	0.101
4	0.85	0.105
5	1.13	0.407
6	1.38	1.341

3. Select either **Auto Generate Envelope** or **Manual Add** from the Limits Controls panel on the right.

A close-up view of the Limits Controls panel. It features a vertical stack of buttons: 'Auto Generate Envelope', 'Manual Add', a dropdown menu for 'Upper/Lower Limit Type' (currently showing 'Upper Pulse 1 Limit'), 'Delete Limit', 'Clear Limit Undo Last Action', and 'Update'.

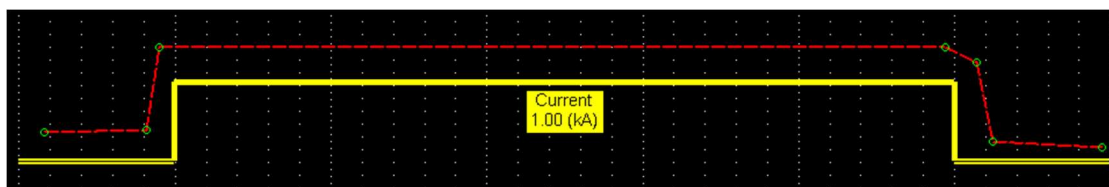
4. Select a pulse and upper or lower limit from the **Upper/Lower Limit Type** dropdown menu.



- a. **Note:** You can only add a limit to a pulse which has already been scheduled through the Schedule tab.

If you have selected Manual Add/Edit Limit

- a. Click on Add/Edit Upper (or Lower) Envelope. You define limits by clicking on a series of points in the Waveform Window. The points you select will appear in the Waveform Window as a series of green circles connected by a red dotted line, as shown below.



- b. Those points will also be listed in the corresponding Pulse/Envelope table, with the first point highlighted. You can edit these points in the Edit Point (X, Y) field next to the table.
- c. To remove a point, click on the Clear Limit/Undo Last Action button.

Pulse 1 Upper Envelope			Edit Point (X , Y)	
Item	Point X	Point Y		
3	1.45	1.13	▲ ▼	1.45 1.13
4	3.39	1.15		
5	4.28	1.16		
6	5.10	1.13		
7	6.11	1.17		

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If you have selected Auto Generate Envelope

The Envelope Limit View window displays.



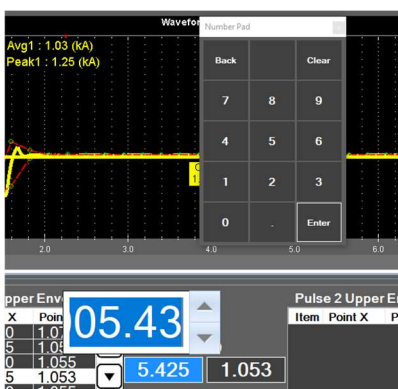
The Envelope Limit View window has four sections.

- **Title Bar:** Allows the user to set the number of welds and the type of waveforms to be graphed.
- **Waveform Window:** Displays the waveforms of the most recent of the selected number of welds.
- **Waveform List:** Lists the selected welds by Schedule number, date, and time, and whether a given weld is to be included or ignored in sample size used to generate the envelope.
- **Settings Bar:** Allows the user to set the parameters for the envelope to be generated.
 - a. Set the number of welds to be graphed and the weld waveform to be graphed in the Title Bar.

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- b. Set the sample size per standard deviation and envelope point size in the settings bar.
- c. Click on the box(es) to generate Upper and Lower Standard Deviation σ (sigma) and Δ (delta) for the envelopes to be generated.
- d. Once the settings have been made, click Generate Envelope.
- e. Click Test Fire and review the envelope generated.
- f. Adjust the settings as needed to create appropriate envelope limits.
- g. Click Update Schedule to save the automatically generated limits.
- h. The system returns to the Limits window, now populated with the points generated through the automated process.
- i. Edit any of the limit points by selecting a point in the upper or lower envelope limit tables and selecting Manual Add / Edit Limit button.
- j. The selected point is highlighted in the table, and the Numeric Pad becomes active with the point's Y value highlighted. Use the scroll arrows or the Numeric Pad to change that value.



- k. When you are done defining the envelope limit, click Update to save that limit.

NOTES

- The upper and lower limits must be a minimum of 0.5 milliseconds in length.
- The Power Supply will automatically adjust the IGNORE 1ST or IGNORE LAST time as appropriate if too much time is entered.
- The monitor limit mode can be different for Pulse 2 than the monitor limit mode for Pulse 1.

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- All lower limits apply only to the Pulse 1 and 2 WELD periods. Lower limits do not cover any upslope or downslope periods.
- All upper limits apply to the entire Pulse and Pulse 2 periods, including their upslope and downslope periods.

Out of Limits Actions

Cool Weld Period

- 1) **None** - Takes no action if upper or lower energy limits are exceeded
- 2) **Stop Weld** - Stops the weld during Pulse 1 and prevents Pulse 2 from firing (if applicable).
- 3) **Inhibit Pulse 2** - Stops the weld immediately at the end of Pulse 1 and prevents Pulse 2. This function will not operate if both pulses are not joined with a cool time.
- 4) **Part Conditioner** - Stops Pulse 1 immediately after upper limit is exceeded but allows Pulse 2 to fire. This function will not operate if both pulses are joined without a cool time.

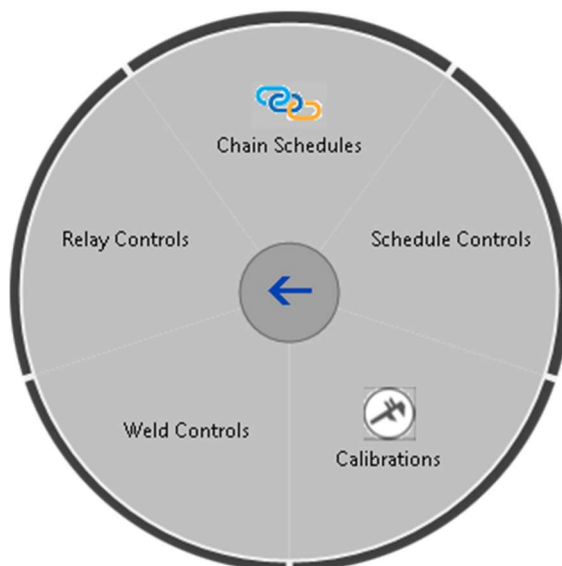
Pulse 2

- 1) **None** – takes no action if the upper or lower energy limits are exceeded.
- 2) **Stop Weld** – Stops Pulse 2 immediately after upper or lower energy limits are exceeded.

Relay Controls

The Power Supply's six relays can be programmed to activate outputs under eighteen user-programmed conditions.

Access Relay Controls through the Security Functions menu.



Select Relay Controls to launch the Relay Output settings window.

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Outputs	Enable	Condition When
Relay 1	ON	Out of Limits
Relay 2	ON	V-A Timeout
Relay 3	ON	P1 or P2 Lower Current
Relay 4	ON	Weld Counter Limit Reached
Relay 5	ON	Electrode Count Reached
Relay 6	ON	V-A Timeout
Relay 7	OFF	(Reserved)
Relay 8	OFF	(Reserved)

Reset Default Update Cancel

Outputs	Enable	Condition When
Relay 1	ON	Weld
Relay 2	ON	End of Weld
Relay 3	ON	Alarm
Relay 4	ON	Out of Limits
Relay 5	ON	V-A Timeout
Relay 6	ON	Unit Ready
Relay 7	OFF	Pulse1 Upper Limit
Relay 8	OFF	Pulse1 Lower Limit

Reset Default Update Cancel

Set a relay to ON in the Enable column and select a condition that will trigger that relay from the dropdown menu in the Condition When column.

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Outputs	Enable	Condition When
Relay 1	ON	Weld
Relay 2	ON	Weld
Relay 3	ON	End of Weld
Relay 4	ON	Alarm
Relay 5	ON	Out of Limits
Relay 6	ON	V-A Timeout
Relay 7	OFF	Unit Ready
Relay 8	OFF	Pulse1 Upper Limit
		Pulse1 Lower Limit
		Pulse2 Upper Limit
		Pulse2 Lower Limit
		P1 or P2 Upper Current
		P1 or P2 Lower Current
		P1 or P2 Upper Voltage
		P1 or P2 Lower Voltage
		P1 or P2 Upper Power
		P1 or P2 Lower Power
		P1 or P2 Upper Resistance
		P1 or P2 Lower Resistance
		Weld Counter Limit Reach
		No Weld Switch

Relay Conditions

NOTE: Programming for each of the relays is identical.

WELD

When welding, the relay output signal will start within ± 5 mms of the start of SQUEEZE and will stay energized for 0 – 150 mms after the end of the HOLD period.

END OF WELD

When welding, the relay output signal will start 0 – 10 mms after the end of the HOLD period and will stay energized for 650 – 850 mms. If another weld is initiated within this time, the END OF WELD relay will be reset at the start of the next weld. The relay will still close in the event of an aborted weld.

ALARM

The relay output signal will start when the Power Supply senses certain ALARM conditions (except for OUT OF LIMITS alarms) and will stay energized until the ALARM state is cleared.

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OUT OF LIMITS

The relay will switch when the Power Supply senses any OUT OF LIMITS condition. It will start 0 – 5 mms after the end of HOLD and will stay energized until the OUT OF LIMITS alarm state is cleared.

V-A TIME OUT

The relay will switch if the actual time exceeds the user set time for Tv for a Pulse using the Combo (V-A) feedback mode (see [Combo Mode](#)). It will start 0 – 5 mms after the end of Pulse 1 is aborted and will stay energized until the V-A TIME OUT alarm state is cleared by pressing the RUN button, or at the start of the next weld.

UNIT READY

Relay will be energized when Power Supply is ready to weld. It will de-energize 0 – 5 mms after receipt of a fire signal. It will energize 0 – 250 mms after the end of HOLD period. The relay will also de-energize when a schedule is being edited, the MENU button functions are accessed, or the SCHEDULE button is pressed to change a schedule.

PULSE 1 UPPER LIMIT

The relay signal will switch when the Power Supply senses that the Pulse 1 energy is higher than the programmed upper limit. It will start 0 – 5 mms after the end of HOLD and will stay energized until the OUT OF LIMITS alarm state is cleared by pressing the RUN button, or at the start of the next weld.

PULSE 1 LOWER LIMIT

The relay signal will switch when the Power Supply senses that the Pulse 1 energy is lower than the programmed lower limit. It will start 0 – 5 mms after the end of HOLD and will stay energized until the OUT OF LIMITS alarm state is cleared by pressing the RUN button, or at the start of the next weld.

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PULSE 2 UPPER LIMIT

The relay signal will switch when the Power Supply senses that the Pulse 2 energy is higher than the programmed upper limit. It will start 0 – 5 mms after the end of HOLD and will stay energized until the OUT OF LIMITS alarm state is cleared by pressing the RUN button, or at the start of the next weld.

PULSE 2 LOWER LIMIT

The relay signal will switch when the Power Supply senses that the Pulse 2 energy is lower than the programmed lower limit. It will start 0 – 5 mms after the end of HOLD and will stay energized until the OUT OF LIMITS alarm state is cleared by pressing the RUN button, or at the start of the next weld.

PULSE 1 OR 2 CURRENT UPPER LIMIT

The relay signal will switch when the Power Supply senses that the Pulse 1 or 2 current is higher than the programmed upper limit. It will start 0 – 5 mms after the end of HOLD and will stay energized until the OUT OF LIMITS alarm state is cleared by pressing the RUN button, or at the start of the next weld.

PULSE 1 OR 2 CURRENT LOWER LIMIT

The relay signal will switch when the Power Supply senses that the Pulse 1 or 2 current is lower than the programmed lower limit. It will start 0-5ms after the end of HOLD and will stay energized until the OUT OF LIMITS alarm state is cleared by pressing the RUN button, or at the start of the next weld.

PULSE 1 OR 2 UPPER VOLTAGE LIMIT

The relay signal will switch when the Power Supply senses that the Pulse 1 or 2 voltage is higher than the programmed upper limit. It will start 0 – 5 mms after the end of HOLD and will stay energized until the OUT OF LIMITS alarm state is cleared by pressing the RUN button, or at the start of the next weld.

PULSE 1 OR 2 LOWER VOLTAGE LIMIT

The relay signal will switch when the Power Supply senses that the Pulse 1 or 2 voltage is lower than the programmed lower limit. It will start 0 – 5 mms after the end of HOLD and

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will stay energized until the OUT OF LIMITS alarm state is cleared by pressing the RUN button, or at the start of the next weld.

NO WELD SWITCH

The relay signal will switch when WELD/NO WELD is pressed. It will switch within 0 – 5 mms after the button is pressed.

PULSE 1 OR 2 POWER UPPER LIMIT

The relay signal will switch when the Power Supply senses that the Pulse 1 or 2 power is higher than the programmed upper limit. It will start 0 – 5 mms after the end of HOLD and will stay energized until the OUT OF LIMITS alarm state is clicking WELD, or at the start of the next weld.

PULSE 1 OR 2 POWER LOWER LIMIT

The relay signal will switch when the Power Supply senses that the Pulse 1 or 2 power is lower than the programmed lower limit. It will start 0 - 5 mms after the end of HOLD and will stay energized until the OUT OF LIMITS alarm state is cleared, or at the start of the next weld.

PULSE 1 OR 2 RESISTANCE UPPER LIMIT

The relay signal will switch when the Power Supply senses that the Pulse 1 or 2 resistance is higher than the programmed upper limit. It will start 0 – 5 mms after the end of HOLD and will stay energized until the OUT OF LIMITS alarm state is cleared, or at the start of the next weld.

PULSE 1 OR 2 RESISTANCE LOWER LIMIT

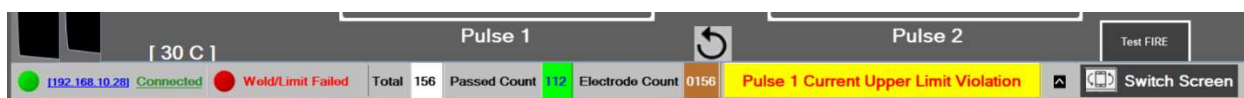
The relay signal will switch when the Power Supply senses that the Pulse 1 or 2 resistance is lower than the programmed lower limit. It will start 0 – 5 mms after the end of HOLD and will stay energized until the OUT OF LIMITS alarm state is cleared, or at the start of the next weld.

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WELD COUNTER LIMIT

The relay signal will switch when the TOTAL WELD COUNTER value reaches the user set value for COUNTER LIMIT. It will start 0 - 5ms after the end of HOLD and will stay energized until the user changes the TOTAL WELDS or COUNTER LIMIT on the WELD COUNTERS Setup screen.

In the example below, the Pulse 1 voltage exceeded the limit set, generating an upper limit violation message.



Chapter 7 OPERATING INSTRUCTIONS

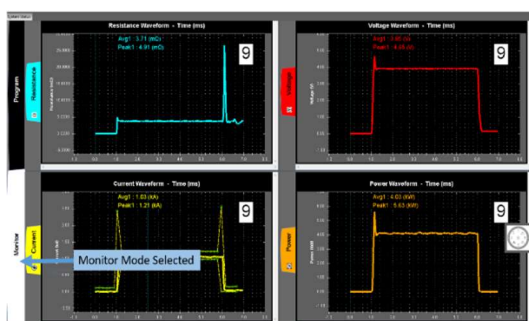
Initial Setup

This section describes the steps required to set up and execute a weld schedule which has already been created through the processes described above.

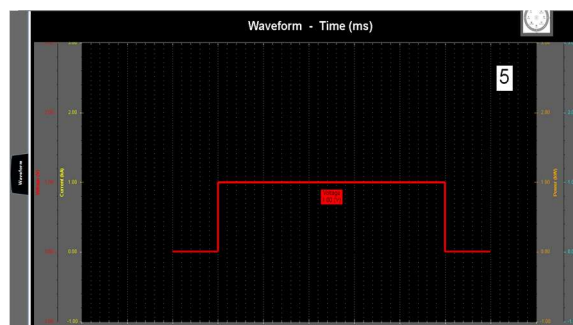
Always observe safety precautions and wear safety glasses when welding.

Using the Monitor and Run Screens

The Monitor Screen can display all four modes simultaneously (Current, Voltage, Power, and Resistance) while the Run Screen shows just one mode. Both screens are functional for users logged in as Operators. (The Program screen is disabled for Operators.)

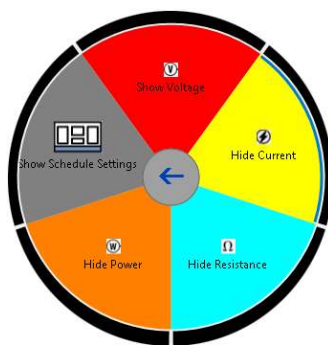


Monitor Screen



Run Screen

Use the Monitor Screens Layout button on the Display Screens menu to show or hide any of the four modes.



Pre-Operational Checks

Always perform these checks **before** operating the Power Supply.

- Verify that the Power Supply has been connected to a manual or air-actuated weld head as described in [Chapter 2 Installation and Setup](#).
- If you are using an air-actuated weld head, verify that compressed air is connected as described in the appropriate sections of your weld head manual. Turn the compressed air ON and adjust it according to the instructions in the manual.

Setting up the Workpiece

1. Ensure that the workpiece is properly secured to the welder and that the correct electrodes for the materials to be welded have been installed.

Insert Electrodes

- Install the correct electrodes in the electrode holders on the Weld Head.
 - Use a flat electrode face for most applications.
 - Use a domed face if surface oxides are a problem.
 - If either of the parts is a wire, the diameter of the electrode face should be equal to or greater than the diameter of the wire.
 - If both parts are flat, the face should be at least one-half the diameter of the electrodes. Pencil point electrodes cause severe electrode sticking to the parts,

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unexplained explosions, and increase the weld heat substantially because of the reduced electrode-to-part contact area.

Set Weld Force

- Set a weld force appropriate for your welding application. A good starting point is the mid-point in the range of the weld head force.
- Turn the On/Off switch on the back of the Power Supply to ON.
- The default screen will display.
- Use the force adjustment knob on the weld head to set the firing force and adjust an air actuated weld head.

Set Force Firing Switch

Manual Weld Heads

For manually actuated weld heads, the weld sequence begins when the force-firing switch closes.

- If the footswitch weld abort is ON (Security Functions Menu, Weld Controls), then opening the fire switch before the weld has completed will terminate the welding sequence.
- If the footswitch weld abort is OFF, opening the fire switch will NOT terminate the welding sequence.

Note: These values are set in the Weld Controls window on the Security Functions menu. See [Weld Controls](#) above for more information.

Force Fired, Air Actuated Weld Heads

For force fired, air actuated weld heads, the weld sequence begins when both levels of a two-level foot switch (FS1 and FS2) are closed and the force firing switch in the air actuated weld head closes.

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As described [above](#), there different firing switch modes – EZ AIR HEAD, AIR HEAD, and MANUAL. which can be set in the Weld Controls section of Circular menu.

1. If FS1 closes and FS2 closes, the unit will wait 10 seconds for the firing switch to close. In 10 seconds, the unit will abort regardless of the state of the footswitch weld abort if the firing switch does not close. This protects against welding with insufficient force.
2. If FS1 closes and then opens the head will lift and abort regardless of the condition of the footswitch weld abort.
3. If FS1 closes and the fire switch closes, the unit will wait for FS2 to close. If FS1 or the fire switch opens before FS2 closes, the unit will abort, and the head will lift regardless of the state of the footswitch weld abort.
4. After FS1, FS2, and fire switches have been closed, the state of the footswitch weld abort determines what happens next.
 - a. If footswitch weld abort is ON, then opening FS1, FS2, or fire switches will terminate the welding sequence.
 - b. If footswitch weld abort is OFF then opening FS1, FS2, or fire will NOT terminate the welding sequence.

When the Power Supply is used with any air actuated weld head, the squeeze period must be long enough to allow sufficient time for the electrodes to close and apply the required weld force to the parts before the weld current begins. Weld current begins when the squeeze period ends. In addition, the hold period can be used to automatically keep the electrodes closed on the parts after weld current has terminated to provide additional heat sinking or parts cooling. The weld strength is formed during the hold period.

Common welding problems can often be identified in the basic set up of the force, energy, and time welding profiles. These problems can lead to weld splash, inconsistency, and variation. Random explosions or unexpected variables will skew statistical data and waste valuable time.

Contact Amada Weld Tech if you would like support in the art and science of developing weld schedules.

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Pre-Weld Check

Use a Pre-Weld Check to determine if parts are misaligned or missing and likely to create an unacceptable weld and/or damage the electrode. (Creating a new Pre-Weld Check requires engineer-level access.)

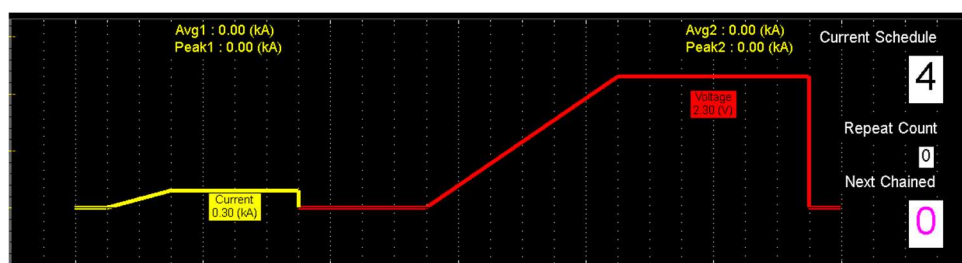
Use Combo Mode or Test Pulse to perform a pre-weld check.

For Combo Mode

Pulse 1 should be very short (1-2 milliseconds), and the current should be low, about 10% of the Pulse 2 current. Pulse 1 should be used as a measurement pulse and should **not** perform a weld.

When either upper or lower voltage limit is reached during Pulse 1, the “inhibit Pulse 2” action can signal operators of weld faults or signal automation equipment to perform pre-programmed actions, such as stop the assembly line so the faulty weld piece can be removed.

If Pulse 1 doesn't reach either upper or lower voltage limit, the Pulse 2 will be started to do the actual weld. Pulse 2 can also be monitored by selected energy limit and the “stop during Pulse 2” alarm can be triggered if the limit is exceeded.



Pre-Weld Check Waveform

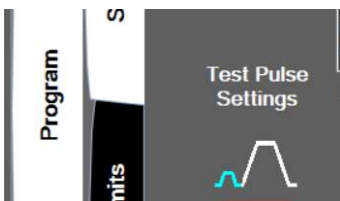
Example: To detect misaligned parts, use constant current and set upper and lower voltage limits for Pulse 1. If parts are misaligned, the work piece resistance will be higher, so the voltage will be higher. If parts are missing, voltage will be lower. In either case, the Pulse 1 upper or lower limits will be exceeded, and Pulse 1 can be inhibited.

Note: You must have Upslope programmed into the pulse to set a lower limit.

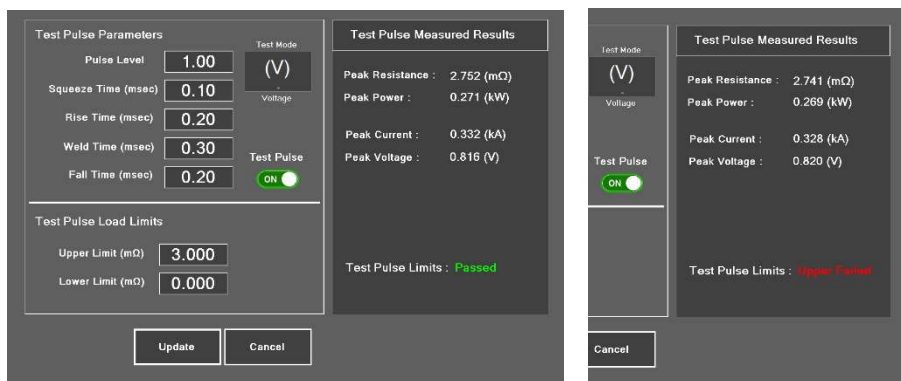
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Test Pulse

To run a test pulse, first click on the Test Pulse Settings icon on the Program Screen.



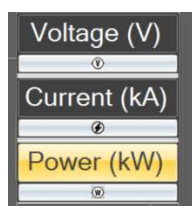
This launches the Test Pulse Parameters Window.



This window displays the Test Pulse Measured Results from the previous weld (if test pulse was enabled). It shows whether that last test weld passed or failed the parameters set.

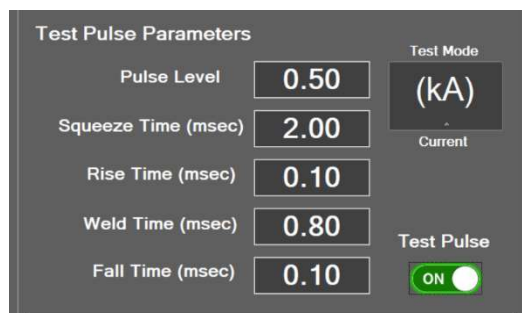
Click on the Test Mode field in the Upper right corner to select Voltage, Current or Power.

Set the Test Pulse Parameters and Upper and Lower Load limit.

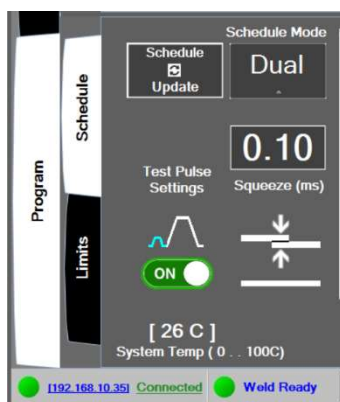


Set Test Pulse to ON and click Update.

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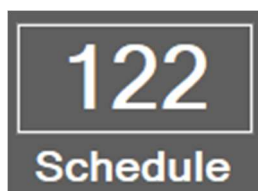
You will be returned to the Program Screen where the Test Pulse slider now shows that Test Pulse is ON.



If the weld fails at the Test Pulse, the weld is aborted before it starts. An error message will display in the Status Bar “Test Pulse (upper/lower) limit violation.”

Select Weld Schedule

- Select the weld schedule to be executed from the Schedule field in the Program Mode.



Make a Trial Weld

Execute the selected weld schedule to make a trial weld.

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- Use pliers to peel the welded materials apart.
 - A satisfactory weld will show residual material pulled from one material to the other.
 - Tearing of base material around the weld nugget indicates a material failure NOT a weld failure.
 - Excessive electrode sticking and/or "spitting" should define a weld as unsatisfactory and indicate that too much weld current, voltage, power, or time has been used.
- If the parts pull apart easily or there is little or no residual material pulled, the weld is weak.
 - Increase the weld time in 1ms increments. Increase weld current, voltage, or power if a satisfactory weld achieved using 10 mms of weld time.

Note: Actual weld strength is a user-defined specification. (See Weld Strength Testing below.)

Weld Strength Testing

Destructive tests should be performed on a random basis using actual manufacturing parts.

Destructive tests made on spot welds include tension, tension-shear, peel, impact, twist, hardness, and macro-etch tests. Fatigue tests and radiography have also been used. Of these methods, a torsional shear test is preferred for round wire, and a 45-degree peel test is preferred for sheet stock.

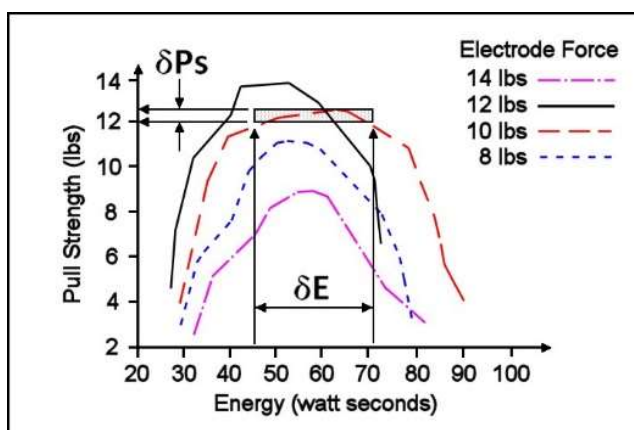
- **Quality Requirements**
 - Pull strength
 - Visual criteria
 - Test method

Weld Strength Profiles

Creating a weld strength profile offers the user a scientific approach to determining the optimum set of welding parameters and then displaying these parameters in a graphical form.

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1. Start at a low weld current, voltage, or power, making five or more welds, then perform pull tests for each weld. Calculate the average pull strength. Increase weld current, voltage, or power and repeat this procedure. Do not change the weld time, weld force, or electrode area.
2. Continue increasing weld current, voltage, or power until any unfavorable characteristic occurs, such as sticking or spitting.
3. Repeat these two steps for different weld forces, then create a plot of part pull strength versus weld current, voltage, or power for different weld forces as shown in the illustration below.



Typical Weld Strength Profile

The diagram above illustrates a typical weld strength profile. The 14 lbs. electrode force curve shows the highest pull strengths but the lowest tolerance to changes in weld current, voltage, or power. The 12 lbs. electrode force curve shows a small reduction in pull strength, but considerably more tolerance to changes in weld energy. Weld heat will vary due to material variations and/or electrode wear.

The 12 lbs. electrode force curve is preferable. It shows more tolerance to changes in weld current, voltage, or power and has nearly the same bond strength as the 14 lbs. electrode force curve.

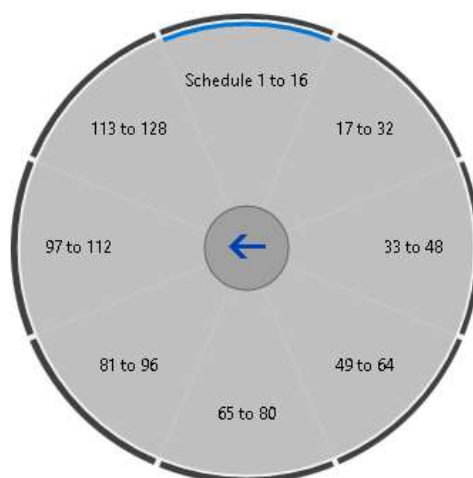
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A comparison of weld schedules for several different applications might show that they could be consolidated into one or two weld schedules. This would have obvious manufacturing advantages.

Advanced Procedures

Chain Schedules

The Chain Schedules tool on the Security Functions menu allows the user to chain together any number of 128 weld schedules in sequence.



Select a schedule set to launch the Chain Schedule Setup window.

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Chain Schedule Setup

Chain Schedule	Repeat Count	Next Schedule	Chain Schedule	Repeat Count	Next Schedule
001	0000	000	009	0000	000
002	0000	000	010	0000	000
003	0000	000	011	0000	000
004	0000	000	012	0000	000
005	0000	000	013	0000	000
006	0000	000	014	0000	000
007	0000	000	015	0000	000
008	0000	000	016	0000	000

Chain Schedule
ON / OFF ☒ ON

Update Cancel

This tool allows you to create a chain of weld schedules by setting a repeat count for a given schedule and designating the next schedule in order. Make sure that the Chain Schedule button is set to ON. Update after any modifications.

When the Chain Schedules function is active. The current schedule, repeat count and next chained schedule display in the Waveform window.

Current Schedule

4

Repeat Count

0

Next Chained

0

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Active Part Conditioning (APC)

Application

- Displaces surface oxides and contamination.
- Reduces contact resistance before the main weld energy is delivered.

Description

In the production environment, it is common to see wide variations in:

- Oxidation and contamination
- Plating thickness and consistency
- Shape and fit up
- Contact resistances due to varying part fit up

For a weld to occur, the surface oxides and contamination must be displaced to allow proper current flow through the parts. Levels of oxide and contamination vary from part to part over time, adversely affecting the consistency of the welding process. If production parts are plated, there can also be variations in the plating process over time, also resulting in inconsistent welds. These minor material variations are a major cause of process instability. It is best to minimize them.

How It Works

Active Part Conditioning (APC) is an algorithm used with standard power supply functionality to fulfil the goals described above.

Constant Power Mode is ideal for APC. As the power supply works to provide constant power to the weld, oxidation impedes current and raises the voltage to high levels early in the output waveform. As the oxide layer is broken down by high voltage, more current flows to the weld. Maintaining constant power causes the voltage and resistance to drop in a controlled manner. APC can be programmed to apply the exact power to the parts required to displace oxide or contaminants.

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Note: By comparison, both constant current feedback and constant voltage feedback modes are limited in their ability to deal with varying levels of part contamination and oxide. If constant current feedback were used, the power supply would ramp the voltage to very high levels to achieve current flow through the oxide. This rapid input of current is likely to cause splash, especially with round parts. Constant voltage mode is not ideal for this purpose either, as the voltage will be restricted from reaching sufficient levels to break down the oxide.

APC uses a dual-pulse output to cope with material contamination or material variation. The first pulse is programmed for constant power, and the second for either constant current, constant voltage, or constant power.

The first pulse will terminate at a precise current flow, thereby preventing the sudden high flow which tends to occur when the oxide is displaced. This prevents weld splash and material expulsion.

Also, APC can help to reduce the variations in contact resistance from part to part caused by different fit up of parts. It will stabilize the contact resistances before the main welding pulse, thereby reducing variation from weld to weld.

The use of a current limit monitor for the first pulse enables the pulse to be terminated when a predetermined amount of current flow is achieved. The rise of the current waveform proves that the oxide is breaking down, and the parts are fitting up together, ready to weld. The first pulse should be programmed to be much longer than is generally required. The power supply will terminate the pulse when the current limit is reached.

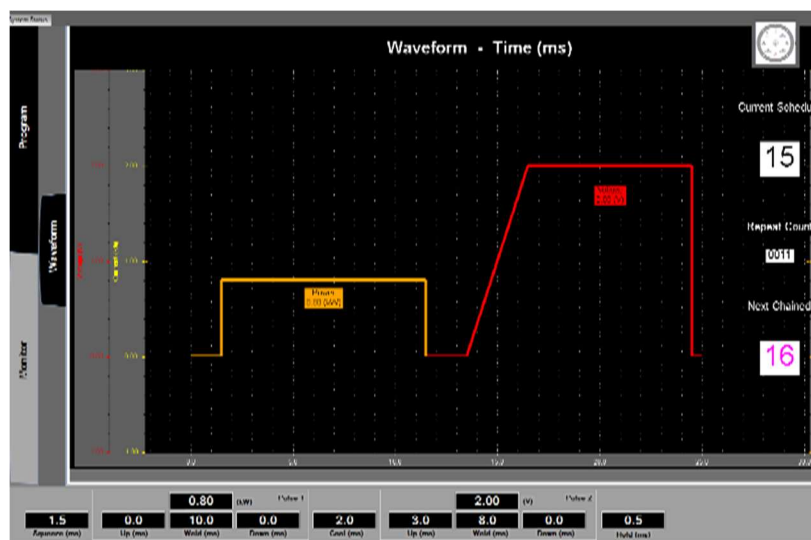
Programming For Active Part Conditioning

The process for developing an APC weld schedule begins with programming a single pulse for Constant Power operation. Program the power level and weld time to cause slight sticking between the two parts. Make a few welds and pull them apart. Increase or decrease the power setting until a light tack weld is achieved. Once this is done:

1. Observe the high peak of the voltage waveform.

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2. Observe the resistance waveform. This should begin high, then start to drop as a tack weld is made and oxides are removed.
3. Observe the current waveform as it starts to rise as the oxidization breaks down. If the current waveform starts to flatten, it indicates that the resistance has stabilized and that the parts have come into closer contact.
4. Optimize the energy and time setting of Pulse 1 (Constant Power) to provide an adequate tack weld and a current waveform that has started to flatten out but is still rising. This indicates that a full melt has not yet occurred.
5. Program an upper current limit on the Envelope Window Tab.
6. Different levels of oxide require different amounts of time to reach the current limit. Extend the programmed weld time (doubling the time usually works). This will ensure that there will be enough time for the current to rise and reach the limit, even with heavily oxidized parts.
7. Try welds with varying amounts of oxide present (clean and dirty). The power supply terminates the first pulse when your programmed current is reached. A clean part will reach the current limit sooner and the pulse will terminate early. A dirty part will require more time before the oxide is broken down and current can flow.
8. Program Pulse 2 as normal to achieve a strong weld. We recommend a constant voltage for round parts and constant current for flat parts. An upslope may be required to restrict the current flow early in the second pulse to avoid weld splash.



Active Part Conditioning Waveform

Setting Energy Limits

Setting Energy Limits is a useful process when there are problems positioning part-to-part or electrode-to-part or when dealing with parts with a narrow weld window.

Energy limits can be set to terminate the weld when work piece resistance changes indicate parts are positioned incorrectly at the weld head are detected; this prevents blowouts, damage to parts or damage to the electrode.

Energy limits can also be used to stop a weld when a sufficient current, voltage, or power level is reached, ensuring a more consistent input of energy and producing consistently good welds.

Description

Setting Energy Limits terminates the weld energy during the welding process when pre-set weld current, voltage, or power limits are exceeded. Energy Limits are set in the Envelope Limit window (see [Working with Envelope Limits](#), above.)

The Power Supply measures the weld energy parameters during the weld period against programmed limits. If a programmed limit is exceeded, the Power Supply is set to a state selected from the dropdown menu.

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Pulse 1 Limit Mode:	Pulse 1 Out of Limit Action:	Pulse 2 Limit Mode:	Pulse 2 Out of Limit Action:
Voltage	None	Voltage	None
	None		
	Stop Weld		
	Inhibit Pulse 2		
	Part Conditioner (Stop Pulse		

Note: Pulse 2 actions are only valid in Dual Pulse mode.

Note: When setting energy limits, always select a mode that is *different* from the feedback mode. For example:

- If you are welding in constant current, monitor voltage.
- If you are welding in constant voltage, monitor current.
- If you are welding in constant power, monitor current or voltage.

Relay Outputs

The Power Supply has six programmable relay outputs which can be used to trigger alarms to signal operators of weld faults, or signal automation equipment to perform pre-programmed actions, such as stopping the production line when a faulty weld piece needs to be removed. These are set in the Relay Output Settings window, found on the Security Functions menu. See [Relay Controls](#) for more information.

Outputs	Enable	Condition When
Relay 1	ON	Out of Limits
Relay 2	ON	V-A Timeout
Relay 3	ON	P1 or P2 Lower Current
Relay 4	ON	Weld Counter Limit Reached
Relay 5	ON	Electrode Count Reached
Relay 6	ON	V-A Timeout
Relay 7	OFF	(Reserved)
Relay 8	OFF	(Reserved)

Reset Default

Update

Cancel

Outputs	Enable	Condition When
Relay 1	OFF	Weld
Relay 2	OFF	Unit Ready
Relay 3	OFF	Alarm
Relay 4	OFF	End of Weld
Relay 5	OFF	Out of Limits
Relay 6	OFF	V-A Timeout
Relay 7	OFF	
Relay 8	OFF	

Update

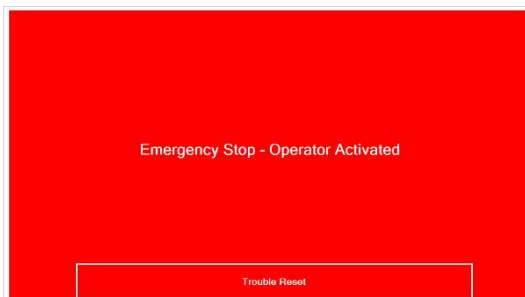
Cancel

Restarting after an E-Stop

Emergency Stop is controlled by a dual channel Emergency Stop safety relay controller configured for PLd performance level. When an Emergency Stop is triggered, the Power Supply

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displays an Emergency Stop message, prevents welds, and cuts power to the valve output via the safety relay. Reset the E-Stop button, then click the Trouble Reset button as shown.



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Precautions

General Operator Safety

ALWAYS wear safety goggles and all appropriate safety equipment when welding.

Operator Maintenance

The Power Supply does not require any Operator Maintenance other than calibration. To ensure consistently accurate welds, AMADA WELD TECH recommends that you calibrate the Power Supply at least once a year. For calibration instructions, please refer to [Chapter 9, Calibration](#).

Troubleshooting

The Power Supply is designed with reliability as a top user priority. From time to time, however, you may run into a problem and need some help to get back to normal operation. Reading this chapter will speed up the process.

General Problems

It has been our experience that most resistance welding power supply problems are caused by lack of material control, process control, and electrode tip surface maintenance. The problems that you might encounter are transient or systemic.

Transient

Check if the problem can be corrected by resetting the system or parameter limits. For example, you should ensure that:

- Correct force is set at the weld head

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- Correct weld energy and time is set at the Power Supply
- The equipment is set up properly
- All electrical connections are tight
- Electrode alignment allows flush contact with the weld pieces
- Electrodes are properly dressed

Systemic

The problem is embedded in the system, and some form of repair will be needed. For example, repair might include replacing a broken weld head flexure.

In either case, you may call the AMADA WELD TECH Applications Laboratory for assistance by calling the telephone number listed above and asking for the Applications Laboratory.

Alarm Messages

Built-in automatic self-test and self-calibration routines will initiate system messages. These messages will usually let you know what action is required of you to correct the reason for the alarm. For a complete listing of the alarm messages, what they mean, and what to do about them, please refer to [Status and Alarm Messages](#).

Troubleshooting

The following Troubleshooting Chart is a comprehensive listing of system and equipment problems, and their probable cause.

Troubleshooting Chart	
PROBLEM	CAUSE (In Order of Probability)
Air-operated weld head will not close	Air valve driver cable not connected. (Check that the Power Supply switches to STANDBY state when footswitch is activated). Check that the air supply is properly connected to the weld head.
Electrode Damage	Excessive current/energy set at the Power Supply. Excessive or insufficient weld head force. Wrong electrode tip shape. Misaligned parts. Excessive weld time set at the Power Supply. Contaminated weld piece surface/ plating. Wrong electrode material. Contaminated electrode surface.

Troubleshooting Chart	
PROBLEM	CAUSE (In Order of Probability)
Electrode Sparking	- Excessive current/energy set at the Power Supply. - Insufficient weld head force. - Slow weld head follow-up. - Incompatible weld piece projection design. - Misaligned parts. - Contaminated weld piece surface/ plating. - Wrong electrode tip shape. - Wrong electrode material. - Contaminated electrode surface. - Polarity reversed on Voltage Sense cable.
Electrode Sticking	- Contaminated weld piece surface/ plating. - Wrong electrode material/ tip shape. - Insufficient weld head force. - Excessive current/energy set at the Power Supply. - Misaligned parts. - Excessive weld time set at the Power Supply. - Contaminated electrode surface. - Slow weld head follow-up.

Troubleshooting Chart	
PROBLEM	CAUSE (In Order of Probability)
Insufficient Weld Nugget	Insufficient current/ energy set at the Power Supply. Wrong electrode material/ tip shape. Worn/mushroomed electrodes. Insufficient weld time set at the Power Supply. Incorrect weld head polarity. Misaligned parts. Contaminated weld piece surface/ plating. Excessive weld head force. Insufficient weld head force. Contaminated electrode surface. Incompatible weld piece projection design. Slow weld head follow-up. Incompatible weld piece materials. No cover gas on weld piece.
LCD Display is blank, and Weld/No Weld LED can be switched ON and OFF.	Possible failed LCD display assembly. Contact AMADA WELD TECH for support.

Troubleshooting Chart	
PROBLEM	CAUSE (In Order of Probability)
LCD is operational, the Power Supply will attempt to fire, but no energy is provided to the weld and the graphs in the RUN screen will not fill in.	Possible open circuit in the secondary circuit. Electrodes did not close properly. Possible failed Capacitor Charging Power Supply. Contact AMADA WELD TECH for support.
Metal Expulsion	Excessive current/energy set at the Power Supply. Insufficient weld head force. Misaligned parts. Slow weld head follow-up. Incompatible weld piece projection design. Contaminated weld piece surface/ plating. Incompatible weld piece materials. Contaminated electrode surface. Wrong electrode tip shape. No cover gas on weld piece. Excessive weld time set at the Power Supply. Misaligned parts. Polarity reversed on Voltage Sense cable

Troubleshooting Chart	
PROBLEM	CAUSE (In Order of Probability)
Weld Piece Discoloration	Excessive weld time set at the Power Supply. No cover gas on weld piece. Excessive current/energy set at the Power Supply. Insufficient weld head force. Contaminated weld piece surface/ plating. Wrong electrode material/tip shape. Contaminated electrode surface.
Weld Piece Overheating	Excessive weld time set at the Power Supply. Excessive current/energy set at the Power Supply. Misaligned parts. Insufficient weld head force. Incompatible weld piece materials. Wrong electrode material/tip shape. Contaminated electrode surface.
Weld Piece Warping	Excessive weld time set at the Power Supply. Excessive weld head force. Incompatible weld piece projection design. Incompatible weld piece materials. Wrong electrode tip shape. Excessive current/energy set at the Power Supply.

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Technical Assistance

If you need further technical assistance, please contact either your authorized service agent or **AMADA WELD TECH** by telephone or FAX, or at the postal or e-mail addresses shown in the *Foreword* of this manual.

Electrode Maintenance

When a welding schedule has been working well for a welding application over many welds, but now it yields poor quality welds, the problem could be electrode deterioration. If you need to increase welding current to maintain the same weld heat, the electrode tip has probably increased in surface area (mushroomed), effectively decreasing weld current density, thereby cooling the weld. Try replacing the electrodes.

The rough surface of a worn electrode tip tends to stick to the work pieces. Periodic tip resurfacing (dressing) will remove pitting, oxides and welding debris from the electrode using a # 600 grit, silicon carbide electrode polishing disk. If you clean a badly damaged tip with a file, use a polishing disk afterwards to ensure the electrode faces are smooth.

The best way to prevent electrode problems is to regularly re-grind electrode tip surfaces and shapes in a certified machine shop.

Parts Replacement



WARNING

Only qualified technicians should perform internal adjustments or replace parts.
Removal of the unit cover could expose personnel to high voltage.
Removal of the unit cover may void the warranty.

There are no replaceable parts for the Power Supply, other than the protection fuse that is installed on the rear panel.

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Part #	DESCRIPTION	LOCATION
330-264	FUSE 6.3X3MM, 15 ^a 20kA, INTERRUPT	Rear Panel

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL