

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

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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

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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.

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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

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SAFETY PRECAUTIONS

Before using this equipment, read these safety precautions carefully to understand the correct usage of the equipment.

General

This user manual describes the operation and maintenance of the power supply and provides instructions relating to its safe usage. Procedures described in this manual must be performed as detailed and by qualified and trained personnel.

To promote safety and to effectively take advantage of the full capabilities of the power supply, please read this manual thoroughly before attempting to use the device.

After reading this manual, retain it for future reference when any questions arise regarding the proper and safe operation of the power supply.

Operation

Procedures other than those described in this manual or not performed as prescribed in this manual may expose personnel to electrical shock or death.

When operating any welding equipment, always wear appropriate personal protective gear.

Maintenance/Service

Review [Chapter 8, Maintenance](#), thoroughly before performing any maintenance on the Power Supply. Use the appropriate tools for terminating the connecting cables, being careful not to nick the wire conductors.

Do **not** modify the Power Supply without prior written approval from Amada Weld Tech.



**Failure to observe all safety precautions may result in SERIOUS INJURY OR DEATH.
Lethal voltages are present in the Power Supply.**

These precautions are given to ensure the safe use of the Power Supply and to prevent injury to operators or others. Be sure to read each of the instructions; they are all important for safe operation.

The specific meanings of the words and symbols on the various warning labels affixed to the device are described below:

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Power Supply Danger Labels



	<p>Do not touch the inside of the power supply unnecessarily.</p> <p>High Voltages are present inside the Power Supply Cabinet. Do not touch the inside of the Power Supply unnecessarily with the power turned ON. You may receive an electric shock. Once the power supply is turned off, it takes more than 70 seconds for the charge to deplete fully.</p>
	<p>Never attempt to disassemble, repair, or modify the Power Supply.</p> <p>These actions can cause electric shock and/or fire. Do not do anything other than the maintenance described in this User Manual.</p>




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Power Supply Warning Labels







	<p>Do NOT put your hands or fingers between the electrodes. Keep your hands and fingers away from the electrodes when welding.</p>
	<p>Do NOT touch any welded part or electrode during or just after welding. The welded parts and electrodes are very hot. You will be burned if you touch them.</p>
	<p>Ground the equipment. You may get an electric shock if the equipment is not grounded properly.</p>
	<p>Use a ground fault breaker. Use a ground fault breaker to prevent an electric shock.</p>
	<p>Do NOT use a damaged power cable, connecting cables, or plugs. Do not step on, twist, or tense any cable. The power cable and connecting cables may be damaged, which can cause electric shock, short circuit, or fire. If any part needs to be repaired or replaced, consult AMADA WELD TECH or your distributor.</p>

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	<p>Stop the operation of the equipment if any trouble occurs.</p> <p>If you detect a burning smell, abnormal sounds, abnormal heat, smoke, etc., turn the power OFF immediately to prevent fire or electric shock. Contact AMADA WELD TECH or your distributor for help.</p>
	<p>People with pacemakers MUST stay away from the Power Supply.</p> <p>When the Power Supply is operating, it generates a magnetic field, which adversely affects pacemakers. People who use a pacemaker must <i>not</i> approach the Power Supply or walk around the welding shop while the Power Supply is operating <i>unless</i> their medical doctor has deemed it safe to do so.</p>
	<p>Wear protective gear.</p> <p>Put on protective gear such as protective gloves, long sleeved jacket, and leather apron to avoid being burned by weld splatter.</p>

Power Supply Caution Labels



	<p>Apply the specified source voltage.</p> <p>Applying the <i>wrong</i> voltage can cause fire and/or electrical shock.</p>
	<p>Keep water and water containers away from the Power Supply.</p> <p>Liquids spilled on the Power Supply can cause a short circuit, electrical shock or fire.</p>
	<p>Use proper tools (wire strippers, pressure wire connectors, etc.) for terminating the connecting cables.</p> <p>Do <i>not</i> nick the wire conductor. Doing so can cause a short circuit, electric shock, or fire.</p>
	<p>Install the Power Supply on a firm, level surface.</p> <p>Injury may result if the Power Supply falls over or drops from an uneven surface.</p>

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	<p>Keep combustible matter away from the Power Supply. Spatter can ignite combustible materials. If you cannot remove all combustible materials, cover them with a non-combustible material.</p>
	<p>Do NOT cover the Power Supply with a blanket, cloth, etc. Heat generated by the operating Power Supply may ignite a blanket or cover.</p>
	<p>Wear ear protectors. Loud noises can damage hearing.</p>
	<p>Keep a fire extinguisher nearby. Make sure there is a fire extinguisher in or near the welding area in case of fire.</p>
	<p>Regularly inspect and maintain the Power Supply. Regular inspection and maintenance are essential to safe operation and long life of the equipment. If you see any damage, make necessary repairs before continuing operations.</p>
	<p>Disposal Properly handle and dispose of used materials. For the disposal of this unit, please contact AMADA WELD TECH.</p>
	<p>Note all program or setting changes to a qualified technician.</p>
	<p>Use eye protection. Never perform any welding operation without wearing protective safety glasses.</p>
	<p>Examine weld terminals for damage.</p>

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LIMITED WARRANTY

GENERAL TERMS AND CONDITIONS FOR THE SALE OF GOODS

1. Applicability.

(a) These terms and conditions of sale (these “**Terms**”) are the only terms which govern the sale of the goods (“**Goods**”) by Amada Weld Tech Inc. (“**Seller**”) to the buyer identified in the Sales Quotation and/or Acknowledgment (as each defined below) to which these Terms are attached or incorporated by reference (“**Buyer**”). Notwithstanding anything herein to the contrary, if a written contract signed by authorized representatives of both parties is in existence covering the sale of the Goods covered hereby, the terms and conditions of said contract shall prevail to the extent they are inconsistent with these Terms.

(b) The accompanying quotation of sale (the “**Sales Quotation**”) provided to Buyer, and/or sales order acknowledgement (“**Acknowledgement**”) and these Terms (collectively, this “**Agreement**”) comprise the entire agreement between the parties, and supersede all prior or contemporaneous understandings, agreements, negotiations, representations and warranties, and communications, both written and oral. For clarification, after the Acknowledgement is received by Buyer, the order for Goods is binding and cannot be cancelled by Buyer for any reason and the full purchase price amount set forth in the Acknowledgement shall be due and payable by Buyer to Seller pursuant to the payment schedule set forth in the Acknowledgement unless otherwise agreed to in writing by Seller. All terms and conditions contained in any prior or contemporaneous oral or written communication which are different from, or in addition to, the terms and conditions in this Agreement are hereby rejected and shall not be binding on Seller, whether or not they would materially alter this Agreement. These Terms prevail over any of Buyer’s terms and conditions of purchase regardless of whether or when Buyer has submitted its purchase order or such terms. Fulfillment of Buyer’s order does not constitute acceptance of any of Buyer’s terms and conditions and does not serve to modify or amend these Terms. Notwithstanding anything herein to the contrary, all orders for Goods must be for a minimum purchase price of \$100 or such orders will be rejected by Seller.

2. Delivery.

(a) The Goods will be delivered within a reasonable time after Seller provides Buyer the Acknowledgment, subject to availability of finished Goods. Seller will endeavor to meet delivery schedules requested by Buyer, but in no event shall Seller incur any liability, consequential or otherwise, for any delays or failure to deliver as a result of ceasing to manufacture any product or any Force Majeure Event. Delivery schedules set forth in the Acknowledgment are Seller’s good faith estimate on the basis of current schedules. In no event shall Seller be liable for special or consequential damages resulting from failure to meet requested delivery schedules.

(b) Unless otherwise agreed in writing by the parties in the Acknowledgement, Seller shall deliver the Goods to Seller’s plant in Monrovia, CA, USA (the “**Shipping Point**”) using Seller’s standard methods for packaging and shipping such Goods. Buyer shall take delivery of the Goods within three (3) days of Seller’s written notice that the Goods have been delivered to the Shipping Point. Buyer shall be responsible for all loading costs (including freight and insurance costs) and provide equipment and labor reasonably suited for receipt of the Goods at the Shipping Point. Seller shall not be liable for any delays, loss or damage in transit.

(c) Seller may, in its sole discretion, without liability or penalty, make partial shipments of Goods to Buyer, if applicable. Each shipment will constitute a separate sale, and Buyer shall pay for the units shipped whether such shipment is in whole or partial fulfillment of Buyer’s purchase order.

(d) If for any reason Buyer fails to accept delivery of any of the Goods on the date fixed pursuant to Seller’s notice that the Goods have been delivered at the Shipping Point, or if Seller is unable to deliver the Goods at the Shipping Point on such date because Buyer has not provided appropriate instructions, documents, licenses or authorizations: (i) risk of loss to the Goods shall pass to Buyer; (ii) the Goods shall be deemed to have been delivered; and (iii) Seller, at its option, may store the Goods until Buyer picks them up, whereupon Buyer shall be liable for all related costs and expenses (including, without limitation, storage and insurance).

3. Non-delivery.

(a) The quantity of any installment of Goods as recorded by Seller on dispatch from Seller’s place of business is conclusive evidence of the quantity received by Buyer on delivery unless Buyer can provide conclusive evidence proving the contrary.

(b) Seller shall not be liable for any non-delivery of Goods (even if caused by Seller’s negligence) unless Buyer gives written notice to Seller of the non-delivery within three (3) days of the date when the Goods would in the ordinary course of events have been received.

(c) Any liability of Seller for non-delivery of the Goods shall be limited to (in Seller’s sole discretion) replacing the Goods within a reasonable time or adjusting the invoice respecting such Goods to reflect the actual quantity delivered.

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4. Shipping Terms. Unless indicated otherwise in the Acknowledgment, Delivery shall be made EXW (Incoterms 2010), Shipping Point, including without limitation, freight and insurance costs. If no delivery terms are specified on the Acknowledgement, the method of shipping will be in the sole discretion of Seller. Unless directed in writing otherwise by Buyer, full invoice value will be declared for all shipments.

5. Title and Risk of Loss. Title and risk of loss passes to Buyer upon delivery of the Goods at the Shipping Point. As collateral security for the payment of the purchase price of the Goods, Buyer hereby grants to Seller a lien on and security interest in and to all of the right, title and interest of Buyer in, to and under the Goods, wherever located, and whether now existing or hereafter arising or acquired from time to time, and in all accessions thereto and replacements or modifications thereof, as well as all proceeds (including insurance proceeds) of the foregoing. The security interest granted under this provision constitutes a purchase money security interest under the California Commercial Code.

6. Amendment and Modification. These Terms may only be amended or modified in a writing which specifically states that it amends these Terms and is signed by an authorized representative of each party.

7. Inspection and Rejection of Nonconforming Goods.

(a) Buyer shall inspect the Goods within two (2) days of receipt (“**Inspection Period**”). Buyer will be deemed to have accepted the Goods unless it notifies Seller in writing of any Nonconforming Goods during the Inspection Period and furnishes such written evidence or other documentation as required by Seller. “**Nonconforming Goods**” means only the following: (i) product shipped is different than identified in Buyer’s Acknowledgement; or (ii) product’s label or packaging incorrectly identifies its contents. Notwithstanding the foregoing, for shipped Goods that require field installation, the “re-verification” terms in the Acknowledgement shall apply and for custom installations, the inspection and verification shall take place at Buyer’s site immediately after the installation is completed.

(b) Seller will only accept Nonconforming Goods that are returned under Seller’s Return Material Authorization procedures then in effect (“**RMA**”). Buyer shall obtain a RMA number from Seller prior to returning any Nonconforming Goods and return the Nonconforming Goods prepaid and insured to Seller at 1820 South Myrtle Avenue, Monrovia, CA 91016 or to such other location as designated in writing by Seller for the examination to take place there. If Seller reasonably verifies Buyer’s claim that the Goods are Nonconforming Goods and that the nonconformance did not developed by use from Buyer, Seller shall, in its sole discretion, (i) replace such Nonconforming Goods with conforming Goods, or (ii) credit or refund the Price for such Nonconforming Goods pursuant to the terms set forth herein. Notwithstanding the foregoing, the only remedy for Nonconforming Goods that are custom systems is repair (not refund or replacement). No returns for Nonconforming Goods are allowed after thirty (30) days from the original shipping date.

(c) Buyer acknowledges and agrees that the remedies set forth in Section 7(a) are Buyer’s exclusive remedies for the delivery of Nonconforming Goods. Except as provided under Section 7(a) and Section 14, all sales of Goods to Buyer are made on a one-way basis and Buyer has no right to return Goods purchased under this Agreement to Seller.

8. Price.

(a) Buyer shall purchase the Goods from Seller at the prices (the “**Prices**”) set forth in Seller’s published catalogue literature in force as of the date of the Sales Quotation. However, the Prices shown in such catalogue literature or any other publication are subject to change without notice. Unless specifically stated to the contrary in the Sales Quotation, quoted Prices and discounts are firm for thirty (30) days from the date of the Sales Quotation. Unless otherwise stated, prices are quoted EXW (Incoterms 2010), Shipping Point. Unless otherwise stated in the Acknowledgement, if the Prices should be increased by Seller before delivery of the Goods to a carrier for shipment to Buyer, then these Terms shall be construed as if the increased prices were originally inserted herein, and Buyer shall be billed by Seller on the basis of such increased prices.

(b) All Prices are exclusive of all sales, use and excise taxes, and any other similar taxes, duties and charges of any kind imposed by any governmental authority on any amounts payable by Buyer. Buyer shall be responsible for all such charges, costs and taxes (present or future); provided, that, Buyer shall not be responsible for any taxes imposed on, or with respect to, Seller’s income, revenues, gross receipts, personnel or real or personal property or other assets.

9. Payment Terms.

(a) Unless otherwise provided in the Acknowledgement, if Buyer has approved credit with Seller, Buyer shall pay all invoiced amounts due to Seller within thirty (30) days from the date of Seller’s invoice. If Seller does not have Buyer’s financial information and has not provided pre-

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approved credit terms for Buyer, the payment must be made in cash with order or C.O.D. in US dollars. If Buyer has approved credit terms, the payment may be made by cash with order, wire transfer of immediately available funds, or check in US dollars. Certain products require a down payment. Any payment terms other than set forth above will be identified in the Acknowledgement. Notwithstanding anything herein to the contrary, all prepaid deposits and down payments are non-refundable. If a deposit is not received when due, Seller reserves the right to postpone manufacturing of Goods until payment is received. Seller will not be responsible for shipment delays due to deposit payment delays.

(b) In Seller's sole discretion, Seller may access Buyer interest on all late payments at the lesser of the rate of 1.5% per month or the highest rate permissible under applicable law, calculated daily and compounded monthly. Buyer shall reimburse Seller for all costs incurred in collecting any late payments, including, without limitation, attorneys' fees. In addition to all other remedies available under these Terms or at law (which Seller does not waive by the exercise of any rights hereunder), Seller shall be entitled to suspend the delivery of any Goods if Buyer fails to pay any amounts when due hereunder and such failure continues for ten (10) days following written notice thereof.

(c) Buyer shall not withhold payment of any amounts due and payable by reason of any set-off of any claim or dispute with Seller, whether relating to Seller's breach, bankruptcy or otherwise.

10. Intellectual Property; Software License.

(a) To the extent that any Goods provided under this Agreement contains software, whether pre-installed, embedded, in read only memory, or found on any other media or other form ("**Software**"), such Software and accompanying documentation are licensed to Buyer, not sold and shall remain the sole and exclusive property of Seller or third party licensors of Seller. Seller grants Buyer a non-exclusive license to use the Software solely as provided in and in connection with the use of the Goods in which such Software is contained and in accordance with any applicable user documentation provided with such Goods and subject to the provisions of this Agreement. Certain of Seller's Goods may include third party software such as computer operating systems. Licenses to such third party software are subject to the terms and conditions of any applicable third party software license agreements. Unless identified in the Acknowledgement, no license is granted by Seller with respect to such third party software products that may be provided with the Goods (if any). Seller makes no warranties regarding any third party software that may accompany the Goods or otherwise and such software is explicitly included in the definition of Third Party Products below.

(b) Buyer shall not copy, modify, or disassemble, or permit others to copy, modify, or disassemble, the Software, nor may Buyer modify, adapt, translate, reverse assemble, decompile, or otherwise attempt to derive source code from the Software. Buyer shall not transfer possession of the Software except as part of, or with, the Goods, and each such transfer shall be subject to the restrictions contained herein. Buyer may not sublicense, rent, loan, assign or otherwise transfer the Software or documentation, and Buyer shall retain on all copies of the Software and documentation all copyright and other proprietary notices or legends appearing therein or thereon. Seller may terminate this license upon written notice for any violation of any of the terms of this license or any material breach of any provision of this Agreement. Buyer shall immediately discontinue use of the Software upon any termination of this license or Agreement. This license shall terminate upon any termination of the Agreement.

(c) All patents, trademarks, copyrights or other intellectual property rights embodied in the Goods, including without limitation the Software, are owned by Seller and its licensors. Seller and its licensors retain all right, title and interest in such intellectual property rights. Except as expressly set forth herein, no license rights or ownership in or to any of the foregoing is granted or transferred hereunder, either directly or by implication. ALL RIGHTS RESERVED.

(d) If Buyer is the United States Government or any agency thereof, each of the components of the Software and user documentation are a "commercial item," and "computer software" as those terms are defined at 48 C.F.R. 2.101, consisting of "commercial computer software" and "commercial computer software documentation," as such terms are used in 48 C.F.R. 12.212. Consistent with 48 C.F.R. 12.212 and 48 C.F.R. 227.7202-1 through 227.7202-4, all United States government Buyers acquire only those rights in the Software and user documentation that are specified in this Agreement.

11. Installation and Other Services. Seller shall provide installation services ("**Installation Services**") to Buyer if set forth in the Acknowledgment. If Installation Services are provided for in the Acknowledgement, Buyer will prepare the location for the installation consistent with Buyer's written specifications and Buyer will install necessary system cable and assemble any necessary equipment or hardware not provided by Seller, unless agreed otherwise in writing by the parties. For Goods that will be operated on or in connection with Buyer supplied hardware or software, Buyer is responsible for ensuring that its hardware and software conform with Seller minimum hardware and software requirements as made available to Buyer. Seller shall provide other field services, such as maintenance visits and field repairs (the "**Other Services**" and together with the Installation Services, the "**Services**") if set forth in the Acknowledgement.

12. Limited Warranty.

(a) Subject to the exceptions and upon the conditions set forth herein, Seller warrants to Buyer that for a period of one (1) year from the date of shipment ("**Warranty Period**"), that such Goods will be free from material defects in material and workmanship.

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(b) Notwithstanding the foregoing and anything herein to the contrary, the warranty set forth in this Section 12 shall be superseded and replaced in its entirety with the warranty set forth on **Exhibit A** hereto if the Goods being purchased are specialty products, which include, without limitation, laser products, fiber markers, custom systems, workstations, Seller-installed products, non-catalogue products and other custom-made items (each a “**Specialty Product**”).

(c) **EXCEPT FOR THE WARRANTY SET FORTH IN SECTION 12(A), SELLER MAKES NO WARRANTY WHATSOEVER WITH RESPECT TO THE GOODS (INCLUDING ANY SOFTWARE) OR SERVICES, INCLUDING ANY (a) WARRANTY OF MERCHANTABILITY; (b) WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE; (c) WARRANTY OF TITLE; OR (d) WARRANTY AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY; WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE.**

(d) Products manufactured by a third party and third party software (“**Third Party Product**”) may constitute, contain, be contained in, incorporated into, attached to or packaged together with, the Goods. Third Party Products are not covered by the warranty in Section 12(a). For the avoidance of doubt, **SELLER MAKES NO REPRESENTATIONS OR WARRANTIES WITH RESPECT TO ANY THIRD PARTY PRODUCT, INCLUDING ANY (a) WARRANTY OF MERCHANTABILITY; (b) WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE; (c) WARRANTY OF TITLE; OR (d) WARRANTY AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY; WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE.** Notwithstanding the foregoing, in the event of the failure of any Third Party Product, Seller will assist (within reason) Buyer (at Buyer’s sole expense) in obtaining, from the respective third party, any (if any) adjustment that is available under such third party’s warranty.

(e) Seller shall not be liable for a breach of the warranty set forth in Section 12(a) unless: (i) Buyer gives written notice of the defect, reasonably described, to Seller within five (5) days of the time when Buyer discovers or ought to have discovered the defect and such notice is received by Seller during the Warranty Period; (ii) Seller is given a reasonable opportunity after receiving the notice to examine such Goods; (iii) Buyer (if requested to do so by Seller) returns such Goods (prepaid and insured to Seller at 1820 South Myrtle Avenue, Monrovia, CA 91016 or to such other location as designated in writing by Seller) to Seller pursuant to Seller’s RMA procedures and Buyer obtains a RMA number from Seller prior to returning such Goods for the examination to take place; and (iii) Seller reasonably verifies Buyer’s claim that the Goods are defective and that the defect developed under normal and proper use.

(f) Seller shall not be liable for a breach of the warranty set forth in Section 12(a) if: (i) Buyer makes any further use of such Goods after giving such notice; (ii) the defect arises because Buyer failed to follow Seller’s oral or written instructions as to the storage, installation, commissioning, use or maintenance of the Goods; (iii) Buyer alters or repairs such Goods without the prior written consent of Seller; or (iv) repairs or modifications are made by persons other than Seller’s own service personnel, or an authorized representative’s personnel, unless such repairs are made with the written consent of Seller in accordance with procedures outlined by Seller.

(g) All expendables such as electrodes are warranted only for defect in material and workmanship which are apparent upon receipt by Buyer. The foregoing warranty is negated after the initial use.

(h) Subject to Section 12(e) and Section 12(f) above, with respect to any such Goods during the Warranty Period, Seller shall, in its sole discretion, either: (i) repair or replace such Goods (or the defective part) or (ii) credit or refund the price of such Goods at the pro rata contract rate, provided that, if Seller so requests, Buyer shall, at Buyer’s expense, return such Goods to Seller.

(i) **THE REMEDIES SET FORTH IN SECTION 12(H) SHALL BE BUYER’S SOLE AND EXCLUSIVE REMEDY AND SELLER’S ENTIRE LIABILITY FOR ANY BREACH OF THE LIMITED WARRANTY SET FORTH IN SECTION 12(A).** Representations and warranties made by any person, including representatives of Seller, which are inconsistent or in conflict with the terms of this warranty, as set forth above, shall not be binding upon Seller.

13. Limitation of Liability.

(a) **IN NO EVENT SHALL SELLER BE LIABLE FOR ANY CONSEQUENTIAL, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR PUNITIVE DAMAGES, LOST PROFITS OR REVENUES OR DIMINUTION IN VALUE, LOSS OF INFORMATION OR DATA, OR PERSONAL INJURY OR DEATH ARISING IN ANY WAY OUT OF THE MANUFACTURE, SALE, USE, OR INABILITY TO USE ANY GOODS, SOFTWARE OR SERVICE, OR ARISING OUT OF OR RELATING TO ANY BREACH OF THESE TERMS, WHETHER OR NOT THE POSSIBILITY OF SUCH DAMAGES HAS BEEN DISCLOSED IN ADVANCE BY BUYER OR COULD HAVE BEEN REASONABLY FORESEEN BY BUYER, REGARDLESS OF THE LEGAL OR EQUITABLE THEORY (CONTRACT, TORT OR OTHERWISE) UPON WHICH THE CLAIM IS BASED, AND NOTWITHSTANDING THE FAILURE OF ANY AGREED OR OTHER REMEDY OF ITS ESSENTIAL PURPOSE.**

(b) **IN NO EVENT SHALL SELLER’S AGGREGATE LIABILITY ARISING OUT OF OR RELATED TO THIS AGREEMENT, WHETHER ARISING OUT OF OR RELATED TO BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE) OR OTHERWISE, EXCEED THE TOTAL OF THE AMOUNTS PAID TO SELLER FOR THE GOODS SOLD HEREUNDER.**

(c) **ALL WARRANTIES SET FORTH HEREIN, DIRECT OR IMPLIED, ARE VOIDED IF THE INITIAL INSTALLATION AND START-UP OF THE SUBJECT GOOD IS NOT SUPERVISED BY AN AUTHORIZED REPRESENTATIVE OF SELLER. AFTER INSTALLATION, ANY RE-ALIGNMENT, RE-CLEANING, OR RE-CALIBRATION, PROVIDED THEY ARE NOT RELATED TO A PROVEN DEFECT IN MATERIALS OR WORKMANSHIP, SHALL BE PERFORMED BY AN AUTHORIZED REPRESENTATIVE OF SELLER AT THE CURRENT SERVICE RATES.**

(d) **WHERE GOODS ARE SUBJECT TO A MOVE TO ANOTHER LOCATION AFTER THE ORIGINAL INSTALLATION HAS BEEN MADE, THE WARRANTY**

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

MAY BE MAINTAINED ONLY IF SUPERVISED BY AN AUTHORIZED REPRESENTATIVE OF SELLER. SELLER, FOR A SERVICE CHARGE, WILL ARRANGE FOR AND SUPERVISE THE DISCONNECTION, TRANSPORTATION, REINSTALLATION AND START-UP OF THE EQUIPMENT. CLAIMS FOR DAMAGE IN SHIPMENT ARE THE RESPONSIBILITY OF BUYER AND SHALL BE FILED PROMPTLY WITH THE TRANSPORTATION COMPANY.

14. Return Goods Policy. Seller's products may be returned to Seller for credit within sixty (60) days of shipment subject to the following conditions.

(a) In order to return products for credit, Buyer must obtain a RMA number from Seller. Upon receipt, it must be executed by an authorized person and then returned with the Goods. Goods returned to Seller without a RMA will be returned at Buyer's expense.

(b) Goods are to be returned to Seller at 1820 South Myrtle Avenue, Monrovia, CA 91016 with Freight Prepaid. Seller will not accept collect shipments.

(c) Restocking fees will be assessed in accordance with the following schedules: (i) Goods returned within the first thirty (30) days from shipment date will be restocked less twenty percent (20%) of the amount billed on the original invoice. (ii) Goods returned over thirty (30) days of shipment but less than sixty (60) days will be restocked less thirty percent (30%) of the amount billed on the original invoice. (iii) No returns are allowed after sixty (60) days from the original shipping date.

(d) The restocking fees set forth above are the minimum fees. If a returned Good requires rework to restore it to a saleable condition, further charges will be assessed. Seller's quality assurance department will document the condition of the Goods when received by Seller and report their findings to Buyer.

(e) **Notwithstanding the foregoing provisions of this Section 14, the following Goods cannot be returned, are not eligible for any credit and cannot be restocked: (i) custom or modified products and (ii) any expendable product(s) that have been used.**

15. Compliance with Law and Indemnification. Buyer shall comply with all applicable laws, regulations and ordinances. Buyer shall maintain in effect all the licenses, permissions, authorizations, consents and permits that it needs to carry out its obligations under this Agreement. Buyer shall comply with all export and import laws of all countries involved in the sale of the Goods under this Agreement or any resale of the Goods by Buyer. Goods, Services and technical data delivered by Seller shall be subject to U.S. export controls. Buyer shall, and shall cause its customers to, obtain all licenses, permits and approvals required by any government and shall comply with all applicable laws, rules, policies and procedures of the applicable government and other competent authorities. Buyer will indemnify and hold Seller harmless for any violation or alleged violation by Buyer of such laws, rules, policies or procedures. Buyer shall not transmit, export or re-export, directly or indirectly, separately or as part of any system, the Goods or any technical data (including processes and Services) received from Seller, without first obtaining any license required by the applicable government, including without limitation, the U.S. government. Buyer also certifies that none of the Goods or technical data supplied by Seller under this Agreement will be sold or otherwise transferred to, or made available for use by or for, any entity that is engaged in the design, development, production or use of nuclear, biological or chemical weapons or missile technology. No Buyer information will be deemed "technical data" unless Buyer specifically identifies it to Seller as such. Buyer assumes all responsibility for shipments of Goods requiring any government import clearance. Seller may terminate this Agreement if any governmental authority imposes antidumping or countervailing duties or any other penalties on Goods. For all international shipments, Seller requires that all required Export Control documentations, including Form BIS-711 Statement by Ultimate Consignee and Purchases, are submitted by Buyer along with the purchase order. Seller reserves the right to postpone shipment until all documentations are completed and submitted to Seller. Seller will not be responsible for shipment delays due to non-compliance by Buyer of the foregoing two sentences.

16. Termination. In addition to any remedies that may be provided under these Terms, Seller may terminate this Agreement with immediate effect upon written notice to Buyer, if Buyer: (i) fails to pay any amount when due under this Agreement and such failure continues for ten (10) days after Buyer's receipt of written notice of nonpayment; (ii) has not otherwise performed or complied with any of these Terms, in whole or in part; or (iii) becomes insolvent, files a petition for bankruptcy or commences or has commenced against it proceedings relating to bankruptcy, receivership, reorganization or assignment for the benefit of creditors.

17. Waiver. No waiver by Seller of any of the provisions of this Agreement is effective unless explicitly set forth in writing and signed by Seller. No failure to exercise, or delay in exercising, any rights, remedy, power or privilege arising from this Agreement operates or may be construed as a waiver thereof. No single or partial exercise of any right, remedy, power or privilege hereunder precludes any other or further exercise thereof or the exercise of any other right, remedy, power or privilege.

18. Confidential Information. All non-public, confidential or proprietary information of Seller, including, but not limited to, specifications, samples, patterns, designs, plans, drawings, documents, data, business operations, customer lists, pricing, discounts or rebates, disclosed by Seller to Buyer, whether disclosed orally or disclosed or accessed in written, electronic or other form or media, and whether or not marked,

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

designated or otherwise identified as “confidential,” in connection with this Agreement is confidential, solely for the use of performing this Agreement and may not be disclosed or copied unless authorized in advance by Seller in writing. Upon Seller’s request, Buyer shall promptly return all documents and other materials received from Seller. Seller shall be entitled to injunctive relief for any violation of this Section 18. This Section 18 does not apply to information that is: (a) in the public domain through no fault of Buyer; (b) known to Buyer at the time of disclosure without restriction as evidenced by its records; or (c) rightfully obtained by Buyer on a non-confidential basis from a third party.

19. Force Majeure. Seller shall not be liable or responsible to Buyer, nor be deemed to have defaulted or breached this Agreement, for any failure or delay in fulfilling or performing any term of this Agreement when and to the extent such failure or delay is caused by or results from acts or circumstances beyond the reasonable control of Seller including, without limitation, acts of God, flood, fire, earthquake, explosion, governmental actions, war, invasion or hostilities (whether war is declared or not), terrorist threats or acts, riot, or other civil unrest, national emergency, revolution, insurrection, epidemic, lock-outs, strikes or other labor disputes (whether or not relating to either party’s workforce), or restraints or delays affecting carriers or inability or delay in obtaining supplies of adequate or suitable materials, materials or telecommunication breakdown or power outage (each a “**Force Majeure Event**”), provided that, if the event in question continues for a continuous period in excess of thirty (30) days, Buyer shall be entitled to give notice in writing to Seller to terminate this Agreement.

20. Assignment. Buyer shall not assign any of its rights or delegate any of its obligations under this Agreement without the prior written consent of Seller. Any purported assignment or delegation in violation of this Section 20 is null and void. No assignment or delegation relieves Buyer of any of its obligations under this Agreement.

21. Relationship of the Parties. The relationship between the parties is that of independent contractors. Nothing contained in this Agreement shall be construed as creating any agency, partnership, joint venture or other form of joint enterprise, employment or fiduciary relationship between the parties, and neither party shall have authority to contract for or bind the other party in any manner whatsoever.

22. No Third-Party Beneficiaries. This Agreement is for the sole benefit of the parties hereto and their respective successors and permitted assigns and nothing herein, express or implied, is intended to or shall confer upon any other person or entity any legal or equitable right, benefit or remedy of any nature whatsoever under or by reason of these Terms.

23. Governing Law. All matters arising out of or relating to this Agreement is governed by and construed in accordance with the internal laws of the State of California without giving effect to any choice or conflict of law provision or rule (whether of the State of California or any other jurisdiction) that would cause the application of the laws of any jurisdiction other than those of the State of California.

24. Dispute Resolution.

(a) If Buyer is an entity formed under the laws of the United States of America, or any of its states, districts or territories (“**U.S. Law**”), then any dispute, legal suit, action or proceeding arising out of or relating to this Agreement shall be adjudicated and decided in the federal courts of the United States of America or the courts of the State of California in each case located in the City of Los Angeles and County of Los Angeles, California and each party irrevocably submits to the exclusive and personal jurisdiction of such courts in any such dispute, suit, action or proceeding.

(b) If Buyer is an entity formed under the laws of any country, state, district or territory other than U.S. Law, then the parties irrevocably agree that any dispute, legal suit, action or proceeding arising out of or relating to this Agreement shall be submitted to the International Court of Arbitration of the International Chamber of Commerce (“**ICC**”) and shall be finally settled under the Rules of Arbitration of the ICC. The place and location of the arbitration shall be in Los Angeles, California, pursuant to the ICC’s Rules of Arbitration and shall be finally settled in accordance with said rules. The arbitration shall be conducted before a panel of three arbitrators. Each party shall select one arbitrator and the two arbitrators so selected shall select the third arbitrator, who shall act as presiding arbitrator. Notwithstanding the foregoing, if the matter under dispute is \$500,000 or less, there shall only be one arbitrator who shall be mutually selected by both parties. If the party-selected arbitrators are unable to agree upon the third arbitrator, if either party fails to select an arbitrator, or in the case that only one arbitrator is required and the parties are unable to agree, then the International Court of Arbitration shall choose the arbitrator. The language to be used in the arbitral proceeding shall be English. The arbitrator(s) shall have no authority to issue an award that is contrary to the express terms of this Agreement or the laws of the State of California or applicable US Federal Law, and the award may be vacated or corrected on appeal to a court of competent jurisdiction for any such error. The arbitrator(s) shall be specifically empowered to allocate between the parties the costs of arbitration, as well as reasonable attorneys’ fees and costs, in such equitable manner as the arbitrator(s) may determine. The arbitrator(s) shall have the authority to determine issues of arbitrability and to award compensatory damages, but they shall not have authority to award punitive or exemplary damages. Judgment upon the award so rendered may be entered in any court having jurisdiction or application may be made to such court for judicial acceptance of any award and an order of enforcement, as the case may be. In no event shall a demand for arbitration be made after the date when institution of a legal or equitable proceeding based upon such claim, dispute or other matter in question would be barred by the applicable statute of limitations. Notwithstanding the foregoing, either party shall have the right, without waiving any right or remedy available to such party under this Agreement or otherwise, to seek and obtain from any court of competent jurisdiction any interim or provisional relief

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

that is necessary or desirable to protect the rights or property of such party, pending the selection of the arbitrator(s) hereunder or pending the arbitrator(s)' determination of any dispute, controversy or claim hereunder.

25. Notices. All notices, request, consents, claims, demands, waivers and other communications hereunder (each, a “**Notice**”) shall be in writing and addressed to the parties at the addresses set forth on the face of the Acknowledgement or to such other address that may be designated by the receiving party in writing. All Notices shall be delivered by personal delivery, nationally recognized overnight courier (with all fees pre-paid), facsimile (with confirmation of transmission) or certified or registered mail (in each case, return receipt requested, postage prepaid). Except as otherwise provided in this Agreement, a Notice is effective only (a) upon receipt of the receiving party, upon confirmation of delivery by nationally recognized overnight courier or upon forty-eight (48) hours after being sent by certified or registered mail (as applicable), and (b) if the party giving the Notice has complied with the requirements of this Section 25.

26. Severability. If any term or provision of this Agreement is invalid, illegal or unenforceable in any jurisdiction, such invalidity, illegality or unenforceability shall not affect any other term or provision of this Agreement or invalidate or render unenforceable such term or provision in any other jurisdiction.

27. Survival. Provisions of these Terms which by their nature should apply beyond their terms will remain in force after any termination or expiration of this Order, including, but not limited to, the following provisions: Compliance with Laws, Confidentiality, Governing Law, Dispute Resolution, Survival, and the restrictions on Software in Sections 10(b), (c) and (d)

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



EC Declaration of Conformity

Company: AMADA WELD TECH INC.
1820 S Myrtle Ave,
Monrovia, CA 91016

Declares that,

Model: UB-1500B, UB-4000B

Description: LINEAR DC RESISTANCE WELDING CONTROL

has been designed and constructed to fulfill all the relevant provisions of the 2006/42/EC Machinery Directive, the 2014/30/EC Electromagnetic Compatibility (EMC) Directive and 2015/863 EU RoHS Directive.

Authorized person to compile the technical file: Amada Weld Tech GmbH
Lindberghstraße 1
82178 Puchheim - Germany
+44 (0)1638 510011

Harmonized standards used: EN 60204-1: 2018
IEC 62135-1: 2015 (reference)
EN ISO 12100: 2010
EN 61000-6-2: 2019, EN 61000-6-4: 2019

Date of issue: February 11, 2025
Place of issue: Monrovia, CA USA

Authorized signatures on behalf of AMADA WELD TECH INC.:

Matthew Green
Director, R&D Technology

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

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.

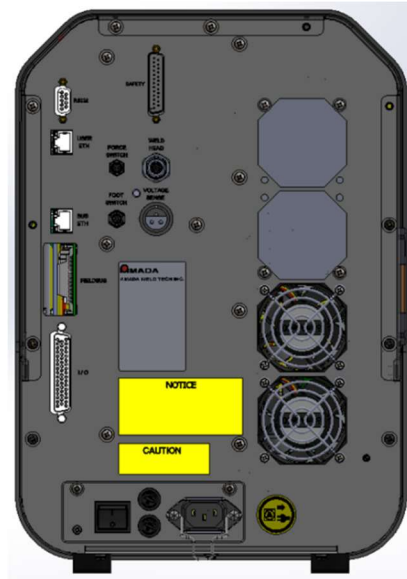
It connects to a weld head from the left side and to input/output and data communications devices via the back panel. For units without a display, an Ethernet port is accessible on the front panel.

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

CHAPTER 1: DESCRIPTION



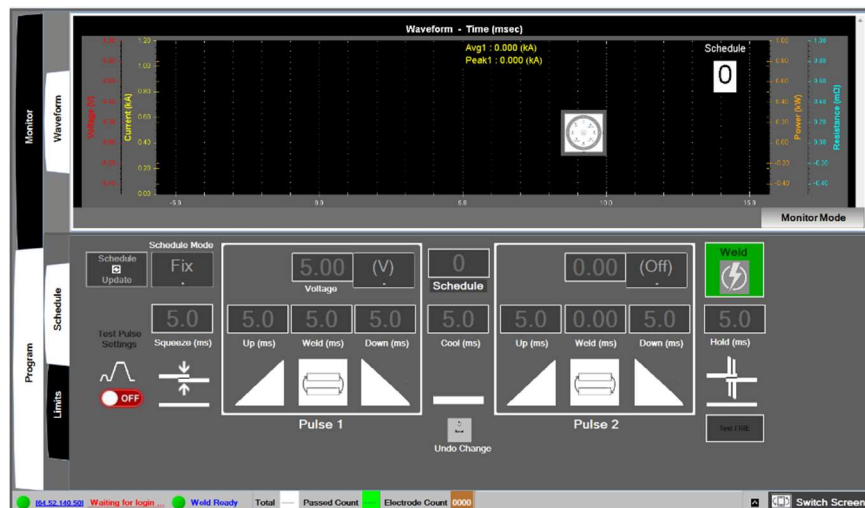
UB-1500B front and left side



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

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

CHAPTER 1: DESCRIPTION

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.)

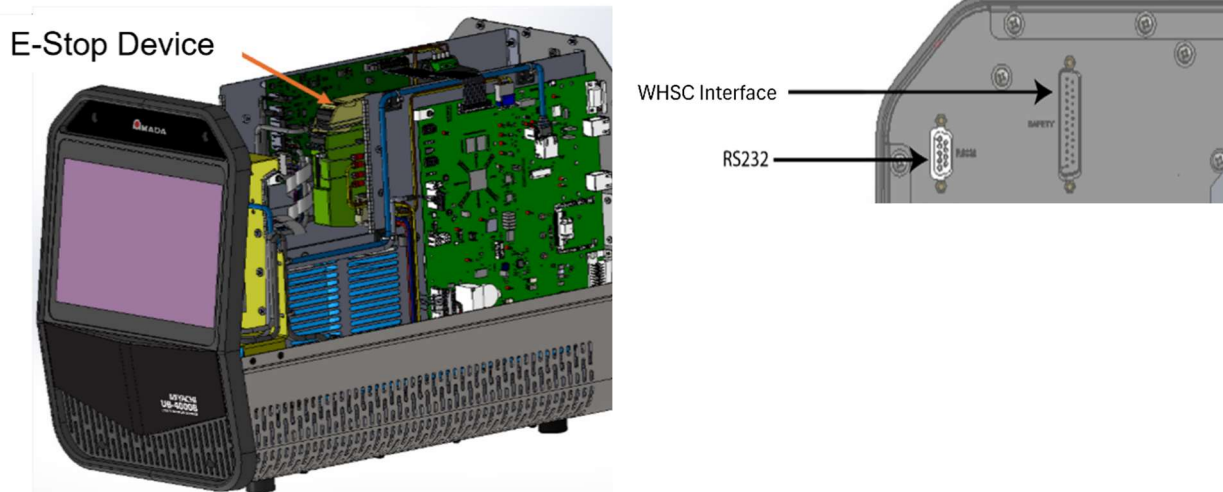
A dual-channel dry contact relay output is available for connecting to other devices.

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

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.



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

CHAPTER 1: DESCRIPTION

Options/Accessories

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

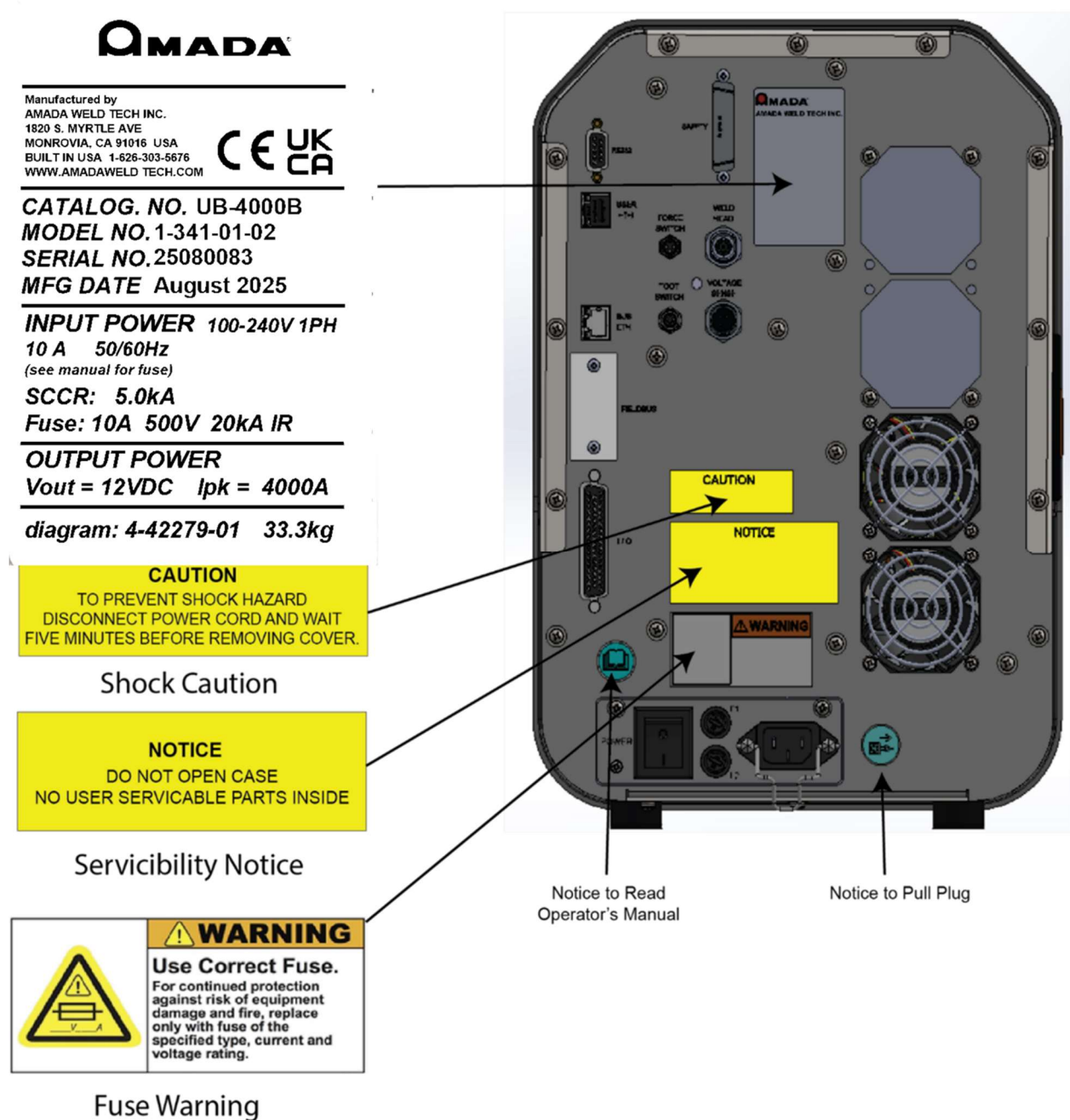
Part #	Component	Description
10-240-03	Footswitch – Line Master	2 level, Dry Contact M8 Connector - 6' length
18-20U-BB-12	Weld Cables	2/0 Weld cables, 18" length
205-629	Valve Drive Cable	AWTA weld head connector on one end, stripped wires on the other

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

CHAPTER 1: DESCRIPTION

Labels

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



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

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.

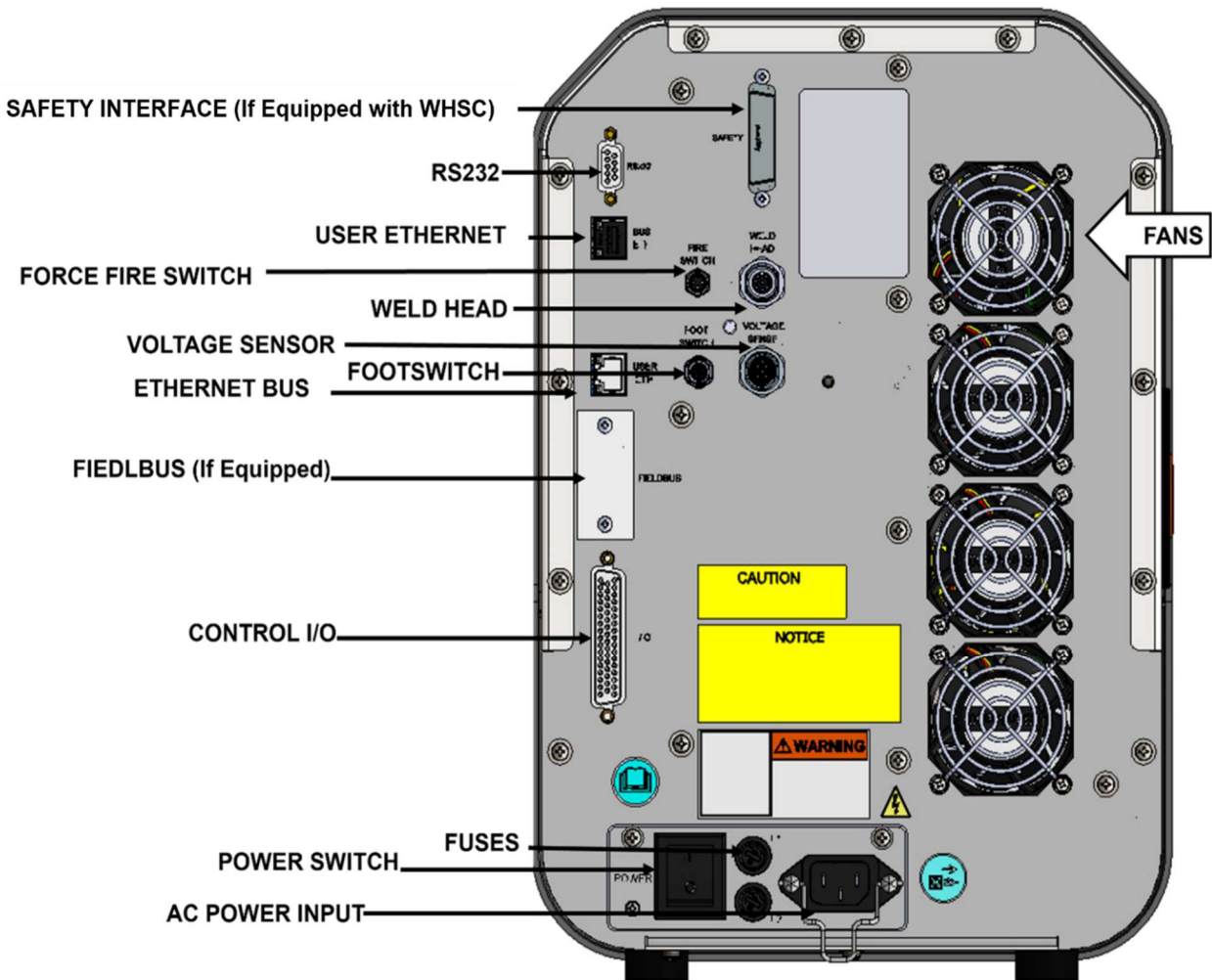
Also verify that the equipment shows no signs of damage. If you see any damage, please document the damage and contact the carrier and AMADA WELD TECH immediately to report it and to obtain further instructions.

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.



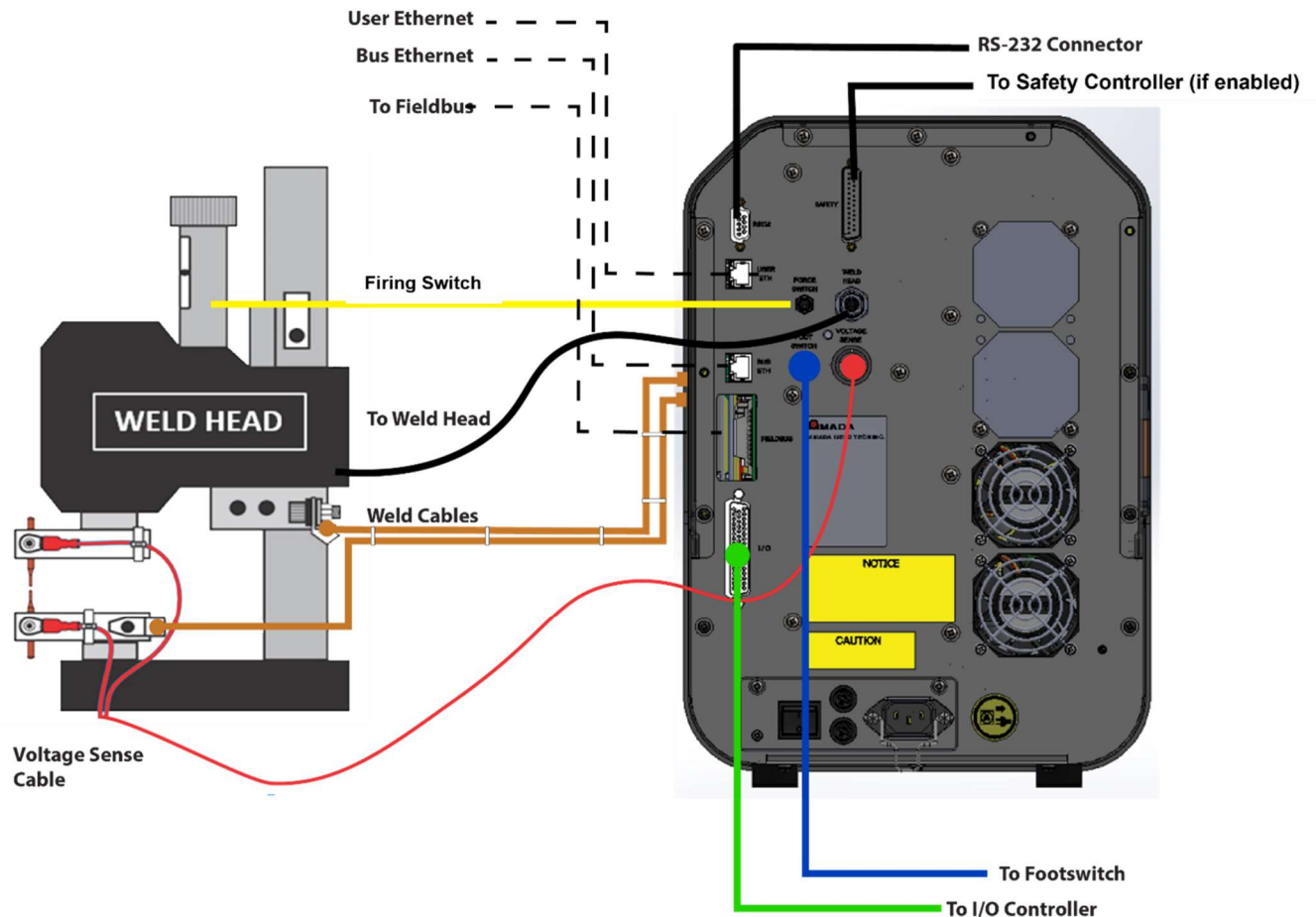
UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

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.

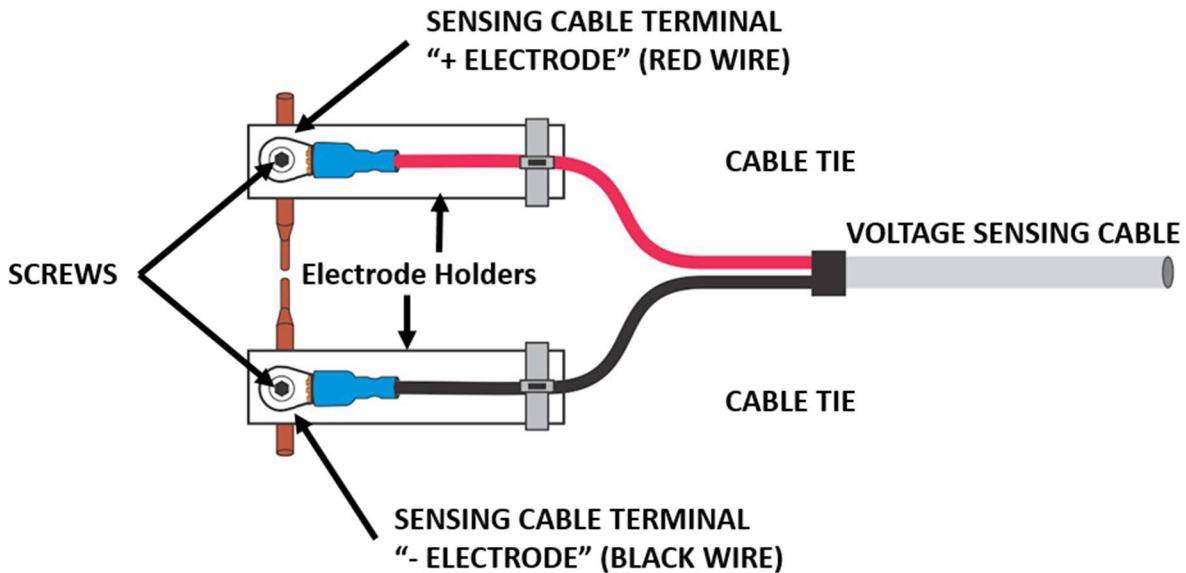
Note: Install weld cable washers between the screw heads and cable terminals, NOT between the cable terminals and Power Supply terminals. Thread length of the screws should be 12 mm or less. **Using longer screws may damage the Power Supply or provide incomplete fastening to the terminal.**



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

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.

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

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
1-337-01-03	1-341-01-02

UB systems without an integrated safety controller

1-337-01-02	1-341-01-02
1-337-01-04	1-341-01-04

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.

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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.

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

CHAPTER 2: INSTALLATION AND SETUP

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.

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

CHAPTER 2: INSTALLATION AND SETUP

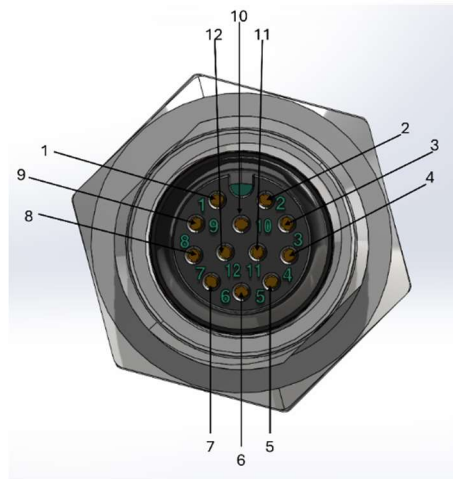
The Amada Weld Tech EZ-Air designs are best equipped with an additional, non-safety, on/off pneumatic valve at the head pneumatic input that only passes air in the presence of 24V_Safe. This valve disconnects the supply to prevent air leakage to atmosphere through the standard control solenoids when 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



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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:

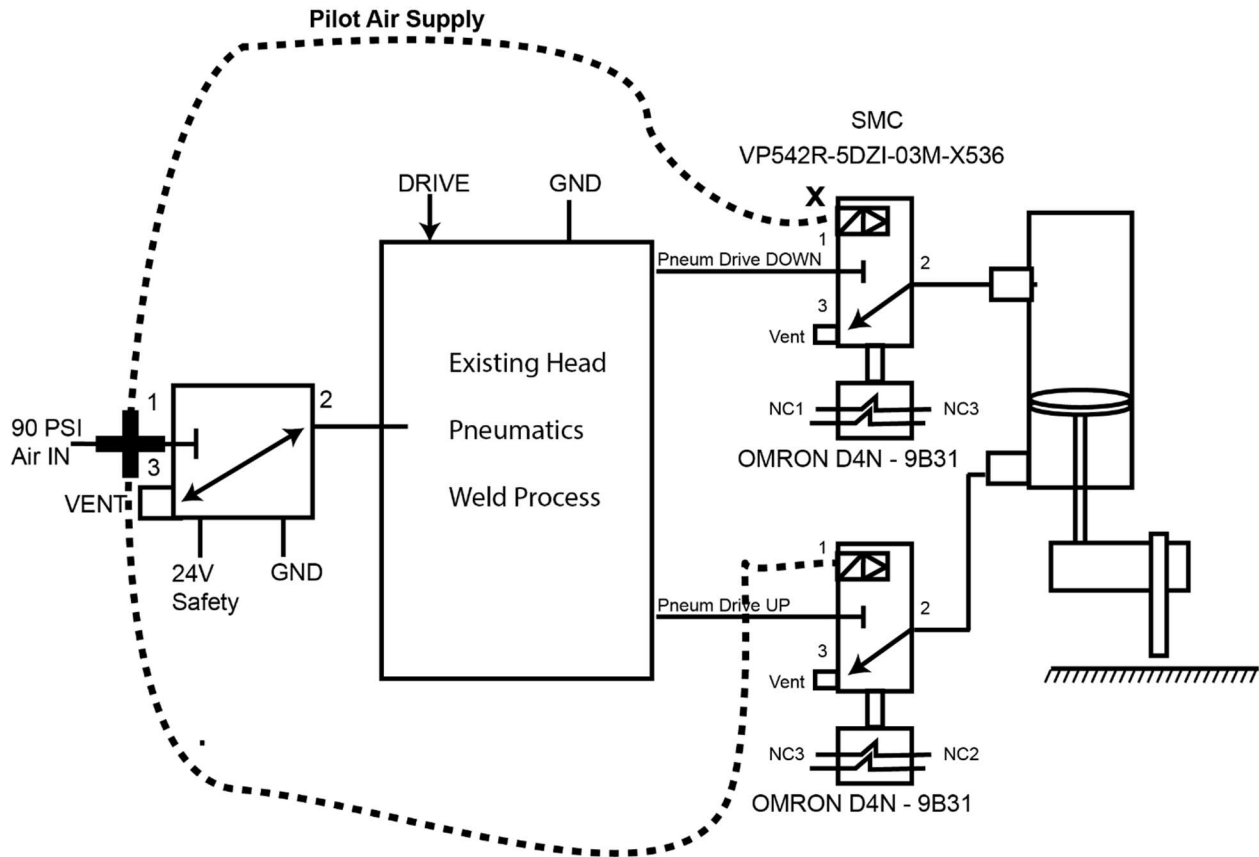
Safety Residual Pressure Relief Valves: SMC model VP542R-5DZ1-03N-M-X536

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.

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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

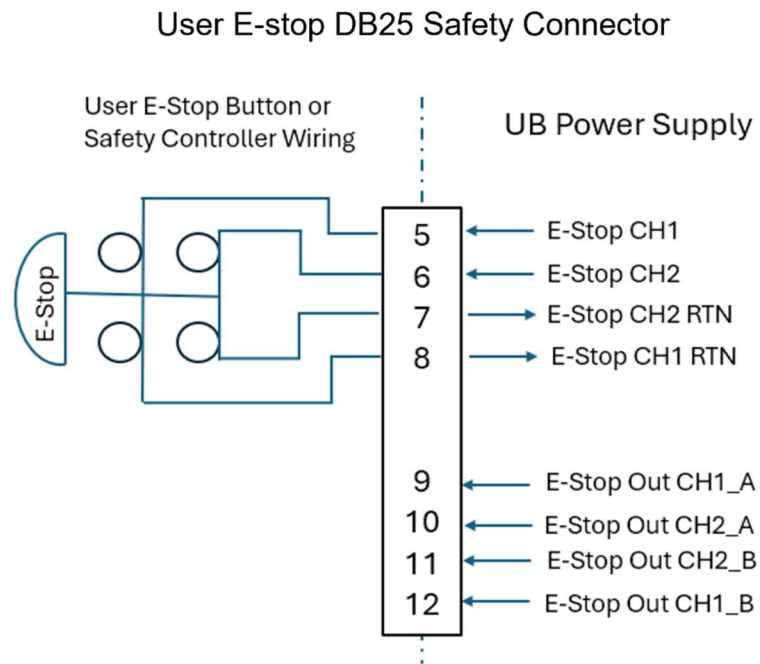
This connector is not present on versions without a safety controller

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.



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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		

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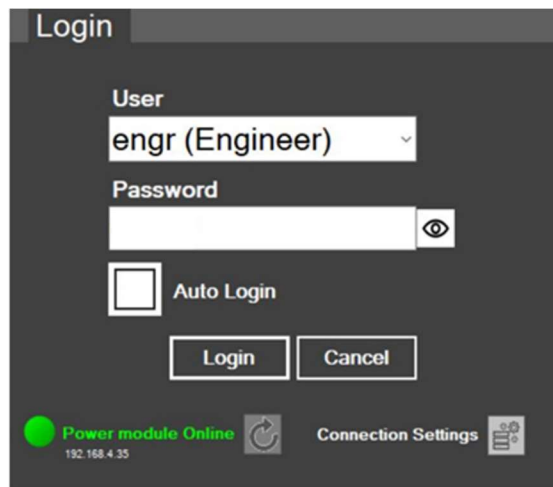
Chapter 3 LOGIN

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.

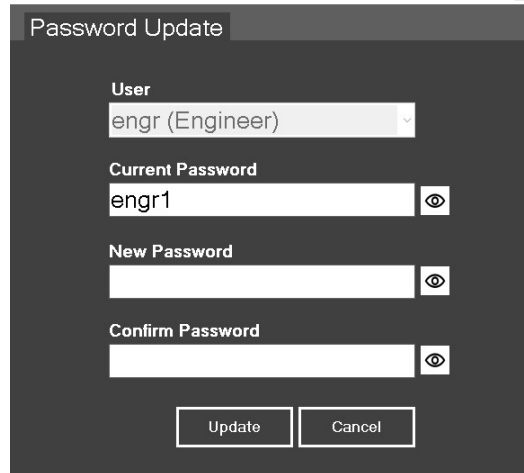
Check the Auto Login box to save your login for future sessions.



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.



The image shows a 'Password Update' dialog box with a dark background. It contains the following fields and controls:

- User:** A dropdown menu showing 'engr (Engineer)'.
- Current Password:** A text input field containing 'engr1' with a toggle icon on the right.
- New Password:** An empty text input field with a toggle icon on the right.
- Confirm Password:** An empty text input field with a toggle icon on the right.
- Buttons:** 'Update' and 'Cancel' buttons at the bottom.

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.

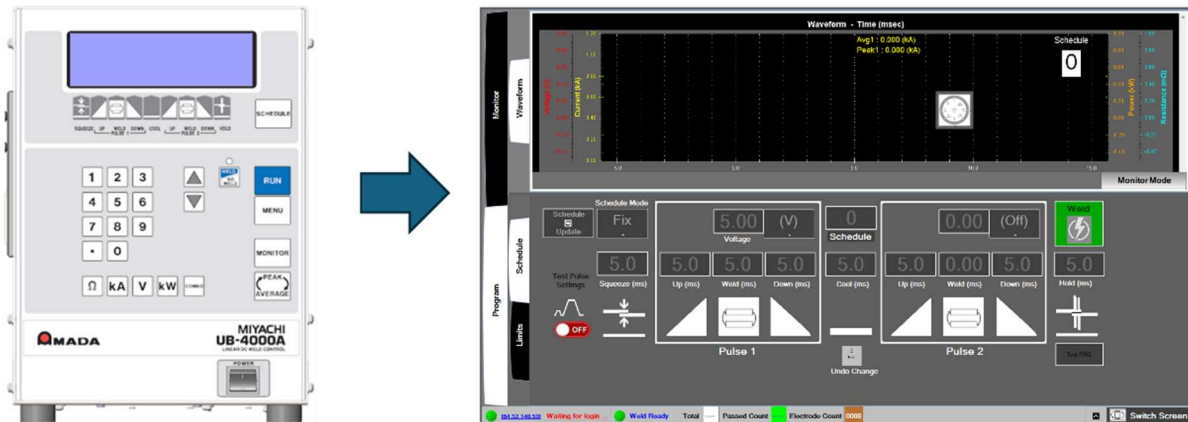


The image shows a 'Login' dialog box with a light gray background. It contains the following fields and controls:

- User:** A dropdown menu showing 'engr (Engineer)'.
- Password:** A text input field containing 'engr1' with a toggle icon on the right.
- Auto Login:** An unchecked checkbox.
- Buttons:** 'Login' and 'Cancel' buttons.
- Footer:** A status bar with a green circle and the text 'Power module Online' on the left, and 'Connection Settings' with a gear icon on the right.

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)

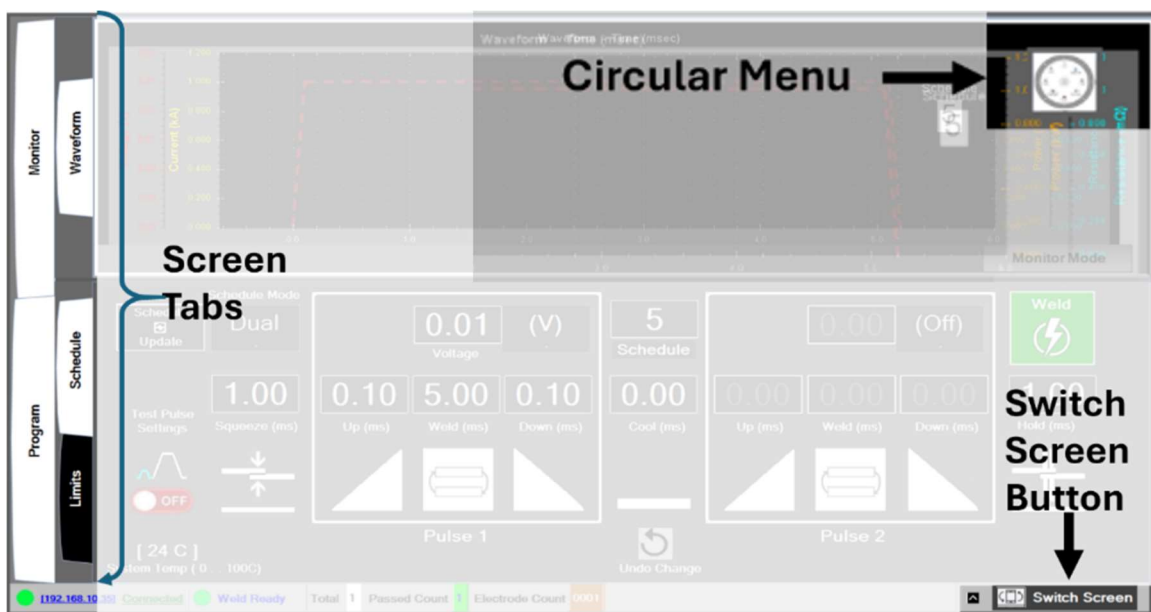
UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

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.



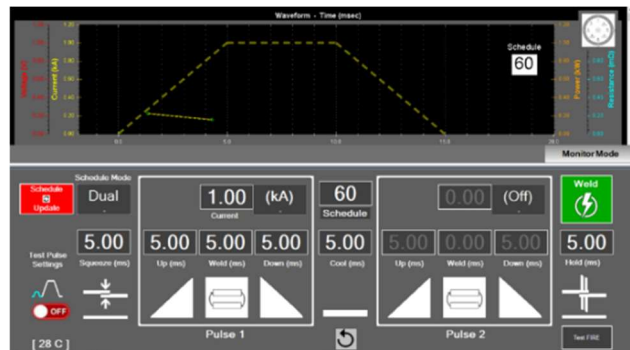
UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

CHAPTER 4: QUICK START GUIDE

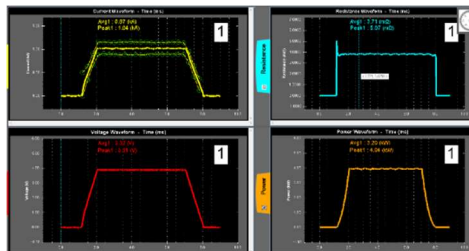
Screen Modes

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.)

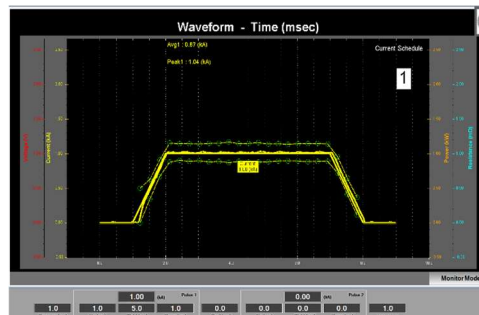
- Use **Program Mode** to create, edit, and store weld schedules (Engineer credentials required.)



- 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.



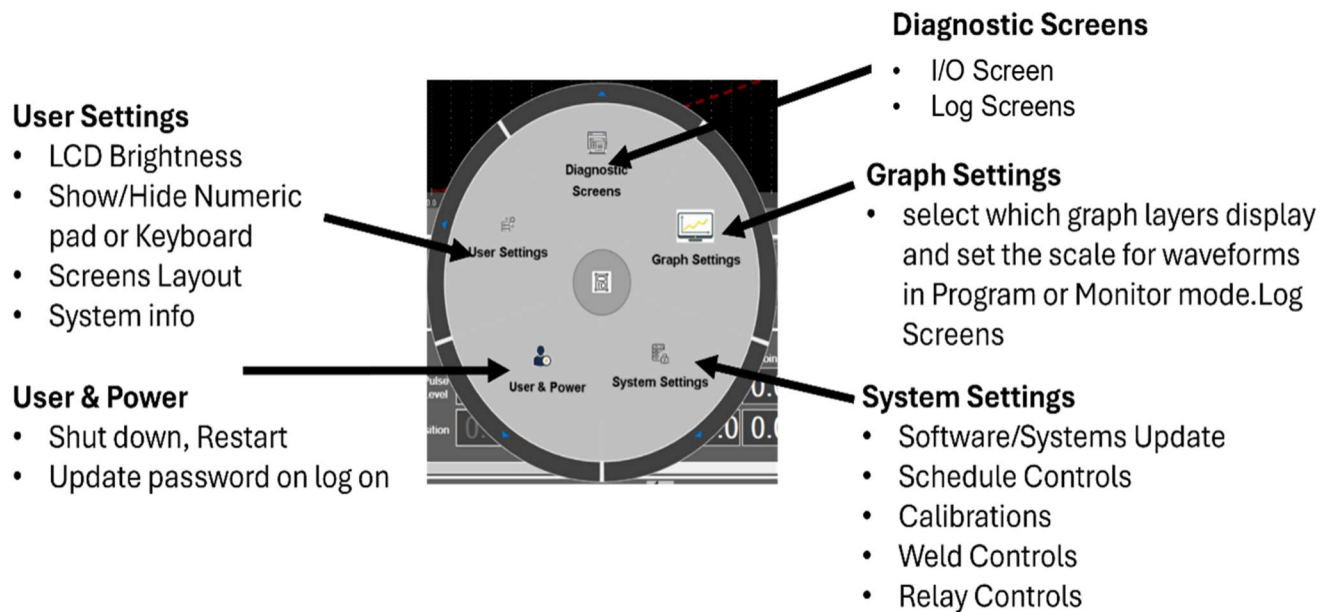
UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

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

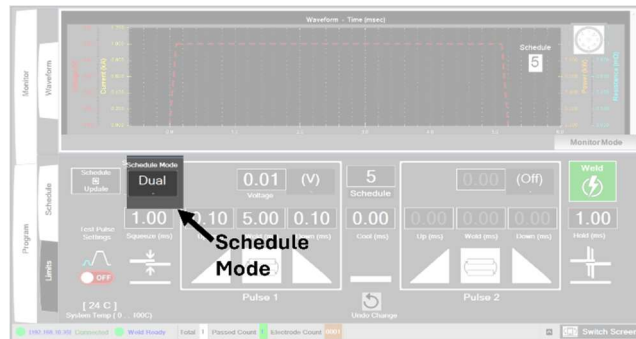
An Engineer uses the Screen Tabs to:

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

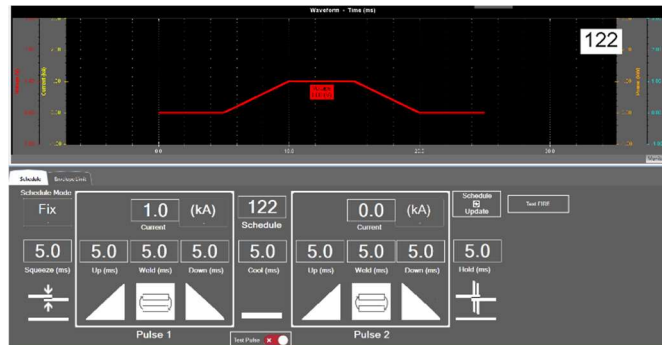
CHAPTER 4: QUICK START GUIDE

Schedule Modes

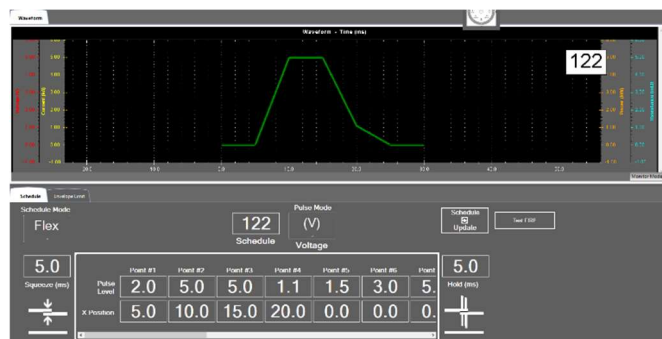
When developing a weld schedule on the **Program** screen, an Engineer can choose between two schedule modes: **Dual Pulse** or **Flex** mode. (See [Select Schedule Mode](#) below for more information.)



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:

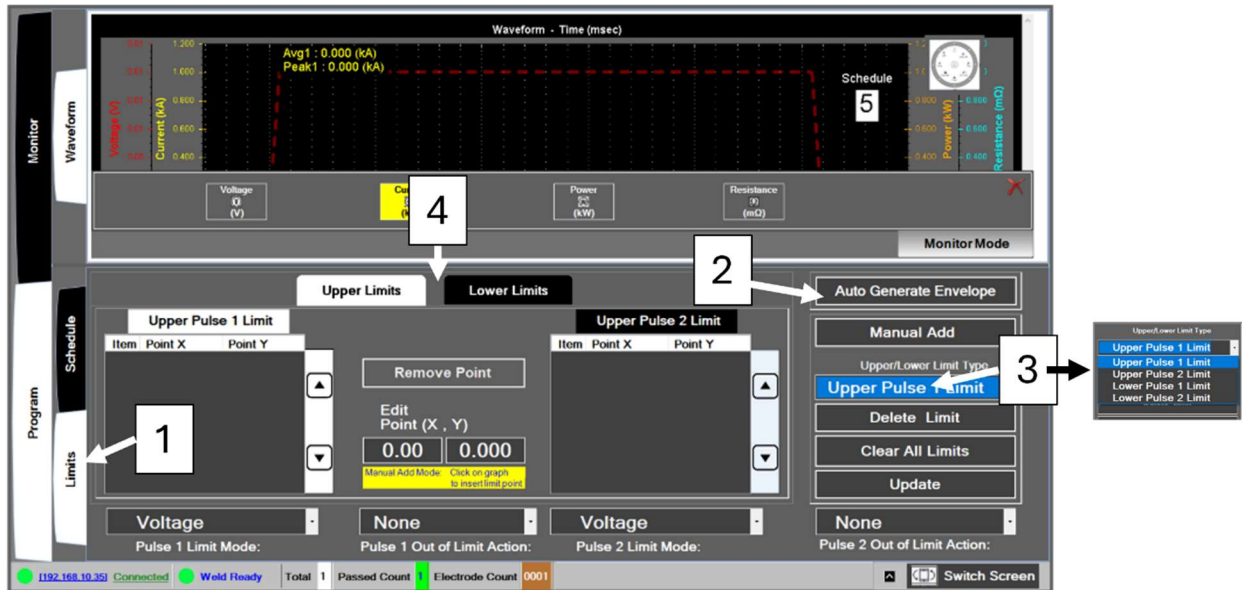
- Schedule Mode:** Dual
- Squeeze (ms):** 1.00
- Voltage:** 0.01 (V)
- Schedule No.:** 5
- Energy Type (Pulse 1):** (Off)
- Energy Type (Pulse 2):** (Off)
- Test Pulse Settings:** OFF
- Pulse 1 Parameters:** Up (ms): 0.10, Weld (ms): 5.00, Down (ms): 0.10
- Pulse 2 Parameters:** Up (ms): 0.00, Weld (ms): 0.00, Down (ms): 0.00
- Cool Time after Pulse 1:** 0.00
- Hold Time:** 1.00

Visual waveforms and icons are provided for each parameter to illustrate its function.

CHAPTER 4: QUICK START GUIDE

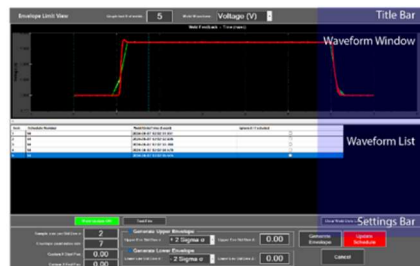
Setting Envelope Limits

To set envelope limits, follow the steps listed below in the order indicated. (See [Working with Envelope Limits](#) for more information.)



- 1) In **Program Mode**, click **Limits** to open the Limits tab.
- 2) Select **Auto Generate Envelope** or **Manual Add**.
- 3) Select from the **Upper or Lower Limit Type** pull down menu.
- 4) If **Manual Add** is selected, select either the **Upper Limits** or **Lower Limits** tab.
Click Update

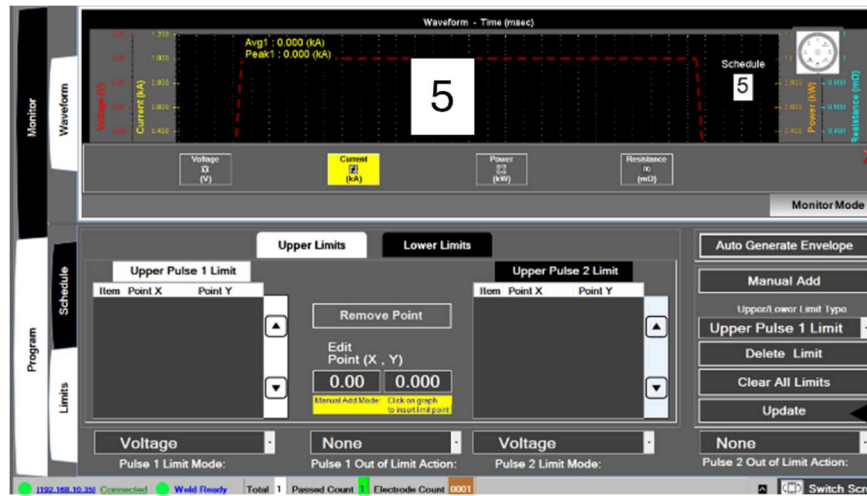
If **Auto Generate Envelope** is selected, the **Envelope Limit View** window displays.



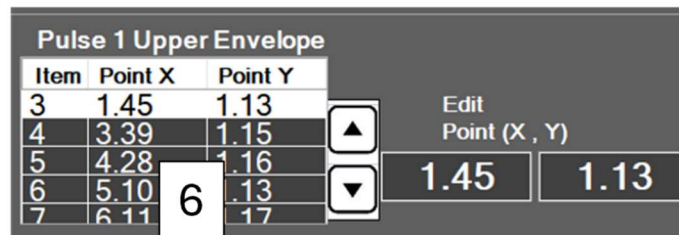
UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

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



Chapter 5 USING UB-B SOFTWARE

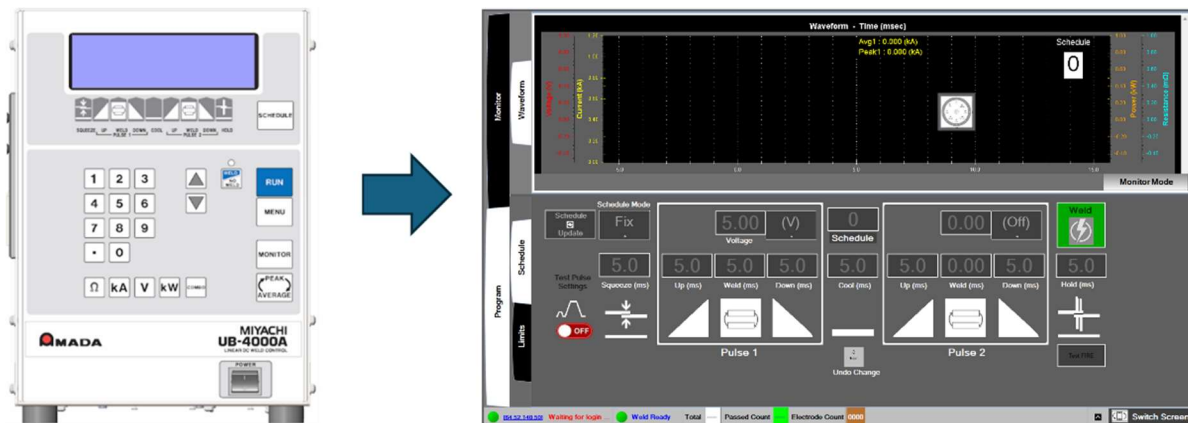
Overview

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

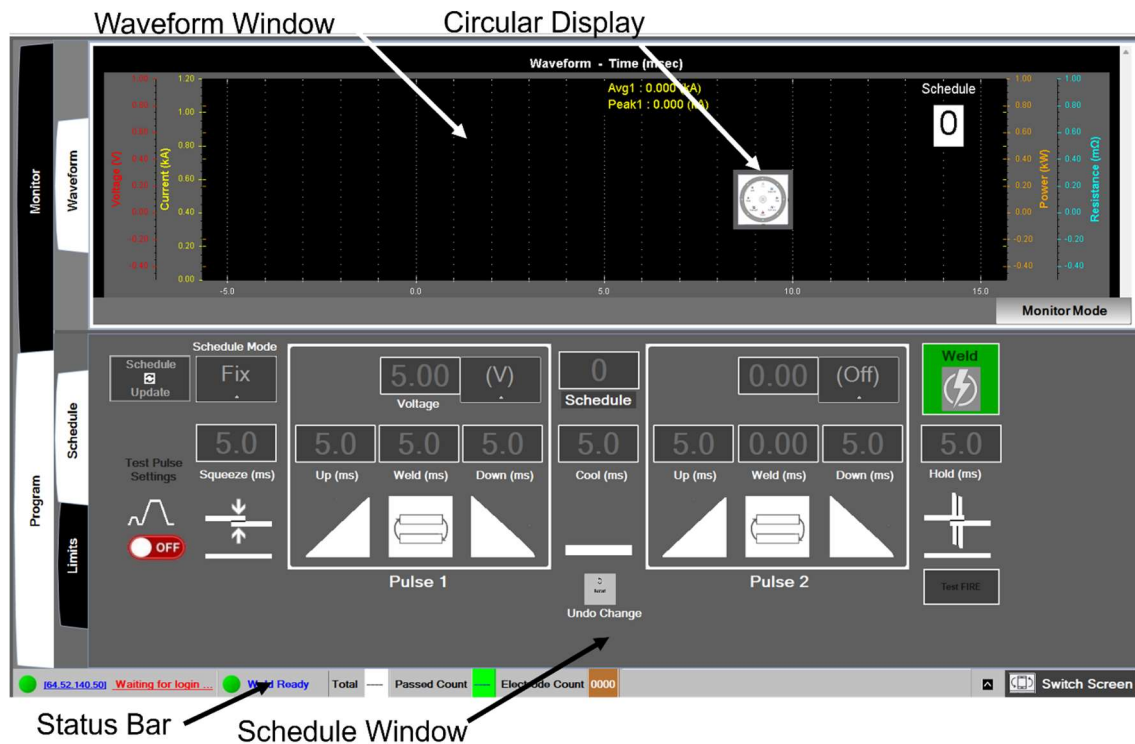
Users familiar with earlier versions of the Power Supply will find the UB-RW software interface largely intuitive. The default Program Screen transforms the pushbutton interface and LED screen from earlier versions into a touchscreen or PC-based interface.



CHAPTER 5: USING UB-B SOFTWARE

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**

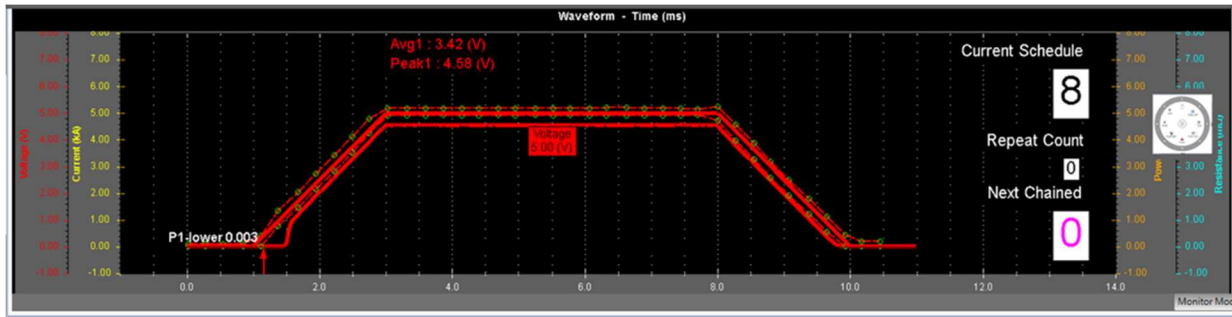


Waveform Window

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).

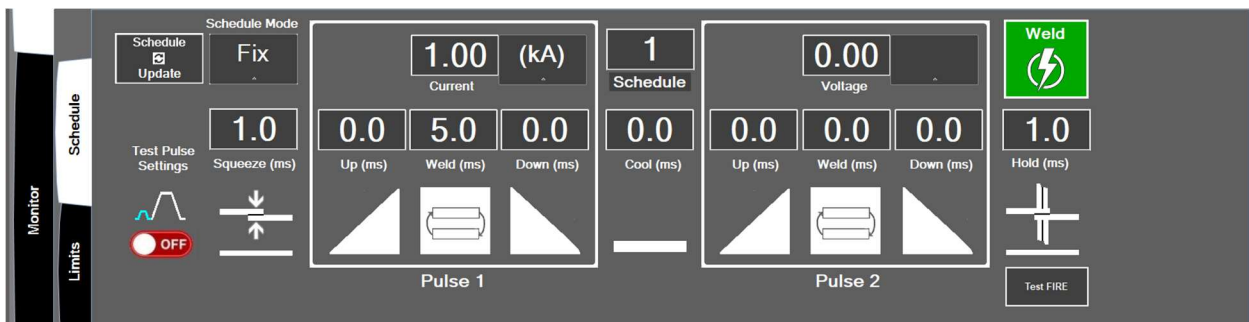
UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

CHAPTER 5: USING UB-B SOFTWARE



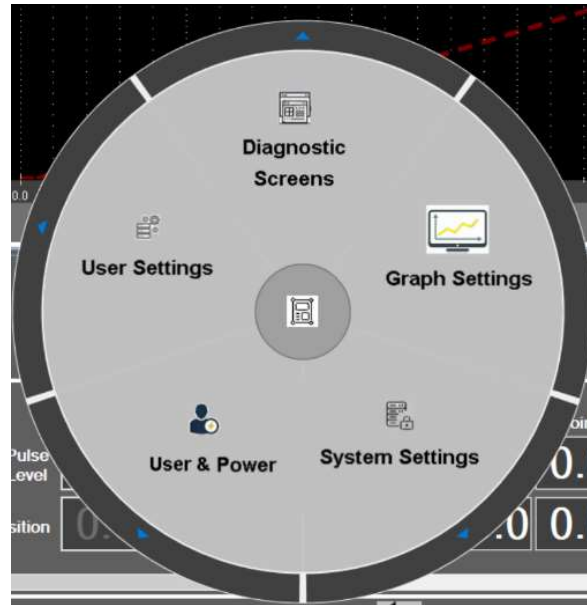
Schedule Window

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

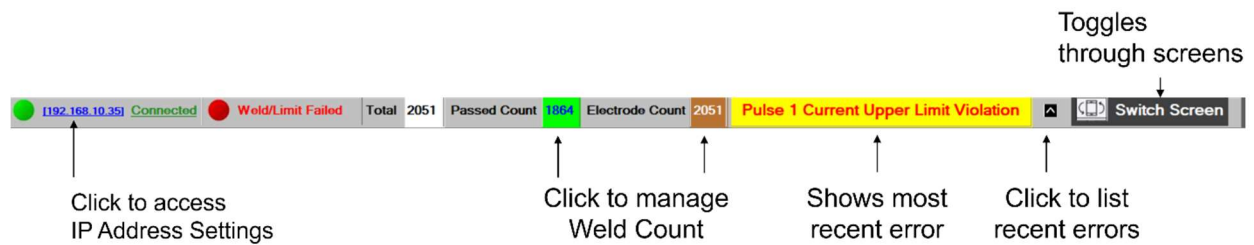
The circular menu provides access to the tools necessary to interact with the device. (The small version of the circular menu is a button that can be dragged to any location on the screen. The expanded version of the window displays center screen and reverts to the button once a selection has been made.)



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

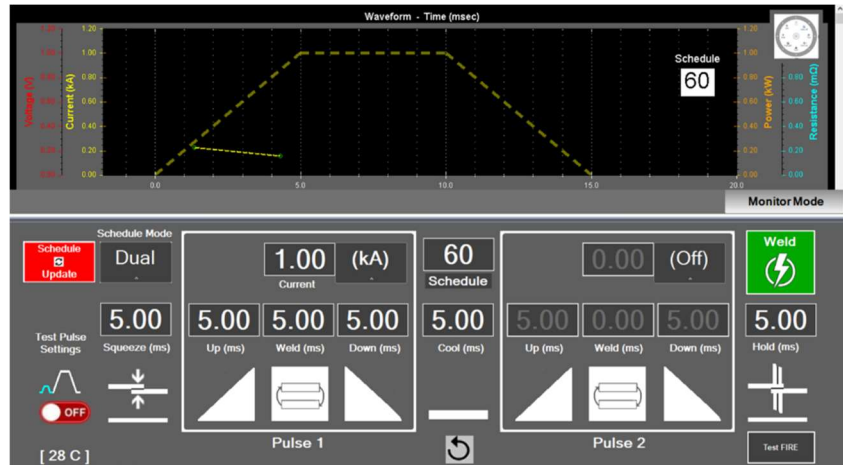


CHAPTER 5: USING UB-B SOFTWARE

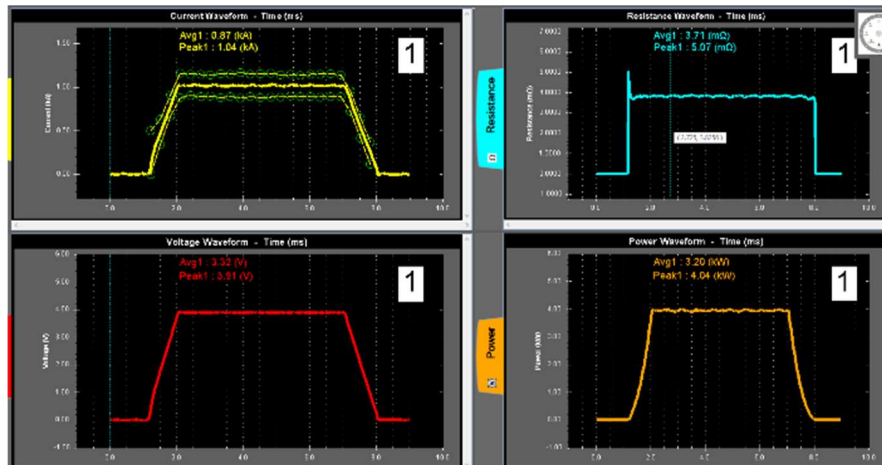
Modes

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.



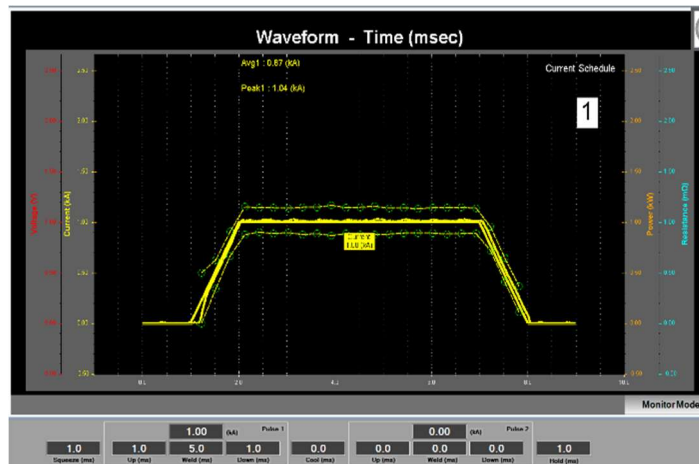
- Use the **Monitor Screen** to monitor each of the data types selected for display (i.e., Resistance, Voltage, Current and Power).



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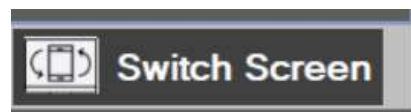
CHAPTER 5: USING UB-B SOFTWARE

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



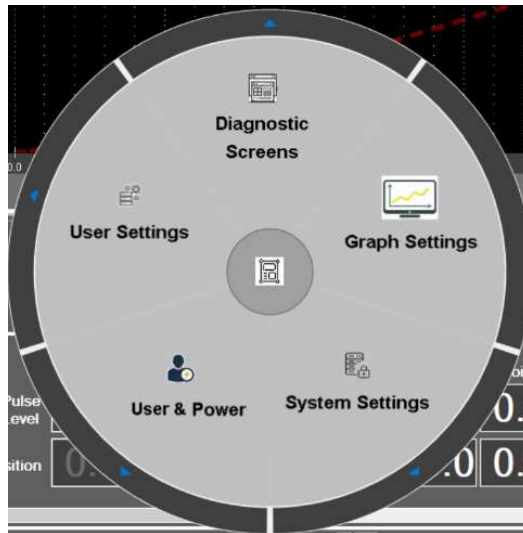
Switch Screen Button

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.



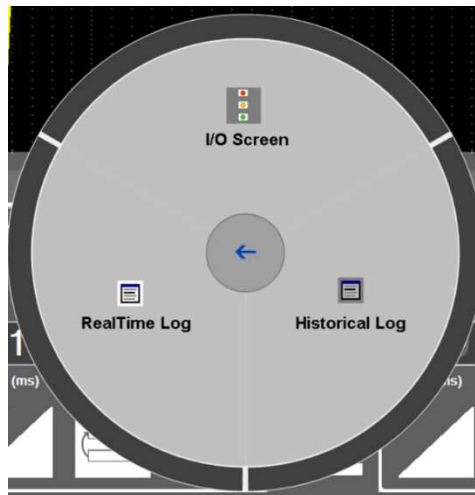
Circular Menu – Submenus and Tools

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.

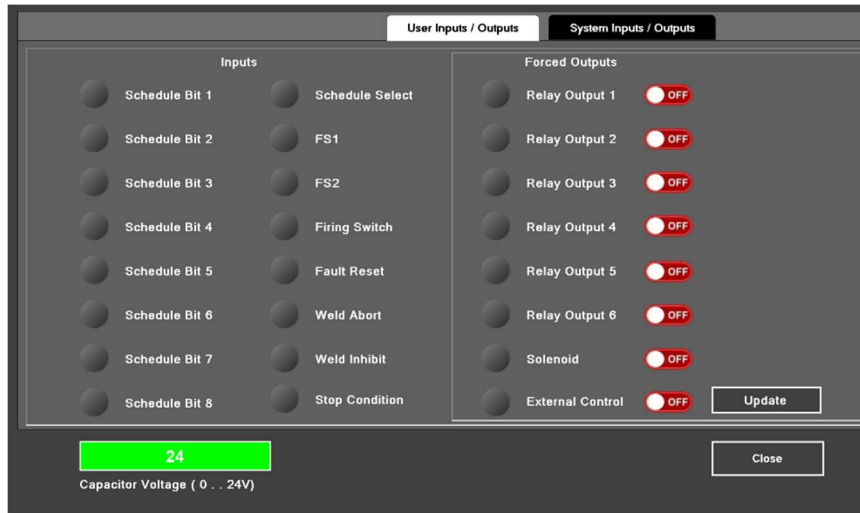


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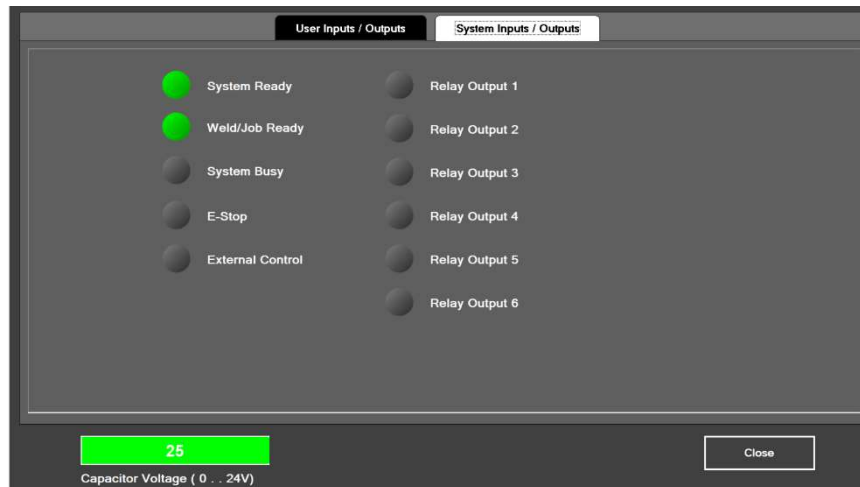
I/O Screen



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



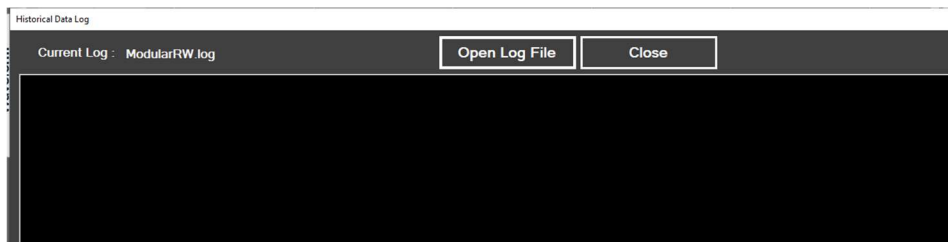
System Inputs/Outputs

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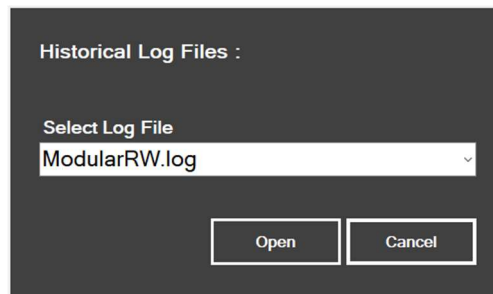
Historical Log



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.

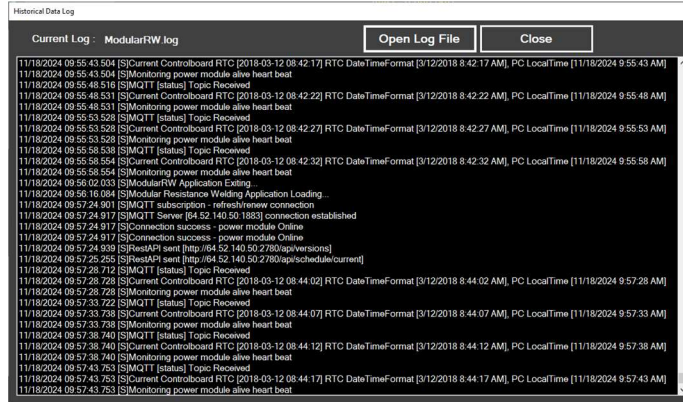


Click Open Log File, a list of available log files displays.



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

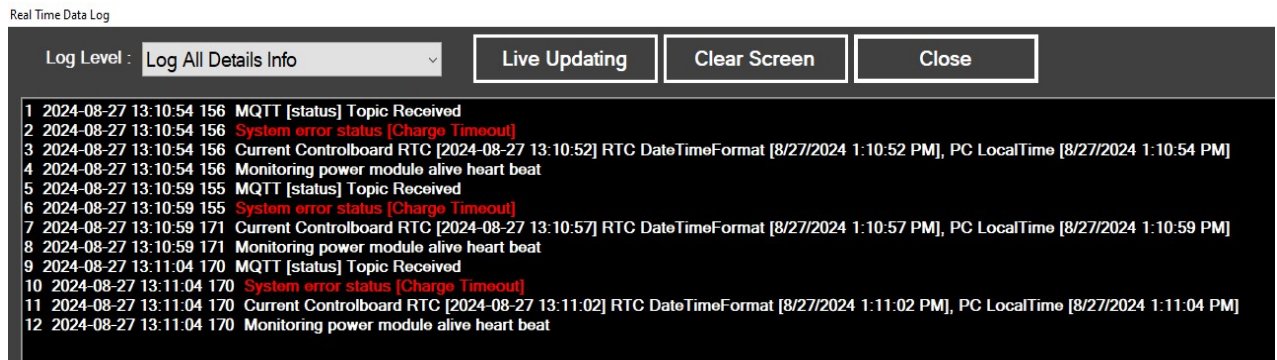
CHAPTER 5: USING UB-B SOFTWARE



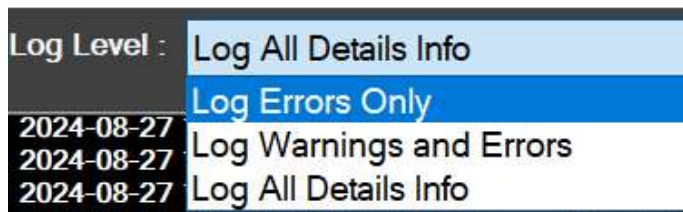
RealTime Log



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.



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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.

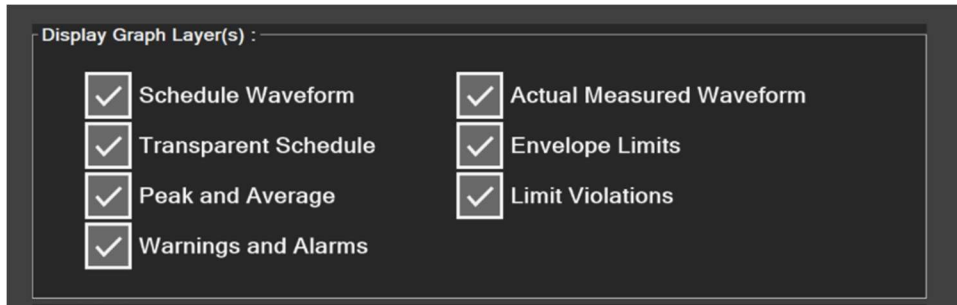
A screenshot of the Graph Settings interface. It has a dark background with white text and controls. The top section is titled "Display Graph Layer(s) :" and contains two columns of checkboxes, all of which are checked. The first column includes "Schedule Waveform", "Transparent Schedule", "Peak and Average", and "Warnings and Alarms". The second column includes "Actual Measured Waveform", "Envelope Limits", and "Limit Violations". Below this is the "Graph Scale" section, which has a dropdown menu for "Graph" currently set to "Y Axis - Current". Underneath are two sub-sections: "Auto Scale Y" and "Auto Scale X", both with checked checkboxes. The "Auto Scale Y" section has input fields for "Y Max" (1.500) and "Y Min" (0.000). The "Auto Scale X" section has input fields for "X Max" (21.836) and "X Min" (-1.857). At the bottom right are "Apply" and "Close" buttons.

Select one or more graph layers to be displayed.

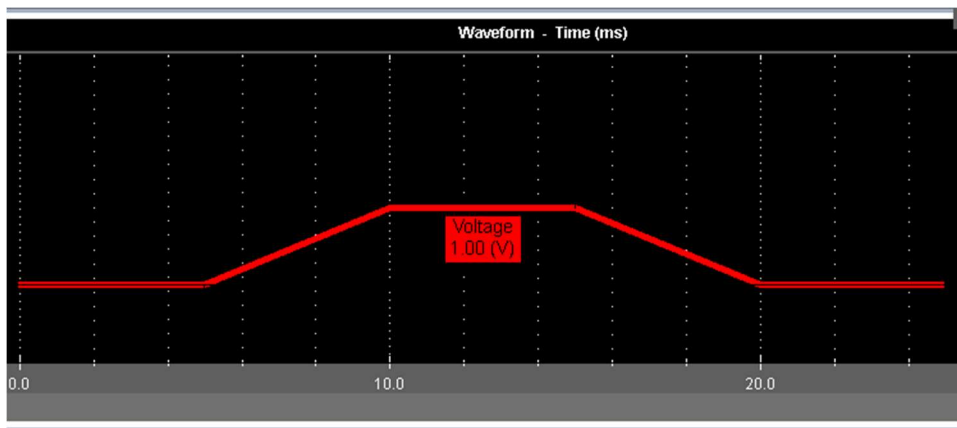
Display Graph Layer(s)

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

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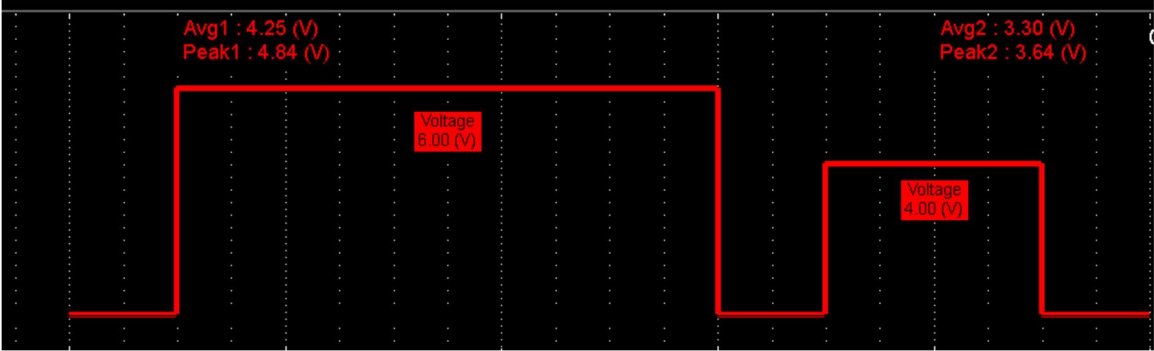


Select **Schedule Waveforms** to display the waveform created in the Schedule Window.



Pulse Waveform

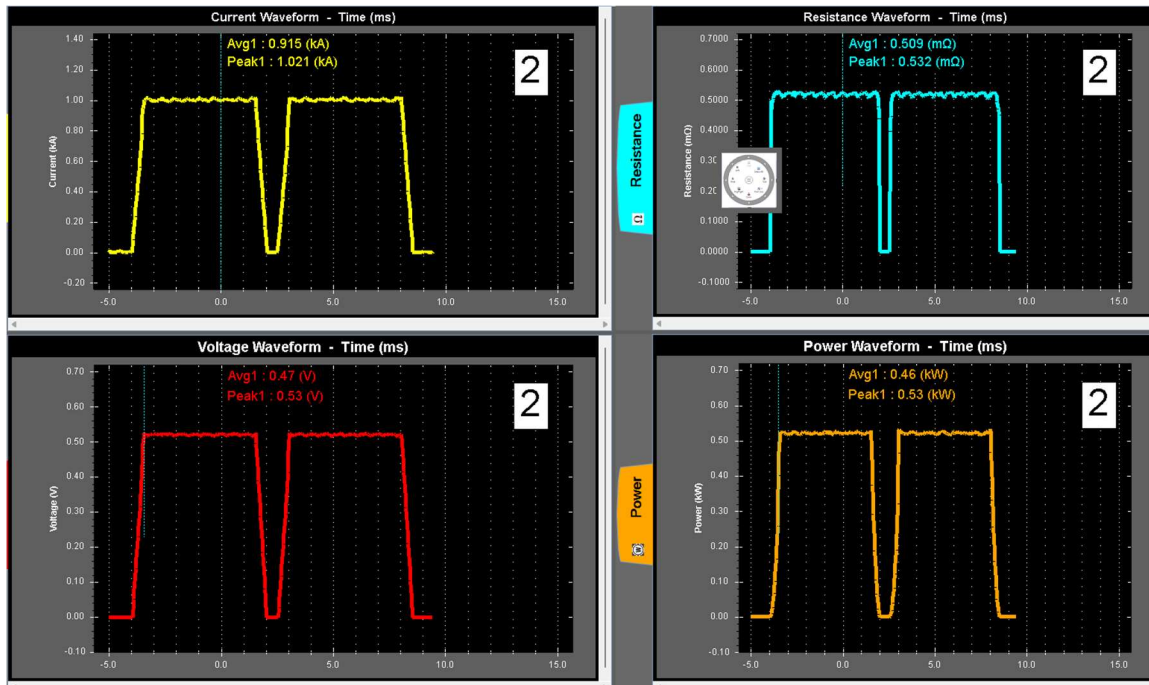
Select **Actual Measured Waveform** to display the waveform generated by the weld, displayed above the waveform for each pulse.



Actual Measured Waveform

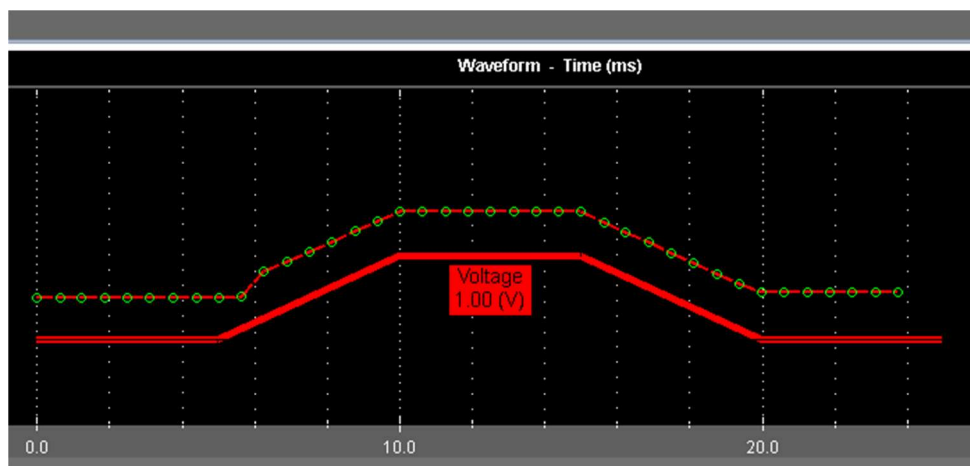
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Select **Peak and Average** to show the peak and average values for each of the waveforms displayed.



Peaks and Average Displayed

Select Envelope Limits to display the Envelope Limits.



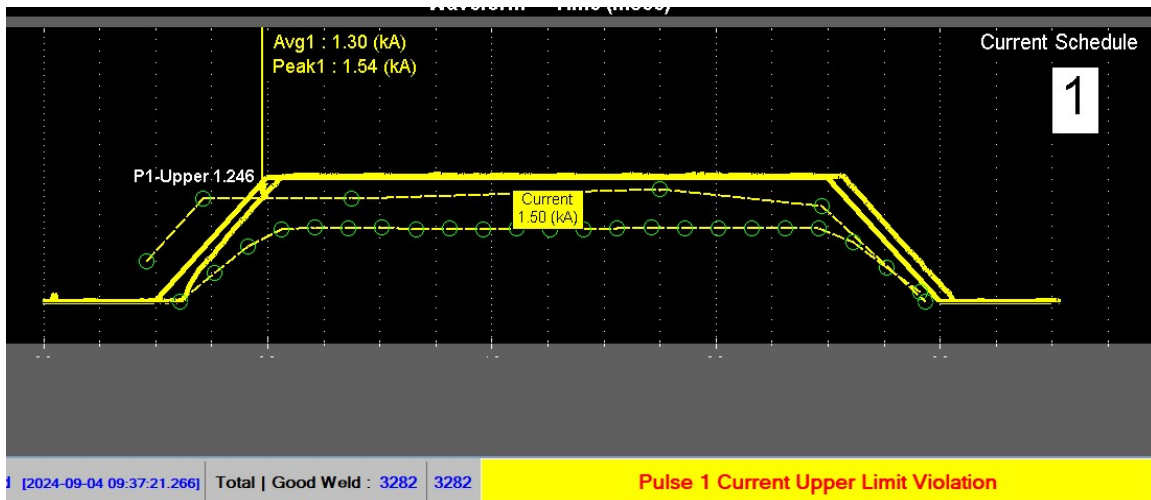
Display Envelope Limits

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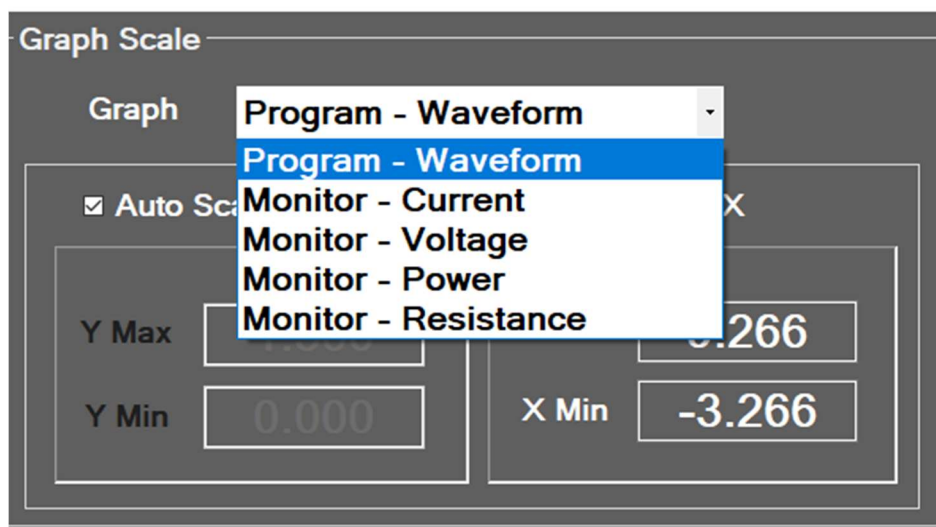
Select **Warnings and Alarms** to display warnings and alarms.

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.



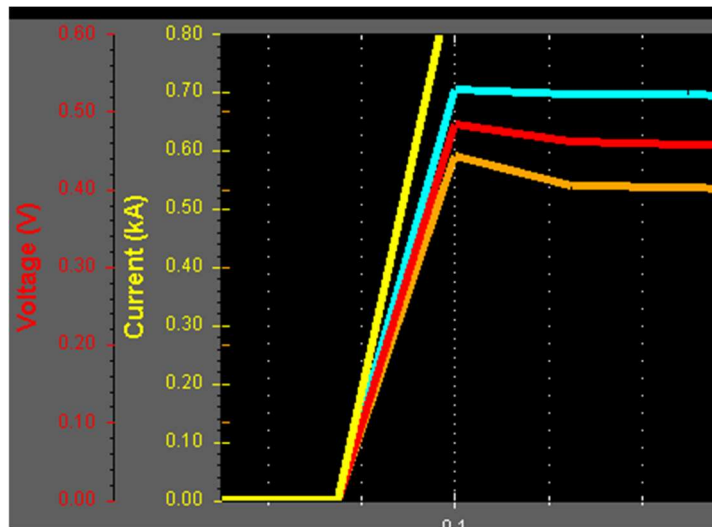
UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

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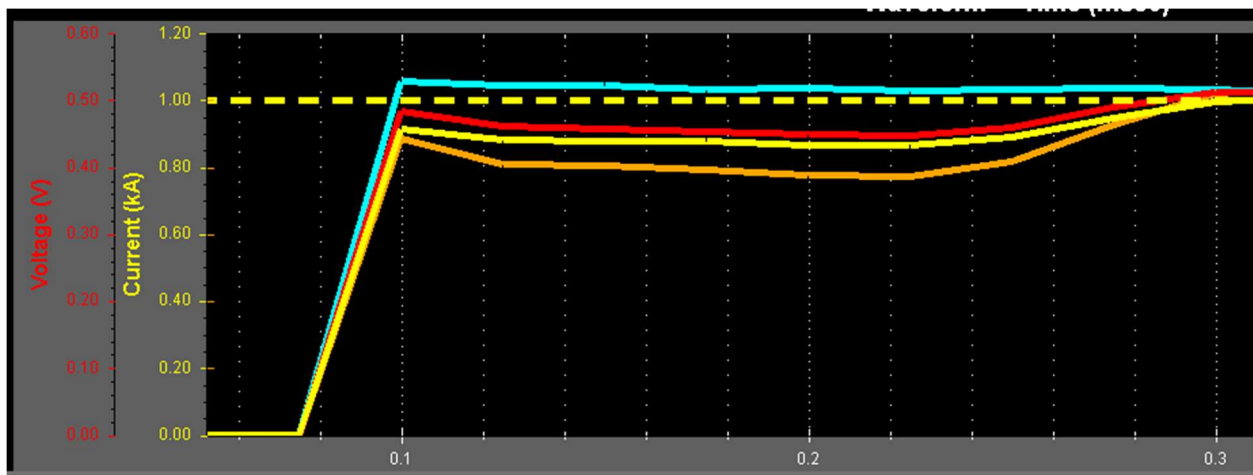
Auto Scale

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.



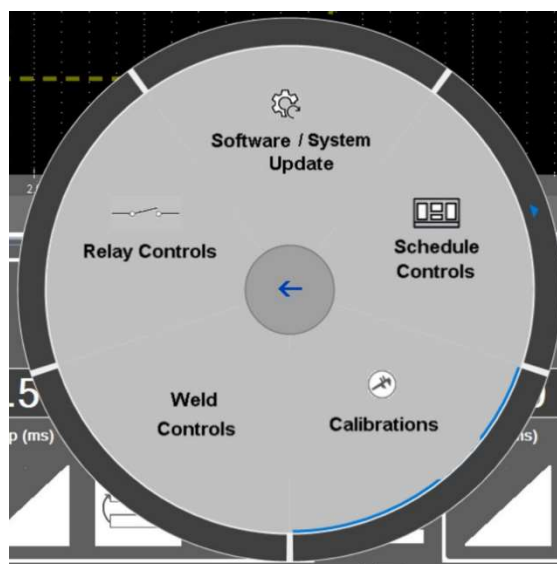
Setting the Auto Scale Y Axis for Current to 0.800 brings it more in line with the other graphs, allowing the user to see the proportional results for each.



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System Settings

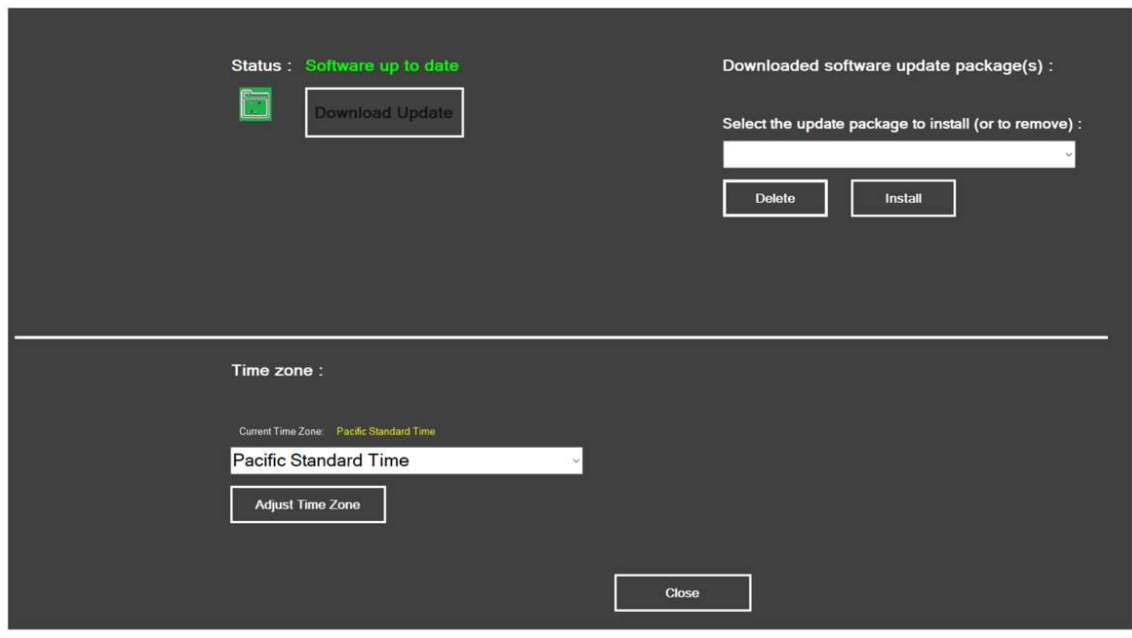
The System Settings icon launches the control tools.



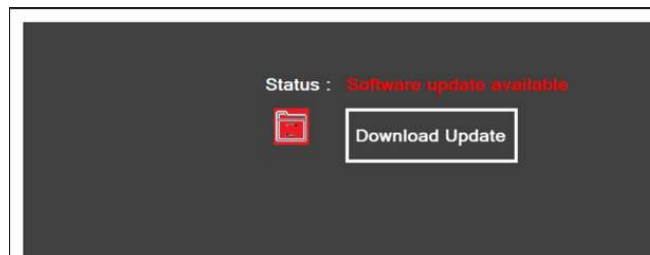
Software / Systems Update

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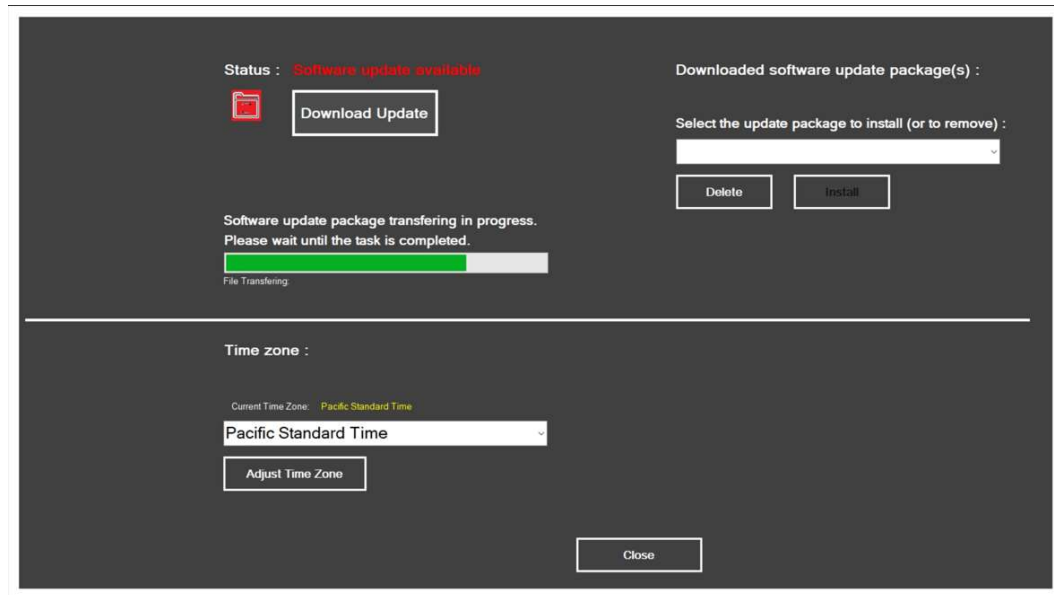
This window shows whether the installed software is current (as shown above). If it is not current, it will show that a Software update package is available (as shown below).



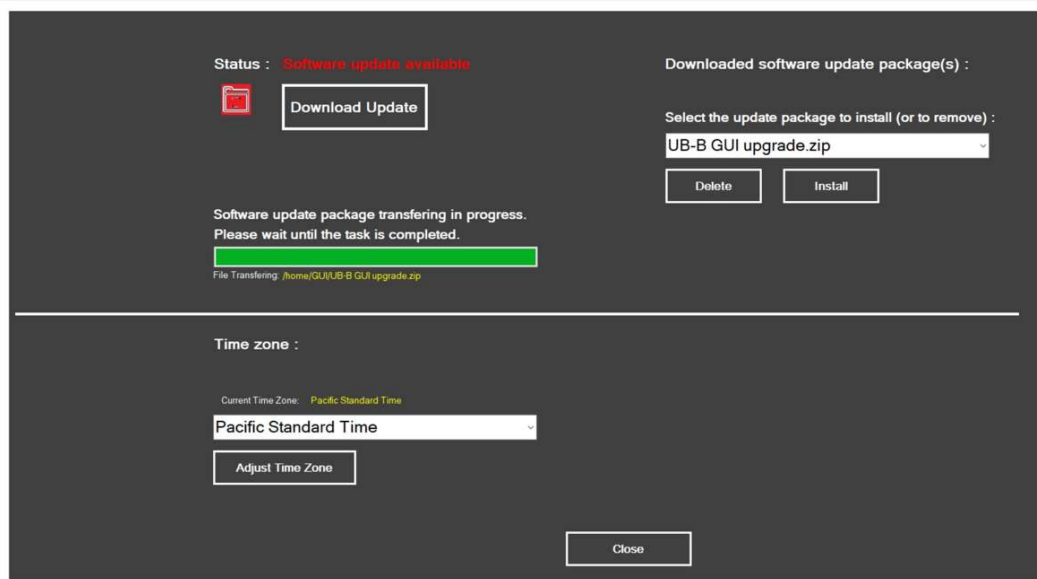
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Software Update Procedure

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.



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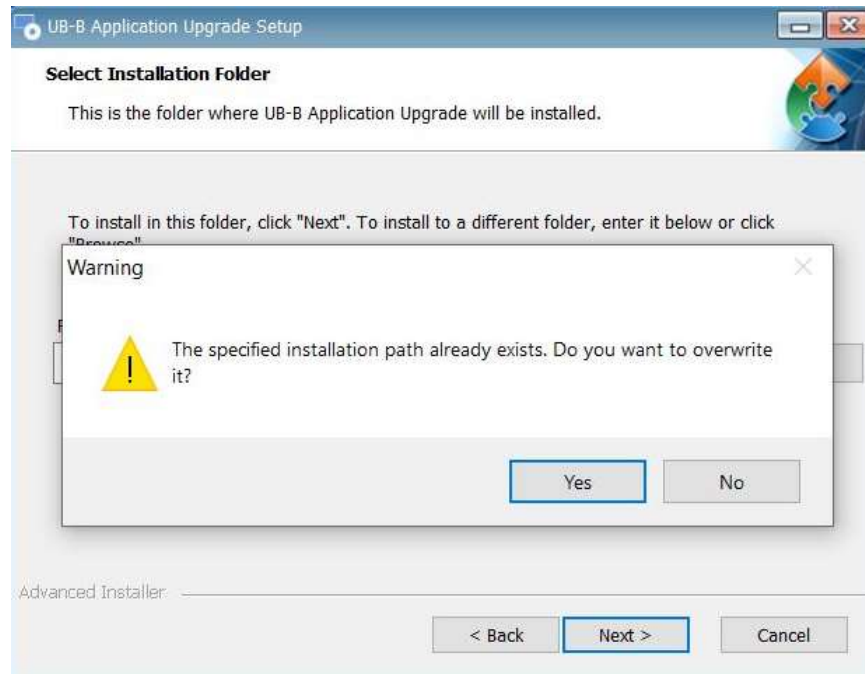
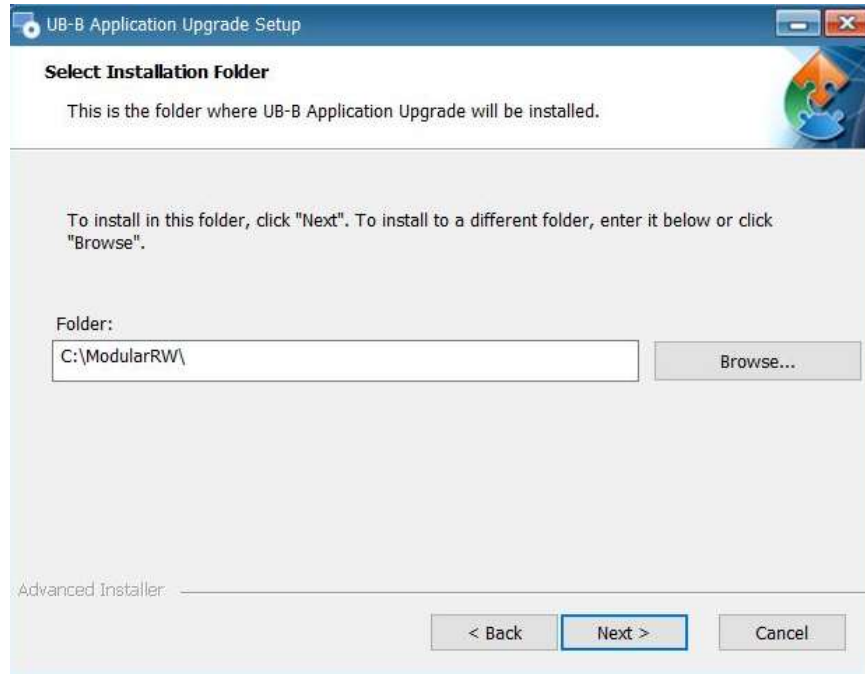
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3. Select the correct upgrade zip package to update and click on the Install button
4. Continue to upgrade.



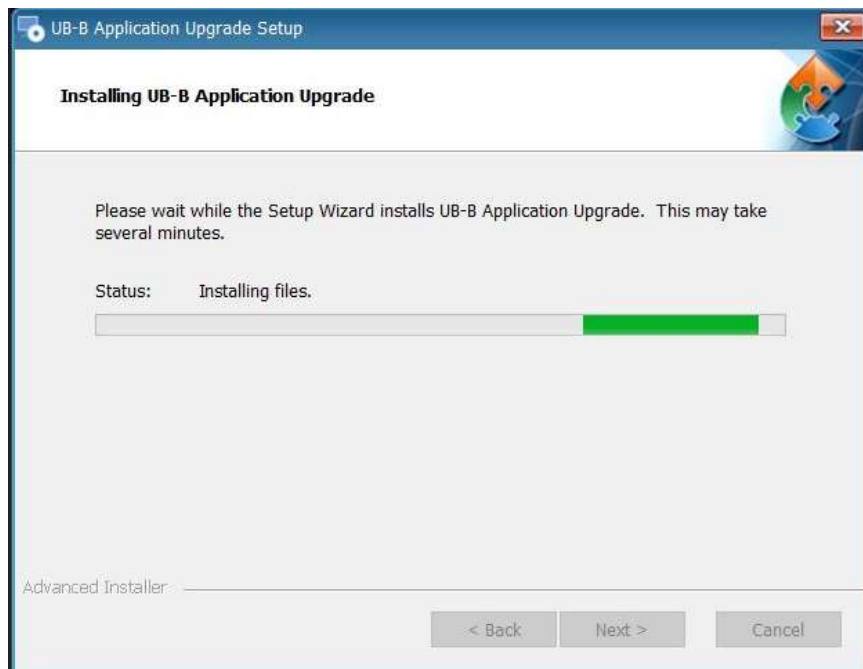
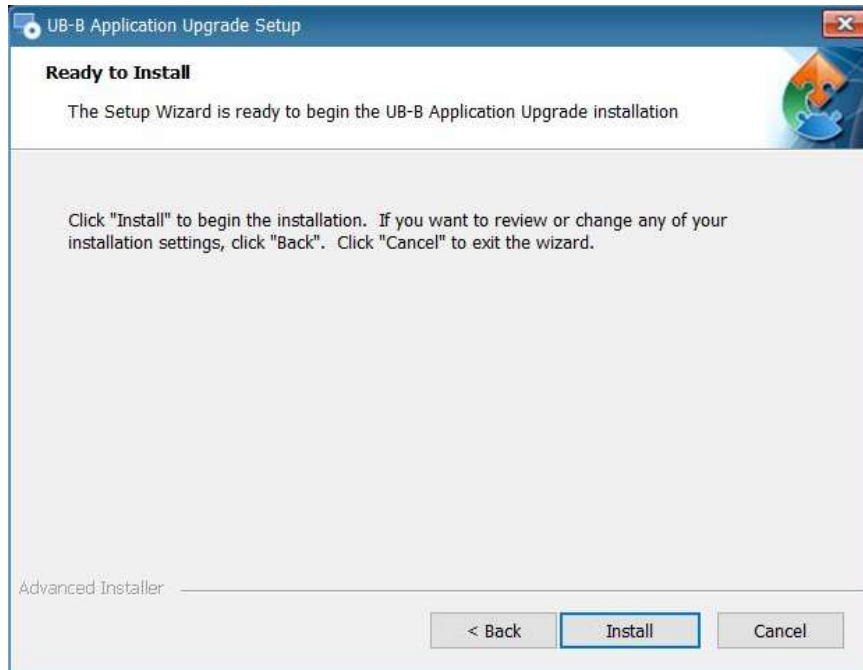
UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

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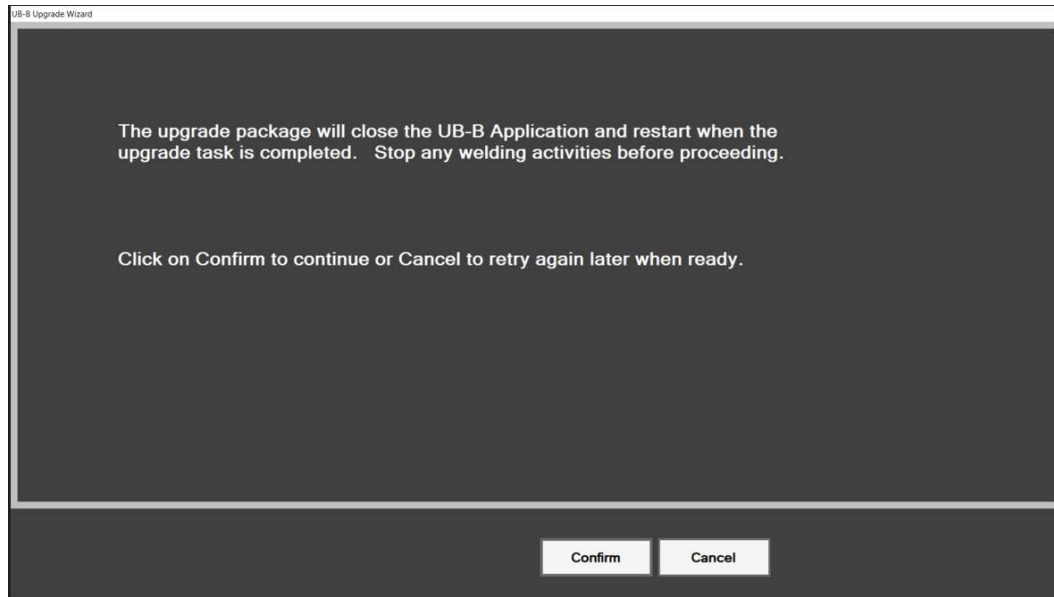
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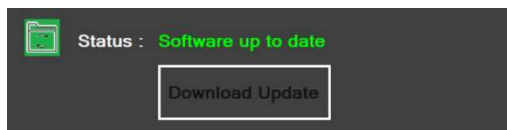
5. Click the Confirm button.

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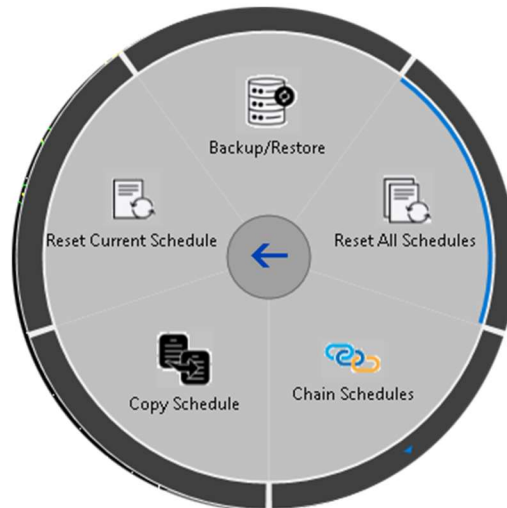
6. UB-B GUI will restart with the new update UB-B GUI version. Clicking on the Software / Systems Update icon again will show that the software is up to date.



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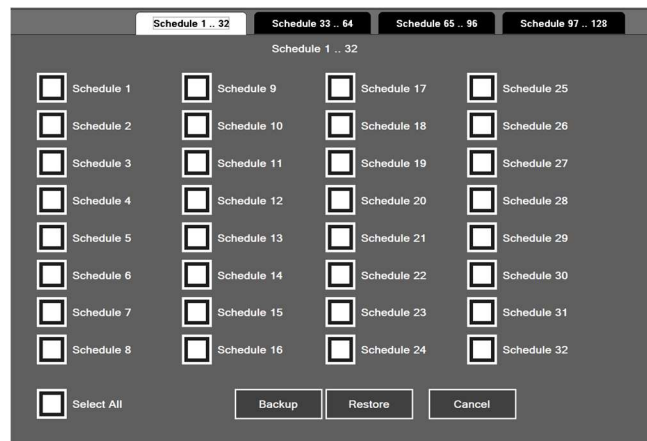
Schedule Controls

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.



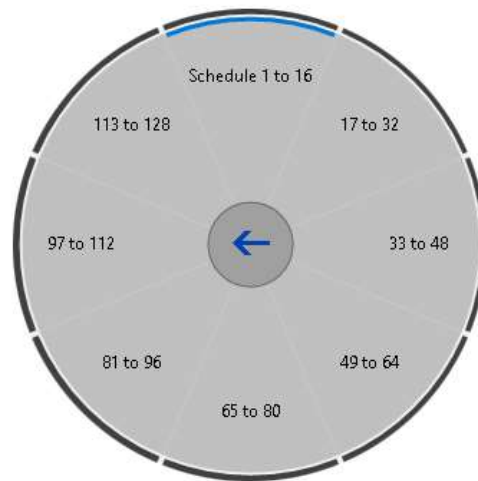
Reset All Schedules

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	<input type="text" value="6"/>	To Schedule	<input type="text" value="2"/>
		<input type="button" value="Copy"/>	<input type="button" value="Cancel"/>

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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 as 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.

The screenshot shows the 'System Calibration' window with the 'Control Loop Calibration' tab selected. The window title is 'System Calibration' and the tab is 'Control Loop Calibration'. The main content area is titled 'Calibration Parameters' and contains a table with four rows: Voltage, Current, Power, and Resistance. Each row has two input fields for 'Cal Offset' and 'Cal Gain', and a 'Calibration' button. The values in the input fields are 0.0000 and 1.0000. At the bottom of the window, there are buttons for 'Reset Default', 'Backup', 'Restore', 'Update', and 'Cancel'.

	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

The screenshot shows the 'Control Loop Calibration' window with the 'Control Loop Calibration' tab selected. The window title is 'System Calibration' and the tab is 'Control Loop Calibration'. The main content area is titled 'Control Loop Parameters' and contains a list of parameters with input fields. The values in the input fields are 80, 0, 128, 128, 128, 240, 240, and 128. At the bottom of the window, there are buttons for 'Reset Default', 'Backup', 'Restore', 'Update', and 'Cancel'. A note at the top right of the content area says '(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

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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 interface. The interface is divided into two columns of settings. 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, there are 'Update' and 'Cancel' buttons.

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.

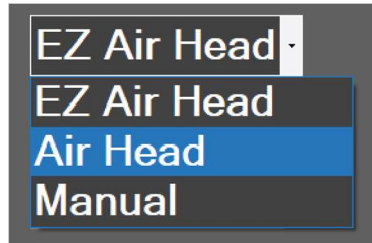
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Firing Switch Timeout

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.



(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.



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	<input type="text" value="1"/>	Welds Counter Limit	<input type="text" value="200000"/>
Total Welds Count	<input type="text" value="1"/>	Electrode Count Limit	<input type="text" value="0000000"/>
Electrode Count	<input type="text" value="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.

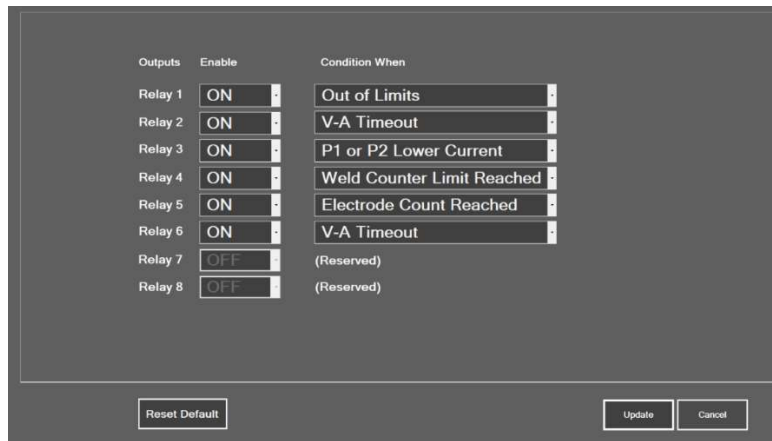
Device ID Number	<input type="text" value="1"/>
RS-232 Communication Role	<input type="text" value="Master"/>
Baud Rate	<input type="text" value="9600"/>
RS-232 Communication	<input type="checkbox" value="OFF"/>

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

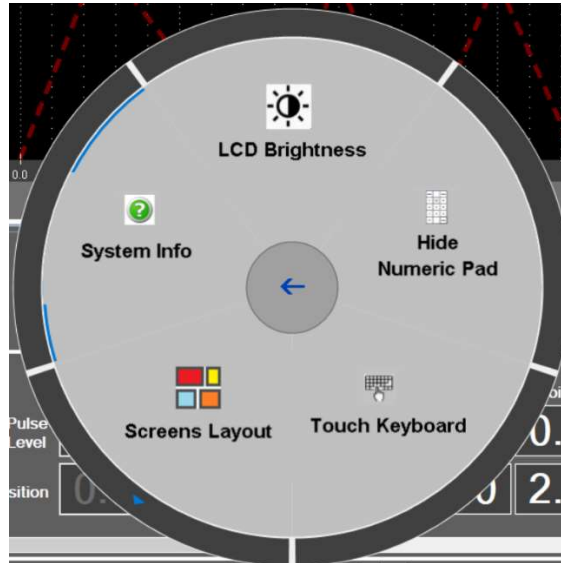
The User and Power menu provides access to basic functions such as shutting down or restarting the program, updating the user password or logging in.



User Settings



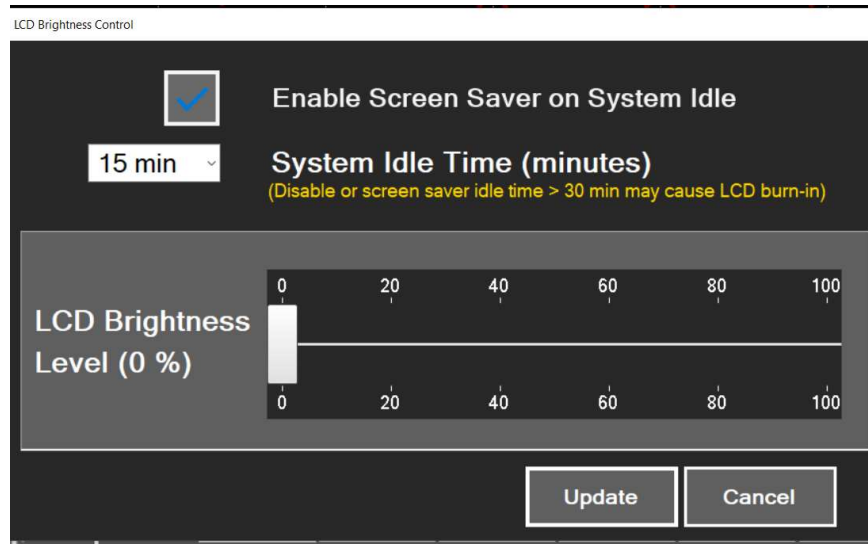
The User Settings tab launches the User Settings menu.



LCD Brightness

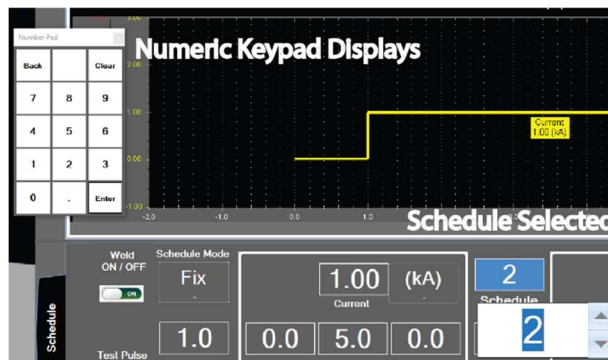
The LCD Brightness tool allows the user to vary the brightness of the interface window. The user can:

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



Use Numeric Keypad

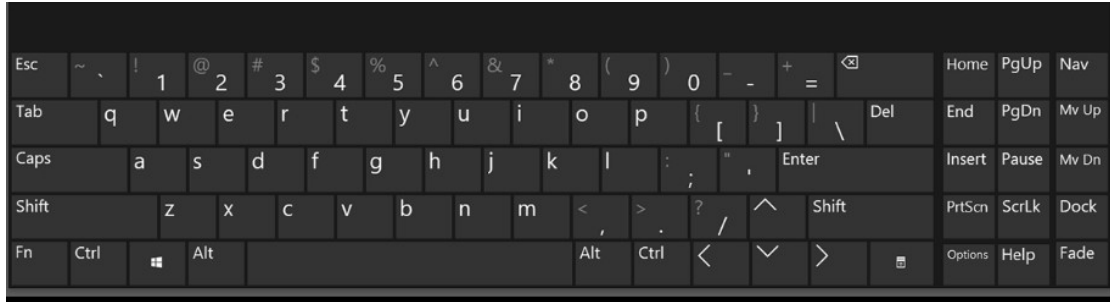
The Use/Hide Numeric Pad function allows the user to toggle between using and hiding the Numeric Keypad on the touchscreen interface. If Show is selected, the Numeric Keypad appears when the user selects a numeric field (e.g., Schedule). Click the X in the upper right hand corner of the keypad or use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



Touch Keyboard

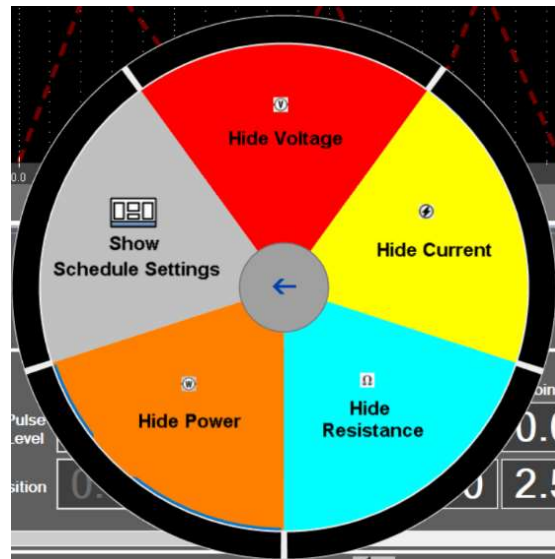
Opens the touch keyboard for full keyboard entry.

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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*.

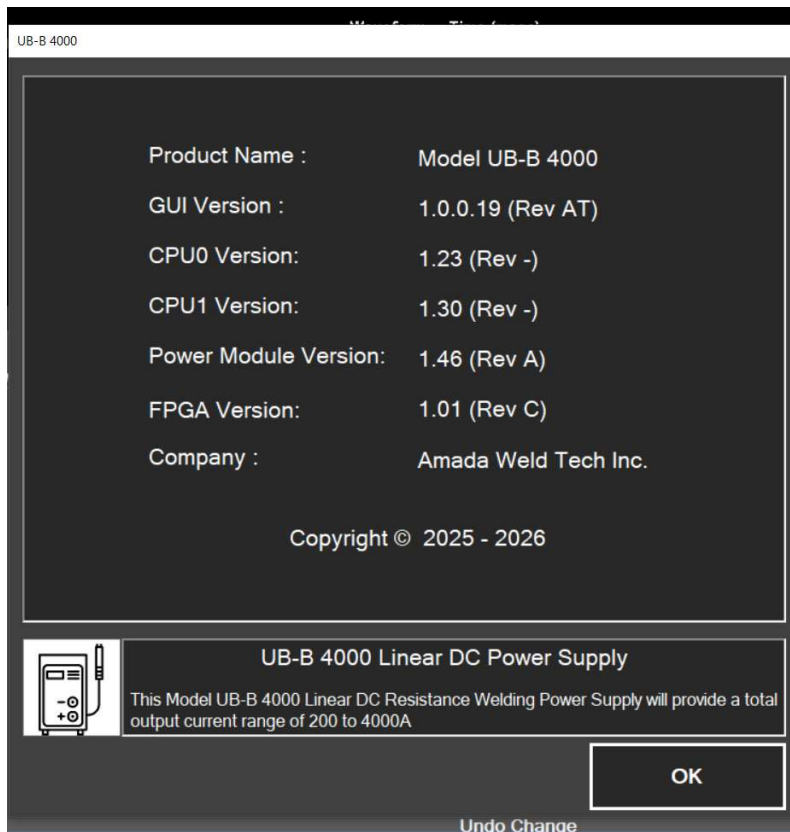


UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

CHAPTER 5: USING UB-B SOFTWARE

System Info

Displays essential information about the system.



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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.

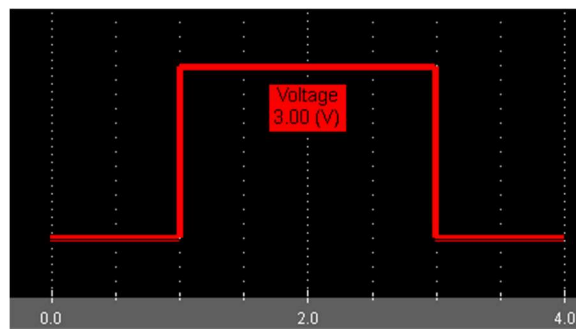
Description: This mode ramps up voltage until a set current level is reached and then delivers a programmed current.

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.



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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

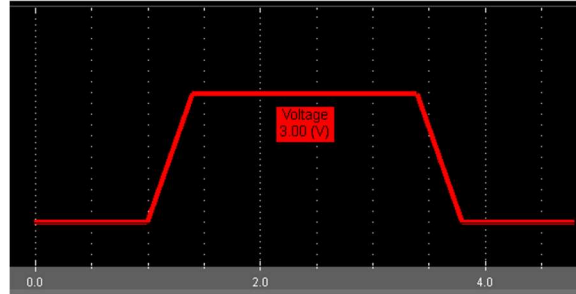
Pulse 2: Enter 0 for all Pulse 2 values

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**.



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

CHAPTER 6: DEVELOPING WELD SCHEDULES

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

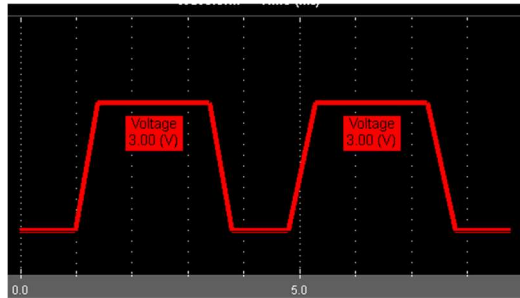
Cool Time: 1.0 mms

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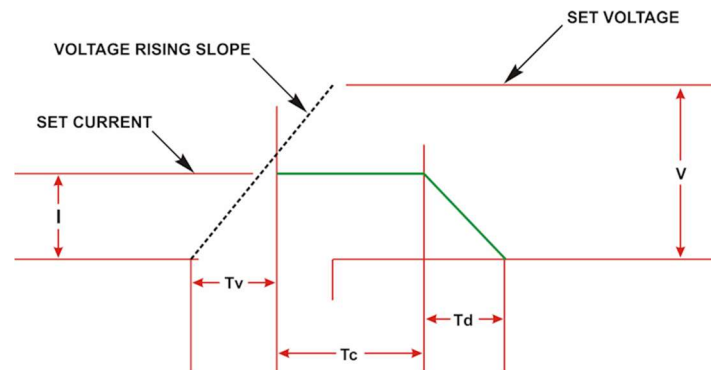
13. **Hold Time:** Enter a time between 0 and 999 mms. Recommended value: 50 mms.

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.

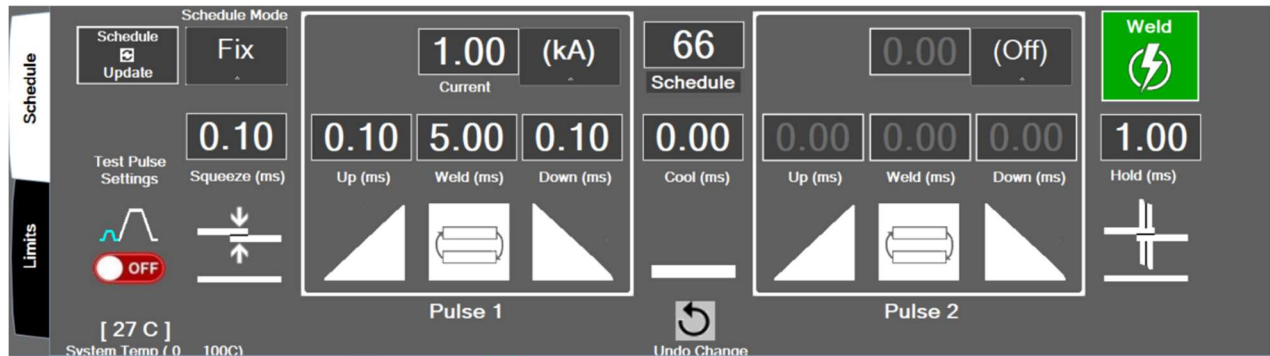
CHAPTER 6: DEVELOPING WELD SCHEDULES

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.



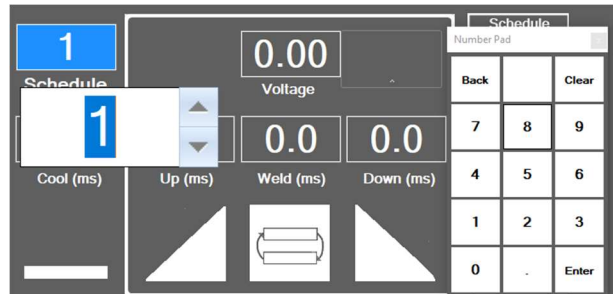
Default Weld Schedule

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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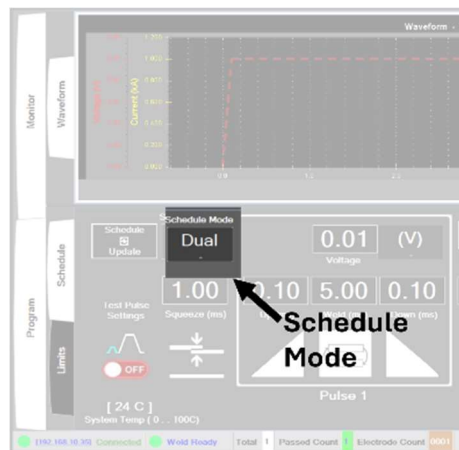


Click in the box and use the ▲▼ (up/down) arrows or the keypad to enter the number of the schedule you want to program. The current settings for the selected schedule will display. (In the example above, Schedule 1 is still in the default schedule configuration.) This method applies to most fields in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



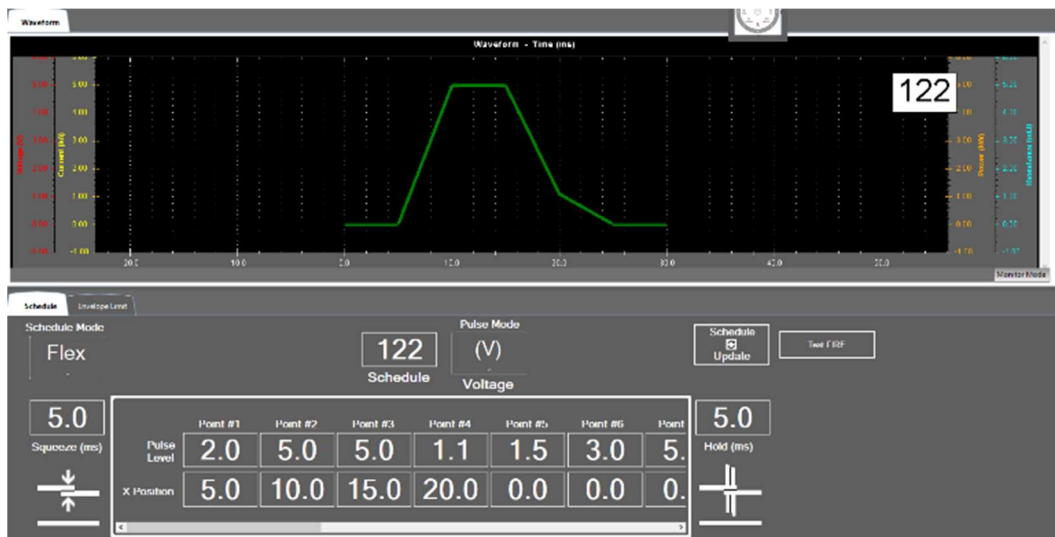
Dual Pulse Mode allows the user to set a single value for each segment in the weld sequence.

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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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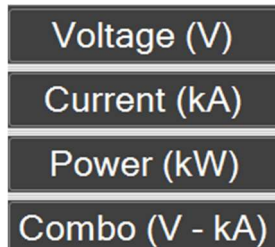
3. Set the Squeeze Time

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.

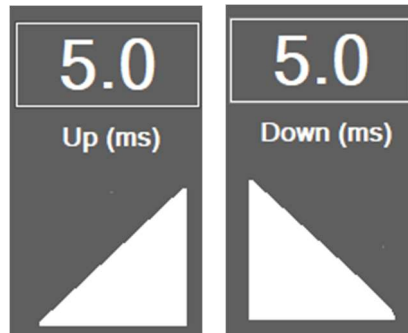


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5. Set any upslope and/or downslope times for that pulse.

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

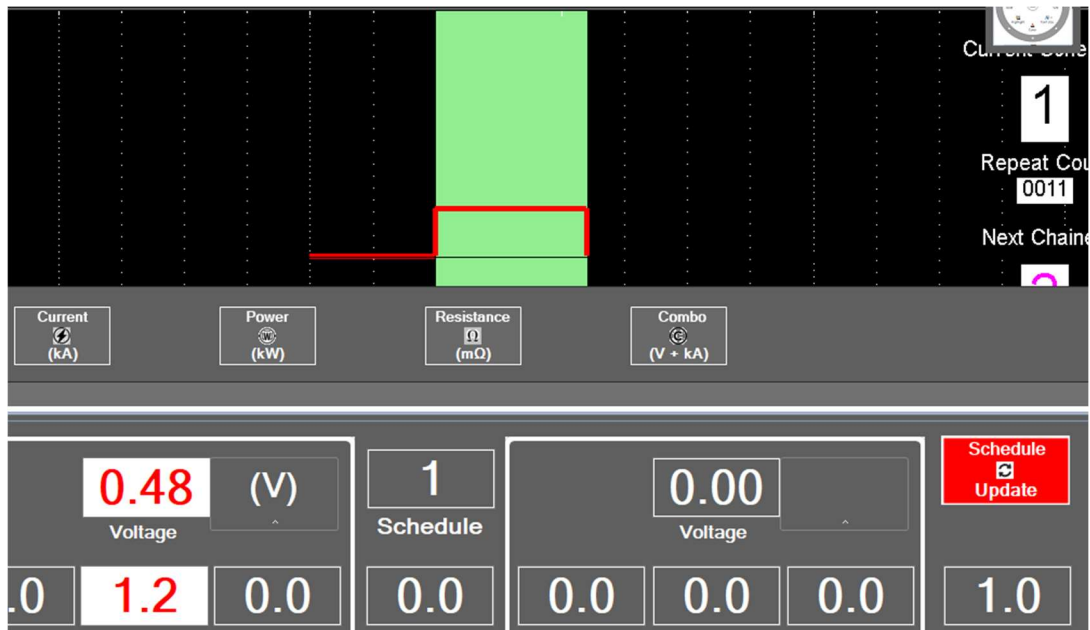
Note: Minimum value for Upslope or Downslope is 0.1 mms.



6. Click on Schedule Update to save any changes.

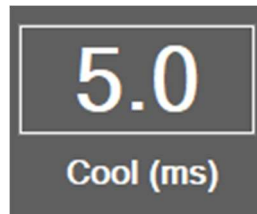
- a. **Note:** As you develop a weld schedule, a graphic representation of its waveform will form in the Weld Waveform window. If you select Waveform Show Fills (in the Graph Settings window) and then modify a given part of a weld schedule, that part will be highlighted in green in the Waveform window 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.

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7. Set the Cool Time.

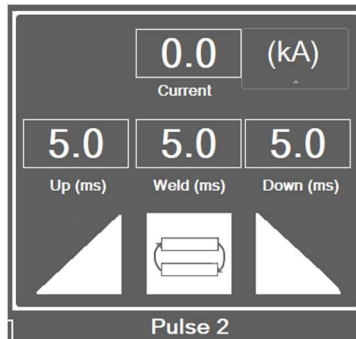
Select the Cool (mms) field to set the cool time.



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.

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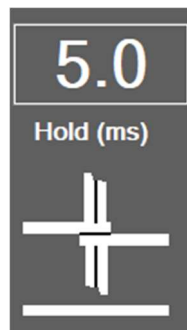
8. If Pulse 2 is required, select the energy type, duration, upslope and downslope for Pulse 2.



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.

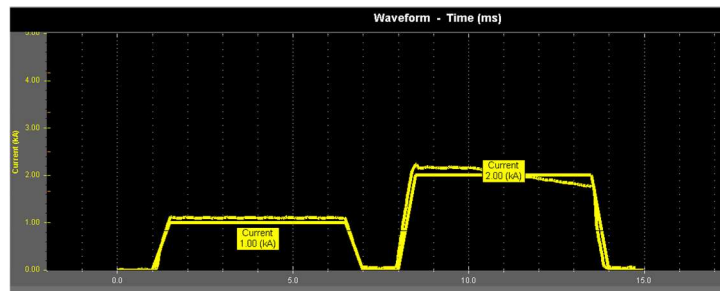
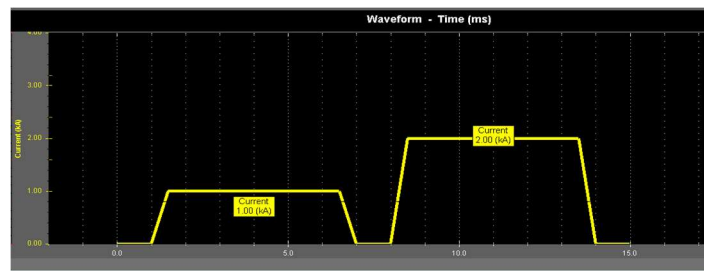
The Waveform Window should now display a graphic representation of the saved weld schedule.

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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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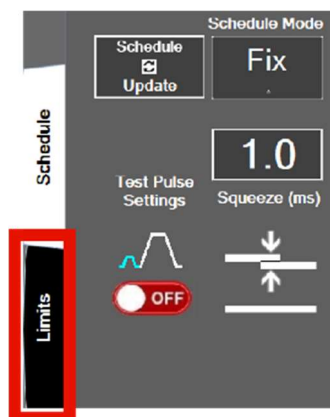
Working with Envelope Limits

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.)

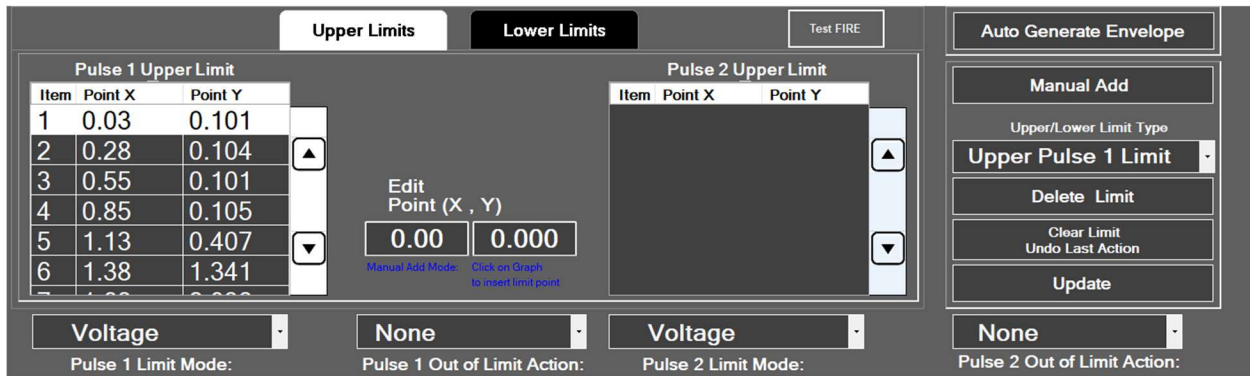
Users familiar with earlier versions of these power supplies will find the same envelope limit functions and tools found in earlier models; accessing those functions and tools is now simpler and more intuitive. For example, limits are programmed from the Program Screen rather than switching to the Run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

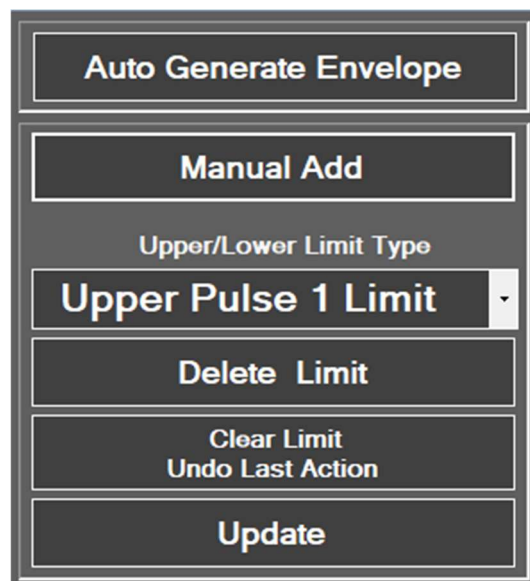


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The Limits Window displays.

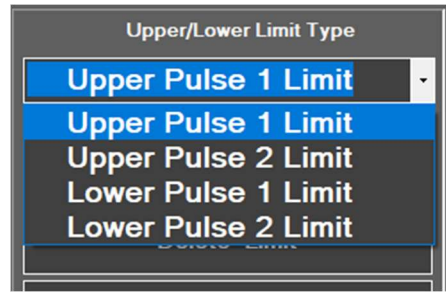


3. Select either **Auto Generate Envelope** or **Manual Add** from the Limits Controls panel on the right.



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

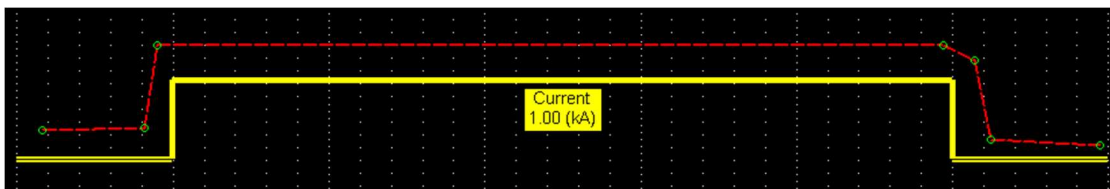
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- a. **Note:** You can only add a limit to a pulse which has already been scheduled through the Schedule tab.

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		
Item	Point X	Point Y
3	1.45	1.13
4	3.39	1.15
5	4.28	1.16
6	5.10	1.13
7	6.11	1.17

▲

▼

Edit
Point (X, Y)

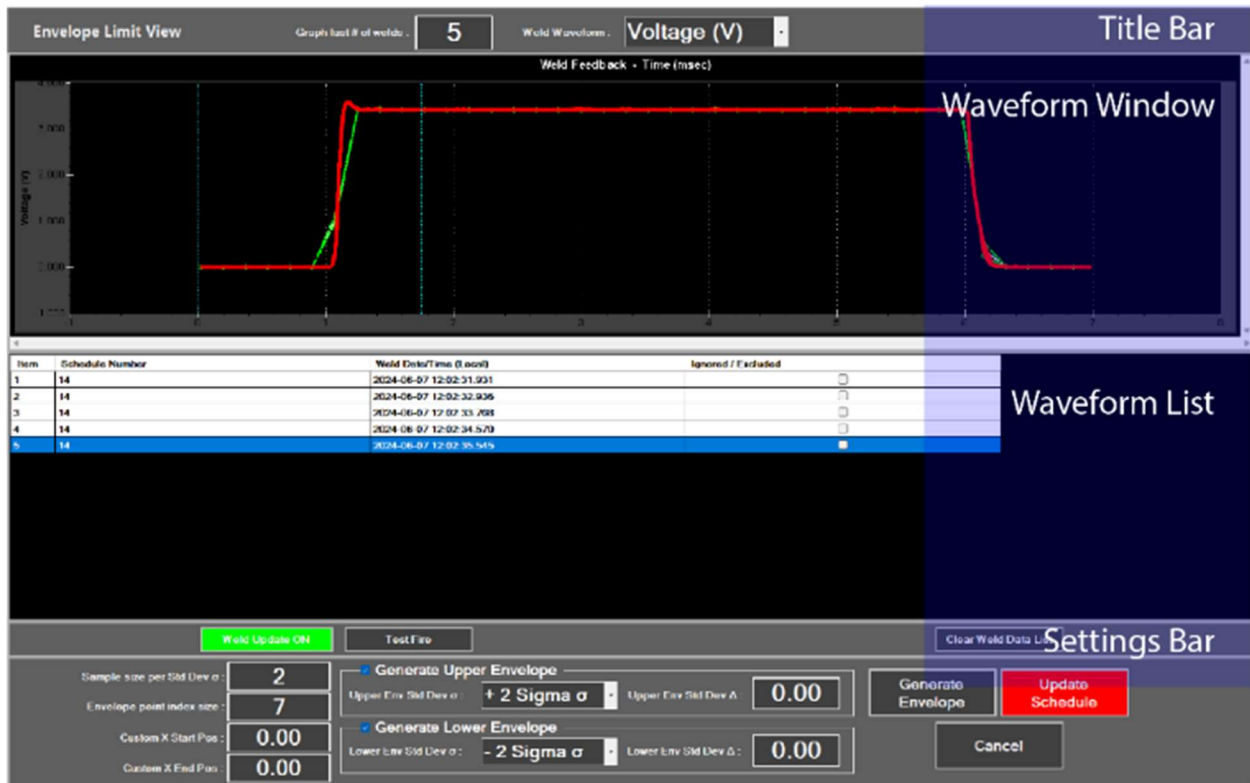
1.45

1.13

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If you have selected Auto Generate Envelope

The Envelope Limit View window displays.



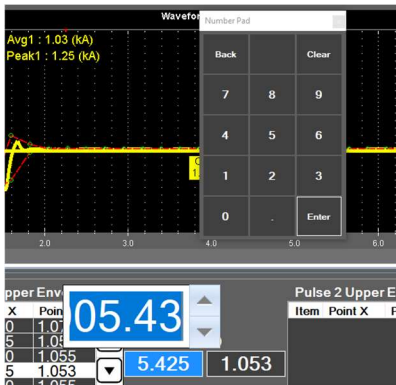
The Envelope Limit View window has four sections.

- **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.

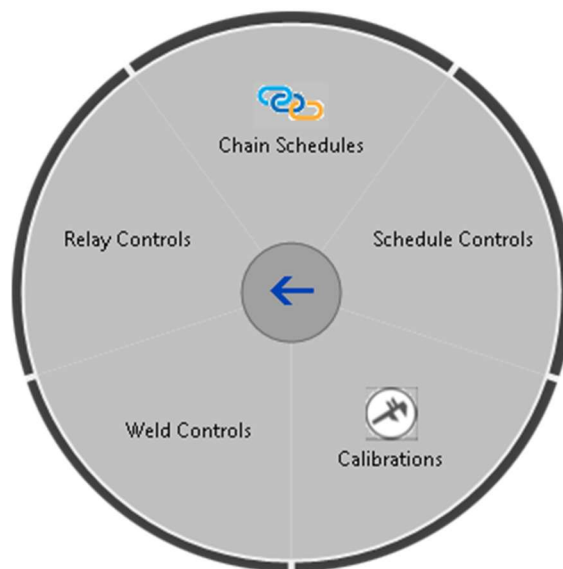
Pulse 2

- 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.

CHAPTER 6: DEVELOPING WELD SCHEDULES

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 Alarm
Relay 3	ON	Out of Limits
Relay 4	ON	V-A Timeout
Relay 5	ON	Unit Ready
Relay 6	ON	Pulse1 Upper Limit
Relay 7	OFF	Pulse1 Lower Limit
Relay 8	OFF	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 Enable
		Weld Counter Limit Reached
		Electrode Count Reached

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 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

Condition When dropdown menu options:

- Weld
- End of Weld Alarm
- Out of Limits
- V-A Timeout
- Unit Ready
- 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.

CHAPTER 6: DEVELOPING WELD SCHEDULES

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

CHAPTER 6: DEVELOPING WELD SCHEDULES

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.

CHAPTER 6: DEVELOPING WELD SCHEDULES

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.



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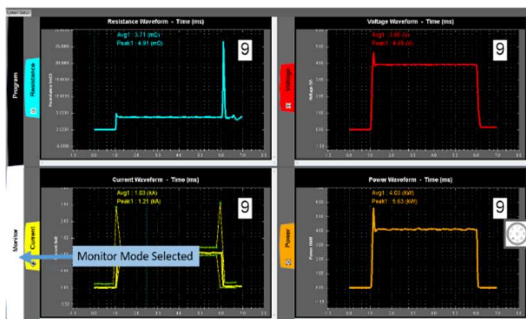
Initial Setup

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

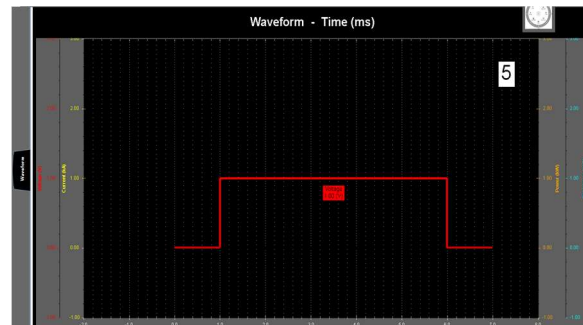
Always observe safety precautions and wear safety glasses when welding.

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.)

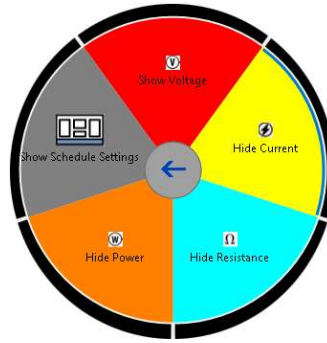


Monitor Screen



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.)

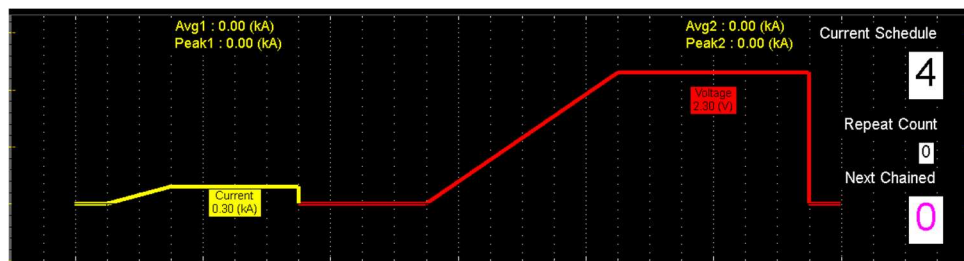
Use Combo Mode or Test Pulse to perform a pre-weld check.

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.

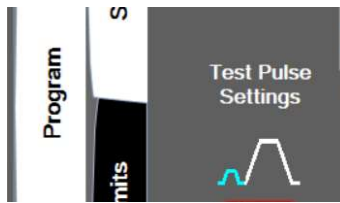
Note: You must have Upslope programmed into the pulse to set a lower limit.

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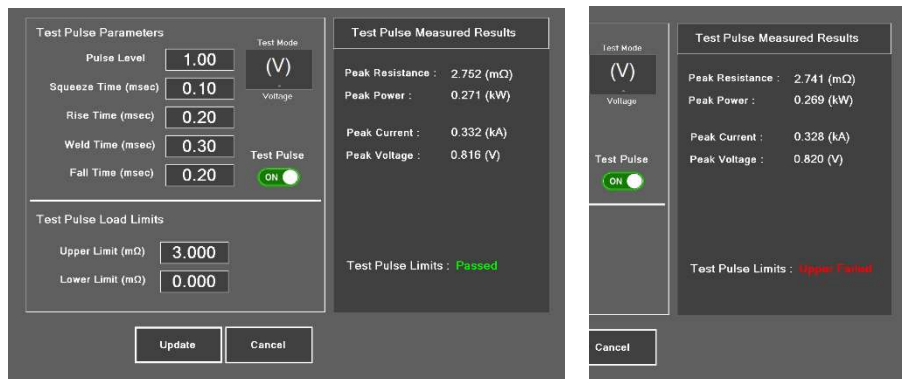
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Test Pulse

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



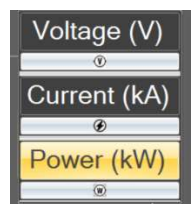
This launches the Test Pulse Parameters Window.



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.

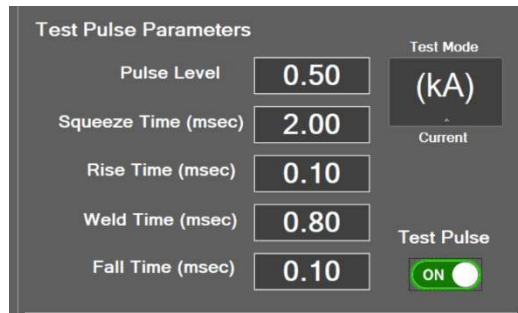
Click on the Test Mode field in the Upper right corner to select Voltage, Current or Power.

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

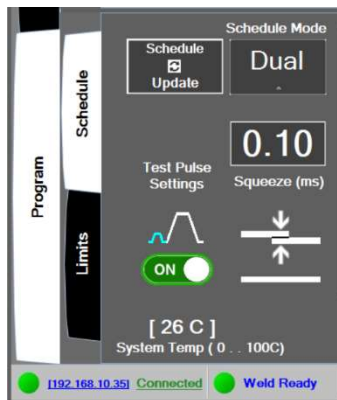


Set Test Pulse to ON and click Update.

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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.

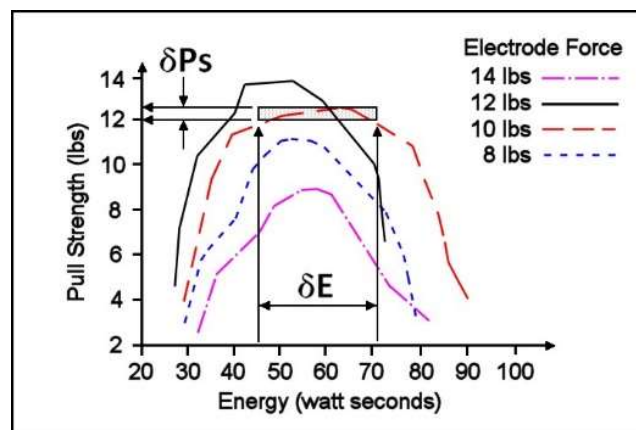
- **Quality Requirements**
 - Pull strength
 - Visual criteria
 - Test method

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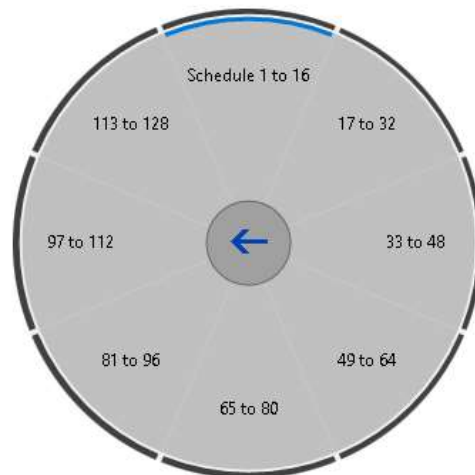
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A comparison of weld schedules for several different applications might show that they could be consolidated into one or two weld schedules. This would have obvious manufacturing advantages.

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

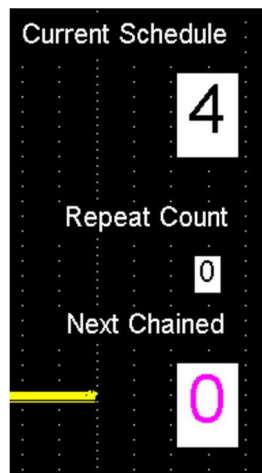
Chain Schedule	Repeat Count	Next Schedule	Chain Schedule	Repeat Count	Next Schedule
001	0000	000	009	0000	000
002	0000	000	010	0000	000
003	0000	000	011	0000	000
004	0000	000	012	0000	000
005	0000	000	013	0000	000
006	0000	000	014	0000	000
007	0000	000	015	0000	000
008	0000	000	016	0000	000

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.



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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.

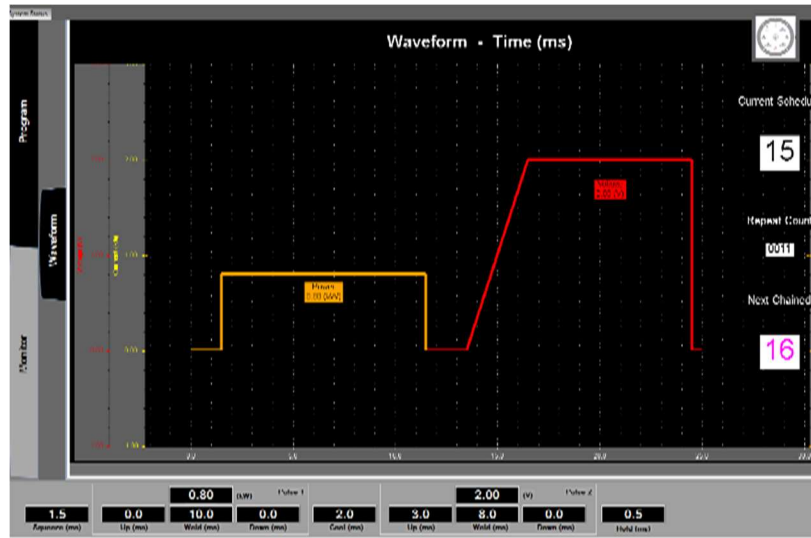
Programming For Active Part Conditioning

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.

CHAPTER 7: OPERATING INSTRUCTIONS

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.

CHAPTER 7: OPERATING INSTRUCTIONS

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	

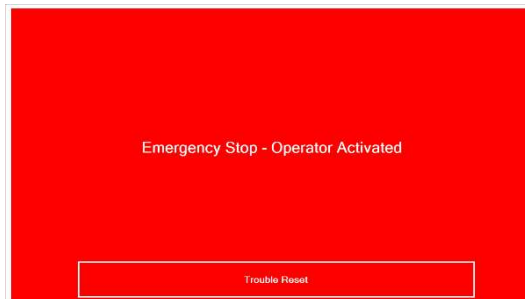
Update Cancel

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

CHAPTER 7: OPERATING INSTRUCTIONS

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.



Chapter 8 MAINTENANCE

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

CHAPTER 8: MAINTENANCE

- 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	<p>Air valve driver cable not connected. (Check that the Power Supply switches to STANDBY state when footswitch is activated).</p> <p>Check that the air supply is properly connected to the weld head.</p>
Electrode Damage	<p>Excessive current/energy set at the Power Supply.</p> <p>Excessive or insufficient weld head force.</p> <p>Wrong electrode tip shape.</p> <p>Misaligned parts.</p> <p>Excessive weld time set at the Power Supply.</p> <p>Contaminated weld piece surface/ plating.</p> <p>Wrong electrode material.</p> <p>Contaminated electrode surface.</p>

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

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

Troubleshooting Chart	
PROBLEM	CAUSE (In Order of Probability)
<p>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.</p>	<p>Possible open circuit in the secondary circuit. Electrodes did not close properly.</p> <p>Possible failed Capacitor Charging Power Supply. Contact AMADA WELD TECH for support.</p>
<p>Metal Expulsion</p>	<p>Excessive current/energy set at the Power Supply.</p> <p>Insufficient weld head force.</p> <p>Misaligned parts.</p> <p>Slow weld head follow-up.</p> <p>Incompatible weld piece projection design.</p> <p>Contaminated weld piece surface/ plating.</p> <p>Incompatible weld piece materials.</p> <p>Contaminated electrode surface.</p> <p>Wrong electrode tip shape.</p> <p>No cover gas on weld piece.</p> <p>Excessive weld time set at the Power Supply.</p> <p>Misaligned parts.</p> <p>Polarity reversed on Voltage Sense cable</p>

Troubleshooting Chart	
PROBLEM	CAUSE (In Order of Probability)
Weld Piece Discoloration	<ul style="list-style-type: none">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	<ul style="list-style-type: none">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	<ul style="list-style-type: none">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.

CHAPTER 8: MAINTENANCE

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.

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

CHAPTER 8: MAINTENANCE

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

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

Chapter 9 CALIBRATION

Equipment Required for Calibration

To properly calibrate the UB Welding Power Supply, you will need the following items:

- Digital oscilloscope, *Agilent* MSO6034A or equivalent
- DC Power Supply *Agilent* 3630A or equivalent
- Calibration Kit. See the table below for Kit part numbers and list of contents.

Calibration Kit

Item	UB-1500A Cal Kit	UB-4000B Cal Kit
	Pt # 10-397-01	Pt # 10-398-01
Shunt	563-004 (0.004 Ω)	563-001 (0.0025 Ω)
Shunt Adapter	4-39426-01	4-39426-01
Weld Cables (pair)	18-20U-BB-12	18-20U-BB-12
Calibration Support Kit	4-35914-01	4-35914-01
Firing Switch Cable	4-39179-01	4-39179-01
Connection Hardware	<i>included</i>	<i>included</i>

The Calibration Kit also includes shunts. If replacing or sourcing the shunt resistors, use these shunts for calibration:

Model	Coaxial Resistor	T&M Research Products P/N
UB-1500B	4.000 milliohm \pm 0.5 %	Model K-1000-2, 150 Watts, Mod 0.0040
UB-4000B	2.500 milliohm \pm 0.5 %	Model K-2000-4, 150 Watts, Mod 0.0025

Source for shunt resistors

T & M Research Products, Inc.

CHAPTER 8: CALIBRATION

139 Rhode Island Street NE
Albuquerque, New Mexico 87108
Telephone: (505) 268-0316
www.tandmresearch.com

Calibration Equipment Setup

Note: You must be logged in as an Engineer to be able to calibrate the power supply.

Gather the required calibration equipment listed above and set it up as shown in the following two diagrams.

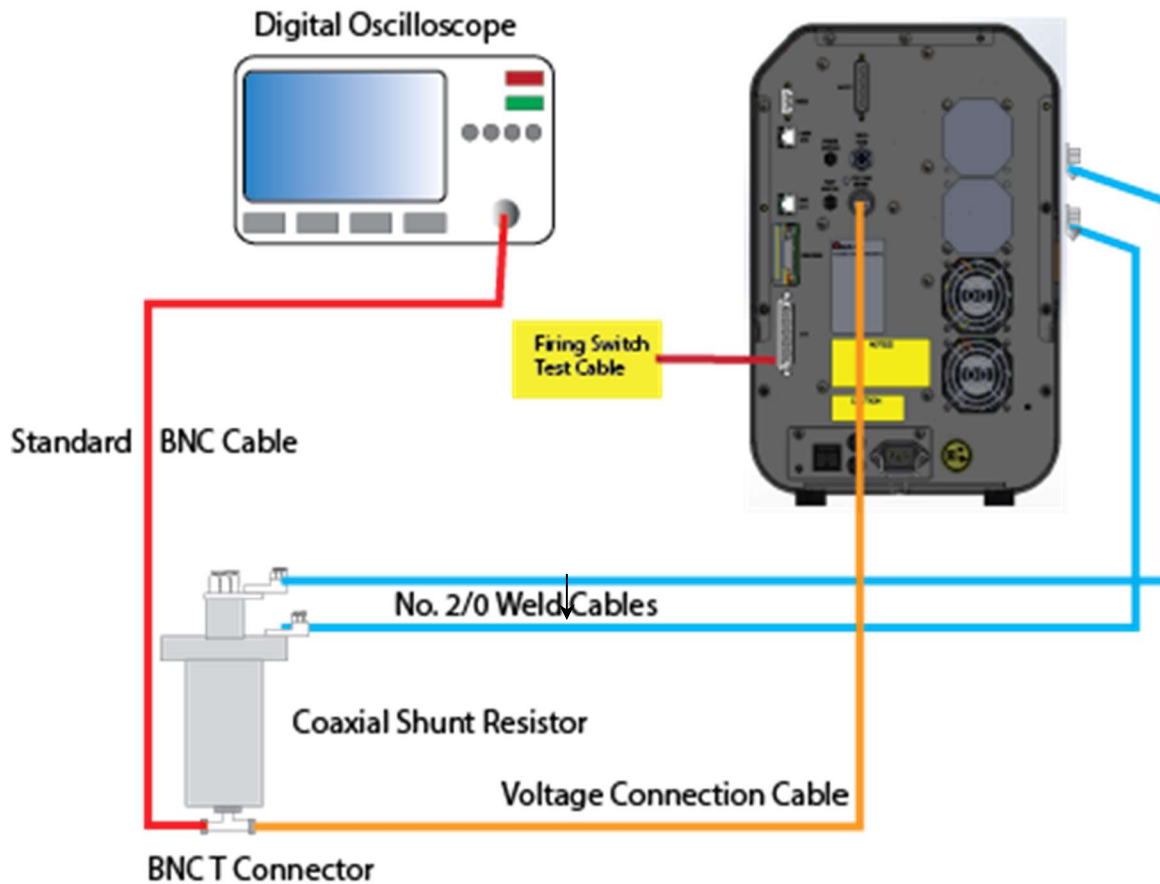


CAUTION

To avoid injury or damage to the equipment, these procedures should **only** be performed by authorized personnel.

CHAPTER 8: CALIBRATION

Calibration Setup for Current, Voltage and Power

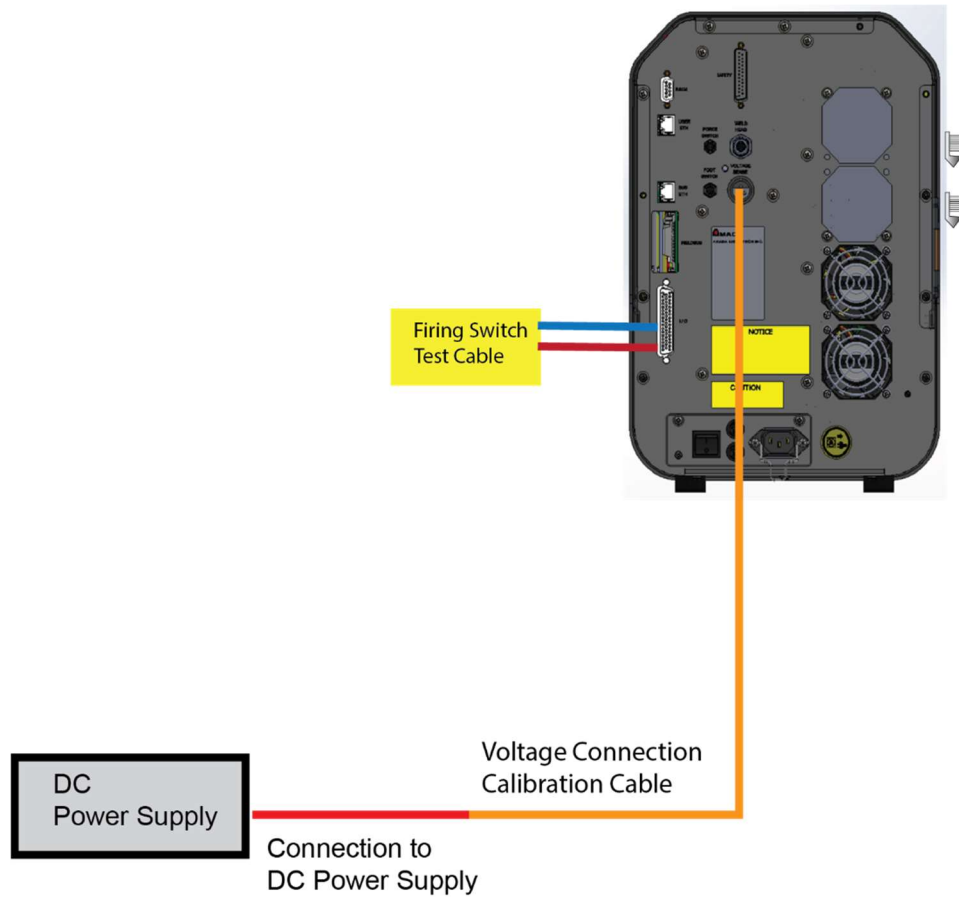


Notes:

- The ground of the oscilloscope should be isolated from the ground of the electrical "live" by an isolation transformer or other means.
- The filter in the Calibration Kit goes between the BNC cable and the oscilloscope input.

CHAPTER 8: CALIBRATION

Calibration Setup for Verification of Voltage Measurement after Calibration



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

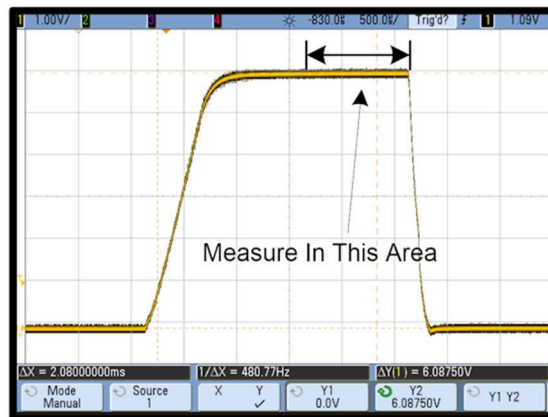
CHAPTER 8: CALIBRATION

Calibration Procedure for Current and Power

The Power Supply uses a two point calibration for both current and power. The values used for calibration are shown in the following table. The screens shown in this section are the UB-4000B screens. The UB-1500B screens are the same as the UB-4000B except the low and high calibration point values shown on the screens are different.

The UB-4000B uses a test waveform for calibration that consists of a 0.5 ms upslope followed by a 2.0 ms pulse. All measurements for calibration are to be done during the last 1 ms of the 2 ms pulse.

Measurement Location



Calibration Point	UB-1500B	UB-4000B
Low Value Voltage	0.50 V	1.00 V
High Value Voltage	5.00 V	6.00 V
Low Value Current	0.10 kA	0.40 kA
High Value Current	1.00 kA	2.50 kA
Low Value Power	0.10 kW	0.40 kW
High Value Power	6.50 kW	15.0 kW

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

CHAPTER 8: CALIBRATION

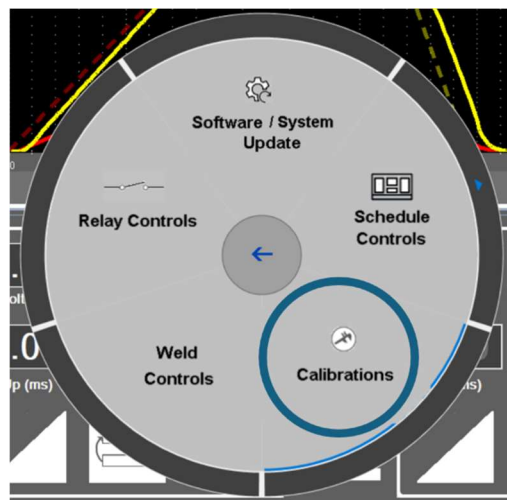
SHUNT LOAD RESISTANCE FOR UB-4000B: 2.5 m Ω

SHUNT LOAD RESISTANCE FOR UB-1500B: 4 m Ω

System and Control Loop Calibration Interface

In the UB-RW software interface, calibration tools are accessed through the Calibration link on the Security Functions menu on the Circular Menu.

Note: You must be logged in as an Engineer to be able to calibrate the power supply.



Click the link to launch the Calibration window. The window consists of two tabs, **System Calibration**, used for the verification of Voltage, Current, Power and Resistance after calibration, and **Control Loop Calibration**, used for the calibration of Current, Voltage, and power at the hardware level.

System Calibration

The System Calibration tab allows the user to set the Calibration Offset and Calibration Gain for Voltage, Current, Power and Resistance. This tab can also be used to reset, backup or restore the default values.

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

CHAPTER 8: CALIBRATION

	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 Default Backup Restore Update Cancel

To Calibrate each value

1. Click the Calibration button for the value to be calibrated. The Calibration Inputs window displays.

Low Input Measurement: Input Source 0.0000 (V), Actual Low Reading 0.0000 (V)

High Input Measurement: Input Source 0.0000 (V), Actual High Reading 0.0000 (V)

Calibration Results

$y = (m + \Delta m)x + (b - \Delta b)$

$m = \text{current gain}$ $\Delta m = \text{measured gain}$
 $b = \text{current offset}$ $\Delta b = \text{measured offset}$

Current (m) gain: 1.0000 Measured (Δm) gain: 0.00000

Current (b) offset: 0.0000 Measured (Δb) offset: 0.00000

$y = (m + \Delta m)x + (b - \Delta b) = (1.0000)x + 0.0000$

Calibrate Accept/Update Cancel

2. Enter the input source and actual reading for the low and high input measurements for the value to be calibrated.
3. Click Calibrate, the calibration results display, derived using the formulae shown.
4. Click Accept/Update. Take low and high measurements again. If the results are satisfactory, the calibration is complete.
5. If the results are unsatisfactory, repeat the calibration again as needed until the low and high measurements are satisfactory.

Control Loop Calibration

Control loop calibration allows the user to calibrate the control loop at the hardware level. Current, voltage and power can be calibrated individually, or a calibration offset can be applied to the system. Calibrated Gain just applies to the start of the weld. The range of possible values for all fields is from 1 to 255.

The screenshot displays a software interface for 'Control Loop Calibration'. At the top, there are two tabs: 'System Calibration' and 'Control Loop Calibration', with the latter being the active tab. Below the tabs is a dark grey panel titled 'Control Loop Parameters'. Inside this panel, five parameters are listed, each with a corresponding numerical value in a white box:

Calibrated Current	10
Calibrated Voltage	90
Calibrated Power	165
Calibrated Offset	160
Calibrated Gain	233

At the bottom of the panel, there are three buttons: 'Reset Default', 'Update', and 'Cancel'.

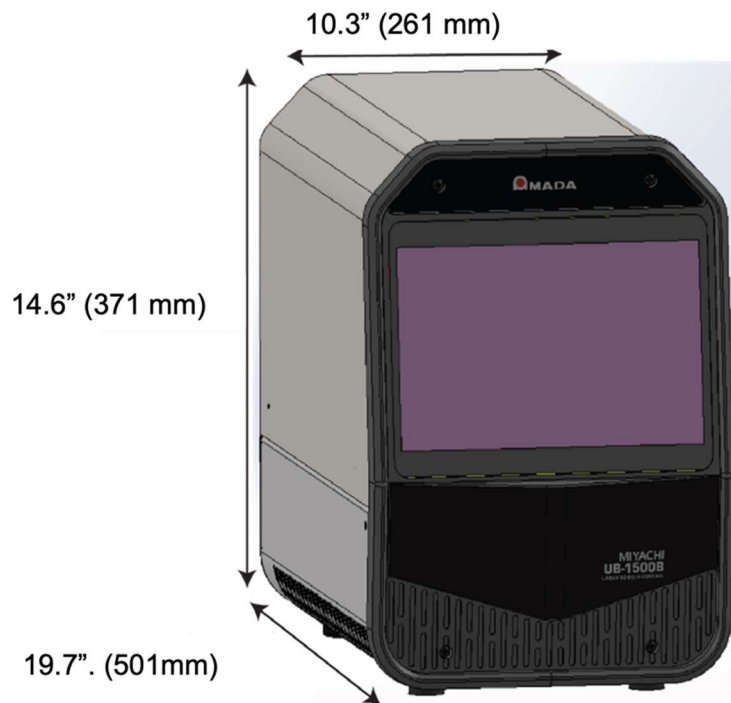
Appendix A TECHNICAL SPECIFICATIONS

NOTE: The specifications listed in this appendix may change without notice.

General

UB1500 and UB4000B are linear DC resistance welding power supplies that send energy directly into a weld without the use of a welding transformer and can execute any weld function at low current, voltage, or power levels with high stability and good control.

Physical Characteristics



WEIGHT: 49 POUNDS (22 KG)

NOTE: In the following tables, Values are for the **UB-4000B** unless noted otherwise.

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX A: TECHNICAL SPECIFICATIONS

Input/Output

Description	Value
Input Line Voltage (1 phase)	Standard nominal voltages and suggested breaker ratings: 100-240V AC, 50/60Hz
Input kVA: (max demand)	1.5 kVA
Output Capability: (max available to load)	Based on load

Output Current/Steps: (Programmable)

Actual achievable output based on load.

Note: Limit detection occurs within the limits shown below.

Device	Value	Notes
UB-1500B	5-1500 Amps, 1 Amp/step	± 3 A of programmed limit value for UB-1500B
UB-4000B	200-4000 Amps, 10 Amps/step	

Output Voltage/Steps: (Programmable)

- 0.10 – 9.99 V (10mV steps)
- Actual achievable output based on load.
- **Note:** Limit detection occurs within ± 40 mV of programmed limit value.

Output Power/Steps: (Programmable)

- Actual achievable output based on load.

Note: Limit detection occurs within ± 5% of programmed limit value.

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX A: TECHNICAL SPECIFICATIONS

Device	Value
UB-1500B	0.050 – 9.99 kW, 10 watts/step
UB-4000B	0.1 – 25.00 kW, 10 watts/step

DESCRIPTION	VALUE	NOTES
Input Line Voltage (1 phase):	Standard nominal voltages and suggested breaker ratings: 100-240V AC, 50/60Hz	
Input kVA: (max demand):	1.5 kVA	
Output Capability: (max available to load):	Based on load	
Output Current/Steps: (Programmable)		Actual achievable output based on load. Note: Limit detection occurs within $\pm 4A$ of programmed limit
Output Voltage/Steps: (Programmable)	0.10 – 9.99V 10 mV steps	Actual achievable output based on load. Note: Limit detection occurs within $\pm 40mV$ of programmed limit value

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX A: TECHNICAL SPECIFICATIONS

DESCRIPTION	VALUE	NOTES
Output Power/Steps: (Programmable)		Actual achievable output based on load. Note: Limit detection occurs within $\pm 5\%$ of programmed limit value
Resistance Monitoring Limits		Note: Limit detection occurs within $\pm 5\%$ of programmed limit value
Weld Periods		
Squeeze	0 – 999 mSec., 1.0 mSec / step	
First/Second Pulse	0.1 – 99 mSec., 0.1 mSec / step	
Up/Downslope	0.1 – 99 mSec., 0.1 mSec / step	NOTE: If downslope is greater than 0 mSec, then upslope or weld pulse must be greater than 0 mSec
Cool	0 – 99 mSec., 0.1 mSec / step	
Hold	0 – 999 mSec., 1 mSec / step	
Duty Cycle	Based on load	See Repetition Rates
Weld Control (Average values are regulated)	Weld Current, Voltage, or Power with simultaneous limits on one unregulated parameter for each pulse.	

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX A: TECHNICAL SPECIFICATIONS

DESCRIPTION	VALUE	NOTES
Regulation During Load Resistance Fluctuation:		Load variation from 0.5 to 10 milliohms, exclusive of ripple. After weld time of 2 ms.
Current	+/-2% of setting +/- 10A, whichever is greater	
Voltage	+/-2% of setting +/- 0.05V, whichever is greater	
Power	+/-5% of setting or +/-50W, whichever is greater	
Steady State Regulation During Line Fluctuations:	Output: +/- 2% of reading	Line voltage within input range
Control Range and Accuracy		Measurements are taken during the last 1ms of a test pulse with 0.5ms rise time and 2ms pulse width using standard test configuration.
Measurement Range and Accuracy		User selectable limits on peak values of one of three parameters: current, voltage, or power. When a parameter goes outside of limits, the unit can be set to report the error, terminate the weld, or inhibit a second pulse. During rise times of <300µs limit events may not be detected.

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX A: TECHNICAL SPECIFICATIONS

DESCRIPTION	VALUE	NOTES
		<p>Accuracy measurements are taken during the last 1ms of a test pulse with 0.5ms rise time and 2ms pulse width using standard test configuration.</p> <p>Voltage monitoring is not guaranteed below 0.1 V.</p>
<p>Rise Time:</p> <p>Current, Voltage, and Power Control Modes</p> <p>V-A Control Mode</p>	<p>Limited by external secondary circuit</p> <p>500 Amps/msec maximum</p>	
Weld Schedules	128	
Data Communications:	<p>Remote capability to upload / download weld schedule; monitor welds; set up parameters; select schedule; and read weld results buffer</p>	

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX A: TECHNICAL SPECIFICATIONS

ENVIRONMENTAL CHARACTERISTICS		
DESCRIPTION	VALUE	NOTES
Operating Ambient Air Temperature:	0 - 40 degrees C	
Operating Humidity:	10 - 95% Relative Humidity	(Non-condensing)

INTERFACE SIGNALS		
DESCRIPTION	VALUE	NOTES
Digital Inputs	24 VDC 5 mAmps typical, 2500 V rms optically isolated,	External or internal power supplied to inputs. Inputs to be current sourcing or sinking. See <i>Appendix B</i> for additional information
Digital Outputs: Relays 1 through 6	24 VAC or 240VDC, 500 mA, optically isolated solid state relays	
Digital Outputs: Other	24VDC, 500 mA, optically isolated solid state relays	
Fire, Footswitch, Alarm, Alarm Reset, Schedule Selection, Weld Inhibit Signal Inputs	24VDC inputs, 5 mAmps, hardware selectable for positive or negative logic.	

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX A: TECHNICAL SPECIFICATIONS

INTERFACE SIGNALS		
Emergency Stop Input	External Emergency Stop Switch rated for 24VDC, 2 amps	Contact rating: 0.5 amps at 30 VAC or 30 VDC maximum
Voltage Sense Input	15 VDC, 0.1 amp maximum	
Head Valve Driver	24 VDC, 0.5 amps maximum	
Programmable Relays	Contact rating: 500mA at 24VDC maximum	
Serial Communication	RS-232	

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX A: TECHNICAL SPECIFICATIONS

Limits

Limit	Value	
Resistance Monitoring Limits	Note: Limit detection occurs within $\pm 5\%$ of programmed limit value.	
Weld Period	Note: If downslope is greater than 0 ms, then upslope or weld pulse must be greater than 0 ms.	
Squeeze	0 – 999 ms, 1.0 ms/step	
First/Second Pulse	0 – 99 ms, 0.1 ms/step	
Up/Downslope	0 – 99 ms, 0.1 ms/step	
Cool	0 – 99 ms, 0.1 ms/step	
Hold	0 – 999 ms, 0.1 ms/step	
Duty Cycle:	Based on load	See <i>Repetition Rates</i>
Weld Control: (Average values are regulated)	Weld Current, Voltage, or Power with simultaneous limits on one unregulated parameter for each pulse	---
Regulation During Load Resistance Fluctuation:	Current: $\pm 2\%$ of setting or ± 10 A, whichever is greater Voltage: $\pm 2\%$ of setting or ± 0.05 V, whichever is greater Power: $\pm 5\%$ of setting or ± 50 W, whichever is greater	Load variation from 0.5 to 10 milliohms, exclusive of ripple. After weld time of 2 ms.
Steady State Regulation During Line Fluctuations:	Output: $\pm 2\%$ of reading	Line voltage within input range

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX A: TECHNICAL SPECIFICATIONS

Power Supply Range and Accuracy

Measurements are taken during the last 1 ms of a test pulse with 0.5 ms rise time and 2 ms pulse width using standard test configuration.

Description	Value
Current UB-1500B	5 - 1500 Amps, $\pm 2\%$ of setting or $\pm 2.5A$ whichever is greater
Current UB-4000B	200 – 4000 Amps, $\pm 2\%$ of setting or $\pm 10A$ whichever is greater
Voltage	0.1 – 9.99 Volts, $\pm 2\%$ of setting or $\pm 0.05 V$ whichever is greater
Power UB-1500B	0.050 – 9.999 kWatts, $\pm 5\%$ of setting or $\pm 40 W$ whichever is greater
Power UB-4000B	0.100 – 25.00 kWatts, $\pm 5\%$ of setting or $\pm 50 W$ whichever is greater

Measurement Range and Accuracy:

User selectable limits on peak values of one of three parameters: current, voltage, or power. When a parameter goes outside of limits, the unit can be set to report the error, terminate the weld, or inhibit a second pulse.

Description	Value	Notes
Current UB-1500B	0 – 1500 Amperes, $\pm 2\%$ of actual value or 10A, whichever is greater	During rise times of $< 300 \mu s$ limit events may not be detected.
Current UB-4000B	0 – 4000 Amperes, $\pm 2\%$ of actual value or 20 A whichever is greater	
Voltage	0 – 9.99 Volts, $\pm 2\%$ of actual value or 50 mV whichever is greater	Accuracy measurements are taken during the last 1 ms of a test pulse with 0.5 ms rise time

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX A: TECHNICAL SPECIFICATIONS

Description	Value	Notes
		and 2 ms pulse width using standard test configuration. Voltage monitoring is not guaranteed below 0.1 V
Power UB-1500B	0 – 4.99 kW, $\pm 5\%$ of actual value or 10 W whichever is greater	
Power UB-4000B	0 – 25.00 kW, $\pm 5\%$ of actual value or 50 W whichever is greater	
Rise Time:		
Current, Voltage and Power Control Modes	Limited by External secondary circuit	
V-A Control Mode	500 A/ms maximum	
Weld Schedules	128	
Data Communications:		Remote capability to upload/download weld schedule; monitor welds; set up parameters; select schedule; and read weld results buffer.

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

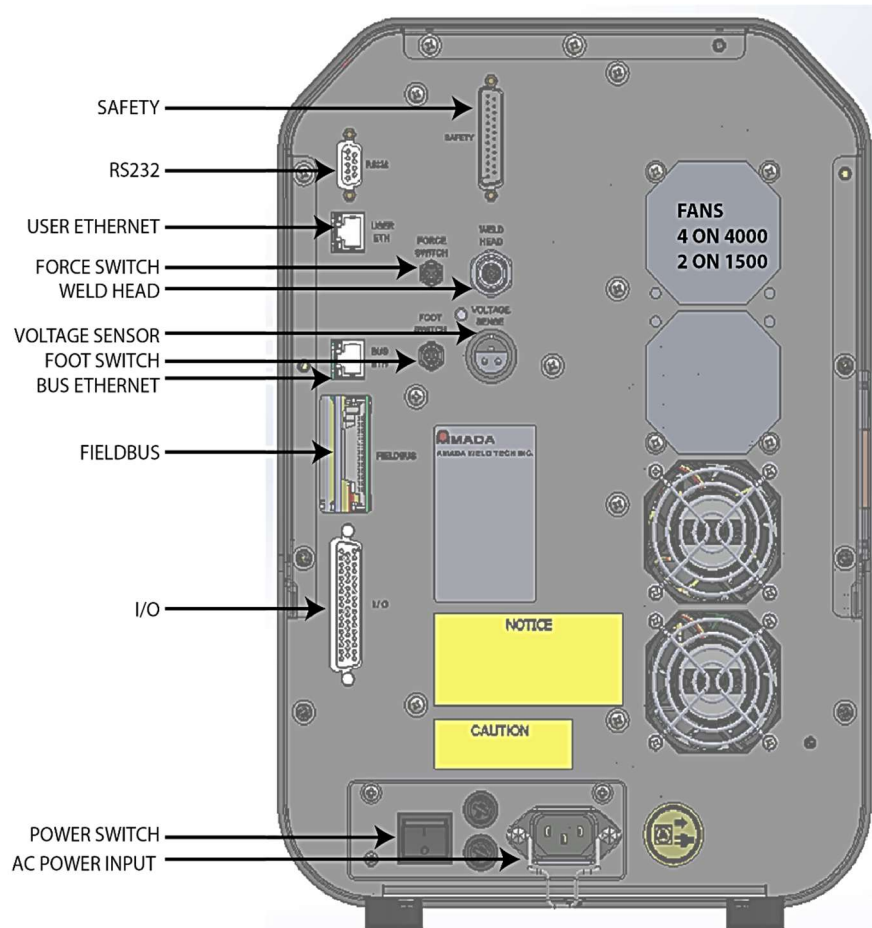
Appendix B ELECTRICAL AND DATA CONNECTIONS

CONNECTIONS

Introduction

This Appendix describes the electrical and data connectors located on the rear panel of the Power Supply. I/O connections on the rear panel will differ in location depending on the model and accessories ordered. This is a general overview of the most common connector locations.

UB-1500B and UB-4000B, Connector Layout:



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX B ELECTRICAL AND DATA CONNECTIONS

Safety

EStop Connector (When equipped with Weld Head Safety Controller (WHSC))

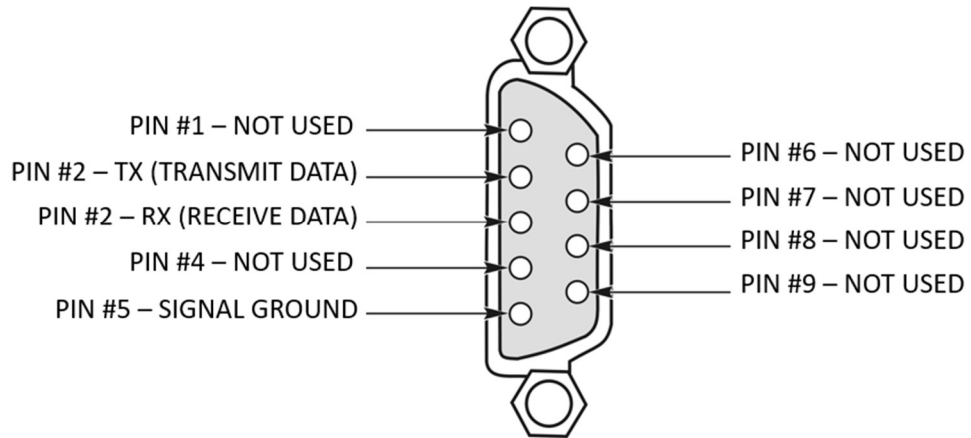
1 Not Used		14 Not Used
2 Not Used		15 Not Used
3 Not Used		16 Not Used
4 Not Used		17 Not Used
5 ESTOP_IN_A1		18 Not Used
6 ESTOP_IN_B1		19 Not Used
7 ESTOP_IN_B2		20 Not Used
8 ESTOP_IN_A2		21 Not Used
9 ESTOP_OUT_A1		22 Not Used
10 ESTOP_OUT_B1		23 Not Used
11 ESTOP_OUT_B2		24 Not Used
12 ESTOP_OUT_A2		25 Not Used
13 Not Used		
0		

ESTOP I/O 25 pin DB connector pinout		
5	ESTOP_IN_A1	ESTOP Channel A input 1
6	ESTOP_IN_B1	ESTOP Channel B input 1
7	ESTOP_IN_B2	ESTOP Channel B input 2
8	ESTOP_IN_A2	ESTOP Channel A input 2
9	ESTOP_OUT_A1	ESTOP Channel A output 1
10	ESTOP_OUT_B1	ESTOP Channel B output 1
11	ESTOP_OUT_B2	ESTOP Channel B output 2
12	ESTOP_OUT_A2	ESTOP Channel A output 2

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX B ELECTRICAL AND DATA CONNECTIONS

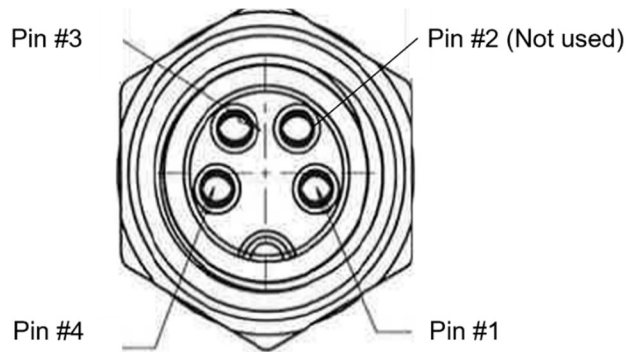
RS-232 Connector



RS-232 CONNECTOR SPECIFICATIONS		
PIN #	DESCRIPTION	PIN TYPE
1	Not Used	
2	TX (Transmit Data)	RS-232 Driver
3	RX (Receive Data)	RS-232 Receiver
4	Not Used	
5	Signal Ground	Analog Ground (ISOGND1)
6	Not Used	
7	Not Used	
8	Not Used	
9	Not Used	

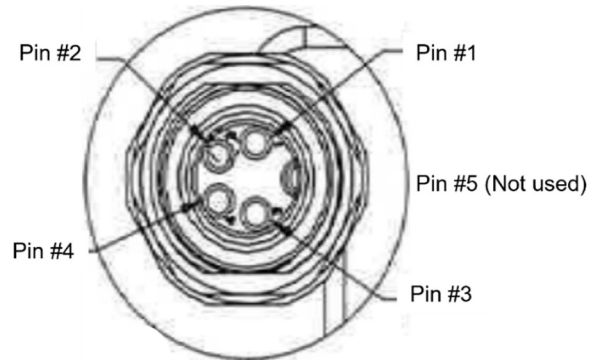
APPENDIX B ELECTRICAL AND DATA CONNECTIONS

FIRE SWITCH



FIRE Switch Connector		
PIN #	NAME	COMMENTS
1	Force 1	Force Fire
3	Force RTN	GND
4	GND BRAID	CHASSIS GROUND

FOOT SWITCH



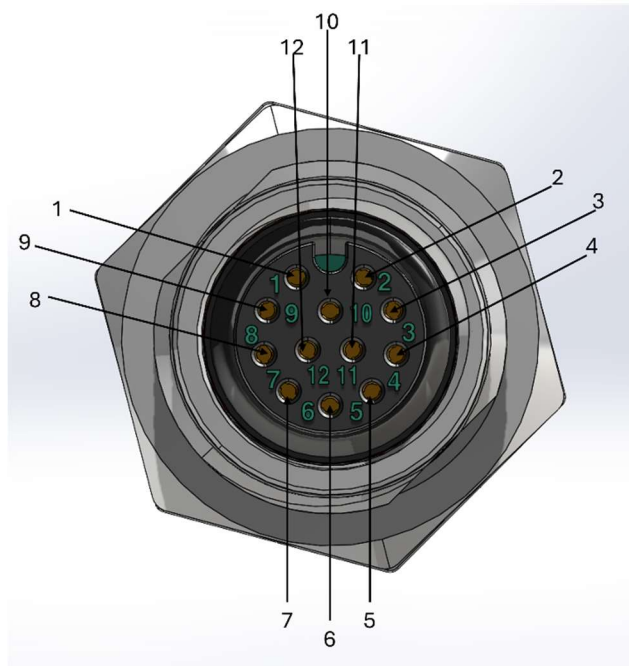
Foot Switch		
PIN #	NAME	COMMENTS
1	GND BRAID	CHASSIS GROUND

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX B ELECTRICAL AND DATA CONNECTIONS

2	FS1	FOOT SWITCH LEVEL 1
3	FS2	FOOT SWITCH LEVEL 2
4	GND	GROUND

Weld Head Connector



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

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX B ELECTRICAL AND DATA CONNECTIONS

Pin #	Description	Comments
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	

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

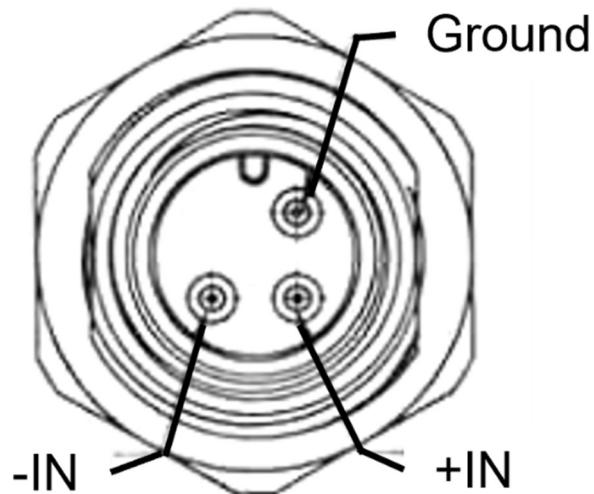
APPENDIX B ELECTRICAL AND DATA CONNECTIONS

WHSC Output



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

Voltage Sense Input

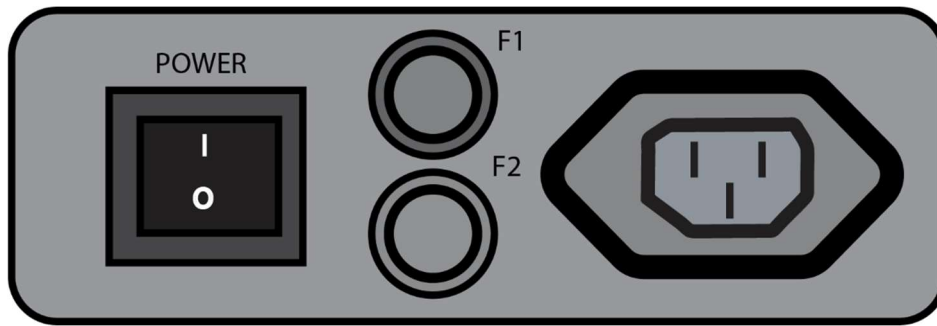


UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX B ELECTRICAL AND DATA CONNECTIONS

VOLTAGE SENSE INPUT CONNECTOR						
PIN #	SIGNAL		MAX VOLTAGE	MAX CURRENT	I/O	COMMENTS
	NAME	TYPE				
1	GND	---	---	---	---	Ground
3	Input #1 V-	Pulse	15 V	0.1 A	I	Note: Polarity of Pins 3 & 4 <i>must</i> be set correctly.
4	Input #2 V+	Pulse	15 V	0.1 A	I	

POWER



AC INPUT POWER CONNECTION SPECIFICATIONS		
TERMINAL	MAXIMUM VOLTAGE	MAXIMUM CURRENT
Hot	100-240 volts AC	10 amps
Neutral	--	--
Ground	--	--
Fuse F1		
Fuse F2		

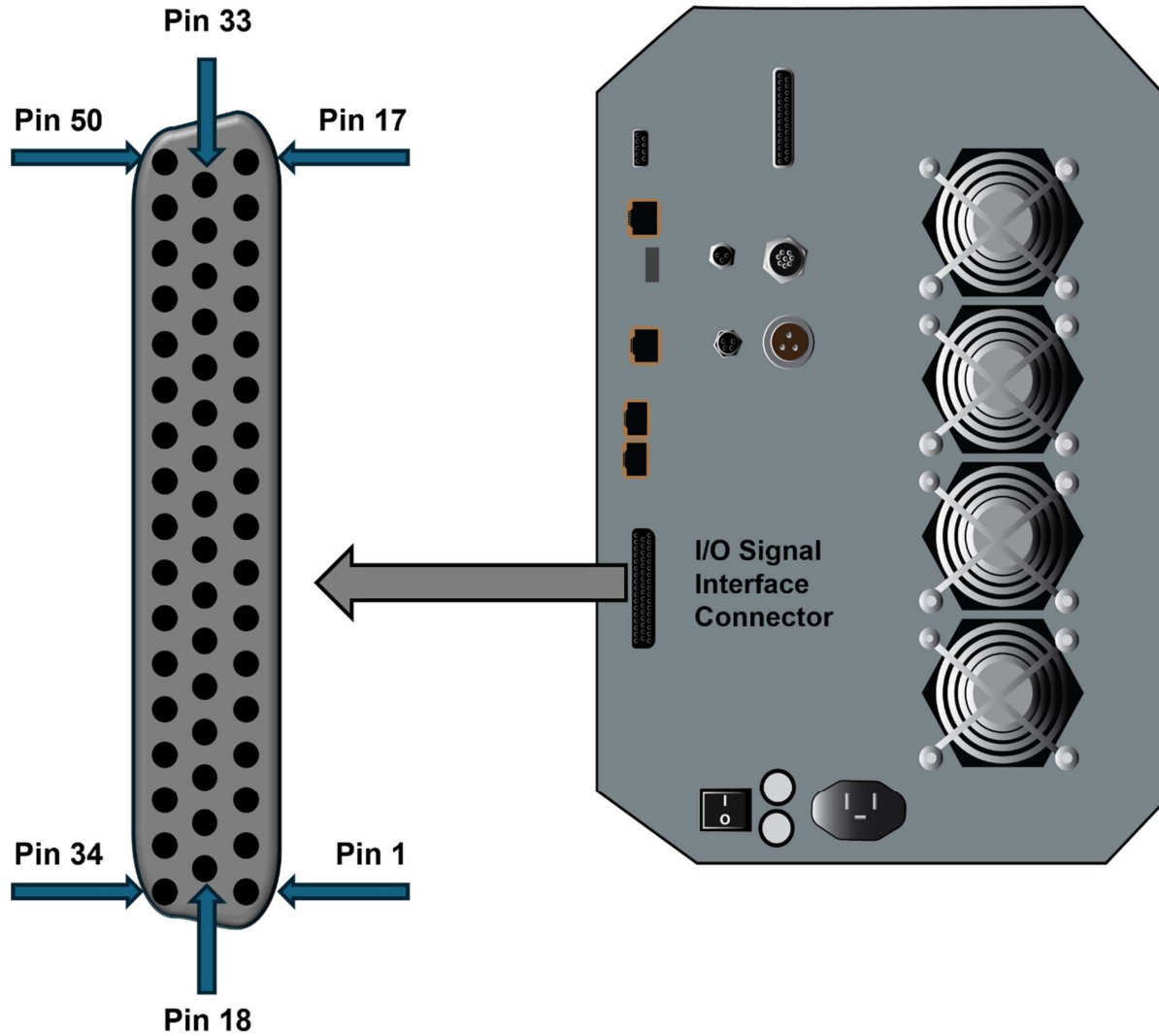
Fuses; AWT Part #330-264 - FUSE 6.3X3MM, 15^a20kA, INTERRUPT

Note: Do not substitute fuses except with equivalent rated devices.

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX B ELECTRICAL AND DATA CONNECTIONS

I/O Signal Interface Connector



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX B ELECTRICAL AND DATA CONNECTIONS

1. SYSTEM I/O Connector

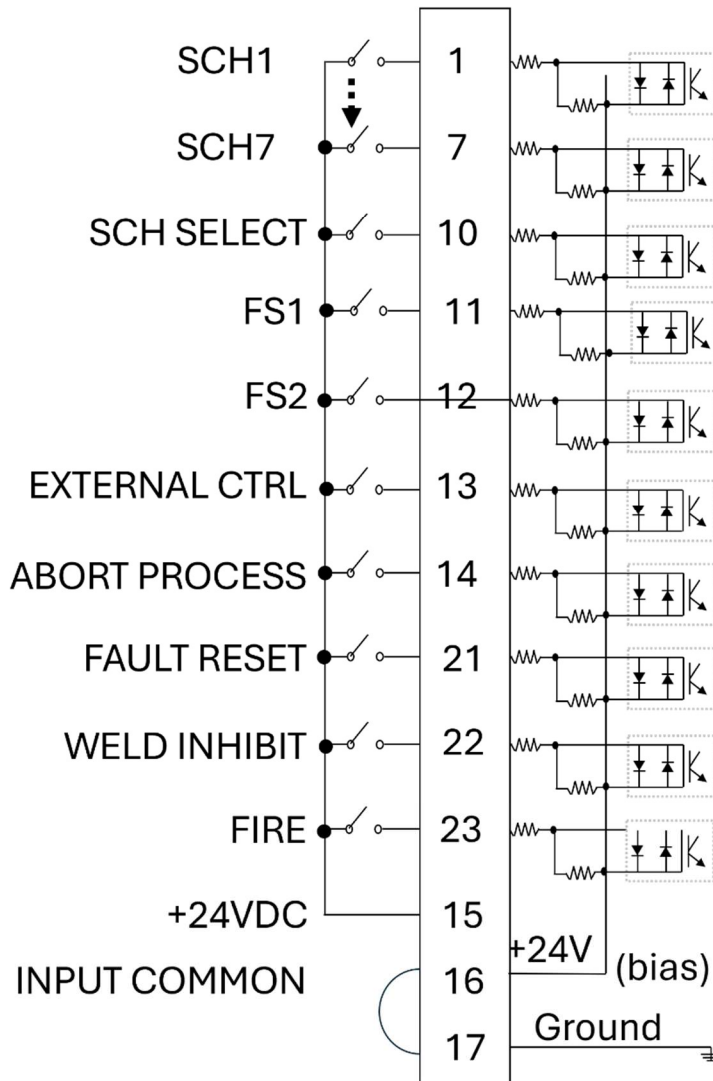
Pin #	Name	Description	Type
1	SCH1	Schedule Bit 1 (LSB)	Input
2	SCH2	Schedule Bit 2	Input
3	SCH3	Schedule Bit 3	Input
4	SCH4	Schedule Bit 4	Input
5	SCH5	Schedule Bit 5	Input
6	SCH6	Schedule Bit 6	Input
7	SCH7	Schedule Bit 7 (MSB)	Input
8	Unused	Unused	N/A
9	Unused	Unused	N/A
10	SCH SELECT	Schedule Select latch, rising edge scans binary inputs and changes schedule if valid	Input
11	FS1	Footswitch Level 1 (Extend head)	Input
12	FS2	Footswitch Level 2 input (Request Fire)	Input
13	EXTERNAL CTRL	Take External Control	Input
14	ABORT PROCESS	Aborts Process. Also use for Weld-to-Displacement weld stop	Input
15	+24VDC	Power supply for I/O biasing. 1.5A shared with pin 18	Voltage Source
16	INPUT COMMON	Input bias pin. Connect to internal or external power/ground	Optocoupler Bias Pin
17	IO GROUND	I/O ground for 24V power supply	Ground

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX B ELECTRICAL AND DATA CONNECTIONS

UB-B System IO IN Dry Contact input Switches

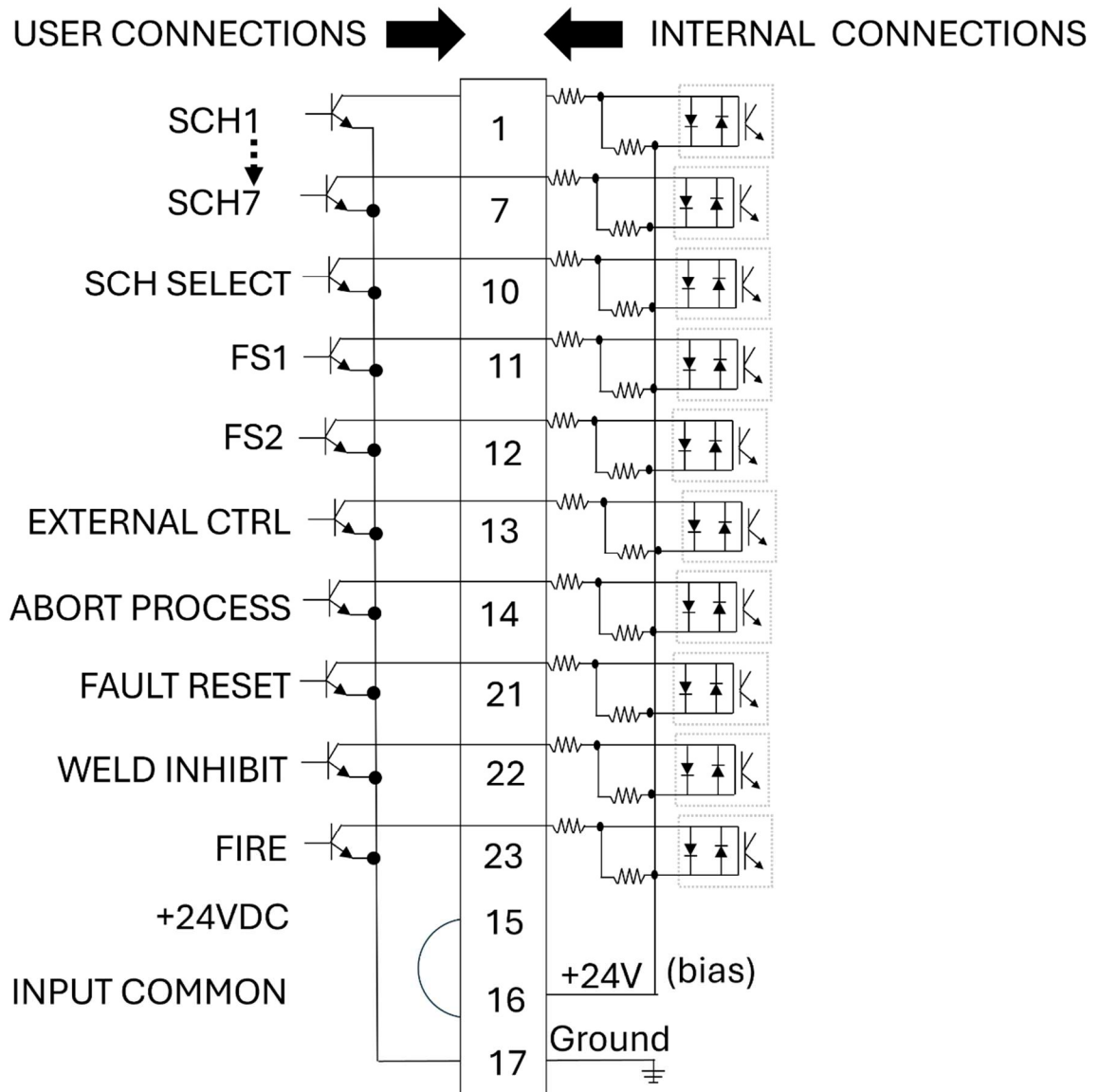
USER CONNECTIONS   INTERNAL CONNECTIONS



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX B ELECTRICAL AND DATA CONNECTIONS

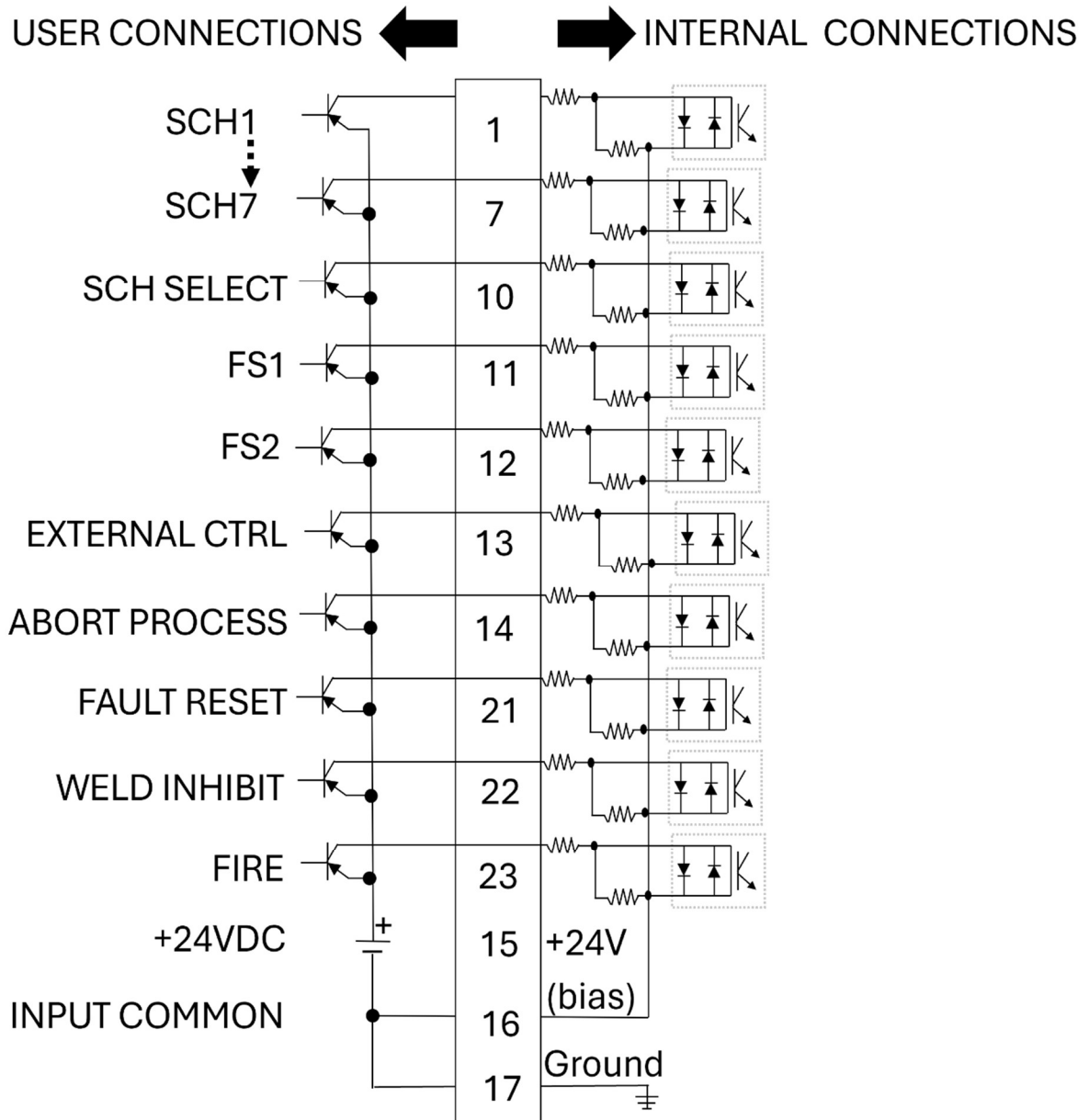
UB-B System I/O IN Transistor (NPN) Input (Internally Biased)



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX B ELECTRICAL AND DATA CONNECTIONS

UB-B System I/O In Transistor (PNP) Input with External +24VDC Power Source



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX B ELECTRICAL AND DATA CONNECTIONS

2. SYSTEM I/O CONNECTIONS

Pin #	Name	Description	Type
18	+24VDC	Power Supply for I/O biasing. 1.5 A shared with pin 15	Voltage Source
19	OUTPUT_COMMON	Output bias pin. Connect to internal or external power/ground	Optocoupler Bias Pin
20	IO GROUND	I/O ground for 24V power supply	Ground
21	FAULT RESET	Reset system faults	Input
22	WELD INHIBIT	Inhibits a weld. If Signal is high during a weld, inhibits the next weld	Input
23	FIRE	Causes Weld	Input
24	STOP	Prevents welding if system is idle. Aborts weld and opens head if system is busy. MUST BE WIRED FOR THE SYSTEM TO OPERATE	Input – Normally Closed (NC).
25-33	Unused	Unused	N/A
34	SYS READY	System Ready Output. Active when system is booted and no faults are present.	Output
35	READY TO WELD	Job Ready Output. Active when a valid schedule has been selected, the capacitor bank is charged, and no faults are present. Inactive when	Output

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX B ELECTRICAL AND DATA CONNECTIONS

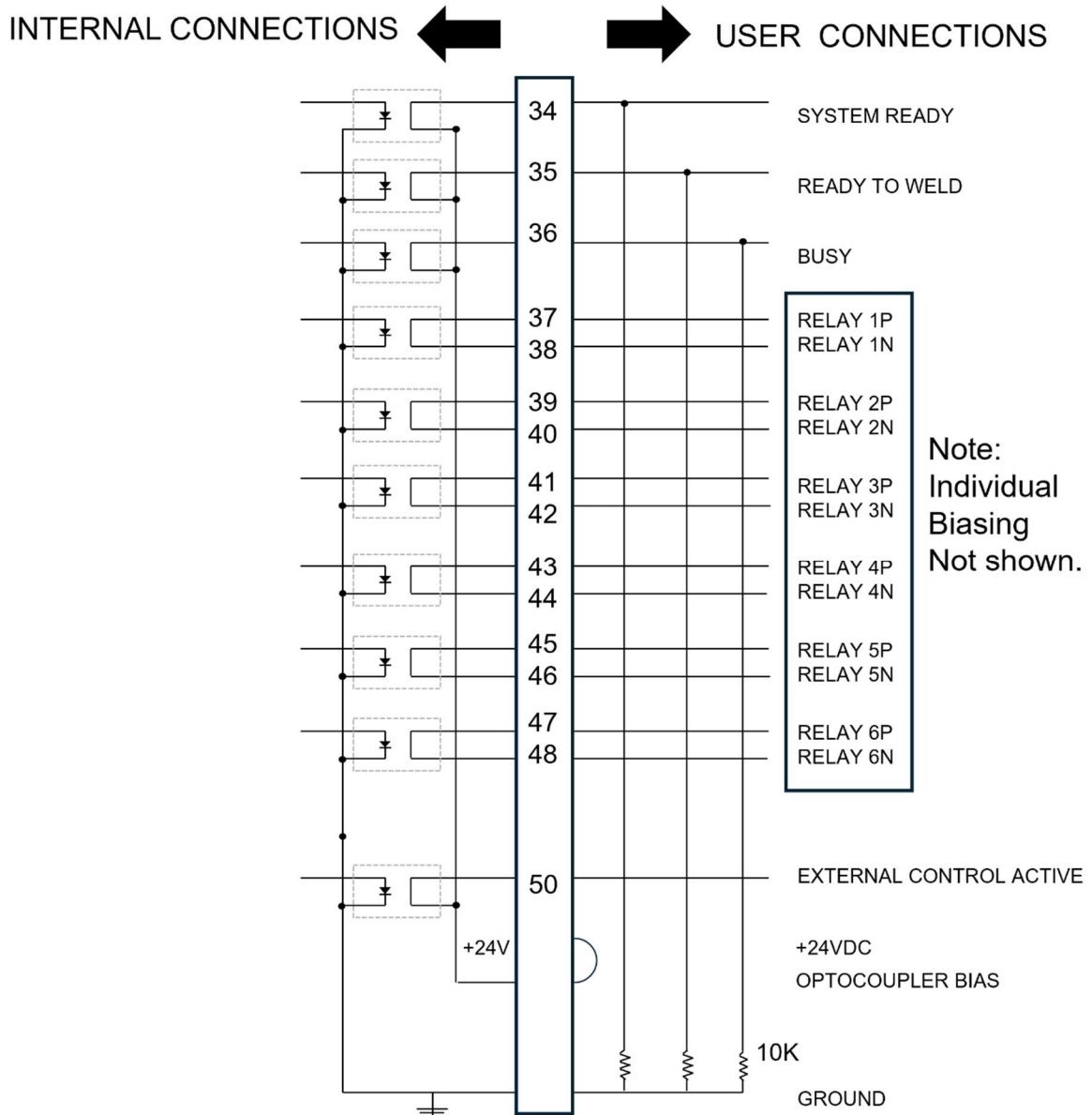
Pin #	Name	Description	Type
		the above conditions are not met or the system is busy performing a weld process	
36	BUSY	Weld Job in Process Output. Active when the system is performing a weld process.	Output
Function of each programmable output is programmed in machine settings			
37	RELAY 1P	Programmable Relay Output 1	Differential Output
38	RELAY 1N		Differential Output
39	RELAY 2P	Programmable Relay Output 2	Differential Output
40	RELAY 2N		Differential Output
41	RELAY 3P	Programmable Relay Output 3	Differential Output
42	RELAY 3N		Differential Output
43	RELAY 4P	Programmable Relay Output 4	Differential Output
44	RELAY 4N		Differential Output
45	RELAY 5P	Programmable Relay Output 5	Differential Output
46	RELAY 5N		Differential Output
47	RELAY 6P	Programmable Relay Output 6	Differential Output
48	RELAY 6N		Differential Output
49	Unused		

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX B ELECTRICAL AND DATA CONNECTIONS

Pin #	Name	Description	Type
50	EXT_CTRL_ACTIVE	External Control Mode Active	Output

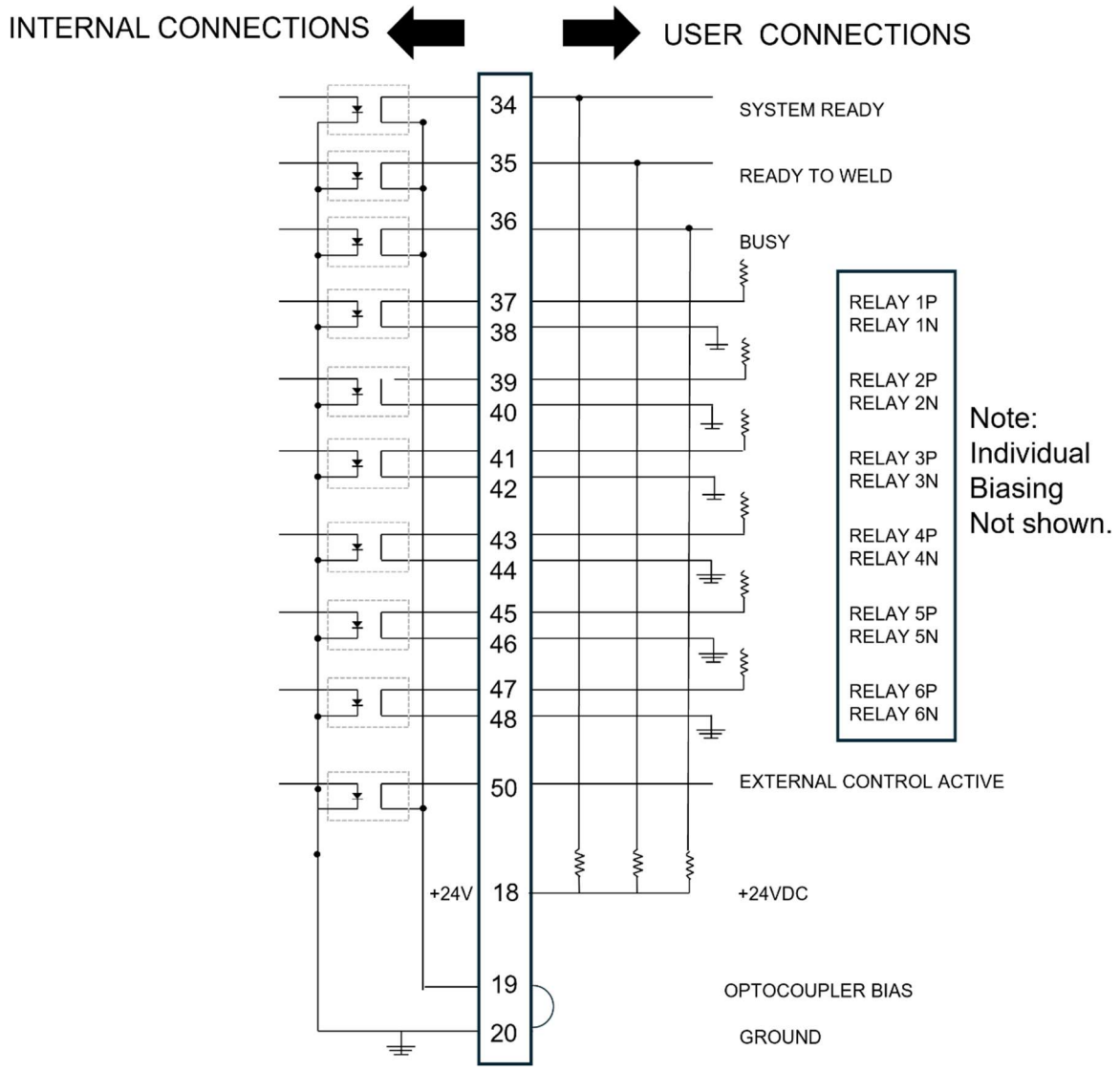
System I/O Out with Customer supplied Pull-down Output on Single-Ended Outputs
 Note: Relays 1 through 6 Biased Individually



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX B ELECTRICAL AND DATA CONNECTIONS

System I/O Out with Customer supplied Pull-up Output on Single-Ended Outputs
Note: Relays 1 through 6 Biased Individually

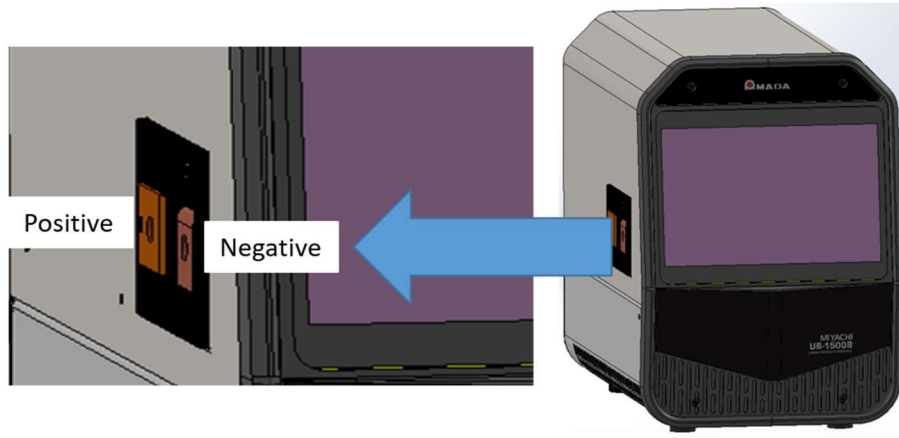


UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX B ELECTRICAL AND DATA CONNECTIONS

Weld Terminals

The bus bars for connecting to the welder are on the left hand side of the unit and are threaded to allow weld cables to be attached with a bolt – no nut required.



UB-1500B WELD TERMINAL SPECIFICATIONS

TERMINAL	MAXIMUM VOLTAGE	MAXIMUM CURRENT	COMMENTS
+	9.9 volts	1500 amps	Variable
-	--	--	Return

UB-4000B WELD TERMINAL SPECIFICATIONS

TERMINAL	MAXIMUM VOLTAGE	MAXIMUM CURRENT	COMMENTS
+	9.9 volts	4,000 amps	Variable
-	--	--	Return

Note: Torque 5-8 ft/lbs

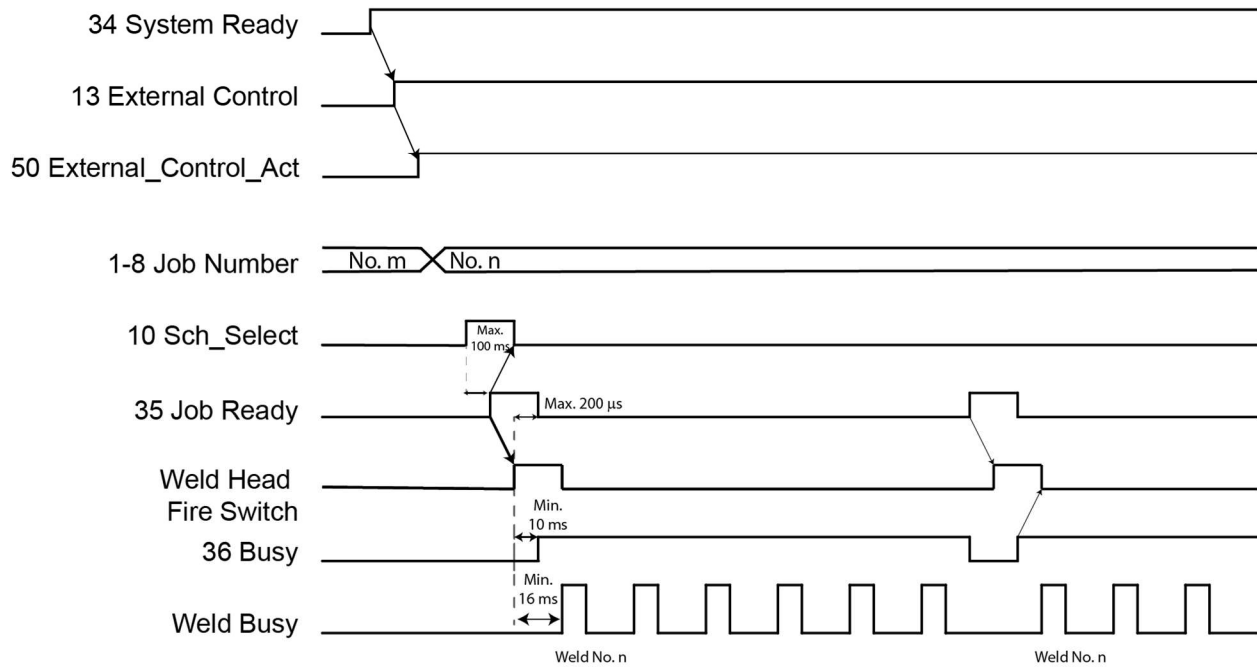
UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX B ELECTRICAL AND DATA CONNECTIONS

Timing Diagrams

Normal Operation

NORMAL OPERATION (Local Execution Mode)

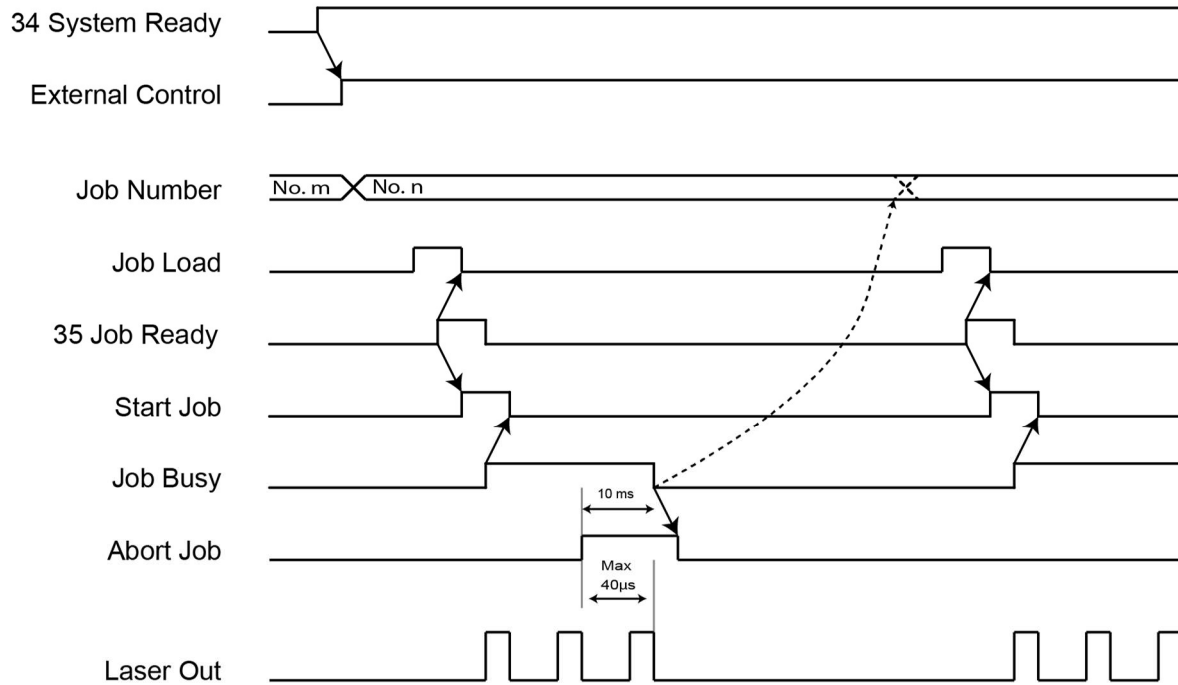


UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX B ELECTRICAL AND DATA CONNECTIONS

Job Abort

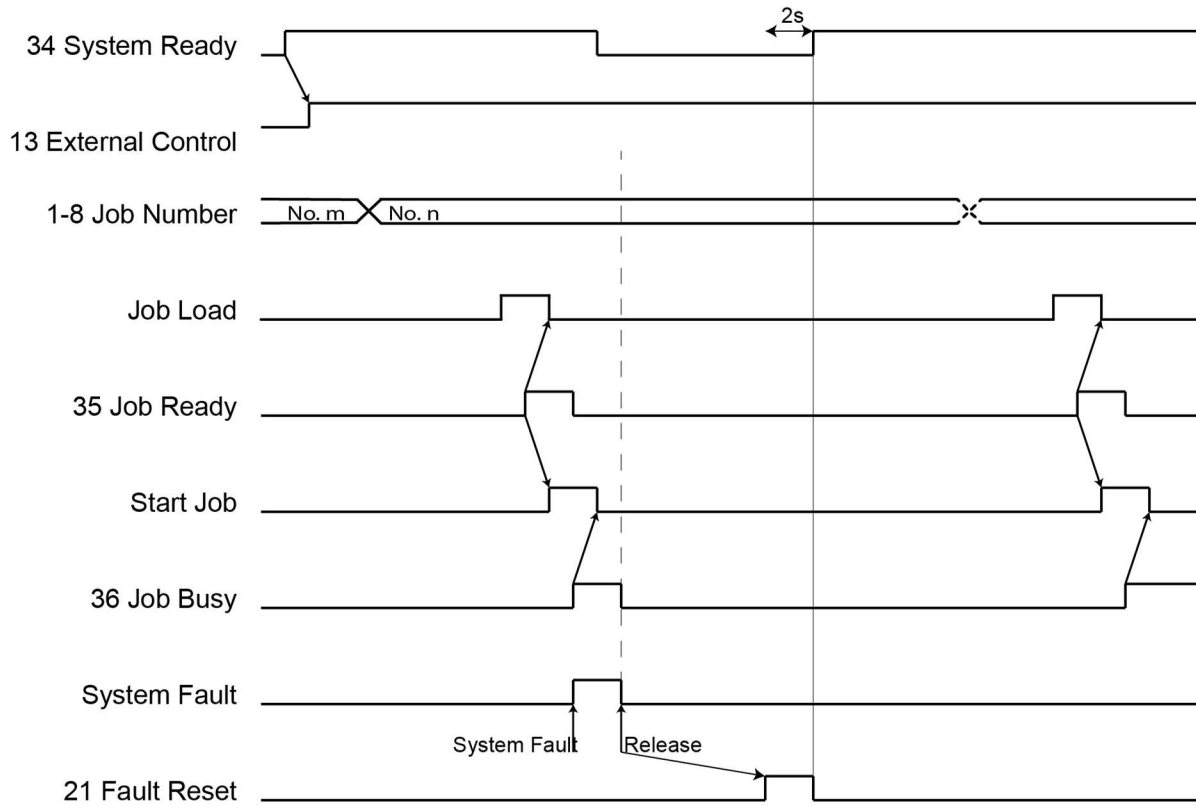
JOB ABORT



APPENDIX B ELECTRICAL AND DATA CONNECTIONS

System Fault

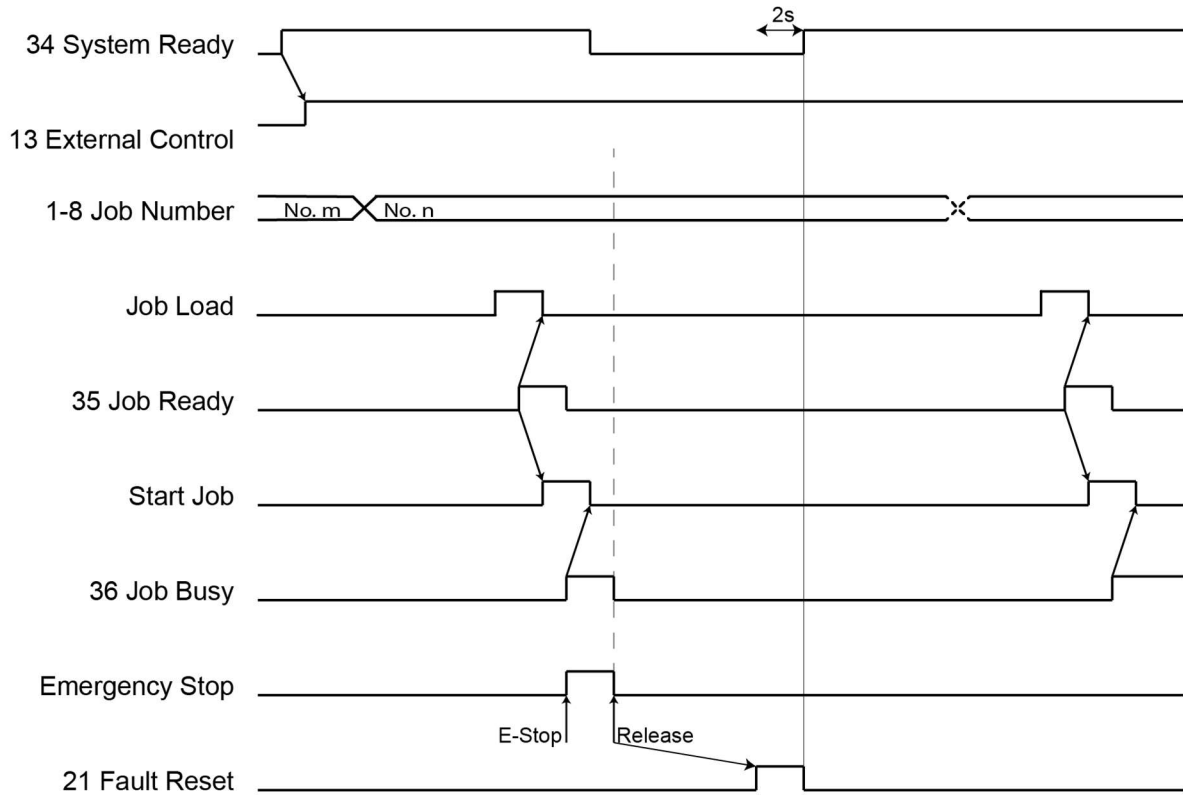
SYSTEM FAULT



APPENDIX B ELECTRICAL AND DATA CONNECTIONS

Emergency Stop

EMERGENCY STOP



Appendix C RELAY TIMING DIAGRAMS

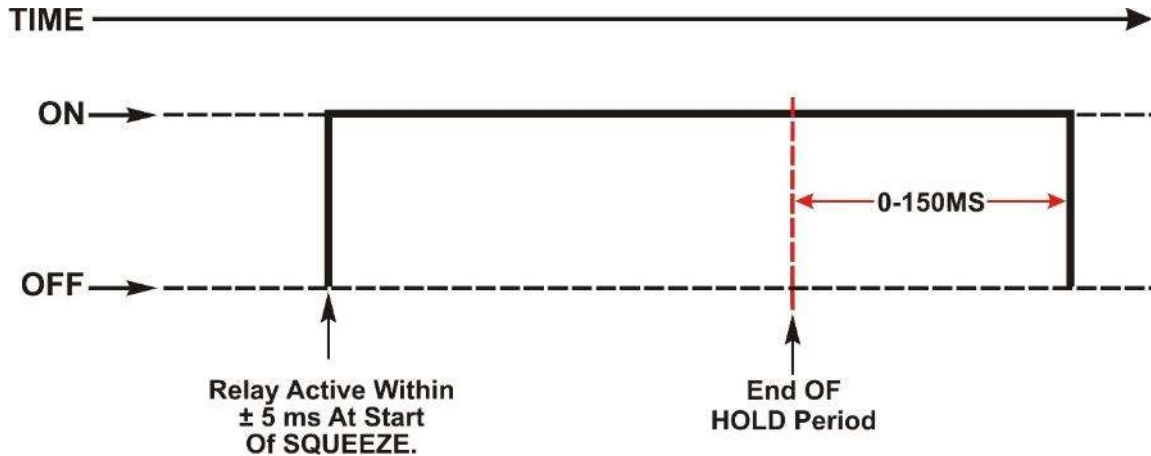
Introduction

Instructions for relay setup are in [Chapter 7, Calibration](#). Instructions cover the **ON/OFF** state and the **CONDITION WHEN** states listed in that section.

- WELD
- END OF WELD
- ALARM
- OUT OF LIMITS
- V-A TIME OUT
- UNIT READY
- WELD COUNTER
- OUT OF LIMITS CONDITIONS (E.g., P1 or P2 High or Low Limit, Current, Voltage, Power or Resistance.)

The following diagrams show the timing sequence for each relay **WHEN** state.

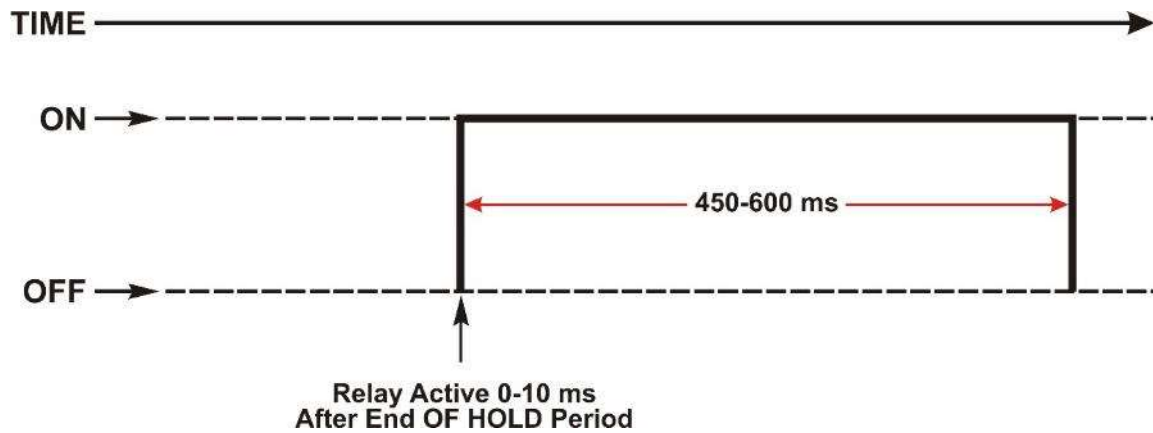
WELD



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

APPENDIX C RELAY TIMING DIAGRAMS

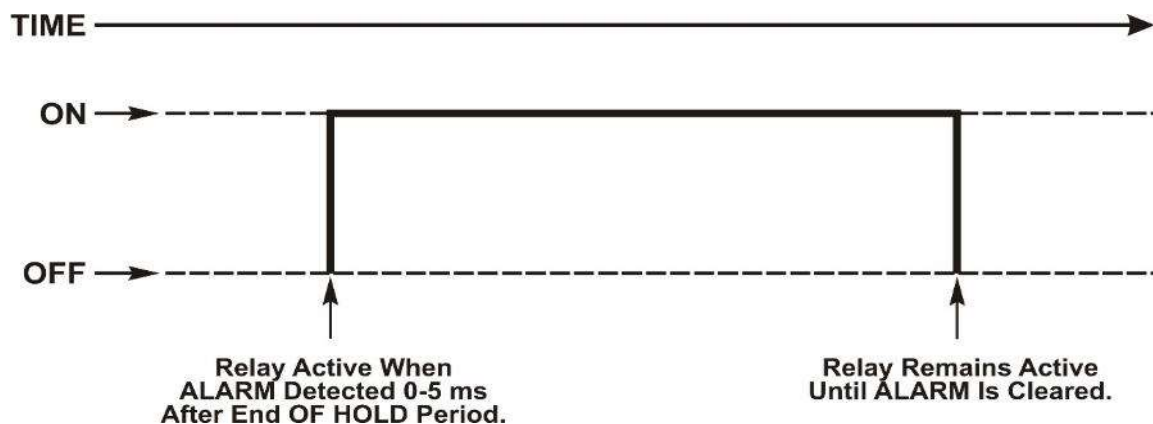
END OF WELD



When welding, the relay output signal will start 0 - 10 milliseconds after the end of the **HOLD** period and will stay energized for 600 - 850 milliseconds.* The relay will still close in case of an aborted weld.

* If another weld is initiated within this time, the **END OF WELD** relay will be reset at the start of the next weld.

ALARM

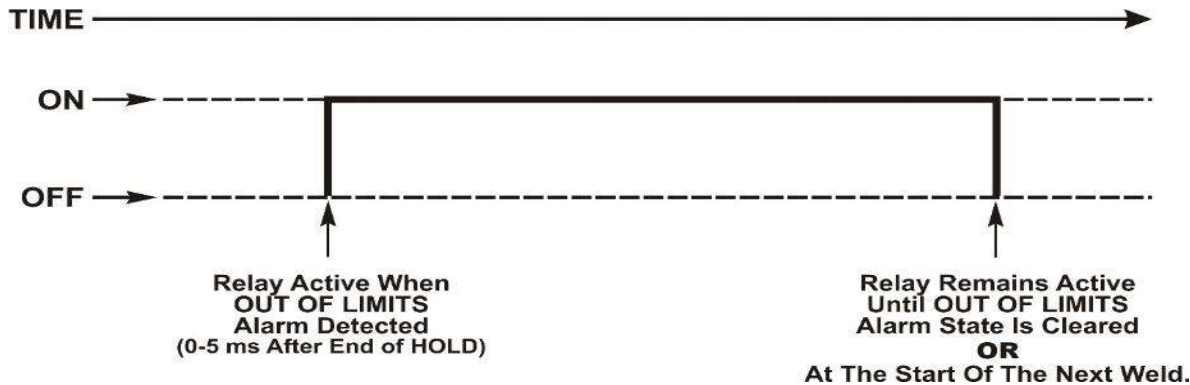


The relay output signal will start when the Control senses an **ALARM** condition. For all **ALARMS**, except for **EMERGENCY STOP**, **OVER TEMPERATURE**, and **A/D FAILURE**, it will stay

APPENDIX C RELAY TIMING DIAGRAMS

energized until the **ALARM** state is cleared by pressing the **RUN** button, setting the **RESET** digital input active, or initiating the next weld. For an **EMERGENCY STOP** alarm, pressing the **RUN** button only, or setting the **RESET** digital input to active, will reset the **ALARM** state. For the **OVER TEMPERATURE** or **A/D FAILURE** alarm, the unit power must be cycled to reset the **ALARM** state.

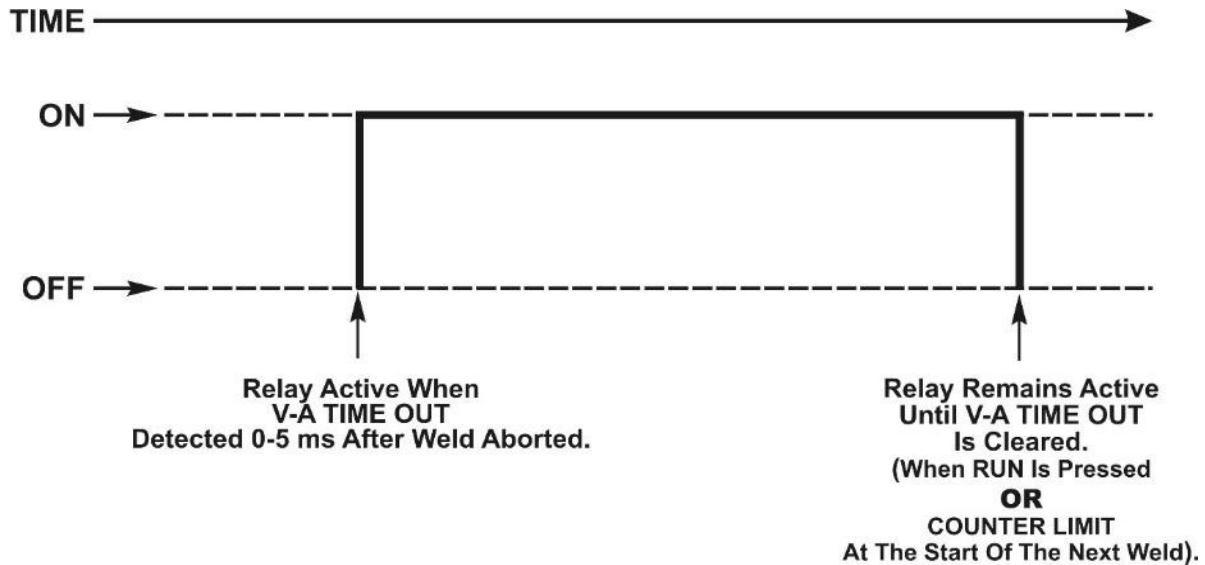
Out of Limits



The relay will switch when the Control senses any **OUT OF LIMITS** condition (e.g., P1 or P2 High or Low Limit, Current, Voltage, Power or Resistance). If the device is set to run automatically, it will record the out of limit condition and stay energized until the start of the next weld. If it is being run manually, it will start 0 - 5 milliseconds after the end of **HOLD** and will stay energized until the **OUT OF LIMITS** alarm state is cleared when the operator clicks the **RUN** button.

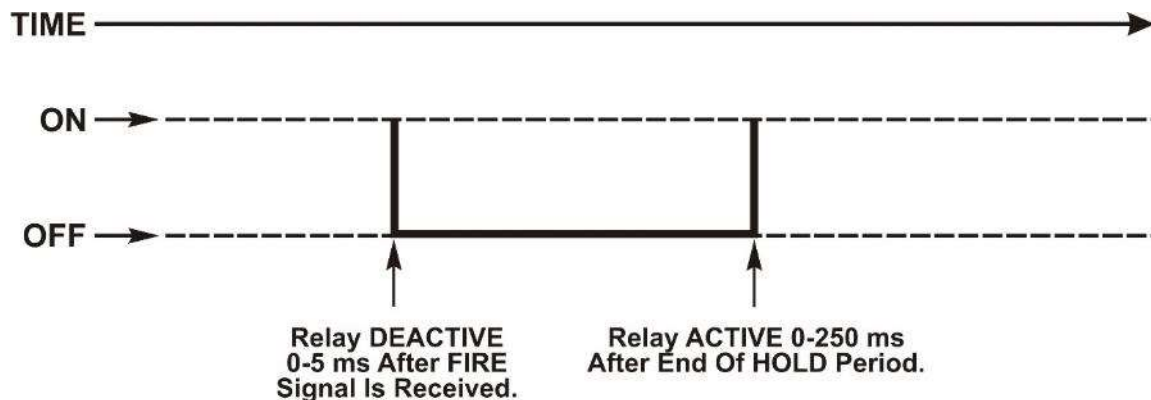
APPENDIX C RELAY TIMING DIAGRAMS

V-A TIME OUT (Combo Mode)



The relay will switch when the Control determined that **V-A** ramp-up time was exceeded. It will start 0 - 5 milliseconds after the weld is aborted and will stay energized until the **V-A TIME OUT** alarm is cleared by pressing the **RUN** button, or at the start of the next weld.

UNIT READY

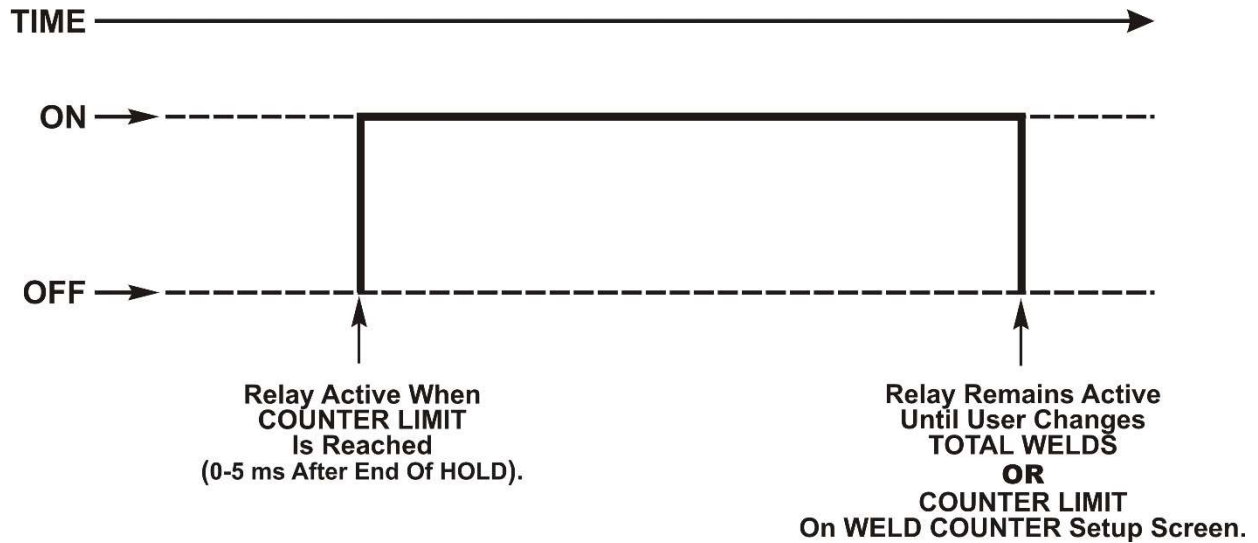


The relay will be energized when the Control is ready to weld. It will de-energize 0 - 5ms after receipt of a fire signal. It will energize 0 - 250ms after the end of **HOLD** period. The relay will

APPENDIX C RELAY TIMING DIAGRAMS

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.

WELD COUNTER



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.

Appendix D RS-232 CONNECTIONS

Overview

The Power Supply has an RS-232 Serial Port connector that is used to transmit commands and weld data to/from a Personal Computer (PC) / host computer or other serial communications device.

The UB-B resistance welder is considered a DCE (data circuit-terminating equipment) device. When interfacing with a computer, a DTE (data terminal equipment) device, a standard DB9 serial cable should be used.

NOTE: RS-232 must be enabled by an engineer account prior to using the web interface. (This is done in the [Weld Control Data Communications](#) window on the System Settings window.)

Interface Protocol

Transmission Mode:	RS-232 compliant, asynchronous	Factory Default Settings:
Default Baud Rate:	full-duplex 115200	
Data Format	Baud Rate: 9600, 19200, 38400, 57600, 115200 bits/sec	115200
	Data bit: 8	8 data bits
	Stop bit: 1	1 stop bits
	Parity bit: None	No Parity
Character Code	ASCII	

To avoid conflicts in multi-welder communication configurations, each welder is assigned a UNIT ID which can be any number between 0 and 99. The UNIT ID serves as the prefix for each command.

The Power Supply can operate as a HOST or CLIENT during RS-232 communications. Under normal running conditions, the unit is configured to the HOST role.

When serving as a HOST, the Power Supply automatically sends the results of the latest weld to the connected computer. The unit will not accept any commands from the Host computer.

APPENDIX D RS-232 CONNECTIONS

This avoids potential collisions between the incoming commands and the automatic reporting of weld results.

When serving as a CLIENT, the Power Supply accepts both Read and Set commands from the Host computer. Automatic reporting of weld results is turned off.

Baud Rate, Unit ID, and HOST/CLIENT role are settings configured from the GUI and can be accessed by selecting: Security Functions → Weld Controls and Communication Settings from the Circular Menu.

Commands

Description

The command structure is as follows:

#	UnitID#	Command Keyword	Command Option {Parameters}	<CRLF>	<LF>
---	---------	-----------------	-----------------------------	--------	------

#	Indicates the start of single transmission.				
Unit ID#	Must be two digits from "00" to "30". Provides backwards compatibility with older units. Default ID# is 00 if not set.				
Command Keyword	Instruction command to the UB-B unit.				
Command Option	Parameters:	Variable or settings for the command			
	Required Parameters	{enclosed in braces}.			
	Choice of Parameters	Separated by vertical bar " " indicating OR.			
<CRLF>	Terminates each parameter field				
<LF>	End data transmission terminates the list of parameter & values.				
BCC	Block Check Character				

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX D RS-232 CONNECTIONS

When you issue a command to the Power Supply, you need to wait about 500ms before issuing the next command. The answer timeout is set to about 500ms, in case the Power Supply doesn't respond to a command.

Suggested error checking procedure on the external host side of the interface:

1. For a host Read command (e.g., read profile data), the host must time out if the unit does not send a complete response within a reasonable amount of time. The host can also check the number of bytes received against the expected number for that message; range check the received data or do whatever else is necessary to have confidence in the received data.
2. Following a host Set command, the host must read the data set and make sure the data set matches data read. For example, if a "set schedule 1" command is sent, the unit must then do a "read schedule 1" and compare the set data against the read data.

Computer Originated Commands

These are the commands sent by the host computer via RS-232 to the Power Supply.

ALARMS

Command **ALARMS** <crLf>
 <lf>

Control State READY state.

Description Reports all active notifications for alarms, faults, and weld status.
 Alarms may be cleared by sending the ALAMRESET command.

CHAIN

Command **CHAIN {READ | SET} chain_state**<crLf>
 <lf>

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX D RS-232 CONNECTIONS

Control State READY state.

Description Provides Host control over schedule chaining operations. When used with the “READ” keyword, the current chain enable state is returned. followed by the list defined links. (See the CHAIN command in the *Power Supply Command Responses* section). When used with the SET keyword, the host provides a new value for chain state to turn on or off chain operations.

When the chain state is YES, then loading any schedule containing a chain link will activate the chain containing that schedule.

The following is the list of parameters that comprise this command:

chain_state: YES (turn on chain operations) or NO (turn off chain operations).

CHAINSETUP

Command CHAINSETUP {READ | SET} <crLf>
link_count<crLf>
linkdef<crLf>
.....
linkdef<crLf>
<lf>

Control State READY state.

Description Provides control over schedule chaining. When used with the “READ” keyword, the number of defined links is provided, followed by the list defined links. (See the CHAINSETUP command in the *Power Supply Command Responses* section). With the SET keyword, the *link_count* is not used, and the host may set (change) the value of one link definition. A sequence of SETs commands could be sent to setup up the entire chain. Once the chain is defined, to execute the

APPENDIX D RS-232 CONNECTIONS

chain, LOAD the first schedule in the chain sequence, followed by the CHAIN SET ON command.

The following is the list of parameters that comprise this command:

Link_Count: The number of schedule containing links. (Range 0 to 128)
(provided in READ response -- Not used with SET option)

linkdef: A linkdef is defined as {*schedule_repeat count, next schedule*}.

- **schedule:** the schedule containing the chain definition. (Range 1 to 128)
- **repeat count:** the number of weld repetitions before advancing to the next schedule. (Range 0 to 1000)
- **next schedule:** the schedule to be loaded for the next weld. (Range 0 to 128)

Note: Chain operations state is set to NO by the SET option.

CHECK

Command CHECK {READ | SET} <crf><lf>

[*parameter_name value*<crf>], where *value* is an integer.

Control State Any state **except** while welding.

Description: Requests the Power Supply to report the Check Percentage settings for the Fire Lockout Charge and Capacity Charge Limits. When used with the "READ" keyword, the CHECK % settings are returned. When the "SET" keyword is used, the host may set (change) the value of one or more of the CHECK % setting parameters.

The following is a list of valid literal substitutions for the *parameter_name* and *value* variables:

CHARGE {*charge_value*} Fire Lockout Charge %

CAP {*cap_value*} Capacity Check %

- *charge_value* the % requirement for the Fire Lockout Charge (Range 0 – 100)
- *cap_value* the % requirement for the capacity Charge limit (Range 0 – 100)

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- **Note:** The Power Supply does not send back any reply for the CHECK SET command, if it was successful.

COMBO

Command COMBO { READ | SET } <crf><lf>

Control State Ready State

Description Provides control over the Power Supply schedule parameters related specifically only the Combo mode. When used with the "READ" keyword, the specific Combo mode parameters pertaining to the currently loaded schedule are returned (see SCHEDULE in the *Power Supply Command Responses* section). When the "SET" keyword is used, the host may set (change) the value of the Combo specific parameters pertaining to the currently loaded schedule.

The following is a list of valid literal substitutions for the parameter name and value variables.

ENABLE { NO | YES } enable Combo (V-A) Mode

VOLT { weld_energy } maximum allowable voltage level for pulse 0 ramp in units of 1 Volt (Range 0 to 9.90)

RISE { rise_time } ramp up time for pulse 0 in msec (Range 0 to 9.90)

WELD { rise_time } ramp up time for pulse 0 in msec (Range 0 to 9.90)

DOWN{ rise_time } ramp up time for pulse 0 in msec (Range 0 to 9.90)

CURRENT { weld_energy } constant current control level for pulse1 in units of 1kAmp (Range .005 to 1.50 | .20 to 4.000)

Note: The Power Supply does not send back any reply for the COMBO SET command, if it was successful.

CONTROL

Command CONTROL {TAKE | RELEASE} <crf>
<lf>

Control State Any state.

Description Allows RS232 command interface to take or release operational control of the UB-B. By default, GUI has control of the UB-B after power up. The RS232 commands are limited to accessing system status, alarms, and weld status

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information. This command with the TAKE option gives the RS232 access to its full command suite and restricts the GUI's access.

Operational suggestion: When RS232 commanding is not needed, the RELEASE option should be issued to restore GUI operations.

PLC operations take precedence over GUI and RS232.

COPY

Command COPY {from_schedule_number} {to_schedule_number} <crf> <lf>

Control State Any

Description Allows one schedule to be copied to another schedule number. From_schedule_number and to_schedule_number may be any number from 1 to 128. Copying a schedule to itself has no effect.

Note: The Power Supply does not send back any reply for this command, if it was successful.

COUNT

Command COUNT<crf><lf>

Control State Any

Description Requests the Power Supply to report the number of weld data accumulated since the last data collection. Power Supply returns the COUNT even if there is no weld data available.

COUNTER

Command COUNTER {READ SET} <crf><lf> [parameter_name value<crf>], where value is an integer

Control State Any

Description Requests the Power Supply to return or update the Power Supply weld counter contents. When used with the "READ" keyword, the Power Supply will return the Total weld and Good weld counts as well as the maximum weld count value

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before an alarm raised. When the "SET" keyword is used, the host may set (change) the value of one or more of the weld counter parameters.

The following is a list of valid literal substitutions for the parameter_name and value variables:

- **TOTAL** the total number of welds counter.
- **GOOD** count of welds within limits
- **LIMIT** the maximum total weld count allowed
- **ELEC_COUNT** count of welds for electrode.
- **ELEC_LIMIT** the maximum electrode count allowed

Note: The Power Supply does not send back any reply for the COUNTER SET command if it was successful.

CURRENT

Command **CURRENT**<crLf><lF>

Control State Any

Description Requests the Power Supply to report the sampled Current data of the last weld. Power Supply shall return with CURRENT report. See CURRENT command in the [Power Supply Command Responses](#) section.

ECO

Command **ECO READ | SET** <crLf><lF>

[parameter_name value<crLf>], where value is an integer.

Control State Any state *except* while welding.

Description Requests the Power Supply to report the ECO settings of the Power Board. When used with the "READ" keyword, all parameters pertaining to the ECO settings are returned. When the "SET" keyword is used, the host may set (change) the value of one or more of the ECO settings parameters.

The following is a list of valid literal substitutions for the parameter_name and value variables:

- ENABLE** {OFF | ON} Enable ECO mode
- FLOOR** {charge_value} Acceptable charge % for ECO mode (Range 65 – 100)

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- charge_value the % of the set charge capacity limit allowed at the end of the weld pulse.

Note: The Power Supply does not send back any reply for the ECO SET command, if it was successful.

ERASE

Command ERASE<crLf><lf>

Control State Any

Description Requests the Power Supply to erase all the weld reports.

Note: The Power Supply does not send back any reply for this command, if it was successful.

FIRE

Command FIRE<crLf><lf>

Control State Any

Description Initiates a weld.

LIMIT Actions

Command LIMIT {READ | SET} ACTIONS <crLf>
[parameter_name value<crLf>]<lf>.

Control State Any state *except* while welding.

Description Provides control over the basic weld energy level limit settings of the Power Supply schedule. When used with the "READ" keyword, the upper/lower energy level limit settings of the currently loaded schedule are returned (See the LIMITS command in the *Power Supply Command Responses* section). When the "SET" keyword is used, the host may set (change) the value of one or more of the parameters of the basic weld limit settings pertaining to the currently loaded schedule.

The following is a list of valid literal substitutions for the parameter name and value variables:

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P1ACTION	{ NONE STOP INHIBIT APC }	Out of Limit Action for pulse 1
P2ACTION	{ NONE STOP }	Out of Limit Action for pulse 2

LIMIT Waveform

CommandLIMIT {READ | SET} {UPPER | LOWER} <crf>
{ENABLE *enable_value*<crf> |
Number_of_limitpoints<crf> *limitpoints* <crf> . . . *limitpoints* <crf>}
<lf>

Control State Any state *except* while welding.

Description Provides the definition of each limitpoint used to generate the limit envelope of weld energy waveform. When used with the "READ" keyword, the set of limitpoints defined for the currently loaded schedule are returned (see LIMIT_WF in the *Power Supply Command Responses* section). When the "SET" keyword is used, the host may set (change) the value of one or more limitpoints for the currently loaded schedule. The number of limitpoints specifies the number limit points provided (READ) or expected (SET) in the command.

The following is a description of the parameters of the command:

ENABLE {YES | NO } Enable application of limit points to weld monitoring

- *Number_of_limitpoints*: The number of limitpoints defined to generate the weld limit envelope (Range 0 to 40)
- *limitpoint*: Defined as {*time_index*, *mode*, *limit_value*}.
 - *time_index*: time index from beginning of weld cycle for limit point. (Range 1 to 999.00 msec)
 - *mode*: the control mode { V | C | P | R | none } that determines type of energy emitted by power supply.
 - *limit_value*: the upper or lower limit based on control mode.
 - *Voltage* weld energy is in units of 1 Volt (Range 0 to 9.90)

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- *Current* weld energy is in units of 1 kAmp (Range .005 to 1.5 | 0.20 to 4.0)
- *Power* weld energy is in units of 1 kWatt (Range 0 to 9.90)

Restrictions on limit points:

- Limit points are not allowed during cool period in the schedule:
- Squeeze period
- Hold period
- Upper limit must be greater than lower limit

Setting Enable to NO and specifying Number of limit points as 0, deletes the upper or lower limit.

LOAD

Command LOAD {*schedule_number*}<crLf><lf>

Control State READY state

Description Selects the *schedule_number* as the currently loaded schedule. *schedule_number* may be any number from 1 to 128. There must be a space between LOAD and *schedule_number*.

Note: The Power Supply does not send back any reply for this command, if it was successful.

OHMS

Command OHMS<crLf><lf>

Control State Any

Description Requests the Power Supply to report the sampled Current data of the last weld. Power Supply shall return with RESISTANCE report. See [OHMS](#) command in the *Power Supply Command Responses* section.

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PBSTATUS

Command **PBSTATUS**<crLf>
 <lf>

Control State Any

Description Requests the Power Supply to provide the following set of status information from the Power Board Module:

- **CAP VOLTAGE** (0 – 24 V)
- **SYS TEMP** (0 – 129 C) Alarm at 65C
- **SCHED** (0 – 128)
- **ALARMS**

The following is the list of possible alarms. All active issues are reported.

HW_ERROR	Memory self-test failed. <ul style="list-style-type: none">▪ Reboot or check hardware.▪ Possible calibration loss
LOW_CAP	Capacitors not charging in expected time. <ul style="list-style-type: none">▪ Reboot or check hardware.
HIGH_TEMP	Heatsink reached unsafe temperature
E-STOP	E-stop input to power board asserted
WELD_CNT	Total weld count has reached maximum set by user
ELEC_CNT	Electrode weld count has reached maximum set by user
LOCKOUT	Capacitor below lockout threshold (charging state)
BUSY	System in busy state (Welding or about to weld) <ul style="list-style-type: none">▪ The system will reject new weld commands in this state.
NONE	Reported when there are no active conditions

To clear alarms, use the RESETFAULT command.

POWER

Command **POWER**<crLf><lf>

Control State Any

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Description Requests the Power Supply to report the sampled Current data of the last weld. Power Supply shall return with POWER report. See [POWER](#) command in the Power Supply Command Responses section.

RELAY

Command **RELAY {READ | SET}** <crLf><lF> *parameter_name value*<crLf>, where *value* is an integer.

Control State Any state *except* while welding.

Description Provides control over the Power Supply schedule parameters for relay settings. When used with the "READ" keyword, the relay settings of the currently loaded schedule are returned (see RELAY in the *Power Supply Command Responses* section). When the "SET" keyword is used, the host may set (change) the value of one or more of the relay settings of the currently loaded schedule.

The following is a list of valid literal substitutions for the *parameter_name* and *value* variables:

parameter_name	value
○ ENABLE1 OFF ON }	Status Messages and Alarms Codes Table
○ WHEN1 condition_value	Status Messages and Alarms Codes Table
○ ENABLE2 { OFF ON }	Relay 2 Active State when relay is enabled
○ WHEN2 condition_value	Relay 2 Conditions when relay is enabled
○ ENABLE3 { OFF ON }	Relay 3 Active State when relay is enabled
○ WHEN3 condition_value	Relay 3 Conditions when relay is enabled
○ ENABLE4 { OFF ON }	Relay 4 Active State when relay is enabled
○ WHEN4 condition_value	Relay 4 Conditions when relay is enabled
○ ENABLE5 { OFF ON }	Relay 5 Active State when relay is enabled
○ WHEN5 condition_value	Relay 5 Conditions when relay is enabled
○ ENABLE6 { OFF ON }	Relay 6 Active State when relay is enabled
○ WHEN6 condition_value	Relay 6 Conditions when relay is enabled
○ <i>condition_value</i> is:	
○ { WELD END ALARM LIMITS TIME READY P1HI P1LOW P2HI P2LOW P12HII P12LOWI P12HIV P12LOWV P12HIP P12LOWP P12HIR P12LOWR WELD_ENAB WELD_CTR ELEC_CTR }	

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Multiple conditions can be specified for the same relay.

Note: The Power Supply does not send back any reply for the **RELAY SET** command, if it was successful.

REPORT

Command **REPORT {OLD | NEW | ERASE} number <crlf><lf>**

Control State Any

Description Requests the Power Supply to send the weld report.

- **OLD** requests to send the number of oldest weld reports since the last data collection.
- **NEW** requests to send the number of newest weld reports and then erases them from the buffer.
- **ERASE:** erase the number of oldest or newest weld reports.

number: the quantity of weld data to be sent or erased.

If the number is greater than the number of weld data in the buffer, than the number of welds stored will be sent. **NOTE:** There must be a space between two fields. For more details, see the [Report](#) command in the Power Supply Command Responses section.

RESETALARM

Command **RESETALARM<crlf><lf>**

Control State Any

Description Resets Alarm and Limit relays, and resets system ready and weld states.

Note: The Power Supply does not send back any reply for the RESETALARM command, if it is successful.

RESETPILZ

Command **RESETPILZ <crlf><lf>**

Control State Any

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Description Resets the hardware safety subsystem and system ready states.

Note: The Power Supply does not send back any reply for the RESETPI LZ command, if it is successful.

RPTSTATUS

Command RPTSTATUS <crlf><lf>

Control State Any

Description Requests the Power Supply to report the status of the weld data buffer. Power Supply returns **STATUS** with either "OK" or "OVERRUN." For more details, see [RPTSTATUS](#) command in the *Power Supply Command Responses* section.

SCHEDULE

Command SCHEDULE <crlf><lf>

Control State Any state *except* while welding.

Description Requests the Power Supply to return the currently selected schedule number.

SCHEDULE parms

Command SCHEDULE PARMS {READ | SET}<crlf>
[parameter_name value<crlf><lf>]

Control State READY state.

Description Provides control over the Power Supply schedule parameters. When used with the "READ" keyword, all parameters pertaining to the currently loaded schedule are returned (see SCHEDULE in the *Power Supply Command Responses* section). When the "SET" keyword is used, the host may set (change) the value of one or more of the parameters pertaining to the currently loaded schedule. The following is a list of valid literal substitutions for the parameter name and value variables:

ENG1	{ energy_level }	energy amount for pulse 1
MODE1	{ V C P }	control mode for pulse 1
ENG2	{ energy_level }	energy amount for pulse 2

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MODE2	{ V C P none }	control mode for pulse 2
SQUEEZE	{ <i>squeeze_time</i> }	squeeze time
UP1	{ <i>weld_time</i> }	up slope time of pulse 1
WELD1	{ <i>weld_time</i> }	weld time of pulse 1
DOWN1	{ <i>weld_time</i> }	down slope time of pulse 1
COOL	{ <i>weld_time</i> }	cool time
UP2	{ <i>weld_time</i> }	up slope time of pulse 2
WELD2	{ <i>weld_time</i> }	weld time of pulse 2
DOWN2	{ <i>weld_time</i> }	down slope time of pulse 2
HOLD	{ <i>hold_time</i> }	hold time

(Times below in msec)

squeeze_time: squeeze period (Range 0 to 999.00)

rise1_time: Pulse1 rise period (Range 0 to 99.00)

weld1_time: Pulse1 weld period (Range 0.0 to 99.00)

fall1_time: Pulse1 fall period (Range 0.0 to 99.00)

cool_time: Cool period (Range 10.0 to 9.00)

rise2_time: Pulse2 rise period (Range 0 to 99.00)

weld2_time: Pulse2 weld period (Range 0 to 99.00)

fall2_time: Pulse2 fall period (Range 0.0 to 99.00)

hold_time: Hold period (Range 0 to 999.00)

Mode: the control mode { Voltage|Current|Power|none} determining type of energy emitted by power supply.

energy_level: the amount of energy delivered by the power supply based on control mode.

- **Voltage** weld energy is in units of 1 Volt (Range 0.1 to 9.90)
- **Current** weld energy is in units of 1 kAmp (Range .005 to 1.5 | .20 to 4)
- **Power** weld energy is in units of 1 kWatt (Range 0.1 to 9.90)

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Note: The Power Supply does not send back any reply for the SCHEDULE SET command, if it was successful.

SCHEDULE Flex Waveform

Command **SCHEDULE WF {READ | SET}<crLf>**
number_of_weldpoints<crLf>
weldpoint<crLf> . . . weldpoint<crLf>
<lf>

Control State READY state.

Description Provides control over the set of weldpoints used to generate the weld energy waveform. When used with the “READ” keyword, the set of weldpoints for the currently loaded schedule is returned (See the SCHEDULE_WF command in the *Power Supply Command Responses* section). The following is the list of parameters that comprise this command:

squeeze_time *time period prior to first Rise period . (Range .1 to 999.00 msec)*

hold_time *time period following the last fall period . (Range .1 to 999.00msec)*

Number_of_weldpoints: The count of *weldpoint* definitions in the command.
(Range: 2 to 40)

- *weldpoint:* Defined as {time_index, mode, energy_level }.
- *time_index:* the number of 25 microsecond increments from the beginning of the weld cycle. (Range 0 to [999.00 msec])
- *mode:* the control mode { V | C | P | R } that determines type of energy emitted by power supply.
- *energy_level:* the amount of Voltage|Current|Power delivered by the power supply based on control mode.

Voltage weld energy is in units of 1 Volt (Range 0 or (.1 to 9.90))

Current weld energy is in units of 1 Amp (Range 0 or (.005 to 1.5 | .20 to 4.0)

Power weld energy is in units of 1 kWatt Range 0 or (.1 to 9.90)

Energy Level = 0 denotes cool period in weld schedule.

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STATE

Command STATE <crLf><lf>

Control State Any

Description Commands the Power Supply to identify its current state. See Section 3.1.18 for command response to this command.

TESTPULSE

Command TESTPULSE {READ | SET}<crLf> [*parameter_name value*]<crLf><lf>

Control State READY state.

Description Provides control over the Power Supply test pulse parameters. When used with the "READ" keyword, all parameters pertaining to the currently loaded schedule are returned (see Testpulse in the *Power Supply Command Responses* section). When the "SET" keyword is used, the host may set (change) the value of one or more of the test pulse parameters pertaining to the currently loaded schedule. The following is a list of valid literal substitutions for the parameter name and value variables:

ENABLE { YES NO }	Indicates whether there is a test pulse or not
SQUEEZE { <i>squeeze_time</i> }	squeeze time
RISE { <i>rise_time</i> }	up slope time of test pulse
TPERIOD { <i>test_time</i> }	time of test pulse period
FALL { <i>fall_time</i> }	down slope time of pulse
MODE { V C P none }	control mode for pulse
ENG { <i>energy_level</i> }	test pulse energy level
LOWLIM { <i>limit_value</i> }	test pulse lower limit
UPLIM { <i>limit_value</i> }	test pulse upper limit

squeeze_time the time for the squeeze period in 1ms (Range 0 to 999)

rise_time the time for the period in 1ms (Range 0 to 3)

test_time the time for the test pulse period (Range 1 to 3)

fall_time the time for the period in 1ms (Range 0 to 3)

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<i>Mode</i>	the control mode { Voltage Current Power} that determining type of energy emitted by power supply.
<i>energy_level</i>	the amount of energy delivered by the power supply based on control mode <ul style="list-style-type: none">▪ Voltage weld energy is in units of 1 Volt (Range 0 to 9.90)▪ Current weld energy is in units of 1 Amp (Range .005 to 1.5 .20 to 4.0)▪ Power weld energy is in units of 1 kWatt(Range 0 to 9.90)
<i>limit_value</i>	the limit value is in units of 1mOhm (Range 0 to 50)

Note: The Power Supply does not send back any reply for the TESTPULSE SET command, if it was successful.

TYPE

Command TYPE<crLf><lf>

Control State Any

Description Requests the Power Supply to return the type of welder, release number, and revision letters. For more details, see Type command in the Power Supply Command Responses section.

VERBOSE

Command VERBOSE {ON | OFF}<<crLf><lf>

Control State Any

Description When OFF, NAK responses contains error condition only. When ON, generic NAK responses contain additional information to identify specific command line data that is in error.

VOLTAGE

Command VOLTAGE <crLf><lf>

Control State Any

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Description Requests the Power Supply to report the sampled Current data of the last weld. Power Supply shall return the VOLTAGE report. See VOLTAGE command in the *Power Supply Command Responses* section.

WELDSTATUS

Command WELDSTATUS {CODE | MSG}<crLf><lf>
<lf>

Control State Any

Description Provides the status of the last weld. When the READ option is used, a value from 0 to -20 is returned. See Section 3.3 for the list of status conditions. When the DISPLAY option is used, the text description from Section 3.3 is reported instead of the status code.

Power Supply Responses

Command Responses

These are the command responses sent from the Power Supply to a host computer.

ALARMS

Command ALARMS *alarm_code* <crLf>

Response <lf>

Description Response to ALARMS READ option. Provides the status code of the last weld performed.

alarm_code: integer value (Range 0 to 46)

See [Status Messages and Alarm Codes](#).

Command ALARMS <crLf>

Response *alarm_description*<crLf>
<lf>

Description Response to ALARMS DISPLAY option. Provides the text description of the current alarm.

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alarm_description: Text description of the alarm code.

CHAIN

Command CHAIN *chain_state*<crLf>

Response <lf>

Description Response to the CHAIN READ option. Provides the current chain active state.
chain_state: YES (chain operations active) or NO (chain operations inactive).

CHAINSETUP

Command CHAINSETUP<crLf>

Response link_count<crLf>
linkdef<crLf>
...
linkdef<crLf>
<lf>

Description Provides the definition of the schedule chained linked to the active schedule.
Link_Count: The number of links in the schedule chain. (Range 0 to 128)
linkdef: A link node in the chain defined as {schedule_repeat count, next schedule}.

- schedule: the schedule containing the chain node. (Range 1 to 128)
- repeat count: the number of weld repetitions before advancing to the next schedule. (Range 0 to 1000)
- next schedule: the schedule to be loaded for the next weld. (Range 0 to 128)

COMBO

Command COMBO *schedule_number*<crLf><lf>

Response ENABLE *enable state* <crLf>

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VOL *energy_level* <crLf>
RISE *time* <crLf>
WEL *time* <crLf>
DOWN *time* <crLf>
CURRENT *energy_level* <crLf>
<lf>

Description Reports the Combo mode specific settings of the currently loaded Power Supply schedule.

enable state Combo mode state inactive or active {OFF | ON}
weld_energy Maximum allowable voltage level for pulse 0 ramp in units of 1 Volt (Range 0 to 9.90)
rise_time ramp up time for pulse 0 in msec (Range 0 to 9.90)
rise_time ramp up time for pulse 0 in msec (Range 0 to 9.90)
rise_time ramp up time for pulse 0 in msec (Range 0 to 9.90)
weld_energy current control level for pulse 1 in units of 1 kAmp (Range .005 1.50 | .20 to 4.000)

COUNT

Command **COUNT** *number*<crLf>

Response <lf>

Description Returns the number of weld data available in Power Supply.

number The number of weld reports that the Power Supply has buffered (0 to 128)

COUNTER

Command **COUNTER** <crLf>

Response **TOTAL** *count*<crLf>

GOOD *count*<crLf>

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LIMIT *count*<crLf>
ELEC_COUNT *count* <crLf>
ELEC_LIMIT *count* <crLf>
<lf>

Description Returns following weld and electrode count information.

count	Integer value denoting the following:
Total	the total number of welds counter.
Good	count of welds within limits
Limit	the maximum total weld count allowed
Elec_Count	count of welds for electrode.
Elec_Limit	the maximum electrode count allowed

CURRENT

Command CURRENT number_of_data<crLf><lf>

Response data <crLf>
.
.
.
.
data <crLf>
<lf>

Description Returns the Current reading of the last weld. The first field is the number of data to be sent. Then follows the packets of data. Each data is separated by <crLf> and this command ends with <crLf><lf>

number_of_data: This is the number of data included in this command. The Power Supply samples current every 50 μ s. For a weld less than 100 ms weld time, the number of data will be approximately: total weld time \div 50 μ s. This number will be always less than 2000.

data: an integer number in unit of A.

ECO

Command ECO <crLf>

Response ENABLE *enable_state* <crLf>

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CHARGE *charge_value* <crLf>
<lf>

Description Returns the current ECO settings. The ECO settings are returned as the following parameter name / value pairs.

enable_state ECO mode inactive or active {OFF | ON}
charge_value Acceptable charge as % of capacity (Range 65 – 100)

LIMIT Actions

Command **LIMIT** *schedule_number* ACTIONS<crLf>

Response **P1ACTION** *p1_option*<crLf>
 P2ACTION *p2_option* <crLf>
<lf>

Description Reports the action that will be taken for a limit violation detected in Pulse 1 or Pulse 2.

schedule_number identifies which schedule is currently loaded (integer from 1 to 128).

p1_option Pulse 1 option: { NONE | STOP | INHIBIT | APC }

NONE No action taken
STOP Stop weld during Pulse 1 and prevent Pulse 2
INHIBIT Stop weld after pulse 1 and prevents Pulse 2
APC Stop Pulse 1 immediately and but allow Pulse 2

p2_option Pulse 2 option: { NONE | STOP }

NONE No action taken
STOP Stop weld during Pulse 2

LIMIT Waveform

Command **LIMIT** *schedule_number limit_option*<crLf>

Response **ENABLE** *enable_state*<crLf>

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```
Number_of_weldpoint_limits<crLf>
Weldpoint_limit<crLf>
. . . .
Weldpoint_limit<crLf>
<lf>
```

Description Reports the definition of each weldpoint limit used to generate the limit envelope waveform

The following is a description of the parameters in the command response.

- *schedule_number* the schedule that is currently loaded (integer from 1 to 128).
- *limit_option* the type of limit { **UPPER** | **LOWER** }
- *enable_state* provides limit enable state { **ON** | **OFF** }
- *number_of_limitpoint* the number of limitpoints that follow in the command response. These points define the limit envelope.
 - *limitpoints* Each *limitpoint* is defined as { *time_index*, *mode*, *energy_level* }.
 - *time_index* the number of 25 microseconds increments from the beginning of the weld cycle. (Range 0 to 999.00) (999 msec)
 - *mode* specifies the control mode { **V** | **C** | **P** | **R** | **none** } that determines type of energy emitted by power supply.
 - *energy_level* the amount of energy delivered by the power supply based on control mode.
 - **Voltage** weld energy Volts (Range 1 to 9.90)
 - **Current** weld energy kAmp (Range .005 to 1.5 | .20 to 4.0)
 - **Power** weld energy kWatt (Range 1 to 9.90)

OHMS

Command OHMS *number_of_data*<crLf>

Response *data* <crLf>

```
. . . .
data <crLf>
```

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<lf>

Description Returns the Resistance reading of the last weld. The first field is the number of data to be sent. Then follows the packets of data. Each data is separated by <crlf> and this command ends with <crlf><lf>

number_of_data: This is the number of data included in this command. The Power Supply samples current every 50 μ s. For a weld less than 100 ms weld time, the number of data will be approximately: total weld time \div 50 μ s. This number will be always less than 2000.

Data: integer number in unit of Ω (10^{-5}).

PBSTATUS

Command PBSTATUS<crlf>

Response CAP_VOLTAGE *voltage* <crlf>
SYS_TEMP *temp* <crlf>
SCHED *schedule_number* <crlf>
ALARMS *alarm*
<lf>

Description Requests the Power Supply to provide the following set of status information from the Power Board Module:

voltage (0 – 24 V)
temp (0 – 129 C) Alarm at 65C
schedule_number (0 – 128)
alarm See list below:

The following is the list of possible alarms. All active issues are reported.

HW_ERROR Memory self-test failed.
- Reboot or check hardware.
- Possible calibration loss
LOW_CAP Capacitors not charging in expected time.

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	- Reboot or check hardware.
<i>HIGH_TEMP</i>	Heatsink reached unsafe temperature
<i>E-STOP</i>	E-stop input to power board asserted
<i>WELD_CNT</i>	Total weld count has reached maximum set by user
<i>ELEC_CNT</i>	Electrode weld count has reached maximum set by user
<i>LOCKOUT</i>	Capacitor below lockout threshold (charging state)
<i>BUSY</i>	System in busy state (Welding or about to weld) - The system will reject new weld commands in this state.
<i>NONE</i>	Reported when there are no active conditions

To clear alarms, use the **RESETALARM** command.

POWER

Command `POWER number_of_data<crf>`

Response `data <crf>`

....

`data <crf>`

`<lf>`

Description Returns the Power reading of the last weld. The first field is the number of data to be sent. Then follows the packets of data. Each data is separated by `<crf>` and this command ends with `<crf><lf>`

number_of_data: This is the number of data included in this command. The Power Supply samples current every 50 μ s. For a weld less than 100 ms weld time, the number of data will be approximately: total weld time \div 50 μ s. This number will be always less than 2000.

Data: integer number in unit W.

REPORT

Command `REPORT number_of_reports<crf>`

`report<crf>`

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...

report <crLf>

<lF>

Description Returns the requested number of weld reports. First field is the number of reports to be sent. Then follows the packets of report. One report pack hold all the information about a weld. Each report packet is separated by <crLf> and this Command ends with <crLf><lF>.

number_of_reports: This is the number of reports that shall be included in this command. If the host computer requests more weld data than is available in the weld data buffer, the Power Supply sends only the weld reports in the weld buffer and the *number_of_reports* is the number of weld reports available in the weld data buffer. After the report is sent to the host computer, the Power Supply erases the weld data sent to the host from the weld data buffer.

Report: {*unit_number, schedule_number, average_current_1, peak_current_1, average_voltage_1, peak_voltage_1, average_power_1, peak_power_1, average_resistance_1, peak_resistance_1, average_current_2, peak_current_2, average_voltage_2, peak_voltage_2, average_power_2, peak_power_2, average_resistance_2, peak_resistance_2, energy_capacity_1, energy_capacity_2, weld_error1, weld_error2, weld_error3, total_wel_count, good_weld_count*}

The fields in the report packet are separated with a comma and all fields are in integer format.

There are always 25 fields in a report packet.

Unit_number: The schedule number of the weld.

Schedule_number: The schedule number of the weld.

average_current_1: average current of pulse 1 (in A).

peak_current_1: The peak current of pulse 1 (in A).

average_voltage_1: The average voltage of pulse 1 (in mV).

peak_voltage_1: The peak voltage of pulse 1 (in mV).

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average_power_1: The average power of pulse 1 (in W).
peak_power_1: The peak power of pulse 1 (in W).
average_resistance_1: The average resistance of pulse 1 (in 10⁻⁵ Ω).
peak_resistance_1: The peak resistance of pulse 1 (in 10⁻⁵ Ω).
average_current_2: The average current of pulse 2 (in A).
peak_current_2: The peak current of pulse 2 (in A).
average_voltage_2: The average voltage of pulse 2 (in mV).
peak_voltage_2: The peak voltage of pulse 2 (in mV).
average_power_2: The average power of pulse 2 (in W).
peak_power_2: The peak power of pulse 2 (in W).
average_resistance_2: The average resistance of pulse 2 (in 10⁻⁵ Ω).
peak_resistance_2: The peak resistance of pulse 2 (in 10⁻⁵ Ω).
energy_capacity_1: The energy capacity result (% at start of weld)
energy_capacity_2: The energy capacity result (% at end of weld).
weld_error1: Power Board Status, no error = 0.
weld_error2: Weld Status, no error = 0.
weld_error3: Weld error, no error = 0.
total_weld_count: Total Weld count for this report.
good_weld_count: Good Weld count for this report.

RPTSTATUS

Command **RPTSTATUS** *report_status*<crLf>

Response <lf>

Description Reports the status of the Power Supply weld report buffers.

report_status **OK** weld report buffers have not overrun

OVERRUN weld report buffers have overrun

The power supply can hold 128 weld reports. When more than 128 welds are performed, the latest weld reports will overwrite the oldest weld reports.

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RELAY

CommandRELAY <crLf>

ResponseENABLE1 *enable_option* <crLf>
 WHEN1 *condition value*<crLf>
 ENABLE2 *enable_option* <crLf>
 WHEN2 *condition value*<crLf>
 ENABLE3 *enable_option* <crLf>
 WHEN3 *condition value*<crLf>
 ENABLE4 *enable_option* <crLf>
 WHEN4 *condition value*<crLf>
 ENABLE5 *enable_option* <crLf>
 WHEN5 *condition value*<crLf>
 ENABLE6 *enable_option* <crLf>
 WHEN6 *condition value*<crLf>
<lf>

Description Reports the relay settings.

enable_option Identifies whether Relay is active { **ON** | **OFF** } when enabled
condition value Identifies the conditions when the relay is enabled (multiple conditions may selected for the relay)

{ WELD | END | ALARM | LIMITS | TIME | READY | P1HI | P1LOW | P2HI | P2LOW | P12HII | P12LOWI | P12HIV | P12LOWV | P12HIP | P12LOWP | P12HIR | P12LOWR | WELD_ENAB | WELD_CTR | ELEC_CTR }

SCHEDULE

CommandSCHEDULE *schedule_number* SCHED_TYPE *schedule_type*<crLf>

Response <lf>

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Description

Returns the current schedule number and the type of schedule to the host.

schedule_number number from 1 to 128.

schedule_type identifies how the schedule is defined

(using fixed parameters or a flex waveform){ **PARMS | WF** }

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SCHEDULE ParmS

Command **SCHEDULE** schedule_number PARMs <crLf>

Response ENG1 energy_level <crLf>
 MODE1 mode<crLf>
 ENG2 energy_level <crLf>
 MODE2 mode <crLf>
 SQUEEZE squeeze_time <crLf>
 UP1 rise1_time <crLf>
 WELD1 weld1_time <crLf>
 DOWN1 down1_time <crLf>
 COOL cool_time <crLf>
 UP2 rise2_time <crLf>
 WELD2 weld2_time <crLf>
 DOWN2 down2_time <crLf>
 HOLD hold_time <crLf>
 <lf>

Description Reports the settings of the currently loaded Power Supply schedule parameters.

schedule_number: schedule that is currently loaded(integer from 1 to 128).

mode: the control mode { V | C | P | NONE } determining type of energy emitted by power supply.

energy_level: the amount of energy delivered by the power supply based on control mode.

Voltage weld energy is in units of 1 Volt (Range 0.1 to 9.90)

Current weld energy is in units of 1 kAmp(Range .005 to 1.5 | .20 to 4.0)

Power weld energy is in units of 1 kWatt(Range 0.1 to 9.90)

Times below in msecS

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squeeze_time: squeeze period (Range 0 to 999.00)
rise1_time: Pulse1 rise period (Range 0 to 99.00)
weld1_time: Pulse1 weld period (Range 1.0 to 99.00)
fall1_time: Pulse1 fall period (Range 0.0 to 99.00)
cool_time: Cool period (Range 10.0 to 99.00)
rise2_time: Pulse2 rise period (Range 1 to 99.00)
weld2_time: Pulse2 weld period (Range 1.0 to 99.00)
fall2_time: Pulse2 fall period (Range 0.0 to 99.00)
hold_time: Hold period (Range 0 to 999.00)

SCHEDULE Flex Waveform

Command SCHEDULE schedule_number WF<crLf>

Response number_of_weldpoints<crLf>
weldpoint<crLf>
...
weldpoint<crLf>
<lf>

Description Reports the definition of each weld point contained in the set of weldpoints used to generate the weld energy waveform.

schedule_number: the schedule that is currently loaded (integer from 1 to 128).

Number_of_points: The number of weldpoints defined to generate the weld energy waveform.

weldpoint: Each weldpoint is defined as {time_index, mode, energy_level}.

time_index: the number of 25 microseconds increments from the beginning of the weld cycle. (Range 0 to 999.00 msecs)

mode: specifies the control mode { V | C | P | none } that determines type of energy emitted by power supply.

energy: the amount of energy delivered by the power supply based on control mode.

Voltage weld energy is in units of 1 Volt (Range .1 to 9.99)

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Current weld energy is in units of 1 Amp (Range .005 to 1.5 | .20 to 4.0)

Power weld energy is in units of 1 kWatt (Range 0.5 to 9.99)

SETTINGS

Command SETTINGS

Response parameter_name value<crlf>

...

parameter_name value<crlf>

<lf>

Description The following is a list of valid literal substitutions for the parameter_name and value variables. The order listed below is the order the settings are reported in the command response.

Parameter Name	Value	
WELDABORT	{ OFF ON }	Footswitch weld abort
DEBOUNCE	{ NONE 10 20 30 40 50 }	Switch debounce time (msecs)
FIRE_SW	{EZ_AIR AIR_HEAD MANUAL }	Firing Switch Type
FIRE_TIMEOUT	{ NONE 10 20 30 40 50 100 200 300 400 500 }	Fire switch timeout (msecs)
BUZZ_VOLUME	{OFF LOW MEDIUM HIGH }	Buzzer Volume
BUZZ_TIME	{.05 1.0 1.5 2.0 3.0 5.0 10 20 30 40 50 60 }	Time Options (seconds)
BUZZ_SETTING	Setting_Value	Firing Switch Type
setting_value is:		
{ NO_BUZZER ESTOP ALARM WELD_FLT LIM_VIOL WELD_CTR WELD_STOP END_OF_CYC }		

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STATE

Command **STATE** system_state<crLf>

Response **CTRL_MODE** control_state<crLf>

WELD_ENABLE enable_state<crLf>

WELD_INHIBIT inhibit_state<crLf>

 <lf>

Description The following is the system state information returned by the STATE command:

system_state	WELD_STATE	Power Supply is performing a weld
	PLC_MODE	PLC is controlling the Power Supply
	JOB_BUSY	Power Supply is performing internal processes
	SYS_READY	Power Supply is ready to Weld or accept commands
	SYS_NOTREADY	An Alarm or E-STOP event has occurred
control_state	PLC PLC	(via I/O assertion) has control of Power Supply
	GUI	GUI has control
	RS232	Serial cmd interface has control
	EXT_ETHERNET	External Ethernet interface has control
enable_state	YES NO	Reports the state of the Weld Enable GUI switch
inhibit_state	YES NO	Reports the state of the Weld Inhibit I/O input

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TESTPULSE

Command **TESTPULSE** schedule_number <crLf>

Response **ENABLE** { YES | NO }<crLf>

SQUEEZE { squeeze_time }<crLf>

RISE S{ rise_time }<crLf>

TPERIOD { test_time }<crLf>

FALL { fall_time }<crLf>

MODE { V | C | P | NONE }<crLf>

ENG { energy_level }<crLf>

LOWLIMIT { limit_value }<crLf>

UPLIMIT { limit_value }<crLf>

 <lf>

Description The following is a list of possible values returned in the Test Pulse Read response:

schedule_number:	identifies which schedule is currently loaded (1 to 128).
squeeze_time	the time for the period in 1ms. (Range 0 to 999)
rise_time	the time for the period in 1ms. (Range 0 to 99)
energy_level	the amount of Voltage Current Power delivered by the power supply based on control mode.
test_time	the time for the period. (Ranges 1 to 300)
fall_time	the time for the period in 1ms. (Range 0 to 99)

Mode specifies the control mode determining type of energy emitted by power supply.

- Voltage weld energy is in units of 1 Volt (Range 0 to 9.90)
- Current weld energy is in units of 1 Amp (Range .005 to 1.5 | .20 to 4.0)
- Power weld energy is in units of 1 kWatt (Range 0 to 9.90)

limit_value the limit value is in units of 1mOhm. (Range 0 to 50).

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APPENDIX D RS-232 CONNECTIONS

TYPE

Command TYPE type, controller_version, powerboard_version<crLf><lf>

Response Returns unit type and software release numbers with revision letters.

Description

type: UB-1500 or UB-4000

controller_version: major.minorRev

powerboard_version: major.minorRev

major and minor are each up to 2 digits representing the version number

rev is up to 2 letters representing the Revision level.

Ex: 1.02B

VOLTAGE

Command VOLTAGE number_of_data<crLf>

Response data <crLf>

....

data <crLf>

<lf>

Description Returns the Voltage reading of the last weld. First field is the number of data to be sent. Then follows the packets of data. Each data is separated by <crLf> and this command ends with <crLf><lf>

number_of_data: This is the number of data that shall be included in this command. The Power Supply samples current every 50 μ s. For a weld less than 100 ms weld time, the number of data will be approximately: total weld time \div 50 μ s. This number will be always less than 2000.

data: an integer number in unit of V.

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WELDSTATUS

Command WELDSTATUS status code <crLf>
Response <lf>
Description The READ command option returns status code of the last weld performed.
status_code: integer value (Range 0 to 19)

See [Status Messages and Alarms Codes Table](#)

Command WELDSTATUS <crLf>
Status_description<crLf><lf>
Description The DISPLAY command option returns status description of the last weld performed.
status_description:

The text description from the [Status Messages and Alarms Codes Table](#) that corresponds to the status reported for the last weld performed.

APPENDIX D RS-232 CONNECTIONS

Command Error Responses

These are the command responses sent from the Power Supply to a host computer identifying a command error condition. The following strings are preceded with “NAK” to indicate it is an error response.

NAK_BAD_COMMAND	Invalid Command Keyword
NAK_BAD_FP_NUMBER	Invalid floating point number
NAK_BAD_MODE	Invalid Energy Mode
NAK_BAD_OPTION	Unrecognized command option
NAK_BAD_PARAM	Unrecognized parameter keyword
NAK_BAD_SYNTAX	Improper field delimiter
NAK_BAD_TIME	Time Value is out of range
NAK_BUSY	System is busy
NAK_CMD_IGNORED	Previous command dropped (improperly terminated)
NAK_DENIED	Insufficient login credentials
NAK_EXTRA_PARAM	Command line contains unexpected data
NAK_FSW1_ACTIVE	Command ignored - foot switch asserted
NAK_INV_ENERGY	Energy Level is out of range
NAK_INV_SCHED	Current Schedule Invalid or undefined
NAK_INV_TIMEDELTA	Time Delta < .1 ms
NAK_INV_TOTALTIME	Total Specified Time exceeds 200ms
NAK_MISSING_CMD	Missing command keyword
NAK_MISSING_OPTION	Missing Command Option
NAK_MISSING_PARAM	Missing required parameter
NAK_OUT_OF_RANGE	Numeric parameter value is out of range
NAK_COOL_VIOLATION	Limit Point is in cool period
NAK_WF_VIOLATION	Limit Point is outside of Weld Waveform
NAK_PLC_ACTIVE	Command ignored - PLC is in control
NAK_EXT_CTL	Command ignored – External Interface is in Control
NAK_GUI	Command ignored – GUI is in Control
NAK_WELD_DISABLED	Fire ignored - welds are disabled
NAK_WELD_INHIBITED	Fire ignored - welds are inhibited

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Status Messages and Alarms Codes

The following status and alarm messages are reported.

0	No Alarm
---	----------

Weld Status Messages	
1	Weld completed per schedule
2	Weld Aborted
3	Test Pulse Upper Limit Violation
4	Test Pulse Lower Limit Violation
5	Current is at Maximum
6	Over Temperature
7	Emergency Stop - Operator Activated
8	Power Board - Power Loss
9	Combo mode V-A Time out
10	Low Charge
11	Voltage Exceeds Maximum
12	No Current Reading
13	No Voltage Reading
14	Capacity Limit Below Cap Bank
15	Weld Stopped on I/O
16	Weld Stopped - Limit Reached
17	Weld Stopped - Power Module Alarm Still Active
18	Maximum Power Exceeds Limit

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19	Maximum Weld Count reached limit
----	----------------------------------

Readiness Alarms

20	FS2 switch on but FS1 switch off
21	Emergency Stop
22	Firing Switch Before Foot Switch
23	Firing switch didn't close in 10 seconds
24	Board Error - Memory self-test failed
25	Temperature Fault - System at unsafe Temp
26	Capacity Limit - Exceeded Cap Bank
27	Weld Fire Lockout - Cap Bank Too Low
28	Emergency Stop
29	Power module is not ready
30	Maximum Weld Count reached limit

Limit Violations

31	Pulse 1 Current Upper Limit Violation
32	Pulse 1 Voltage Upper Limit Violation
33	Pulse 1 Power Upper Limit Violation
34	Pulse 1 Resistance Upper Limit Violation
35	Pulse 1 Current Lower Limit Violation

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36	Pulse 1 Voltage Lower Limit Violation
37	Pulse 1 Power Lower Limit Violation
38	Pulse 1 Resistance Lower Limit Violation
39	Pulse 2 Current Upper Limit Violation
40	Pulse 2 Voltage Upper Limit Violation
41	Pulse 2 Power Upper Limit Violation
42	Pulse 2 Resistance Upper Limit Violation
43	Pulse 2 Current Lower Limit Violation
44	Pulse 2 Voltage Lower Limit Violation
45	Pulse 2 Power Lower Limit Violation
46	Pulse 2 Resistance Lower Limit Violation

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Appendix E REST API

REST API allows for control of unit operation and configuration using messages set over TCP/IP. REST API must conform to the design principles of the REST, or representational state transfer architectural style. Please refer to Appendix G – Security for security-related details

Factory Reset

Factory reset to default settings (usernames & passwords, all schedules).

URL: /api/factory_reset

Method: POST

Permission Level: admin

URL Params: None

Data Params: None

Success response: None

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

Notes: 3 new Access levels (username, password)

enr, unique password – Engineer; enables schedule programming and related functionality

user, unique password – Operators; disables schedule programming and related functionality

localapiuser, unique password – For loop1 API only

APPENDIX E REST API

New Password

Change default factory password to a new password and respond with a newly generated hashed password.

Hashed password is implemented based on BCrypt, a password hashing algorithm.

URL: /api/new_password

Method: POST

Permission Level: localapiuser, user, engr

URL Params: None

Data Params:

Content type: application/json; charset=UTF-8

Field Name	Description	Values
username	Default username	3 default usernames: <ul style="list-style-type: none">• engr• user
password	Default password	3 default passwords: <ul style="list-style-type: none">• engr1• user1
new_password	New password	Unique password
conf_password	Confirm password	Same as unique password

Success response:

```
{
  "status": "OK",
  "msg": "Password updated."
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

Notes: 3 new Access levels (username, password)

engr, unique password – Engineer; enables schedule programming and related functionality

user, unique password – Operators; disables schedule programming and related functionality

localapiuser, unique password – For loop1 API only

APPENDIX E REST API

Update Password

Update password to a new password and respond with a new generated hashed password.

URL: /api/update_password

Method: POST

Permission Level: localapiuser, user, engr

URL Params: None

Data Params:

Content type: application/json; charset=UTF-8

Field Name	Description	Values
new_password	New password	Unique password
conf_password	Confirm password	Same as unique password

Success response:

```
{
  "status": "OK",
  "msg": "Password changed."
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Set Schedule Waveform by Parameters

Sets the waveform for specified schedule by defining the pulse parameters.
The waveform points will be derived from the specified parameters.

URL: /api/schedule/<schedule_number>/wv_params

Method: POST

Permission Level: All users

URL Params: None

Data Params:

Content type: application/json; charset=UTF-8

Field Name	Description	Values
test_pulse	Test pulse status bit. 1 indicates this is a test pulse with resistance limit enabled	0 : Not test pulse 1 : Test Pulse
squeeze_time	Squeeze time (ms)	0 – 999 (TBD)
pulse0_mode	Pulse0 mode	0 : None (standard mode, not Combo Mode) 1 : Voltage (only applicable if in Combo Mode)
pulse0_level	Pulse0 level, voltage unit	Float (only applicable if in Combo Mode)
pulse0_rise	Pulse1 rise time (ms)	0 – 10 (TBD) (only applicable if in Combo Mode)
pulse1_mode	Pulse1 mode	1 : Voltage 2 : Current 3 : Power
pulse1_rise	Pulse1 rise time (ms)	0 – 100 (TBD)
pulse1_level	Pulse1 level, unit depends on mode	Float
pulse1_time	Pulse1 time (ms)	1 – 300 (TBD)
pulse1_fall	Pulse1 fall time (ms)	0 – 100 (TBD)
pulse2_mode	Pulse2 mode.	0 : None 1 : Voltage 2 : Current 3 : Power 0 if no pulse 2. All the pulse2 parameters below will be unused and will not contribute to the weld.
pulse2_cool	Cool time (ms)	10 – 100 (TBD)

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pulse2_rise	Pulse2 rise time (ms)	1 – 300 (TBD)
pulse2_level	Pulse2 level, unit depends on mode	Float
pulse2_time	Pulse2 time (ms)	1 – 300 (TBD)
pulse2_fall	Pulse2 fall time (ms)	0 – 100 (TBD)
hold_time	Hold time (ms)	0 – 999 (TBD)
decimation	Weld data decimation	1 – 255 (TBD)

Success response:

```
{"status": "OK"}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Set Schedule Waveform by Points

Sets the waveform for specified schedule by directly defining the waveform points.

URL: /api/schedule/<schedule_number>/wv_points

Method: POST

Permission Level: All users

URL Params: None

Data Params:

Content type: application/json; charset=UTF-8

Field Name	Description	Values
points	Array of waveform x-y points (time index, level, mode) (uint32, float, uint32)	mode: 0 : none 1 : Voltage 2 : Current 3 : Power Units for the level depends on the pulse mode. Level units can change midway through the array if pulse modes are different. Data point for SqueezeTime, CoolTime, HoldTime will have mode = 0
decimation	Weld data decimation	1 – 255 (TBD)

Success response:

```
{"status": "OK", "TBD" }
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Set Schedule Upper Limit

Sets schedule upper limits into the specified schedule number.

URL: /api/schedule/<schedule_number>/upperlimit

Method: POST

Permission Level: All users

URL Params: None

Data Params:

Content type: application/json; charset=UTF-8

Field Name	Description	Values
points	Array of upper limit points (time index, level, limit_mode) (uint32, float, uint32)	Limit mode: 0 : None/Standby (no limit checking on overshoot, undershoot, ringing, etc...) 1 : Voltage 2 : Current 3 : Power 4 : Resistance Units for the level depends on the waveform pulse mode.

Success response:

```
{"status": "OK", TBD }
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Set Schedule Lower Limit

Sets schedule lower limits into the specified schedule number.

URL: /api/schedule/<schedule_number>/lowerlimit

Method: POST

Permission Level: All users

URL Params: None

Data Params:

Content type: application/json; charset=UTF-8

Field Name	Description	Values
points	Array of lower limit points (time index, level, limit_mode) (uint32, float, uint32)	Limit mode: 0 : None/Standby (no limit checking on overshoot, undershoot, ringing, etc...) 1 : Voltage 2 : Current 3 : Power 4 : Resistance Units for the level depends on the waveform pulse mode.

Success response:

```
{"status": "OK", "TBD" }
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Set Test Pulse

Sets test pulse into the specified schedule number.

URL: /api/schedule/<schedule_number>/testpulse

Method: POST

Permission Level: All users

URL Params: None

Data Params:

Content type: application/json; charset=UTF-8

Field Name	Description	Values
test_pulse	Test pulse status bit. 1 indicates this is a test pulse with resistance limit enabled	0 : Not test pulse 1 : Test Pulse
squeezeT_time	Test pulse squeeze time (ms)	0 – 999 (TBD)
pulseT_rise	Test pulse rise time (ms)	0 – 100 (TBD)
pulseT_level	Test pulse level	Float
pulseT_time	Test pulse time (ms)	1 – 300 (TBD)
pulseT_fall	Test pulse fall time (ms)	0 – 100 (TBD)
pulseT_mode	Test pulse mode	0 : None 1 : Voltage 2 : Current 3 : Power
pulseT_low_limit	Test pulse low limit (mOhm)	0 – 50 (TBD)
pulseT_up_limit	Test pulse up limit (mOhm)	0 – 50 (TBD)

Success response:

```
{"status": "OK", TBD }
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Get Test Pulse

Get test pulse for the specified schedule number.

URL: /api/schedule/<schedule_number>/testpulse

Method: GET

Permission Level: All users

URL Params: None

Data Params: None

Success Response:

```
{
  "settings":
  {
    "module": {
      "resistance": 0 - 50,           // Resistance value (mOhm)
      "status": -1 to -3,           // -1: Weld end normal
                                   // -2: Test pulse end high limit
                                   // -3: Test pulse end low limit
    },
    "test_settings": {
      "pulseT_fall": 0 - 100 (TBD), // Test pulse fall time (ms)
      "pulseT_level": float,        // Test pulse level
      "pulseT_low_limit": 0 - 50 (TBD), // Test pulse low limit (mOhm)
      "pulseT_mode": 0 -3,          // 0 : None, 1 : Voltage
                                   // 2 : Current, 3 : Power
      "pulseT_rise": 0 - 100 (TBD), // Test pulse rise time (ms)
      "pulseT_time": 0 - 300 (TBD), // Test pulse time (ms)
      "pulseT_up_limit": 0 - 50 (TBD), // Test pulse up limit (mOhm)
      "squeezeT_time": 0 - 999 (TBD), // Test pulse squeeze time (ms)
      "test_pulse": 0 - 1           // 0 : Not test pulse
                                   // 1 : Test Pulse
    }
  },
  "status": "OK",
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Set Limit Mode and Action

Sets limit mode and action into the specified schedule number.

URL: /api/schedule/<schedule_number>/limit_mode_action

Method: POST

Permission Level: All users

URL Params: None

Data Params:

Content type: application/json; charset=UTF-8

Field Name	Description	Values
pulse1_limit_action	Pulse 1 limit monitor action	0 : None 1 : stop weld 2 : inhibit pulse 2 3 : part condition
pulse2_limit_action	Pulse 2 limit monitor action	0 : None 1 : stop weld

Success response:

```
{"status": "OK", "TBD" }
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Fire

Starts a weld.

URL: /api/fire

Method: POST

Permission Level: All users

URL Params: None

Data Params: None

Success response:

```
{"status": "OK", TBD }
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Get Schedule

Get schedule for the specified schedule number or current active schedule.

URL: /api/schedule/<schedule_number>

URL: /api/schedule/current

Method: GET

Permission Level: All users

URL Params: None

Data Params: None

Success Response:

```
{
  "status": "OK",
  "schedule": {
    "number": 1-128,
    "definition": "parameters" or "points", // This value determines which set of
                                             // parameters appear in weld_settings
                                             below
    "weld_settings": {
      Parameters from Set Schedule Waveform by Parameters command
      -or-
      Parameters from Set Schedule Waveform by Points command
    }, // see the weld settings with additions of test pulse, pulse 0

    "pulse1_limit_action" : 0-3, // 0 : none, 1 : stop weld,
                                  // 2 : inhibit pulse2, 3 : part conditioning
    "pulse2_limit_action" : 0-1, // 0 : none, 1 : stop weld

    "upper_limit": {
      "points": [ [x0,y0,z0], [x1,y1,z1], ... [xN,yN,zN] ] // Array of (x,y,z)
      points where
                                             // z : limit mode
    }
    "lower_limit": {
      "points": [ [x0,y0,z0], [x1,y1,z1], ... [xN,yN,zN] ] // Array of (x,y,z)
      points where
                                             // z : limit mode
    }
    "test_settings": {
      Same as "test_settings" in Get Test Pulse command
    }
  }
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

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APPENDIX E REST API

Select Schedule

Select specified schedule number and returns the schedule data.

URL: /api/schedule/select/<schedule_number>

Method: POST

Permission Level: All users

URL Params: None

Data Params: None

Success response:

```
{
  "status": "OK",
  "schedule": { Same as Get Schedule command }
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Reset All Schedules

Reset all schedules to their default values.

URL: /api/schedule/resetall

Method: POST

Permission Level: All users

URL Params: None

Data Params: None

Success response:

```
{ "status": "OK" }
```

Error response:

```
{ "status": "ERR", "msg": "Error Description" }
```

APPENDIX E REST API

Backup All Schedules

Backup all schedules to the designated backup folder.

URL: /api/schedule/backup

Method: POST

Permission Level: All users

URL Params: None

Data Params: None

Success response:

```
{ "status": "OK" }
```

Error response:

```
{ "status": "ERR", "msg": "Error Description" }
```

APPENDIX E REST API

Restore All Schedules

Restore schedules from the backup folder to the designated schedule folder.

URL: /api/schedule/restore

Method: POST

Permission Level: All users

URL Params: None

Data Params: None

Success response:

```
{ "status": "OK" }
```

Error response:

```
{ "status": "ERR", "msg": "Error Description" }
```

APPENDIX E REST API

Reset Safety

Reset safety relay.

URL: /api/PILZreset
Method: POST

URL Params: None
Data Params: None

Success response:

```
{  
  "status": "OK",  
  "code": 1 – Command execute  
         0 – Command not execute (When FS1, FS2, or both are ON)  
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

Fault Reset

Fault reset.

URL: /api/fault_reset
Method: POST

URL Params: None
Data Params: None

Success response:

```
{"status": "OK", "code": 1 }
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

GUI Installation Acknowledge

Acknowledging GUI installation is done.

URL: /api/install/gui_ack

Method: POST

URL Params: None

Data Params: None

Success response:

```
{"status": "OK", "msg": "Installation done."}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

Set Weld Enable

Set weld enabled/disabled.

URL: /api/weld

Method: POST

Permission Level: All users

URL Params: None

Data Params:

Content type: application/json; charset=UTF-8

Field Name	Description	Values
enable	Weld enable/disable state	0 : disable (don't run) 1 : enable (run)

Success response:

```
{"status": "OK", "code": 1 }
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

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APPENDIX E REST API

Set Calibration Settings

Set calibration settings.

URL: /api/calibration/settings

Method: POST

Permission Level: engr, admin

URL Params: None

Data Params:

Content type: application/json; charset=UTF-8

Field Name	Description	Values
year	Year	xx : 20xx
month	Month	1 – 12 : January - December
date	Date	1 – 28/29/30/31 : Date
dow	Date of week	0 – 6 : Sunday - Saturday
hour	Hour	0 – 23 : Hour
minute	Minute	0 – 59 : Minute
seconds	Seconds	0 – 59 : Seconds
step_voltage	Step up voltage compensation	0 – 255 : Steps
step_current	Step up current compensation	0 – 255 : Steps
step_power	Step up power compensation	0 – 255 : Steps
Loop_power_offset	Control loop power offset	0 – 255 : Steps
loop_current	Control loop current compensation	0 – 255 : Steps
loop_voltage	Control loop voltage compensation	0 – 255 : Steps
loop_power	Control loop power compensation	0 – 255 : Steps
loop_offset	Control loop offset compensation	0 – 255 : Steps

Success response:

```
{
  "status": "OK",
  "settings": {"status": 1/0}
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX E REST API

Get Calibration Settings

Get calibration settings.

URL: /api/calibration/settings

Method: GET

Permission Level: All users

URL Params: None

Data Params: None

Success Response:

```
{
  "status": "OK",
  "settings": { Same as Set Calibration settings command }
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Set Calibration Data

Set calibration data.

URL: /api/calibration/data

Method: POST

Permission Level: engr, admin

URL Params: None

Data Params:

Content type: application/json; charset=UTF-8

Field Name	Description	Values
current_gain	Current gain	Current gain: 0.15 – 1.5
current_offset	Current offset	Current offset: 0 – 1.0
voltage_gain	Voltage gain	Voltage gain: 0.15 – 1.5
voltage_offset	Voltage offset	Voltage offset: 0 – 1.0
power_gain	Power gain	Power gain: 0.15 – 1.5
power_offset	Power offset	Power offset: 0 – 1.0
resistance_gain	Resistance gain	Resistance gain: 0.15 – 1.5
resistance_offset	Resistance offset	Resistance offset: 0 – 1.0

Success response:

```
{
  "status": "OK",
  "settings": {"status": 1/0}
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Get Calibration Data

Get calibration data.

URL: /api/calibration/data

Method: GET

Permission Level: All users

URL Params: None

Data Params: None

Success Response:

```
{
  "status": "OK",
  "settings": { Same as Set Calibration data command }
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

Reset Calibration

Reset calibration.

URL: /api/calibration/reset

Method: POST

Permission Level: All users

URL Params: None

Data Params: None

Success response:

```
{
  "status": "OK",
  "code": 1
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Set Weld Counts

Set total, good, and maximum weld counts.

URL: /api/weld_counts/set

Method: POST

Permission Level: All users

URL Params: None

Data Params:

Content type: application/json; charset=UTF-8

Field Name	Description	Values
total_weld	Total weld count	Total weld count: -1 – 10000 -1: No update to total weld
good_weld	Good weld count	Good weld count: -1 – 10000 -1: No update to good weld
max_weld	Maximum weld count	Maximum weld count: 0 – 10000

Success response:

```
{
  "status": "OK",
  "code": 1
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Get Weld Counts

Get total, good, and maximum weld counts.

URL: /api/weld_counts/get

Method: POST

Permission Level: All users

URL Params: None

Data Params: None

Success response:

```
{
  "status": "OK",
  "settings": { Same as Set Weld Counts command }
}
```

Error response:

```
{ "status": "ERR", "msg": "Error Description" }
```

APPENDIX E REST API

Set Eco Setting

Set “Enable” and “Acceptable Percentage Charge” for the Eco setting on the power board.

URL: /api/eco_setting/set

Method: POST

Permission Level: All users

URL Params: None

Data Params:

Content type: application/json; charset=UTF-8

Field Name	Description	Values
enable	Enable/Disable	Enable: 1/0: Enable/disable
charge_floor	Acceptable percentage charge	Acceptable percentage charge: 65 – 100: Acceptable range

Success response:

```
{  
  "status": "OK",  
  "code": 1  
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Get Eco Setting

Set “Enable” and “Acceptable Percentage Charge” for the Eco setting on the power board.

URL: /api/eco_setting/get

Method: POST

Permission Level: All users

URL Params: None

Data Params: None

Success response:

```
{  
  "status": "OK",  
  "settings": { Same as Set Eco Setting command }  
}
```

Error response:

```
{ "status": "ERR", "msg": "Error Description" }
```

APPENDIX E REST API

Set Fire Lockout Charge

Set capacitor bank fire lockout charge and capacitor check percentage in percentage (0 – 100%).

URL: /api/fire_lockout/set

Method: POST

Permission Level: All users

URL Params: None

Data Params:

Content type: application/json; charset=UTF-8

Field Name	Description	Values
fire_lockout_charge	Capacitor bank fire lockout charge (percentage)	fire_lockout_charge: 0 - 100
capacity_percentage	Capacity Check percentage (percentage)	capacity_percentage: 0 - 100

Success response:

```
{
  "status": "OK",
  "code": 1
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Get Fire Lockout Charge

Get capacitor bank fire lockout charge and capacitor check percentage in percentage (0 – 100%).

URL: /api/fire_lockout/get

Method: POST

Permission Level: All users

URL Params: None

Data Params: None

Success response:

```
{
  "status": "OK",
  "settings": { Same as Set Fire Lockout Charge command }
}
```

Error response:

```
{ "status": "ERR", "msg": "Error Description" }
```

APPENDIX E REST API

Clear Warnings

Clear warnings.

URL: /api/warnings/clear

Method: POST

Permission Level: All users

URL Params: None

Data Params:

Content type: application/json; charset=UTF-8

Field Name	Description	Values
warnings	Clear warnings	Clear warnings: 1: Clear Error bit 2: Clear Busy bit 4: Clear Capacitor bit 8: Clear Temperature bit 16: Clear E-Stop bit 32: Clear maximum weld count bit 511: Clear all warnings

Success response:

```
{  
  "status": "OK",  
  "code": 1  
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Set Chain Schedules

Create a "chain" of schedules that can accommodate a variety of welding needs.

URL: /api/chain_schedule/set

Method: POST

Permission Level: All users

URL Params: None

Data Params:

Content type: application/json; charset=UTF-8

Field Name	Description	Values
schedules	Array of schedules (schedule number, repeat count, next schedule) (uint32, uint32, uint32)	Schedule number: 1 - 128 Repeat count: 1 – 1000 (TBD) Next schedule: 1 - 128

Success response:

```
{
  "status": "OK",
  "code": 1
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Get Chain Schedules Settings

Get a "chain" of 16 schedules from provided schedule number that can accommodate a variety of welding needs.

URL: /api/chain_schedule/get/<schedule_number>

Method: GET

Permission Level: All users

URL Params: None

Data Params: None

Success response:

{

Content type: application/json; charset=UTF-8

Field Name	Description	Values
status	Status	OK
schedules	Array of 16 schedules (schedule number, repeat count, next schedule) (uint32, uint32, uint32)	Schedule number: 1 - 128 Repeat count: 1 – 1000 (TBD) Next schedule: 1 - 128

}

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Set Chain Schedules Enable

Enable/Disable automatically change from any weld schedule to any other schedule after its associated repeat count.

URL: /api/chain_schedule/enable

Method: POST

Permission Level: All users

URL Params: None

Data Params:

Content type: application/json; charset=UTF-8

Field Name	Description	Values
enable	Enable/disable chain schedules	Disable - 0 Enable - 1

Success response:

```
{
  "status": "OK",
  "code": 1
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Set Relay Settings

Setup programmable relays under user programmed conditions.

URL: /api/relays/set

Method: POST

Permission Level: All users

URL Params: None

Data Params:

Content type: application/json; charset=UTF-8

Field Name	Description	Values
relays	6 relays in order of relay 1 to relay 6: (operating condition (int), when (int)), (operating condition (int), when (int)), (operating condition (int), when (int)), (operating condition (int), when (int)), (operating condition (int), when (int)), (operating condition (int), when (int))	Operating condition (int): 0: Off 1: On When (int): 1: Weld 2: End of weld 3: Alarm 4: Out of limits 5: V-A time out 6: Unit ready 7: P1 high limit 8: P1 low limit 9: P2 high limit 10: P2 low limit 11: P1 or P2 high current 12: P1 or P2 low current 13: P1 or P2 high voltage 14: P1 or P2 low voltage 15: P1 or P2 high power 16: P1 or P2 low power 17: P1 or P2 high resistance 18: P1 or P2 low resistance 19: Weld Enable/Disable 20: Weld counter

Success response:

```
{  
  "status": "OK",  
  "code": 1  
}
```

Error response:

APPENDIX E REST API

```
{"status": "ERR", "msg": "Error Description"}
```

Get Relay Settings

Get programmable relays under user programmed conditions.

URL: /api/relays/get

Method: GET

Permission Level: All users

URL Params: None

Data Params: None

Success response:

```
{  
  "status": "OK",  
  "settings": { Same as Set Relay Settings command }  
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Get Versions

Get current versions of FPGA, CPU0, CPU1 (Core controller), and main PIC (Power board). In addition, a 'schedule' MQTT topic is posted to MQTT channel.

URL: /api/versions

Method: GET

Permission Level: All users

URL Params: None

Data Params: None

Success response:

```
{  
  Content type: application/json; charset=UTF-8
```

Field Name	Description	Values
status	Status	OK
versions		
CPU0_version	CPU0 version (4 bytes)	Spare (MSB): 0 (in decimal) Major (1 byte): 0 – 255 (in decimal) Minor (1 byte): 0 - 255 (in decimal) Revision letter (LSB): '-', 'A' – 'Z' (in ascii)
CPU1_version	CPU1 version (4 bytes)	Spare (MSB): 0 (in decimal) Major (1 byte): 0 – 255 (in decimal) Minor (1 byte): 0 - 255 (in decimal) Revision letter (LSB): '-', 'A' – 'Z' (in ascii)
FPGA_version	FPGA version (4 bytes)	Spare (MSB): 0 (in decimal) Major (1 byte): 0 – 255 (in decimal) Minor (1 byte): 0 - 255 (in decimal) Revision letter (LSB): '-', 'A' – 'Z' (in ascii)
PWR_version	Main PIC version (4 bytes)	Valid Response: Type (MSB) UB 1500: 15 (in decimal) UB 4000: 40 (in decimal) Major (1 byte): 0 – 255 (in decimal) Minor (1 byte): 0 - 255 (in decimal) Revision letter (LSB): '-', 'A' – 'Z' (in ascii) Invalid: 0xFFFF FFFF (No Response)

```
}
```

Error response:

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APPENDIX E REST API

```
{"status": "ERR", "msg": "Error Description"}
```

Set Switches Debounce

Set debounce time for switches.

URL: /api/switches/debounce

Method: POST

Permission Level: All users

URL Params: None

Data Params:

Content type: application/json; charset=UTF-8

Field Name	Description	Values
setting	Debounce setting (msec)	0: No debounce 1: 10 msec 2: 20 msec 3: 30 msec 4: 40 msec 5: 50 msec

Success response:

```
{  
  "status": "OK",  
  "code": 1  
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Get Switches Debounce

Get current debounce time.

URL: /api/switches/debounce

Method: GET

Permission Level: All users

URL Params: None

Data Params: None

Success response:

{

Content type: application/json; charset=UTF-8

Field Name	Description	Values
status	Status	OK
setting	Debounce setting (msec)	0: No debounce 1: 10 msec 2: 20 msec 3: 30 msec 4: 40 msec 5: 50 msec

}

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Set Serial Communication

Setup the serial communication and data.

URL: /api/communication/uart

Method: POST

Permission Level: All users

URL Params: None

Data Params:

Content type: application/json; charset=UTF-8

Field Name	Description	Values
Id	ID number (Decimal)	1 - 99
baud_rate	Baud rate of the serial port	1: 9.6K 2: 19.2K 3: 38.4K 4: 56.0k 5: 115K (default)
role	Communication role	0: Client (default) 1: Host

Success response:

```
{
  "status": "OK",
  "code": 1
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Get Serial Communication

Get the current serial communication and data.

URL: /api/communication/uart

Method: GET

Permission Level: All users

URL Params: None

Data Params: None

Success response:

```
{  
  "status": "OK",  
  "settings": { Same as Set Serial Communication command }  
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Set Firing Switch

Set the firing switch.

URL: /api/switches/firing

Method: POST

Permission Level: All users

URL Params: None

Data Params:

Content type: application/json; charset=UTF-8

Field Name	Description	Values
firing	Firing switch setting	0: Auto 1: None
time_out	Fire time out	0: None 1: 10 msec 2: 20 msec 3: 30 msec ... 50: 500 msec

Success response:

```
{  
  "status": "OK",  
  "code": 1  
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Get Firing Switch

Get the current firing switch setting.

URL: /api/switches/firing

Method: GET

Permission Level: All users

URL Params: None

Data Params: None

Success response:

```
{  
  Content type: application/json; charset=UTF-8  


| Field Name | Description           | Values                                                                   |
|------------|-----------------------|--------------------------------------------------------------------------|
| status     | Status                | OK                                                                       |
| firing     | Firing switch setting | 0: Auto<br>1: None                                                       |
| time_out   | Fire time out         | 0: None<br>1: 10 msec<br>2: 20 msec<br>3: 30 msec<br>...<br>50: 500 msec |

  
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Set Foot Switch Abort

Set the foot switch abort.

URL: /api/switches/foot

Method: POST

Permission Level: All users

URL Params: None

Data Params:

Content type: application/json; charset=UTF-8

Field Name	Description	Values
abort	Abort foot switch setting	0: Off 1: On

Success response:

```
{  
  "status": "OK",  
  "code": 1  
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Get Foot Switch Abort

Get the current foot switch abort setting.

URL: /api/switches/foot

Method: GET

Permission Level: All users

URL Params: None

Data Params: None

Success response:

```
{  
  Content type: application/json; charset=UTF-8  


| Field Name | Description               | Values          |
|------------|---------------------------|-----------------|
| status     | Status                    | OK              |
| abort      | Abort foot switch setting | 0: Off<br>1: On |

  
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Set RTC time

Set time to the RTC device.

URL: /api/rtcptime

Method: POST

Permission Level: All users

URL Params: None

Data Params:

Content type: application/json; charset=UTF-8

Field Name	Description	Values
datetime	Formatted date time string (ex. "2024-07-10 14:07:00")	"yyyy-mm-dd hh:mm:ss" yyyy: 4 digits year mm: 2 digits month dd: 2 digits day hh: 2 digits hour mm: 2 digits minute ss: 2 digits second

Success response:

```
{  
  "status": "OK",  
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

APPENDIX E REST API

Get RTC time

Get time from the RTC device.

URL: /api/rtctime

Method: GET

Permission Level: All users

URL Params: None

Data Params: None

Success response:

```
{
```

Content type: application/json; charset=UTF-8

Field Name	Description	Values
rtctime		
status	Status	OK
formatted	Formatted date time string (ex. "2024:07:10 14:07:00")	"yyyy-mm-dd hh:mm:ss" yyyy: 4 digits year mm: 2 digits month dd: 2 digits date hh: 2 digits hour mm: 2 digits minute ss: 2 digits second
date	Date	date: 1-2 digits
month	Month	month: 1-2 digits
year	Year	year: 2 digits
dow	Date of week	dow: 1 digit
hour	Hour	hour: 1-2 digits
minute	Minute	minute: 1-2 digits
seconds	Seconds	seconds: 1-2 digits

```
}
```

Error response:

```
{"status": "ERR", "msg": "Error Description"}
```

Appendix F MQTT TOPICS

Unit publishes data on these topics.

status

Periodic status message.

```
{
  "schedule": {
    "number": 1-128,
    "chain_schedule": 0-1,    // 0: Disable chain schedule, 1: Enable chain schedule
    "next_schedule": 1-128,  // 1-128: Next schedule on the chain schedule
    "weld_count": uint32, // Internal weld count on the chain schedule
    "weld_enable": 0-1    // 0: No weld, 1: Weld
  },
  "seq_num": int,
  "external_control": uint32,    // 1: GUI control
                                // 2: Ethernet control
                                // 4: UART control
                                // 8: PLC control
  "status_install": uint32,     // 1: GUI installation
                                // 2: Power module installation
                                // 4: RWCC installation
                                // 8: RWCC certificate
  "status_IO": uint32,         // bit 0: Program output 0
                                // bit 1: Program output 1
                                // bit 2: Program output 2
                                // bit 3: Program output 3
                                // bit 4: Program output 4
                                // bit 5: Program output 5
                                // bit 6: Program output 6
                                // bit 7: Program output 7
                                // bit 8: Valve output
                                // bit 9: System ready
                                // bit 10: Job ready
                                // bit 11: Busy
                                // bit 12: Schedule related parameter(s) was updated
                                // bit 13: Calibration related parameter(s) was updated
                                // bit 14: Weld related parameter(s) was updated
                                // bit 15: I/O related parameter(s) was updated
                                // bit 16: UART related parameter(s) was updated
}
```

APPENDIX F MQTT TOPICS

```
        // bit 29: Fault. 0: No fault, 1: Fault
        // bit 30: Alarm. 0: No alarm, 1: Alarm
        // bit 31: Safety Relay. 0: Fault, 1: No Fault
"module": {
  "Capacitor_voltage": uint16,
    // 0 – 24: Capacitor voltage (0 – 24V)
    // 65535: Invalid (No response)
  "schedule_num": uint16,
    //1-128: active schedule on power module
    //65535: invalid
  "decimation": uint16,
    //1-255: Not implemented in this product, should read 1
    //65535: invalid
  "system_status": int32
    // bit 0: Weld/Busy
    // bit 1: Lockout charge – system in charging state
    // bit 15: Max Weld count reached.
    // bit 28: E-Stop Fault – E-Stop to power module asserted
    // bit 29: Temperature Fault – system at unsafe temperature
    // bit 30: Capacitor Charge Error – reset or check hardware
    // bit 31: Board Error – Memory self-test failed.
    reboot or check hardware. Possible calibration loss
    // -1: Invalid (No response)
},
"system": {
  "datetime": "20xx-xx-xx xx:xx:xx"
},
}
```

APPENDIX F MQTT TOPICS

schedule

Publish a schedule ONCE when a new schedule is loaded by either PLC, RS232, or external ethernet. The current loaded schedule is published ONCE when 'Get Versions' REST API is received.

```
{
  "number": 1-128,
  "definition": "parameters" or "points", // This value determines which set of
                                                // parameters appear in weld_settings
                                                below
  "weld_settings": {
    Parameters from Set Schedule Waveform by Parameters command
    -or-
    Parameters from Set Schedule Waveform by Points command
    }, // see the weld settings with additions of test pulse, pulse 0

    "pulse1_limit_action" : 0-3, // 0 : none, 1 : stop weld,
                                // 2 : inhibit pulse2, 3 : part conditioning
    "pulse2_limit_action" : 0-1, // 0 : none, 1 : stop weld

    "upper_limit": {
      "points": [ [x0,y0,z0], [x1,y1,z1], ... [xN,yN,zN] ] // Array of (x,y,z)
      points where
                                // z : limit mode
    }
    "lower_limit": {
      "points": [ [x0,y0,z0], [x1,y1,z1], ... [xN,yN,zN] ] // Array of (x,y,z)
      points where
                                // z : limit mode
    }
    "test_settings": {
      Same as "test_settings" in Get Test Pulse command
    }
  }
}
```

APPENDIX F MQTT TOPICS

weld_data

Message with weld data.

```
{
  "power_block": {
    "status": <number>, // -1 : Weld data transmit completed normally
                    // -2 : Weld software abort command
                    // -3 : Test Pulse Upper limit violation
                    // -4 : Test Pulse Lower limit violation
                    // -5 : Exceeded max current
                    // -6 : Exceeded max temperature
                    // -7 : Emergency Relay
                    // -8 : Power Board – power loss
                    // -9 : Combo switch unsuccessful
                    // -10: Low Charge
                    // -11: Max Voltage
                    // -12: No Current – power board to shunt connector
                    // -13: No Voltage – check voltage cable
                    // -14 = Below Capacity – Energy feedback below set percentage
                    // -15 = Weld hardware abort command
                    // -16 = FPGA Limit violation
                    // -17 = END on PW ALARM
                    // -18 = Exceeded max power
                    // -19 = Reached Maximum weld count
    "schedule_num": 1-128, // Schedule number
    "decimation": 1-255, // Weld data decimation
    "limit": [p1, p2], // Pulse 1 and pulse 2 limits
                    // 0 : no violation
                    // 1 : upper limit violation
                    // 2 : lower limit violation
                    // 3 : upper and lower limit violation
    "upper": [x1,y1],[x2,y2], // Pulse 1 and pulse 2 upper limit indexes and values
                    // Upper limit violation index and value (x, y)
    "lower": [x1,y1],[x2,y2], // Pulse 1 and pulse 2 lower limit indexes and values
                    // lower limit violation index and value (x, y)
    "total_weld_count": d, // d - Total weld count (32 bit value)
    "good_weld_count": d, // d - Good weld count (32 bit value)
    "repeat_weld_count": d, // d - Repeat weld count (32 bit value)
    "ave_current1": f, // f – Pulse 1 average current (float value)
    "peak_current1": f, // f – Pulse 1 peak current (float value)
    "ave_voltage1": f, // f – Pulse 1 average voltage (float value)
    "peak_voltage1": f, // f – Pulse 1 peak voltage (float value)
    "ave_power1": f, // f – Pulse 1 average power (float value)
  }
}
```

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APPENDIX F MQTT TOPICS

```
"peak_power1": f, // f – Pulse 1 peak power (float value)
"ave_resistance1": f, // f – Pulse 1 average resistance (float value)
"peak_resistance1": f, // f – Pulse 1 peak resistance (float value)
"ave_current2": f, // f – Pulse 2 average current (float value)
"peak_current2": f, // f – Pulse 2 peak current (float value)
"ave_voltage2": f, // f – Pulse 2 average voltage (float value)
"peak_voltage2": f, // f – Pulse 2 peak voltage (float value)
"ave_power2": f, // f – Pulse 2 average power (float value)
"peak_power2": f, // f – Pulse 2 peak power (float value)
"ave_resistance2": f, // f – Pulse 2 average resistance (float value)
"peak_resistance2": f, // f – Pulse 2 peak resistance (float value)

// The length of these arrays should be equal
"time_idx": [ array of time indices ], // X-values
"voltage": [ array of voltage measurements ], // Voltage Y-values
"current": [ array of current measurements ], // Current Y-values
"power": [ array of power levels ], // Power Y-values
"resistance": [ array of resistance levels ], // Resistance Y-values
},

"status": {
  0/1, // 0/1 : Bad/good weld capture status
  0 – 7, // 0 – 7 : Ring buffer index
  d, // d – Number of "Fire" commands sent to power board
  x, // Not used
  x // Not used
}
```

Appendix G SECURITY AND ADMINISTRATIVE FUNCTIONS

Security Functions – Remote Control

Overview

The system has several features available for protecting and controlling machine operation, sensitive data, and process settings over the various control interfaces. Since system functionality can be controlled remotely via RestAPI, it is necessary to be able to block unauthorized users from taking control of the machine.

User access is authenticated using a tiered-access design; four different user levels with different permission levels and different levels of access to operational and administrative functions. The customer is responsible for defining and implementing these security levels for a given installation. For example, a UB-B communicating with a PLC on a secure local network on a secure factory floor would probably not require data encryption. However, encryption would provide significant protection for sensitive data and process settings for the same machine if it was being remotely monitored from another site over the Internet.

- **Administrator (admin)** credentials have significant permissions to configure and set up the machine – they can (among other functions):
 - reset other users' passwords to the default
 - change system network settings
 - upload and download schedules
 - backup and restore the system
 - configure security certificates
 - install software update

APPENDIX G SECURITY AND ADMINSTRATIVE FUNCTIONS

Administrators do not have access to operational features related to regular machine operation and the administrator account is not intended to be used by remote users for machine control.

- **Engineer (engr)** credentials provide full access to welding functionality: Engineers can:
 - can run the machine
 - get data
 - make changes to schedules and settings
 - and related functions

Engineers can change their own password but not the passwords of others.

- **Operator (operator)** credentials allow the user to:
 - use functions related to machine operation
 - can change their own password

Operators cannot change schedule settings or other protected process settings or change the password of another user.

- **Factory Reset (reset)** credentials are used to perform a factory reset of the machine to default settings. During a factory reset the system calibration can be retained or reset to default. The default password for **reset** is **reset1**. The Factory Reset user password cannot be changed. Use this account to wipe the machine if the administrator password is lost.

When shipped, the Administrator, Engineer, and Operator accounts have a blank password but will enforce a password change on first use.

RS-232 Interface Security

The RS-232 interface does not have authentication or encryption functions and should not be considered secure.

The RS-232 interface is disabled by default and must be enabled in the web interface by a user with administrator credentials before it can be used. When enabled, the RS-232 interface can be used to configure, run, and download data from the unit.

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RestAPI over TCP/IP Interface Security

RestAPI is the main control interface over TCP/IP. It offers has multiple levels of security levels.

1. Secure REST API over https with Certificate Authentication using Self-Signed Certificate

Since the machine is expected to operate without internet access, it is not possible to connect to a Certificate Authority using the internet. Therefore, the UB-B is equipped with a self-signed certificate to authenticate a REST API connection used with data encryption (TLS).

- The username/password is required for authentication to ensure user access level is controlled. Username and password are encrypted in transit.
- TLS encryption is used for security of data.
- The certificate is stored on the Power Supply. Before a remote device can communicate with the Power Supply via REST API, the certificate must be downloaded onto that device. (See [System Security](#) for instructions on downloading the certificate.)
- Connections must be made to the local host address, not the IP address, on port 443.
 - The default local host address is “**amada-xx-xx.local**” (where the “xx-xx” is the last four characters of the MAC address of the Ethernet adapter in the Power Supply).
 - This can be changed or accessed by logging into the web interface as administrator. If the local host name has been changed, a new certificate must be generated and installed on the remote device.
- For remote access outside of the local network, Avahi and device ports (443) must be forwarded.
- This method of communication is required for the function of the user interface. It cannot be disabled.

2. Insecure REST API communication via http

Some systems require an IP address and/or can only use http communication for REST API communications. Messages are exchanged over port 80 in plain text.

- **Traffic is not encrypted and can be compromised. Only use this in an otherwise secure environment.**
- **Avoid transmitting Administrator level credentials over an insecure http. Use only Engineer or Operator credentials when using this communication protocol.**
- This interface is disabled by default and must be enabled through the web server using Administrator credentials.
- Username/password required for authentication.
- Connections can be made to local host address or IP address on port 80.

MQTT Interface Security

MQTT is a lightweight, open-standard publish/subscribe messaging protocol using TCP/IP for low-bandwidth, unreliable networks. MQTT transmits data in plain text and is best for internal, trusted networks where speed is prioritized over security.

MQTT is a publish/subscribe model data interface used to broadcast data after each weld event. The MQTT interface can be operated in plain-text (MQTT) or secure (MQTTS) modes. MQTTS mode is recommended if the remote device supports it as MQTT does not have username/password authentication. Although MQTT(S) does not allow for control of the machine, it does present a risk that data confidentiality may be compromised.

1. Standard MQTT

- Plain text data
- MQTT traffic is on port 1883
- Connections can be made to local host address or IP address
- No username/password required

2. Secure MQTTS with certificate authentication using self-signed certificate

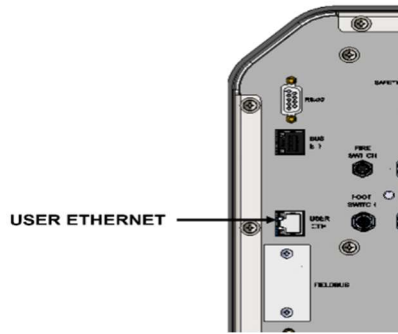
- Certificate must be downloaded into remote device
- **Connection must be made to local host address**
- MQTTS traffic is on port 8883
- Avahi port, 8883 must be forwarded for access outside local network

Administrative Functions/Settings – Web Interface

The system web interface allows users to access certain system settings, determined by the individual user's role, administrator, engineer, operator or remote control. (See the [Overview](#) of this appendix for a description of each of these roles.)

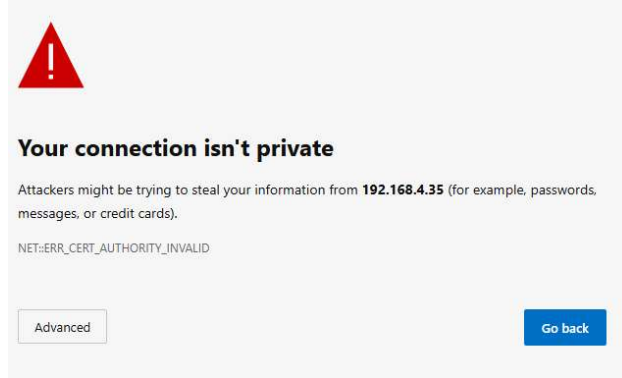
Accessing Administrative Functions

All users access the web interface by connecting to the Power Supply through the user Ethernet connection on the back of the device, via a router, or directly to a computer.

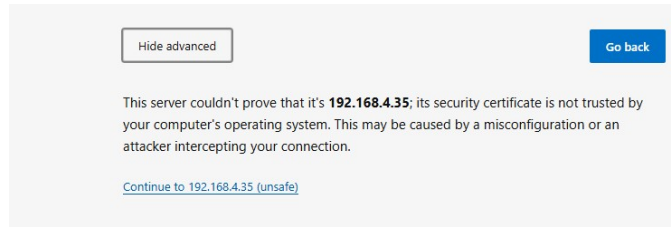


1. Input the user Ethernet IP Address (default: **https://192.168.10.3**) into the URL of your browser. You may receive notice that your connection isn't private because the certificate hasn't been validated, but it is still an https encrypted connection. To avoid this message in the future, download and install the certificate from the System Security page, as described below) and install it in your browser. This step is optional.

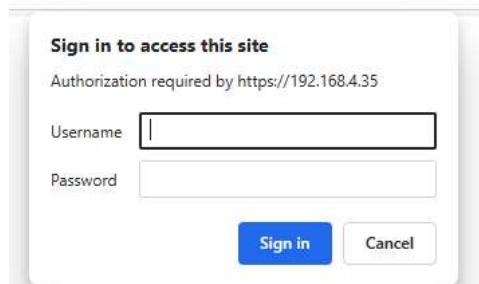
APPENDIX G SECURITY AND ADMINSTRATIVE FUNCTIONS



2. Click **Advanced**. An additional notice will display and include a link to continue to the URL you entered.
3. Click the link.



4. When prompted, enter your User ID and password.



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APPENDIX G SECURITY AND ADMINSTRATIVE FUNCTIONS

User IDs and Passwords

Access to administrative and security functions is determined by whether the user is logged into the administrator account. The password for each account is assigned by the user at first boot and should be recorded – if lost, the only recourse is to reset the machine to factory defaults.

Administrator (admin)

A user logging in as Administrator has access to many administrative and setup functions including the ability to reset other users' passwords to the default. An Administrator user cannot perform functions related to process configuration or run a process.

Engineer and Operator, and Remote Users Login (engr, operator)

If you log on as an Engineer, Operator or a Remote user for the first time, you will be given access to the Password Update interface. If a new password has been previously assigned by logging into the user interface, use that password. If needed, enter your current and new password and click Change Password. No access is provided to the other administrative functions.

The screenshot shows a web interface for the 'UB-B RW Controller'. At the top, it says 'Logged in as: operator'. Below this is a section titled 'Password Update'. The interface is divided into two main columns: 'Username' and 'Password'. The 'Username' column contains the text 'operator'. The 'Password' column contains three input fields: 'Current password', 'New password', and 'Verify password'. Below these fields is a button labeled 'Change Password'.

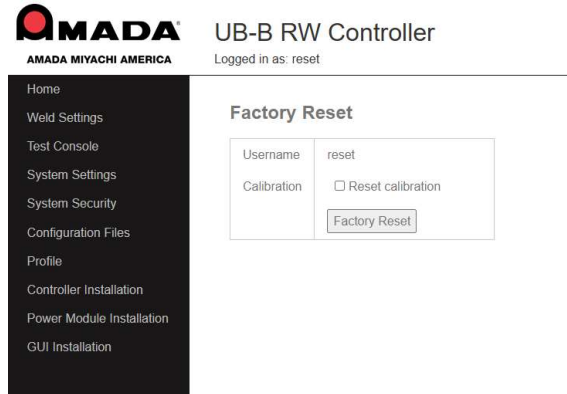
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APPENDIX G SECURITY AND ADMINSTRATIVE FUNCTIONS

Factory Reset (reset)

A user who has logged in as Factory Reset can initiate a factory reset, bringing all the passwords and usernames back to the default and wiping out stored data. (The default credentials are reset/reset1.)

A Factory Reset account can also reset the calibration. No access is provided to the other administrative or security functions. (Note that the user is logged in as “reset.”)



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APPENDIX G SECURITY AND ADMINSTRATIVE FUNCTIONS

Home Page

The Home Page displays when a user logs on as Administrator

AMADA
AMADA MIYACHI AMERICA

UB-B RW Controller
Logged in as: engr

- Home
- Weld Settings
- Test Console
- System Log
- System Settings
- Profile
- Configuration Files
- Controller Certificate
- Controller Installation
- Power Module Installation
- GUI Installation

UB-B RW Controller Info

Date/Time	2026-02-03 12:08:44
Data Drive	Mounted (12% used, 896 MB free) [Storage Info]
RFS type	ext4
App Version	1.27 Rev. -
Firmware Version	1.33 Rev. -
FPGA Version	1.1 Rev. C
Power Board Version	1.48 Rev. A
Power Type (Amp)	1500

It displays basic information about the controller (version numbers, etc.)

The menu on the left hand side of the window provides links to other pages where an engineer can access essential administrative and safety functions, as described below.

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Weld Settings

The Weld Settings Page provides an overview of the current weld schedule.



UB-B RW Controller

Logged in as: engr

- Home
- Weld Settings
- Test Console
- System Settings
- System Security
- Configuration Files
- Profile
- Controller Installation
- Power Module Installation
- GUI Installation

Current Schedule

Schedule 1

Definition	parameters
Decimation	1
Squeeze (ms)	1.0
P0 Mode 0=None, 1=Combo Volt	0
P0 Level	0.0
P0 Rise	0.0
P1 Mode 1=V, 2=I, 3=P	2
P1 Rise	0.1
P1 Level	1000.0
P1 Time	5.0
P1 Fall	0.1
Cool	0.0
P2 Rise	0.1
P2 Mode 0=None 1=V, 2=I, 3=P	0

Test Pulse 1

Test Pulse 1=Enable	0
Squeeze Time	0.0
Pulse Rise	0.0
Pulse Mode	1
Pulse Level	1.0
Pulse Time	0.0
Pulse Fall	0.0
Pulse Low Limit	0.0
Pulse Up Limit	0.0

Upper Limit

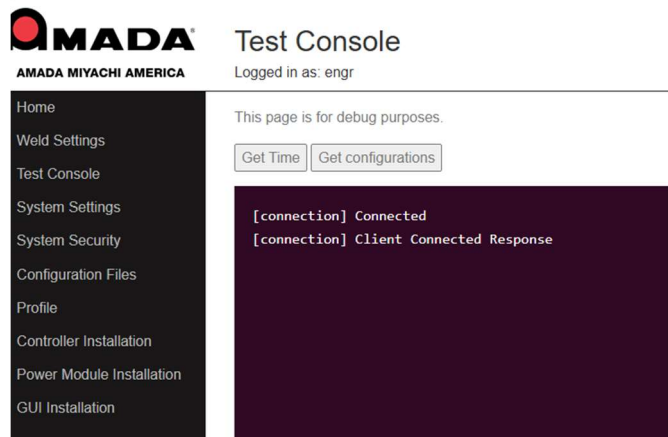
Enable	
Points (0)	(us, level, mode)

Lower Limit

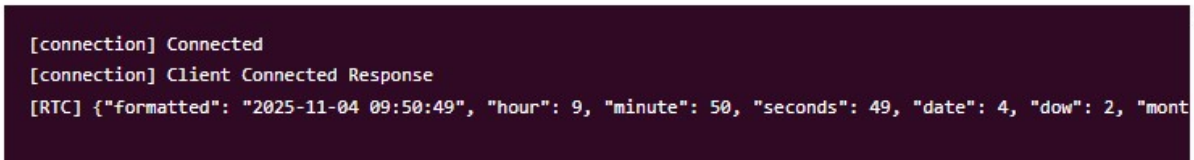
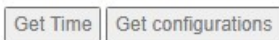
Enable	
Points (0)	(us, level, mode)

Test Console

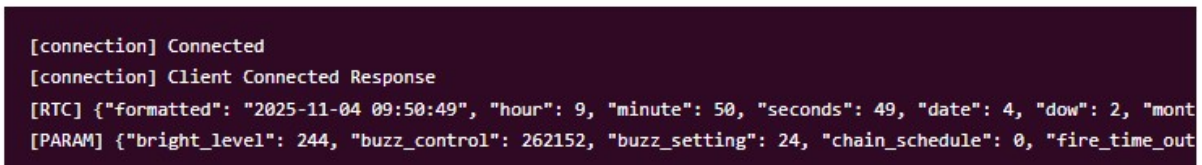
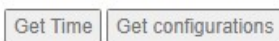
The Test Console page is used for debugging.



Click to Get time.



Click to Get configurations.



APPENDIX G SECURITY AND ADMINSTRATIVE FUNCTIONS

System Settings

The System Settings page allows the user to set their local date and time and to set the IP and MAC addresses for Ethernet 1, an internal Ethernet port located inside the power supply, and Ethernet 2, the Ethernet Bus). Fields that are grayed out cannot be changed.

Enter the new date or address and click the respective Set button for each field.

The screenshot displays a web interface for system settings. On the left is a dark sidebar with a menu containing: Home, Weld Settings, Test Console, System Settings (highlighted), System Security, Configuration Files, Profile, Controller Installation, Power Module Installation, and GUI Installation. The main content area is titled 'Set Time' and shows a date field with '2026-02-02 11:23' and a blue 'Set' button. Below this are sections for 'Central API Server' and 'Central MQTT Broker', each with 'ServerIP' and 'Port' input fields. The 'Ethernet 1 Settings' section includes 'IP setting' (Static IP), 'IP Address' (192.168.10.3), and 'MAC address' (70:B3:D5:7B:62:03) fields, with a blue 'Set' button. A note below states: 'Ethernet 1 is an internal ethernet port located inside of the power supply unit. Subnets of ethernet 1 and ethernet 2 should not be the same.' The 'Ethernet 2 Settings' section has similar fields for 'IP setting' (Static IP), 'IP Address' (192.168.4.3), and 'MAC address' (70:B3:D5:7B:61:03), also with a blue 'Set' button. A note below states: 'External 2 is an external ethernet port located at rear pannel of the power supply unit.'

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System Security

The System Security page allows the user to upload or download the Certificate File, modify the Local Host name, or set security for REST API and/or MQTT.

<p>Certificate File</p> <p>Download Certificate Zip File: <input type="button" value="Download"/></p> <hr/> <p>Upload Certificate Zip File: <input type="button" value="Browse..."/> No file selected. <input type="button" value="Upload"/></p> <hr/> <p>Modify Local Host Name: Local Hostname <input type="text" value="amada-zed-03"/>.local <input type="button" value="Modify"/></p> <hr/>	<p>REST API</p> <p><input checked="" type="checkbox"/> HTTPS Secure & Encrypt Communication <input type="checkbox"/> Hash Password <input type="button" value="Apply"/></p> <p><small>Note: HTTP (port 80) sends data in plain text, making it vulnerable, while HTTPS (port 443) encrypts data for secure, private communication. Hash password only applies to 'Remote' and 'Operator' users.</small></p> <hr/> <p>MQTT</p> <p><input type="checkbox"/> MQTT Secure & Encrypt Communication <input type="button" value="Apply"/></p> <p><small>Note: MQTT uses a standard, plain text transmission (unsecure port 1883), where secure connections (secure port 8883) encrypt data to prevent eavesdropping or interception.</small></p>
---	---

Modify Local Host Name

The system includes a default certificate that is tied to the machine hardware/MAC address; it has a default local host name of 'amada-xx-xx.local', where 'xx-xx' is the last four digits of the MAC address.

To change the local host name, enter the new name in the 'Local Hostname' edit box and click 'Modify' to generate a new certificate with the new local host name. The Local Host is **required** when using the certificate for secure and encrypted communications. Lower levels of security can use the local host address or IP address for communication. **If the Local Host name is changed a new certificate must be generated and installed.**

Set REST API Security

REST API

HTTPS Secure & Encrypt Communication

Hash Password

Apply

Note: HTTP (port 80) sends data in plain text, making it vulnerable, while HTTPS (port 443) encrypts data for secure, private communication. Hash password only applies to 'Remote' and 'Operator' users.

HTTPS Secure & Encrypt Communication

Secure authentication with encrypted messages in-transit is always enabled. This standard protocol employs SSL/TLS to encrypt data transmitted between the client and server. The user must use the localhost name to communicate with the RestAPI over HTTPS using port 443.

The default local host address is "**amada-xx-xx.local**" where the "xx-xx" is the last four characters of the MAC address of the Ethernet adapter in the UB-B. This can be changed or accessed by logging into the web interface as administrator. If the local host name is changed, a new certificate must be generated and installed on the remote device.

Prior to connecting to the RestAPI via HTTPS the certificate must be downloaded from the web interface and stored to the client device for this encryption method to work.

When connecting the unit from a location beyond the local network, and/or without a VPN, we strongly recommend using SSL/TLS communications. The appropriate ports must be forwarded within the IT network for this to work correctly beyond a local network.

If HTTP Communication is checked

A user logged on as Administrator can enable RestAPI over standard (insecure) HTTP with plain text username and send a plain text password. HTTP is used for data exchange without any security/protection. The user can use the device's IP address or local host address for direct communication using port 80.

MQTT Data Interface

MQTT

MQTT Secure & Encrypt Communication

Apply

Note: MQTT uses a standard, plain text transmission (unsecure port 1883), where secure connections (secure port 8883) encrypt data to prevent eavesdropping or interception.

If MQTT Secure & Encrypt Communication is unchecked (MQTT)

Deselecting Secure & Encrypt MQTT will cause all MQTT data to be transmitted via plain text. This MQTT traffic is sent over port 1883.

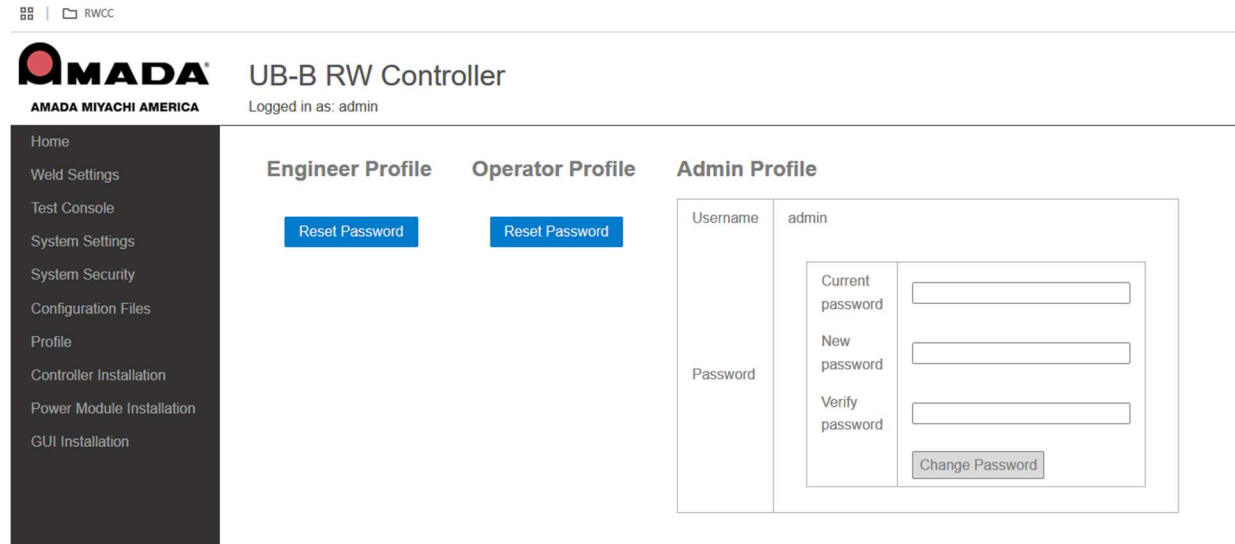
If MQTT Secure & Encrypt Communication is checked (MQTTS)

MQTTS will secure the MQTT communications using SSL/TLS by providing encrypted communication, authentication, and security on port 8883. MQTTS adds security but increases resource consumption. MQTTS is critical for public networks or sensitive data transmission; both sides must be equipped with this capability.

APPENDIX G SECURITY AND ADMINSTRATIVE FUNCTIONS

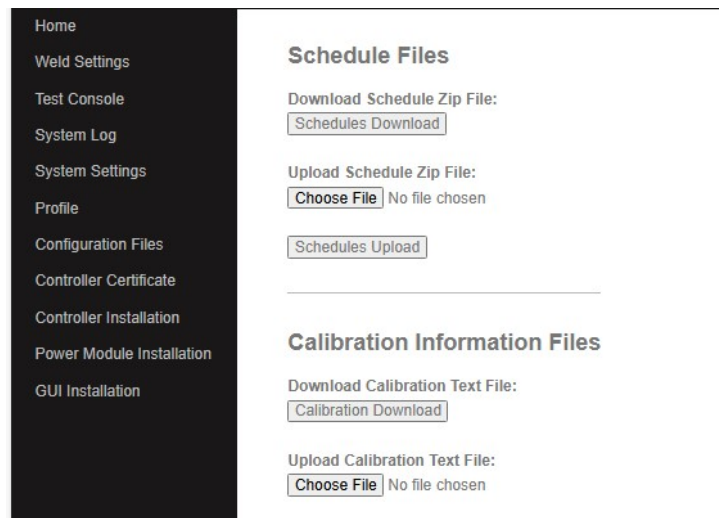
Profile

The profile page allows an Administrator to change their own password or return an Engineer or Operator's password to the default.



Configuration Files

The Configuration Files page allows the user to download or upload schedule files and/or Calibration files.



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

Controller Installation

The Controller Installation page allows the administrator to select and install the controller installation software file. Clicking Choose File will launch a Windows Explorer window which includes the Controller Zip file. Click to choose a file, then click to install.

Controller Installation File

Full-screen Snip

Zip File:

No file chosen

Power Module Installation

The Power Module Installation page allows the Administrator to open and install the Power Module Installation Software file. Clicking Choose File will launch a Windows Explorer window which includes the Power Module Installation Zip file. Click to choose a file, then click to install.

Power Module Installation File

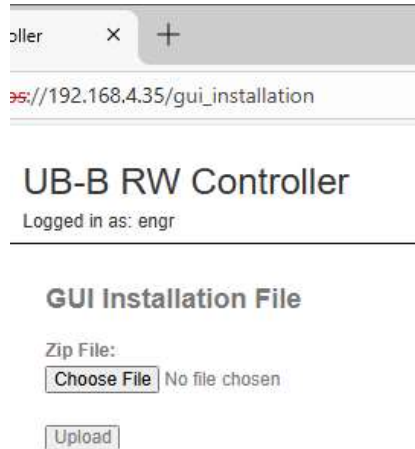
Full-screen Snip

Zip File:

No file chosen

GUI Installation

The GUI Installation page allows the Administrator to open and upload the GUI. Clicking Choose File will launch a Windows Explorer window which includes the Power Module Installation Zip file.

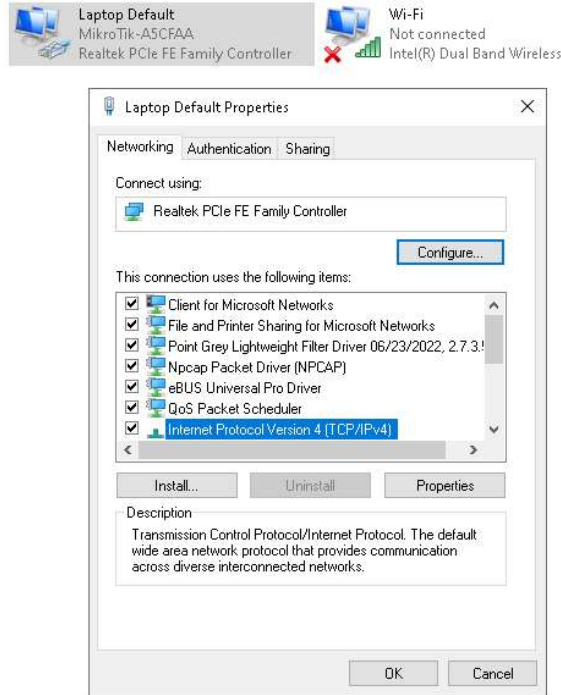


UB-B GUI Software Upgrade Procedures

To Transfer the UB-B GUI software upgrade zip package into the UB-B device

1. Locate the ethernet port with the “User Eth” label on the back of the UB-B device (The IP address configured for this “User Eth” ethernet port must be known for the remote PC to connect and transfer the software upgrade software package.)
2. Find an available network port on the remote PC and connect to the UB-B device “User Eth” port via an RJ45 ethernet cable.
3. The remote PC network port used to connect / transfer the software upgrade package must be in the same IP address range and subnet range.
 - a. **For example**, if the configured IP address for the “User Eth” port is 192.168.4.35, subnet 255.255.255.0, on the remote PC, locate an available network port and configure this port IP address to the same network range.
4. On the Network Connection window, select the Network Adapter, open the **NIC properties -> Internet Protocol Version 4 properties**.

APPENDIX G SECURITY AND ADMINSTRATIVE FUNCTIONS



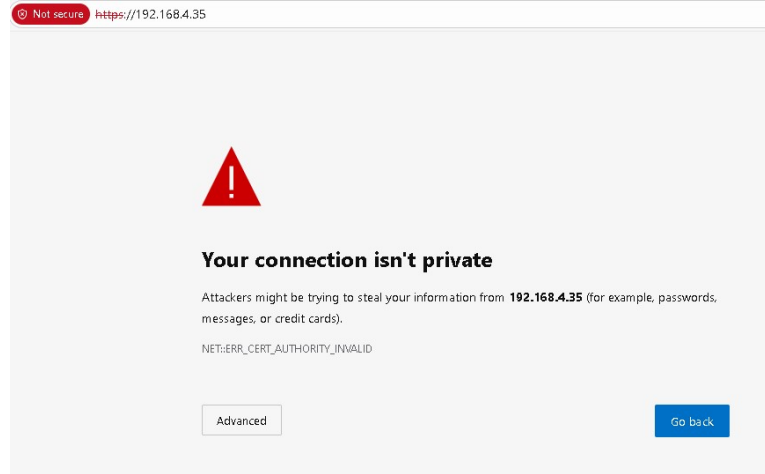
5. Configure the IP address and subnet mask as shown below and click OK.



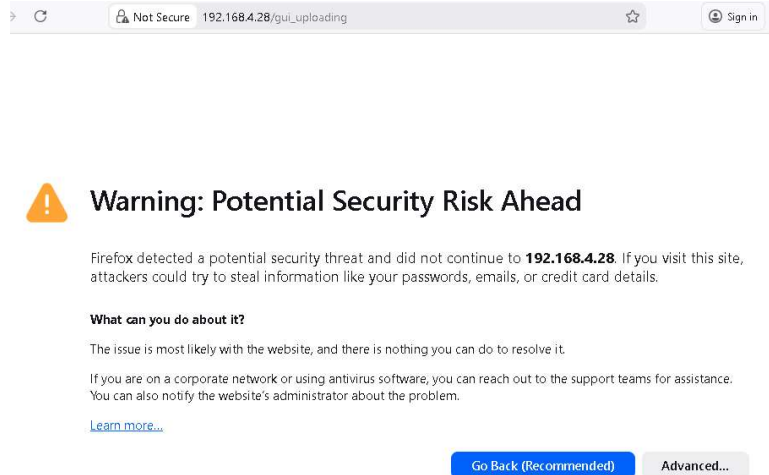
UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX G SECURITY AND ADMINSTRATIVE FUNCTIONS

6. On the remote PC, open a web browser page and enter the UB-B device “User Eth” port IP address <https://192.168.4.35>
 - a. If the page is reported with a Network error



Or



- b. Click on the Advance button and continue, accept any unsafe connection risk.
7. Once connected, a username / password will be prompted for authentication.
 - a. Enter the following
 - User name : engr
 - Password : engr2 (or the current engineer password)

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX G SECURITY AND ADMINSTRATIVE FUNCTIONS



192.168.4.35

This site is asking you to sign in.

Username

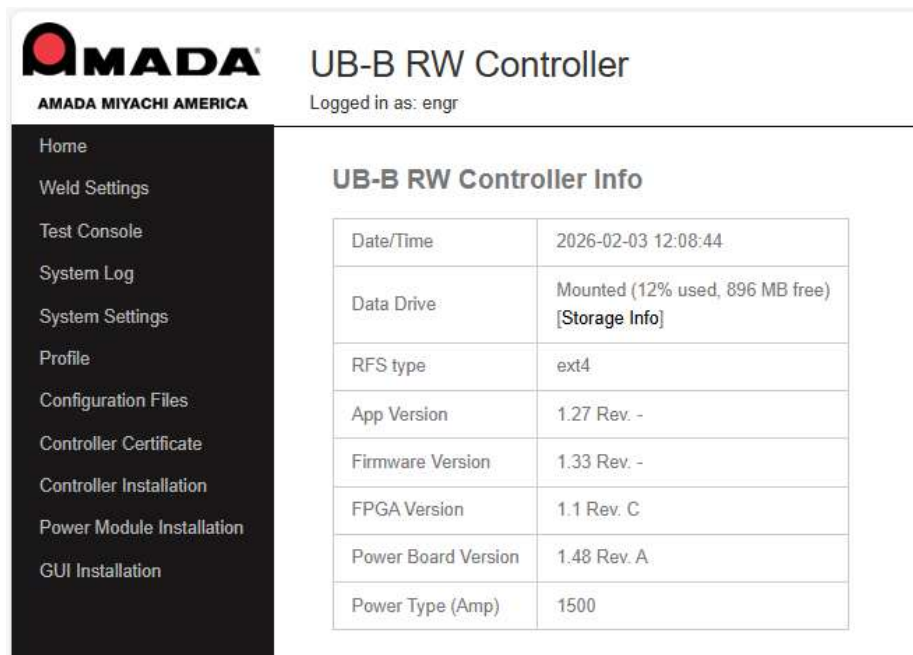
engr

Password

engr1

Sign in Cancel

8. On the UB-B RW Controller main page, click on the GUI installation link.



AMADA
AMADA MIYACHI AMERICA

UB-B RW Controller
Logged in as: engr

- Home
- Weld Settings
- Test Console
- System Log
- System Settings
- Profile
- Configuration Files
- Controller Certificate
- Controller Installation
- Power Module Installation
- GUI Installation

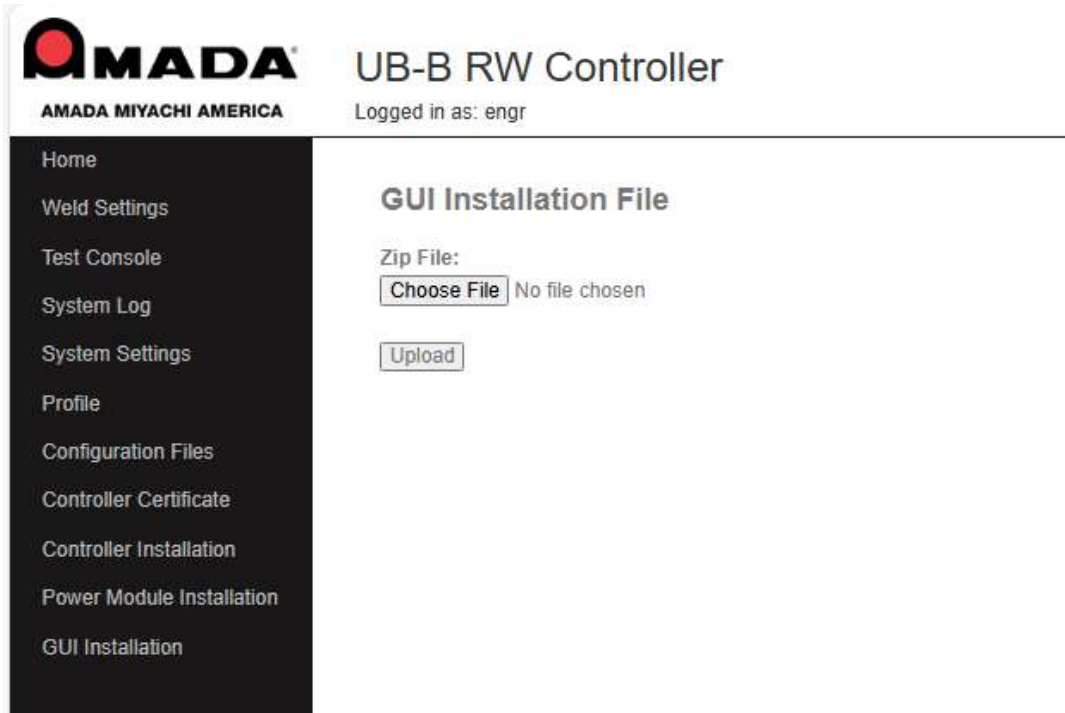
UB-B RW Controller Info

Date/Time	2026-02-03 12:08:44
Data Drive	Mounted (12% used, 896 MB free) [Storage Info]
RFS type	ext4
App Version	1.27 Rev. -
Firmware Version	1.33 Rev. -
FPGA Version	1.1 Rev. C
Power Board Version	1.48 Rev. A
Power Type (Amp)	1500

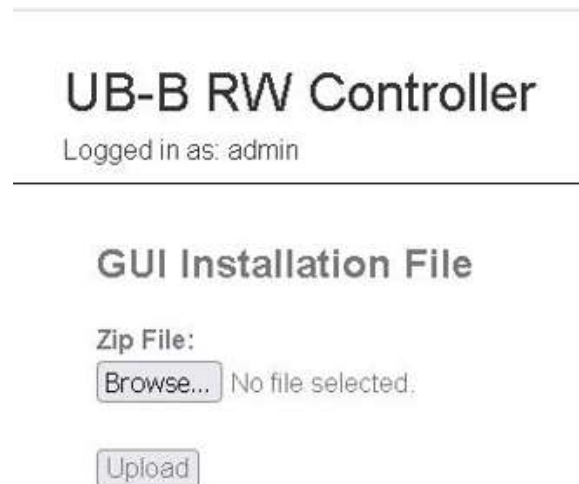
UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX G SECURITY AND ADMINSTRATIVE FUNCTIONS

9. On the GUI Installation File page, click on the Browse button to locate and select the UB-B GUI software upgrade zip package.



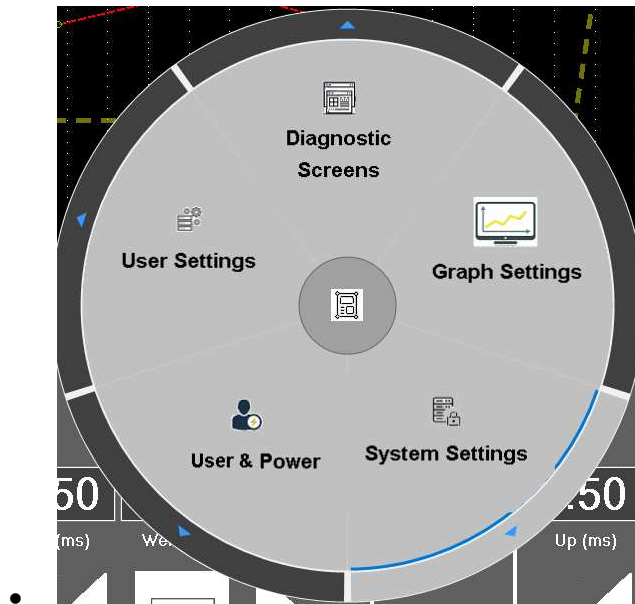
10. Once the UB-B GUI software upgrade zip package is selected, click on the Upload button to transfer the file onto the UB-B device.
11. When the file has been uploaded successfully, the Browse button would show “No file selected.”



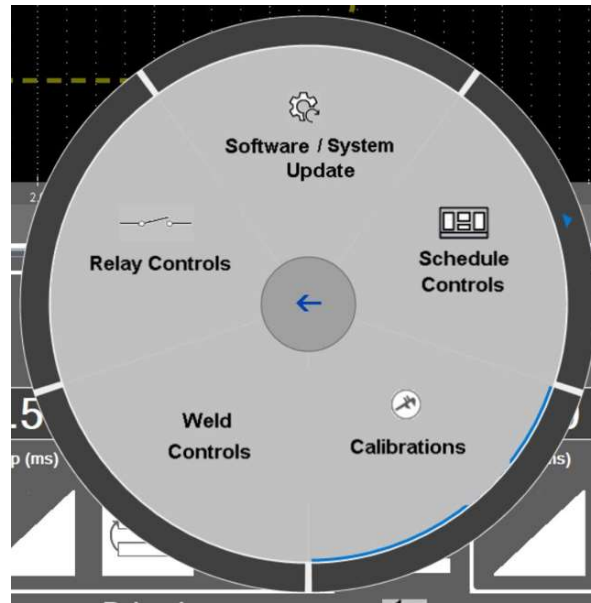
UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX G SECURITY AND ADMINSTRATIVE FUNCTIONS

12. On the UB-B system, log into the UB-B account (not the UB-B_Kiosk account)
13. Open the UB-B GUI
14. On the circular menu, click on the System Settings and Software / System Update menu.

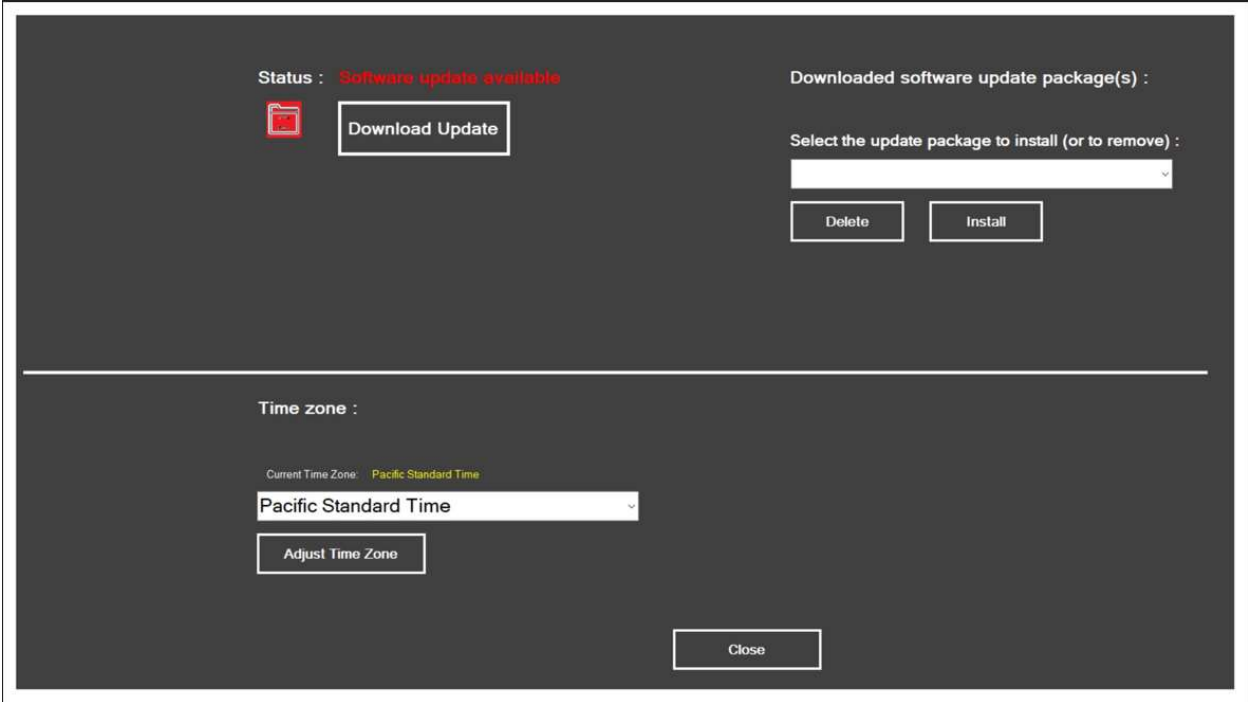


APPENDIX G SECURITY AND ADMINSTRATIVE FUNCTIONS



-
-
- 15. On the Software Update window, if the UB-B GUI software upgrade zip package has been transferred into the UB-B device from a remote PC, the Status will be shown as “Software update available.”

APPENDIX G SECURITY AND ADMINSTRATIVE FUNCTIONS



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

Appendix H SOFTWARE INSTALLATION

Software installation on a new PC

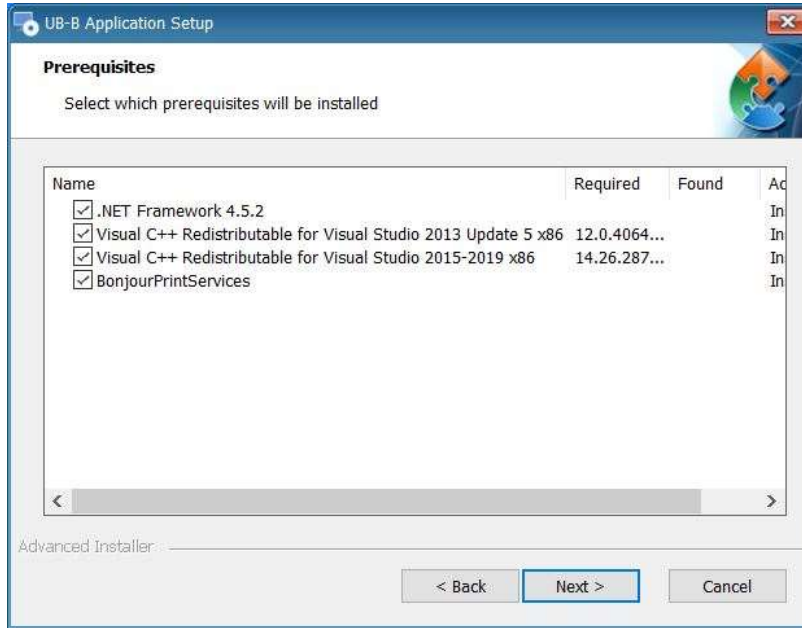
UB-1500B/4000B system is delivered with the software installed. The instructions below apply to installing the software on a new PC.

Launch the Prerequisites Setup Wizard

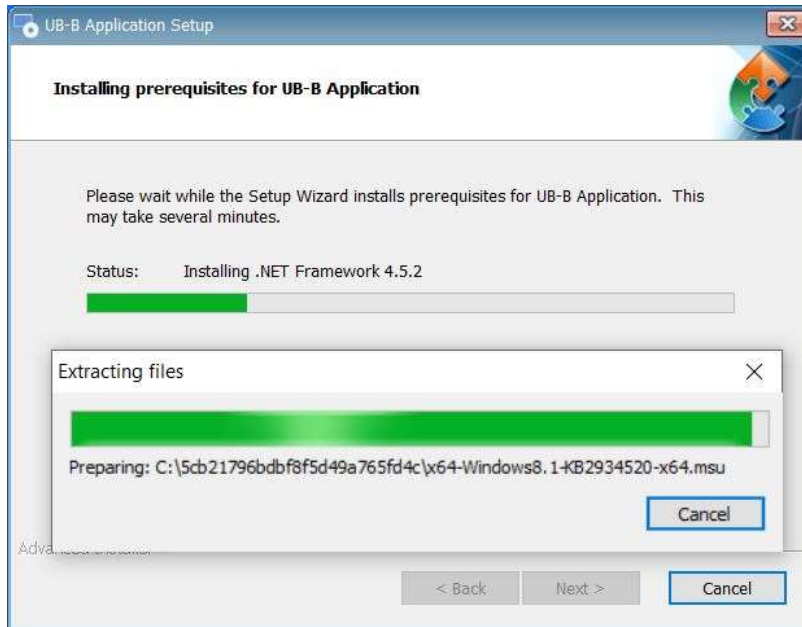


Select all items listed. Click Next.

APPENDIX H SOFTWARE INSTALLATION



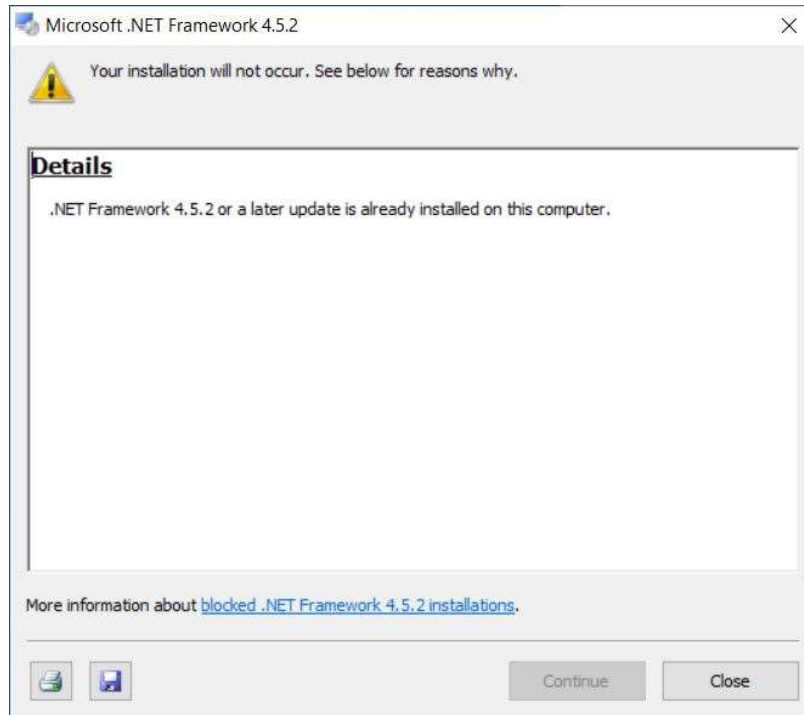
The prerequisites are installed.



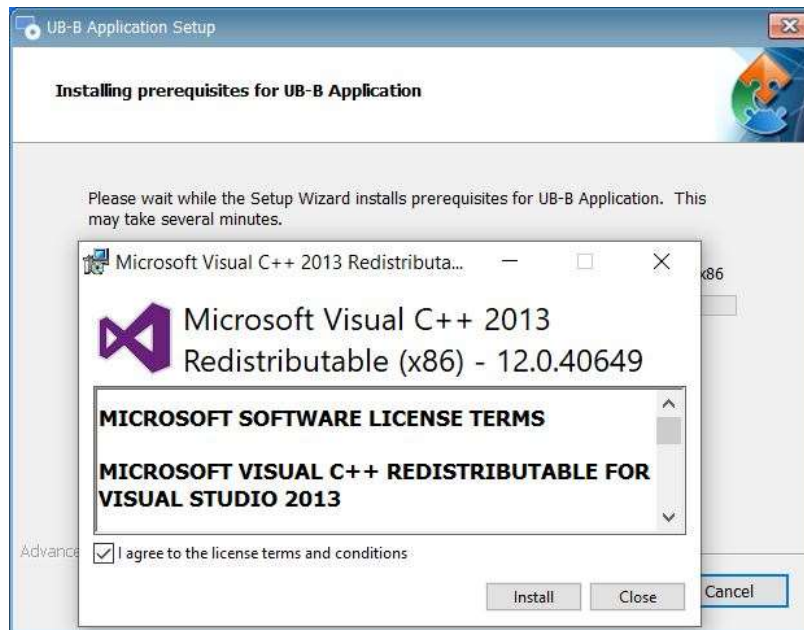
Notifications may display. Click Close.

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX H SOFTWARE INSTALLATION



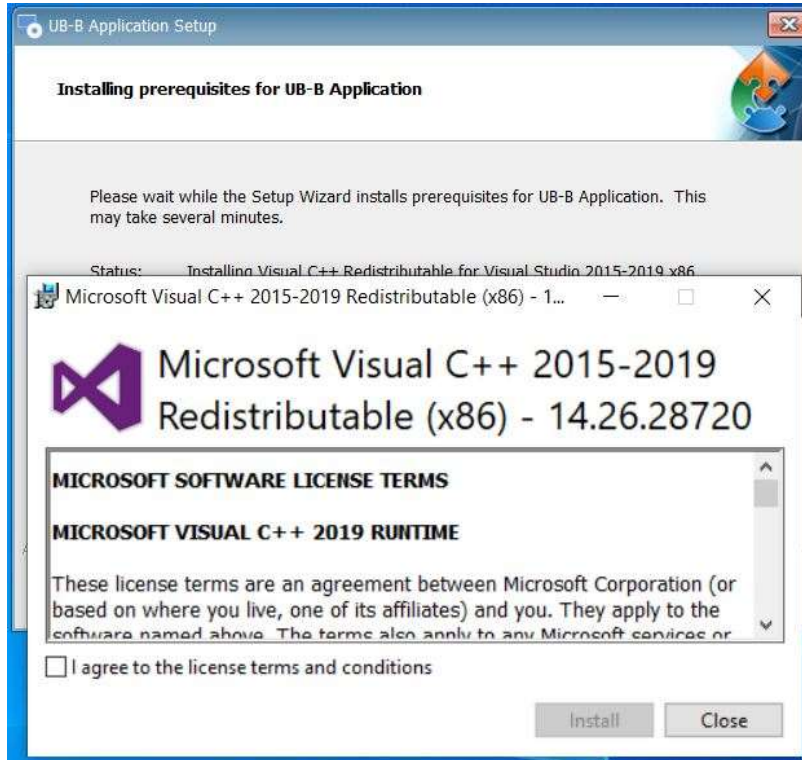
Click install at prompt.



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

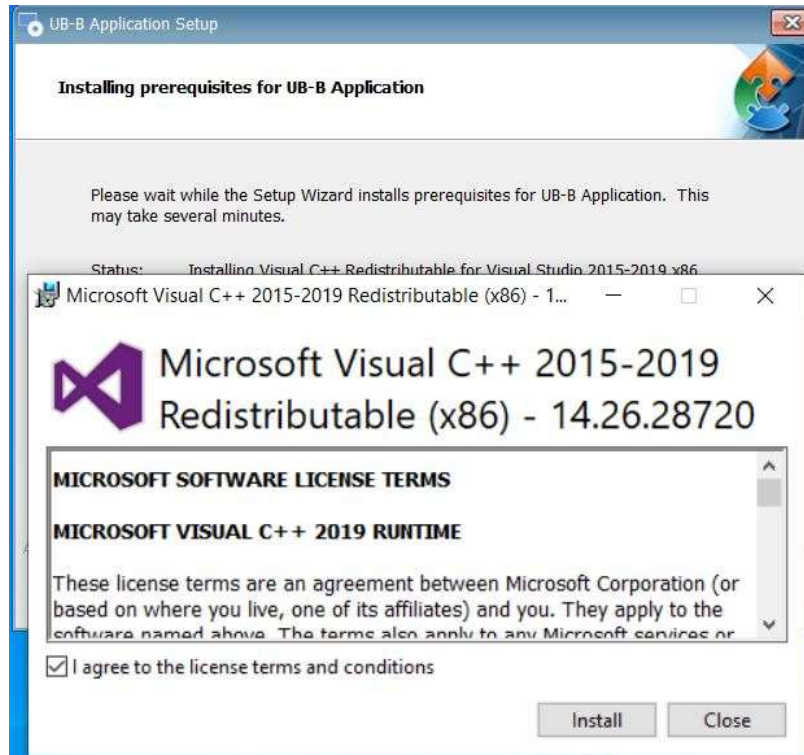
APPENDIX H SOFTWARE INSTALLATION

Agree to license terms.



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

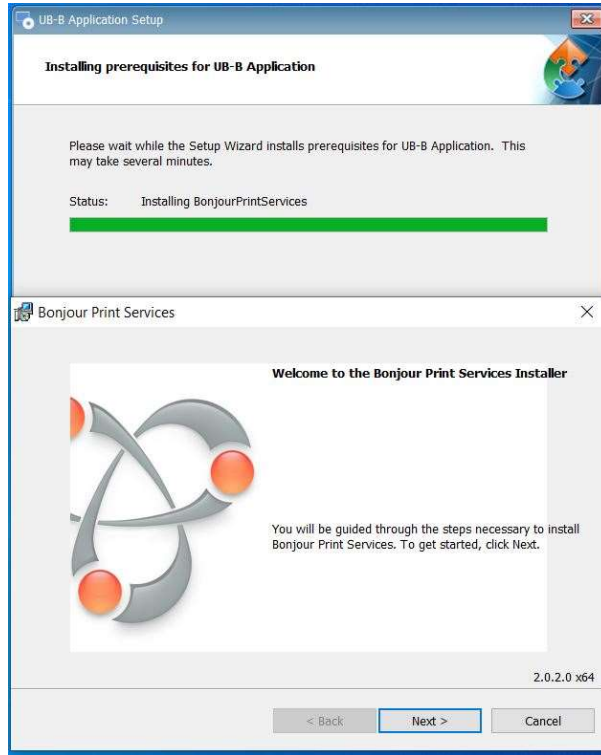
APPENDIX H SOFTWARE INSTALLATION



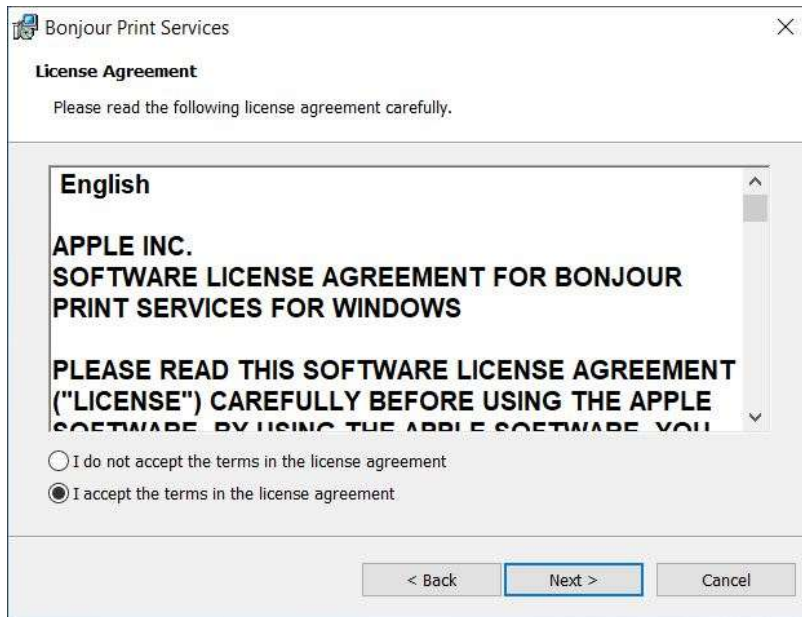
Prerequisite applications install and the Bonjour application launches.

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX H SOFTWARE INSTALLATION



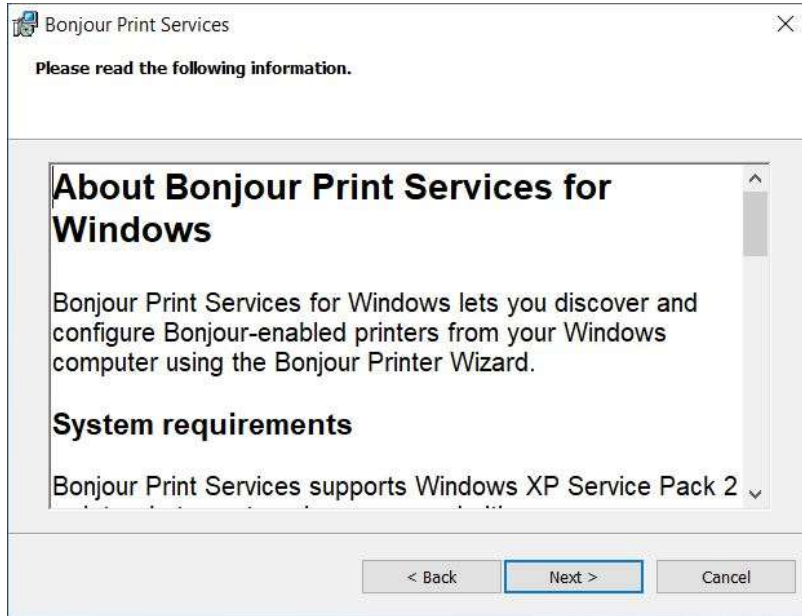
Agree to license terms.



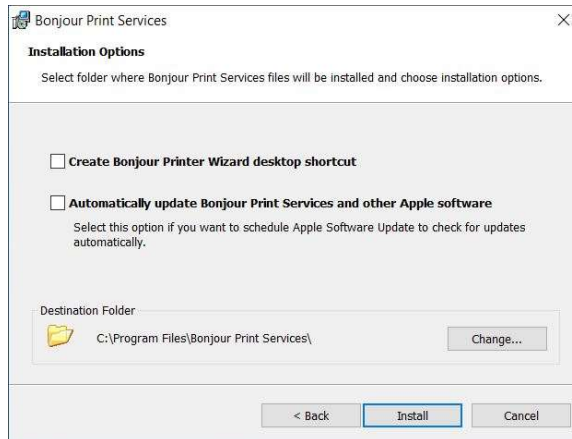
Read and Click Next.

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX H SOFTWARE INSTALLATION

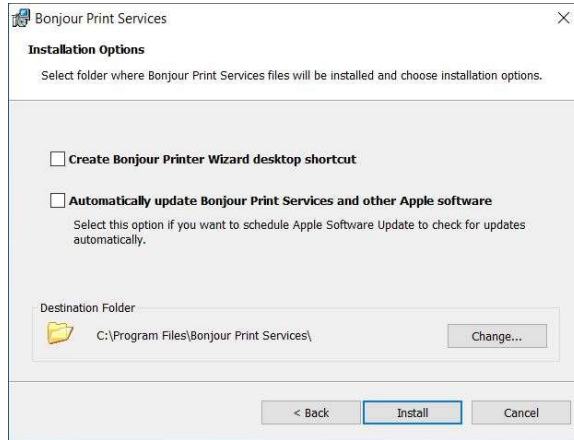


Select Installation options.

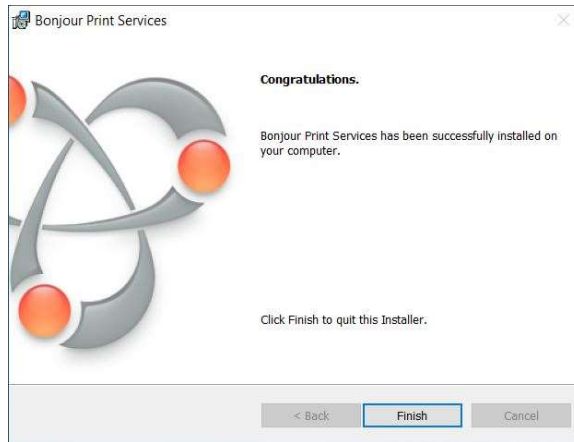


UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX H SOFTWARE INSTALLATION

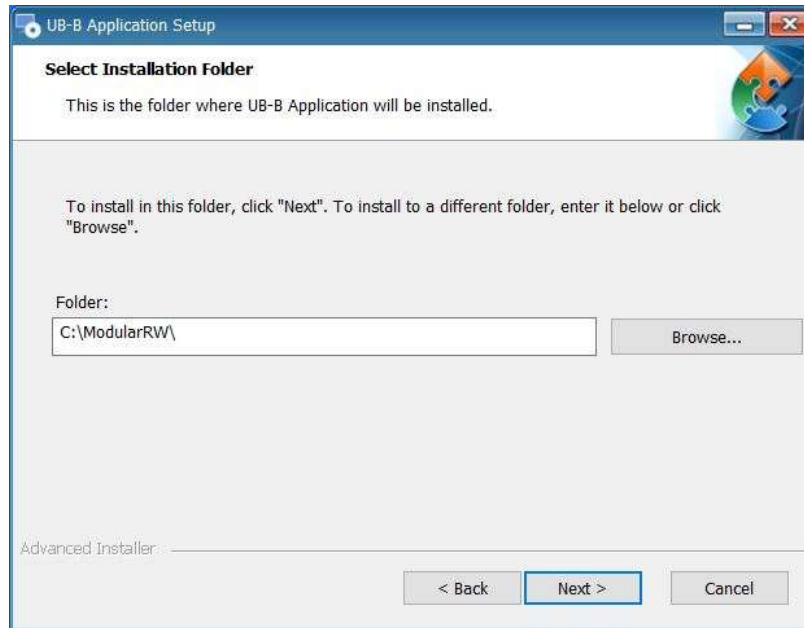


Installation is complete.

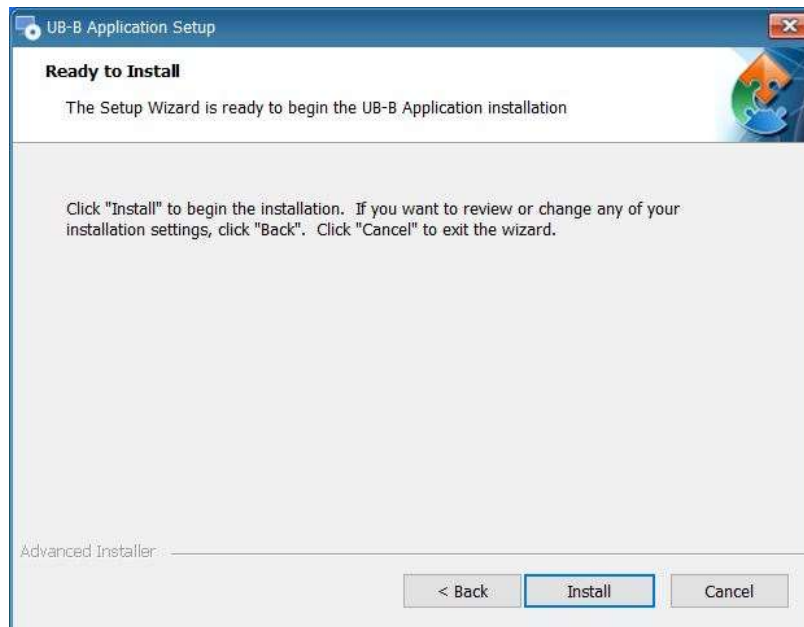


Select the folder where the UB-B Application will be installed.

APPENDIX H SOFTWARE INSTALLATION



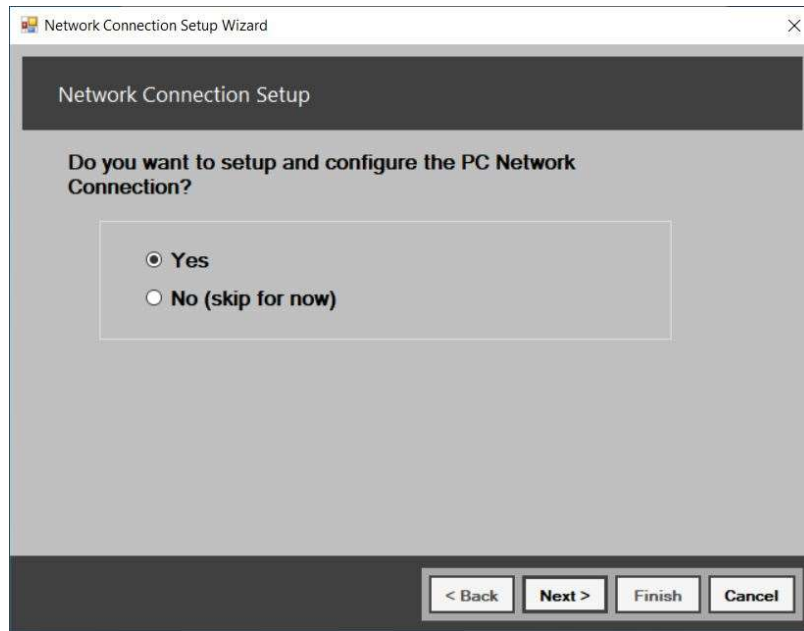
Click Install.



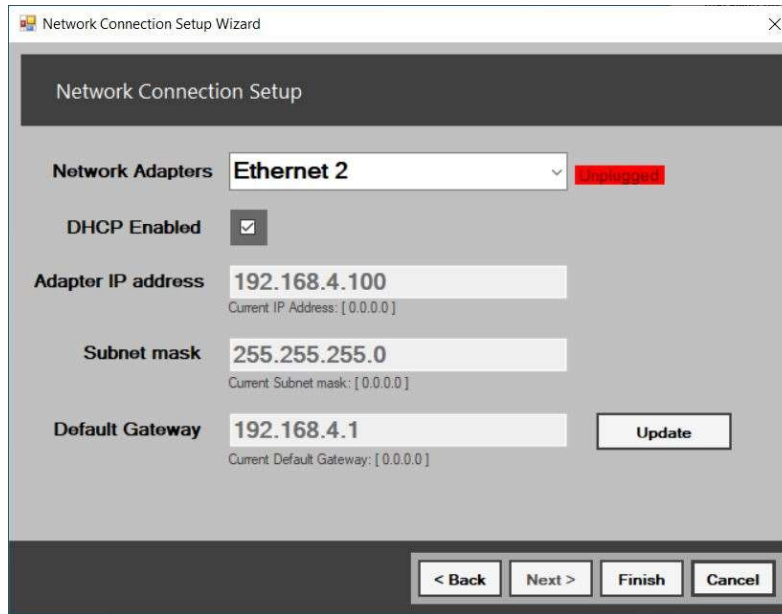
UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX H SOFTWARE INSTALLATION

Click Yes to setup and configure the PC Network Connection.



The Network Connection Setup window displays.

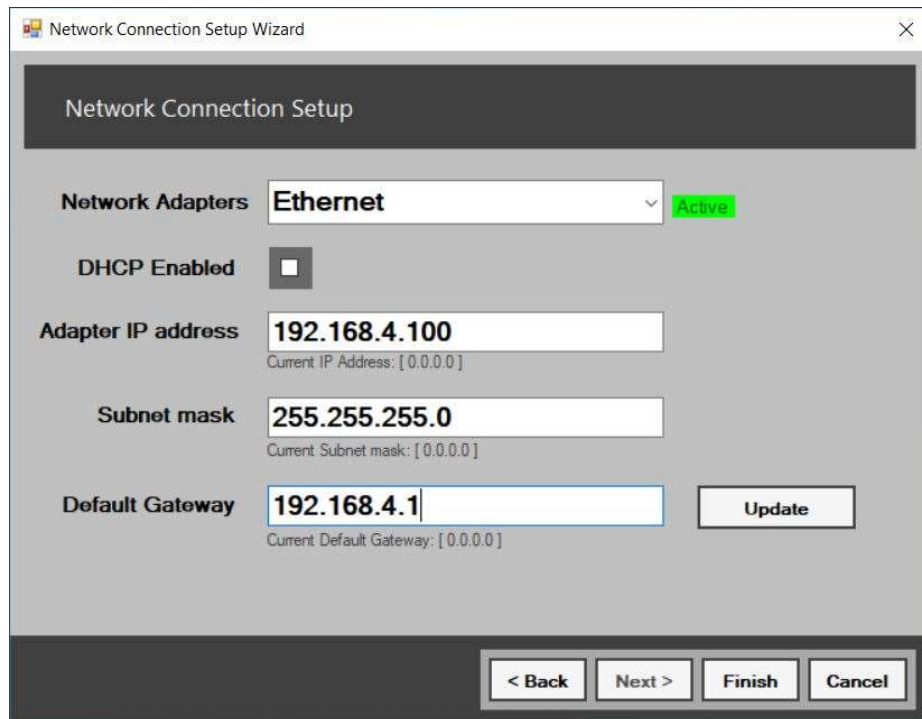


- Select Ethernet 2 as the Network Adapter
- Disable DHCP

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX H SOFTWARE INSTALLATION

- Input Adapter IP address 192.168.4.100 as show
- Insert Subnet mask 255.255.255.0 as shown
- Set Default Gateway as 192.168.4.1 as shown
- Click Update.
- Click Finish

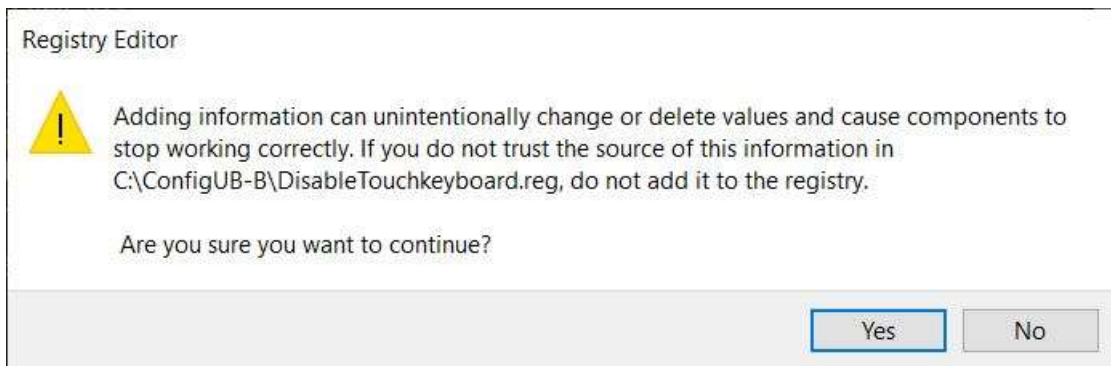


Agree to license terms.

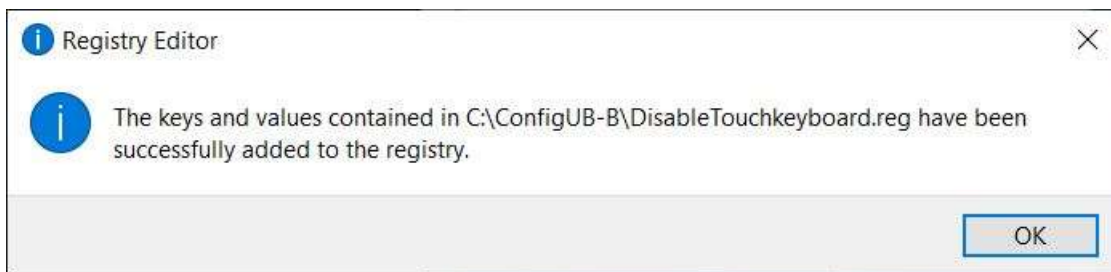
APPENDIX H SOFTWARE INSTALLATION



Click Yes at prompt



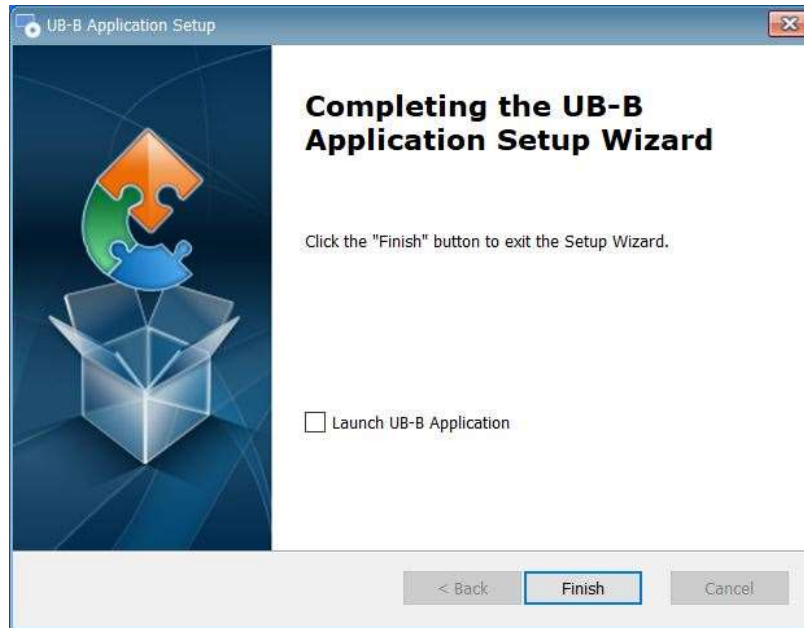
Click OK.



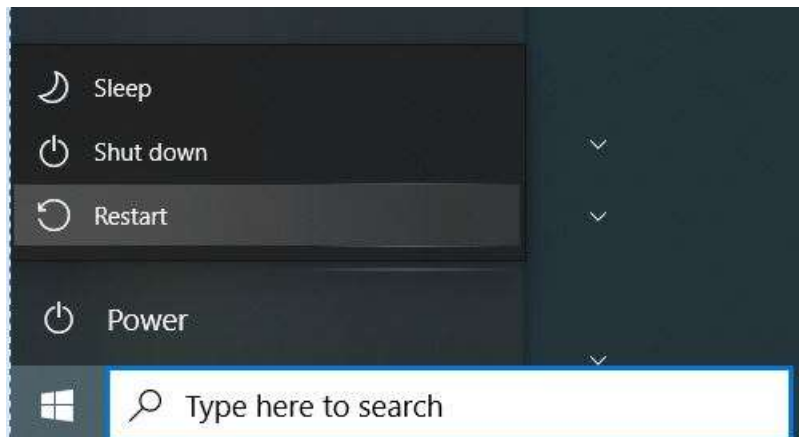
Click Finish to complete setup.

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX H SOFTWARE INSTALLATION



Restart the PC.



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

Software installation on a Remote PC

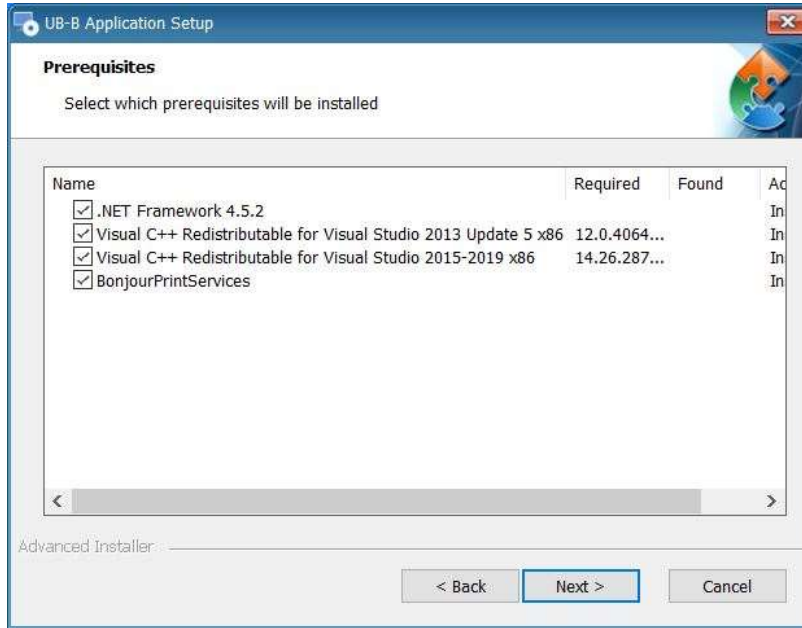
To install UB-RW software on a remote PC connected to a UB-B Power Supply without a touch screen interface, you will need the UB-B installation software USB memory stick.

- Insert the memory stick into your PC and double click on the “UB-B GUI Desktop installation exe” installation file.
- Launch the Prerequisites Setup Wizard

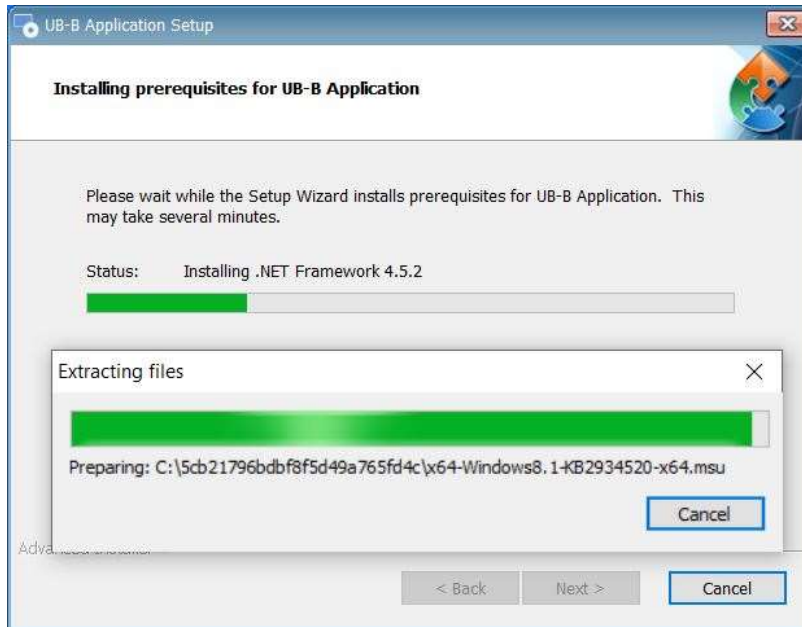


- Select all items listed. Click Next.

APPENDIX H SOFTWARE INSTALLATION



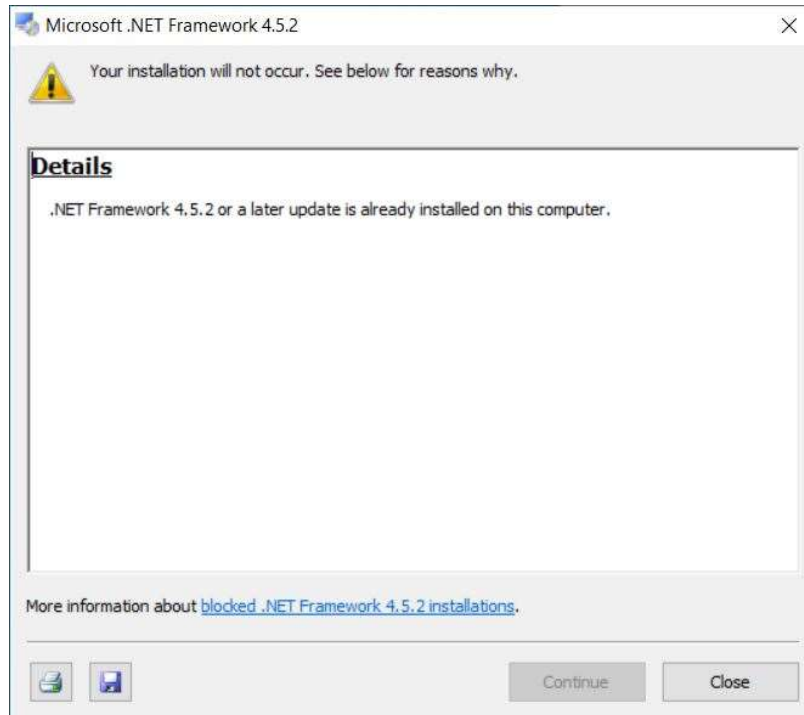
- The prerequisites are installed.



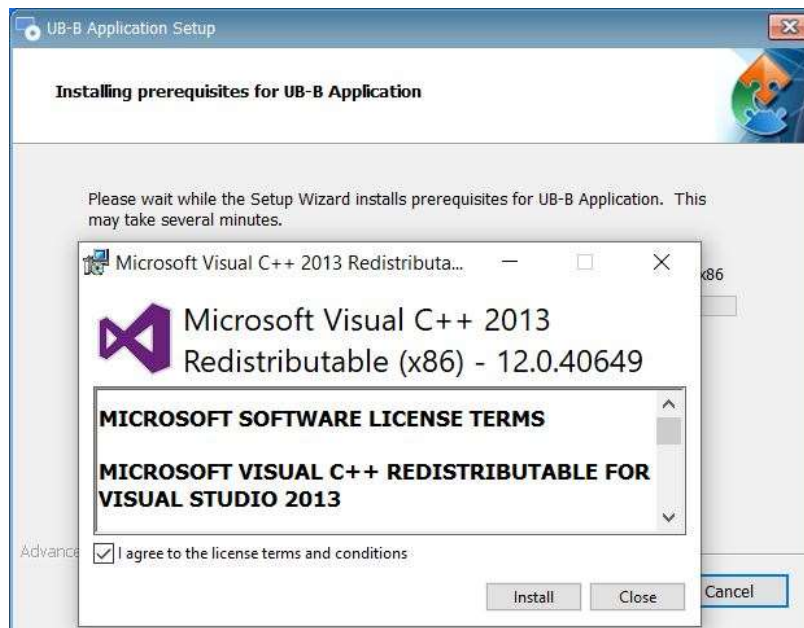
- Notifications may display. Click Close.

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX H SOFTWARE INSTALLATION



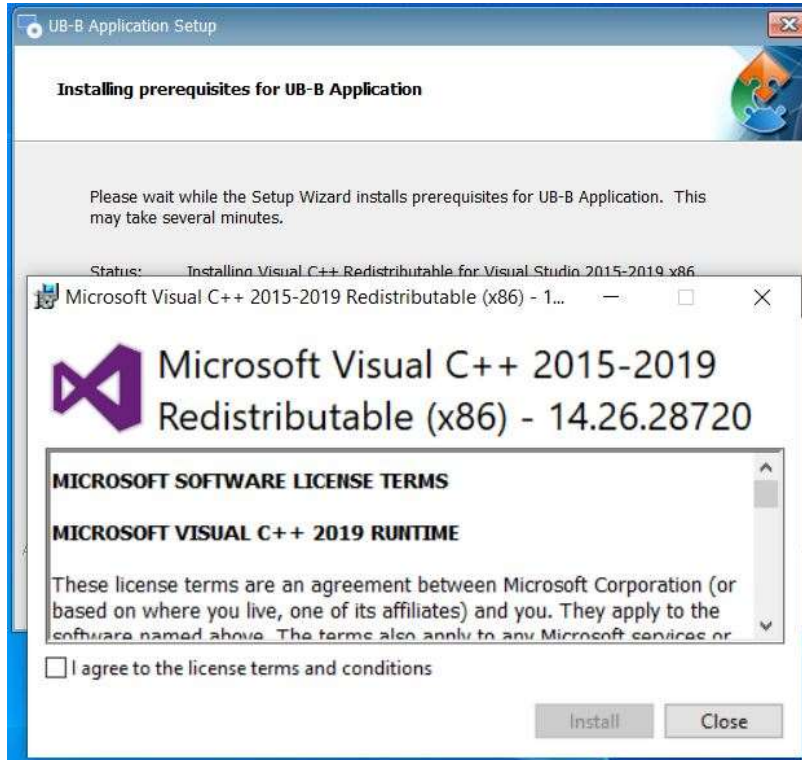
- Click install at prompt.



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

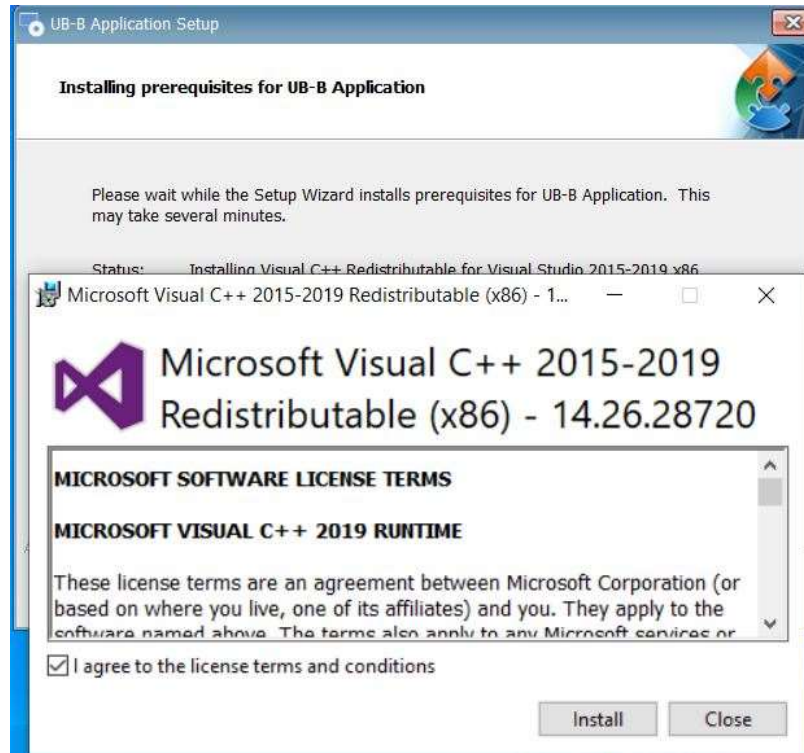
APPENDIX H SOFTWARE INSTALLATION

- Agree to license terms.



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

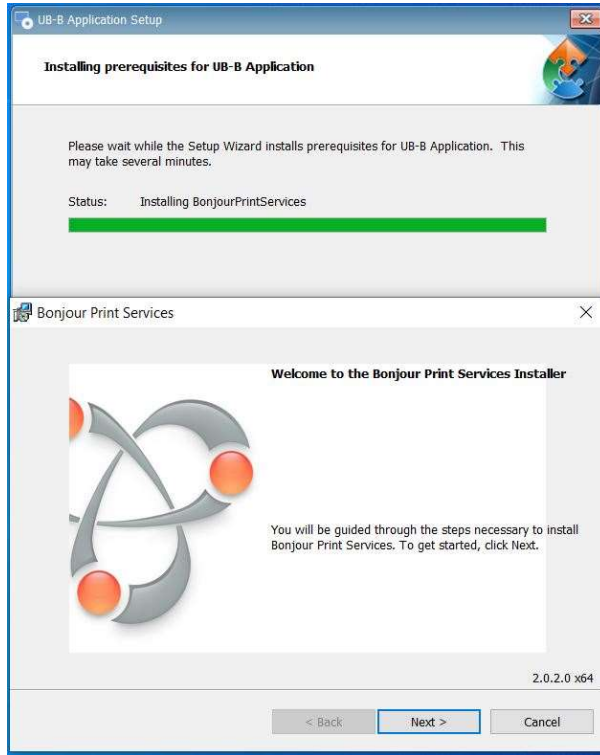
APPENDIX H SOFTWARE INSTALLATION



- Prerequisite applications install and the Bonjour application launches.

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX H SOFTWARE INSTALLATION



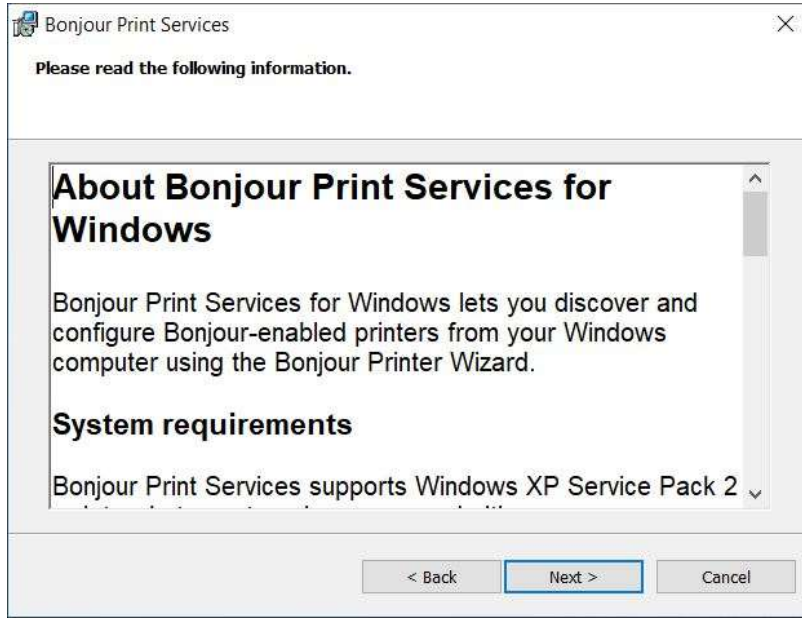
- Agree to license terms.



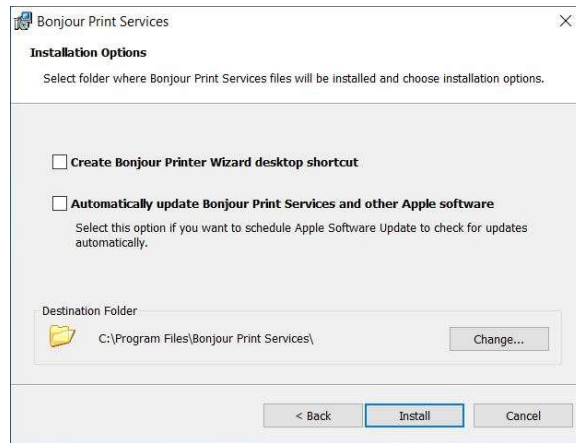
- Read and Click Next.

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX H SOFTWARE INSTALLATION

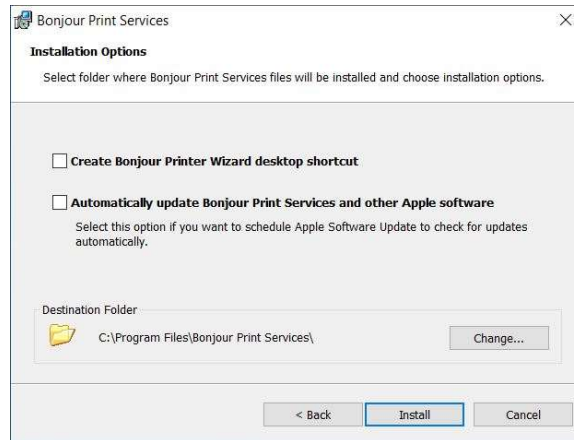


- Select Installation options.

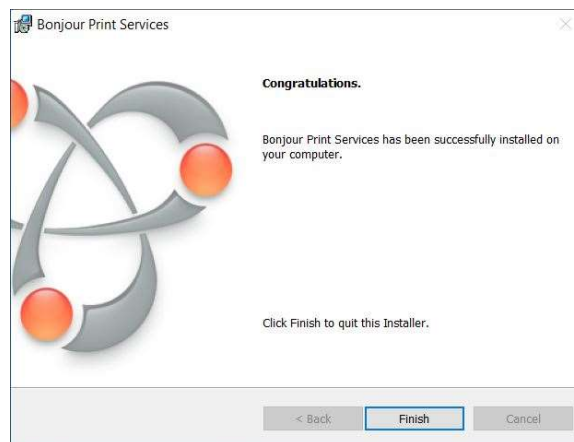


UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX H SOFTWARE INSTALLATION

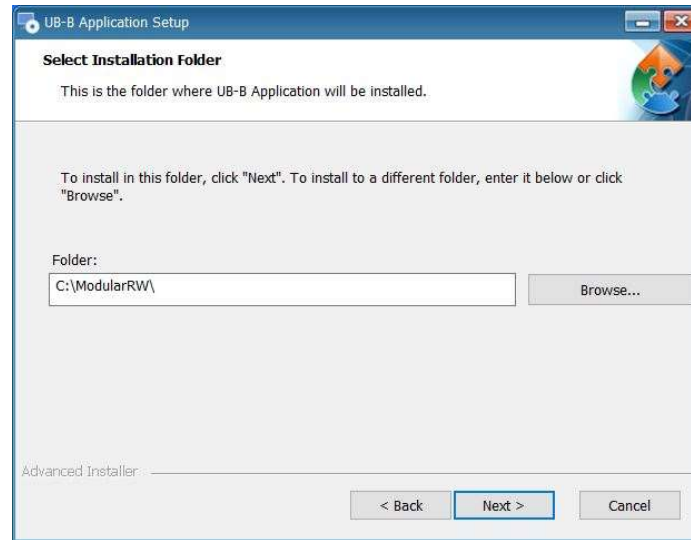


- Installation is complete.

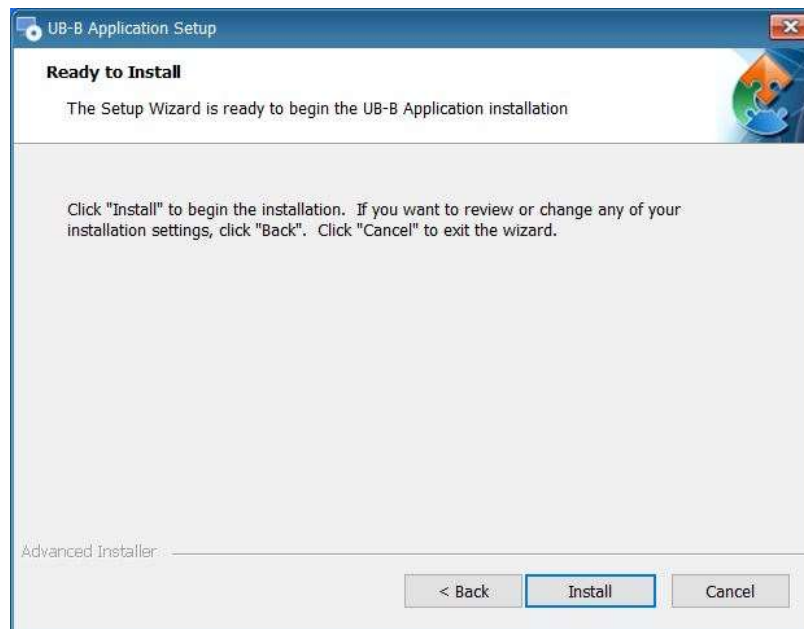


- Select the folder where the UB-B Application will be installed.

APPENDIX H SOFTWARE INSTALLATION



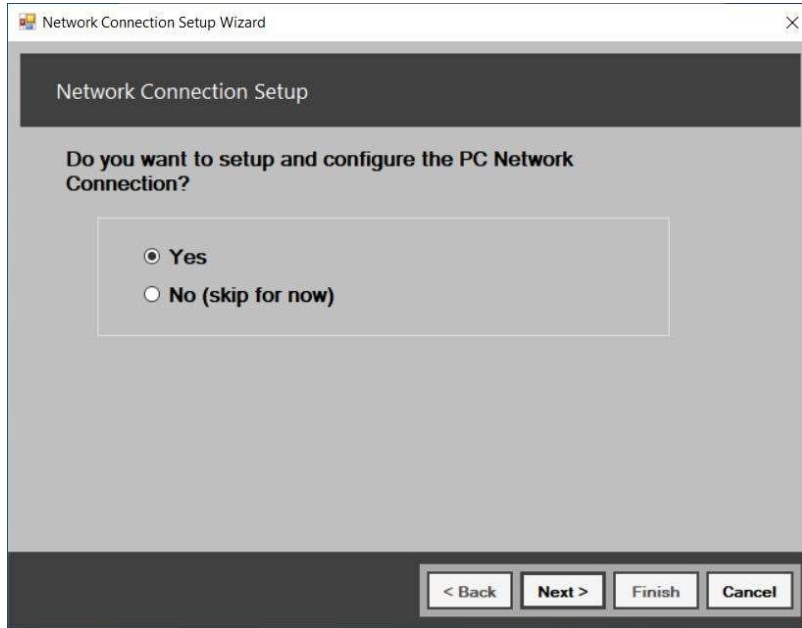
- Click Install.



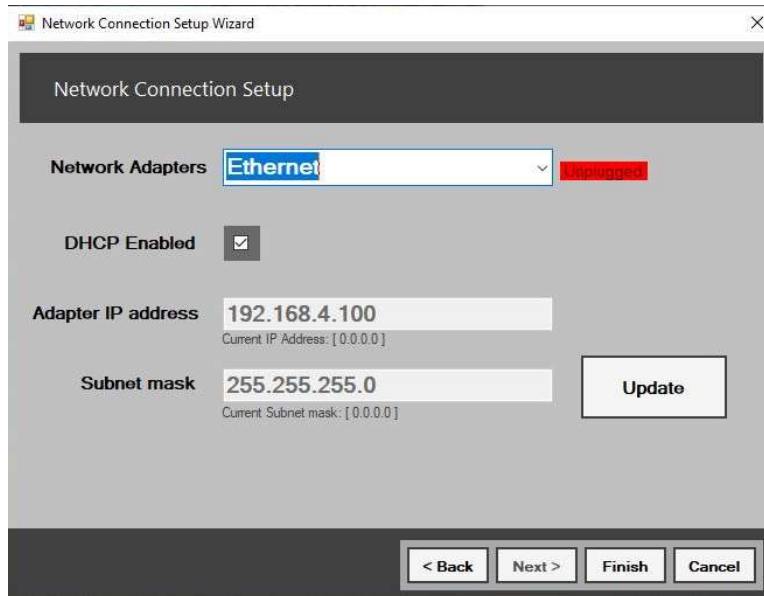
- Click Yes to setup and configure the PC Network Connection.

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX H SOFTWARE INSTALLATION

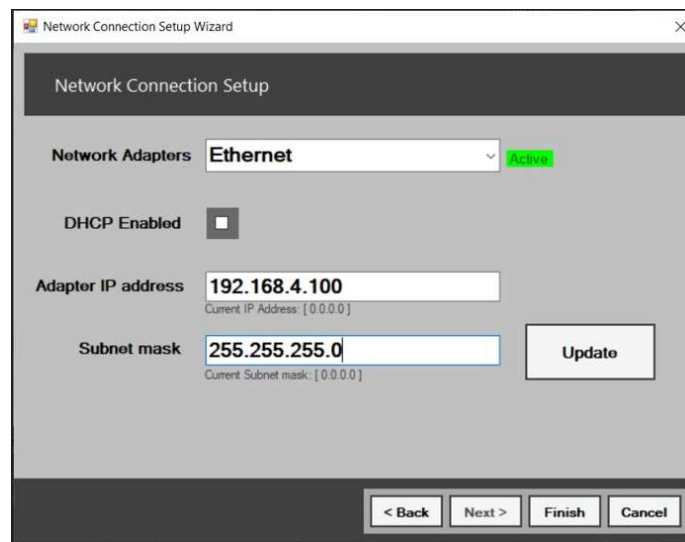
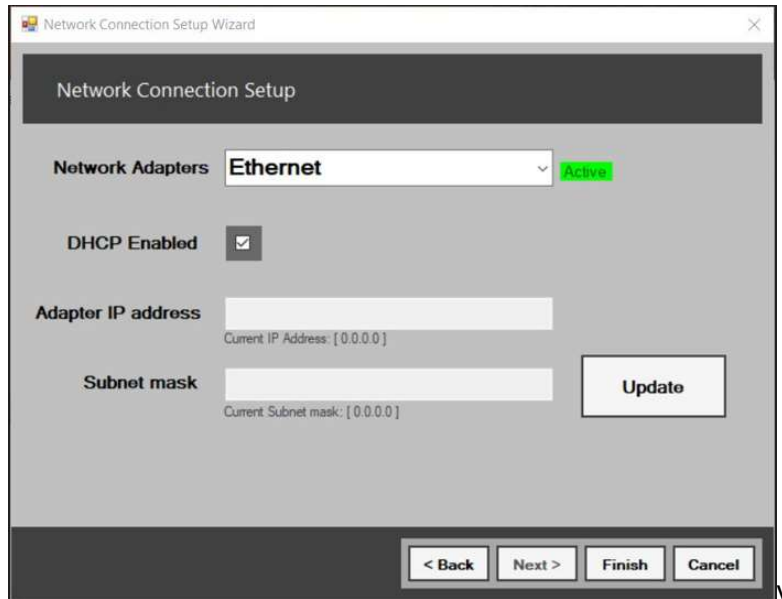


- The Network Connection Setup window displays.



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX H SOFTWARE INSTALLATION

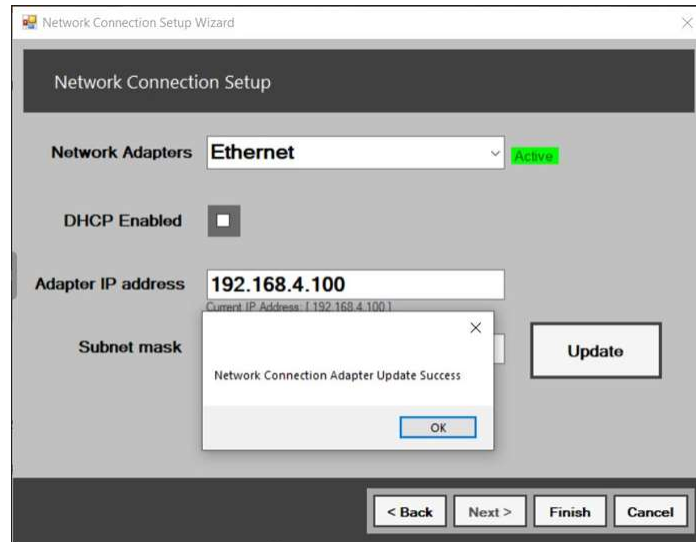


- **Select Ethernet as the Network Adapter**
- **Uncheck the DHCP Enabled checkbox**
- **Input Adapter IP address 192.168.4.100 as shown**
- **Insert Subnet mask 255.255.255.0 as shown**

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX H SOFTWARE INSTALLATION

- Click Update.
- Click Finish

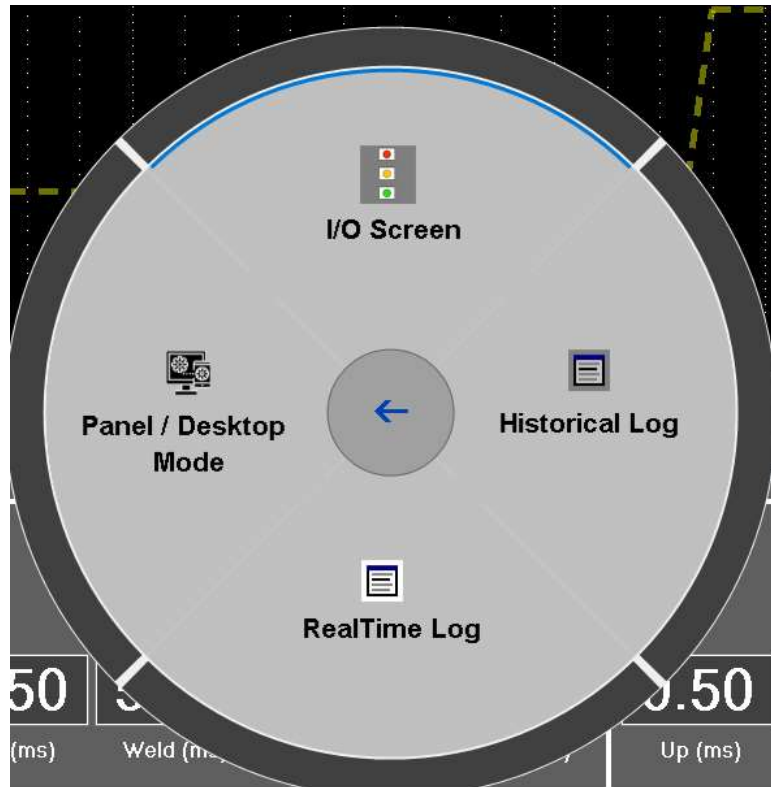


1. To run the UB-B GUI program, double click on the ModularRW shortcut on the desktop to launch the non-Kiosk mode UB-B GUI program.



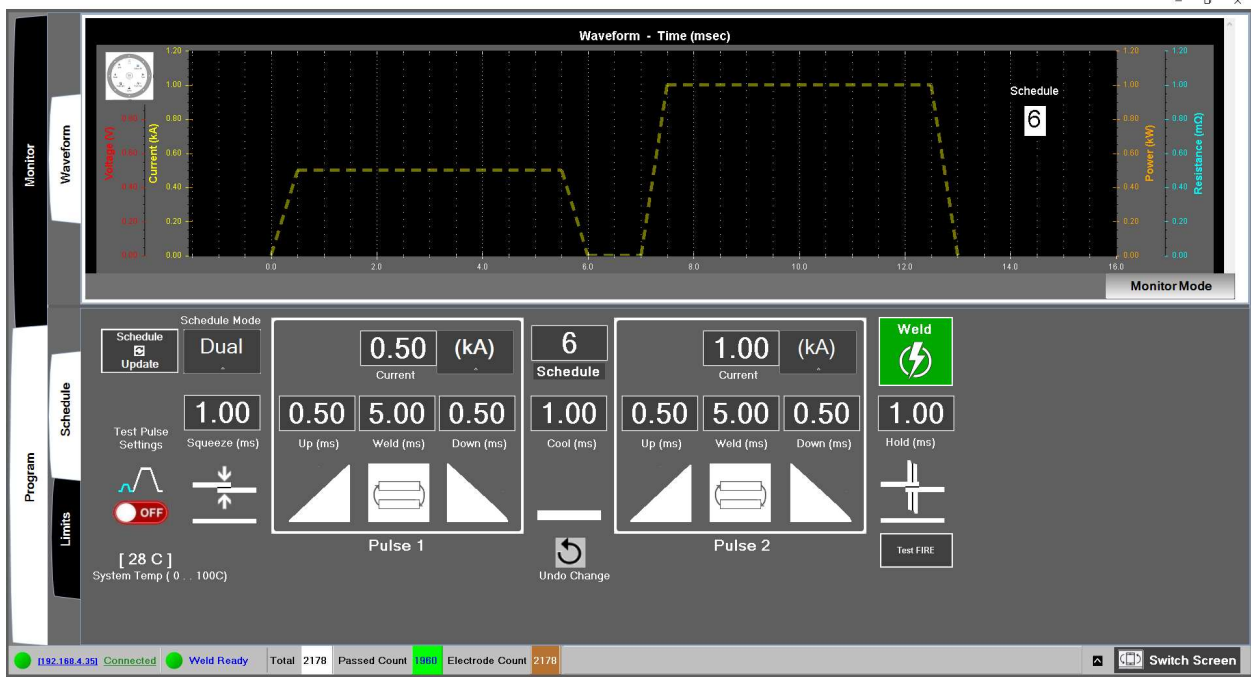
2. The non-Kiosk mode UB-B GUI program operates the same as the standard kiosk UB-B GUI program on the UB-B system with the exception of an additional menu item”
“Panel / Desktop Mode” under the Diagnostic Screen sub menu

UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL



3. The Desktop Mode option will enable the Desktop Title bar to the UB-B GUI which allows the UB-B GUI to operate similar to any window desktop program.

APPENDIX H SOFTWARE INSTALLATION



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

Appendix I REPETITION RATES

Introduction

“Repetition Rate” refers to how often weld pulses can be repeated based on the Power Supply’s recharging time. The energy used to generate weld pulses is stored internally in a capacitor bank. This energy is used to provide the desired weld pulses. There are limits to the duration of weld pulses the unit can provide, and time must be provided between welds for the capacitor bank to recharge.

The following graph details the maximum acceptable pulse durations at various current levels for repetition rates of 1, 2, and 3 welds per second. The secondary circuit resistance and/or inductance will affect actual results and may reduce actual repetition rates.

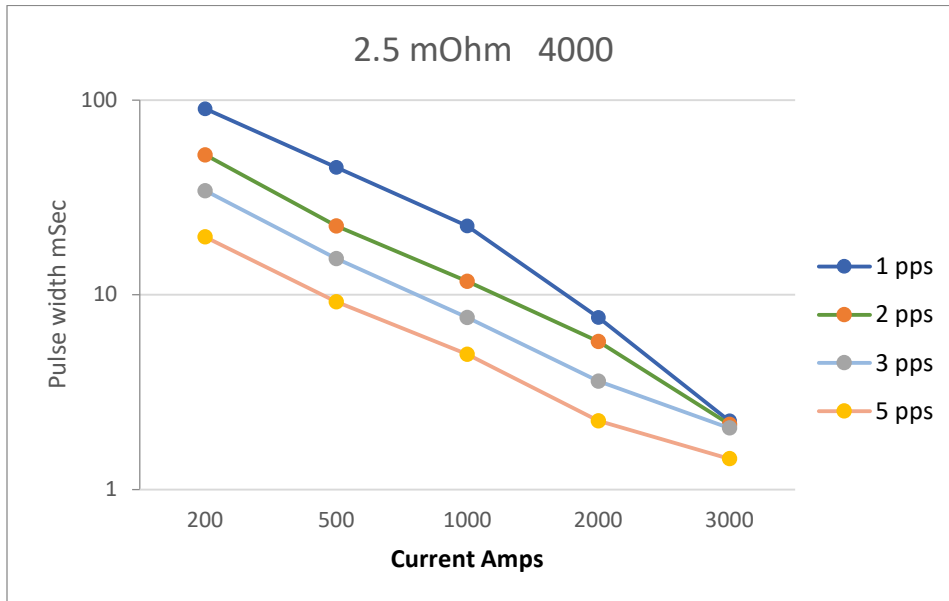
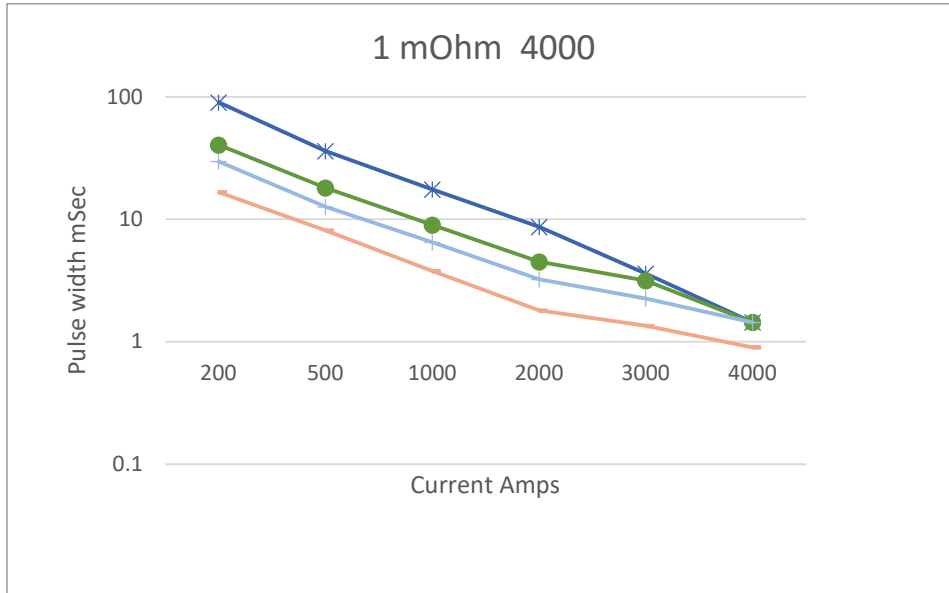
Weld pulses that fall below the lines are within the capability of the Power Supply for the stated repetition rates. The time to be used in determining the duration is the sum of the weld period and one half the periods of upslope and downslope, if any. For dual-pulse welding, the sum of both pulses must be compared to the chart.

For welds using the current control mode, the durations can be read directly off the chart. For welds in the voltage control or power control modes, the average current from the monitor screen and the programmed duration can be compared to this chart.

It is possible that longer durations may be provided by the Power Supply (depending upon the details of the secondary circuit) but the stability of the waveform may decrease. In this circumstance, a reduction of the secondary circuit resistance and/or inductance will be beneficial. (Shorten weld cables and/or tie them together.) Testing with the actual secondary circuit to be used will be required in this case.

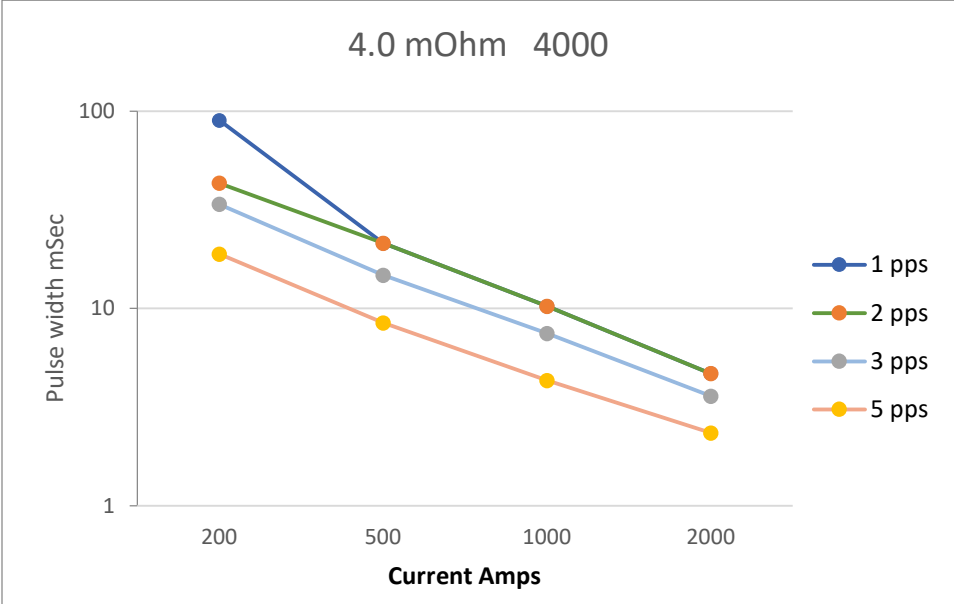
APPENDIX I REPETITION RATES

UB-4000B Repetition Rates



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

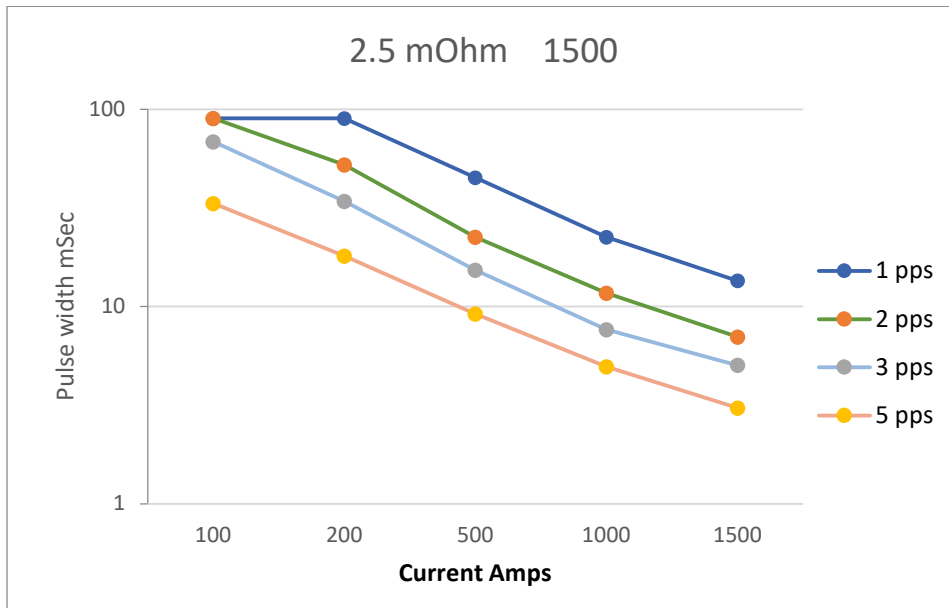
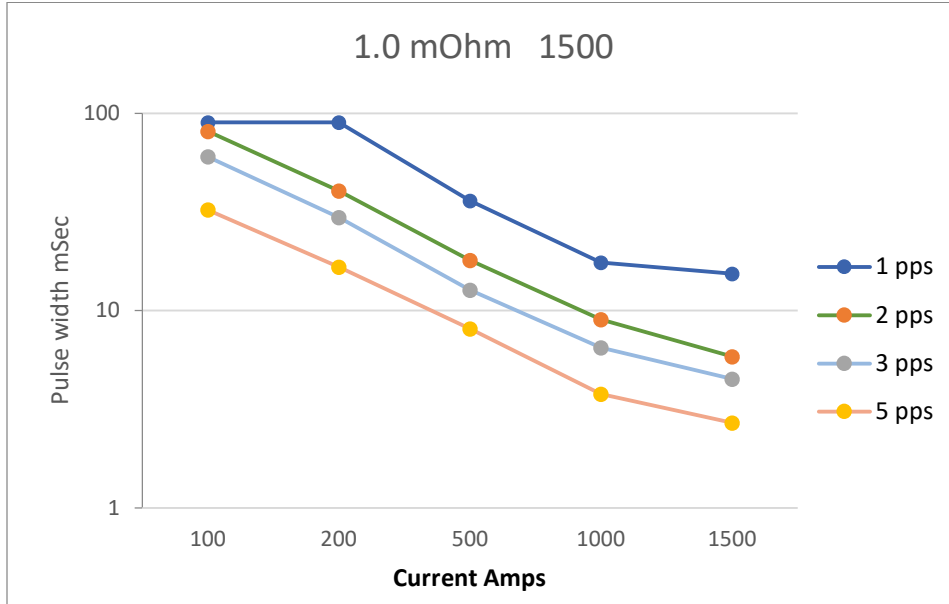
APPENDIX I REPETITION RATES



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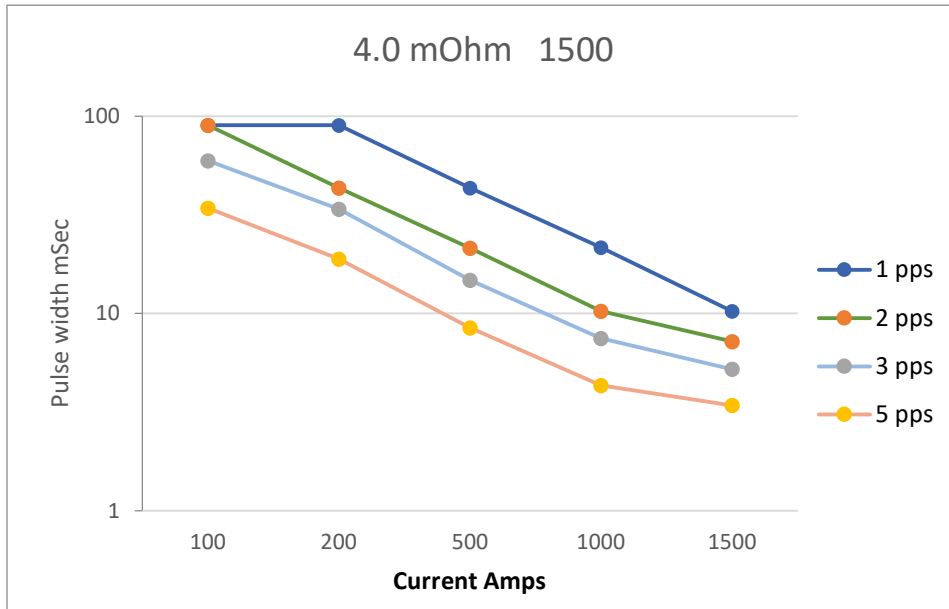
APPENDIX I REPETITION RATES

UB-1500B Repetition Rates



UB1500B, UB-4000B LINEAR DC RESISTANCE WELDING CONTROL

APPENDIX I REPETITION RATES



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