

STORED ENERGY POWER SUPPLY

250DP

USER MANUAL



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Revision Record

Revision	EO	Date	Basis of Revision
A	ENRG-RLSE	01/94	Released Original Manual.
B	17215	11/97	<ul style="list-style-type: none">• Reorganize data and update format.• Incorporate Addendum 995-280, Rev A (10/97); and Errata 996-280, Rev B.
C	17405	04/98	Add operating features.
D	17574	06/98	Correct Test Point designation.
E	18282	05/00	<ul style="list-style-type: none">• Add CAUTION statement about polarity in chained weld schedules.• Add Declaration of Conformity.
F	18577	11/00	<ul style="list-style-type: none">• Add tolerance to pulse output voltage.• Clarify operation of relay outputs.
G	19146	01/02	Complete Update
H	20002	03/04	Updated Schematics. Minor formatting changes.
J	42840	11/13	Updated to Miyachi America name and logo.
K	43479	12/14	Updated to Amada Miyachi America name and logo.
L	43808	07/15	Updated to Amada format.
M	45833	04/20	Update Company Name (Amada Weld Tech)
N	46292	04/21	See ECO for details
P	47206	01/24	Change Manual Title

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CONTACT US

Thank you for purchasing an AMADA WELD TECH Model 250DP Dual Pulse Resistance Welding Power Supply. Upon receipt of your equipment, please thoroughly inspect it for shipping damage prior to its installation. Should there be any damage, please immediately contact the shipping company to file a claim, and notify us at:

AMADA WELD TECH INC.

1820 South Myrtle Avenue

Monrovia, CA 91016

Telephone: (626) 303-5676

FAX: (626) 358-8048

e-mail: info@amadaweldtech.com

The purpose of this manual is to supply operating and maintenance personnel with the information needed to properly and safely operate and maintain the Model 250DP Dual Pulse Resistance Welding Power Supply. We have made every effort to ensure that the information in this manual is accurate and adequate.

Should questions arise, or if you have suggestions for improvement of this manual, please contact us at the above location/numbers.

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

SAFETY NOTES

This instruction manual describes how to operate, maintain and service the Model 250DP Dual Pulse Resistance Welding Power Supply, and provides instructions relating to its SAFE use. Procedures described in this manual MUST be performed, as detailed, by QUALIFIED and TRAINED personnel.

For SAFETY, and to effectively take advantage of the full capabilities of the tester, please read these instruction manuals before attempting to use the workstation.

Procedures other than those described in this manual or not performed as prescribed in it, may expose personnel to electrical hazards.

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

Please note the following conventions used in this manual:

WARNING: Comments marked this way warn the reader of actions which, if not followed, might result in immediate death or serious injury.

CAUTION: Comments marked this way warn the reader of actions which, if not followed, might result in either damage to the equipment, or injury to the individual if subject to long-term exposure to the indicated hazard.



Disposal

Properly handle and dispose of used materials.

For the disposal of electronic waste please contact AMADA WELD TECH.

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 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.

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.

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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-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 Acknowledgment, 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 Acknowledgment.

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.

(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.**

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(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 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, 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.

250DP DUAL PULSE RESISTANCE WELDING POWER SUPPLY

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 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).

250DP DUAL PULSE RESISTANCE WELDING POWER SUPPLY

CHAPTER 1

SYSTEM DESCRIPTION

Applications

The 250DP (figure 1-1) is a versatile, 250 watt-second stored energy, capacitor discharge, dual pulse power supply which can effectively solve most precision, small parts, resistance welding problems. Its exclusive, context sensitive, user help screens quickly guide you through even the most complex program.

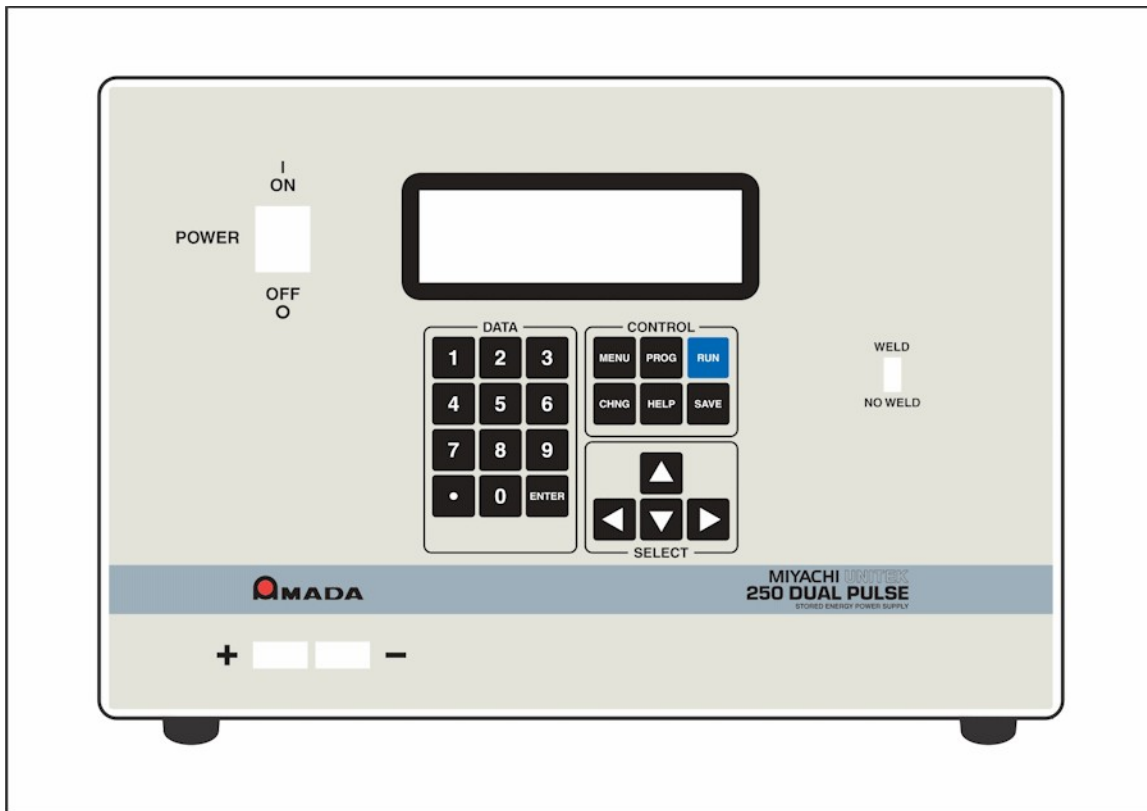


Figure 1-1. 250DP Dual Pulse Resistance Welding Power Supply

You can program up to 128 weld schedules and save them in battery backup memory. A built-in schedule protection feature protects weld schedules from unauthorized or inadvertent changes. Schedule 0 serves as a scratch-pad which anyone can use to perform occasional jobs without jeopardizing the integrity of the production line. The exclusive weld fire lockout feature guarantees that weld quality is independent of line voltage fluctuations and the speed at which the power supply is operated.

CHAPTER 1: SYSTEM DESCRIPTION

Dual pulse welding, an exclusive and unique feature of AMADA WELD TECH power supplies, improves weld quality and eliminates weld splash. *Dual pulse* means each weld is performed with two pulses with independent energy levels. The first pulse displaces the plating or contamination and reforms the surface so that it is in intimate contact with the electrode. The second pulse welds the base metals. You can also use the automatic step feature to step to a new schedule, after a preset number of welds, in order to compensate for electrode wear.

The optional built-in AMADA WELD TECH Weld Sentry adds a weld monitoring capability to the 250DP which improves process control by detecting subtle changes in voltage, current, and power. The remote schedule feature allows the 250DP to reliably select weld schedules in automated applications.

The 250DP can be used with manual, user actuated, or air actuated weld heads. It is a multi-voltage unit designed for operation at 100, 115, 208, or 230 VAC, 50/60 Hz.

Features

- Multi-function microprocessor control provides repeatable process control and is compatible with air or manually actuated weld heads. Facilitates multiple applications at a single work-station and protects weld schedules from changes by unauthorized personnel.
- Dual pulse welding eliminates weld splash. Improves weld quality, especially when welding plated materials.
- Three weld functions available:
 - Basic
 - Rollspot (seam weld)
 - Sequence Repeat.
- User-friendly programming serves as a built-in manual, quickly guiding you through the most complex programs. Menu-driven utilities make it easy to copy schedules and calibrate the power supply.
- Two air valve drivers are provided to sequentially control two separate air operated weld heads. Air Valve Driver 1 controls a 24 VAC or 115 VAC air actuated weld head. Air Valve Driver 2 is programmed by Output Relay 1 (refer to the next-listed feature).
- You can use two relays to provide status signals to external devices. You can also use Relay 1 to program Air Valve Driver 2 to control a second 24 VAC air actuated weld head.
- You can specify the polarity of the output pulse for each weld schedule.

CAUTION: If weld schedules are chained together, do NOT change polarity. All schedules in the chain must have the same polarity or the relay contacts may be damaged.

- An optional built-in Weld Sentry monitors the process, signals reject alarms, calculates statistical and SPC data, displays graphs and charts and transmits, via an RS-232 interface, to a printer or PC.

250DP DUAL PULSE RESISTANCE WELDING POWER SUPPLY

- Remote schedule selection simplifies use in automated systems. A CONTROL SIGNALS connector accepts remote control signals for Emergency Stop, Remote Weld Inhibit, and Remote Weld Schedule Selection.
- The chain schedule feature allows any number of schedules to be chained together in a user specified sequence.
- The automatic step feature increases electrode life and reduces downtime for electrode dressing by automatically changing weld energy to compensate for electrode wear.
- Schedule protection and system security features protects weld schedules, except Schedule 0, from changes by unauthorized personnel.
- The schedule lock feature allows you to restrict welding to one selected weld schedule.
- Power-up schedule selection allows any of the 128 schedules, or the last schedule used, to be specified as the default power-up schedule.
- The digital display allows operators to set welding energy accurately and quickly.
- The 250DP is compatible with manually actuated weld heads and air actuated heads with 1-level or 2-level foot switches.
- The 250DP is compatible with force fired and non-force fired weld heads. Squeeze (delay) time is adjustable from 0 to 9.9 seconds. An end of cycle buzzer sounds at the end of each weld sequence as a signal to the operator to release the foot pedal.
- Built-in weld counters allow you to control events which are a function of the number of welds made.
- The firing circuit uses single pole, double pole or optical firing (pressure) switches.
- Weld fire lockout helps prevent poor welds caused by firing the power supply before the capacitor bank is properly charged or discharged.
- The foot switch weld abort safety feature causes the 250DP to abort the welding process if you release the foot switch, on an air actuated system, before the end of the welding sequence.
- The line failure turndown safety feature discharges the capacitor bank when input power is interrupted.
- The 250DP is protected from radio frequency interference and electromagnetic interference, resulting in reliable operation even in high electrical noise environments. Input switch debounce circuitry eliminates false triggering.

CHAPTER 2

INSTALLATION

Location

Install the 250DP in a well-ventilated area that is free from dirt and moisture. Allow sufficient clearance around the sides and rear of the unit so that cooling air may flow properly. Position the 250DP as close as practical to the weld head.

Power Line

CAUTION: Do not connect the line cord at this time.

This power supply was wired for the specific input line voltage marked on the line cord at the factory. The standard 250DP is wired for 115 VAC. Reconnection for operation at another voltage may be made by a qualified technician. Refer to Chapter 7 under *Modifications and Calibration*.

Welding Cables

Position the 250DP on the work bench approximately 5 inches behind the weld head. Use the cables furnished with the weld head to connect the terminals on the back of the weld head to the appropriate terminals on the front of the 250DP. Convention is to connect the lower electrode of the weld head or hand-piece to the (+) output terminal and the upper electrode to the (-) output terminal of the 250DP. If the weld head cables are unserviceable, use the following criteria in selecting new cables:

- Use No. 2 AWG welding cables, or No. 2/0 AWG welding cables if the cables are more than 12 inches long. The diameter of the cables should be as large as practical.
- Use the shortest possible welding cables. It is not uncommon to have losses up to 50% per foot for No. 6 cable and 20% for No. 2 cable.

To reduce energy losses, follow these recommendations:

- Route cables so that they do not surround magnetic materials such as air solenoids, tooling, or steel weld heads (see figure 2-1).

CHAPTER 2: INSTALLATION

- Tape cables together to minimize the inductive losses. A separation of weld cables surrounding an area of one square foot could result in losses of up to 65% (figure 2-1).

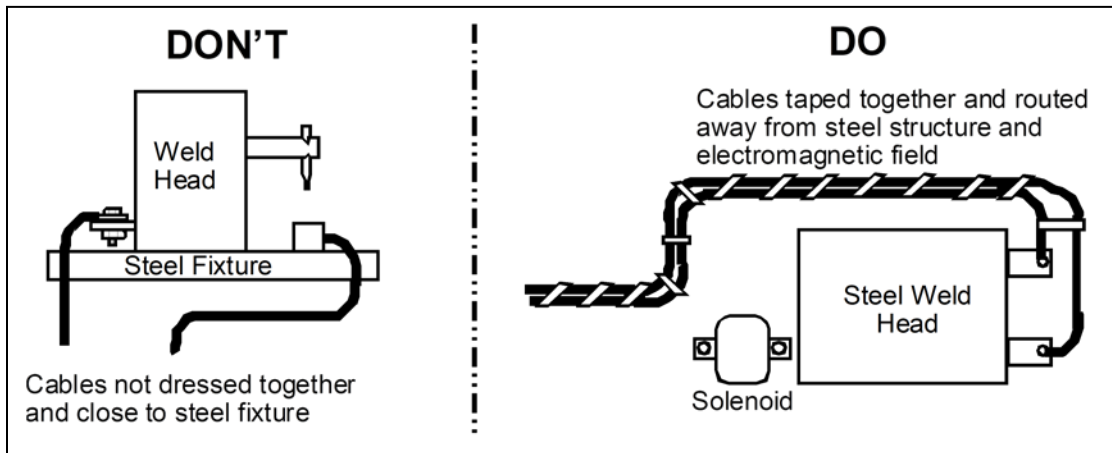


Figure 2-1. Cable Routing Examples

- Bolt connections directly together. Do not place washers between the terminals of the 250DP and the terminals of the cables. Tighten connections securely, they must be free from oxidation, dirt and/or grease (see figure 2-2).

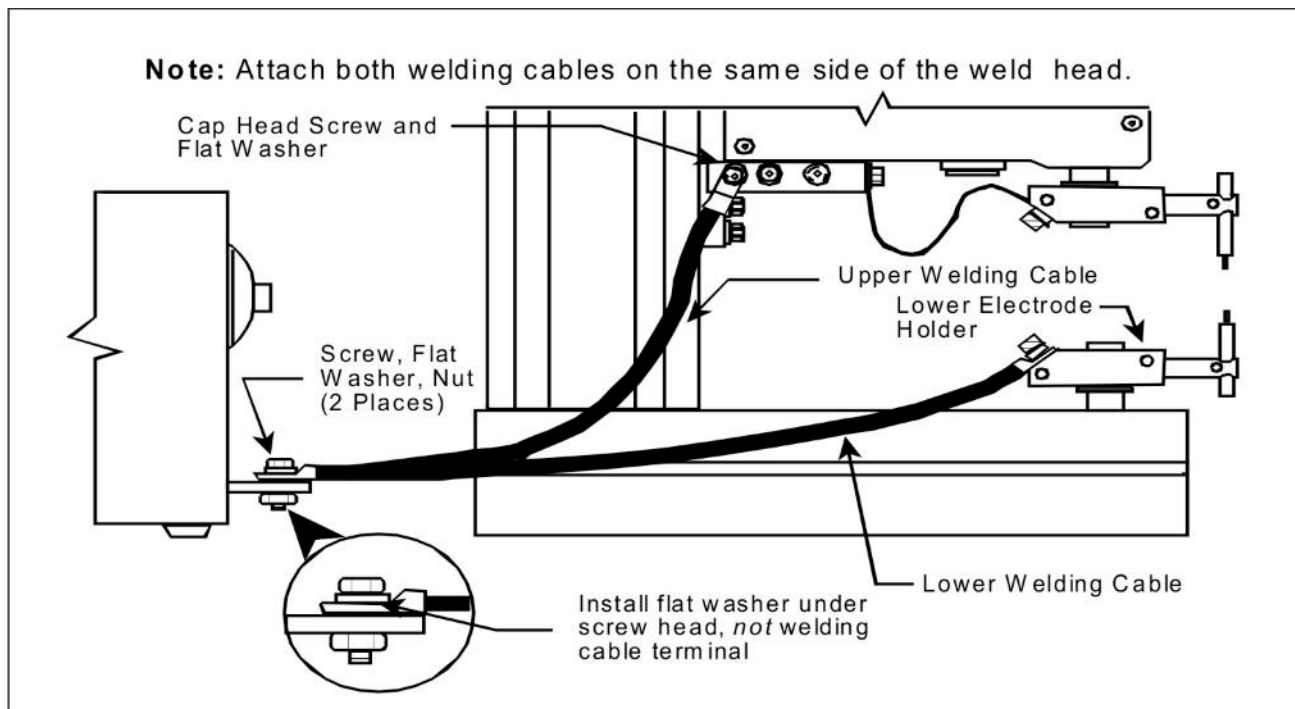


Figure 2-2. Terminal Connection Examples

Rear Panel Components

The input and output connections located on the rear panel of the 250DP (figure 2-3) are listed below.

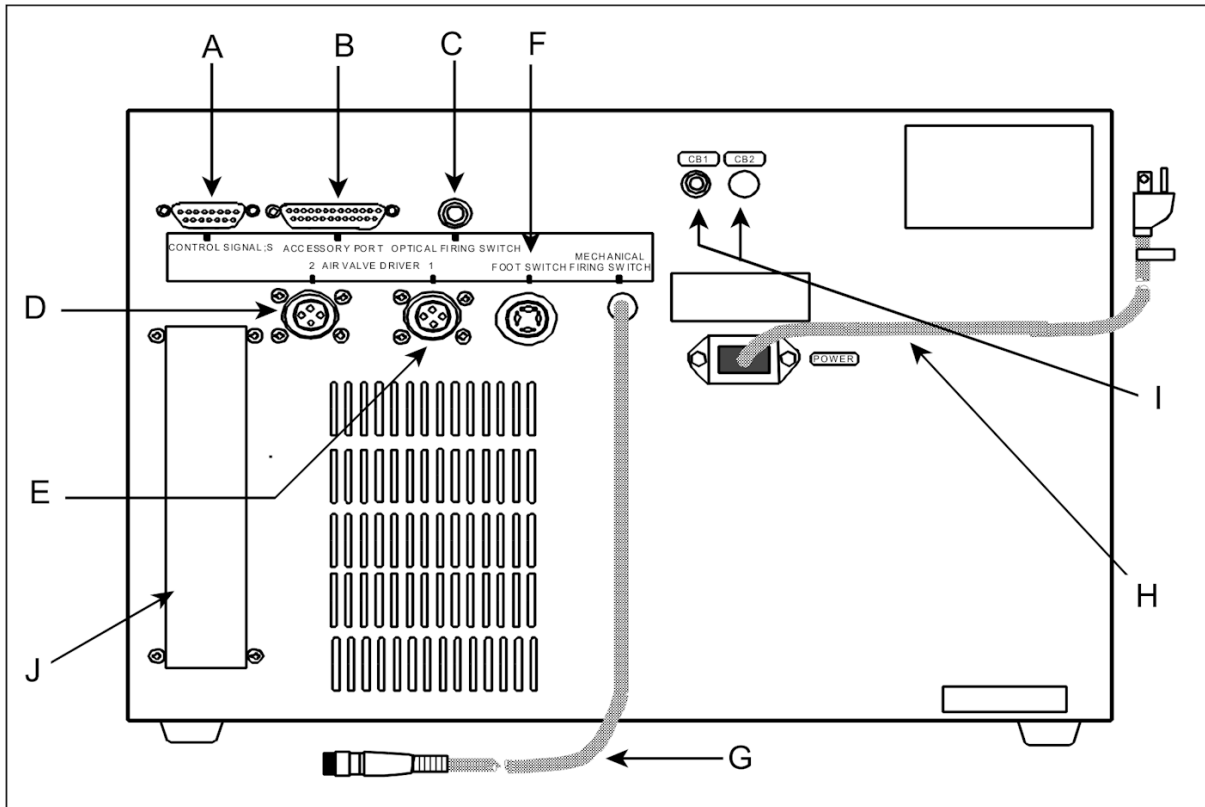


Figure 2-3. Rear Panel Components

- A **CONTROL SIGNALS:** 15-pin, subminiature D-type connector used for remote schedule selection, output relays, process inhibit and emergency stop (refer to Appendix A under Control Signals).
- B **ACCESSORY PORT:** 25-pin, subminiature D-type connector used to interface with other AMADA WELD TECH devices.
- C **OPTICAL FIRING SWITCH:** 5-pin receptacle is used to connect the 250DP to weld heads with either a 3-wire firing switch or an optical switch.
- D **AIR VALVE DRIVER 2:** Provides 24 VAC to control a second AMADA WELD TECH air actuated weld head.
- E **AIR VALVE DRIVER 1:** Provides either 24 or 115 VAC to control an AMADA WELD TECH air actuated weld head.

CHAPTER 2: INSTALLATION

- F FOOTSWITCH: This receptacle is used to connect either a 1-level or 2-level AMADA WELD TECH footswitch. Footswitches are only used with air or electrically actuated weld heads.
- G MECHANICAL FIRING SWITCH: 4-foot cable is used to connect the 250DP to the force firing switch in all AMADA WELD TECH weld heads and hand-pieces.
- H POWER CABLE: 5-foot cable is terminated with the appropriate 115 or 230 volt plug. The standard plug for the 115 VAC power supply is a NEMA 5-15P rated for 15 amps.
- I CB1, CB2: Circuit breakers are used to protect the incoming power line.
- J COVER PLATE: Used when the Weld Sentry option is not installed.

Firing Switch Connections

Connect the weld head or hand-piece to the appropriate firing cable or switch located on the rear panel of the 250DP.

Mechanical Firing Switch

AMADA WELD TECH weld heads and hand-pieces are force fired and have two-pin firing switch connectors which can be connected directly to the mating connector of the MECHANICAL FIRING SWITCH located on the rear panel of the 250DP.

Users of manually actuated weld heads which do not have force firing switches must connect the two pins in the mechanical firing switch to an external switch in order to initiate the 250DP.

Air actuated weld heads which do not have force firing switches rely on the squeeze time to ensure that the weld head has time to close and apply the proper force to the workpieces. Use the squeeze time option and select NO FIRING SWITCH from the Options Menu (refer to Chapter 3).

Optical Firing Switch

Users of weld heads with pressure switches using a 3-wire switch or an optical device should use the OPTICAL FIRING SWITCH receptacle located on the rear panel of the 250DP (refer to Appendix A under *Initiation Switch*).

3-Wire Firing Switches

Users of weld heads with single pole, double throw, 3-wire pressure switches should also use the OPTICAL FIRING SWITCH connector. The 250DP will automatically detect that the system is using a 3-wire switch if Pin 2 is low at power-up.

Air Actuated Weld Head Connections

Solenoid valve/regulator assemblies which are not mounted on the weld head should be located as close as possible to the weld head. Use the *shortest* air lines possible to obtain the fastest mechanical response.

Connect the inlet port on the air valve (solenoid) to a *properly filtered air supply* (100 psig maximum). Use 0.25-inch OD plastic hose with a rated burst pressure of 250 psi to connect the outlet ports of the solenoid/regulator assembly to the flow controls on the air cylinders. Figure 2-4 illustrates a typical single regulator installation for an AMADA WELD TECH TL-080B Weld Head. Turn the regulator(s) fully counter-clockwise to ensure minimum air pressure. Turn on the air supply. Repair leaks if necessary.

All Thinline weld heads are capable of cycling at a rate of 1 weld per second, *provided that the tubing between pressure regulators and the air cylinder is kept as short as possible*. Increasing the length of the tubing produces very sluggish mechanical motion. *Do not use lubrication on the input air line* because, as the internal seals on the air cylinder wear, lubricating oil will leak past these seals and contaminate the electrode and the workpiece with a fine oil mist. Once every six months or every 1 million operations, whichever occurs first, remove the top flow control valve and place two drops of light machine oil in the top of the air cylinder.

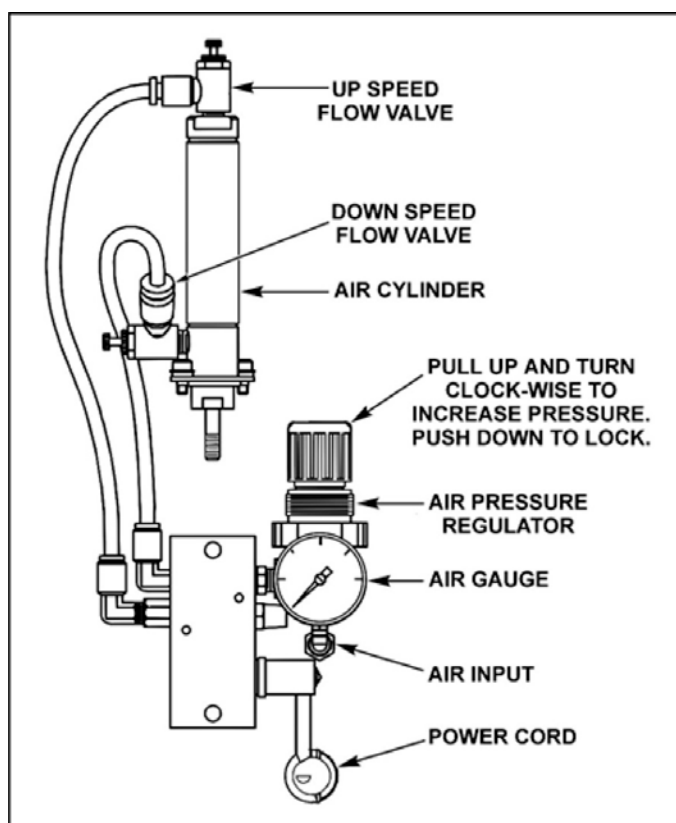


Figure 2-4. Typical Solenoid Air Valve Assembly with a Single Regulator

Air Valve Driver

Connect the solenoid air valve to the AIR VALVE DRIVER 1 receptacle located on the rear panel of the 250DP. Weld heads with 4-pin 24/115 VAC connectors can be plugged directly into the power supply. Weld Heads with standard 115 volt plugs (NEMA 5-15P) require an adapter, AMADA WELD TECH Model VDAC, Valve Driver Adapter Cable. When the connection has been made, the 250DP will automatically recognize that an air head has been connected.

Non AMADA WELD TECH Air Actuated Weld Heads

Users of air actuated weld heads not manufactured by AMADA WELD TECH should connect the air solenoid valve on the head or regulator valve assembly to either the appropriate 24 volt or 115 volt pins of the receptacle on the rear of the 250DP. Refer to Appendix A under *Control Signals* for detailed information.

Air Actuated Weld Heads without Force Firing Switches

Users of air actuated weld heads not having force firing switches must use sufficient squeeze time to allow the head to close and to apply the proper force to the workpieces.

Second Air Head

Connect the solenoid air valve of a second air actuated AMADA WELD TECH weld head to the AIR VALVE DRIVER 2 receptacle. *Only weld heads with 4-pin 24 VAC connectors can be plugged directly into the power supply.*

Users of air actuated weld heads not manufactured by AMADA WELD TECH should connect the air solenoid valve on the head, or regulator valve assembly, to the appropriate 24 volt pins of the receptacle on the rear of the 250DP. Refer to Appendix A under *Control Signals* for detailed information.

Footswitch

Connect either a 1-Level or 2-Level Footswitch to the FOOTSWITCH receptacle located on the rear panel. The 250DP will automatically recognize which type AMADA WELD TECH Footswitch has been connected.

1-Level Footswitch

When the operator fully depresses the 1-level footswitch, the 250DP will energize the air valve on the weld head. The upper electrode will close and apply force to the workpiece. If the operator releases the footswitch before the weld head applies the preset firing force, the 250DP will remove the voltage from the air valve and the upper electrode will return to the open position.

If the FOOTSWITCH WELD ABORT option has been set to ON by changing the status on the OPTIONS menu, the welding sequence will be terminated if the footswitch is released before the welding sequence is completed.

If the FOOTSWITCH WELD ABORT option has been set to OFF, the welding process will continue to its conclusion, regardless of the position of the footswitch, once the preset firing force has been applied to the workpiece by the upper electrode of the weld head.

2-Level Footswitch

When a 2-level footswitch is pressed to the first level, the weld head will close and apply force to the workpiece. At this point, if the operator does not press further (harder) and actuate the second level, the footswitch can be released so that the workpiece can be re-positioned. Once the second level has been actuated, a 2-level footswitch will operate in the same manner as a 1-level footswitch.

Remote Schedule Selection

A 15-pin, subminiature D-type CONTROL SIGNALS connector, located on the rear panel, is provided for seven single-pole inputs which are used to:

- Remotely select Weld Schedules 1 through 127 in a binary sequence.
- Remotely inhibit (prevent) the flow of weld current, which is the same function provided by the front panel WELD/NO WELD Switch.
- Invoke the emergency stop condition, which abruptly terminates the welding sequence. Refer to Appendix A, under *Control Signals*, for detailed connector information.

Relay Outputs

Two output relays can be used to provide status (timing) signals to external devices. They can also provide an on (closed) state during a Run state or if there is an alarm.

Relay 1 can also be used to control a second 24 VAC air actuated weld head. (Refer to Air Actuated Weld Head Connections for the appropriate hook-up connections and figure 4-5 for appropriate jumper connections.)

Relay 2 can provide a 5 to 50 VDC signal.

When used to provide status (timing) signals, the relays can be independently programmed as follows:

- In Basic Mode, each relay can be programmed on (closed) or off (open) during either of the two weld periods.
- In Roll Spot Mode, each relay can be programmed on (closed) or off (open) during either of the two weld periods or during the cool period (between each spot weld cycle).
- In Repeat Mode, each relay can be programmed on (closed) or off (open) during either of the two weld periods or during the off period (between each Repeat cycle).

In all of the above cases, if the relay is programmed to be on (closed), it will close at the beginning of the scheduled period and open at the end of that period. If scheduled to be closed during any successive periods, it will not open at the end of the first period, but will remain closed during both (or all) periods for which it is scheduled to be closed.

Interconnection Diagram

Refer to figure 2-5 for a wiring diagram of the 250DP as it is interconnected with external equipment.

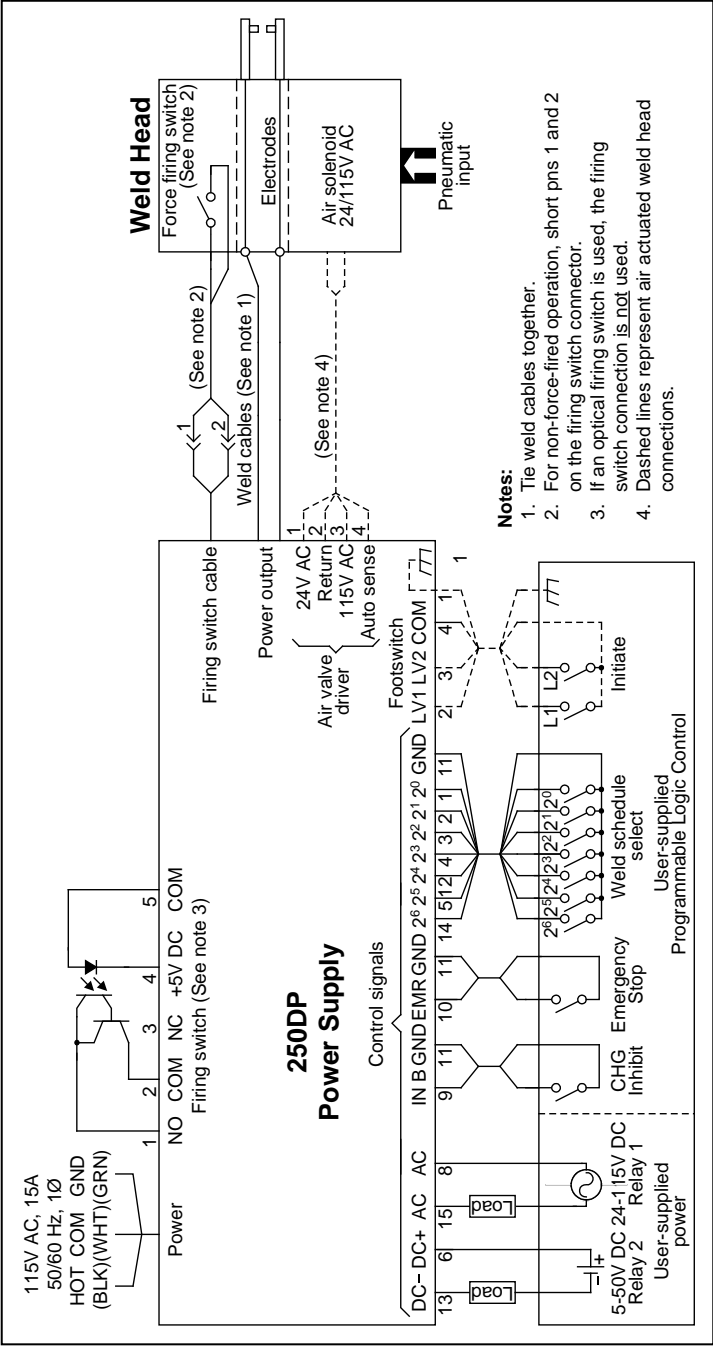


Figure 2-5. 250DP Equipment Interconnection Diagram

CHAPTER 3

OPERATING CONTROLS AND SCREENS

Operating Controls

Figure 3-1 illustrates the layout of the operating controls on the front panel of the 250DP.

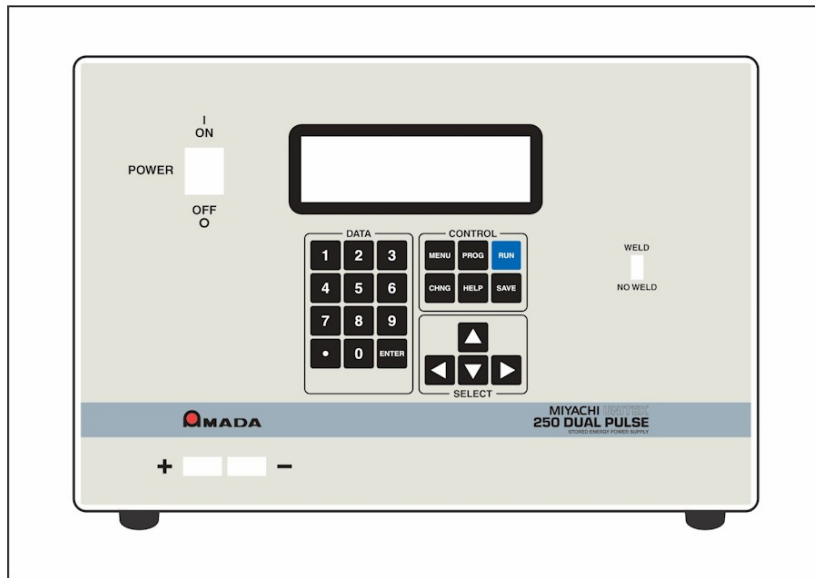


Figure 3-1. Front Panel Controls

The controls on the front panel are identified as follows:

NOTE: Instructions in the manual to “press []” means that you are to press the key or button described inside the brackets. For example, “Press [PROG]” means that you should press the key labeled PROG on the front panel. “Press [?/>]” means that you should press either the ? SELECT or the > SELECT key, whichever is appropriate.

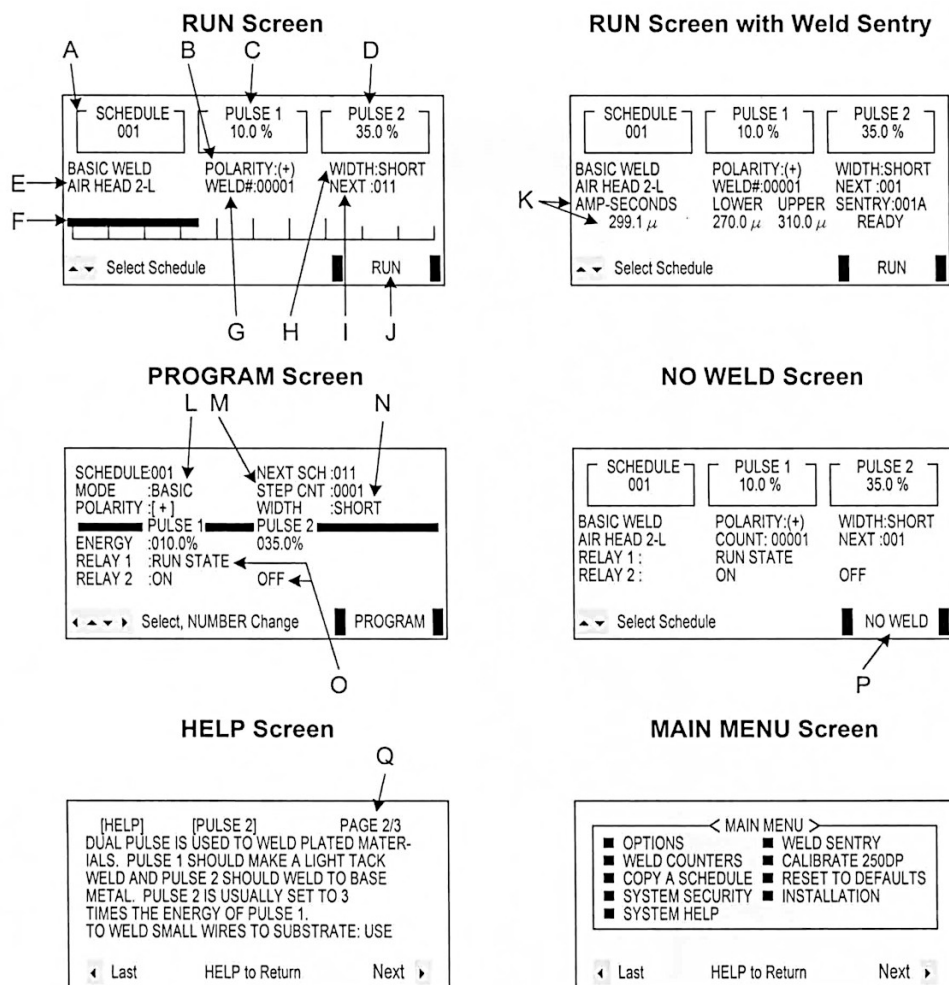
KEY	DESCRIPTION
[KEYPAD]	Use the 10 numeric keys to enter numeric information. [.] is used to enter decimal values.
[> ?]	In the run state, this key changes ([>] increases and [?] decreases) the schedule number displayed. In program and menu states, the [>] and [?] SELECT keys are used to move up and down on the screen to select fields.

CHAPTER 3: OPERATING CONTROLS AND SCREENS

KEY	DESCRIPTION
[<=]	In the program and menu states, this key is used to select the parameter to the right (<) or left (=) of the parameter which is highlighted.
[PROG]	Causes the 250DP to enter the program state so that you can make changes to Schedules 0 through 127. If a Weld Sentry is installed, when [PROGRAM] is pressed a second time, you can make changes to the Weld Sentry programs related to each weld schedule. Press [PROGRAM] to return to the PROGRAM screen (refer to <i>Screen Formats</i> next in this chapter).
[RUN]	Causes the 250DP to exit the program state without saving the changed schedule. The changed schedule will become Schedule 0 and will <i>not</i> be written to permanent memory. If no changes are made to the schedule or the Weld Sentry program, then it will not be transferred to Schedule 0. Welding is done in the run state.
[SAVE]	In the program state, pressing this key saves (writes) any schedule and its related Weld Sentry programs to permanent memory. The 250DP will then exit the program state and return to the run state. This key has no function in the run state.
[MENU]	In either the run or program state, [MENU] will provide you with a menu which allows you to select or change options which are common to all schedules.
[HELP]	The 250DP contains a built-in operation manual. Press this key whenever you need <i>HELP</i> or additional information from the built-in manual. Press this key a second time to return to the original state.
[CHNG]	Changes the contents of alphanumeric fields in the program or menu state. Changes the RUN screen, Lines 6 and 7, to display either a: <ul style="list-style-type: none">• graphic bar showing the energy level of the capacitor bank, or• the status of the output relays, or• the Weld Sentry Program Line (if the Weld Sentry is installed).
[ENTER]	Use this key to signify that the data entry you have entered using the keypad is complete.
WELD / NO WELD SWITCH	Welding current will not flow when this switch is in the NO WELD position. However, the Power Supply will actuate the weld head and execute the welding sequence (Squeeze, Weld and Hold). This switch must be in the WELD position in order to make a weld.
ALARM VOLUME	Adjusts the volume of the alarm buzzer. It is located on the front, right-hand side of the cover.
DISPLAY CONTRAST	Adjusts the contrast of the LCD Display. It is located on the front, right-hand side of the cover.

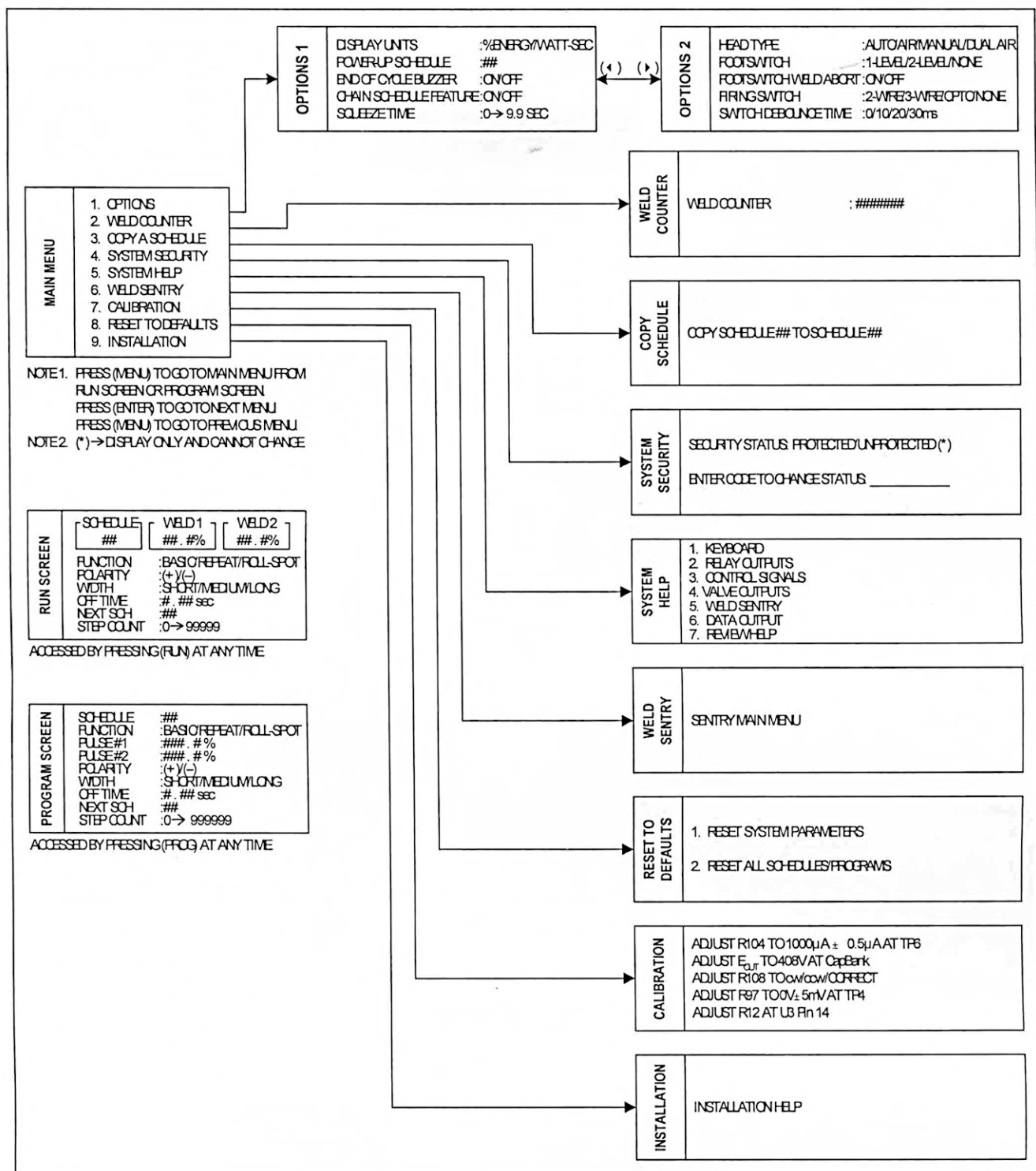
Screen Formats

Illustrated below is the information displayed in RUN, PROGRAM, NO WELD, HELP and MAIN MENU screens. Note that the 250DP operational state is displayed at the bottom right corner of the operation screens. Figure 3-2 shows the detailed sequence of the screens.



- A. Schedule number (0 - 127)
- B. Polarity of output welding pulses
- C. Energy of Weld Pulse 1
- D. Energy of Weld Pulse 2 (dual pulse)
- E. Type of weld head and foot switch
- F. Graphic display of Weld Pulse 1 energy
- G. Weld counter step count for next schedule
- H. Pulse width of Weld Pulses 1 and 2
- I. Next schedule number (1-127) in chain
- J. Present state of 250DP
- K. Weld Sentry program lines – Program (A-E), last weld results, measurement unit, upper/lower limits, Sentry status
- L. Weld function: basic, repeat or roll-spot
- M. Weld counter step count for next schedule
- N. Pulse width of Weld Pulses 1 and 2
- O. Switching status of output relays
- P. Run state with NO WELD switch ON
- Q. Typical multi-page help screen

CHAPTER 3: OPERATING CONTROLS AND SCREENS



CHAPTER 4

GETTING STARTED

Powering Up

- 1 Set the front panel POWER Switch to ON.
- 2 To prevent the 250DP from firing until you are ready to weld, select [NO WELD].
- 3 Press [>/?] to change the weld schedule number.
- 4 Press [CHNG] to change the format of the RUN state screen.
- 5 Press [HELP] to obtain help.
- 6 Press [MENU] to change any of the system options or to use any of the 250DP utilities.
- 7 Press [PROG] to make changes to weld schedules 0 to 127. Schedules 1 through 127 cannot be changed when the system security is PROTECTED. If SCHEDULE LOCK is also ON, only the schedule displayed can be used to weld. To change system security and/or turn OFF SCHEDULE LOCK, press [MENU] and select SYSTEM SECURITY.

NOTE: To override the security code, refer to Appendix A under *Weld Schedules*.

- 8 If appropriate, change the output relay configuration with the PROGRAM screen.

Adjusting an Air Actuated Weld Head

NOTE: If an alarm occurs, press [RUN] to silence the alarm, then press [HELP] to receive an explanation. Alarm messages will be erased from the display as soon as the alarm condition is corrected or when [PROG] is pressed. Refer to Appendix A under *Control Signals* to remotely clear alarms.

- 1 Refer to the appropriate weld head manual instructions on how to install the welding electrodes.
- 2 To adjust the pressure regulators and flow controls, refer to the following instructions or those which are printed on the side of the weld head.
- 3 To prevent the 250DP from firing until you are ready to weld, select [NO WELD]. Remove the workpiece from between or beneath the electrodes.
- 4 Set the force indicator on all AMADA WELD TECH weld heads to 3. For more detailed information on setting up each specific weld head, refer to their respective manuals. See figures 4-1 and 4-2 for illustrations of typical air actuated systems.

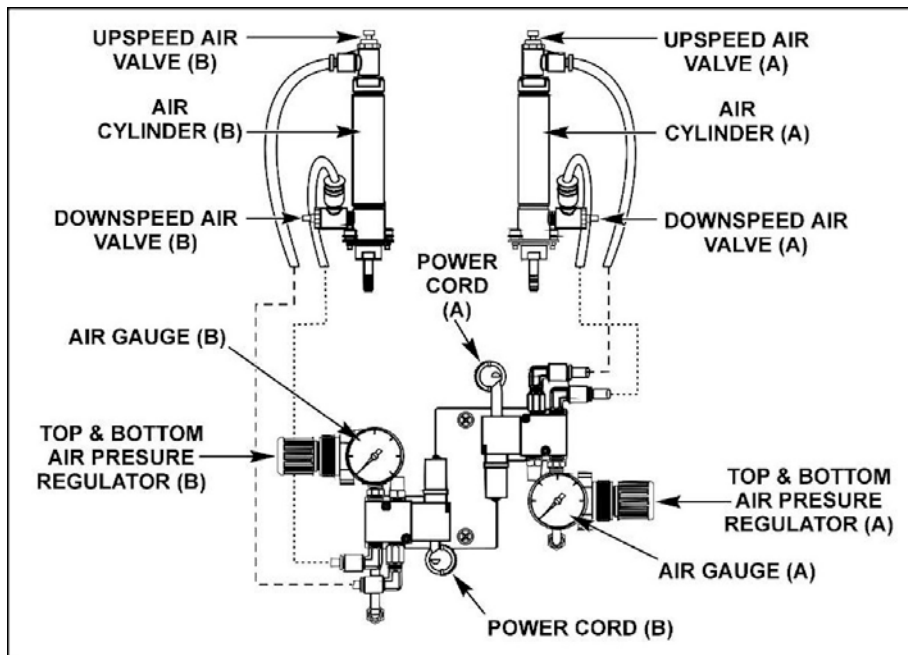


Figure 4-1. Typical Solenoid Air Valve System with Dual Regulators

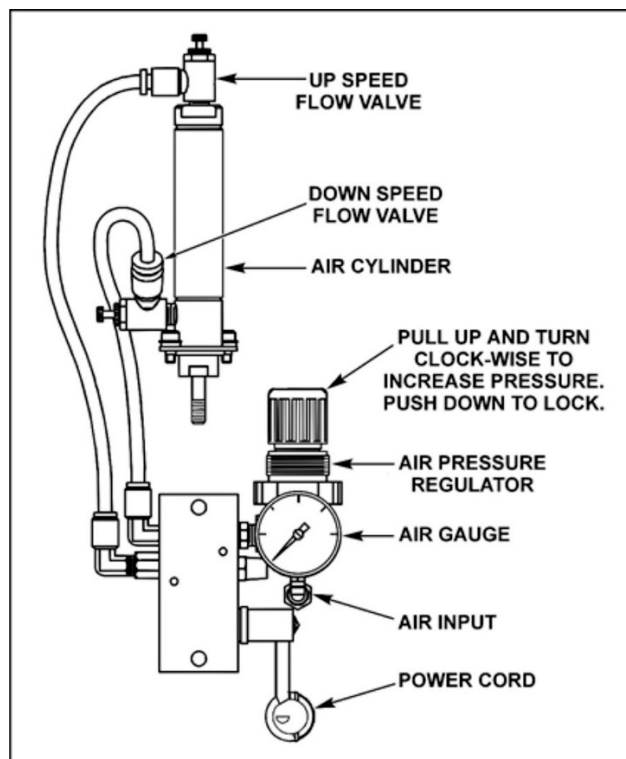


Figure 4-2. Typical Solenoid Air Valve System with a Single Regulator

- 5 Unlock the regulator(s) by pulling the red ring up. Set the air gauge(s) for 25 psig. Fully open both flow controls.

- 6 The operational sequence with an air head is as follows:

The first level of a 2-Level foot switch actuates the weld head, moving the electrodes together. The weld period cannot begin until the second level of the foot switch *and* the force firing switch in the weld head close. The 250DP will enter a standby state until these conditions are met. When the firing force is reached, the weld period will start. Assuming that an alarm does not occur, the welding sequence will continue to completion and the weld head will rise at the end of the hold period. If FOOT SWITCH WELD ABORT is ON, releasing the foot switch at any time during the welding sequence will terminate the sequence.

- 7 Adjust the upspeed flow control on the top of the cylinder so that the upper arm of the weld head moves at a reasonable rate but does not slam against the up-stop. This adjustment is made by pressing, then quickly releasing, the foot switch.
- 8 Adjust the regulator that controls the air pressure on the top of the cylinder to obtain the desired welding force. Place the workpiece in position between the electrodes. Close the down speed flow control located on the bottom of the cylinder.
- 9 Press the foot switch. Adjust the downspeed flow control so that the upper electrode moves at a reasonable rate and does not impact the workpiece hard enough to damage either the electrode or the workpiece. If the flow controls interact, readjust the air pressure which controls the pressure on the bottom of the cylinder so that it is identical to that set on the other regulator. Then adjust the flow control so that the upper electrode does not slam against the bottom electrode or the downstop.
- 10 Adjust the pressure regulator, which controls the air pressure on the top of the air cylinder so that it is *just sufficient* to cause the Force Firing Switch in the head to close (see figure 4-3). *When the Force Firing Switch in the head closes, the screen on the 250DP will no longer display STANDBY.* Re-adjust both flow controls, as necessary.

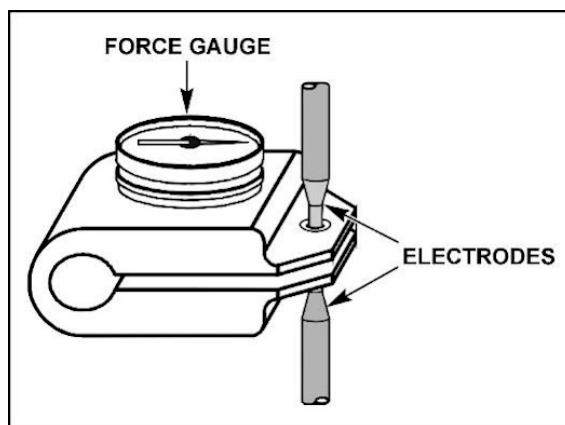


Figure 4-3. Measuring Preset Firing Force of the Weld Head with a Force Gauge

CHAPTER 4: GETTING STARTED

CAUTION: Resist the temptation to increase the downspeed by increasing the regulator setting since this increases the force applied to the workpiece by the electrodes (see figure 4-4). Illustration (a) in figure 4-4 shows the correct air pressure adjustment – the *actual* force equals the firing force setting. Illustration (b) shows the result of excessive air pressure – the *actual* force is much greater than the firing force setting. Excessive air pressure causes the electrodes to mushroom as well as wear faster.

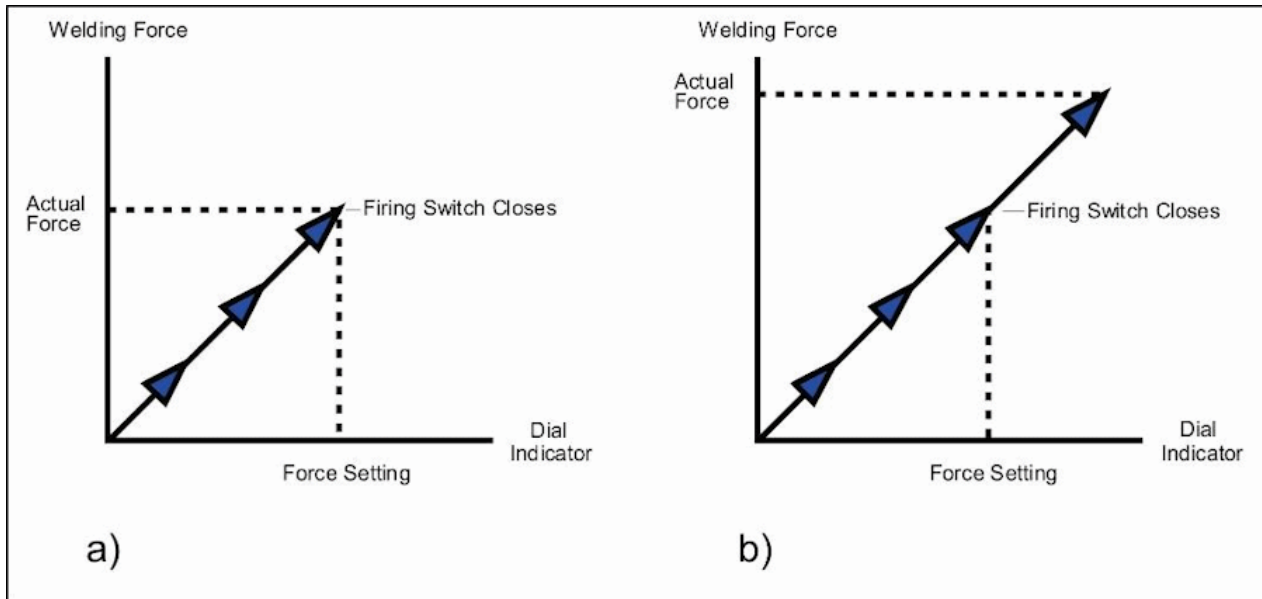


Figure 4-4. Results of Excessive Air Pressure

- 11 If a higher welding force is necessary, reset the force indicator on the weld head to a *larger* number, then repeat Steps 9 and 10.
- 12 If a lower welding force is necessary, reset the force indicator on the weld head to a *smaller* number, *reduce* the pressure regulator, which controls the air pressure on the top of the air cylinder, then repeat Steps 9 and 10.
- 13 If appropriate, configure the Weld Sentry. Press [MENU], select WELD SENTRY followed by SYSTEM SETUP.
- 14 If appropriate, configure the Weld Sentry print options, relay outputs, and communications options. Set the Weld Sentry clock for the correct time and date.
- 15 If appropriate, modify the Weld Sentry program. To develop a Weld Sentry program, use the Weld Sentry basic setup option, which is accessed by pressing [MENU] and selecting WELD SENTRY followed by BASIC SETUP.
- 16 If you want to see a graphical representation of a weld schedule, select DISPLAY GRAPH OF LAST WELD from the Weld Sentry print utility menu.

- 17 If you are using a second air actuated weld head:
- Connect the second air head to Air Valve Driver 2.
 - There are two jumper headers, E10 and E11, located on the lower right hand area of the control printed circuit board. Re-jumper the headers to the dual air configuration as shown in figure 4-5.
 - Press [MENU] and select OPTIONS.
 - Change the weld head type to DUAL AIR.
 - Press [PROGRAM] and move the cursor to the RELAY 1 field.
 - Press [CHNG] until AIR HEAD 2 is displayed.

Press [SAVE] to store the changes

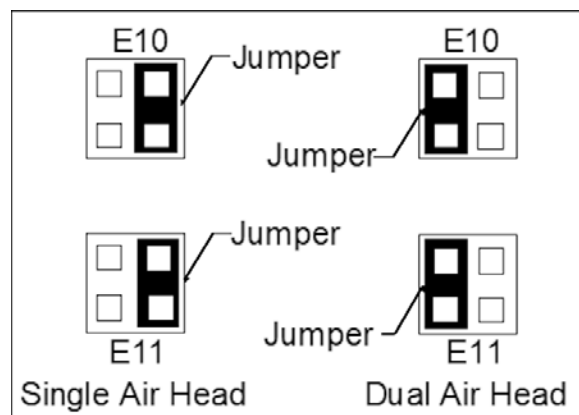


Figure 4-5. Weld Head Configuration Jumper Selection

CHAPTER 5

OPERATING INSTRUCTIONS

Successful Welding

This chapter is a guide to be used in establishing the parameters required to make a successful weld, then making and evaluating a weld. The development of an optimum weld schedule will aid in achieving a repeatable, reliable process.

Resistance Welding Parameters

The three basic welding parameters are heat, time, and pressure. These welding parameters are controlled by:

Parameter	Controlling Factors
Heat	%ENERGY selected on 250DP
Time	PULSE WIDTH selected on 250DP. Number of pulses selected on 250DP.
Pressure	Electrode firing force set on weld head. Surface area of electrode faces.

The effects of excessive or insufficient heat, time and pressure on a weld are illustrated in figure 5-1. You should consider the interaction between these basic welding parameters when developing a weld schedule.

Weld Schedule Development

Developing a weld schedule is a methodical procedure consisting of making sample welds and evaluating the results. You should make the first weld at low energy settings. Then, you make adjustments to each of the parameters *one at a time* until a successful weld is made.

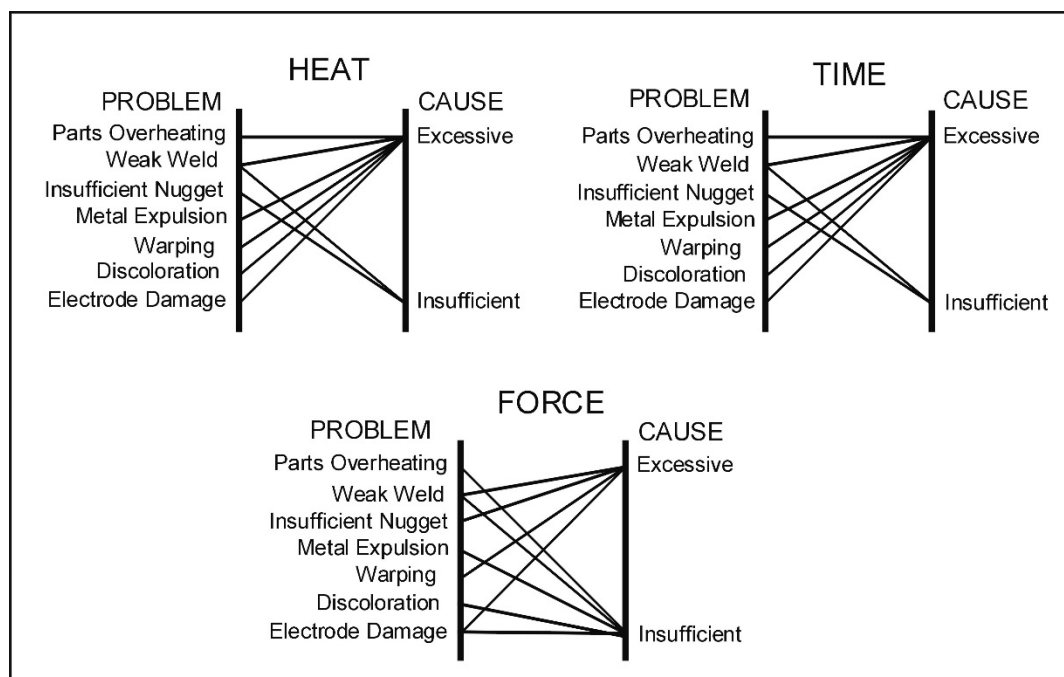


Figure 5-1. Effects of Excessive or Insufficient Heat, Time and Pressure

Weld Head Parameters

There are two critical weld head parameters that you must pay particular attention to: electrode force and electrode face area.

Electrode Force:

1. Install the correct electrodes in the electrode holders on the weld head. Refer to table 5-1 for electrode material recommendations.
2. Set the force adjustment knob on the weld head to set the firing force. Start at a moderate force setting, 3 on an AMADA WELD TECH Weld Head. Figure 5-1 illustrates the effect of electrode force on the work piece.
3. Adjust the air pressure for air operated weld heads.

Table 5-1. Recommended Electrode Materials

Material	Electrode RWMA Type	Material	Electrode RWMA Type	Material	Electrode RWMA Type	Material	Electrode RWMA Type
Alumel	2	Evanohm	14	Kulgrid	2	Palladium	14
Aluminum	1	Gold	11	Magnesium	2	Rhenium	2
Aluminum Alloys	1	Gold Plated Dumet	2	Manganin	2	Silver	11
Beryllium Copper	2	Gold Plated Kovar	2	Molybdenum	2	Stainless Steel	2
Brass	2, 11	Hastalloy X	2	Nichrome	2	Tantalum	2
Bronze	2	Inconel	2	Nickel	2	Tinned Brass	14
Chromel	2	Invar	2	Nickel Alloy	2	Tinned Copper	14
Consil	11	Iridium	2	Niobium	2	Titanium	2
Constantan	2	Iron	2	NiSpan C	2	Tungsten	2
Copper	14	Karma	2	Platinum	2	Zinc	14
Dumet	2	Kovar	2	Paliney 7	2		

Electrode Face: Use a flat electrode face for most applications. Use a “domed” face if surface oxides are a problem. If either of the work pieces is a wire, the diameter of the electrode face should be equal to or greater than the diameter of the wire. If both work pieces are flat, the face should be at least one-half the diameter of the electrodes. *Pencil point* electrodes reduce the overall quality of the welding process, and are not recommended.

250DP Power Supply Parameters

You can develop weld schedules using Schedule 0, then copy it to any other schedule number.

Single Pulse Operation. Select pulse width and % energy as follows:

- Pulse Width: Short
- % Energy, Pulse 1: 10%
- % Energy, Pulse 2: 0%

Dual Pulse Operation. Dual pulse operation can be helpful when welding plated materials, materials with heavy oxidation, or small wires. For these applications start as follows:

- Pulse Width: Short
- % Energy, Pulse 1: 5%
- % Energy, Pulse 2: 15%.

NOTE: Pulse 1 should be $\frac{1}{2}$ to $\frac{1}{3}$ the energy of the Pulse 2.

Making a Weld

CAUTION: Always observe safety precautions when welding. Wear your safety glasses.

- 1 Select [RUN] and [WELD] on the 250DP.
- 2 Position the parts between the electrodes.
- 3 Press the footpedal or footswitch to initiate the 250DP. Assuming no weld occurred, increase %ENERGY in increments of 5% until the parts begin to weld. If you are using dual pulse operation, increase Pulse 2 in increments of 5% and change the energy of Pulse 1 to maintain the ½ to ⅓ ratio.

Evaluating the Weld

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. Electrode sticking and/or "spitting" should define a weld as unsatisfactory.

Weak Weld

If the parts pull apart easily, or there is little or no residual material pulled, the weld is weak. Increase the %ENERGY in increments of 1% to 2%. The actual weld strength is a user defined specification.

Electrode Sticking

Electrode sticking includes burning, sparking, and "blown welds." These problems indicate that either the %ENERGY is too high or the electrode force is too low. Refer to figure 5-1.

Examine the electrode face. Resurface it if it is pitted, contaminated or burned. See *Electrode Maintenance* later in this chapter. Increase electrode force and/or decrease %ENERGY and save it to the weld schedule you are using.

Causes of Imperfect Welds

Table 5-2 lists the effects of the basic welding parameters on weld quality.

Table 5-2. Causes of Imperfect Welds

Problem	Energy	Electrode		Time
		Force	Size	
Weak Weld	Too Low	Too High	Too Large	Too Short
Blow Holes. Expulsion.	Too High	Too Low	Too Small	Too Long
Burned, Pitted or Cracked Electrodes	Too High	Too Low. Requires Maintenance	Poor Maintenance	Too Short

Electrode Force and %ENERGY

The heat of resistance welding is produced, in part, by the resistance of the interface between the work pieces to the flow of electricity (the contact resistance).

Sufficient electrode force is required to contain the molten material produced during the weld. However, as the force is increased, the contact resistance decreases.

Lower contact resistance requires additional energy to produce the heat required to form a weld.

The higher the electrode force, the greater the energy (current and/or time) required to produce a given weld. Low force usually results in lower bond strength. Increased force requires higher energy but usually results in a stronger bond. Energy is proportional to time and the square of the welding current.

Polarity

Users of stored energy equipment have found that the direction of current flow can have a marked effect on the weld characteristics of some material combinations. This effect occurs when welding:

- Materials with large differences in resistivity, such as copper and nickel.
- Identical materials with thickness ratios greater than 4 to 1.

Since polarity can be an important consideration in resistance welding of some material combinations, be sure to check the weld schedule results using both positive and negative polarity. Polarity can be changed in the PROGRAM state. The general rule is that the more resistive material, or the thinner material, should be placed against the negative (-) electrode.

CAUTION: If weld schedules are chained together, do NOT change polarity. All schedules in the chain must have the same polarity or the relay contacts may be damaged.

Weld Strength Profiles

Weld strength profiles are graphic presentations of the varying effects of %ENERGY and electrode force. To make a weld strength profile, start at an initial energy setting, make four or five welds, and perform pull tests for each weld. Calculate the average pull strength. Increase the %ENERGY and repeat the procedure. Continue to increase the %ENERGY until any unfavorable characteristic occurs, such as sticking or spitting.

Perform pull tests and plot the results of %ENERGY versus Pull Strength (see figure 5-2). Repeat this procedure for different forces and plot a separate curve for each electrode force.

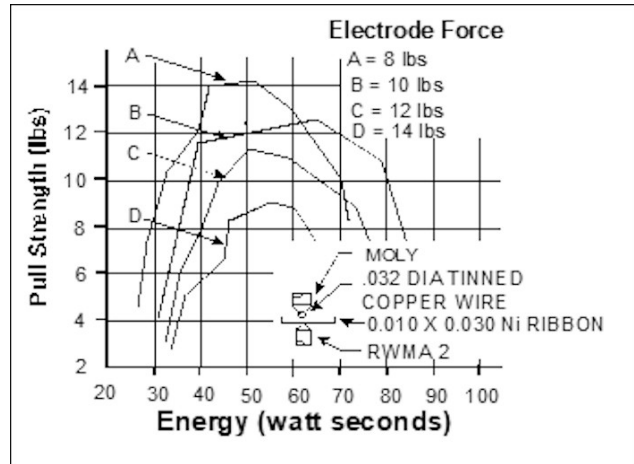


Figure 5-2. Typical Weld Strength Profile

Perform pull tests and plot the results of %ENERGY versus Pull Strength (see figure 5-2). Repeat this procedure for different forces and plot a separate curve for each electrode force.

Repeat this procedure using the longer pulse width.

In figure 5-2, Curve C shows the highest pull strengths but the lowest tolerance to changes in weld energy. Curve B shows a small reduction in strength but considerably more tolerance to changes in weld energy.

Weld energy/current will vary as a result of material variations and electrode wear. Curve B is preferred since it shows more tolerance to changes in weld energy and has nearly the same bond strength as Curve C. 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.

Destructive Testing

Destructive Testing can be performed on the actual work piece or on test specimens. For small, inexpensive parts, actual production samples, taken on a random basis, should be used. 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 torsional shear is preferred for round wire and a 45 degree peel test for sheet stock.

Electrode Maintenance

Depending on use, periodic tip resurfacing is required to remove oxides and welding debris from electrodes. On the production line, you should use # 400 - 600 grit electrode polishing disks. For less critical applications, you can use a file to clean a badly damaged tip. After filing, however, use polishing disks to ensure that the electrode faces are smooth and parallel. If you don't, the rough surface of the electrode face will have a tendency to stick to the work piece; or, if the faces are not parallel, energy will be concentrated at the point of contact and a blowout will result.

To dress the electrode tip:

- 1 Select [NO WELD].
- 2 On air actuated weld heads, reduce the air pressure to a value just sufficient to lower the upper electrode arm.
- 2 Place the polishing disks between the electrodes and actuate the footpedal or footswitch to bring the electrodes into light contact with the polishing disk. Move the polishing disk in a rotary motion.

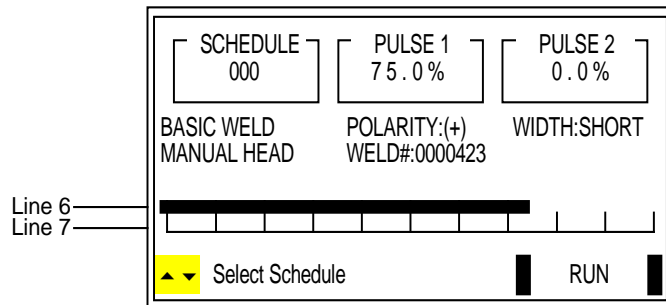
250DP States

RUN State

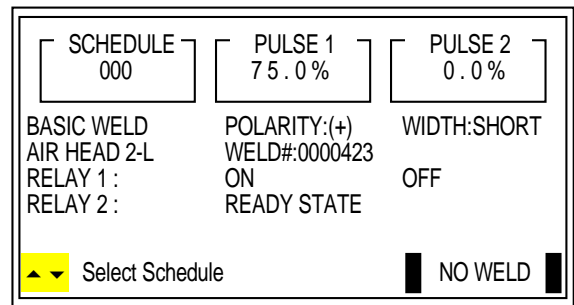
- X (a) and (c) graphic below, showing the energy of Pulse 1 for a manual or air head, or
- X (b) the status of the output relays, or
- X (d) the status of the Weld Sentry.

If [NO WELD] has been selected, the legend **R U N** in the right lower corner will be replaced by **NO WELD**, as shown in (b).

Press [CHNG] to display different information on Line 6 and Line 7.

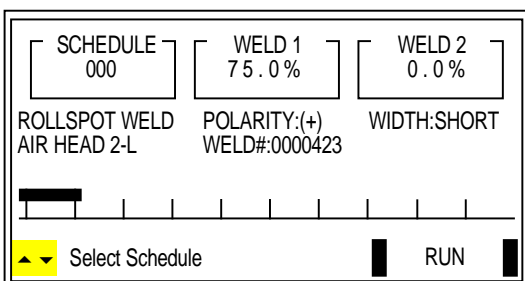


(a) RUN State Showing Pulse 1 Energy Level.
Head using Basic Weld Function.

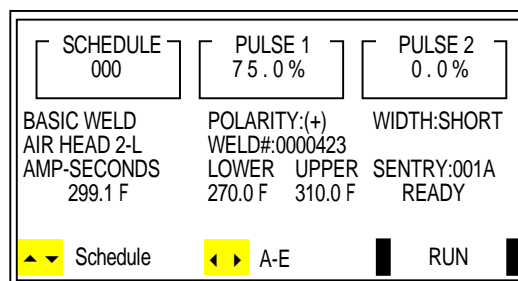


(b) NO WELD State showing Relay Manual Status.

CHAPTER 6: PROCESS DEFINITIONS AND WELD FUNCTIONS



(c) Run State showing Weld 1 Energy Level. Head using Rollspot Weld Function.

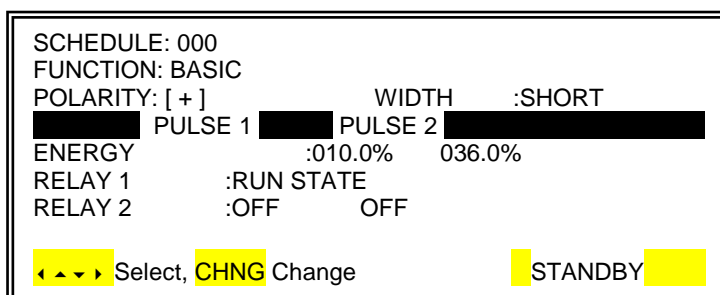


(d) Run State with the Weld Sentry Air Installed and Sentry Status Displayed

STANDBY State

The 250DP is waiting for a mandatory event to occur such as:

- The force firing switch in an air head to close, or
- The schedule number information to be placed on the terminals of the CONTROL SIGNALS connector, or
- Waiting to be reset to another schedule after a stop command in a chained schedule.



PROGRAM State

In this state, the 250DP will allow you to change and save (write to permanent memory) any weld schedule. Press [PROG] to enter the PROGRAM state, which is signified by the legend **PROGRAM** in the lower right-hand corner of the screen. In those units which include the Weld Sentry option, the PROGRAM state also allows you to change the measurement unit, the limits related to the Weld Sentry program, and the other parameters associated with the Weld Sentry.

Use the cursor to move to the field you wish to change. After you have made the changes, press [SAVE] to exit to the RUN state and save the changes.

CHAPTER 6: PROCESS DEFINITIONS AND WELD FUNCTIONS

SCHEDULE:000	
FUNCTION:BASIC	
POLARITY:[+]	WIDTH :SHORT
████ PULSE 1 █████	PULSE 2 █████
ENERGY :010.0%	036.0%
RELAY 1 :RUN STATE	
RELAY 2 :OFF	OFF
◀ ▶ Select, CHNG Change	PROGRAM ▶

MENU State

In this state, the 250DP will display a menu which allows you to select options which are common to all weld schedules, to access the Weld Sentry option, and obtain general information. The OPTIONS selection of the MAIN MENU screen has three sub-screens: OPTIONS 1, OPTIONS 2, and OPTIONS 3.

<MAIN MENU>	
■ OPTIONS	■ WELD SENTRY
■ WELD COUNTERS	■ CALIBRATE 250DP
■ COPY A SCHEDULE	■ RESET TO DEFAULTS
■ SYSTEM SECURITY	■ INSTALLATION
■ SYSTEM HELP	
◀ ▶ Select then ENTER	

<OPTIONS 1>	
DISPLAY UNITS	:% ENERGY
POWER UP SCHEDULE	:LAST
END CYCLE BUZZER	:OFF
CHAIN SCHEDULE FEATURE	:OFF
▶ Select, CHNG Change	More Options ▶

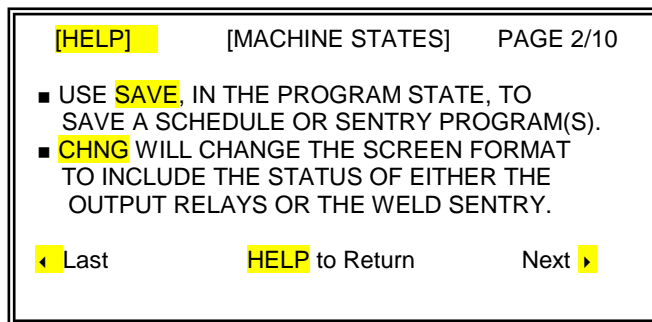
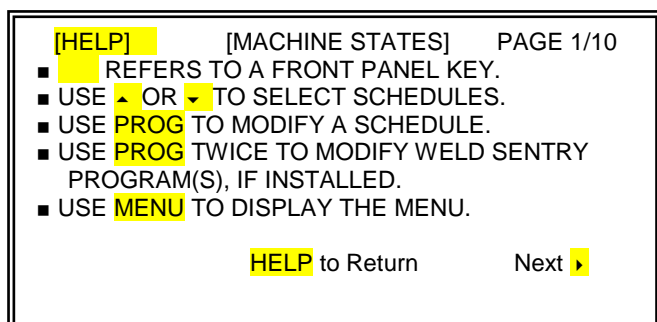
<OPTIONS 2>	
WELD HEAD TYPE	: AUTO
FOOTSWITCH TYPE	: AUTO
FOOTSWITCH WELD ABORT	: ON
FIRING SWITCH	: 2-WIRE
SWITCH DEBOUNCE TIME	: 10 msec
▶ Select, CHNG Change	More Options ▶

<OPTIONS 3>	
SQUEEZE TIME	:0.00 sec
HOLD TIME	:0.00 sec
▶ Select, CHNG Change	More Options ▶

CHAPTER 6: PROCESS DEFINITIONS AND WELD FUNCTIONS

HELP State

The 250DP offers you context sensitive help when running or programming. Press [HELP] whenever you have a question. Press [HELP] again to return to the original screen. For example, if you press [HELP] from the RUN state, information on the function of the 250DP keys will be displayed as illustrated below:



Typical HELP screens. If there is more than one page of Help, the number of pages will be displayed in the upper right-hand corner. Use [<] or [=] to move from page to page. Press [HELP] to return to the previous state.

NO WELD State

The WELD/NO WELD switch is in the NO WELD position. The 250DP will execute any weld schedule, but the capacitor bank will not be discharged and no welding current will flow.

FIRE State

The firing switch in the weld head has closed and the welding sequence is proceeding.

Weld Function Field

The 250DP allows you program 127 weld schedules. Each schedule can use one of its three weld functions. There are two versions of the basic and rollspot functions: one for an air actuated weld head and the other for a manually actuated weld head. The repeat function only applies to an air actuated weld head.

Basic Function

This function makes a simple spot weld. It provides the solution for the majority of the resistance welding applications. It is designed for both air actuated weld heads and manually actuated weld heads. The example shown below illustrates the dual pulse feature; that is, energies have been specified for both weld pulses. The name of the weld function appears in the second line of the display. In this example, Relay 1 would be switched to ON in the event of an alarm and Relay 2 is switched to ON during both weld periods.

SCHEDULE:000	
FUNCTION: BASIC	
POLARITY: [+]	
ENERGY PULSE 1	WIDTH PULSE 2 :SHORT
:010.0%	036.0%
RELAY 1 :ALARM	
RELAY 2 :ON	ON
◀ ▶ Select, CHNG Change	PROGRAM

The PROGRAM State Screen for the Basic Function

When the firing switch in the weld head closes, the weld sequence (Pulse 1 followed by Pulse 2) will be executed. The next sequence will not be executed until the firing switch opens and closes again.

The weld period consists of one or two weld pulses. The weld period starts after the second level of a 2-level foot switch closes *and* after the firing switch in the head closes. It includes the time required to recharge the capacitor bank for the second pulse. In AC welding, a hold period is usually included as part of a basic weld function. It allows the electrodes to cool the work piece. However, the energy level of the 250DP is not sufficient to require a hold period, so, it has been omitted from the basic function.

Weld energy is measured as the energy stored in the capacitor bank which provides the current required to make a weld. The USER OPTION menu permits you to display this energy as a percentage of 250 watt-seconds or as watt-seconds. You can set the energy for both weld pulses independently. If you set the energy level of Pulse 2 to 0, the weld will consist of one pulse.

There are two output relays which you can use to provide status signals to external devices. You can also use Relay 1 to control a second air actuated weld head or to signal an alarm condition. When used for status signals, these relays can be independently programmed to close:

CHAPTER 6: PROCESS DEFINITIONS AND WELD FUNCTIONS

- X When the 250DP is initiated, or
- X After Pulse 1, or
- X After Pulse 2, or
- X During the cool or off periods, or
- X When the 250DP is in the RUN state waiting for the welding sequence to start.

The status of each relay, shown on Lines 6 and 7, is set in the PROGRAM state and is confirmed, in real time, in the RUN state.

Repeat Function

This function provides an automatic *repeat* of the weld sequence for simple automated air actuated applications. It is ideal for volume production which requires a single schedule.

NOTE: Repeat can only be used with an air actuated weld head.

You should specify the off time so that it is sufficient to allow the weld head to open the electrodes, and to allow you to reposition the work piece before the entire welding sequence repeats. Footswitch Weld Abort OFF is not permitted with the repeat function.

SCHEDULE:10		
MODE :REPEAT		
POLARITY:[+]		
WIDTH	:SHORT	
<input type="checkbox"/> PULSE 1	<input type="checkbox"/> PULSE 2	<input type="checkbox"/> OFF
ENERGY :010.0%	030.0%	0.25 sec
RELAY 1 :ON	ON	OFF
RELAY 2 :ALARM		
<input type="button" value="◀ ▶"/>	Select	<input type="button" value="PROGRAM"/>

The PROGRAM State Screen for the Repeat Function.

NOTE: The OFF Period is only used with this function.

Rollspot Function

While the force firing switch remains closed, the weld/cool sequence will be repeated. The cool time and the rotational speed of the wheel electrodes determines the distance between spots. Assuming a reasonable wheel speed, the cool period could be reduced so that the spots would overlap. The energy required for the first spot, Weld 1, should be less than that required for all subsequent spots, Weld 2, in the sequence.

CHAPTER 6: PROCESS DEFINITIONS AND WELD FUNCTIONS

Rollspot cannot be used in a chain. Dual pulse and/or Footswitch Weld Abort OFF are not permitted in Rollspot.

SCHEDULE:10			
MODE :ROLLSPOT			
POLARITY:[+]		WIDTH	:SHORT
WELD 1	WELD 2	COOL	
ENERGY :020.0%	022.5%	0.25 sec	
RELAY 1 :OFF	OFF	OFF	
RELAY 2 :OFF	OFF	OFF	
Select		PROGRAM	

The PROGRAM State Screen for the Rollspot Weld Function

In the rollspot application shown on the above screen, the welds would not overlap if the rotational speed of the wheel exceeded 0.25 inches/second, assuming a spot which is 1/16 inch long, because the recharge time was approximately 0.050 seconds (refer to Appendix A under *Welding Speed*) and the cool time was set to 0.250 seconds.

CHAPTER 7

MAINTENANCE

Modification and Calibration

Unless you are a skilled technician, we suggest you telephone the AMADA WELD TECH Repair Department at the telephone number shown in the Foreword of this manual for advice before attempting calibration and/or modification.

WARNING: Contact with voltages present in this power supply may cause serious or fatal injuries.

Cover Removal

It will be necessary to remove the outside cover to perform calibration or modifications. Use the following procedure:

- 1 Set the front panel POWER switch to OFF.
- 2 Disconnect the power supply from its power source.
- 3 Remove the top two screws on each side of the cover.
- 4 Loosen the bottom two screws on each side and lift the cover straight upwards.

Capacitor Bank Modifications

To operate the 250DP as a 125 watt-second unit, disconnect one half of the capacitor bank. This will cause the 250DP to operate as per specifications listed in Appendix A for a 1,500 μ F capacitor bank, and the maximum capacity of the 250DP will change from 250 watt-seconds to 125 watt-seconds.

To disconnect the right half of the capacitor bank from the left half, refer to figure 7-1 and proceed as follows:

WARNING: After turning power OFF, wait at least 5 minutes for the capacitors to discharge before starting this procedure.

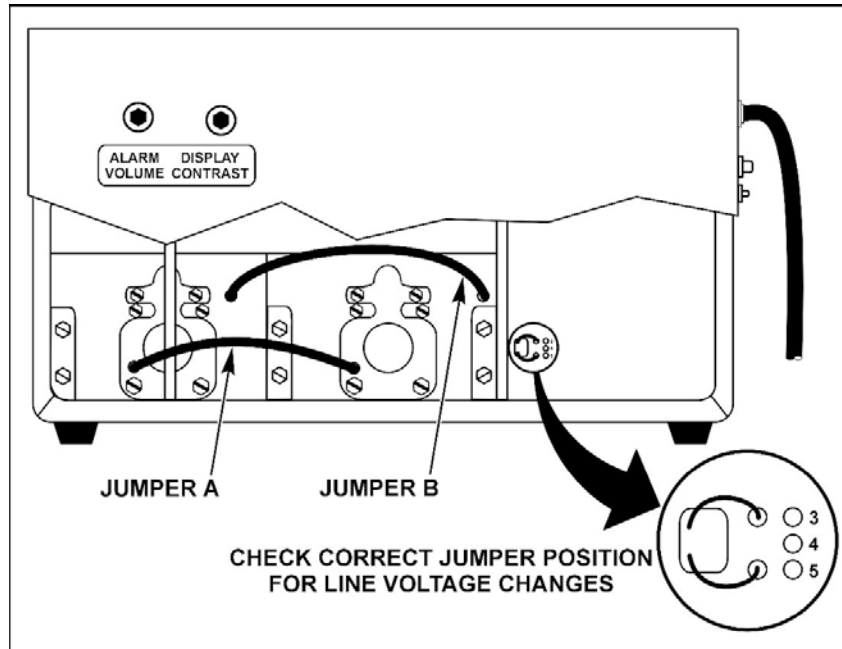


Figure 7-1. Line Voltage and Capacitor Bank Jumpering

- 1 Display units should be set to % Energy *not* Watt-Seconds.
- 2 Set the front panel POWER switch to OFF.
- 3 Remove the cover.
- 4 Remove Jumper A connecting the center terminals.
- 5 Remove Jumper B connecting the positive terminals.
- 6 Replace the cover.

Line Voltage Changes

You may reconnect the power supply to operate at different line voltages: 100, 115, 208 or 230 VAC, 50/60 Hz. To reconfigure the line power input circuitry, proceed as follows:

- 1 Set the front panel POWER switch to OFF.
- 2 Remove the cover.
- 3 Select the schematic of the primary circuit for the required voltage, figures 7-2 through 7-5. Check the connections and reconfigure the following components:
 - Jumpers E3 and E4, located in the top center area of the control printed circuit board.
 - Bead Pins BP1-BP14 and Terminals E2 and E3, located along the top edge of the control printed circuit board.

- The taps on Charging Transformer T3, located on the floor of the power supply housing (refer to figure 7-1).
- 4 Install the correct circuit breaker. Refer to Appendix A under *Input / Output Cable Connections and Fusing*.
 - 5 Install the line cord plug appropriate to your line voltage supply.
 - 6 Change all labels and tags so that they indicate the correct line voltage.
 - 7 Replace the cover.

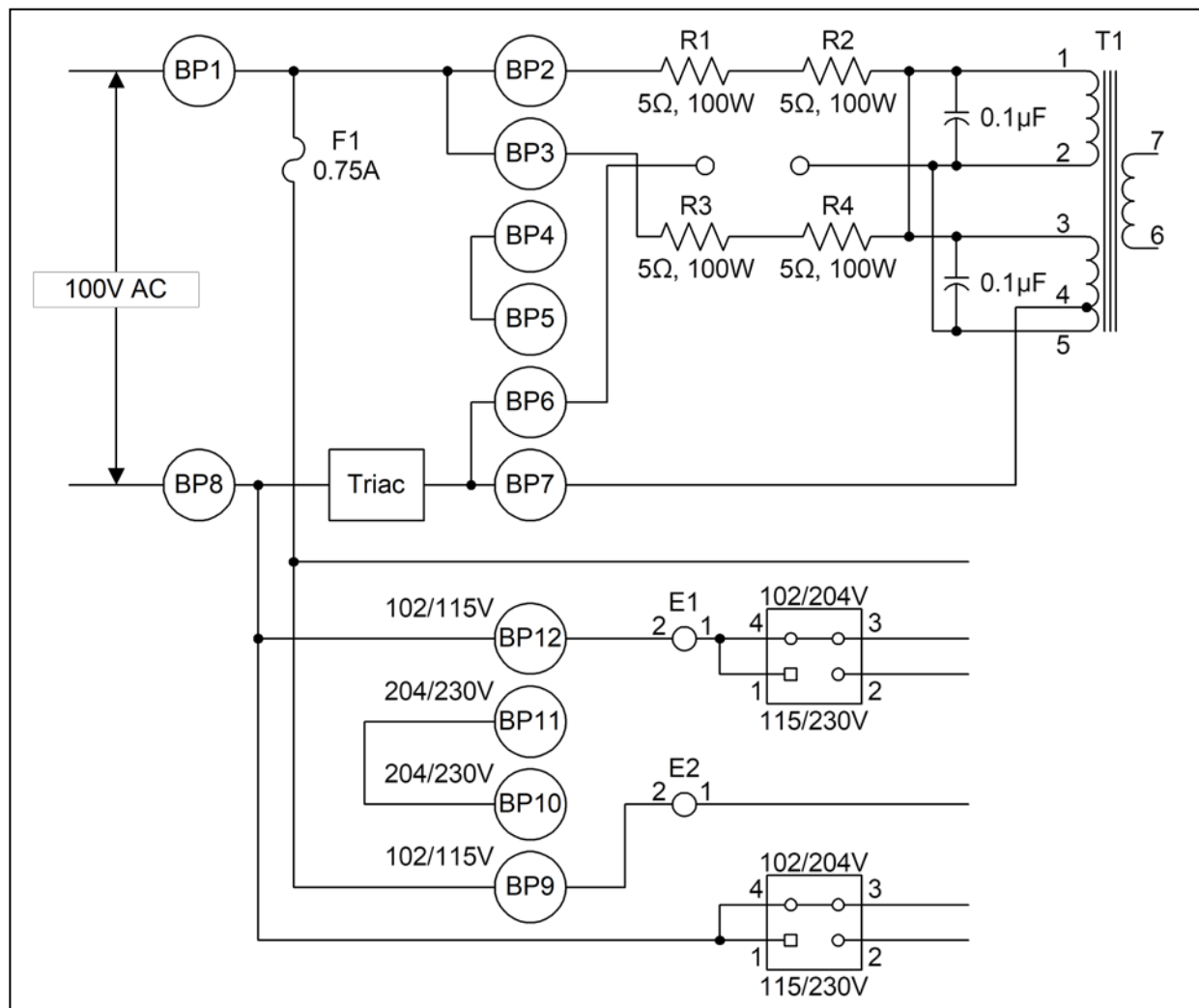


Figure 7-2. 100 VAC Line Voltage Configuration

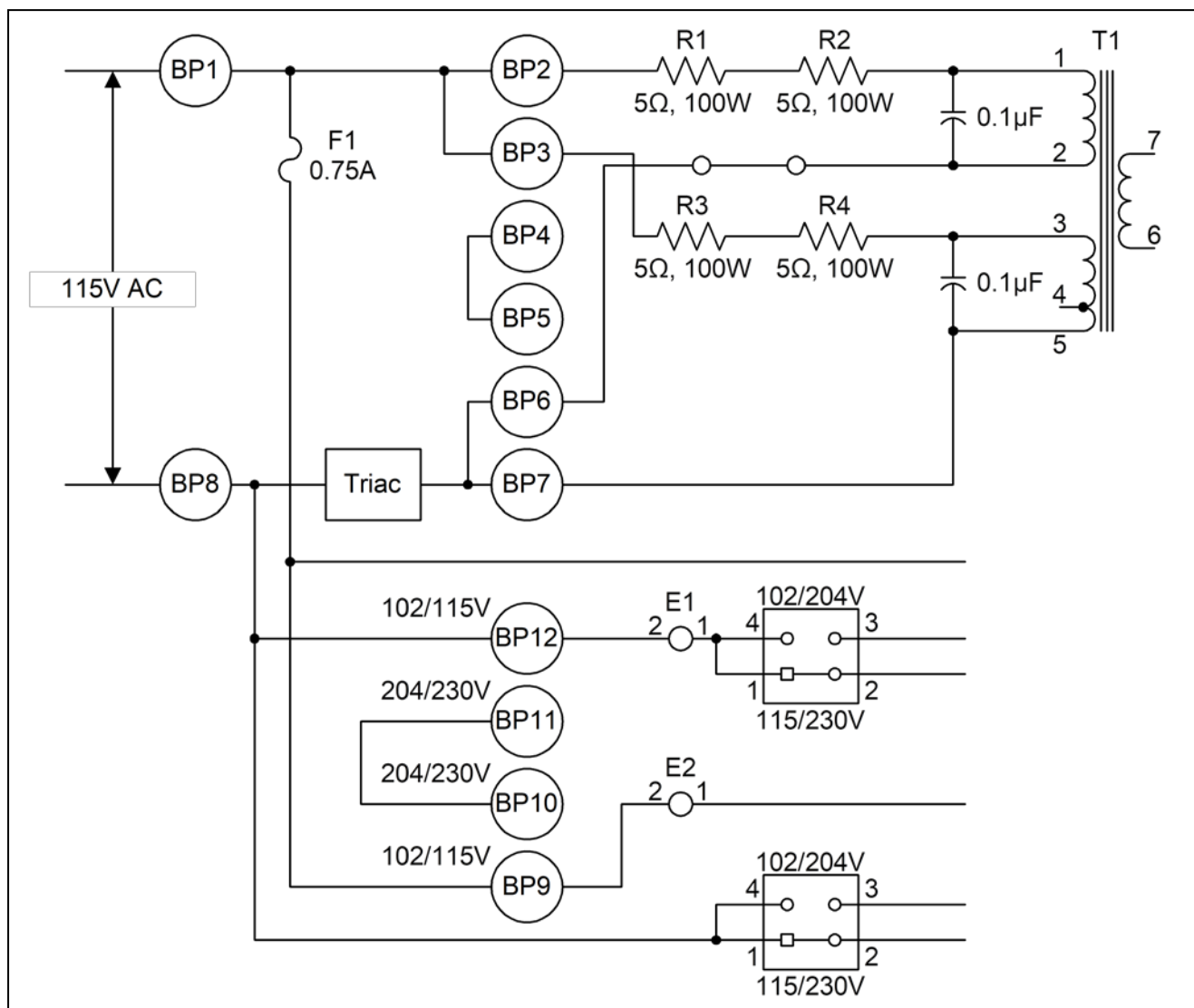


Figure 7-3. 115 VAC Line Voltage Configuration

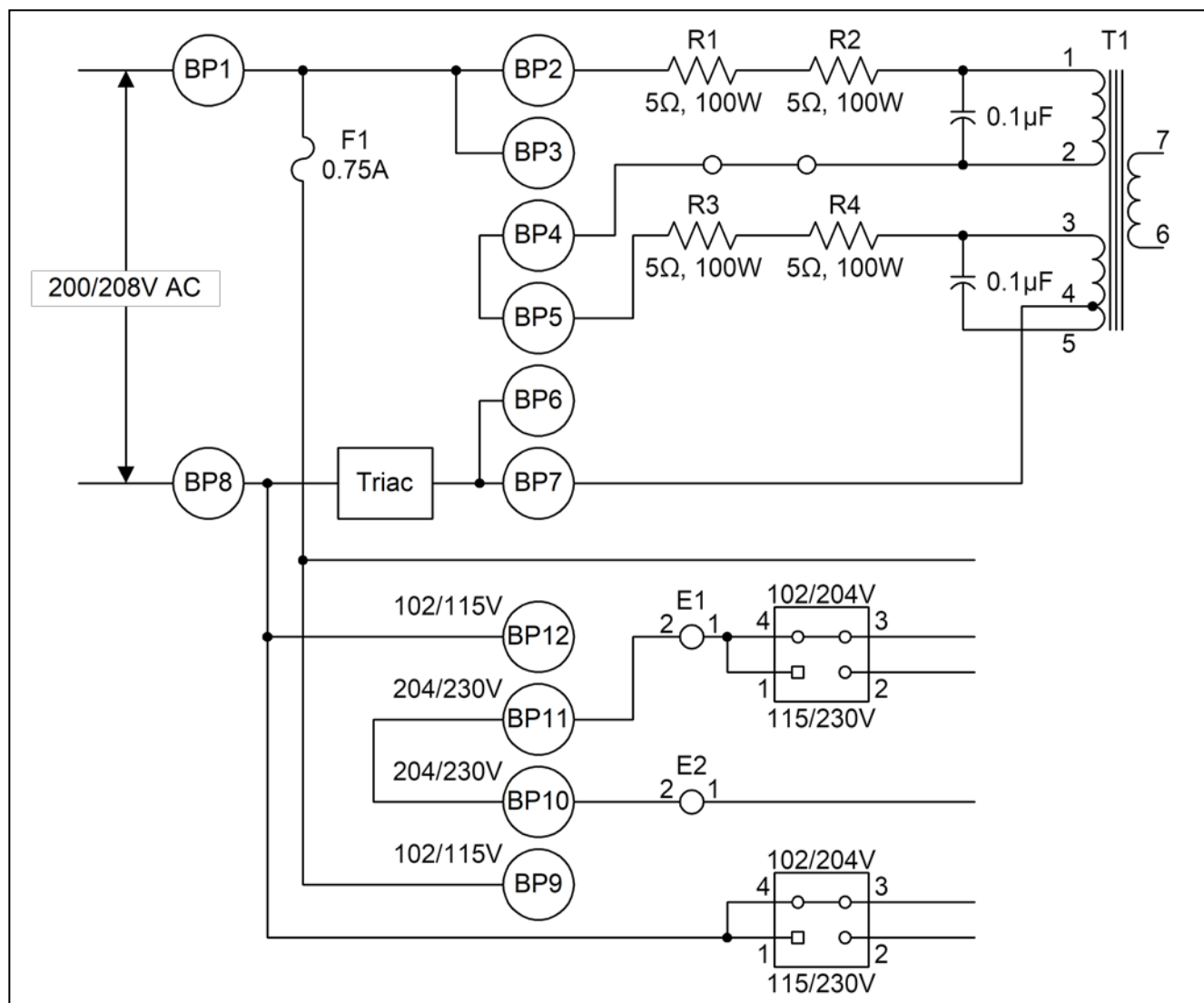


Figure 7-4. 208 VAC Line Voltage Configuration

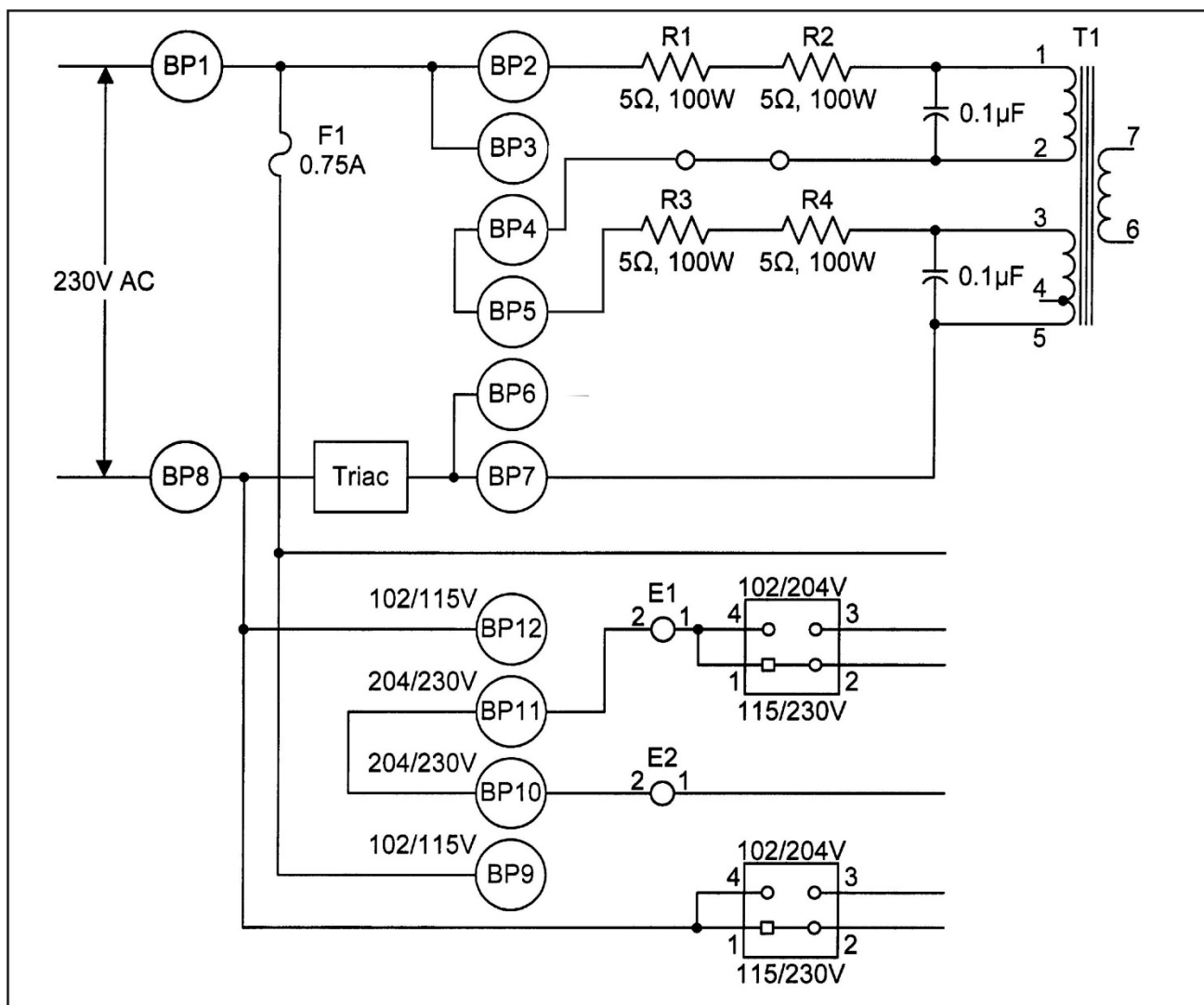


Figure 7-5. 230 VAC Line Voltage Configuration

Calibration

The 250DP should not require any regular adjustments. Use the following procedure as a guideline to *check* the calibration. Take care not to make unnecessary adjustments; however, if any components or software are replaced, check the calibration. Do not hesitate to call the AMADA WELD TECH Repair Department with any questions.

Calibration should be performed only by a qualified technician. Test equipment should be calibrated for accuracy.

Test Equipment Required.

- Digital Voltmeter, Keithley Model 2002 or equivalent.
- Oscilloscope

Pre-Calibration Procedures. Calibration is performed using the instructions displayed on the screen and the HELP messages. The procedure consists of verifying power supply voltages and capacitor bank values, and adjusting five trimpots on the control printed circuit board. As each trimpot *adjustment is performed, it must be displayed on the screen with the cursor positioned next to the instruction.*

NOTE: 250DP power should be on for at least 5 minutes before attempting calibration.

- 1 Switch power OFF.
- 2 Remove the cover.

CAUTION: Exercise static protection procedures so that no IC chips are damaged.

- 3 Switch power ON. Use a DVM to check the voltage at each of the points listed in table 7-1. Use TP0 as reference ground.

Table 7-1. Power Supply Voltage Range Specifications

Power Supply	Test Point	Acceptable Range (V)
+15 V	C21(+)	+14.25 to +15.75
-15 V	C23(-)	-14.25 to -15.75
+5 V	C26(+)	+4.75 to +5.25
Commutation Supply	CR35 cathode	+101.5 to +106.5*
+5 V Ref	U19, Pin 6	+4.98 to +5.02

***NOTE:** With line voltage at nominal, ± 0.1 volt

- 4 Switch power OFF and disconnect BP13 on the control printed circuit board and remove IC chip U5. Push power ON.

NOTE: It is not necessary to turn the trimpots (Steps 5 and 6) if you are only performing a *calibration check.*

- 5 Turn R12 and R36 fully counter-clockwise.
- 6 Turn R108, R97, and R104 to mid-range.
- 7 Press [ENTER] to display the calibration screen.

CHAPTER 7: MAINTENANCE

Entering Capacitor Bank Values. Press [ENTER] to display the next calibration screen and follow the instructions on that screen.

Adjustment Potentiometers. Seven trimpots are located on the control printed circuit board. These adjustments are set at the factory and, with the possible exception of the alarm volume and display contrast, should not require adjustment in the field. The potentiometers and their specific functions are:

R 108	Calibrate Display	R 104	Reference Adjustment
R 97	Offset Adjustment	R 135	Alarm Volume
R 36	E _{Out}	R 131	Display Contrast
R 12	Overvoltage Adjustment		

To adjust the trimpots, press [ENTER] to display the calibration screen listing the trimpot adjustments. Adjust the trimpots as instructed on the screen.

NOTE: The current measured at TP5 must not drift more than $\pm 1.5\mu\text{A}$.

Replace the cover and top screws. Securely tighten all screws.

Troubleshooting

If the circuit breaker trips repeatedly, one of the following is probably the cause:

- Overload - Exceeding the duty cycle. Reduce the duty cycle.
- Control printed circuit board malfunction. Replace the board.
- Defective circuit breaker. Replace the circuit breaker.
- Defective charging transformer. Replace the transformer.
- Misconnected charging transformer. Refer to figures 7-2 through 7-5, as appropriate to the input line voltage.
- Capacitor bank. Charge the bank with an external 400 volt DC power supply. After 5 minutes, the steady state current should be less than 10 milliamps. If it is not, one or more of the capacitors is shorted. Discharge the capacitor bank with a 500 to 2,000 ohm, 25 watt resistor to ground and replace the defective capacitor.

WARNING: Do not discharge the capacitor bank by shorting it directly to ground. The stored energy could be sufficient to melt the shorting tool in an explosive manner.

After making any repairs and checking the results, replace the cover and tighten all screws.

Repair Service

Telephone Service

Call the AMADA WELD TECH Repair Department at the telephone number shown in the Foreword of this manual. Before calling, please obtain the model number and serial number from the identification plate on the rear panel.

Factory Service Repair

AMADA WELD TECH provides a repair service for both warranty and non-warranty repairs. Call the Customer Service Department at the telephone number shown in the Foreword of this manual for a Return Material Authorization number. All equipment to be returned to AMADA WELD TECH for repair must be shipped PREPAID.

Please include information concerning the type of problem you are experiencing. Include with the shipping information the name and telephone number of the person whom we should call with the estimated cost of repairs.

APPENDIX A

TECHNICAL SPECIFICATIONS

250DP Power Supply

1.5 to 250 watt-second (joules) stored energy power supply which can operate in a single or dual pulse mode. Is capable of operating with air or manually actuated weld heads. Compatible with 1-level or 2-level footswitches. It can sense single pole, double pole or optical firing (pressure) switches.

Power Requirements

Approximately 2700 watts charging and 25 watts standby. Line voltage is single phase 100, 115, 208, or 230 volts, 50/60 Hz.

Capacitor Bank

The full bank of eight capacitors totals 3,000 μF nominally. The capacitors are grouped in two half-banks of four capacitors, each half-bank totaling 1,500 μF nominally. At full rating, the capacitor banks are operated at a voltage dependent on the actual capacitance. The following specifications are related to the capacitor bank:

Output Pulse Characteristics

Pulse width and Polarity can be specified for each of 127 weld schedules. Internal switching relays are used to implement this feature. Pulse characteristics are measured at the power output terminals, across a non-inductive 0.001 ohm load (with a tolerance of no greater than 2%), including weld cable. Rise time is measured between zero and peak amplitude and pulse width is measured between the 10% amplitude points. When half of the capacitors are disconnected, the 250DP operates on one bank of four capacitors, totaling 1,500 μF . The amount of energy stored is 125 watt-seconds total and the pulse characteristics are changed (see table A-1).

Table A-1. Pulse Characteristics

Pulse Transformer Connections	Capacitor Bank	Rise Time	Pulse Width	Pulse Height
SHORT (Parallel)	3,000 μF	1.6 ms	6.7 ms	6.7 V - 7.4 V
MEDIUM		2.1 ms	7.8 ms	5.7 V - 6.4 V
LONG (Series)		2.6 ms	10.7 ms	4.4 V - 4.8 V
SHORT (Parallel)	1,500 μF	1.2 ms	4.5 ms	5.7 V - 6.4 V
MEDIUM		1.6 ms	5.4 ms	4.8 V - 5.3 V
LONG (Series)		2.1 ms	11.0 ms	4.0 V - 4.4 V

APPENDIX A: TECHNICAL SPECIFICATIONS

Weld Fire Lockout

Output of the error amplifier inhibits the firing circuit during the charge and turndown intervals. This helps prevent poor welds caused by firing the power supply before the capacitor bank is properly charged or discharged.

Line Voltage Regulation

Maintains voltage on the capacitor bank within $\pm 0.25\%$ of setting for a $\pm 13\%$ change from the nominal rated line voltage.

Turndown Circuit

When voltage from the error amplifier exceeds that required to turn off the charging circuit, a resistor is connected across the capacitor bank, discharging the bank to the required level. The turndown circuit deadband is approximately 0.6% of full scale voltage.

Line Failure Turndown

When input power is interrupted, a turndown resistor is automatically connected, discharging the capacitor bank.

Over-Voltage Lockout

Protects the capacitor bank from damage due to circuit malfunction or improper calibration. The circuit breaker opens, removing primary power, and the line failure turndown circuit automatically discharges the capacitor bank. The circuit is adjusted to operate when 440 ± 1 volts is placed across the capacitor bank.

Charge Lockout Circuit

Nominal 60 millisecond commutation pulse, generated in the microprocessor, inhibits the charging circuit until the output SCR has been switched off.

Polarity Selection

Positive (+) and negative (-) polarity can be specified for each weld schedule. Polarity sets the initial direction of the weld current flow through the workpiece. This feature is useful for welding applications which are sensitive to the direction of weld current flow because of dissimilar materials and/or materials with thickness ratios greater than 4 to 1.

Welding Speed

Repetition rate is the average number of welds allowable in 1 minute based upon the thermal rating of the system components. The averaging period used to determine the repetition rate can be as long as 20 minutes. Hit rate, or maximum intermittent welding speed, defines how fast the power supply can make consecutive welds on a non-continuous basis. See table A-2 and figures A-1 and A-2.

Table A-2. Welding Speed

Percent Full Energy	1,500 μ F Capacitor		3,000 μ F Capacitor BANK	
	Rep Rate (welds/min)	Hit Rate (welds/min)	Rep Rate (welds/min)	Hit Rate (welds/min)
2%	300	300	300	300
10%	290	290	250	280
25%	260	260	175	180
50%	210	240	120	124
75%	160	160	95	99
100%	125	125	65	70
Conditions: 25 °C Ambient, Nominal Line Voltage, 60 Hz.				

In dual pulse operation, the repetition rate or hit rate for each individual pulse may be calculated as follows:

RR_1 = First Pulse Rep Rate (Hit Rate)

RR_2 = Second Pulse Rep Rate (Hit Rate)

Calculate $RR_{(1+2)}$, Rep Rate (Hit Rate) for dual pulse operation.

$$RR_{(1+2)} = \frac{(RR_1) (RR_2)}{RR_1 + RR_2}$$

For example, if the energy level of Pulse 1 is 25% and Pulse 2 is 75%, the repetition rate for the dual pulse weld would be:

$$RR_{(1+2)} = \frac{(175) (95)}{175 + 95} = 61.57 \text{ welds/min.}$$

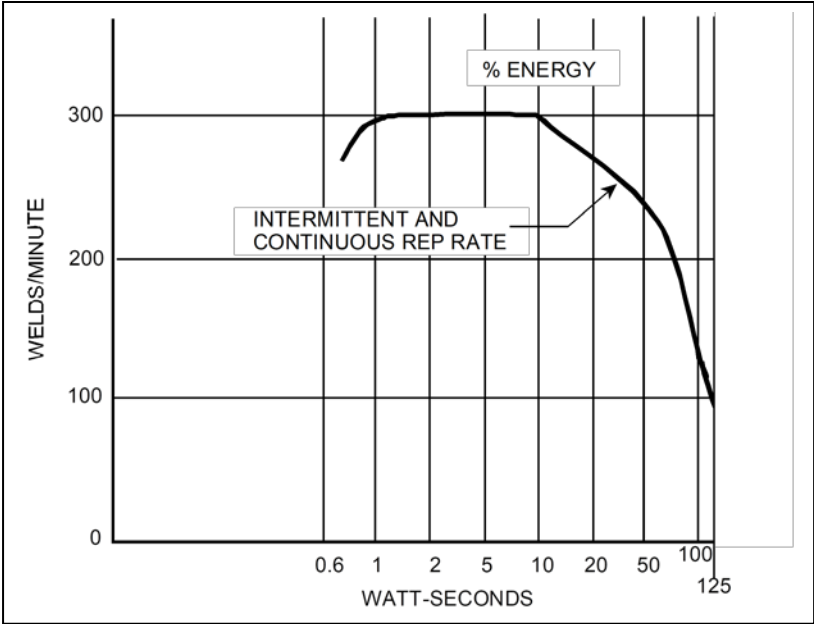


Figure A-1. Rep/Hit Rate with 1,500 µF Capacitor Bank

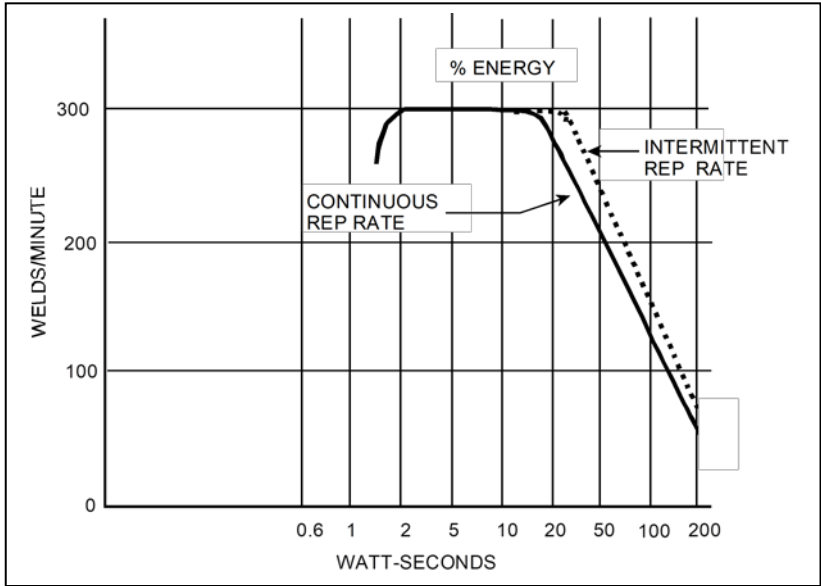


Figure A-2. Rep/Hit Rate with 3,000 µF Capacitor Bank

Weld Schedules

You can save (write) 127 different weld schedules in SRAM (Static Random Access Memory.) In this manual, SRAM is referred to as *permanent memory*. Weld schedules are numbered 1 through 127.

Weld Schedule Definition

A weld schedule is defined as the following information:

- | | | | |
|---|---------------------------|---|--|
| a | Schedule number (0 - 127) | g | Energy of Pulse 1 and Pulse 2 |
| b | Weld Function | h | Cool Time (Rollspot Function) |
| c | Weld Polarity | i | Off Time (Repeat Function) |
| d | Pulse Width | j | Status of Relay 1 |
| e | Next Schedule | k | Status of Relay 2 |
| f | Step Count | l | Weld Sentry Program(s) A-E of the same number (if the Sentry option has been installed). |

Weld schedules 1 through 127 can be protected from unauthorized or inadvertent changes by AMADA WELD TECH's system security feature. When the system security is protected, Schedule 0 can still be modified and used as a "scratchpad." When schedule lock is also turned ON, no other schedules can be displayed or used to weld except the currently displayed schedule.

NOTE: If the security code is lost: Select SYSTEM SECURITY from the main menu. Switch the WELD SWITCH to NO WELD, press and hold the [SAVE] button, then the press the [←] key. The status will change to UNPROTECTED.

Options

You can change the following options from the main menu:

- | | | | |
|---|-----------------------------|---|------------------------------|
| a | Units of Measure for Energy | f | Weld Head Type |
| b | Schedule Number at Power-Up | g | Footswitch Type |
| c | End of Cycle Buzzer ON/OFF | h | Footswitch Weld Abort ON/OFF |
| d | Chain Schedule ON/OFF | i | Firing Switch Type |
| e | Squeeze Time | j | Switch Debounce Time |
| | | k | Hold Time |

Schedule Number at Power-Up

This option determines which schedule will be used when the 250DP is switched to ON. The option will be either Schedule Number 0 - 127 or the schedule which was selected just before the power was switched to OFF.

APPENDIX A: TECHNICAL SPECIFICATIONS

Utilities

The following Utilities are available to the operator from the main menu:

- a Change System Security Status c Reset Default Parameters
- b Copy a Schedule d Set Weld Counters

Information

Information on the following subjects is available to the operator from the main menu:

- a Calibration d Description of Relay Outputs
- b Installation e Description of Control Signals
- c Description of Keyboard f Description of Valve Outputs

Weld Sentry

When the Weld Sentry option is installed, the Sentry Menu provides the following options and utilities:

- a Basic Setup f Set Time and Date
- b Print Utilities g System Setup
- c Print Options h Calibrate Sentry
- d Relay Output i Communications
- e SPC

System Setup

Default System Parameters are:

- a Head Type = Auto g Power-Up Schedule = 0
- b Footswitch = Auto h End Cycle Buzzer = Off
- c Footswitch Weld Abort = On i Chain Schedule Feature = Off
- d Force Firing Switch = 2-Wire j Switch Debounce = 0.01 sec
- e Display Units = % Energy k Squeeze Time = 0.00 sec
- f System Security = Unprotected l Hold Time = 0.00 sec

Weld Functions

Three weld functions can be selected: Basic, repeat and rollspot. The duration of the squeeze (system option), cool (rollspot) and off time (repeat) periods can be set between 0 and 9.99 seconds.

Head Type

The 250DP can be used with a manual, user actuated, or air actuated weld head. Air actuation means that the 250DP will provide a 24 or 115 VAC output which can be used to control an air valve (solenoid) on an air actuated weld head. The 250DP can automatically detect the presence of an AMADA WELD TECH actuated weld head.

You can indicate the presence of a user-supplied non-AMADA WELD TECH air head by jumpering Pin 4 to Pin 2 on the VALVE DRIVER connector. If Pin 4 is not connected to Pin 2, the 250DP assumes that a manual head is being used. The options menu can be programmed to override the automatic selection feature.

Squeeze Time

For Manual Heads or Air Heads with 1-Level Foot Switch, squeeze time is the delay from the firing switch closure until the start of the weld period.

For Air Heads with 2-Level Foot Switch, squeeze time is the delay from the combination of both firing switch closure and second-level foot switch closure until the start of the weld period.

Cool Time

Cool time is the time between welds. In the rollspot function, the electrodes are wheels. The cool time and the rotational speed of the wheels determine the distance between welds. An air head will not open until the footswitch is released. Cool time can be set between 0.00 and 9.99 seconds.

Hold Time

Hold time is the delay from the end of the weld pulse until the head valve opens. Hold time applies only to an air head. The delay can be set from 0.00 to 9.99 seconds.

Footswitch Type

The 250DP requires the use of a 1-level or 2-level footswitch in order to control an air actuated weld head. The 250DP will automatically detect whether an AMADA WELD TECH 1-level or 2-level footswitch is connected to the FOOTSWITCH connector located on the rear panel.

The 250DP assumes that a 1-level footswitch is used if the input to the 2nd level is continuously closed. The 250DP determines whether it is connected to a 1-level or 2-level footswitch whenever it enters the RUN state. The options menu can be used to override the automatic selection feature.

FOOTSWITCH Connector

The FOOTSWITCH connector is a 4-pin Amphenol 91-PC4F (Pt # 550-006) that mates with an Amphenol 91-MC4M (Pt # 520-009). Connect Pin 2 to Pin 3 on a user supplied 1-level footswitch. This connector is wired as follows:

<u>Pin</u>	<u>Description</u>
1	Chassis Ground
2	Footswitch Level 1 or Single Level Footswitch
3	Footswitch Level 2
4	Common

Footswitch Weld Abort Feature

The footswitch weld abort feature is controlled from the options menu.

Footswitch Weld Abort On

With FOOTSWITCH WELD ABORT ON selected, the welding sequence is initiated by the closure of the initiation switch, and continues to its conclusion as long as the initiation switch remains closed. If the initiation switch or the force firing switch open during the welding sequence, the sequence will terminate. FOOTSWITCH WELD ABORT ON is preferred since it allows the operator to abort the welding sequence by releasing the footswitch, or footpedal in the case of a manual head.

Footswitch Weld Abort Off

With FOOTSWITCH WELD ABORT OFF selected, the welding sequence is initiated by a single, momentary, closure of the initiation switch. Opening the initiation switch during the welding sequence will *not* terminate the welding sequence.

The initiation switch must open and re-close in order to start the next sequence. FOOTSWITCH WELD ABORT OFF is used in automated process control systems where operator intervention is not an issue.

Firing Switch Type

The 250DP can use as an input signal either a:

- Single pole, single throw switch
- Double pole, double throw (3-wire) switch, or an
- Optical switch.

APPENDIX A: TECHNICAL SPECIFICATIONS

The input signal will indicate when the weld head has applied the proper force to the workpiece. Weld heads with single pole firing switches should be connected to the MECHANICAL FIRING SWITCH connector. A 3-wire switch or optical firing switch, either of which should be connected to the OPTICAL FIRING SWITCH connector, eliminates switch bounce (which causes false triggering), and should be used when the welding speed exceeds 1.5 welds per second.

Firing Circuit

The firing circuit requires external contact closure or low logic level for firing. Internal filtering prevents premature firing due to radio frequency interference. The 250DP will automatically detect that the system is using a 3-wire switch whenever it enters the RUN state if Pin 1 is shorted to Pin 2.

Switch Debounce Time

Single pole mechanical firing switch contacts 'bounce' when they close. The switch debounce time feature allows you to specify that the firing switch must remain closed for 0, 10, 20 or 30 milliseconds before the weld period can be initiated. The 250DP will automatically set the switch debounce time to 0.0 milliseconds whenever a 3-wire or optical switch is selected.

Mechanical Firing Switch Cable

This cable is 5 feet long. It is a Type 2/C, 600 volt cable containing two shielded, twisted 22 AWG conductors of high-flex stranded wire. The firing switch connector is a 2-pin Amphenol 80-MC2FI (Pt # 520-008), with strain relief. It mates with an Amphenol 80-MC2M (Pt # 520-001). Pin 2 is ground.

Optical Firing Switch Connector

This connector is a 5-pin AMP 212044-1 (Pt # 550-064) located on the rear panel (see figure A-3). It mates with an TE Connectivity Assembly consisting of an TE Connectivity 212437-3 Plug, 212435-7 Ferrule and 212800-1 Strain Relief.

The connector is wired as follows:

<u>Pin</u>	<u>Description</u>
Shell	Shield
1	Switch Normally Closed
2	Switch Common
3	Switch Normally Open
4	+5 VDC
5	Switch Common

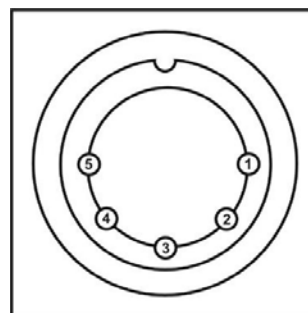


Figure A-3. Pin Numbers as Viewed from the Rear Panel

Initiation Switch

Manual Head Operation

If the 250DP is connected to a manual head, the initiation switch is the force firing switch located in the weld head.

Air Head Operation

If the 250DP is connected to an air actuated head, the initiation switch is the footswitch. The first level of a 2-level footswitch instructs the 250DP to:

- Switch the valve driver to ON, which causes the upper electrode of the weld head to apply force, as determined by the air regulator connected to the top of the air cylinder on the weld head, to the workpiece.
- Start the squeeze period.

The 2nd Level initiates the start of the Weld Period, provided that the Force Firing Switch has closed *and* the Squeeze Period has ended. A 1-Level Footswitch combines the functions of both levels of a 2-Level Footswitch.

Chain Schedules Feature

The chain schedules feature is used to automatically change the weld schedule in use to another specified schedule. Chain schedules is a system feature, and is turned ON using the options menu.

When chain schedules is turned ON, the RUN screen and PROGRAM screen for each schedule will have additional fields for both STEP COUNT and NEXT SCHEDULE. STEP COUNT and NEXT SCHEDULE are used to chain schedules together.

Step Count

STEP COUNT is a weld counter which counts down to 0. Any number from 00001 to 99999 can be entered as a step count. When the step count reaches 0, the schedule will change as specified by the NEXT SCHEDULE. If a weld sequence is not completed and/or the WELD/NO WELD switch is set to NO WELD, the step counter will *not* count down.

Next Schedule

NEXT SCHEDULE is the number of the weld schedule to be used when the step count reaches zero. Any schedule number from 001 to 127 can be used and any number of schedules can be chained together, with some exceptions as follows:

- X Next Schedule = 0: Can only be used at the beginning of a chain.
- X Next Schedule = Current Schedule: Prevents chaining. When the step count reaches 0, it will reset and the current schedule will remain in use.
- X Next Schedule = [.] period: Causes the 250DP to stop after the step count has reached 0 and issue a standby stop command alarm.
- X Weld Function = Rollspot: Can only be used as the last schedule in a chain.

CAUTION: If weld schedules are chained together, do NOT change polarity. All schedules in the chain must have the same polarity or the relay contacts may be damaged.

Audible Buzzer

During alarm conditions, an audible tone (buzzer) is generated for 5 seconds. It can be immediately silenced by pressing [RUN]. It is also used to signal the operator of an incorrect keyboard entry. The volume can be adjusted with a potentiometer on the control printed circuit board. The potentiometer is accessible for adjustment through a hole in the upper, front, right-hand corner of the cover.

End Of Cycle Buzzer ON/OFF

This feature is normally used with manual heads. ON means that an audible signal will be given at the end of each weld sequence as a signal to the operator to release the footpedal. The end of cycle buzzer is controlled from the options menu.

Key Click

Whenever a key is pressed, a click sound is generated.

Weld Counter

A seven-digit weld counter automatically increments after each complete weld sequence. This counter can be reset back to 0 at any time unless the system security is in the protected state.

The Weld Sentry option allows you to set upper and lower limits for each Weld Sentry program. To implement this feature, there are three additional counters which keep track of the number of welds: under the lower limit (999,999), over the upper limit (999,999), and within these limits (9,999,999). These counters can be independently reset to 0 at any time, unless system security is in the protected state.

Note that all counters retain their counts when the input power is interrupted, because the contents of these counters are stored in battery-backed-up memory.

Alarms

The 250DP issues three alarms. All alarms terminate or inhibit the welding sequence. To clear an alarm, press [RUN] or toggle the remote process inhibit line. Alarm conditions are processed in a priority order corresponding to the following list:

- 1 ALARM SCR: The output SCR, which discharges the capacitor bank into the pulse transformer, may be defective.
- 2 ALARM EMERGENCY STOP: An emergency stop signal was received via the CONTROL SIGNALS connector.
- 3 ALARM FIRING SWITCH: The force firing switch in the weld head either did not stay closed during the weld sequence, or did not close within 10 seconds after the 1-level footswitch or the second level of a 2-level footswitch closed.

Air Valve Driver

The air valve driver provides power to control the solenoid of an air actuated weld head. The 250DP can sequentially operate two separate air actuated weld heads using two receptacles on the rear panel, AIR VALVE DRIVER 1 and AIR VALVE DRIVER 2.

Air Valve Driver 1

The output from the AIR VALVE DRIVER 1 receptacle is 12 volt-amps at 24 or 115 volts AC. This circuit is fused, together with the control printed circuit board, by Fuse F1 located on the control printed circuit board. The receptacle is wired so that either 115 or 24 volts are available. Air Valve Driver 1 is configured through the options menu, WELD HEAD TYPE, and selecting either AIR or AUTO.

Air Valve Driver 2

The output of the AIR VALVE DRIVER 2 receptacle provides 24 VAC to power a second air actuated weld head. Jumpers E10 and E11, located near the lower right hand corner of the control board must be moved to the correct positions, as shown in figure A-4.

Air valve driver 2 is wired only for 24 VAC through receptacle Pins 1 and 2. Pins 3 and 4 are not provided. To provide power to Air valve driver 2, move Jumpers E10 and E11 and program WELD HEAD TYPE to DUAL AIR.

NOTE: When air valve driver 2 is used, Relay 1 cannot be used.

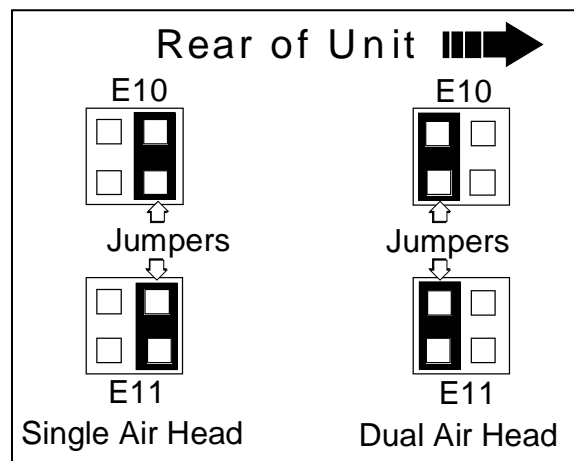


Figure A-4. Jumper Selection for Air Valve Driver Control

Air Valve Driver Receptacles

The 4-pin receptacles located on the rear panel are TE Connectivity 206430-1 (Pt # 550-062). The mating plug is an TE Connectivity 206429-1 (Pt # 520-107), which uses a cable clamp, TE Connectivity 206358-2 (Pt # 245-084). Air Valve Driver 1 is wired as follows:

<u>Pin</u>	<u>Description</u>
1	24 VAC
2	115 and 24 VAC return
3	115 VAC
4	Air head sensing - externally connected to Pin 2

NOTE: Connect Pin 2 to Pin 4 on a non-AMADA WELD TECH air actuated weld head.

Control Signals Connector

A 15-pin, sub-miniature D-type CONTROL SIGNALS connector, located on the rear panel, is provided for the two relays and seven single pole inputs. The relays and switch inputs are used to:

- Remotely select Weld Schedules 1 through 127
- Remotely inhibit recharging the capacitor bank
- Invoke an emergency stop condition to abruptly terminate the welding sequence.

The CONTROL SIGNALS connector (Figure A-5) is a Viking DMRST15RA05CG (Pt # 250-195). The mating connector, which included in the shipping kit, is a TRW Cinch Connector comprised of a DA-15P (Pt # 250-199) male connector and a DE-51210-1 (Pt # 250-200) plastic junction shell. The pin assignments are listed below:

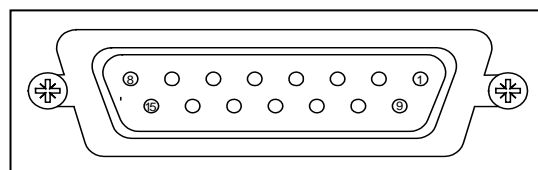


Figure A-5. CONTROL SIGNALS Connector

The CONTROL SIGNALS connector (Figure A-5) is a Viking DMRST15RA05CG (Pt # 250-195). The mating connector, which included in the shipping kit, is a TRW Cinch Connector comprised of a DA-15P (Pt # 250-199) male connector and a DE-51210-1 (Pt # 250-200) plastic junction shell. The pin assignments are listed below:

<u>Pin</u>	<u>Function</u>
1	Remote Weld Schedule Selection, Control Line 2 ⁰
2	Remote Weld Schedule Selection, Control Line 2 ¹
3	Remote Weld Schedule Selection, Control Line 2 ²
4	Remote Weld Schedule Selection, Control Line 2 ³
5	Remote Weld Schedule Selection, Control Line 2 ⁵
6	Relay 2 Input
7	No Connection
8	Relay 1 Input

250DP DUAL PULSE RESISTANCE WELDING POWER SUPPLY

APPENDIX A: TECHNICAL SPECIFICATIONS

9	Process and Charge Inhibit
10	Emergency Stop
11	Signal and Chassis Ground
12	Remote Weld Schedule Selection, Control Line 24
13	RELAY 2 Return
14	Remote Weld Schedule Selection, Control Line 26
15	RELAY 1 Return

Emergency Stop

Emergency stop, or any other external function that should abort the welding sequence, can be implemented by continuously shorting Pin 10 to Pin 11 of the CONTROL SIGNALS connector. If either Pulse 1 or Pulse 2 has been initiated before the emergency stop signal occurs, that pulse will not be interrupted. After that, no further operation can be initiated until the short has been removed.

Charge (Process) Inhibit

Shorting Pin 9 to Pin 11 will close the charge (process) inhibit line and prevent recharging of the capacitor bank. The charge inhibit line is used during remote schedule selection to prevent the capacitors from recharging to a higher energy schedule when loading a lower energy schedule. This saves the time required to discharge the capacitors unnecessarily. The charge inhibit line must be closed immediately after the power supply fires and before the 60 millisecond commutation pulse has ended.

The line must then be opened before the next schedule can be executed. Charge inhibit can also be used instead of [RUN] to remotely clear any error stop alarm. Short Pin 9 to Pin 11 momentarily and immediately open the short to clear the alarm.

Remote Weld Schedule Selection

Refer to figure A-6. To use this feature, connect the seven control lines from a user supplied, normally open contact (open collector or TTL logic levels can also be used) to mating CONTROL SIGNALS connector Pins 1, 2, 3, 4, 12, 5, and 14. Connecting any one of these inputs to Pin 11 will cause the 250DP to load the weld schedule defined by the corresponding pin combination, immediately after the initiation switch closes. Weld schedules are selected according to the binary pattern shown in the table A-3.

Table A-3. Binary Codes for Remote Weld Schedule Selection

Schedule Panel Control Number	INPUT PIN NUMBERS (1 = Switch Closure)						
	1(2 ⁰)	1(2 ¹)	1(2 ²)	1(2 ³)	1(2 ⁴)	1(2 ⁵)	1(2 ⁶)
0	0	0	0	0	0	0	0
1	1	0	0	0	0	0	0
2	0	1	0	0	0	0	0
4	0	0	1	0	0	0	0
8	0	0	0	1	0	0	0
16	0	0	0	0	1	0	0
32	0	0	0	0	0	1	0
64	0	0	0	0	0	0	1

Binary Schedule Selection Code

To select a schedule, connect the pin(s) corresponding to the schedule number to Pin 11. The schedules listed below are selected using the pin indicated by the 1 marked under the pin number. To select any other schedule number, select the schedule numbers whose sum equals the desired schedule, then connect all of the corresponding pins.

For example, to select Schedule 127, connect the pins which correspond to the numbers totaling 127.

$$\text{Schedule 127} = 1 + 2 + 4 + 8 + 16 + 32 + 64$$

Connect Pins 1, 2, 3, 4, 12, 5 and 14 to Pin 11 (ground)

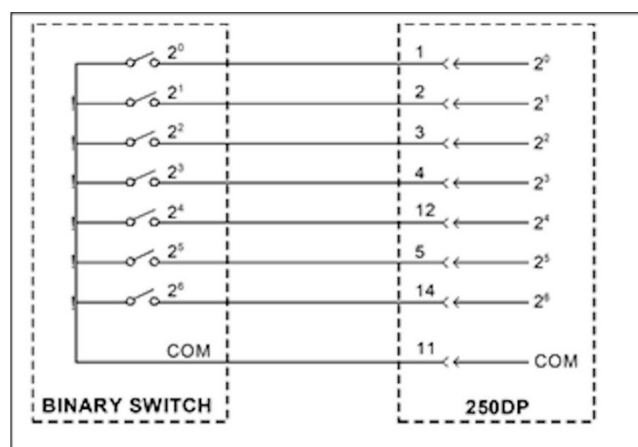


Figure A-6. Remote Schedule Selection with a Remote Binary Switch

APPENDIX A: TECHNICAL SPECIFICATIONS

When all input pins are open, control of the power supply remains at the front panel. When any one of the pins is shorted, the front panel controls are disabled. The capacitor bank will begin to recharge 60 milliseconds after the end of the previous pulse unless the charge inhibit line is grounded. Therefore, any change in the schedule selection code should be made during this 60 millisecond period and/or while the charge inhibit line is grounded.

Alarm stop conditions can also be cleared remotely by toggling the charge inhibit line.

Relay Outputs

Two output relays can be used to provide status (timing) signals to external devices. They can also provide an on (closed) state during a Run state or if there is an alarm.

Relay 1 can also be used to control a second 24 VAC air actuated weld head. (Refer to Air Actuated Weld Head Connections for the appropriate hook-up connections and figure A-3 for appropriate jumper connections.)

Relay 2 can provide a 5 to 50 VDC signal.

When used to provide status (timing) signals, the relays can be independently programmed as follows:

- In Basic Mode, each relay can be programmed on (closed) or off (open) during either of the two weld periods.
- In Roll Spot Mode, each relay can be programmed on (closed) or off (open) during either of the two weld periods or during the cool period (between each spot weld cycle).
- In Repeat Mode, each relay can be programmed on (closed) or off (open) during either of the two weld periods or during the off period (between each Repeat cycle).

In all of the above cases, if the relay is programmed to be on (closed), it will close at the beginning of the scheduled period and open at the end of that period. If scheduled to be closed during any successive periods, it will not open at the end of the first period, but will remain closed during both (or all) periods for which it is scheduled to be closed.

The 24 to 115 VAC input and output for Relay 1 are Pins 8 and 15, respectively, of the CONTROL SIGNALS connector. The 5 to 50 VDC input and output for Relay 2 are Pins 6 and 13, respectively. You must supply the voltage source and, in each case, the ungrounded side of the AC power source for Relay 1. The DC power source for Relay 2 should be connected to the 250DP as illustrated in figure 3-5 in Chapter 3. Either relay is capable of switching up to 250 ma.

RELAY 1 is *also* used to control Air Valve Driver 2.

The options menu can be used to specify Dual Air Head 2. Under this condition, Relay 1 will display Dual Air. In the program state, the options for Relay 1 then must be either AIR HEAD 2 or NOT USED. The second air head will be actuated in any schedule in which Relay 1 is defined as AIR HEAD 2. The standard valve driver will be actuated in any weld schedule in which Relay 1 is defined as NOT USED.

Accessory Port

A 25-pin, sub-miniature D-type connector, located on the rear panel, is provided to control other devices contemplated for the future.

Input / Output Cable Connectors and Fusing

Input Line Power

The 250DP may be connected to any 100, 115, 208, or 230 volt outlet that is capable of supplying the peak currents specified in table A-4.

Circuit Breakers

Circuit breakers are used to protect the incoming power line. The circuit breakers may need to be replaced if the power supply is reconnected for a different line voltage (see table A-4).

Fuses

A $\frac{3}{4}$ amp fuse, F1, is located near the top center of the control printed circuit board. The 250DP is shipped wired for 115 VAC unless otherwise specified.

Power Input Connector

The standard power connector is an IEC-320 with a harmonized, molded power cord.

Table A-4. Input Power Specifications

Nominal Line Voltage (Volts RMS)	Line Voltage Range (Volts RMS)	Line Frequency (Hz)	Peak Input Current * (Amps)	Circuit Breaker Size (Amps)	Circuit Breaker Quantity
100	87 - 113	50/60	28	10	1
115	100 - 130	50/60	32	10	1
208	180 - 235	50/60	15	5	2
230	200 - 260	50/60	16	5	2
* First half-cycle.					

Front Panel Switches

There are 22 electro-statically shielded membrane switches which are integral to the front panel. The function of each key is defined in Chapter 4.

APPENDIX A: TECHNICAL SPECIFICATIONS

Microprocessor CPU

The 250DP uses a Motorola M68HC11A1 CPU with an 8.0 Mhz clock, 8K bytes of random access memory, 512 bytes of electrically programmable read only memory and 128K bytes of ultra-violet erasable and programmable read only memory.

Display

This is an electro-statically shielded, 8 row by 40 column, rear lit liquid crystal cold cathode display. A contrast level adjustment potentiometer can be accessed through a hole in the right side of the cover. The energy display accuracy is 0.5%. The resolution of the display ranges from 0.1% to 0.6% energy, depending upon the amount of energy selected. Energy can be displayed in either watt-seconds or % of 250 watt-seconds.

Cooling

Cooling within the housing is provided by a muffin-type fan that operates on 115 VAC, 50/60 Hz power. The air inlet is underneath the unit, and exhaust is through the rear panel. No restriction to air flow should be closer than 2 inches to the sides and rear of the 250DP. Do not place the 250DP on a soft pad, or on any other surface, which could block the air inlets on the bottom of the housing. Do not allow the 250DP to sit on surfaces which are covered with heavy dirt or dust.

Physical Characteristics

NOTE: Dimensions are inches/centimeters

Weight is 99 lb. / 45 kg

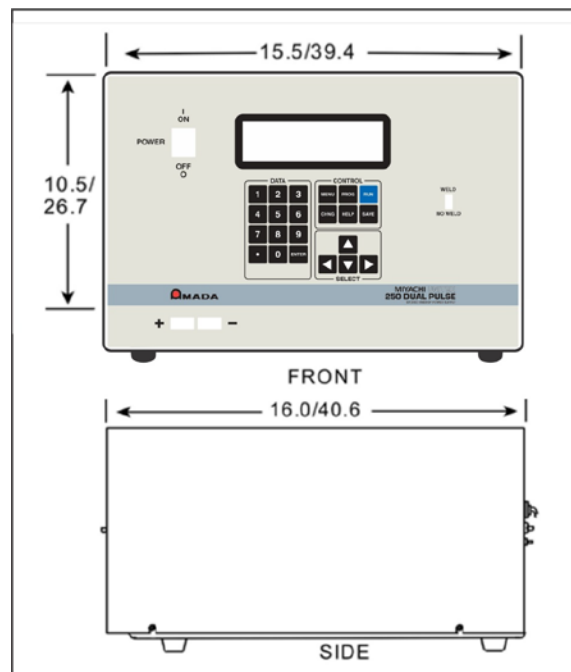


Figure A-7. 250DP Dimensions

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