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STORED ENERGY POWER SUPPLY

125DP

OPERATION MANUAL



990-270 Rev J

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Revision Record

Revision	EO	Date	Basis of Revision
A	16610	4/96	Correct schedule save instructions
B	16841	9/96	Correct power supply output voltages for calibration procedure
C	17831	3/99	Complete revision of Calibration Procedures (Paragraph 8.03)
D	18576	11/99	Add tolerance to pulse output voltage. Add Letter of Conformity.
E	19146	10/01	Complete Update
F	42762	8/13	Updated technical information and calibration values.
G	42840	11/13	Update to Miyachi America name and logo.
H	43479	12/14	Update to Amada Miyachi America name and logo.
J	43808	7/15	Update to Amada format.

FOREWORD

Thank you for purchasing a Miyachi Unitek **Dual Pulse 125 Stored Energy 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 Miyachi America
1820 South Myrtle Ave.
Monrovia, California 91017-7135
Phone: (626) 303-5676
FAX: (626) 358-8048
E-mail: info@amadamiyachi.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 Dual Pulse 125 Stored Energy 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 Miyachi America 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 Dual Pulse 125 Stored Energy 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.

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LIMITED WARRANTY

1. (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 1 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 Products."**

(c) EXCEPT FOR THE WARRANTY SET FORTH IN SECTION 1(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 1(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 1(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 91016or 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 1(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 1(e) and Section 1(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 1(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 1(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.

Exhibit A
Warranty for "Specialty Products"

Limited Warranty

EXCEPT FOR THE WARRANTY SET FORTH BELOW IN THIS EXHIBIT 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.

Warranty Period: The Warranty Period for Specialty Products is for one (1) year, and the Warranty Period for laser welders and laser markers is two (2) years (unlimited hours), and the Warranty Period for the laser pump diodes or modules is two (2) years or 10,000 clock hours, whichever occurs first (as applicable, the "**Warranty Period**"). The Warranty Period begins as follows: (i) on orders for Goods purchased directly by Buyer, upon installation at Buyer's site or thirty (30) days after the date of shipment, whichever occurs first; or (ii) on equipment purchased by a Buyer that is an OEM or systems integrators, upon installation at the end user's site or six (6) months after the date of shipment, whichever occurs first.

Acceptance Tests: Acceptance Tests (when required) shall be conducted at Amada Miyachi America, Inc., Monrovia, CA, USA (the "**Testing Site**") unless otherwise mutually agreed in writing prior to issuance or acceptance of the Acknowledgement. Acceptance Tests shall consist of a final visual inspection and a functional test of all laser, workstation, enclosure, motion and accessory hardware. Acceptance Tests shall include electrical, mechanical, optical, beam delivery, and software items deliverable under the terms of the Acknowledgement. Terms and conditions for Additional Acceptance Tests either at Seller's or Buyer's facility shall be mutually agreed in writing prior to issuance or acceptance of the Acknowledgement.

Performance Warranty: The system is warranted to pass the identical performance criteria at Buyer's site as demonstrated during final Acceptance Testing at the Testing Site during the Warranty Period, as provided in the Acknowledgement. Seller explicitly disclaims any responsibility for the process results of the laser processing (welding, marking, drilling, cutting, etc.) operations.

Exclusions: Seller makes no warranty, express or implied, with respect to the design or operation of any system in which any Seller's product sold hereunder is a component.

Limitations: The limited warranty set forth on this Exhibit A does not cover loss, damage, or defects resulting from transportation to Buyer's facility, improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the equipment, or improper site preparation and maintenance. This warranty also does not cover damage from misuse, accident, fire or other casualties of failures caused by modifications to any part of the equipment or unauthorized entry to those portions of the laser which are stated. Furthermore, Seller shall not be liable for a breach of the warranty set forth in this Exhibit 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.

Seller further warrants that all Services performed by Seller's employees will be performed in a good and workmanlike manner. Seller's sole liability under the foregoing warranty is limited to the obligation to re-perform, at Seller's cost, any such Services not so performed, within a reasonable amount of time following receipt of written notice from Buyer of such breach, provided that Buyer must inform Seller of any such breach within ten (10) days of the date of performance of such Services.

Seller shall not be liable for a breach of the warranty set forth in this Exhibit A unless: (i) Buyer gives written notice of the defect or non-compliance covered by the warranty, reasonably described, to Seller within five (5) days of the time when Buyer discovers or ought to have discovered the defect or non-compliance 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 and (a) Buyer returns such Goods to Seller's place of business at Buyer's cost (prepaid and insured); or (b) in the case of custom systems, Seller dispatches a field service provider to Buyer's location at Buyer's expense, for the examination to take place there; and (iii) Seller reasonably verifies Buyer's claim that the Goods are defective or non-compliant and the defect or non-compliance developed under normal and proper use.

All consumable, optical fibers, and 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.

No warranty made hereunder shall extend to any product whose serial number is altered, defaced, or removed.

Remedies: With respect to any such Goods during the Warranty Period, Seller shall, in its sole discretion, either: repair such Goods (or the defective part). **THE REMEDIES SET FORTH IN THE FOREGOING SENTENCE SHALL BE BUYER'S SOLE AND EXCLUSIVE REMEDY AND SELLER'S ENTIRE LIABILITY FOR ANY BREACH OF THE LIMITED WARRANTY SET FORTH IN THIS EXHIBIT 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.

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 this Exhibit 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.

CHAPTER 1
SYSTEM DESCRIPTION

Section I: Features

The Miyachi Unitek™ Dual Pulse 125 (125DP) is a stored energy, capacitor discharge, power supply designed to perform precision resistance welding. The circuitry is solid state, microprocessor controlled, with components conservatively rated when used within the maximum specified repetition rates. The charging circuit uses silicon controlled rectifiers in a patented manner which provides high reliability and precise charging intervals. Special precautions protect against false triggering in high RFI and EMI environments. It is a multi-voltage unit designed for operation at 100, 115, 200/208, or 230 VAC, 50/60 Hz. The features of the 125DP include:

- Energy selectable up to 125 watt-seconds
- Dual Pulse Capability which simplifies welding to plated materials
- Digital Display allows operators to set energy levels accurately and quickly
- Stores up to 8 Different Weld Schedules which facilitates multiple applications at a single work station
- Remote Schedule Selection for use in automation
- Air Head Capability is standard feature which allows it to control air actuated welding heads
- Programmable Squeeze Time for non-force fired weld heads
- Schedule Protection Feature protects Weld Schedules from changes by unauthorized personnel
- Weld Fire Lockout prevents welding whenever the energy level is not within 1% of the preset level therefore weld quality is independent of line voltage and the speed at which the power supply is operated
- Protected from Radio Frequency Interference and Electro-Magnetic Interference to ensure reliable operation even in high electrical noise environments
- Multiple Line Voltages - can operate at 100, 115, 200/208, or 230 VAC, 50/60 Hz.

Section II: System Components

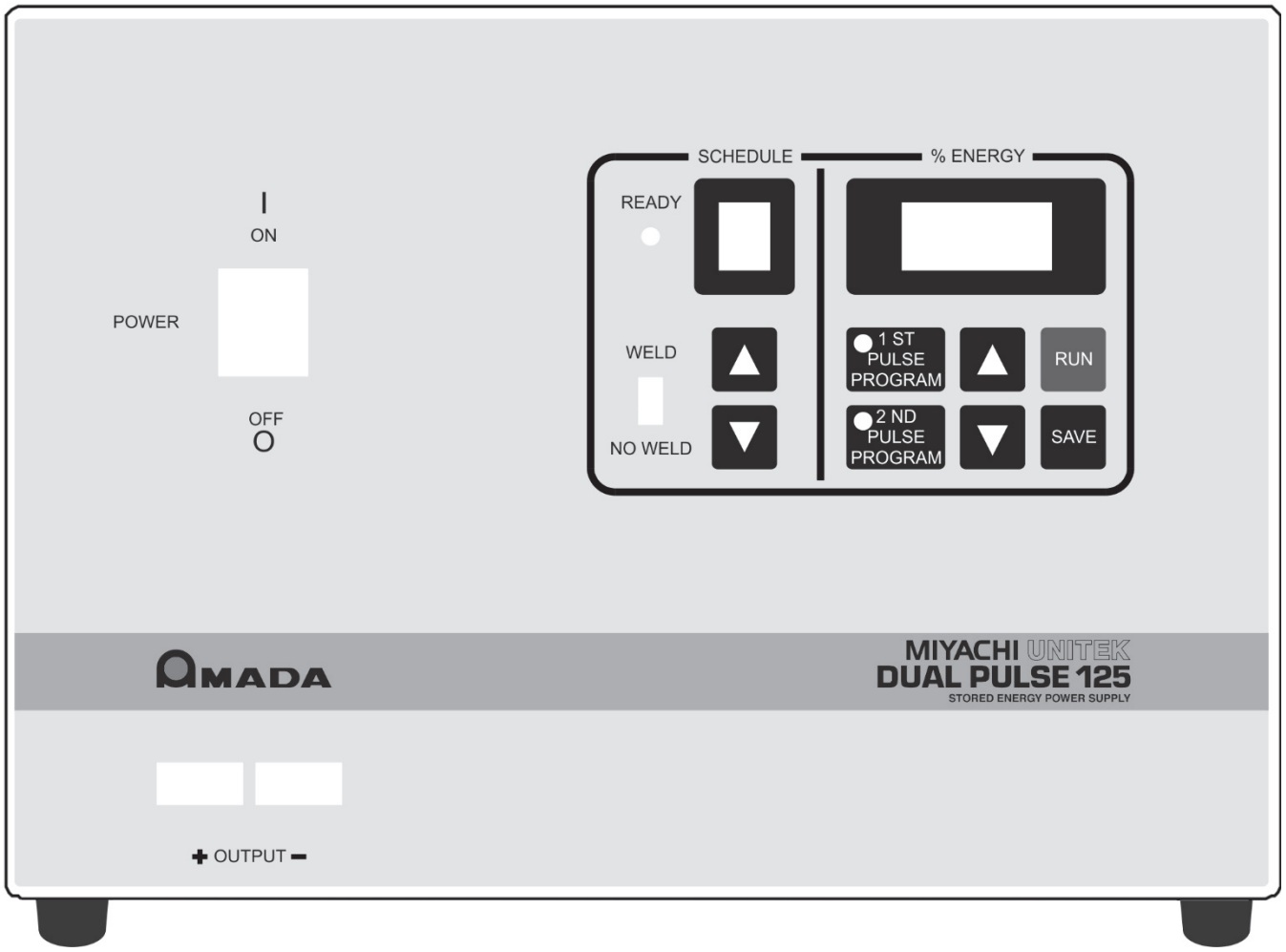
Front Panel Description

POWER SWITCH - Used to switch both sides of the incoming power line.

WELD/NO WELD SWITCH - Welding current will not flow when this switch is in the NO WELD position. For Air Operated Weld Heads, the Air Valve Driver will still actuate the weld head. This switch must be in the WELD position in order to make a weld.

NOTE: Instructions to "Select **WELD** or **NO WELD**" mean that you are to place this switch in either the **WELD** or the **NO WELD** position, whichever is indicated inside the brackets.

POWER OUTPUT TERMINALS - Positive (**+**) and Negative (**-**) terminals provide taps for bolt on connection of Welding Cables to the Weld Head or Handpiece.



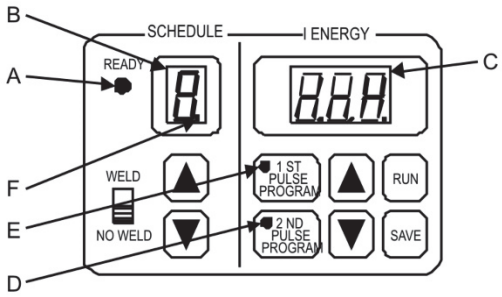
Front Panel Keys

The eight keys on the Front Panel are identified as follows:

KEY	DESCRIPTION
SCHEDULE ▲	Changes (increases) the **SCHEDULE** number which is displayed. Schedules 0 through 7 can be selected.
SCHEDULE ▼	Changes (decreases) the **SCHEDULE** number which is displayed.
ENERGY ▲	Changes (increases) the %ENERGY displayed up to a maximum of 100%. Also used to change SQUEEZE TIME up to a maximum of 9.9 seconds.
ENERGY ▼	Changes (decreases) the %ENERGY displayed down to a minimum of 0.6%. **NOTE:** The **2ND** Pulse display can be decreased to 000%. Also used to change Squeeze Time down to a minimum of 0.1 seconds, or 0.0 to disable.
1ST PULSE	Causes the 125DP to enter the PROGRAM State so that the user can change the FIRST PULSE %ENERGY for the current schedule. When already in the Program State, press and hold **1ST PULSE** and press **ENERGY ▲▼** to change SQUEEZE TIME.
2ND PULSE	Causes the 125DP to enter the PROGRAM State so that the user can change the SECOND PULSE %ENERGY for the current schedule. The %ENERGY DISPLAY will change to display the 2ND Pulse %Energy.
RUN	Causes the 125DP to exit the PROGRAM State without saving the changed schedule. The changed schedule will become Schedule 0 and will NOT be written to permanent memory. Welding is done in the RUN State.
SAVE	In the PROGRAM State, saves (writes) any schedule to permanent memory. The 125DP will then exit the PROGRAM State and return to RUN State. This key has no function in the RUN State.

NOTE: Instructions to "press [ ]", mean that you are to press the key described inside the brackets. For example: "Press **1ST PULSE**" means press the key labeled 1ST PULSE PROGRAM. "Press [**SCHEDULE ▲▼**" means press either the ▲ or the ▼ located beneath the SCHEDULE NUMBER.

Indicators and Displays



Dual Pulse 125 Indicators and Displays

A **READY INDICATOR** - The green LED (light emitting diode) indicator lights when power supply is ready and welding is permitted. Welding is allowed only when the capacitors are properly charged and **WELD** is selected. The READY INDICATOR will not light in the PROGRAM State.

B **SCHEDULE NUMBER DISPLAY** - Indicates the currently selected Schedule Number. Press **SCHEDULE ▲▼** to select Schedules 0 through 7. The SCHEDULE NUMBER DISPLAY is also used at power up to briefly display the first digit of the Software Version Number. The 125DP will then go to the RUN State and display the last Schedule saved in memory.

C **ENERGY DISPLAY** - Indicates Energy setting for the currently displayed schedule number. Energy settings are shown as a percent of total energy, 125 watt-seconds. PERCENT ENERGY can be set from 0.6% to 100%. The 1st Pulse %Energy is always displayed in the Run State. The 2nd Pulse %Energy is displayed when the 2nd Pulse Indicator is flashing in the Program State.

D **2ND PULSE INDICATOR** - Flashes when **2ND PULSE** is pressed and the power supply is placed in the PROGRAM State. The 2nd Pulse %Energy is only displayed when the 2nd Pulse Indicator is flashing. In the RUN State, the 2nd Pulse Indicator will stay lit to indicate that a 2nd Pulse has been programmed.

NOTE: The digital display may not increment in continuous steps, however, it will always be within ± 0.6% of the desired setting. At power up, the Energy Display will briefly display the last 3 digits of the Software Version Number and then the status of the Schedule Protection Feature. In the PROGRAM STATE, when **1ST PULSE** is pressed, the Energy Display is used to display SQUEEZE TIME.

E **1ST PULSE INDICATOR** - Flashes when **1ST PULSE** is pressed and the power supply is placed in the PROGRAM State. In the RUN State, the 1st Pulse Indicator is always lighted.

F **FIRING SWITCH INDICATOR** - The red decimal point, next to the SCHEDULE NUMBER, will light when the Force Firing Switch in the weld head closes. This feature is a convenience when setting the electrode firing force.

Rear Panel

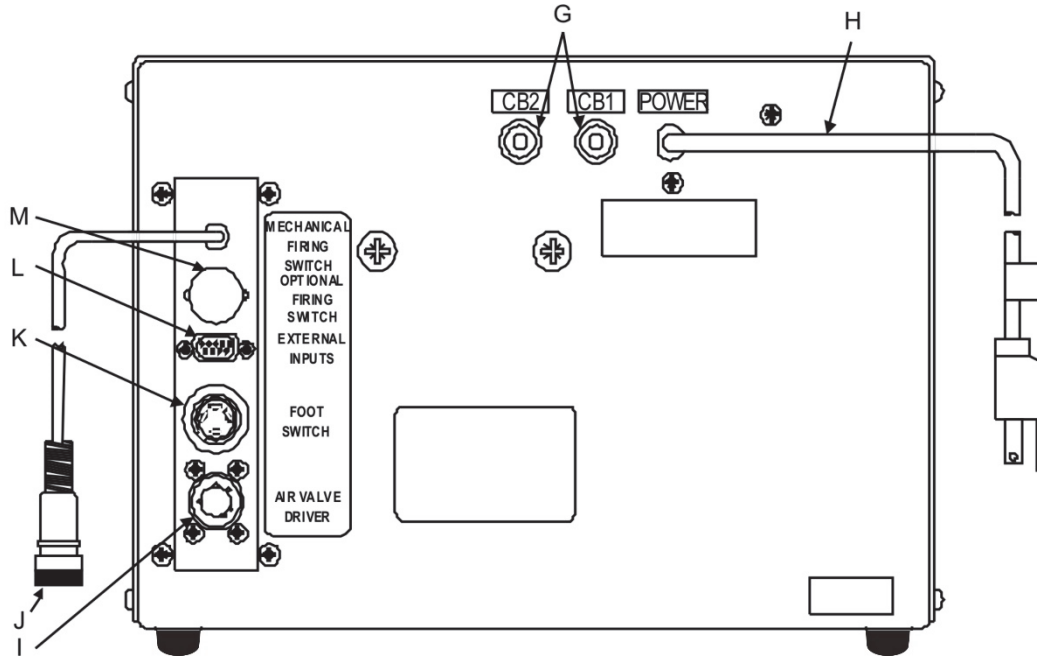


Figure 1-3. Rear Panel of the Dual Pulse 125

G **CB1, CB2** - Circuit breaker(s) used to protect both sides of the incoming power line.

H **POWER CABLE** - 5 foot cable is terminated with the appropriate 115 or 230 volt plug. The standard connector for the 115 VAC power supply is the NEMA 5-15P rated for 15 amps.

I **AIR VALVE DRIVER** - Provides either 24 or 115 volts (AC) to Miyachi Unitek Air Actuated Weld Heads.

J **MECHANICAL FIRING SWITCH** - 5 foot cable is used to connect the 125DP to the Force Firing Switch in all Miyachi Unitek Weld Heads and Handpieces.

K **FOOTSWITCH RECEPTACLE** - Used to connect either a 1 Level or 2 Level Miyachi Unitek Footswitch. Footswitches are only used with air or electrically actuated weld heads.

L **EXTERNAL INPUTS** - 9-pin, sub-miniature "D" connector used for Remote Schedule Selection. See Chapter 2.

M **OPTIONAL FIRING SWITCH** - An additional firing switch can be wired in this position.

CHAPTER 2
GETTING STARTED

Section I: Planning for Installation

Location

It is recommended that the power supply be installed in a well-ventilated area, free from dirt and moisture. Air intake for cooling is through the underside, do not place on deep carpet, felt, or foam pads. Air exits through the left side, allow sufficient clearance so that cooling air may flow properly. Position the power supply as close as possible to the weld head.

Power Line

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

This power supply was wired for a specific voltage which was marked on the line cord during the manufacturing process. The standard 125DP is wired for 115 VAC. Re-connection for operation at another voltage may be made by a qualified technician. Refer to Chapter 5 - Calibration and Modifications.

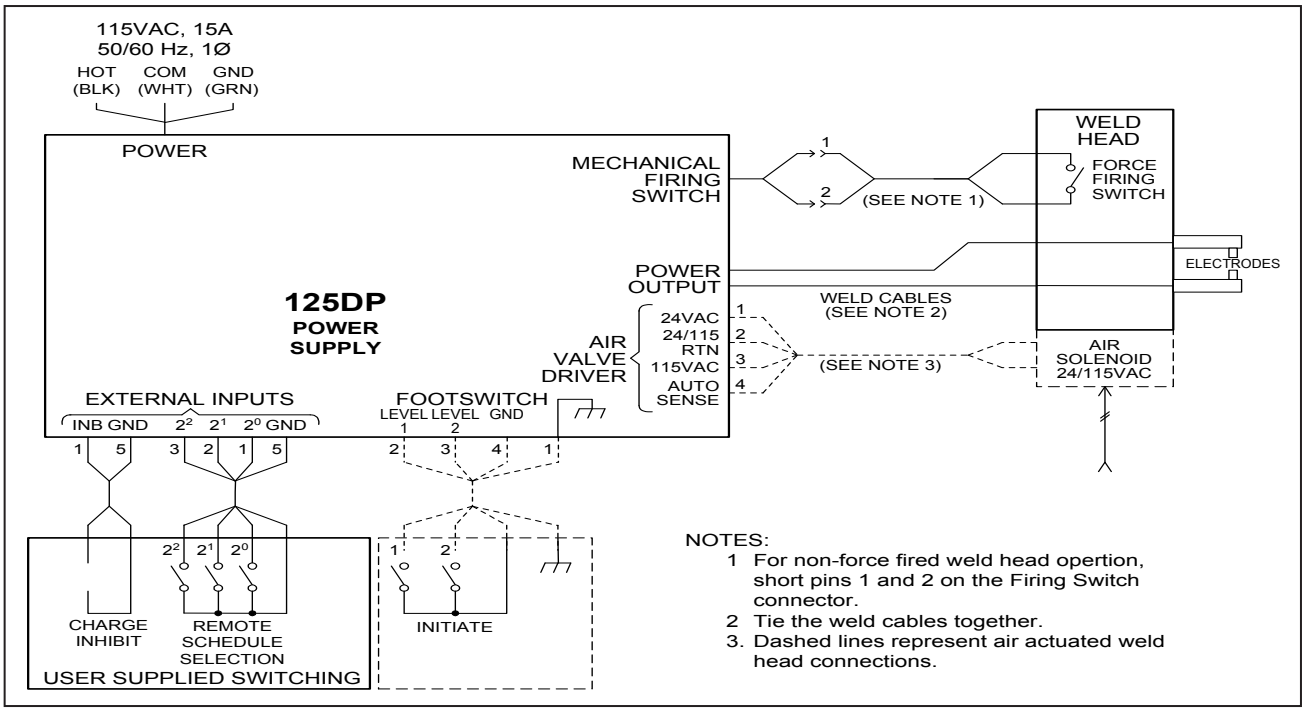


Figure 2-1. Typical set-up diagram for the 125DP showing both Manually Actuated and Air Actuated Weld Head connections.

Welding Cables

Position the 125DP on the work bench approximately 5 inches behind the weld head. Use the cables which are furnished with the weld head to connect the terminals on the back of the weld head to the appropriate terminals on the transformer. Convention is to connect the lower electrode of the weld head or handpiece to the (+) Power Output Terminal and the upper electrode to the (-) Power Output Terminal of the power supply. Refer to Chapter 5 - POLARITY

For proper cable connections and to reduce energy losses follow these recommendations:

a Use the #2 AWG Welding Cables especially if the cables are more than 12 inches long. The diameter of the cables should be as large as practical.

b Use the shortest possible Welding Cables. It is not uncommon to have losses of up to 50% per foot for #6 cables and 20% for #2 cables.

c Bolt terminals together, DO NOT place washers between the terminals of the power supply and the terminals of the cables. Tighten connections securely, they must be free from oxidation, dirt and/or grease. See figure 2-2.

d Route cables so that they do not surround magnetic materials such as air solenoids, tooling, or steel weld heads. See figure 2-3.

e 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%.

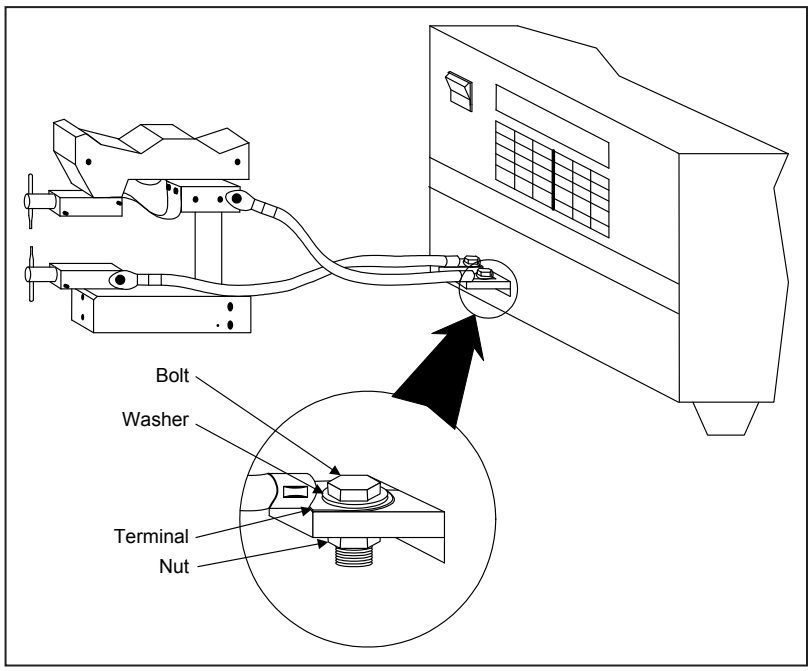


Figure 2-2. Correct Terminal Connection

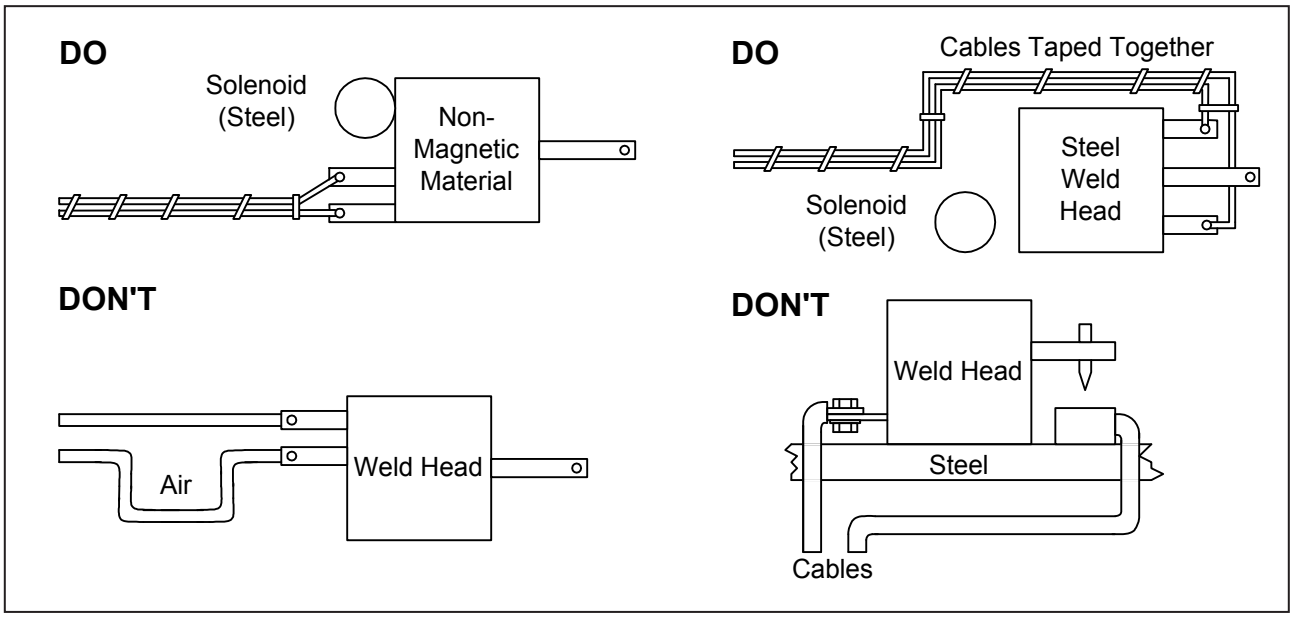


Figure 2-3. Examples of Cable Routings

Firing Switch

Connect the Mechanical Firing Switch located on the rear panel of the 125DP to the mating connector of a Miyachi Unitek weld head or handpiece. Miyachi Unitek weld heads are force fired, instructions for weld heads which are not force-fired are as follows:

Manually Actuated Weld Heads

Connect an external switch to the firing switch connector if the weld head is not force-fired. The weld sequence will be initiated when the external switch is closed. See Chapter 6 - Firing Circuit.

Air Actuated Weld Heads

No firing switch connection is necessary for non-force fired Air Heads. The 125DP has a programmable Squeeze Time feature which automatically initiates the weld sequence after the Squeeze Time has elapsed. Be sure to allow sufficient Squeeze Time to ensure that the weld head has time to close and apply the proper force to the workpieces. See Chapter 3 - Squeeze Time.

Installing Air Actuated Weld Heads

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. All Thinline weld heads are capable of cycling at a rate of 1 weld per second, *provided that the tubing between pressure regulator(s) and the air cylinder is kept as short as possible.* Increasing the length of tubing produces very sluggish mechanical motion.

Connect the inlet port on the Air Valve (Solenoid) to a PROPERLY FILTERED AIR SUPPLY (100 psig maximum). Use 0.25" O.D. I.D. 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. See figure 2-4. Turn the regulator(s) fully counter-clockwise to insure minimum air pressure. Turn on the air supply. Repair leaks if necessary.

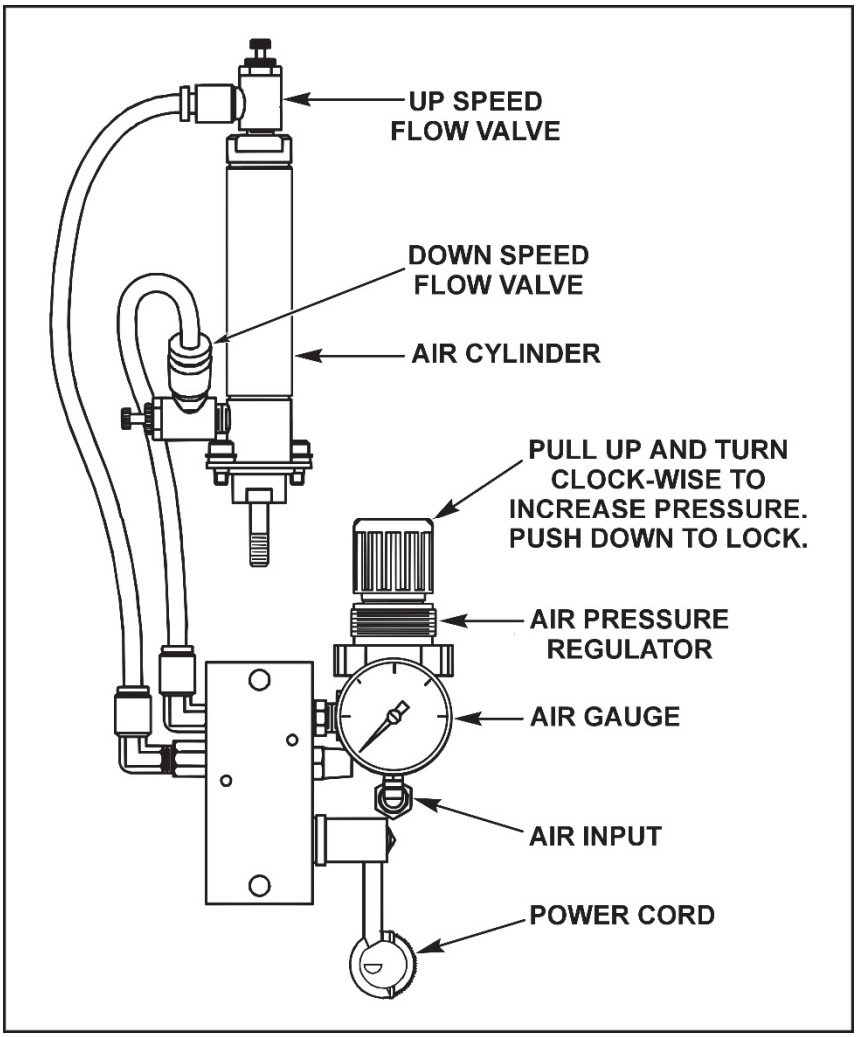


Figure 2-4. Solenoid Air Valve Assembly for Thinline Model 80A

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 workpiece with a fine oil mist. Lubricators are only to be used in automated applications, since excess oil can blow-by worn seals in the air cylinder and be deposited on the workpieces. 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 into the top of the air cylinder.

Air Valve Driver

Connect the plug on the Air Valve (Solenoid) to the Air Valve Driver receptacle located on the rear panel of the power supply. The Air Valve connector is designed to accept the 4-pin 24/115 VAC plug provided on Miyachi Unitek Weld Heads. When the connector is plugged in, the power supply will automatically recognize that an Air Head has been connected.

Miyachi Unitek Air Actuated Weld Heads with standard 3-prong, 115 volt plugs (NEMA 5-15P) require an adapter, Miyachi Unitek Model VDAC, Valve Driver Adapter Cable.

Miyachi Unitek Air Actuated Weld Heads with 4-pin 24 volt plugs manufactured prior to 1991, require a jumper connection. Pin 4 must be jumpered to Pin 2 so that the 125DP can recognize that an Air Head is connected. Refer to Appendix A - Specifications.

Users of Air Actuated Weld Heads which are not manufactured by Amada Miyachi America should connect the air solenoid valve on the head, or regulator valve assembly, to the appropriate 24 volt or 115 volt pins of the receptacle on the rear of the 125DP. See Appendix A – Specifications.

Footswitch

Connect either a 1-Level or 2-Level Footswitch to the FOOTSWITCH Receptacle located on the rear panel. The power supply will automatically recognize which type Miyachi Unitek Footswitch has been connected.

1-Level Footswitch

The 1-Level Footswitch should be fully depressed by the operator. When the Footswitch closes, the power supply will energize the Air Valve on the weld head and the upper electrode will close and apply force to the workpiece. If the Footswitch is released before the weld head applies the Preset Firing Force, the power supply 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 ON, 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 OFF, the welding sequence 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.

Options

It is necessary to remove the outside cover to change the Footswitch Weld Abort and Pulse Width Options. Use the following procedure:

a Switch the Front Panel Power Switch to OFF.

b Disconnect the Power Supply from its power source.

c WAIT 5 MINUTES for the Capacitor Bank to fully discharge.

NOTE: Due to dielectric absorption, a characteristic of all electrolytic capacitors, the capacitor bank may retain its charge, at what could be hazardous levels, until the power supply has discharged fully through the turndown circuit.

d Remove the two screws located at the top rear on each side of the cover.

e LOOSEN the four remaining screws along the bottom on each side of the cover and lift the cover "straight up" to remove it.

Footswitch Weld Abort

When this Option is ON, the operator can abort (terminate) the weld cycle before its completion by releasing the Footswitch. The power supply is shipped with this function ON. If this function is OFF, once the operator presses a 1-Level Footswitch, or the second level of a 2-Level Footswitch, AND the Preset Firing Force has been applied to the workpiece, the operator cannot terminate the welding sequence. FOOTSWITCH WELD ABORT is turned ON or OFF by changing the position of Jumper E10 on the Control Board. See figure 2-5.

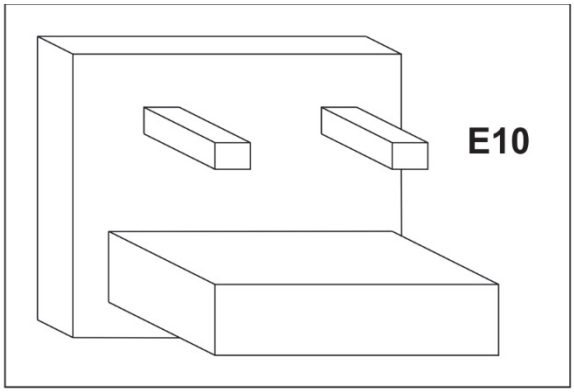


Figure 2-5. Footswitch Weld Abort Jumper in the ON Position

The position of the Footswitch Weld Abort jumper is applicable only when using an Air Operated Weld Head. When using a Manual Weld Head, the Footpedal will always function as if Footswitch Weld Abort was ON regardless of the position of the Jumper on the control board. This means that if the operator releases the Footpedal during the welding sequence, the sequence will abruptly abort (terminate).

Pulse Width Changes

Pulse duration is determined by position of jumpers on the terminals of the Pulse Transformer. The PARALLEL connection results in a SHORT Pulse. The SERIES connection results in a LONG Pulse. The amplitude of the Long Pulse is approximately two-thirds that of the Short Pulse. Refer to Chapter 6. Most welding applications use the Short Pulse. The 125DP is shipped from the factory connected for the Short Pulse.

The pulse transformer is located under the cover at the front left-hand side of the power supply. Figure 2-6 shows the location of terminals 1-4 on the transformer. Figure 2-7 shows the correct position of the jumpers for both short and long pulse duration.

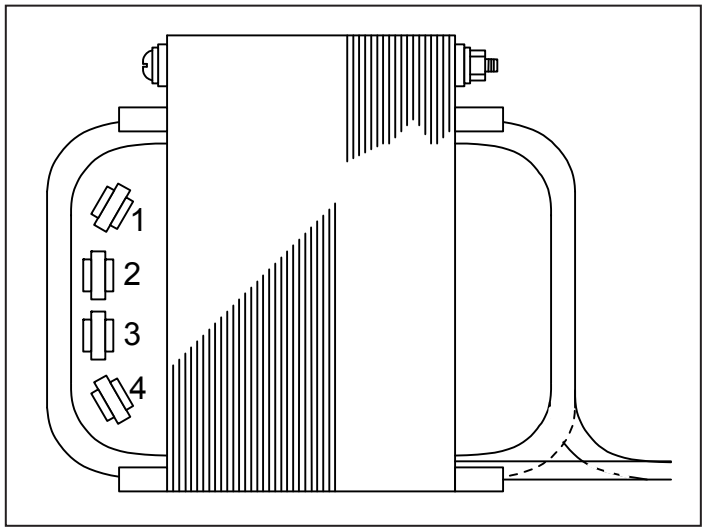


Figure 2-6. Location of terminals 1-4 on the Pulse Transformer

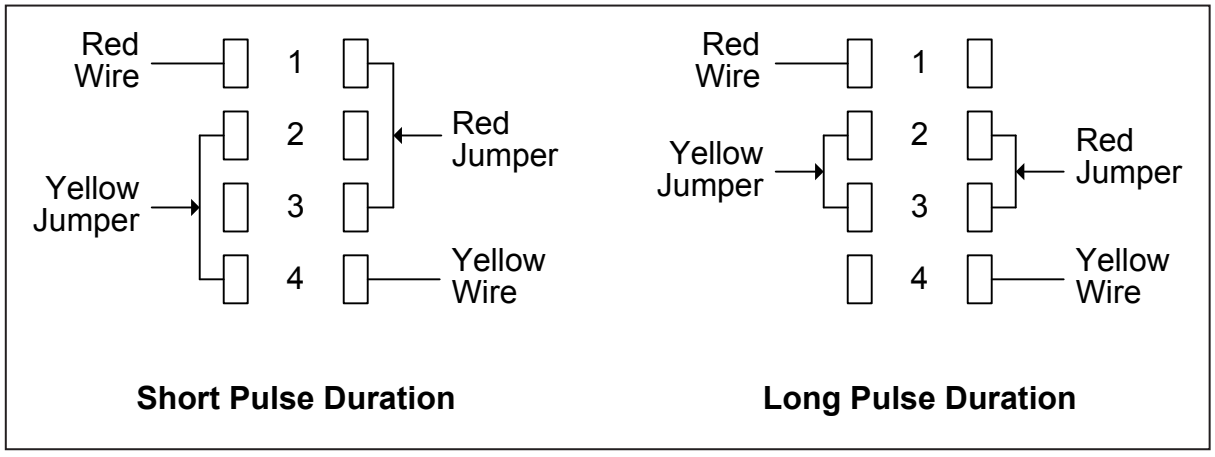


Figure 2-7. Change jumper connections on the Pulse Transformer to select pulse width

Replace Cover

After performing all internal selections, replace cover and screws and tighten securely. After verifying that all necessary installation and modification procedures have been completed, connect the line cord to the proper power outlet.

External Inputs Options

A 9-pin, sub-miniature "D" EXTERNAL INPUTS connector, located on the rear panel, is provided for four single pole inputs which are used to: (a) remotely inhibit recharging of the capacitor bank, and (b) remotely select Weld Schedules #1 through #7. See Appendix A for connector specifications. The pin assignments are:

PIN	FUNCTION
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	Charge Inhibit Line
5	Circuit Ground

When all input pins are open, control of the power supply remains at the Front Panel. When any one of the input pins is shorted, control of the power supply becomes remote and the Front Panel is disabled.

To use CHARGE INHIBIT, connect one wire from the normally open contacts of a user supplied switch to Pin 4 of the EXTERNAL INPUTS connector. The second wire should be connected to Pin 5. See figure 2-8. The switch is closed to inhibit recharging of the capacitor bank while changing schedules using Remote Schedule Selection. Also inhibits the Schedule Display.

To use REMOTE SCHEDULE SELECTION, connect three control lines from a user supplied, normally open contact to the EXTERNAL INPUTS connector, Pins 1, 2, and 3. See figure 2-8. Weld Schedules are selected by shorting across Pin 5 and the appropriate pins coded to the BCD (binary coded decimal) pattern shown in figure 2-9.

Use the following sequence to use Remote Schedule Selection:

a Select [WELD].

b Close Charge Inhibit Switch (Pins 4 & 5) - disables front panel control, inhibits charging of capacitors.

NOTE: If the schedule displayed has not been fired, the capacitors can still discharge.

c Select BCD Schedule Number (Pins 1,2,3 & 5) - schedule is ready to be used.

d Open Charge Inhibit Switch - Schedule is displayed, capacitors charge waiting for trigger.

e After firing, immediately close Charge Inhibit (within 60 ms) - inhibits recharging.

f Select new BCD Schedule Number - new schedule is loaded, but not displayed.

g Open Charge Inhibit - Displays new schedule and capacitors charge waiting for trigger.

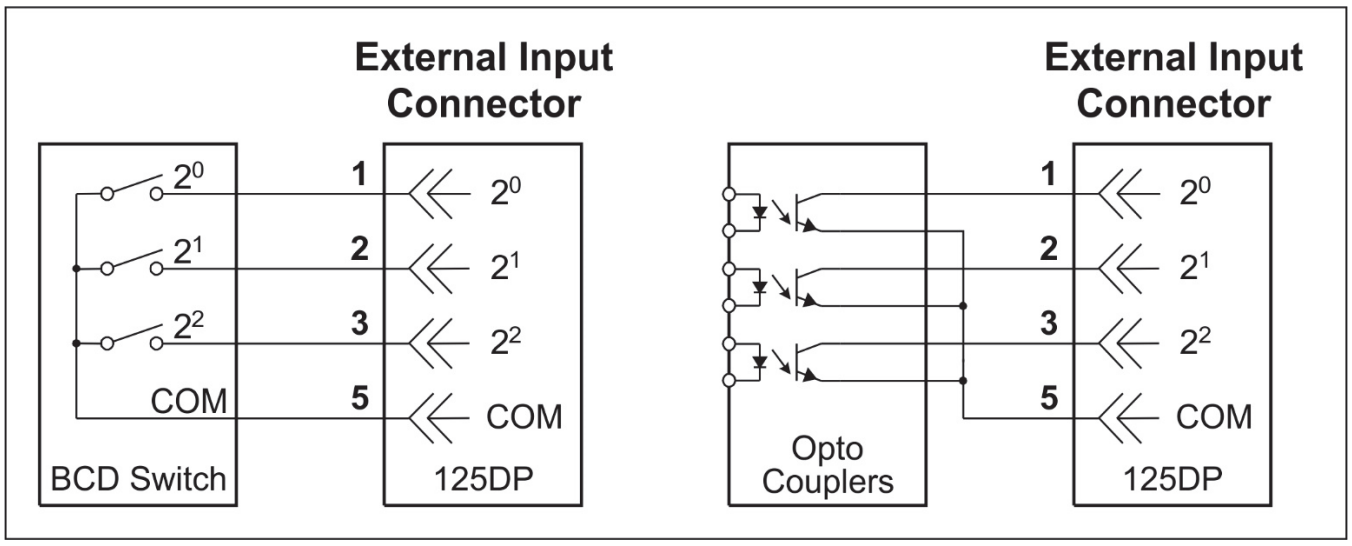


Figure 2-8. Remote Schedule Selection via BCD Coded Switches

NOTE: If only a single schedule is to be executed, it is not necessary to close Charge Inhibit each time the power supply fires.

Input Pin Numbers			
1 (2^0)	**2 (2^1)**	**3 (2^2)**	**Schedule**
0	0	0	Front Panel Control
*1	0	0	#1
0	1	0	#2
1	1	0	#3
0	0	1	#4
1	0	1	#5
0	1	1	#6
1	1	1	#7
* 1 = Switch Closure			

Figure 2-9. Remote Schedule Selection BCD Code

CHAPTER 3
OPERATING INSTRUCTIONS

Section I: Preparing for Operation

Power Up

Push the Power Switch to "ON".

The Software Version number will be displayed briefly across the SCHEDULE and %ENERGY DISPLAYS as follows:

[x.] [xxx] indicates that x.xxx is the Software Version number.

The status of the Schedule Protection Feature will be displayed briefly across the % ENERGY DISPLAY as follows:

[CCC] indicates Schedule Protection is OFF.
[UUU] indicates Schedule Protection is ON.

To prevent firing until ready to weld, select **NO WELD**. The READY indicator should go out and welding will be inhibited.

Select State

The 125DP has two states: the PROGRAM State and the RUN State. Press either **1ST PULSE PROGRAM** or **2ND PULSE PROGRAM** to enter the PROGRAM State. The Program Indicator will flash next to the appropriate key.

Press **RUN** to enter the RUN State. The PROGRAM indicators will stop flashing. The 1st Pulse Indicator is always lit in the RUN State, the 2nd Pulse Indicator will only light when a 2nd Pulse %Energy has been set. Welding is done in the RUN State.

The 125DP will always power up in the RUN state with the last Schedule saved displayed.

Select Schedule

Press **RUN** if a PROGRAM indicator is lit. Press **SCHEDULE ▲▼** to select any schedule number from 0 to 7.

As each schedule is displayed, the 1ST PULSE %ENERGY associated with that Schedule will be displayed.

As soon as **SCHEDULE ▲▼** is released, the capacitor bank will be charged to the %ENERGY displayed.

Change Energy Level

Press **SCHEDULE ▲▼** to select Schedule 0. In the RUN State, only the 1st Pulse for Schedule 0 can be changed. To change the 2nd Pulse or either pulse for Programs 1 to 7, you must first be in the PROGRAM State - refer to Programming Weld Schedules.

NOTE: Any attempt to press **ENERGY ▲▼** in the RUN state to change Schedules 1 through 7 will result in a flashing error message of [ƆƆƆ]. Press [RUN] to clear the error code.

Press **ENERGY ▲▼** to set the Energy Level of the 1ST Pulse. When the key is released the 125DP will charge the capacitor bank to the %ENERGY displayed. The amount of energy used to make the weld is determined by the %ENERGY. For the 125DP, 100% energy is 125 watt-seconds.

Dual Pulse Welding

Dual Pulse Welding consists of two pulse outputs for a single welding sequence. The 1ST Pulse will be immediately followed by the 2ND Pulse. The energy contained in each pulse can be set independently. This feature is useful when welding plated materials and small wires. Typically, the 1ST Pulse should be approximately one-third to one-half the energy of the 2ND Pulse. The 2ND Pulse performs the weld. The 1ST Pulse is used to seat the electrodes and, if applicable, force the plating from the weld area.

SELECT **2ND PULSE** - Press [2ND PULSE PROGRAM]. The %ENERGY of the 2ND Pulse will be displayed. The 2ND PULSE INDICATOR will begin flashing. The 2ND Pulse can now be changed.

Press **ENERGY ▲▼** to change the 2ND PULSE %Energy Display.

Press **RUN** to return to the 1ST PULSE %ENERGY DISPLAY.

The 2ND PULSE INDICATOR will stop flashing.

If a 2ND PULSE has been set, the [2ND PULSE] indicator will light steadily while the 1ST Pulse is displayed.

Select 2nd Pulse - for example:

a) Press **SCHEDULE** ▲▼ to select Schedule 0.

b) Press **ENERGY** ▲▼ to change the %ENERGY of the First Pulse.

c) Press **2ND PULSE** to display the 2ND Pulse.

d) Press **ENERGY** ▲▼ to change the %ENERGY of the 2ND Pulse.

e) Select 000% if a 2ND Pulse is NOT desired.

f) Press **RUN** to return to 1ST Pulse display.

Welding Rate

Do ***not*** exceed either the Hit Rate or Repetition Rate Specifications as shown in Appendix A – Welding Speed.

The Weld Fire Lockout Circuit will not allow the power supply to fire until the capacitors are properly charged or discharged to the selected energy level. *For this reason the Force Firing Switch, located in the Welding Head, must close AFTER the capacitors reach the correct level.* If the Force Firing Switch closes BEFORE the 125DP is properly charged, the Lockout Circuit will ignore the Firing Switch and a weld will not be made.

Set Electrode Force

All Miyachi Unitek Weld Heads are Force Fired. The FIRING SWITCH INDICATOR will illuminate when the Force Firing Switch in the weld head closes. The Force Firing Switch closes when the preset electrode force has been applied to the workpiece. The Firing Switch indicator is the decimal point to the right of the SCHEDULE NUMBER. For non-force fired Air Operated Weld Heads see *Chapter 3, Squeeze Time*.

Ready to Weld

Select **WELD** when you are ready to make a weld. Press **RUN** if the **PROGRAM** indicator is on. When the READY INDICATOR lights the power supply is ready to fire.

NOTE: Before welding verify that all WELD SCHEDULE parameters have been correctly set. Refer to *Chapter 4, Developing Weld Schedules*.

Section II: Operation

Programming Weld Schedules

Program State

Changes to Schedules 1 through 7 must be made in the PROGRAM State.

Press **SCHEDULE ▲▼** to select the Schedule Number you wish to change.

Press either **1ST PULSE PROGRAM** or [**2ND PULSE PROGRAM**] to enter the PROGRAM State. The PROGRAM indicator will flash next the Program Key selected and the %ENERGY for the Pulse Selected will be displayed and can be changed.

NOTE: A flashing display of [UUU] after pressing either PROGRAM Key indicates that the Schedule cannot be changed because the Schedule Protection Feature is ON. See Page 3-7. Press **RUN** to clear the error code and return to the RUN State.

Change 1st Pulse

Press **ENERGY ▲▼** to change the % Energy. When the key is released, the new %ENERGY for the 1ST Pulse will be displayed.

Change 2nd Pulse

If the 2ND PULSE INDICATOR is NOT flashing, press **2ND PULSE**. When the 2ND Pulse is displayed press **ENERGY ▲▼** to change %ENERGY. If a 2ND Pulse is NOT desired, set its %ENERGY to 000%.

You may either SAVE these changes or transfer them to Schedule 0 in the RUN state.

Press **SAVE** and hold down for 1 second. The ENERGY LEVEL DISPLAY will go blank to indicate that the schedule is being saved (written) in the 125DP's permanent memory.

This "new" information will replace the "old" information previously saved for this Schedule. Schedules which are saved are remembered even if the power is switched to OFF. Schedules 0 through 7 can be saved.

After the Schedule has been saved the 125DP will automatically re-enter the RUN State.

NOTE: After entering the RUN state the capacitors will begin to charge to the PROGRAMMED level.

Press **RUN** if you *do not* want to save the changes. The RUN State will be re-entered and the changes will be transferred to Schedule 0. *These changes will remain as Schedule 0 only until the power is switched to OFF since this information was not saved in permanent memory.*

For example:

- Use **SCHEDULE ▲▼** to select Schedule 1.
- Press **1ST PULSE PROGRAM.**
- Now use **ENERGY ▲▼** to select 86%.
- Press **RUN**.

The change made to Schedule 1 has been transferred to Schedule 0 and the 125DP is in the RUN State, ready to make a weld. Schedule 1 has remained unchanged.

Example continued:

- Use **SCHEDULE ▲▼** to select Schedule 1. Notice that the parameters for Schedule 1 are as they were before the 86% Energy entered.
- Press **1ST PULSE PROGRAM**]. Use **ENERGY ▲▼** to select 91%.
- Press **SAVE**.
- Since Schedule 1 was "saved," the %ENERGY for the 1st Pulse was changed to 91% and saved in the 125DP's permanent memory.
- Notice that the information was not transferred to Schedule 0 because **RUN** was not pressed.

Power Up Schedule

The last Schedule which was SAVED will be displayed EACH time the power supply is turned on.

NOTE: This feature can be used to selectively determine the Schedule displayed on power up. To start the next day with the schedule currently in use:

- Press **PROGRAM**.
- Press **SAVE**.

The current Schedule is now the last schedule SAVED and will be displayed when the unit is switched OFF and then ON.

Copying Information in Schedule 0 to another Schedule

Schedule 0 is unprotected, therefore it is assumed that it will be used to develop new weld schedules. After the weld schedule is tested it can be copied, without re-keying, to another schedule and saved in permanent memory

a) Select **PROGRAM**].

b) Use **SCHEDULE ▲▼** to select SCHEDULE 0 if it is not already selected.

c) Press **SAVE**] and continue to hold it down for at least 1 second.

d) The SCHEDULE NUMBER will go blank.

e) Continue to press **SAVE**] and use **SCHEDULE ▲▼** to select another Schedule Number.

f) Release **SAVE** when the desired Schedule number is displayed.

g) The information from Schedule 0 has now been copied to the new Schedule number. BOTH Schedules have the information saved in permanent memory.

Programming Squeeze Time

Users of Air Operated Weld Heads which do not have force-firing switches may use the Squeeze Time feature. Squeeze Time begins when the 125DP recognizes an Air Head Connection and a Footswitch closure (the first Level of a 1-Level Footswitch or the second Level of a 2-Level Footswitch). See *Chapter 2, Installing Air Actuated Weld Heads*. After the Squeeze Time has elapsed the 125DP will fire. It is not necessary to make a Firing Switch connection when using Squeeze Time.

Use the following procedure to program Squeeze Time:

a Press **1ST PULSE PROGRAM**. The 125DP must be in the PROGRAM state to program Squeeze Time. Any Schedule number can be displayed. Squeeze Time is a system parameter and will be used by ***all*** weld schedules.

b Press **1ST PULSE PROGRAM** again and hold. The ENERGY DISPLAY will display SQUEEZE TIME in seconds. The PROGRAM indicators will go out while Squeeze Time is displayed.

c Press **ENERGY ▲▼** while holding **1ST PULSE PROGRAM** to change Squeeze Time. Squeeze Time can be set from 0.1 to 9.9 seconds. To disable set at 0.0.

d Release **1ST PULSE PROGRAM** to SAVE Squeeze Time in permanent memory. Press RUN to return to RUN state.

NOTE: This section of this manual contains instructions which should not be made available to operators or personnel who are not authorized to make Schedule Changes.

Schedule Protection ON

When Schedule Protection is turned ON, all Schedules except Schedule 0 are protected from accidental or unauthorized changes. Changes to Schedule 0 can still be made in the RUN State but cannot be saved to permanent memory. When Schedule Protection is turned ON, [PROGRAM] is disabled:

1 Select **NO WELD**.

2 Press **RUN**.

3 Use **SCHEDULE ▲▼** to select Schedule 0.

4 First press **SAVE** and, while holding it depressed, press **SCHEDULE ▲**.

5 Hold until [UUU] is displayed.

6 Schedule Protection is now ON.

7 When Schedule Protection is ON, an attempt to press **PROGRAM** will result in a flashing error message of [UUU]

Schedule Protection OFF

This code will enable **PROGRAM**:

1 Select **NO WELD**.

2 Press **RUN**.

3 Use **SCHEDULE ▲▼** to select Schedule 0.

4 First press **SAVE** and, while holding it depressed, press **SCHEDULE ▼**.

5 Hold until [UUU] is displayed.

6 Schedule Protection is now OFF. You may now press **PROGRAM** to make changes to all schedules and press **SAVE** to write changes to memory.

CHAPTER 4
DEVELOPING WELD SCHEDULES

This section is a guide to be used in establishing the parameters required to make a successful weld. Careful development of a 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 125DP
Time	PULSE WIDTH selected on 125DP. Number of pulses selected on 125DP.
Pressure	Electrode firing force set on weld head. Surface area of electrode faces.

The interaction between the three basic welding parameters should be considered when developing a Weld Schedule.

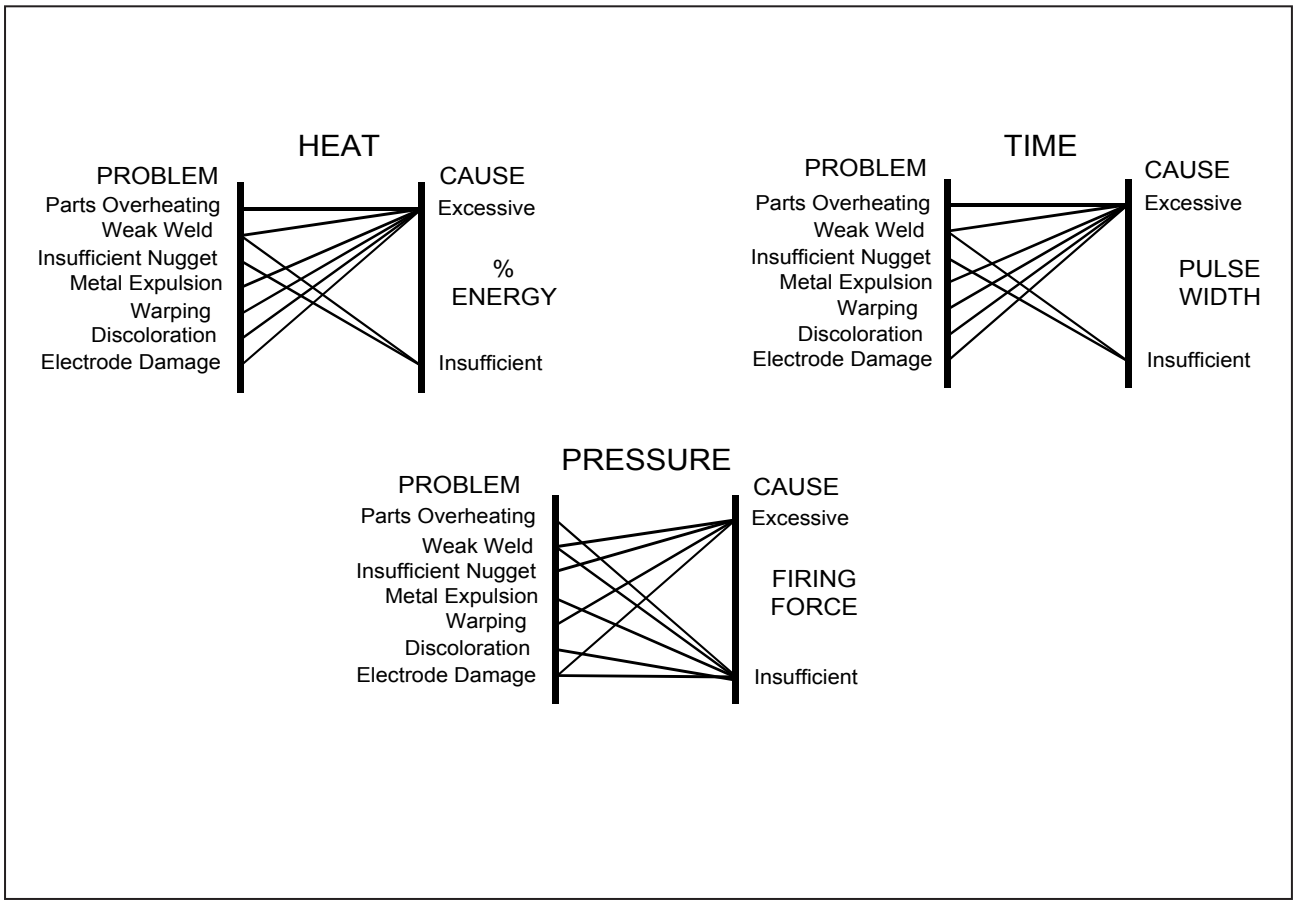


Figure 4-1. A graphic presentation of the effects of %ENERGY, Time and Pressure on the Weld

Procedure

Developing a Weld Schedule is a methodical procedure which consists of making sample welds and evaluating the results. The first weld should be made at low energy settings. Adjustments are then made to adjust the parameters **one at a time** until a successful weld is made.

WELD HEAD - Parameter: Electrode Force

Insert the correct electrodes in the weld head. Refer to the Miyachi Unitek Resistance Welding Catalog for Electrode Material Recommendations.

Use the Force Adjustment Knob on the Weld Head to set the Firing Force. Start at a moderate force setting, #3 on a Miyachi Unitek Weld Head. Figure 4-1 illustrates the effect of electrode force on the part.

Adjust the air pressure for Air Operated Heads. See Chapter 2.

WELD HEAD - Parameter: Area of Electrode Face

Use a flat electrode face for most applications. Use a "domed" face if surface oxides are a problem. If either of the workpieces is a wire, the diameter of the electrode face should be equal to or greater than the diameter of the wire. If both workpieces are flat, the face should be at least one-half the diameter of the electrodes. In any event, "pencil point" electrodes reduce the overall quality of the welding process.

125DP POWER SUPPLY - Parameters: PULSE WIDTH, %ENERGY, NUMBER OF PULSES

Select SHORT pulse width. See Chapter 2

Select Schedule 0. Weld Schedules can be developed using Schedule 0 and then they can be copied to any other Schedule Number

Select 1ST PULSE %ENERGY @ 10%.

Select 2ND PULSE %ENERGY @ 000%. (See Dual Pulse Operation)

Dual Pulse Operation

Dual Pulse Operation can be helpful when welding plated materials, materials with heavy oxidation, or small wires. See Chapter 4. For these applications start as follows:

Select 1ST PULSE %ENERGY @ 5%

Select 2ND PULSE %ENERGY @ 15%.

NOTE: The 1ST Pulse should be ½ to ⅓ the energy of the 2ND Pulse.

Make A Weld

Always observe safety precautions when welding.

CAUTION: Wear your safety glasses.

Select [RUN] and [WELD] on the 125DP.
Position parts between electrodes.
Press the Footpedal or Footswitch to fire the Weld Pulse.

Assuming no weld occurred, increase %ENERGY in increments of 5% until the parts just weld.

If using Dual Pulse, increase the 2ND Pulse in increments of 5% and change the 1ST Pulse to maintain the ½ to ⅓ ratio.

Evaluate 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.

If the weld is satisfactory, make numerous welds, *using the exact physical set-up which is planned for the production line*, to determine if the process is repeatable. Then you should properly document your Weld Schedule and COPY Schedule 0 to one of the 125DP's permanent Schedules (1 - 7). See Chapter 3.

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 4-1.

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. Repeat Make a Weld.

Causes of Imperfect Welds

Table 4-1 lists the effects of the basic welding parameters on weld quality.

Table 4-1. 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 by reversing the weld cable connections, Connecting the lower electrode to the (-) power output terminal. Refer to Chapter 2. The general rule is that the more resistive material, or the thinner material, should be placed against the negative (-) electrode.

Weld Strength Profiles

Weld strength profiles are graphic presentations of the varying effects of %ENERGY, electrode force and weld strength. Make 3 or 4 welds after at the previous settings. Perform pull tests and plot the results. Continue to plot points until any unfavorable characteristic occurs, such as sticking or spitting. Repeat this procedure at different Electrode Forces. Remember, force is the least critical parameter.

Repeat this procedure using the longer pulse width.

Perform pull tests and plot the results of %ENERGY versus Pull Strength (see figure 5-1). Repeat this procedure for different forces and plot a separate curve for each electrode force.

Destructive testing can be performed on the actual workpiece 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.

Evaluate Results

Figure 4-2 illustrates a typical Weld Strength Profile. 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.

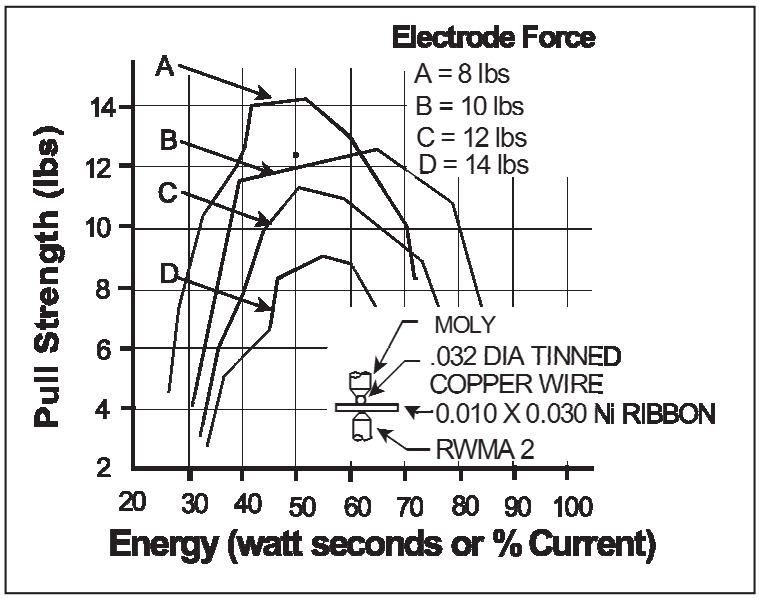


Figure 4-2. Typical Weld Strength Profile

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.

Electrode Maintenance

Depending on use, periodic tip resurfacing is required to remove oxides and welding debris from electrodes.

Select [NO WELD]. On air actuated weld heads, reduce the air pressure to a value just sufficient to lower the upper electrode arm.

Cleaning of electrodes on production line should be limited to use of #400-600 grit electrode polishing disks. For less critical applications, a file can be used to clean a badly damaged tip. However, polishing disks should then be used to ensure that the electrode faces are smooth. If this is not done, the rough surface of the electrode face will have a tendency to stick to the workpiece.

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.

CHAPTER 5
MAINTENANCE

Modification and Calibration

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

WARNING

To avoid electrical shock, use a voltmeter capable of measuring 500 volts to verify that the voltage across the capacitors is less than 30 volts. Due to dielectric absorption, a characteristic of all electrolytic capacitors, the capacitor bank will tend to recharge itself, to possibly hazardous levels, even though the power is off.

Modification of Line Voltage

The power supply is designed to operate at line voltages of 100, 115, 200/208, or 230VAC, 50/60 Hz. To change the operating Line Voltage:

a) Change jumper connections on Control Board. Refer to figure 5-1.
b) Install correct circuit breaker(s). Refer to *Appendix A*.
c) Provide correct line cord plug.
d) Change all labels and tags to indicate the correct line voltage.

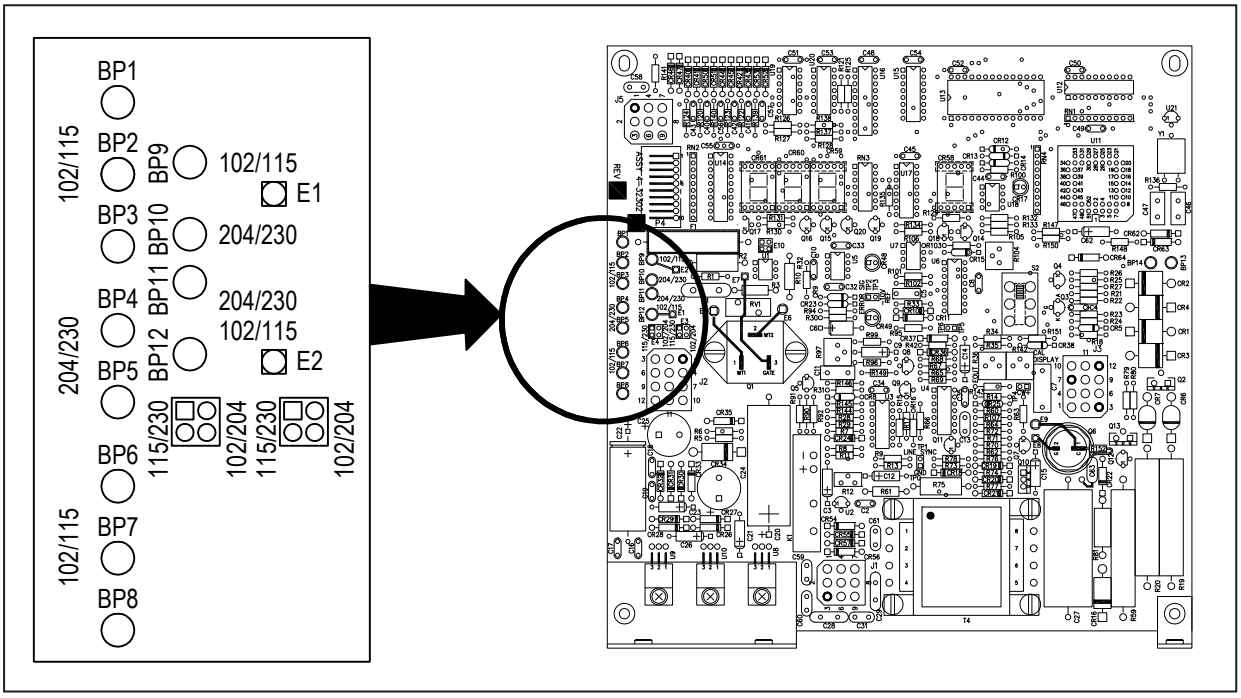


Figure 5-1. Line Voltage pins on Control Board

Calibration

The 125DP should not require any regular adjustments. Use the following procedure as a guideline to *check* the calibration. Care should be taken not to make unnecessary adjustments. Do not hesitate to call the Amada Miyachi America Repair Department with any questions.

1. Push the **POWER** Switch to OFF. Remove the cover.
2. Push to **POWER** Switch to ON. Use a Digital Voltmeter to check the output of the power supplies. Use a Digital Voltmeter to check the output of the power supplies. Using TP0 as ground, the voltages should be as follows:

Nominal Output	Test Point	Acceptable Range
-15 volts	U9, Pin 3	-14.25 to -15.75 volts
+15 volts	U8, Pin 3	+14.25 to +15.75 volts
Comm Supply	CR35 Cathode+	+101.50 to +106.50 volts (115V input) * **NOTE:** With Line Voltage at Nominal, ± 0.1V.
+5 volts	U10, Pin 3	+4.75 to +5.25 volts
+15 volts REF	U2, Pin 1	+14.25 to +15.75 volts

3. Push the **POWER** Switch to OFF, disconnect BP13 or BP14 and remove U5. Push the **POWER** Switch to ON again.

   NOTE: ***Before proceeding***, allow unit to warm up for a minimum of 5 minutes.

4. Use 1st Pulse Program, **% ENERGY▲**, and the **SAVE** keys to set 100% on the **% ENERGY** display. Connect a Digital Microammeter from TP6 to TP0 (Ground). Adjust R104 for a reading of -1000 ± 0.5 µA.

   NOTE: During calibration, reading may drift, but must ***not*** drift more than ±1.5 µA.

5. Switch the **POWER** Switch to OFF. Install U5. Reconnect BP13 and/or BP14. Switch the **POWER** Switch to ON.

6. Set 100% ENERGY. With an accurate Digital Voltmeter connected across the Capacitor Bank, adjust the E_{out} Trimpot to 408 ± 1.0 volts.

7. Set 0.6% ENERGY and adjust R97 to 0 ±0.5 mv at TP5.

8. Set 99.5% ENERGY. Quickly press **RUN** 3 times. The decimal point should begin to flash. Adjust the Calibration Display Trimpot, R142, so that the display remains exactly 99.5%.

   Repeat Steps 7 and 8 above until all readings are within tolerance.

9. Press and hold **RUN**. Press **ENERGY▲** to set 116% ENERGY. The Capacitor Bank Voltage should now read 440 ± 2 volts.

10. Adjust R12 slowly clockwise until U3 Pin 14 goes high. Quickly readjust R12 slightly counter-clockwise until Pin 14 just barely goes low. This must be done within less than 5 seconds or the Circuit Breaker will trip (open).

11. Switch the **POWER** Switch to OFF then ON. This will restore the Automatic 100% Limit. Recheck Step 6 above.

12. Set to 0.6% ENERGY

Troubleshooting

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

a) Overload - Exceeding the duty cycle.

b) Lockup of the output SCR, Q6 (switches ON, but not OFF).

c) Shorting of the charging Triac Q1.

d) Charge shunting SCR, Q2, shorted or locked ON.

e) Charging bridge rectifier diode(s) shorted.

f) Malfunction in the charging regulator which turns on the Overvoltage Protection Lockout Circuit.

g) Malfunction or improper adjustment of the Overvoltage Protection Lockout Circuit.

h) Defective circuit breaker.

i) Miscellaneous short circuits or misconnection of the pulse transformer or the control board.

1. Test the Triac by removing U1 on the Control Board. This should switch the Triac OFF and no current should flow. If it does not turn off, replace the Triac.
2. Test all diodes for shorts by using an ohmmeter.
3. Disconnect the capacitor bank. Charge the bank with an external 400 volt DC power supply. After five minutes, the steady state current should be less than 12 milliamps. If it is not, one or more of the capacitors is shorted. Discharge the bank with a 500 - 2000 ohm, 25 watt resistor and replace the defective capacitor.



CAUTION

Do ***not*** discharge the bank by directly shorting it with a screw-driver, clip lead, or the like. The stored energy could be sufficient to melt them in an explosive manner.

4. Replace Cover - After performing any modifications and checking internal connections replace cover and tighten screws.

Repair Service

Telephone Service

Call the Amada Miyachi America 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 Miyachi America 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 Miyachi America 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

Stored Energy Rating

0.75 to 125 watt-seconds (joules).

Energy Display

The accuracy of the display is 0.5%. The resolution of the display ranges from 0.1% to 0.6% energy, depending upon the amount of energy selected.

Line Voltage

Table A-1. Line Voltage

Nominal Line Voltage volts RMS	Line Voltage Range volts RMS	Line Frequency Hz	Peak Input Current * amps	Circuit Breaker Size amps	No. of Breakers Required
100	87 – 113	50 / 60	13	4	1
115	100 – 130	50 / 60	15	4	1
208	180 – 235	50 / 60	8.2	2	2
230	200 – 260	50 / 60	7.5	2	2
* First half-cycle					

Fusing

A ½ amp fuse is located on the control circuit board.

Circuit Breaker(s)

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-1

Power

Approximately 1325 watts charging and 25 watts stand-by.

Capacitor Bank

The full bank of four capacitors total 1500 µF ±5% at 20º C. Four capacitors are grouped in two banks of two capacitors. At full rating, the Capacitor Banks are operated at 408 volts. The Pulse Width characteristics as well as the Hit Rate and Repetition Rate can be changed by disconnecting one-half of the Capacitor Bank. See the two paragraphs below.

Line Voltage Regulation

Maintains voltage on the capacitor bank within ± 0.25% of setting for a ± 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.

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.

Firing Circuit

Requires external contact closure or low logic level for firing. Internal filtering prevents premature firing due to radio frequency interferences (RFI).

Output Pulse Characteristics

Pulse characteristics are measured at the Power Output terminals, across a non-inductive .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 between the 10% amplitude points.

Table A-2. Output Pulse Characteristics

Pulse Transformer Connections	Capacitor bank	Rise Time	Pulse Length	Minimum Pulse Height
Parallel (Short	1500 µF	0.65 ms	2.3 ms	7.0 – 7.7v
	750 µF	0.45 ms	1.7 ms	6.1 – 6.7v
Series (Long)	1500 µF	1.05 ms	4.0 ms	4.5 – 5.0v
	750 µF	0.80 ms	3.2 ms	4.2 – 4.6v

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-3. Welding Speed

	1500 µF Capacitor		750 µF Capacitor BANK	
Percent Full Energy	**Rep Rate (welds/min)**	**Hit Rate (welds/min)**	**Rep Rate (welds/min)**	**Hit Rate (welds/min)**
Under 2%	265	305	330	375
10%	130	215	190	290
25%	85	160	135	225
50%	62	120	108	175
75%	52	86	92	137
100%	45	60	84	107
Conditions: 25°C Ambient, Nominal Line Voltage, 60 Hz.				

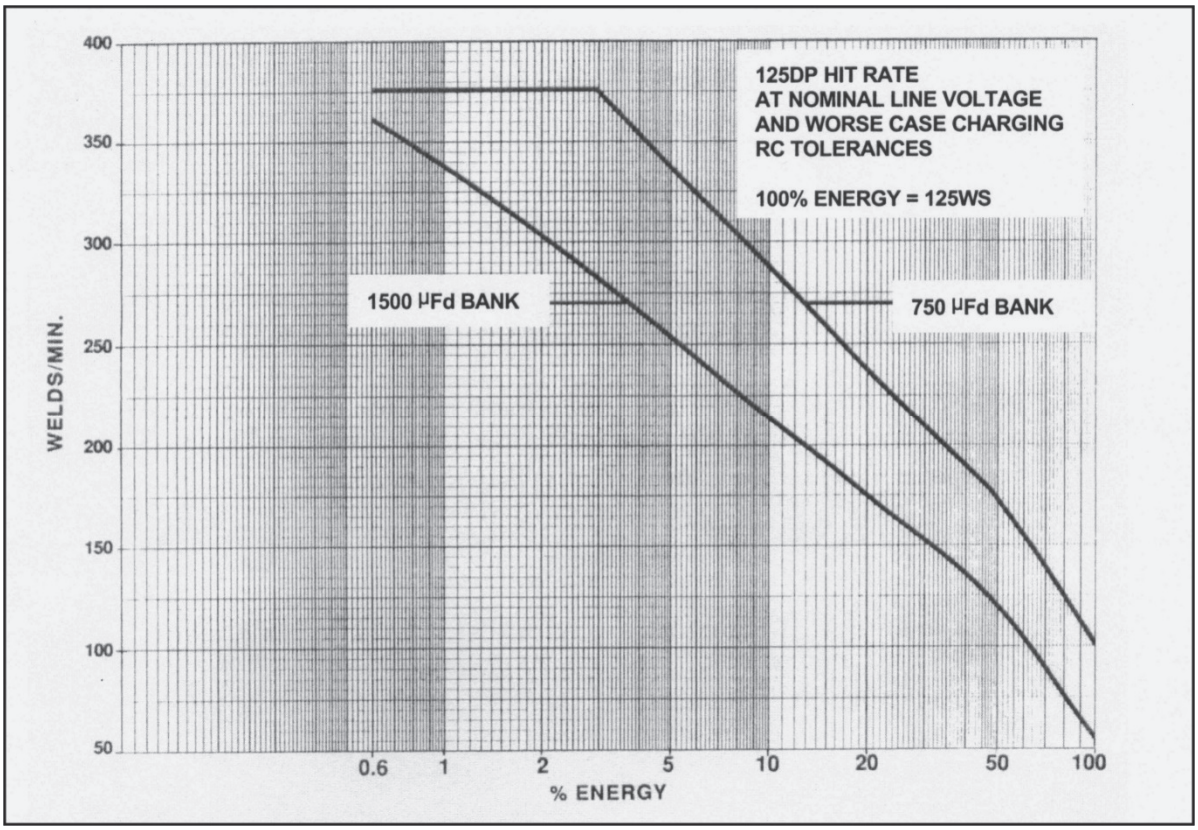


Figure A-1. Hit Rate of 125DP with 1500 µF and 750 µF Capacitor Bank

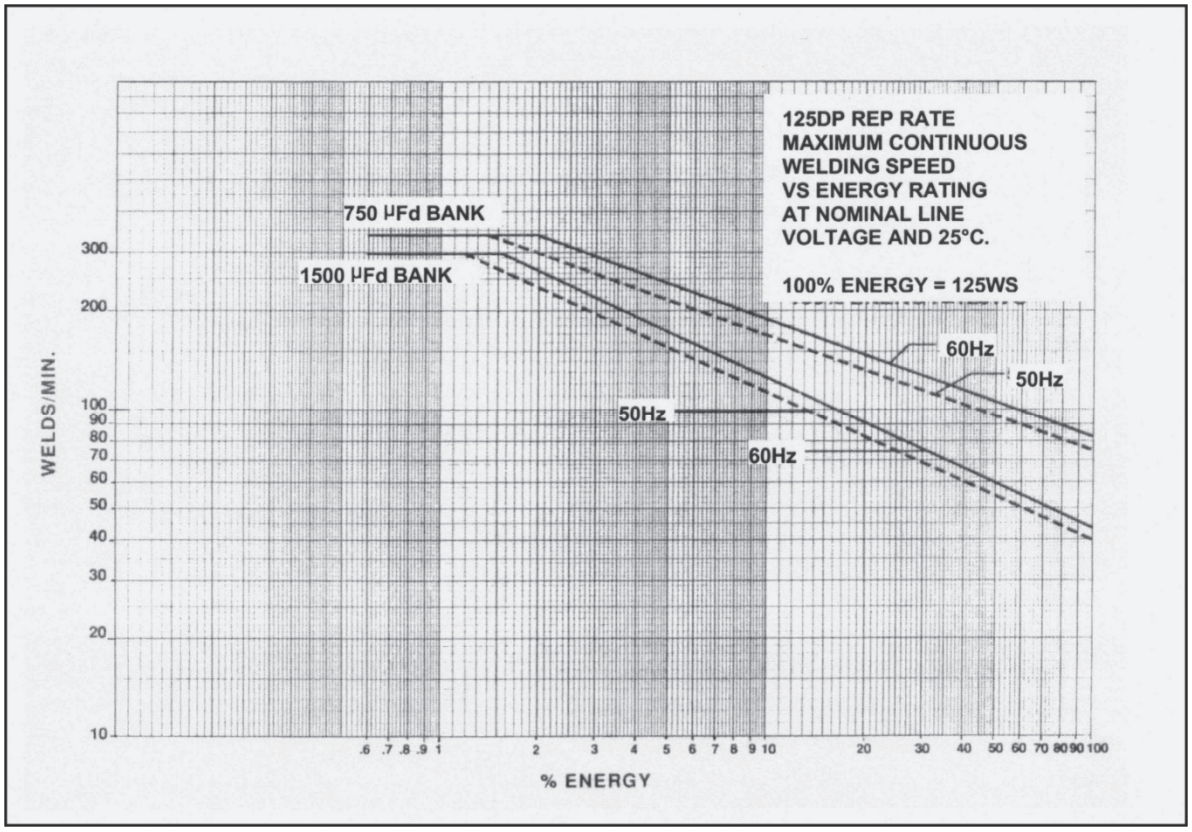


Figure A-2. Repetition Rate, Maximum Continuous welding Speed of Model 125DP

Dual Pulse Welding Speed

The Repetition Rate or Hit Rate for Dual Pulse operation may be calculated as follows:

Refer to table A-3 or figures A-1 and A-2.

Find the Repetition Rate or Hit Rate for each individual pulse.

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.

$$RR_{(1+2)} = \frac{(RR_1)\,(RR_2)}{RR_1 + RR_2} = \text{welds/minute}$$

For example, with a 1500 µf capacitor bank, if the energy level of **Pulse 1** is 25% and **Pulse 2** is 75%, the repetition rate for the dual pulse weld would be:

$$RR_{(1+2)} = \frac{(85)\,(52)}{85 + 52} = 32.2 \text{ welds/min.}$$

Power Cord

5 foot cable is Type SJT, 3 conductor, 16 AWG stranded wire.

Firing Switch

Required for all weld heads or handpieces, the 5 foot cable is Type 2/C, 600 volt, with 2 shielded, twisted 22 AWG conductors of high-flex stranded wire. Firing switch connector is an Amphenol 80-MC2FI with strain relief that mates with an Amphenol 80-MC2M.

Footswitch Connector

Provided for connection of Air operated Weld Heads. The receptacle is a 4-pin Amphenol 91-PC4F (550-1-006) that mates with an Amphenol 91-MC4M (520-1-009) connector. Connect Pin 3 to Pin 4 on a user supplied 1-Level Footswitch. This connector is wired as follows:

Pin	Wire Color	Description
1	-	Chassis Ground
2	Blue / White	Footswitch Level #1 or Single Level Footswitch
3	Green	Footswitch Level #2
4	Violet / White	Common

Air Valve Driver

Provided for direct connection of 24 or 115 VAC Solenoid for Air operated Weld Heads. The receptacle is an AMP 206430-1 (550-1-062) 4-Pin receptacle which mates with an AMP 206429-1 (520-1-107) plug. Connection of a standard 115 volt plug can be accomplished by using the Miyachi Unitek Model

VDAC Adapter. Connect Pin 2 to Pin 4 on a non-Miyachi Unitek Air Actuated Head. The connector is wired as follows:

Pin	Wire Color	Description
1	Red / White	24 volt AC
2	Black / White	115 and 24 volt AC return
3		115 volt AC
4		Air Head Sensing

Cooling

Muffin type fan, 115V, 50/60 Hz. Air inlet is underneath the unit, exhaust is to the left. No restriction to air flow should be closer than two inches to the side of the 125DP. *Do not place the rear lefthand corner of the power supply in a corner in such a manner that the exhaust air will recirculate.*

External Inputs Connector

A 9-pin, sub-miniature "D" EXTERNAL INPUTS connector, located on the rear panel, is provided for four single pole inputs which are used to: (a) remotely inhibit recharging of the capacitor bank, and (b) remotely select Weld Schedules #1 through #7. The 9-pin connector is a 3M, #928642-01-09-31 (250-1-185). The mating TRW Cinch Connector consists of a DP-9P (250-1-193) male connector with a DE-51218-1 (250-1-194) plastic junction shell. The pin assignments are:

Pin	Description
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	Charge Inhibit Line
5	Circuit Ground

To use Remote Schedule Selection connect three control lines from a user supplied, normally open contact to the mating EXTERNAL INPUTS connector, Pins 1, 2, and 3, see figure 2-8.

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 immediately upon receiving a signal on any one of the control lines.

Shorting Pin 4 to Pin 5 will close the Charge Inhibit Line, and prevent recharging of the Capacitor Bank while a weld schedule is being selected. This line must be closed immediately after the power supply fires, before the 60 ms commutation pulse has ended. See Firing Circuit.

The weld schedule is selected by shorting across Pin 5 and the appropriate pins coded to the BCD (binary coded decimal) pattern shown in figure 2-9. The charge inhibit line must be closed or the capacitor bank will begin to recharge before the correct schedule has been selected.

The schedule is executed by disconnecting Pin 4 from Pin 5 and opening the charge inhibit line.

BCD codes are listed below:

Input Pin Numbers			
1 (2^0)	**2 (2^1)**	**3 (2^2)**	**Schedule**
0	0	0	Front Panel Control
1	0	0	#1
0	1	0	#2
1	1	0	#3
0	0	1	#4
1	0	1	#5
0	1	1	#6
1	1	1	#7
* 1 = Switch Closure			

Physical Characteristics

See figure 4-5.

Height:	9.50 inches	(24.2 cm)
Width:	13.00 inches	(33.0 cm)
Depth:	13.25 inches	(33.7 cm)
Weight:	44.0 lbs.	(20.0 kg)

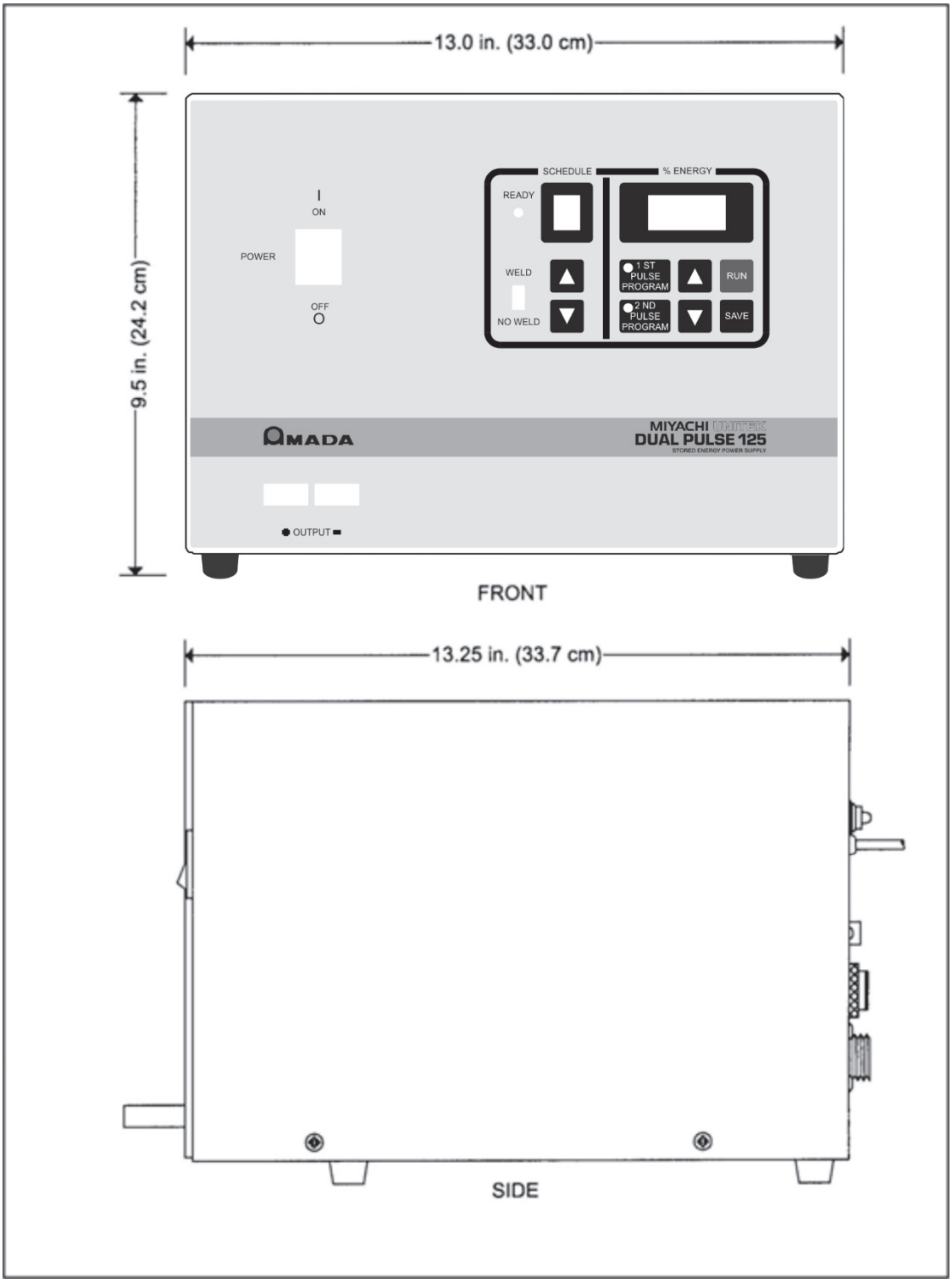


Figure A-3. 125DP Outline Drawing

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