

INVERTER POWER SUPPLY

IS-800CA/1400CA

USER MANUAL



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F	46130	12/20	Update I/O Schematics in Appendix B
G	46311	04/21	Add EU Disposal statement
H	47208	01/24	Update Mounting Dimensions, Duty-Cycle and Manual Title

FOREWORD

Thank you for purchasing an AMADA WELD TECH IS-800CA/1400CA Inverter Power Supply. For the rest of this manual, the **IS-800CA/1400CA** will be referred to simply as ***the 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, California 91016
Phone: (626) 303-5676
FAX: (626) 358-8048
e-mail: info@amadaweldtech.com

About This Manual

The purpose of this manual is to supply operating and maintenance personnel with the information needed to properly and safely operate and maintain the IS-300CA Inverter Power Supply.

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

Should any 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.

This manual covers the following models:

Original Model Name	Original P/N		Current Model Name	Current P/N
IS-800CR, 380V, non CE	IS-800CR-xx-xx	→	IS-800CA/380	IS-800CA-xx-xx
IS-800CR, 380V, CE	IS-800CR-xx-xx	→	IS-800CA/380/CE	IS-800CA-xx-xx
IS-800CR, 480V, non CE	IS-800CR-xx-xx	→	IS-800CA/480	IS-800CA-xx-xx
IS-800CR, 480V, CE	IS-800CR-xx-xx	→	IS-800CA/480V/CE	IS-800CA-xx-xx
IS-1400CR, 380V, non CE	IS-1400CR-xx-xx	→	IS-1400CA/380	IS-1400CA-xx-xx
IS-1400CR, 380V, CE	IS-1400CR-xx-xx	→	IS-1400CA/380/CE	IS-1400CA-xx-xx
IS-1400CR, 480V, non CE	IS-1400CR-xx-xx	→	IS-1400CA/480	IS-1400CA-xx-xx
IS-1400CR, 480V, CE	IS-1400CR-xx-xx	→	IS-1400CA/480/CE	IS-1400CA-xx-xx

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CHAPTER 1

SYSTEM DESCRIPTION

Section I: Features

Basic and Advanced Units

The AMADA WELD TECH IS-800CA/1400CA is an inverter-type power supply specially designed for spot welding and fusing. The IS-800CA provides 800 amps of primary current, while the IS-1400CA provides 1400 amps of primary current.

The IS-800CA/1400CA can be ordered as a **Basic** (IS-800CA/1400CA-Ax-xx) or **Advanced** (IS-800CA/1400CA-Bx-xx) unit. The feature differences are highlighted below and throughout the manual. For the rest of this manual, the AMADA WELD TECH IS-800CA/1400CA will simply be referred to as ***the Power Supply***, unless a feature or procedure unique to a specific model is described.

You program and monitor Power Supply operation by using the external MA-660A Program Unit which is sold separately. This Program Unit is commonly referred to as “the Pendant.” For the rest of this manual, the MA-660A will simply be referred to as ***the Pendant***.

- The power supply accepts 3-phase voltage from 380 VAC or 480 VAC (model dependent).
- Welding-current monitoring function for judgment of weld quality.
- Six control systems:
 - Primary constant-current effective value control.
 - Secondary constant-current effective value control.
 - Secondary constant-power effective value control.
 - Primary constant-current peak value control.
 - Secondary constant-voltage effective value control, and Constant-phase control for stable weld quality. The control method can be set for WELD1 to WELD3, respectively.
 - Pulse and upslope (downslope) can be set for WELD1 to WELD3, respectively.
- The welding frequency can be adjusted from 600 – 3000 Hz in 100 Hz steps in each schedule. Higher frequencies aid in the welding of finer applications. Please match the frequency of the welder to the transformer.
- Comes equipped with a current-shutoff function, which shuts off current in response to external input (e.g., displacement of the electrode) for WELD1 to WELD3 respectively, ensuring stable fusing.
- Use of an inverter allows for high power factor and stable power conditions.
- Easy setting of a variety of items through the menu selection system.
- Applicable to inverter transformers manufactured by various companies by changing the frequency (600 Hz to 3,000 Hz in units of 100 Hz).

CHAPTER 1: SYSTEM DESCRIPTION

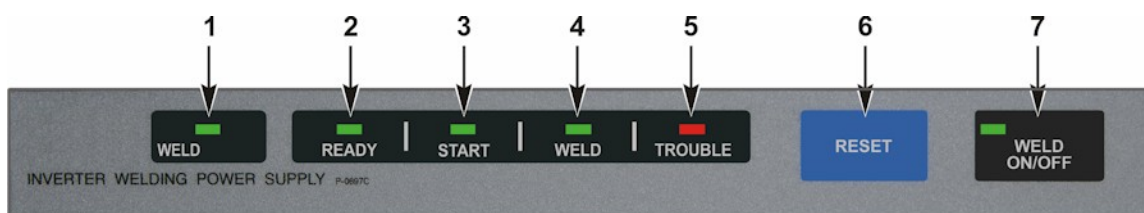
- Seven protective functions for maximum ease of operation:
 - No-current / no-voltage
 - Over current
 - Temperature
 - Self diagnostics
 - Grounding error
 - Load short error
 - Phase error
- Circuit breaker with rotary handle is included (IS-800CA: 250 amps, IS-1400CA: 400 amps).
- 120 VAC, 150 VA valve transformer standard, 250 VA optional.
- 24 VDC valve voltage: 2 amps (optional), 5 amps (optional).
- Output contactors optional.
- CE compliance optional.
- RS-232 communications standard, RS-485 optional.

Advanced Models Only

- **IS-800CA/1400CA:** The analog output terminal (voltage output proportional to force) for electro-pneumatic proportional valve and the analog input terminal (voltage input proportional to force) for force measurement have two channels, respectively.
- **IS-800CA/1400CA:** Welding can be stopped at the set displacement by connecting the displacement gauge and measuring the displacement produced in fusing.

Section II: System Components

Front Panel



1. WELD POWER Lamp

Indicator that lights when the power is supplied to the Power Supply.

2. READY Lamp

Indicator that lights when the system is ready to start welding. For this status to exist, the following conditions must be met:

- The **WELD ON/OFF** button must be pressed to ON (The **WELD ON/OFF** indicator is lit)
- The **WELD ON/OFF** setting on the MA-660A pendant must be ON, and
- External **WELD ON/OFF** signal must be ON.

3. START Lamp

Indicator that lights when the Start signal is present.

4. WELD Lamp

Indicator that lights when the weld current is flowing.

5. TROUBLE Lamp

Indicator that lights when trouble is detected. The Pendant will also make a beeping sound. When this condition occurs, the unit operation is interrupted.

6. RESET Pushbutton Switch

This switch resets a trouble condition **only if the trouble has been corrected**. If the cause of trouble is not removed, the operation will again be interrupted and the **TROUBLE** indicator will light again. After the RESET pushbutton switch is pressed, the START signal must be re-sent to the Power Supply for welding to begin.

7. WELD ON/OFF Pushbutton Switch

This switch enables the unit to weld. When **ON**, the green indicator lights. When operating, the switch needs to be held until the green LED lights (or goes out). This is one of three conditions required to place the unit in the Ready condition; see "READY," above.

CHAPTER 1: SYSTEM DESCRIPTION

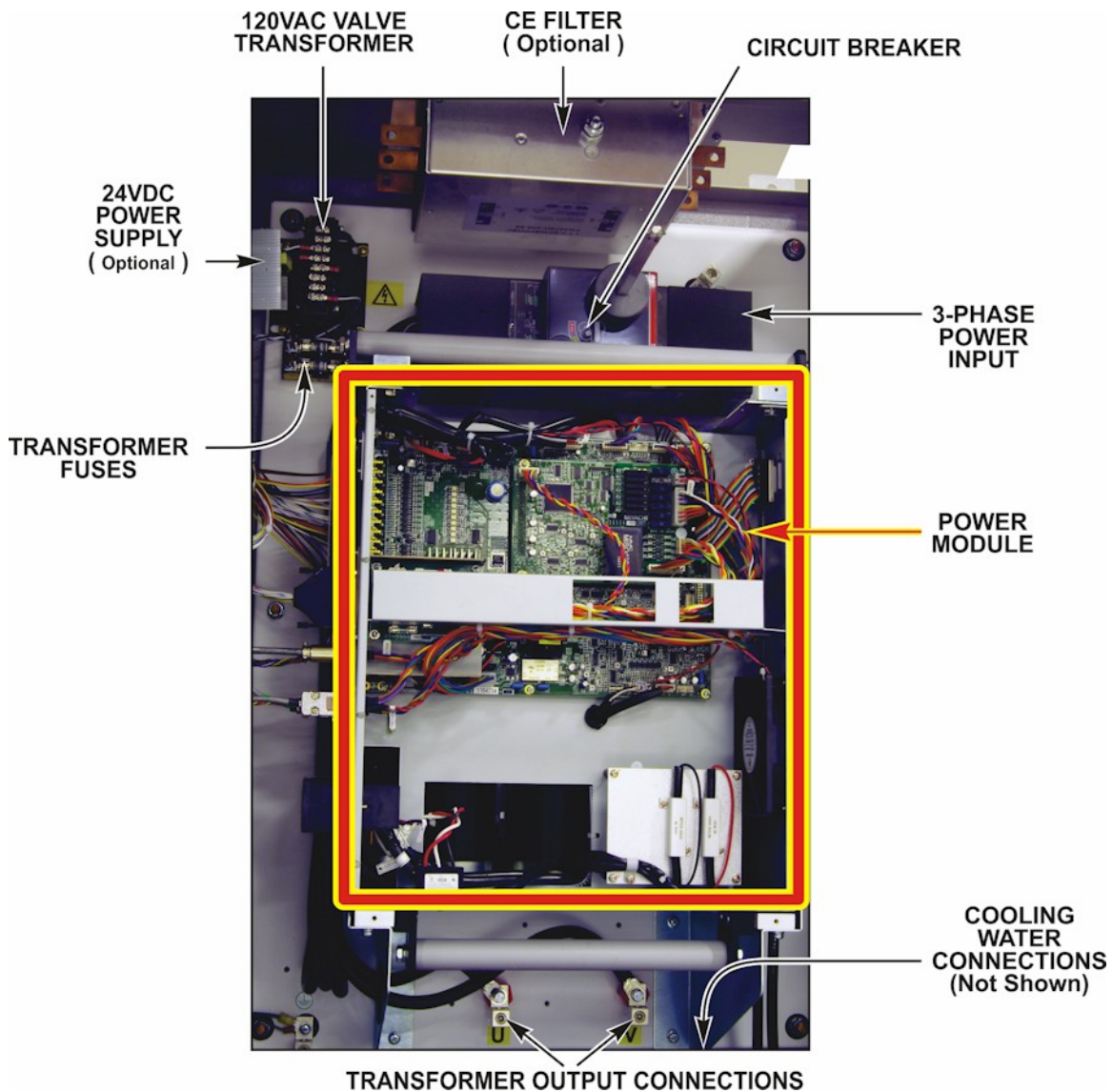
Internal Components



DANGER

Do **not** touch the inside of the **Power Supply** for at least 20 minutes after power down, since you may get a severe electric shock.

NOTE: There are minor differences between the size and connector locations between the IS-800CA and the IS-1400CA, but in all other respects the internal components of the two models are identical.

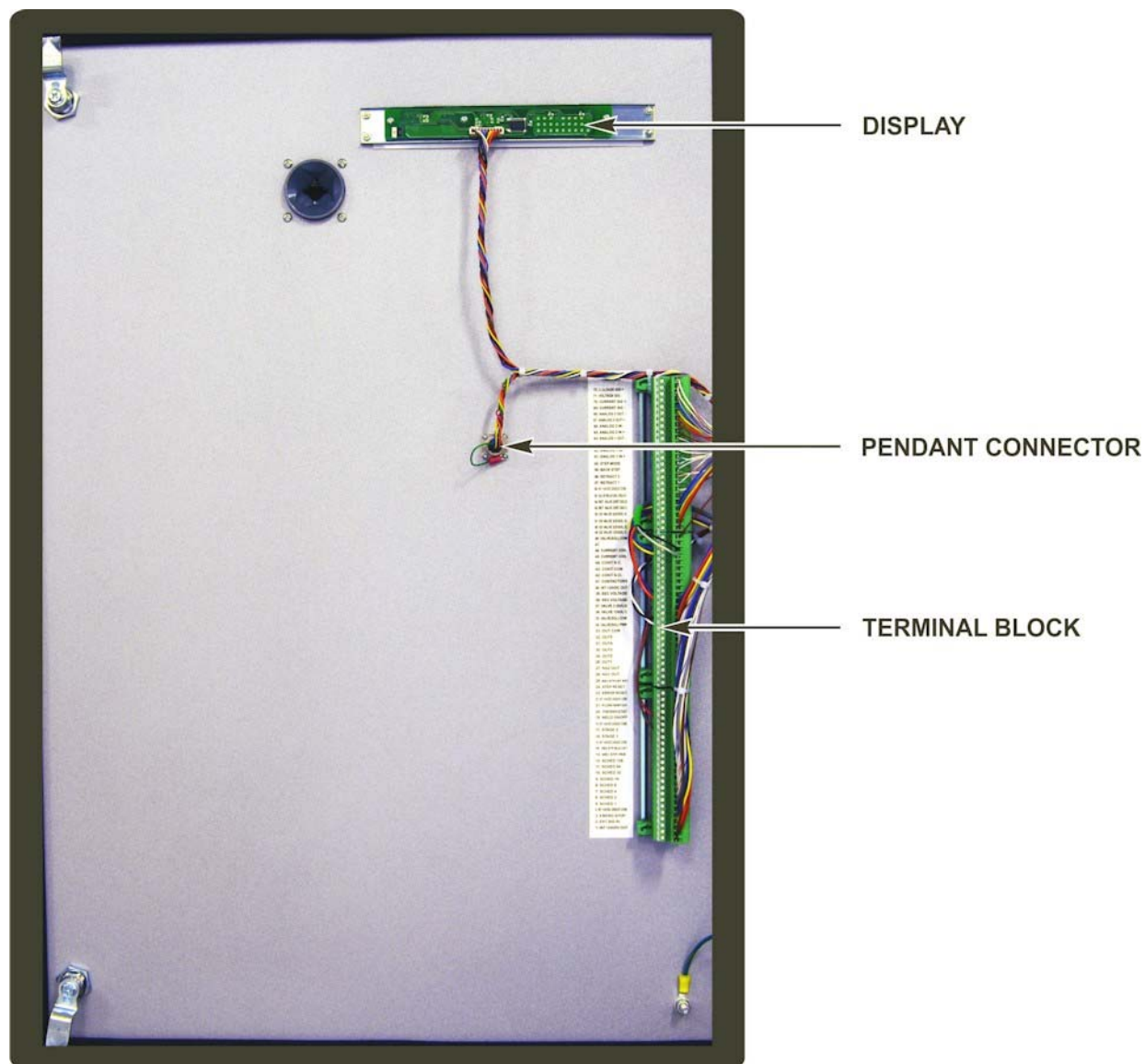


IS-800CA/1400CA INVERTER POWER SUPPLY

Connecting Terminal Strip for External Input / Output Signals

Used to input start signals and output trouble signals.

NOTE: The IS-800CA **Basic** model is shown here. The IS-800CA **Advanced** has more I/O connections



CHAPTER 1: SYSTEM DESCRIPTION

CHARGE INDICATOR Lamp

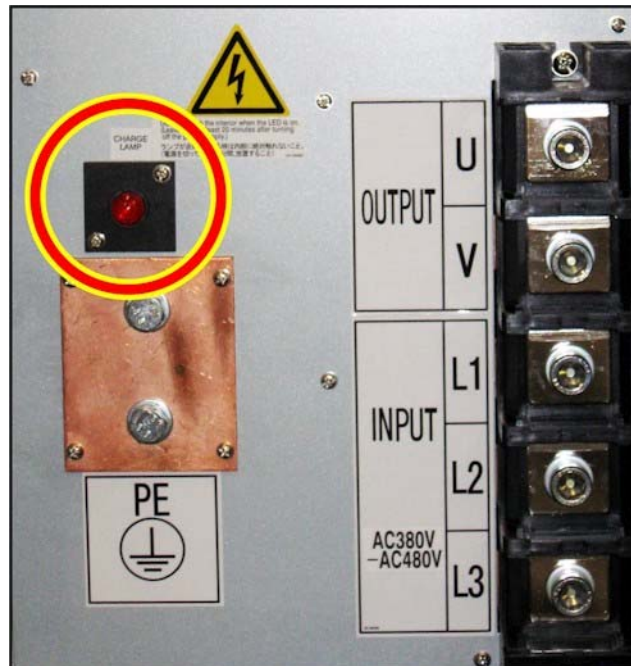


DANGER

Lethal voltages are present when the capacitors are charged. Do **not** touch the interior of the Power Supply when the LED is ON. ***Leave it alone for at least 20 minutes after turning the Power Supply OFF.***

This lamp is located on the panel next to the transformer **INPUT/OUTPUT** terminals on the Power Module.

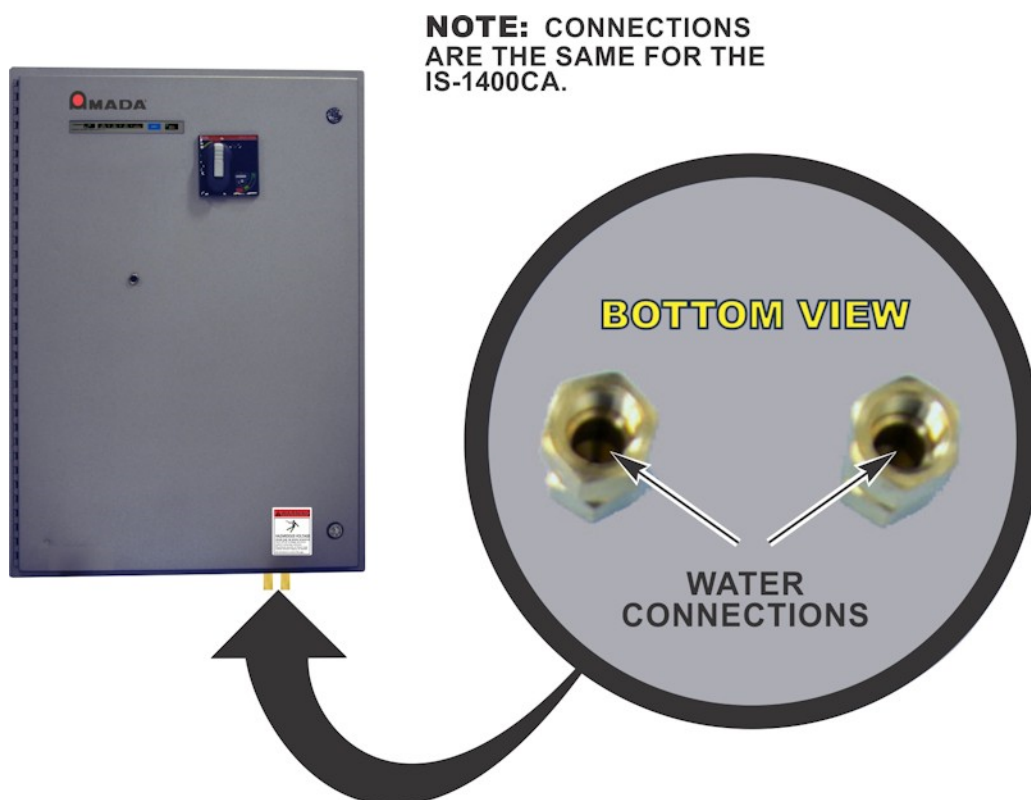
The charge level of this electrolytic capacitor is indicated by the brightness of the **CHARGE INDICATOR** lamp. The more the capacitor is charged, the brighter the **CHARGE INDICATOR** lamp will be.



External Connections

Cooling Water Pipe Connectors

Used for the supply (input) and drain (output) of cooling water, which cools the inside of the enclosure and power supply unit.

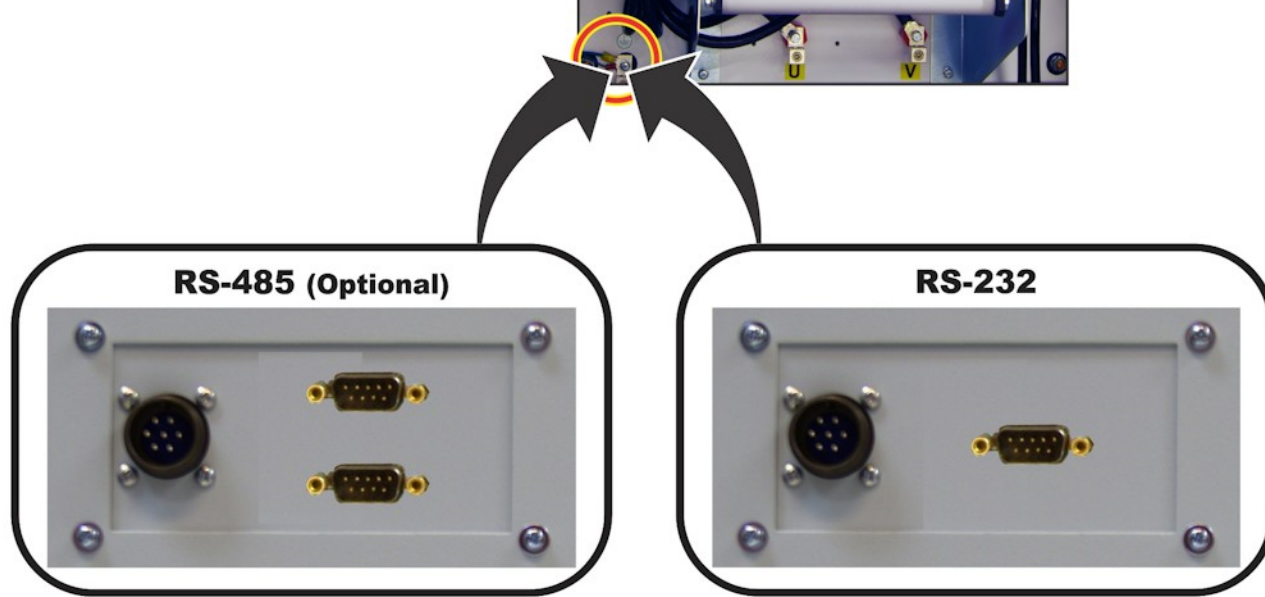


CHAPTER 1: SYSTEM DESCRIPTION

RS-485/RS-232C Connector

For external communication see *Appendix F, Communications*.

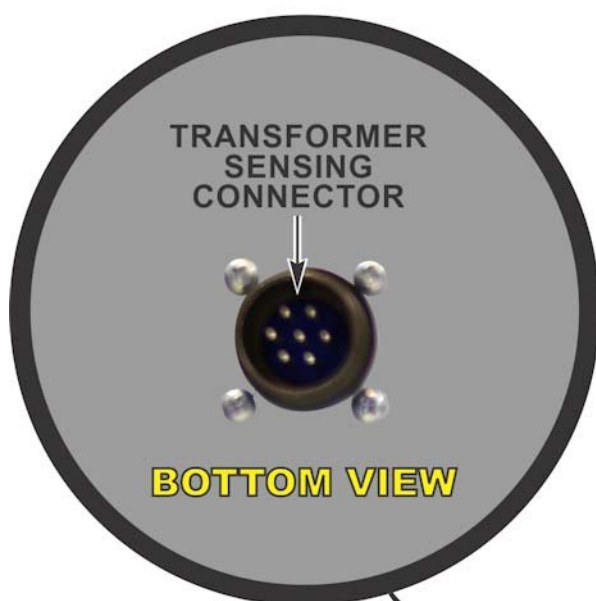
NOTE: IS-800CA SHOWN
HERE. CONNECTOR
LOCATION IS THE SAME
ON THE IS-1400CA.



TRANSFORMER SENSING CONNECTOR (Optional Toroidal Coil)

The Toroidal Coil is attached on the transformer away from the Power Supply. The signal comes through the **TRANSFORMER SENSING CONNECTOR** on bottom of Power Supply. The coil is used for the secondary constant-current effective value control and secondary constant-power effective value control.

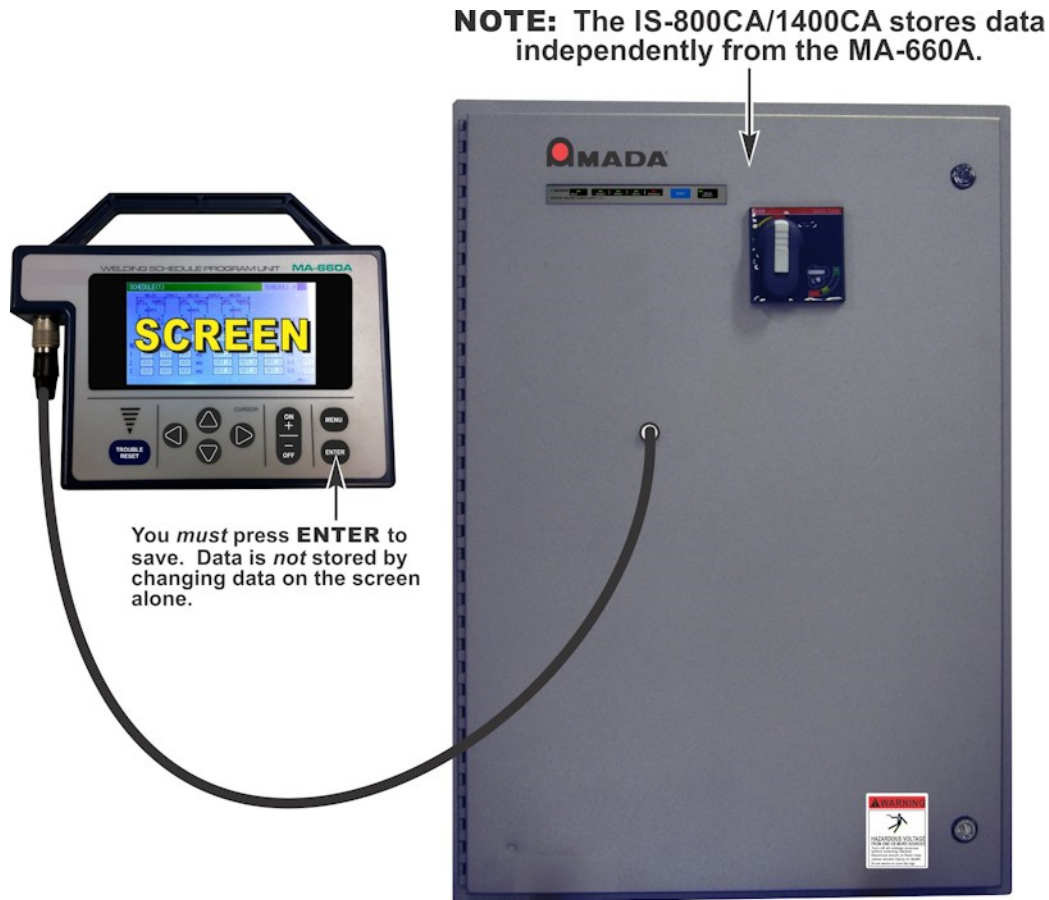
NOTE: CONNECTION IS THE SAME FOR THE IS-1400CA.



CHAPTER 1: SYSTEM DESCRIPTION

MA-660A Program Unit (“The Pendant”) (Sold Separately)

The **Power Supply** uses the **Pendant** to set the weld schedules and see the monitored results. The Pendant is connected to the Power Supply by a cable attached to the connector on the front door of the Power Supply as shown below.





TROUBLE RESET key

Press this key after the cause of trouble is eliminated. Once selected all error messages that appear on the screen will turn off.

CURSOR Keys

Used to move the cursor or to select an item.

+ON/-OFF Keys

Used to change the value of a selected item or turn it on and off.

ENTER Key

Used to write the set or changed value and [ON/OFF] data in the Power Supply connected to the MA-660A. After any data is set or changed, be sure to press this **ENTER** key to write that data before moving the cursor.

If this **ENTER** key is not pressed, the Power Supply connected to the MA-660A will not recognize the set data.

CHAPTER 1: SYSTEM DESCRIPTION

The Power Supply writes data into FLASH ROM on the control board when a setting is changed or a schedule data is copied. The **READY** lamp on the front panel and the external **READY** signal are turned off during writing. Check that the **READY** lamp is turned on to start welding.

It takes about 3 seconds maximum to change a setting, about 125 seconds to copy a schedule, and about 5 seconds maximum to initialize schedules in FLASH ROM. During that time, do not turn off the power.

MENU Key

Used to display the **MENU** screen. Press this key to return to **MENU** screen from any other screen.



CAUTION

No setting changes can be made while the start signal is ON or during a weld sequence.

If a setting is changed during the welding sequence, an error message will appear. Press the **TROUBLE RESET** key to clear the message.

Also, when making a screen change to call up another setting schedule during a welding sequence, the **TROUBLE RESET** key will not work even if the following screen appears. In this case, you need to recycle the power to the Unit.



(When connecting to the Power Supply, **IS-800CA/1400CA Advanced**)

CHAPTER 2

INSTALLATION AND SETUP

Section I: Planning

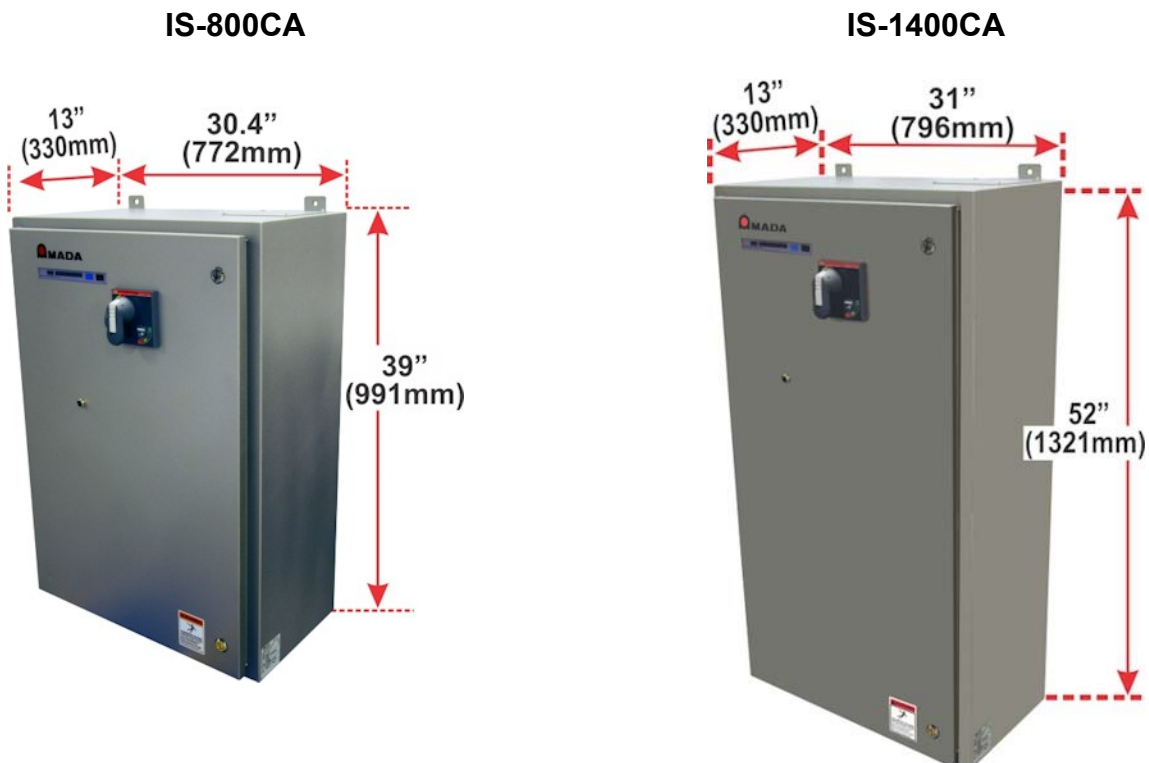
Environmental Factors

We recommend that you install the Power Supply in a well-ventilated area that is free from excessive dust, weld expulsion, acids, corrosive gasses, salt, moisture, oil, coolant, and contaminants. Allow adequate space around the unit for power and signal cabling runs, water-cooling hose connections, and to open the front door. Electrical input is made from the top of the Power Supply; output power (to the weld transformer) is made from the bottom of the Power Supply. Signal connections may be made from either the top or bottom of the Power Supply.

The Power Supply is designed to work in the following ambient conditions:

- Temperature: 41 – 104 °F (5 – 40 °C)
- Humidity: Less than 90%, non-condensing

Space and Mounting Requirements



Power Requirements

Power required for the Power Supply is three-phase, 380 or 480 VAC (nominal), 50-60 Hz. When changing the input voltage, the valve transformer input leads will need to be changed to the new voltage.

NOTES:

- All items other than IS-800CA are sold separately.
- In the secondary constant-current effective value control and secondary constant-power effective value control, a toroidal coil and a volt-sensing cable are required. Connect the volt-sensing cable near an electrode and connect the opposite side of the cable to pins 38 and 39 on the external I/O terminal strip.

NOTE: If used with AMADA WELD TECH - IT Transformers, you can purchase the 18-045-01 transformer sense cable which will have these connections.

- The screw of terminal block for welding power input (output) is M8 hexagon bolt 18 mm long for the IS-800CA and M12 hexagon bolt 20 mm long with cross-recessed head.

Section II: Installation



CAUTION

- Make sure the mounting location can support the **weight** of the unit!
- A “2-man” lift should be used for unpacking and installation due to the weight of the unit!
- We recommend removal of the plates before drilling and punching, but if plates cannot be removed, be sure all metallic shards are removed from the Power Supply after completion of the work.

Unpacking

Unpack the Power Supply from its shipping crate. Carefully save and store packing materials for future storage or shipment of the Power Supply.

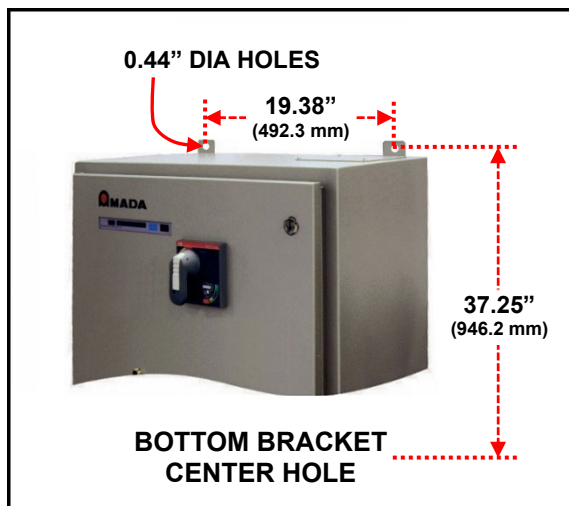
Installation

Installation consists of mounting the unit and making power, signal, and cooling water connections.

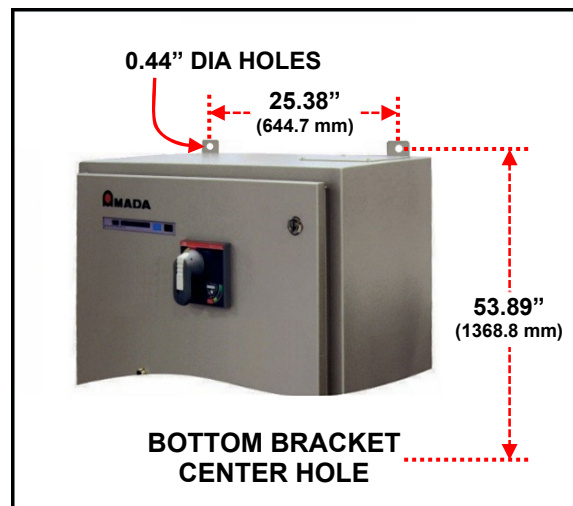
Mounting the Power Supply

The unit has four mounting tabs, two with mounting holes, and two with mounting slots, as shown below. As each installation is different, no mounting hardware is provided with the unit. The holes on the mounting tabs are 0.44-inch diameter, and are designed for 7/16” screws or bolts. You will need to provide the appropriate screws or bolts, flat and lock washers, and nuts.

1. Loosely install the two lower mounting screws.
2. Slide the Power Supply bottom (slotted) tabs into the two lower mounting screws.
3. While the Power Supply is being held in place, install the two upper mounting screws then tighten the two lower mounting screws.



IS-800CA Mounting



IS-1400CA Mounting

Electrical Connections



DANGER

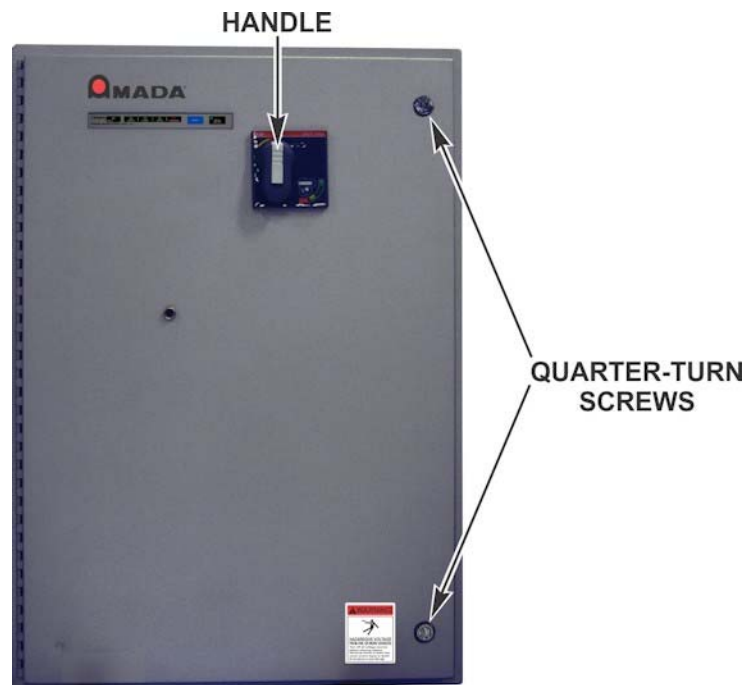
- Do **not** install power to the Power Supply without the input power service being turned off and tagged. Serious injury or death can result from contacting live power lines.
- The installer **must** make electrical connections in accordance to all applicable codes. For appropriate cable rating, see *Appendix B, Electrical and Data Connections*.

Input Power Connections

Electrical input is made from the top of the Power Supply through the Line-In cover plate. We recommend removal of the cover plate to an area away from the Power Supply before drilling holes. This will reduce the need to protect the electronics from metallic shards that otherwise could damage the unit or injure personnel.

1. Make sure the input 3-phase power coming from the wall is off.
2. Open the front door by turning the two quarter-turn screws and turning the handle.

NOTE: When the handle is turned and the door opened, the circuit breaker turns OFF.



3. Remove the terminal cover from the top of the circuit breaker by grasping the cover on both sides and pulling it toward you.
4. Remove the four screws that secure the Line-In Cover Plate directly above the circuit breaker.
5. Drill appropriate hole(s) in the plate to receive the input power conduit(s).

NOTE: Remove **all metal shards**, then re-install the plate.

6. Install service conduit to plate and feed input power cables into the Power Supply.
7. Connect three-phase power cables to the three socket head screws in the circuit breaker. Input is not phase dependent.

8. Connect the ground cable to the chassis ground terminal to the right of the circuit breaker.
9. Slide the circuit breaker terminal cover back on to the circuit breaker.
10. Remove the four screws that secure the Line-Out Cover Plate on the bottom of the Power Supply.
11. Drill appropriate hole(s) in the plate to receive the weld transformer power conduit(s).

NOTE: Remove all metal shards, then re-install the plate.

12. Install the weld transformer conduit to the plate and feed cables into the Power Supply.
13. Connect the ground cable to the ground lug.
14. Connect the two transformer cables to connectors labeled U and V in the power module.

Breaker

Breaker Rated Current

Calculate the average Input current using output current (momentary maximum current) and duty cycle:

$$\text{Effective continuous current} = I \times 0.817 \times \sqrt{\frac{\alpha}{100}}$$

$\left[\begin{array}{l} I : \text{Output current (momentary maximum current) of IS-800CA/1400CA} \\ \alpha : \text{Duty cycle (\%)} \end{array} \right]$

Select the breaker rated current of at least the average input current above. Check the coordination of output current (momentary maximum current) and tripping time on the tripping characteristic curve of the breaker to select the appropriate breaker.

Output current = 500 A / Duty cycle = 15%	
$500 \times 0.817 \times \sqrt{\frac{15}{100}} = 158 \text{ (A)}$	
Breaker of at least 158 A (e.g., 175 A or 200 A) must be selected.	

Input / Output Cable

An input/output cable is determined by the average input current and the average output current. Calculate the average input current and the average output current using output current (momentary maximum current) and duty cycle.

$$\text{Effective continuous current} = I \times 0.817 \times \sqrt{\frac{\alpha}{100}}$$

$$\text{Effective continuous current} = I \times \sqrt{\frac{\alpha}{100}}$$

$$\left[\begin{array}{l} I : \text{Output current (momentary maximum current) of IS-800CA/1400CA} \\ \alpha : \text{Duty cycle (\%)} \end{array} \right]$$

Check the manufacturer's characteristic table to select the cross section of the cable according to the allowable current. Although a four-core cable is used for input cable and a three-core cable is used for output cable, one of the cores is for grounding. Therefore, use the allowable current of three cores for input cable and that of two cores for output cable.

Output current (momentary maximum current) = 300 A / Duty cycle = 15%

Average input current is as follows.

$$300 \times 0.817 \times \sqrt{\frac{15}{100}} = 95 \text{ (A)}$$

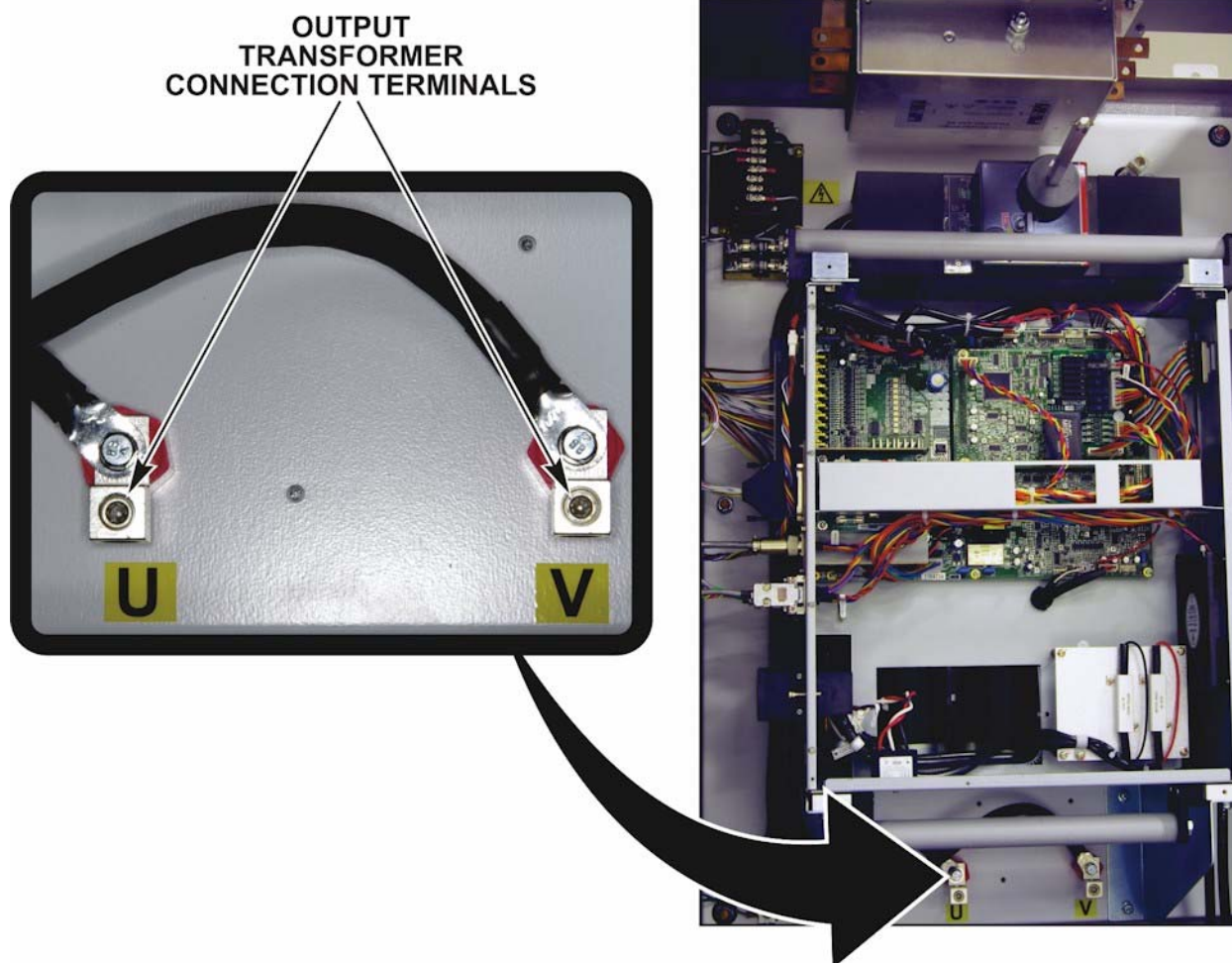
Average output current is as follows.

$$300 \times \sqrt{\frac{15}{100}} = 116 \text{ (A)}$$

Use a cable of a nominal cross section with 95 (A) or more of allowable current of three cores for input cable and 116 (A) or more of allowable current of two cores for output cable.

Output Power Connections

Weld transformer connections are made from the bottom of the Power Supply through the Line-Out Cover Plate. We recommend that you remove the cover plate to an area **away** from the Power Supply **before** drilling holes. This will reduce the need to protect the electronics from metallic shards that otherwise could damage the unit or injure personnel.

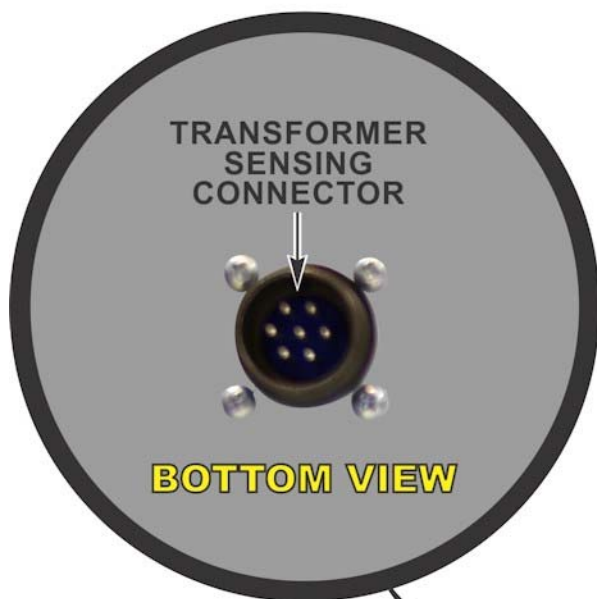


CHAPTER 2: INSTALLATION AND SETUP

Signal Sensing Connections

See *Appendix B, Electrical and Data Connections, Section I, Data Connectors* for connector pin information and *Section II, Input / Output Signal Configuration* for connection and configuration instructions.

NOTE: CONNECTION IS
THE SAME FOR THE
IS-1400CA.



Section III: Cooling Water

Cooling Water Requirements

The connections to the Power Supply are made with $\frac{3}{8}$ " FNPT fittings through the bottom of the Power Supply. We recommend the installation of quick-disconnect fittings to expedite water draining or Power Unit replacement. See *Appendix A, Technical Specifications* for cooling water specifications.

CAUTION: If the temperature drops below 32 °F (0 °C), the water inside the Power Supply can freeze and damage the equipment. If the temperature is likely to drop **below** 32 °F (0 °C), drain the water in accordance to the procedure in *Chapter 4, Maintenance*. To prevent condensation, which may damage the Power Supply, do **not** run cooling water through an unused Power Supply unit if the water is 4 °F (2.2 °C) **below** the minimum operating ambient temperature. Therefore, take special care to keep the water temperature above the minimum operating ambient temperature.

The installation site should be free of sudden temperature fluctuations and the humidity should be $\leq 85\%$ (non-condensing).



CAUTION:

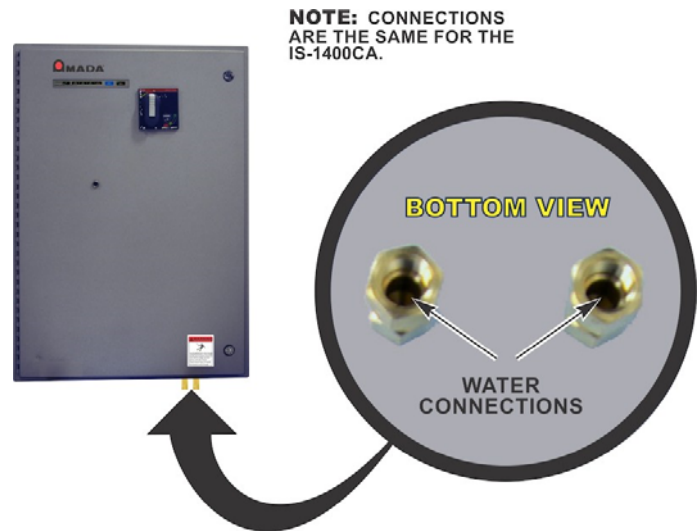
Verify that the cooling water lines do not condense with moisture. If necessary, increase the external cooling water temperature to raise the dew point and prevent condensation.

Cooling Water Hose Connections

CAUTION: Do **not** perform service on cooling system unless the Power Supply is turned OFF and breaker handle tagged! (Lock-Out Tag-Out)

NOTE: Internal Cooling Water hoses are factory-installed with quick-disconnect fittings.

1. Install a water flow failure indicator on the water outlet. The flow failure indicator output signals should be connected to the appropriate pins of the I/O Signals terminal block.



2. **After** you connect all cooling water hoses, turn the water ON and check for leaks.

NOTE: Adjust the cooling water flow rate to at least 2 L/min. If it is low, the IGBT thermostat error will be detected and operation will stop.

CHAPTER 3

USING PROGRAMMING FUNCTIONS

Section I. Introduction

This chapter shows Pendant screens used for both **Basic** and **Advanced** models of the Power Supply. Functions related to the **Advanced** models *only* will be noted in the text.

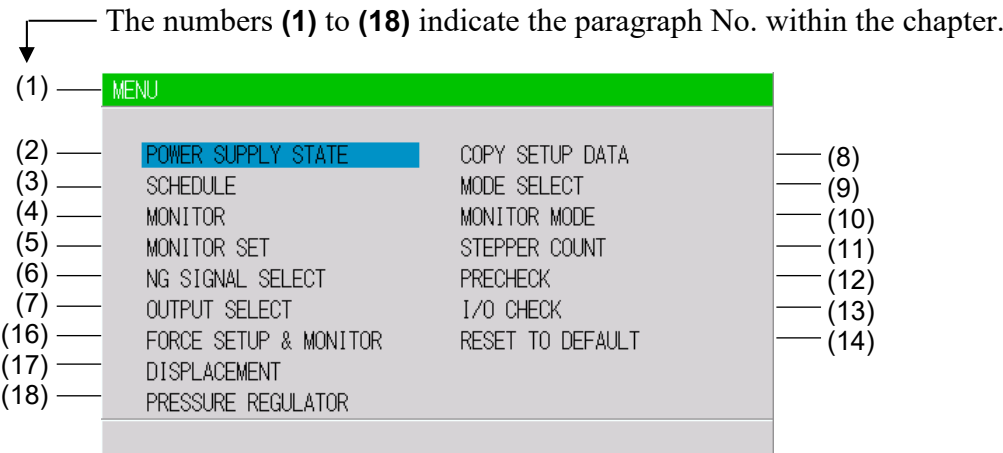
FLASH ROM The Power Supply writes data into FLASH ROM on the control board when a setting is changed or a schedule data is copied. The **READY** lamp on the front panel and the external **READY** signal are turned off during writing. It takes about 2 seconds at longest to change a setting and about 1 minute to copy a schedule into FLASH ROM. During that time, do *not* turn the power OFF. When you have finished programming, make sure the **READY** lamp is turned ON in order to start welding.

SHADED CHARACTERS Items for which a value must be input, or which must be set ON or OFF will be **shaded**. Move the cursor to the item and type in the appropriate changes.

Section II. Programming Options For Basic and Advanced Models

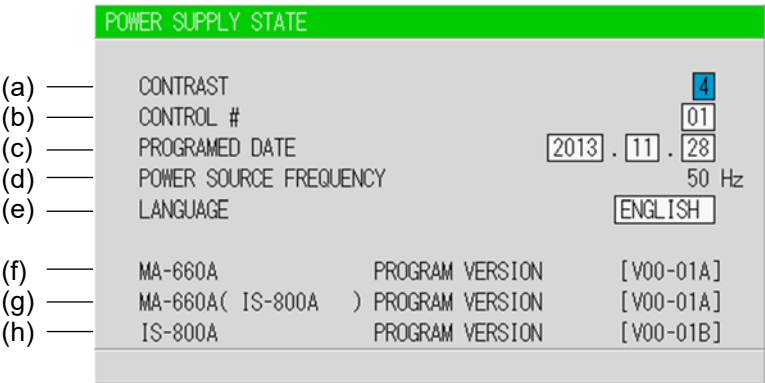
1. MENU Screen

The Pendant has various functions that are set from the respective screens. The **MENU** screen displays these functions in menu form.
Move the cursor () to the desired item; press the **ENTER** key to move to the selected screen.



2. POWER SUPPLY STATE Screen

This screen is used to display and set data for the Power Supply. Move the cursor to change the value.



a. LCD CONTRAST

Sets the screen contrast. The contrast can be set in a range from 0 to 9. The larger the value, the darker the screen. Adjust the contrast if the screen is difficult to view.

b. CONTROL

Input the identification No. of your Power Supply.

If you have two or more Power Supply units, input 01 for the first one, 02 for the second one, 03 for the third one, and so on. Used for communication.

c. PROGRAMMED DATE

Input the date on which a schedule is set as data. The date does not affect the set schedule. When the Power Supply memory is initialized, the date is also initialized to the date on which the ROM version is created.

d. POWER SOURCE FREQUENCY

The frequency of the welding power is measured and indicated automatically.

e. LANGUAGE

Select the language from Japanese and English.

f. MA-660A the Pendant ROM VERSION

Indicates the ROM version No. of the Pendant.

g. MA-660A the Pendant (IS-800CA / 1400CA) PROGRAM VERSION

Indicates the program version No. of the Power Supplies screen display part.

h. IS-800CA (IS-1400CA) ROM VERSION

Indicates the ROM version No. of the Power Supply.

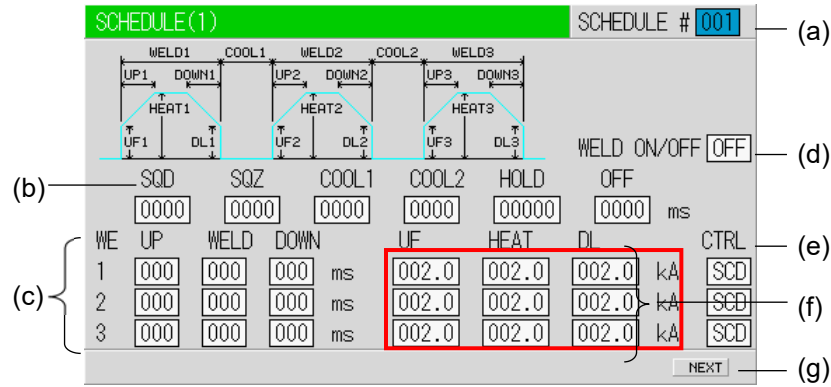
3. SCHEDULE Screen

Up to 255 welding schedules can be set on the Power Supply. These schedules are indicated as SCHEDULE #1 to #255. In the SCHEDULE screen, there is a Current and time setting screen and a PULSATION and transformer screen.

CURRENT and TIME Setting Screen

This screen is used to set the SCHEDULE No., length of weld time, welding current, and so on. The ms mode or CYC mode can be changed via WELD TIME (Refer to (9)(h)) on the MODE SELECT screen.

CHAPTER 3: USING PROGRAMMING FUNCTIONS



NOTE: The screen shows the settings for **IS-800CA**. The settings surrounded with frames are 004.0 kA for **IS-1400CA**. Also, unit, resolution, and setting range change depending on the settings of CTRL/CURR RANGE.

a. SCHEDULE

Select from #1 to #255 to set the SCHEDULE. Normally select #1 first, then select additional schedules in sequential order.

b. TIME

Set the time for each operation during welding.

Units of time are in ms or CYC. The screen above is in ms setting. CYC can be selected via the MODE SELECT screen. See the Timing Chart for each operation.

SQD / Squeeze delay time	Length of time added to SQZ; only for the first weld after start signal in repeat operation
SQZ / Squeeze time	Length of time until proper squeeze is applied to workpiece
COOL1 and COOL2 Cooling time 1 and Cooling time 2	Length of time to cool workpiece after turning off welding current
HOLD / Hold time	Length of time to hold workpiece after turning off welding current
OFF / Off time (*)	Length of time to turn off valve signal between repeated operations (No repeat operation if set to "0" or the upper/lower limit judgment error occurs in a sequence.)

* OFF/Off time

- Count and step value are updated each welding.
- RE-WELD** does not work simultaneously with **OFF**. When **OFF** is set, **RE-WELD** becomes invalid.
- START SIG.MODE** has limitations. When **OFF** is set, **MAINTAINED** of **START SIG.MODE** does not work. It works as **LATCHED**.

c. WELD (1, 2, 3)

Set the length of time to allow welding current to flow. As units of time, ms and CYC may be selected. Either unit can be selected via the MODE SELECT screen.

UP (1, 2, 3)

Set the upslope time (to increase the welding current gradually).

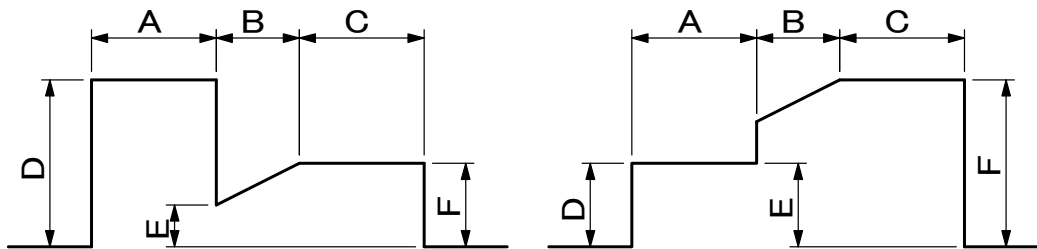
DOWN (1, 2, 3)

Set the downslope time (to decrease the welding current gradually).

NOTE: Upslope / Downslope waveform when COOL (cooling time) is set to 0. The welding current normally increases from the UF set value to the HEAT set value and decreases from the HEAT set value to the UF set value, but E-10 (Schedule setting error) will occur when the Power Supply starts with the following setting.

When the control methods for the previous and subsequent stages in the multi-stage welding are changed. The control method for the previous stage is different from that for the subsequent stage.

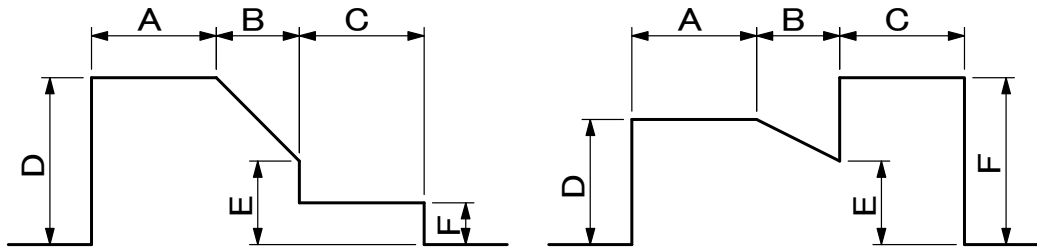
When the upslope time is set for the subsequent stage in the multi-stage welding, the upslope time is set for the subsequent stage, and the **HEAT** setting of **D** and the **UF HEAT** setting of **E** are different.



A: WELD1 time or WELD2 time
B: UP2 time or UP3 time
C: WELD2 time or WELD3 time
D: WELD1 HEAT or WELD2 HEAT
E: UF2 HEAT or UF3 HEAT
F: WELD2 HEAT or WELD3 HEAT

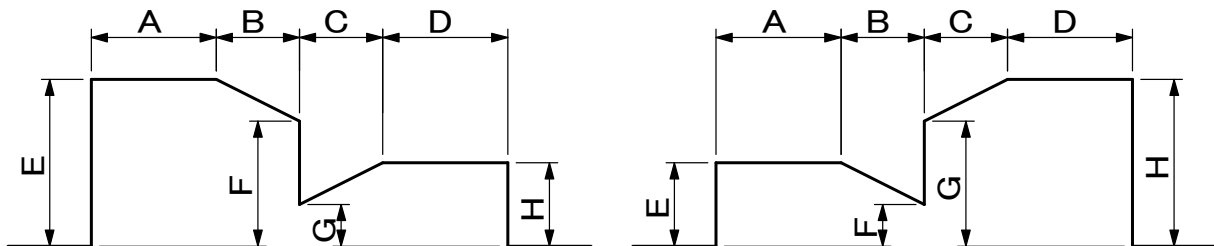
CHAPTER 3: USING PROGRAMMING FUNCTIONS

When the downslope time is set for the previous stage in the multi-stage welding, the downslope time is set for the previous stage, and the **DL HEAT** setting of **E** and the **HEAT** setting of **F** are different.



A: WELD1 time or WELD2 time
B: DOWN1 time or DOWN2 time
C: WELD2 time or WELD3 time
D: WELD1 HEAT or WELD2 HEAT
E: DL1 HEAT or DL2 HEAT
F: WELD2 HEAT or WELD3 HEAT

When the slope times are set for the previous and subsequent stages in the multi-stage welding. The downslope time is set for the previous stage, the upslope time is set for the subsequent stage, and the **DL HEAT** setting of **F** and the **UF HEAT** setting of **G** are different.



A: WELD1 time or WELD2 time
B: DOWN1 time or DOWN2 time
C: UP2 time or UP3 time
D: WELD2 time or WELD3 time
E: WELD1 HEAT or WELD2 HEAT
F: DL1 HEAT or DL2 HEAT
G: UF2 HEAT or UF3 HEAT
H: WELD2 HEAT or WELD3 HEAT

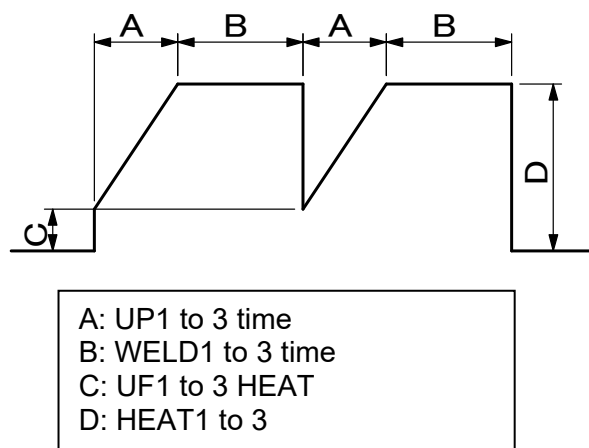
NOTES:

- Set 1 (ms/CYC) or more for at least one of WELD1, WELD2 and WELD3. Also, set the total time of UP and DOWN to be shorter than WELD. If not, E-10 (Schedule setting error) will be displayed.

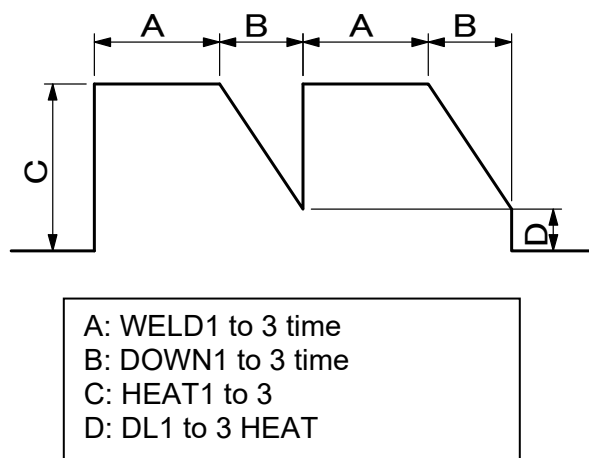
CHAPTER 3: USING PROGRAMMING FUNCTIONS

- Upslope / Downslope waveform when INT (downtime) is set to 0.
- E-10 (Schedule setting error) will occur when the Power Supply starts with the setting below.

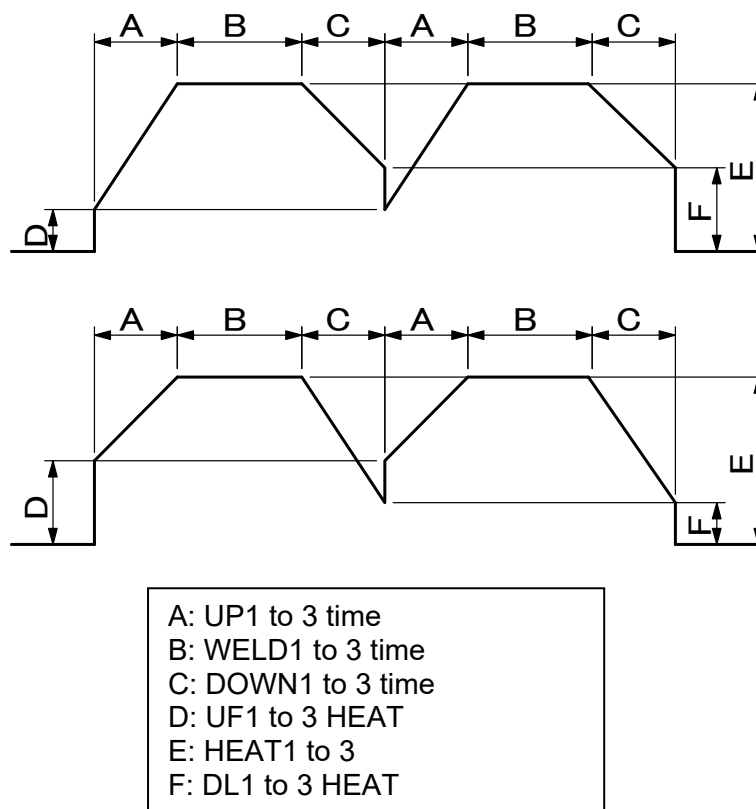
When the upslope time is set in the pulsation welding. The upslope time is set, and the UF HEAT setting of C and the HEAT setting of D are different.



When the downslope time is set in the pulsation welding. The downslope time is set, and the **HEAT** setting of C and the **DL HEAT** setting of D are different.



When the upslope time and the downslope times are set in the pulsation welding. The upslope time and the downslope time are set, and the **UF HEAT** setting of D and the **DL HEAT** setting of F are different.



d. WELD ON/OFF

One of the settings required to turn the READY lamp of the Power Supply ON.

NOTE: Even if this switch is ON, the Power Supply cannot supply welding current if the WELD ON/OFF key on the front panel or external WELD ON/OFF signal is OFF. In order for the Power Supply to supply welding current, this switch, the WELD ON/OFF key, and the external WELD ON/OFF signal must all be ON.

e. CTRL

Select one from the following six welding current control methods for **WE1**, **WE2** and **WE3**, respectively. Press **+ON/-OFF** key to switch the setting. The initial setting is the secondary constant-current effective value control (**SCD**).

Display	Control method
PRI	Primary constant-current effective value control
SCD	Secondary constant-current effective value control
PWR	Secondary constant-power effective value control
PLM	Primary constant-current peak value control
VLT	Secondary constant-voltage effective value control
FPL	Constant-phase control

CHAPTER 3: USING PROGRAMMING FUNCTIONS

(Note) Control method of the inverter-type welding power supply

CONTROL METHOD	FEATURE	APPLICATION	CONTROL MECHANISM
Primary constant-current control (PWM effective value control)	Requires no connection of toroidal coil on the secondary side of the transformer. Requires turn ratio setting of the inverter-type transformer. The loss inside the transformer is not considered.	Used for welding in a robot or an environment where the weld head moves and that causes disconnection of toroidal coil and cable.	Detects the primary current by the current sensor mounted into the power supply to compare the measured current obtained by calculating with each control frequency to the primary current obtained by “set current ÷ turn ratio”, and controls pulse width so that there is no difference in these values.
Secondary constant-current control (PWM effective value control)	Compared to the primary constant-current control, the current accuracy is high since the welding is directly controlled, being detecting the welding current.	Commonly used for general welding.	Detects the welding current with toroidal coil to compare the measured current obtained by calculating with each control frequency to the set current, and controls pulse width so that there is no difference in these values.
Secondary constant-power control (PWM effective value control)	Controls so that the power between electrodes becomes constant. Responds to change in work piece state during welding to make heat input constant.	Used when you want to reduce expulsion in early welding, shunt current is occurred at welding, or make heat generation constant.	Detects the welding current with toroidal coil and the voltage between electrodes with the voltage detecting cable to compare the power calculated by the measured current obtained by calculating with each control frequency and voltage to the set current, and controls pulse width so that there is no difference in these values.
Primary constant-current peak value control (PWM peak value control)	Requires no connection of toroidal coil on the secondary side of the transformer. Requires turn ratio setting of the inverter-type transformer. The loss inside the transformer is not considered. Compared to the effective value control, the rise of the current is fast, but the effective current changes depending on how large the current ripple is.	Used for welding of coated metal or dissimilar metal.	Sets the primary current obtained by the set current and the transformer turn ratio as current limiter, and controls pulse width so that the switching is turned off when the primary current detected by the current sensor mounted into the power supply has reached to the current limiter.
Secondary constant-voltage control (PWM effective value control)	Controls with the voltage between electrodes. Provides welding without expulsion by making voltage from the rise constant and reducing the current.	Used for welding of high specific resistance material, welding of high contact resistance work piece such as cross wire, and projection welding, which has resistance change in early welding to reduce expulsion.	Detects the voltage between electrodes with the voltage detecting cable to compare the measured current obtained by calculating with each control frequency to the set voltage, and controls pulse width so that there is no difference in these values.
Constant-phase control (Non-constant current)	Welding with the fixed pulse width. No feedback control.	Used for special cases such as the test of welder, and not used for normal welding.	Controls switching with the set pulse width.

CHAPTER 3: USING PROGRAMMING FUNCTIONS

f. HEAT

Set the welding current for **WELD1**, **WELD2**, and **WELD3**, respectively. When **CTRL** is changed, the content to be set also change. Also, the settable range of welding current changes depending on the current range.

UF (UP SLOPE FIRST)

Sets the initial current value of upslope. The set value is the as **HEAT**.

DL (DOWN SLOPE LAST)

Sets the final current value of downslope. The set value is the as **HEAT**.

NOTE: When **UP/DOWN** is set, **UF/DL** becomes effective. It becomes a target value in the effective value control, so a difference occurs between the set value and the value of actual welding.



DANGER

Even though E-07 (No-current error) is displayed, current is flowing. Exercise caution in handling.

g. NEXT

When the cursor is at ▼, moving the cursor down will change the display to **PULSATION** and transformer screen.

PULSATION and transformer screen

SCHEDULE(2)

SCHEDULE # 001

WELD ON/OFF OFF

WELD1 00.0 %

WELD2 00.0 %

WELD3 00.0 %

WELD TRANS FREQ 1000 Hz

VALVE # 1

CURRENT RANGE 40 kA

MAX CURRENT 10 kA

PULSATION

INTERVAL1 01

INTERVAL2 01

INTERVAL3 01

VOLT COMPENSATION 000 %

GAIN 01

TURN RATIO 001.0

TRANS # 1

REV

(a) (b) (c) (d) (e) (f) (g) (h) (i) (j) (k) (l) (m)

a. SCHEDULE

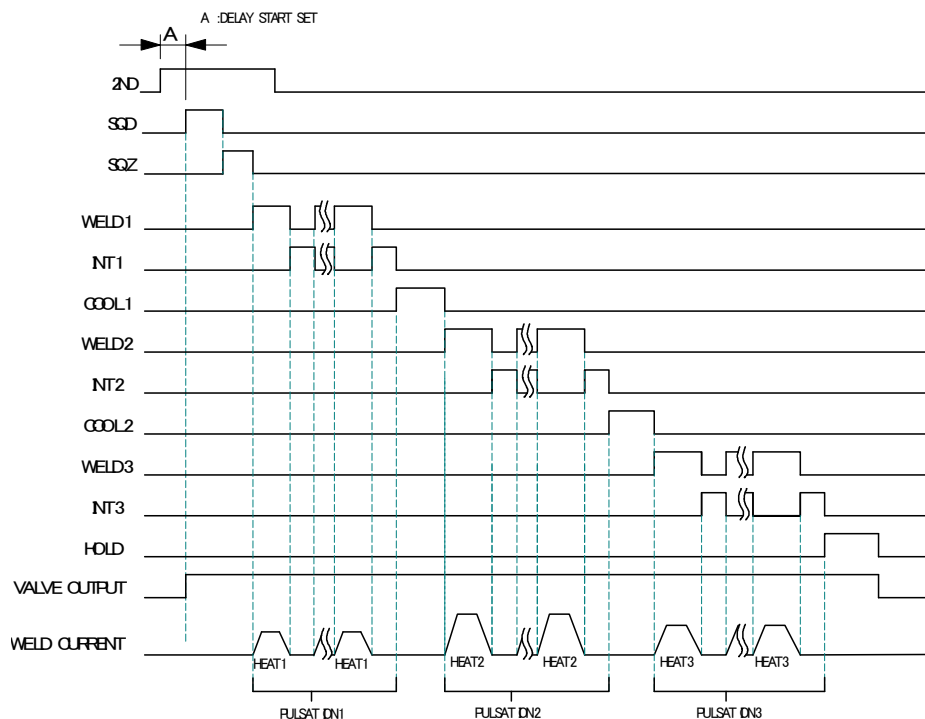
Select from #1 to #255 to set the **SCHEDULE**. Normally select #1 first, then select additional schedules in sequential order.

b. PULSE LIMIT

When limiting the pulse width in Primary constant-current peak value control, set the limit for each of **WE1**, **WE2** and **WE3**.

c. PULSATION / INTERVAL 1 to 3

Set the number of repetitions **PULSATION (01 to 19)** and the downtime (**INT1 to 3**) in **WE1** to **3** (See the figure below). However, when the number of repetitions is set to 01, the downtime does not work.



- When performing a welding with the setting **PULSATION** to **02** or more and **INT1** to **3** to **0**, set the control system to the primary constant-current effective value control or the primary constant-current peak value control. If a welding is performed with the other controls, control and monitored value may not function correctly.
- When performing a welding with the setting **PULSATION** to **02** or more, only the last welding data is displayed as the monitored value of **WELD2** after completion of sequence. In the timing chart above, the data of the third time is displayed, see the **MONITOR** screen. If the current gets out of the range of upper/lower limit judgment during repeated **PULSATION** operation, a caution signal is output after completion of welding (see the **MONITOR SET** screen.)

d. WELD TRANS FREQ

Sets the frequency of the welding transformer to be used. **Basic** models can be set from 600 Hz to 3,000 Hz in units of 100 Hz. **Advanced** models can be set from 600 Hz to 1,000 Hz. If a value greater than 1,000 Hz is entered, a SET ERROR message will display upon firing.



CAUTION

Do **not** use the welding transformer whose frequency is higher than the output frequency of the inverter power supply, this will cause a malfunction. When setting the output frequency of the inverter power supply, check the frequency of the welding transformer.

e. VALVE

Use this setting to select which of the valves to use. **Basic** models have two valves available, while **Advanced** models have four.

f. CURRENT RANGE

Selects the current range in accordance with the welding current to use.

Range	IS-800CA		IS-1400CA	
	Current Setting Range	Power Setting Range	Current Setting Range	Power Setting Range
80 kA	---	---	004.0 to 080.0 kA	004.0 to 120.0 kW
40 kA	002.0 to 040.0 kA	002.0 to 060.0 kW	002.0 to 040.0 kA	002.0 to 060.0 kW
20 kA	001.0 to 020.0 kA	001.0 to 020.0 kW	001.0 to 020.0 kA	001.0 to 020.0 kW
10 kA	00.50 to 09.99 kA	00.50 to 09.99 kW	00.50 to 09.99 kA	00.50 to 09.99 kW
05 kA	00.05 to 05.00 kA	00.05 to 05.00 kW	00.05 to 05.00 kA	00.05 to 05.00 kW

g. MAX CURRENT

Sets the maximum current of transformer.

h. WELD ON/OFF

One of the settings required to turn on the **READY** lamp of the Power Supply.

ON: WELD ON **OFF: WELD OFF**

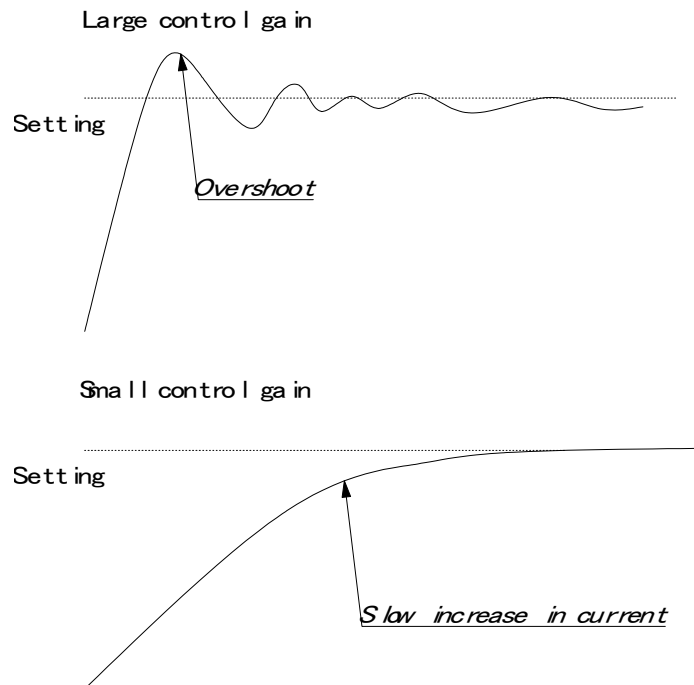
i. VOLT COMPENSATION (effective when PULSE LIM is set)

Compensates the pulse limit for the fluctuation in the three-phase power-supply voltage on the primary side. However, the compensation is for power-supply voltage prior to welding, and not applied during welding. The setting range is 000 to 100%.

j. GAIN (01-09)

Sets the amount of feedback correction in the primary constant-current effective value control, secondary constant-current effective value control, secondary constant-power effective value control, and secondary constant-voltage effective value control. Though 1 is normally used, the larger value will give the shorter rise time. (Invalid in the primary constant-current peak value control and the constant-phase control.)

NOTE: Control gain refers to a correction amount in feedback control. Although the current rises more rapidly with greater control gain, the current waveform may experience overshoot. On the other hand, a smaller control gain suppresses current waveform overshoot but causes a slower increase in current. The Power Supply offers nine 9 choices of gain levels.



k. TURN RATIO

Set the welding transformer turns ratio. The turns ratio can be set in a range from 001.0 to 199.9.

NOTE: When using the primary constant-current effective value control or primary constant-current peak value control, always set the correct turns ratio. An incorrect ratio will result in incorrect output.

CHAPTER 3: USING PROGRAMMING FUNCTIONS

I. TRANS

Keep set to **1**. Feature is not active and not shown on **Basic** models.

m. REV

When the cursor () is displayed, pressing the **ENTER** key will change the display to Current and time setting screen.

4. MONITOR Screen

In this screen, you can confirm the operational conditions during welding. Monitored data is displayed for each **SCHEDULE**.

	(b)	(c)	(d)	(e)	(f)	
	MONITOR					SCHEDULE # 001 (a)
	TIME	CURRENT	VOLTAGE	POWER	PULSE	
	WELD1 000 ms	00.00 kA	0.00 V	0.000 kW	00.0 %	
	WELD2 000 ms	00.00 kA	0.00 V	0.000 kW	00.0 %	
	WELD3 000 ms	00.00 kA	0.00 V	0.000 kW	00.0 %	
		VALVE1	VALEVE2	VALEVE3	VALEVE4	
(g) —	STEP #	1	1	1	1	
(h) —	STEPPER COUNT	0000	0000	0000	0000	
(i) —	STEP2 REPEAT	00	STEP RATIO		000 %	(j)
(k) —	CAP CHANGE	0000				
(l) —	TOTAL COUNTER	000000				

NOTE: The screen shows the settings for 10 kA or 05 kA range. In 20 kA, 40 kA, or 80 kA range, CURRENT is 000.0 kA to 999.9 kA and POWER is 000.0 kW to 999.9 kW.

a. SCHEDULE

Set the No. of the **SCHEDULE** to monitor. The measured values (welding current, voltage, etc.) for welding within that **SCHEDULE** are displayed. The Power Supply stores the latest measured values of each **SCHEDULE** number. The stored measurement values are not erased even when the power is turned off, and thus can be checked for the next job.

b. TIME

The lengths of periods during which current was supplied in the course of **WELD1**, **WELD2** and **WELD3** operations are displayed. The latest measured value welded with the displayed **SCHEDULE** No. is displayed. As units of time, ms and CYC may be selected. Either unit can be selected via the **MODE SELECT** screen.

c. CURRENT

The current during which current was supplied in the course of **WELD1**, **WELD2** and **WELD3** operations are displayed. The latest measured value welded with the displayed **SCHEDULE** No. is displayed.

d. VOLTAGE

The voltage during which current was supplied in the course of **WELD1**, **WELD2** and **WELD3** operations are displayed. To display the voltage, you need to measure the secondary voltage by connecting the voltage detecting cable. The latest measured value welded with the displayed **SCHEDULE** No. is displayed.

e. POWER

The power during which current was supplied in the course of **WELD1**, **WELD2** and **WELD3** operations are displayed. The value calculated from current and voltage (current x voltage) is displayed. To display the voltage, you need to measure the secondary voltage by connecting the voltage detecting cable. The latest measured value welded with the displayed **SCHEDULE** No. is displayed.

f. PULSE

The widest pulse among the supplied primary pulse current is displayed as a percentage of pulse width in full wave mode. The pulse width in full wave mode varies with the frequency setting (**WELD TRANS FREQ**). The latest measured value welded with the displayed **SCHEDULE** No. is displayed.

NOTE: The value displayed on the MONITOR screen is the average of value sampled at each welding pulse. Therefore, the value may differ from the measurement value of a weld checker (**MM-370B** etc.).

g. STEP

The present number of steps is displayed when **STEPPER MODE** is not OFF on the MODE SELECT screen.

h. STEPPER COUNT

The number of welds in the present step is displayed when **STEPPERMODE** is not OFF on the MODE SELECT screen

i. STEP2 REPEAT (Advanced Models ONLY)

Remaining number of repetition for the stepper used for STEP2 of the displayed **SCHEDULE** is displayed when **STEPPERMODE** is not OFF on the MODE SELECT screen. The latest measured value welded with the displayed **SCHEDULE** No. is displayed.

j. STEP RATIO (Advanced Models ONLY)

The step-up (-down) ratio is displayed when **STEPPERMODE** is not OFF on the MODE SELECT screen. The latest measured value welded with the displayed **SCHEDULE** No. is displayed.

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k. CAP CHANGE

The number of times before prior notice for cap change setting for the stepper used for the displayed SCHEDULE is displayed when STEPPERMODE is not OFF on the MODE SELECT screen. The latest measured value welded with the displayed SCHEDULE No. is displayed.

I. TOTAL COUNTER

The display changes depending on the setting of WELD2 STOP/WELD COUNT and COUNTER on the MODE SELECT screen.

1. When **WELD2 STOP/WELD COUNT** is **WELD2 STOP** and **COUNTER** is **TOTAL**

MONITOR						SCHEDULE #	001
	TIME	CURRENT	VOLTAGE	POWER	PULSE		
WELD1	000 ms	0.00 kA	0.00 V	00.00 kW	00.0 %		
WELD2	000 ms	0.00 kA	0.00 V	00.00 kW	00.0 %		
WELD3	000 ms	0.00 kA	0.00 V	00.00 kW	00.0 %		
		VALVE1		VALEVE2			
STEP #		1		1			
STEPPER COUNT		0000		0000			
TOTAL COUNTER		000000					

TOTAL COUNTER is displayed. The count value is incremented by one despite the result of the upper/lower limit judgment in monitoring.

2. When **WELD2 STOP/WELD COUNT** is **WELD2 STOP** and **COUNTER** is **GOOD**.

MONITOR						SCHEDULE #	001
	TIME	CURRENT	VOLTAGE	POWER	PULSE		
WELD1	000 ms	0.00 kA	0.00 V	00.00 kW	00.0 %		
WELD2	000 ms	0.00 kA	0.00 V	00.00 kW	00.0 %		
WELD3	000 ms	0.00 kA	0.00 V	00.00 kW	00.0 %		
		VALVE1		VALEVE2			
STEP #		1		1			
STEPPER COUNT		0000		0000			
GOOD COUNTER		000000					

GOOD COUNTER is displayed. The count value is incremented by one when the monitored value is within the range of the upper/lower limit.

3. When **WELD2 STOP/WELD COUNT** is **WELD2 STOP** and **COUNTER** is **WORK**:

MONITOR					
SCHEDULE # 001					
	TIME	CURRENT	VOLTAGE	POWER	PULSE
WELD1	000 ms	0.00 kA	0.00 V	00.00 kW	00.0 %
WELD2	000 ms	0.00 kA	0.00 V	00.00 kW	00.0 %
WELD3	000 ms	0.00 kA	0.00 V	00.00 kW	00.0 %
		VALVE1		VALEVE2	
STEP #		1		1	
STEPPER COUNT		0000		0000	
WELD COUNTER		0000	WORK COUNTER	000000	

WELD COUNTER and **WORK COUNTER** are displayed. When the count reaches the set **WELD** count value, **WORK** count value is incremented by one. This is different from **WELD COUNTER** described below.

4. When **WELD2 STOP/WELD COUNT** is **WELD COUNT**:

MONITOR					
SCHEDULE # 001					
	TIME	CURRENT	VOLTAGE	POWER	PULSE
WELD1	000 ms	0.00 kA	0.00 V	00.00 kW	00.0 %
WELD2	000 ms	0.00 kA	0.00 V	00.00 kW	00.0 %
WELD3	000 ms	0.00 kA	0.00 V	00.00 kW	00.0 %
		VALVE1		VALEVE2	
STEP #		1		1	
STEPPER COUNT		0000		0000	
WELD COUNTER		0000			

WELD COUNTER is displayed.

This is different from **WELD COUNTER** described above.

Monitored Value Notes:

- Only the last monitored value and the number of counts of each **SCHEDULE** are kept for a period of 10 days after the power is turned off.
- When the repetition welding is performed with **PULSATION** or OFF time setting, only the last data is displayed as the monitored value. The passing data is not displayed.
- The monitor display is not automatically updated depending on the **MONITOR DISP MODE** setting.

5. MONITOR SET Screen

Set the conditions for determining a good or bad weld, including values for welding current, upper or lower limits for the secondary voltage, etc. If the monitored welding current, secondary voltage, etc., do not meet the set conditions, a caution signal is output, and can be used to activate an alarm buzzer, alarm lamp, or similar event.

(b) (c) (d) (e) (f)

MONITOR SET SCHEDULE 001 (a)

		TIME		CURRENT		VOLTAGE		POWER		PULSE	
WE1	HI	999	ms	9.99	kA	9.99	V	99.99	kW	100.0	%
	LO	000	ms	0.00	kA	0.00	V	00.00	kW		
WE2	HI	999	ms	9.99	kA	9.99	V	99.99	kW	100.0	%
	LO	000	ms	0.00	kA	0.00	V	00.00	kW		
WE3	HI	999	ms	9.99	kA	9.99	V	99.99	kW	100.0	%
	LO	000	ms	0.00	kA	0.00	V	00.00	kW		

(Note) The screen shows the settings for 10 kA or 5 kA range. In 20 kA, 40 kA, or 80 kA range, CURRENT is 000.0 to 999.9 kA and POWER is 000.0 to 999.9 kW.

a. SCHEDULE

Input the number of the **SCHEDULE** to monitor.

b. TIME

Set the upper limit (**HI**) and lower limit (**LO**) of the weld time for each of **WE1**, **WE2** and **WE3**. Use this function to monitor the weld time when it becomes unstable by the welding stop input.

c. CURRENT

Set the upper limit (**HI**) and lower limit (**LO**) of the welding current for each of **WE1**, **WE2** and **WE3**.

d. VOLTAGE

Set the upper limit (**HI**) and lower limit (**LO**) of the secondary voltage for each of **WE1**, **WE2** and **WE3**.

e. POWER

Set the upper limit (**HI**) and lower limit (**LO**) of the electric power for each of **WE1**, **WE2** and **WE3**.

f. PULSE

If the ratio of welding current pulse / pulse width in full wave mode exceeds the percentage set in the **PULSE HIGH**, an **ERROR** signal is output. Pulse width is expressed assuming that the full wave is 100%.

NOTE: Upper/Lower limit judgment value when **STEPPER MODE** is set to **ON**

The upper/lower limit judgment value set here is for the current when a welding is performed, not for the initial setting. Therefore, when **STEPPER MODE** is set to **ON** to perform step-up (step-down) for the initial setting, the upper/lower limit judgment value is stepped up or down automatically.

EXAMPLE: When the current is set to 2 kA, HI; 2.2 kA, LO; 1.8 kA. When the step becomes 150%, **H** and **L** become as follows.

$$\begin{aligned} \text{H: } & 2.2 \times 1.5 = 3.3 \text{ kA} \\ \text{L: } & 1.8 \times 1.5 = 2.7 \text{ kA} \end{aligned}$$

6. NG SIGNAL SELECT Screen

Sets the output mode and the signal for each item to output, **ERROR** or **CAUTION**, in an error occurring.

(a) — ERROR OUTPUT MODE **N.C.**

(b) {

TIME-OVER	CAUTION	NO CURR	ERROR
CURRENT-OVER	CAUTION	WORK ERROR	ERROR
VOLTAGE-OVER	CAUTION		
POWER-OVER	CAUTION		
PULSE-OVER	CAUTION		
WORK-OVER	ERROR		
DISPL-OVER	CAUTION		

NOTE: This screen shows initial settings.

a. ERROR OUTPUT MODE

Sets the output modes of **NG1** of the external output signals.

N.C.	(NORMAL CLOSE) Closed at normal / Open at error
N.O.	(NORMAL OPEN) Open at normal / Closed at error

NOTE: NG2 is N.O. only

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b. TIME-OVER / CURR-OVER / VOLT-OVER / POWER-OVER / PULSE-OVER / NO CURR / WRK ERR.

Sets the signal to output, **ERROR** or **CAUTION**. The signal is output in the following states.

TIME-OVER	When the weld time exceeds the upper/lower limit
CURRENT-OVER	When the current exceeds the upper/lower limit
VOLTAGE-OVER	When the voltage exceeds the upper/lower limit
POWER-OVER	When the power exceeds the upper/lower limit
PULSE-OVER	When the pulse width exceeds the upper limit
WORK-OVER	Advanced models ONLY. When the work piece detection by displacement measurement exceeds the upper/lower limit
DISPL-OVER	Advanced models ONLY. When the final displacement by displacement measurement exceeds the upper/lower limit
NO CURR	When the no-current error occurs (For the no-current error, see Troubleshooting .)
WORK ERROR	When the pre-check error occurs

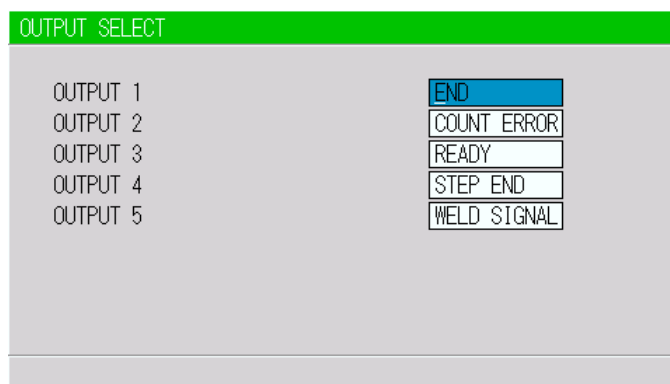
When two or more items are the same settings, the **ERROR** signal or the **CAUTION** signal is output if either one meets the condition above.

NOTE: Receiving the start signal after error output and Continuous welding operation

		START SIGNAL AFTER ERROR OUTPUT	CONTINUOUS WELDING WITH OFF TIME (OFF)
Upper/lower limit monitor error	ERROR	Receive	Stop
	CAUTION	Receive	Not stop
No-current error, Work piece error	ERROR	Not receive	Stop
	CAUTION	Receive	Stop
Counter error		Receive	Stop
Other device error		Not receive	Stop

7. OUTPUT SELECT Screen

Sets the output signals OUT1 (Pin 28) to OUT5 (Pin 32) of the external output signals.



NOTE: This screen shows initial settings.

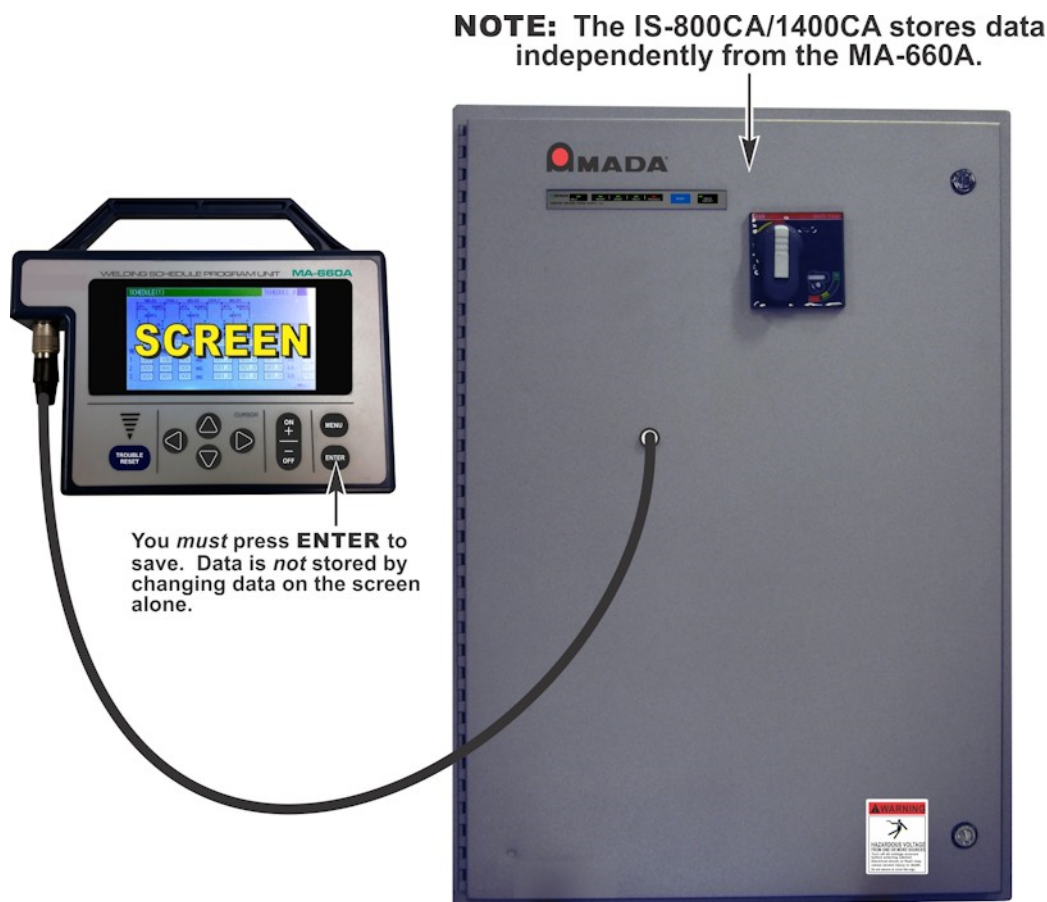
Pressing the **+ON** key switches the signal in the following order (in the reverse direction when pressing **-OFF** key):

END (end signal) → **COUNT ERROR** (count error signal) → **READY** (ready signal)
→ **STEP END** (step end signal) → **WELD SIGNAL** (welding timing signal)
→ **GOOD** (normal signal) → **COUNT UP** (count up signal)
→ **OUT I** (OUT I timing output) → **OUT II** (OUT II timing output)

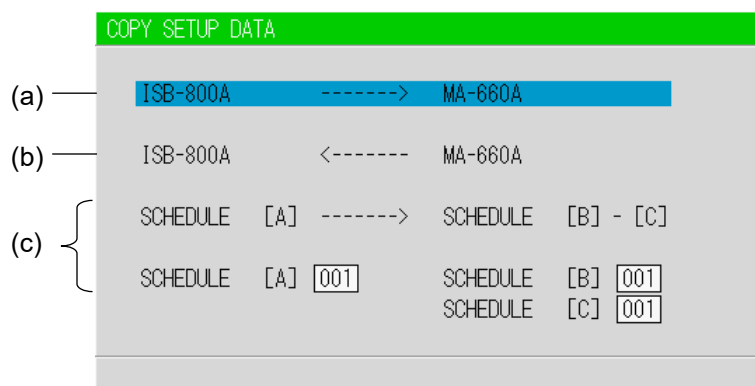
For output timings of **END**, **WELD SIGNAL**, **GOOD**, **OUT I**, and **OUT II**, see the Timing Chart.

8. COPY SETUP DATA Screen

The Pendant can store data as shown in the figure below. When the Pendant is connected to the Power Supply, the data stored in the Power Supply memory is displayed on the Monitor Panel. When the data is changed and the **ENTER** key is pressed, the contents of the memory of the Power Supply are overwritten by the new setting.



NOTE: The **Pendant** stores data for only one **IS-800CA/1400CA** unit. When two or more the Power Supply units are used and the contents of the memory of the first unit need to be copied to the second unit, copy the data from the first unit to the memory of the Pendant temporarily, then copy this data to the second unit.



Move the cursor ▲▼◀▶ to the required item then press the ENTER key; the data will be copied.

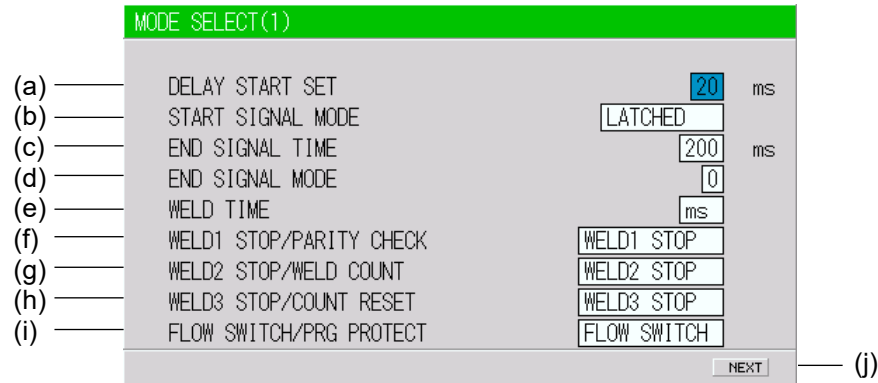
- a. **IS-800CA (IS-1400CA) → MA-660A.** The data in IS-800CA/1400CA is copied to MEMORY of MA-660A. When copy is complete, <END> is displayed.
- b. **IS-800CA (IS-1400CA) ← MA-660A.** The data in MEMORY of MA-660A is copied to IS-800CA/1400CA. When copy is complete, <END> is displayed.
- c. **SCHEDULE [A] → SCHEDULE [B]–[C].** This function is used to copy the SCHEDULE (welding condition). The Power Supply can set up to 255 schedules, indicated as SCHEDULE #1–#255. This function is also used to change from the SCHEDULE #1 setting, to perform welding according to another schedule.

EXAMPLES:

- **Schedule #2** can be set by switching from **SCHEDULE #1** as follows:
 - **SCHEDULE 001 → SCHEDULE 002–002.** Be sure to press the **ENTER** key before moving the cursor).
 - Move the cursor to the left of the letters of **SCHEDULE** and press the **ENTER** key. The data for **SCHEDULE #1** is copied to **SCHEDULE #2** through this operation. Call up #2 on the **SCHEDULE** screen, and change the values, if necessary.
- **SCHEDULE #1** can be copied immediately to **SCHEDULE #2** via **SCHEDULE #4** through the following setting:
 - **SCHEDULE 001 -----> SCHEDULE 002 - 004**

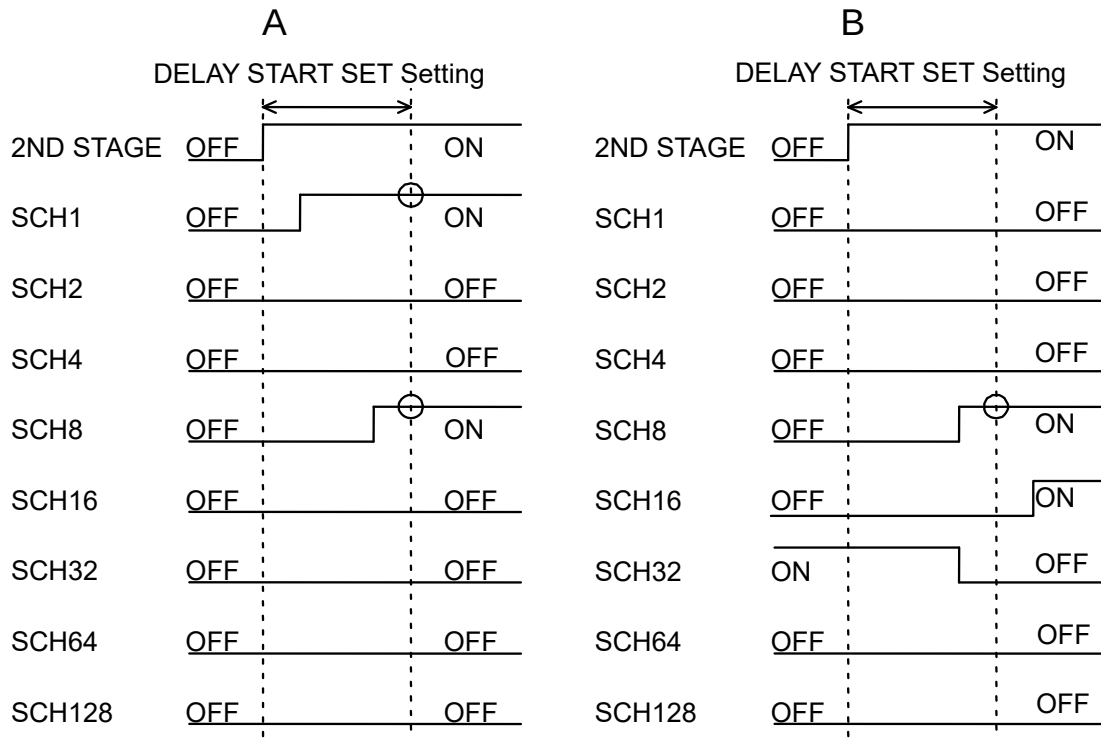
NOTE: Do *not* operate the Pendant until the copy is complete.

9. MODE SELECT Screen



a. DELAY START SET

One welding condition is determined via **DELAY START SET**, a value corresponding to chatter prevention time, after a start signal is input. The **DELAY START SET** period can be set in a range from 1 to 20 ms, in unit of 1 ms.



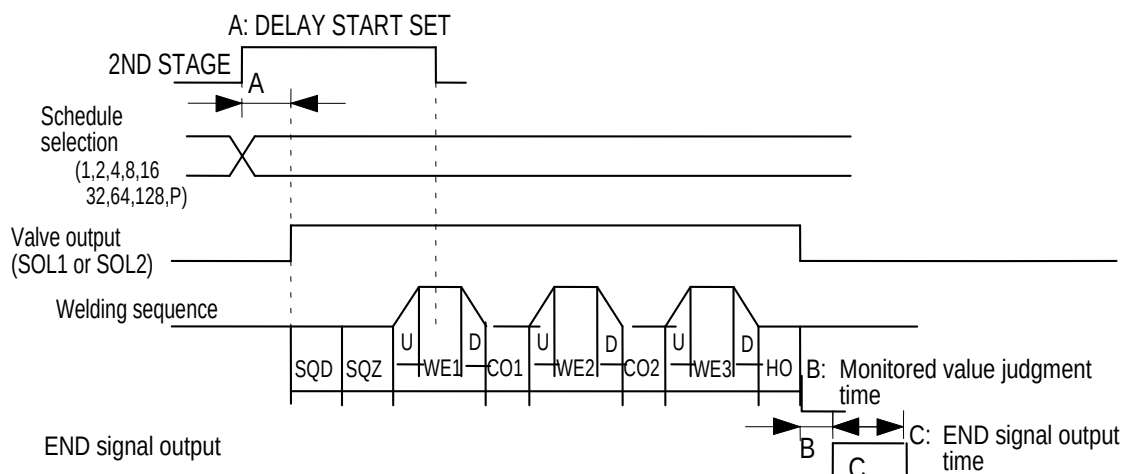
In Figure A above, the schedule signals 1 and 8 are ON. Therefore, welding is performed using schedule number. 9. In Figure B above, only schedule signal 8 is ON. As a result, welding is performed using schedule number 8. Schedule signals 16 and 32 are invalid because they are OFF when the schedule is determined.

NOTE: When **DELAY START SET** is 1 ms or 2 ms, the schedule number when the **2ND STAGE** signal is received is selected. Therefore, in Fig. (A) above, the schedule number is not selected and the schedule signal input error occurs. When **DELAY START SET** is 1 ms or 2 ms, input the schedule signal in advance before the **2ND STAGE** signal is received.

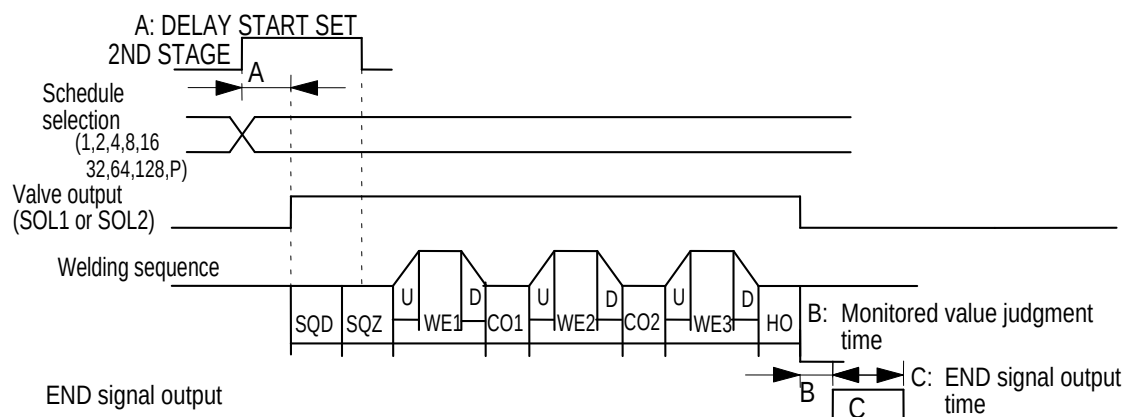
b. START SIGNAL MODE

Set the input method of the start signal to activate the Power Supply.

- **WHEN LATCHED.** The welding sequence halts if the **2ND STAGE** signal stops during squeeze time (SQZ). The welding sequence proceeds to completion when the **2ND STAGE** signal stops during Weld 1 time (WE1) or later.



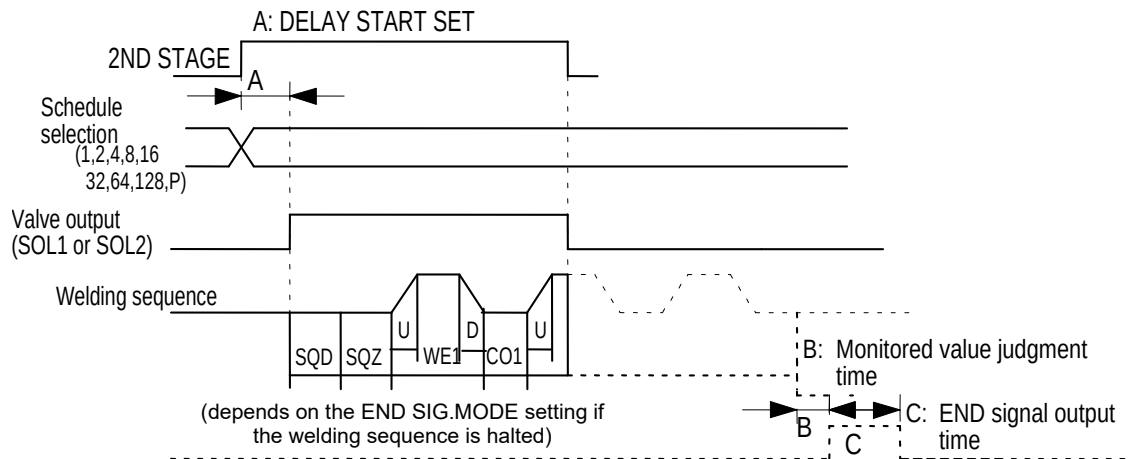
- **WHEN PULSED.** When the **2ND STAGE** signal is input for more than the time set through **DELAY START SET** and then stops, the welding sequence will proceed to completion.



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- **WHEN MAINTAINED.** If the **2ND STAGE** signal stops halfway through the welding sequence (from the beginning of initial squeeze delay time through the end of hold time), the welding sequence will halt at that point.

NOTE: The **END** signal depends on the **END SIG.MODE** setting.



c. END SIGNAL TIME.

Set the length of time for output of the end signal. The output time can be set in a range from 10 to 200 ms and in units of 10 ms. Setting 0ms switches to **HOLD** and maintains the end signal output during the start input. When **OFF** is set, actually output **END** time changes depending on the **OFF** setting even if a value is set for **END SIG.TIME** (see below). Also, this is not output depending on the **END SIGNAL MODE** setting.

EXAMPLE: END SIGNAL TIME is 0 ms

- 1) **OFF** is 0 ms (**OFF** time = 0 ms)
 - a) When the start input time is longer than the sequence time, the end signal time is the start input time (Sequence time $\leq$ start input time $\rightarrow$ **END** time = start input time)
 - b) When the start input time is shorter than the sequence time, the end signal time is the 10 ms. Sequence time $>$ start input time $\rightarrow$ **END** time = 10 ms)
- 2) **OFF** time is 10 ms to 200 ms ($10\text{ms} \leq \text{OFF time} \leq 200\text{ms}$). End signal time is the set **OFF** time (**END** time = **OFF** time).
- 3) **OFF** time is 200 ms or more (**OFF** time $>$ 200 ms). End signal time is the 200 ms. (**END** time = 200 ms).

EXAMPLE: END SIGNAL TIME is 10 to 200 ms

- 1) **OFF** is 0 ms (**OFF** time = 0 ms). End signal time is the set **END SIG.TIME** time. (**END** time = **END SIG.TIME** time).

- 2) **OFF** time is set ($10 \text{ ms} \leq \text{OFF time}$)
 - a) **END SIG.TIME** time is shorter than **OFF** time (**END SIG.TIME** time $< \text{OFF}$ time)
End signal time is the set **END SIG.TIME** time. (**END** time = **END SIG.TIME** time).
 - b) **OFF** time is longer than **END SIG.TIME** time (**END SIG.TIME** time $\geq \text{OFF}$ time)
End signal time is the **OFF** time. (**END** time = **OFF** time)

d. END SIGNAL MODE

Set the conditions for output of the end signal upon completion of the weld sequence.

0. Outputs the end signal even when the monitored value is outside the upper and lower tolerance limits. The end signal will not be output in the event of an error or when the sequence is interrupted by **START SIGNAL MODE (MAINTAINED)**.
1. The end signal will not be output when the monitored value is outside the upper and lower tolerance limits(*), in the event of an error, or when the sequence is interrupted by **START SIG.MODE (MAINTAINED)**.
2. The end signal will be output even when the monitored value is outside the upper and lower tolerance limits(*), even in the event of an error, and even when the sequence is interrupted by **START SIGMODE (MAINTAINED)**.

NOTE: There is no distinction between **ERROR** and **CAUTION**.

END signal output

END SIG. MODE	NORMAL	COUNT- RELATED ERROR	UPPER/LOWER LIMIT ERROR	OTHER ERRORS AT WELDING	STOPPED HALFWAY (MAINTAINED)
0	Output	Output	Output	No output	No output
1	Output	Output	No output	No output	No output
2	Output	Output	Output	Output	Output

NOTE: For faults, see the Fault Code List. Priority is “Stopped halfway” = “Other errors at welding” > “Upper/lower limit error” > “Count-related error”.

e. WELD TIME

Use this setting to change the units for time settings available on the **SCHEDULE** screen.

CYC	50 Hz: 1CYC = 20 ms 60 Hz: 1CYC = 16.6 ms
ms	—

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f. WELD1 STOP / PARITY CHECK.

Set external input pin 13.

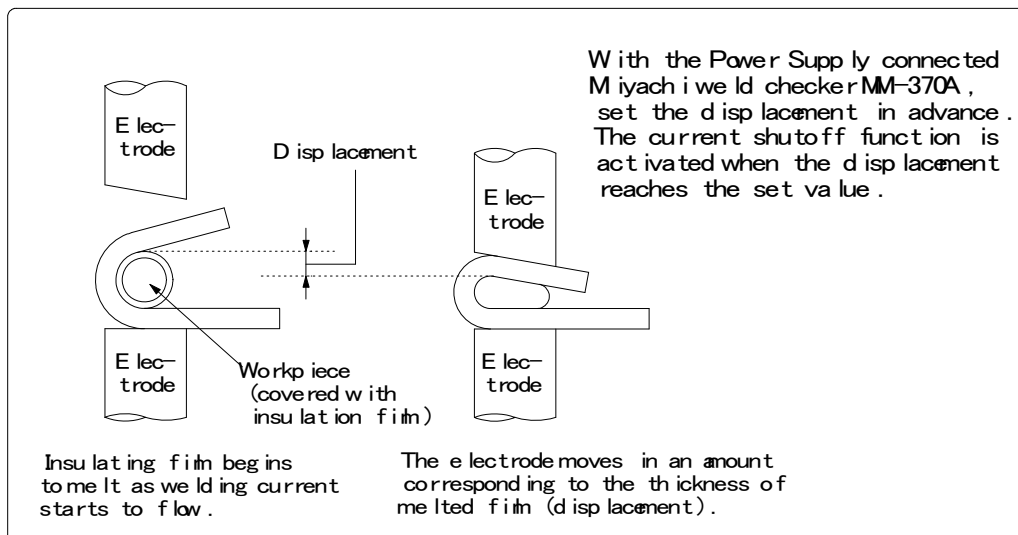
- When **WELD1 STOP** is selected. Parity check will not be performed. The sequence will proceed to COOL1 if external input pin 13 is closed during the **WELD1** sequence operation. (Refer to Note 2, “Current shutoff function.”)
- When **PARITY CHECK** is selected. Parity check will be performed. This check allows for detection of a failure resulting from a wire break in the schedule selection signal lines. Be sure that the total number of closed schedule selection and parity signal lines is always odd. (Refer to Note 1, “Schedule Numbers and Schedule Selection Pins.”)

NOTE: Schedule Numbers and Schedule Selection Pins

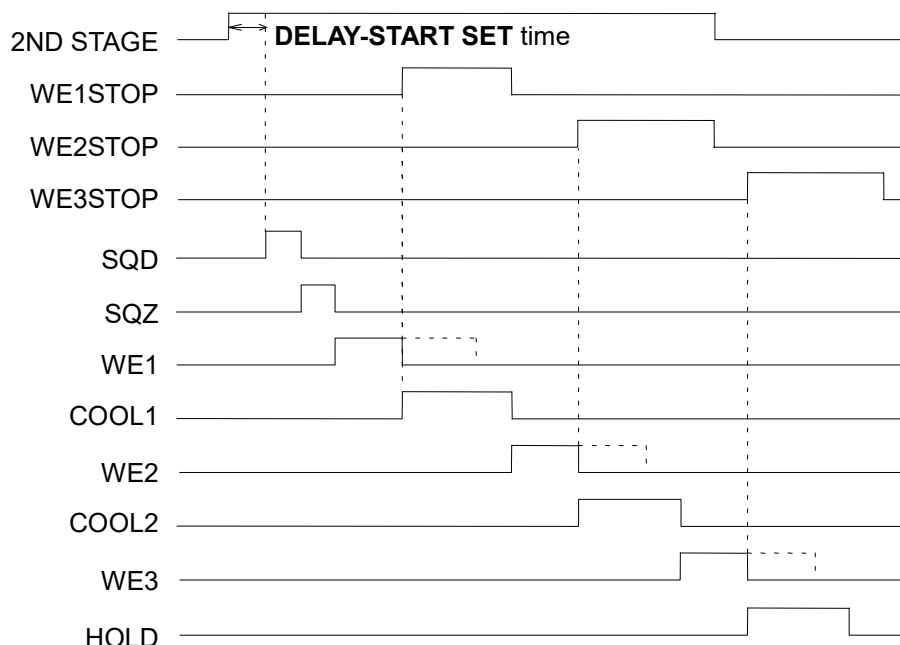
●: Closed Blank: Open

SCHEDULE #	SCH 1	SCH 2	SCH 4	SCH 8	SCH 16	SCH 32	SCH 64	SCH 128	PARITY
1	●								
2		●							
3	●	●							●
4			●						
5	●		●						●
6		●	●						●
7	●	●	●						
8				●					
9	●			●					●
10		●		●					●
11	●	●		●					
12			●	●					●
13	●		●	●					
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
247	●	●	●		●	●	●	●	
248				●	●	●	●	●	
249	●			●	●	●	●	●	●
250		●		●	●	●	●	●	●
251	●	●		●	●	●	●	●	
252			●	●	●	●	●	●	●
253	●		●	●	●	●	●	●	
254		●	●	●	●	●	●	●	
255	●	●	●	●	●	●	●	●	●

NOTE: Current shutoff function. The current shutoff function shuts off current when the proper weld penetration is achieved for example, during fusing thus preventing excessive penetration. (Refer to the figure below)



Timing chart for stopping current



The **WE1STOP** signal shuts off current immediately when input during the **WE1** period, switching the sequence to **COOL1**. The **WE1STOP** signal shuts off current immediately after the **WE1** starts (the current is supplied for about 1 cycle) when input before the **WE1** period, switching the sequence to **COOL1**. The **WE1STOP** signal will not shut off current if input during the **WE2** or **WE3** period.

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The **WE2STOP** signal shuts off current immediately when input during the **WE2** period, switching the sequence to **COOL2**. The **WE2STOP** signal shuts off current immediately after the **WE2** starts (the current is supplied for about 1 cycle) when input before the **WE2** period, switching the sequence to **COOL2**. The **WE2STOP** signal will not shut off current if input during the **WE3** period.

The **WE3STOP** signal shuts off current immediately when input during the **WE3** period, switching the sequence to **HOLD**. The **WE3STOP** signal shuts off current immediately after the **WE3** starts (the current is supplied for about 1 cycle) when input before the **WE3** period, switching the sequence to **HOLD**.

When the welding stop signal is input before the start signal is received, the welding stop error occurs.

When **WELD STOP OFF TIME** is set, the current is supplied for the time period in **WE1/2/3**.

This weld time is the **WELD** repetition time except for the **INT** time.

EXAMPLE: When **WELD STOP OFF TIME: 60 ms**, **WELD: 15ms**, **INT: 10 ms**, and repetition: **3**, the total time is 75 ms. The welding current is supplied for at least 60 ms and neglected for 15ms (**WELD: 5 ms + INT: 10 ms**). This is also effective when the off time (**OFF**) is set. Welding is stopped when the signal is input before each **WE**. Welding is performed when the signal is released before each **WE**.

g. WELD2 STOP / WELD COUNT

Set external input to pin 14. When **WELD2 STOP** is selected the weld count will not be checked. The sequence will proceed to **COOL2** if external input pin 14 is closed during the **WELD2** sequence operation. When the **WELD2 STOP** signal is input before the start signal is input even if the **WELD1** is set, the welding stop error occurs. When **WELD COUNT** is selected the weld count will be checked.

h. WELD3 STOP / COUNT RESET

Set external input to pin 25. When **WELD3 STOP** is selected the count will not be reset. The sequence will proceed to **HOLD** if external input pin 25 is closed during the **WELD3** sequence operation. When the **WELD3 STOP** signal is input before the start signal is input even if the **WELD1** or the **WELD2** is set, the welding stop error occurs. When **COUNT RESET** is selected the count will be reset.

i. FLOW SWITCH / PRG PROTECT

Set external input pin 21.

When **FLOW SWITCH** is selected

Flow switch input pin. Opening this pin will result in a flow rate error.

When **PRG PROTECT** is selected

Program inhibit input pin. Closing this pin will not allow you to change the settings.

j. NEXT

When the cursor () is displayed, pressing the **ENTER** key will change the display to the **MODE SELECT (2)** screen.

(k) —

(l) —

(m) —

(n) —

(r) —

(s) —

(u) —

MODE SELECT(2)

STEPPER MODE	OFF	RE-WELD	OFF
SCHEDULE	EXT	COUNTER	TOTAL
VALVE MODE	1 VALVE	SCAN MODE	OFF
MONITOR DISP MODE	NORMAL		
<div style="display: flex; justify-content: space-between;"> <div> <p>COMM CONTROL</p> <p>COMM SPEED</p> </div> <div> <p>COMM MODE</p> <p>RS-485</p> </div> </div>			
<div style="display: flex; justify-content: space-between;"> <div>DISPLC SENSOR STEP</div> <div>1.0 um</div> </div>			

REV

(o) —

(p) —

(q) —

(t) —

(v) —

k. STEPPER MODE

Select whether or not to perform step-up (step-down) operation, refer to the **STEPPER COUNT** Screen.

OFF	Step-up (step-down) will not be performed.
FIXED	Step-up (step-down) will be performed. (Stepwise)
LINER	Step-up (step-down) will be performed. (Linear)

NOTE: RATIO has an effect on **HEAT** only. Fixed for **UF/DL**. When the **HEAT** value multiplied by **RATIO** falls below the **UF/DL** value, an error occurs.

The **COUNT** value works as each **STEP** value. **Example: STEP1 0020 STEP2 0010** indicates that **STEP1** is 20 times and **STEP2** is 10 times. The conditions for stepper count-up is the same as the **TOTAL** counter.

l. SCHEDULE

Sets the selection method of schedule number.

EXT	Selects the schedule number by binary of the I/O terminal strip.
INT	Selects the schedule number by the SCHEDULE number of the Pendant . (Note)

NOTE: When setting SCHEDULE to INT, be sure to connect the **Pendant** and select the SCHEDULE screen or the MONITOR screen.

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m. VALVE MODE (Advanced Models ONLY)

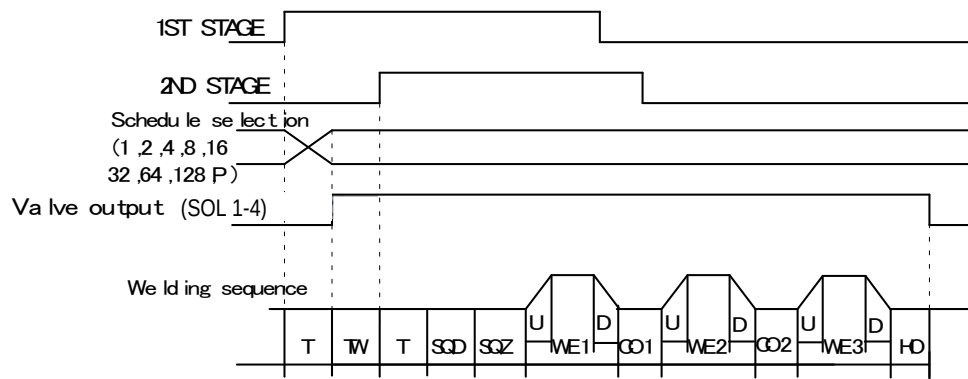
Select the output method (1 VALVE or 2 VALVE) of the solenoid valve signal.

When 1 VALVE is selected

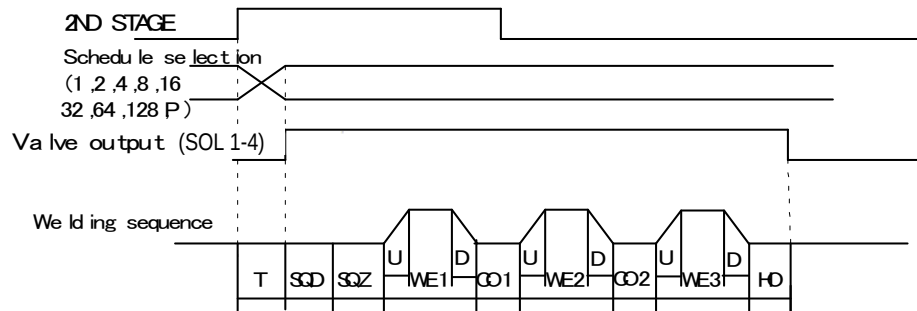
When the 1ST STAGE signal is input, the valve signal (SOL1 - 4) with the selected schedule number is output and the sequence waits for the 2ND STAGE signal input. Next, when the 2ND STAGE signal is input, the welding sequence with the selected schedule number starts. After the welding sequence starts, the valve signal is output until the sequence ends even if the 1ST STAGE signal is turned OFF.

T: DELAY START SET (1 to 20 ms)

TW: 2ND STAGE signal input wait time (uncertain)



When the 2ND STAGE signal is input, the valve signal (SOL1 or SOL2) with the selected schedule number is output. After the welding sequence starts, the valve signal is output until the sequence ends even if the 2ND STAGE is turned OFF.

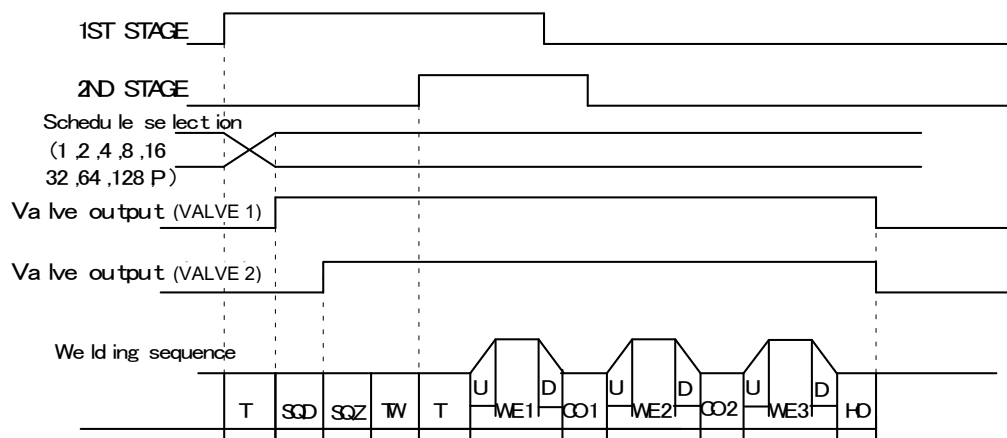


When 2 VALVE is selected

2 valve signals (VALVE 1, 2) are output in a sequence. When VALVE 1 is used, the weld force position can be adjusted by the 1ST STAGE signal output timing of VALVE 2 to the start of SQZ. After the welding sequence starts, the valve signal is output until the sequence ends even if the 1ST STAGE signal is turned OFF. When VALVE MODE is set to 2 VALVE, the following functions become disabled.

- OFF (repeated operation)
- STEPPER (step-up (-down) operation)

When the 1ST STAGE signal is input, VALVE 1 is output, and then SOL2 is output after SQD. After SQD and SQZ, the sequence waits for the 2ND STAGE signal input. Next, when the 2ND STAGE signal is input, the welding sequence after WELD1 starts.



n. MONITOR DISP MODE

Sets the monitor display. This function is invalid when the Pendant is disconnected.

NORMAL	The monitor display is updated each time. It takes monitored value computing time + display time (ms). Used when the part cycle time is relatively slow. * Communicated with the Pendant each time welding is complete.
LAST	The monitor display is not updated. When the MONITOR screen is updated, the last measured value is displayed. Used when the part cycle time is relatively fast. Errors are also displayed only when updated (communicated with the Pendant). * Not communicated with the Pendant automatically.

o. RE-WELD

Select whether or not to supply welding current again at the same location if the monitored current is lower than the lower limit. The second welding current will be 5% greater than the setting value.

ON	Welding current will be supplied again.
OFF	Welding current will not be supplied again.

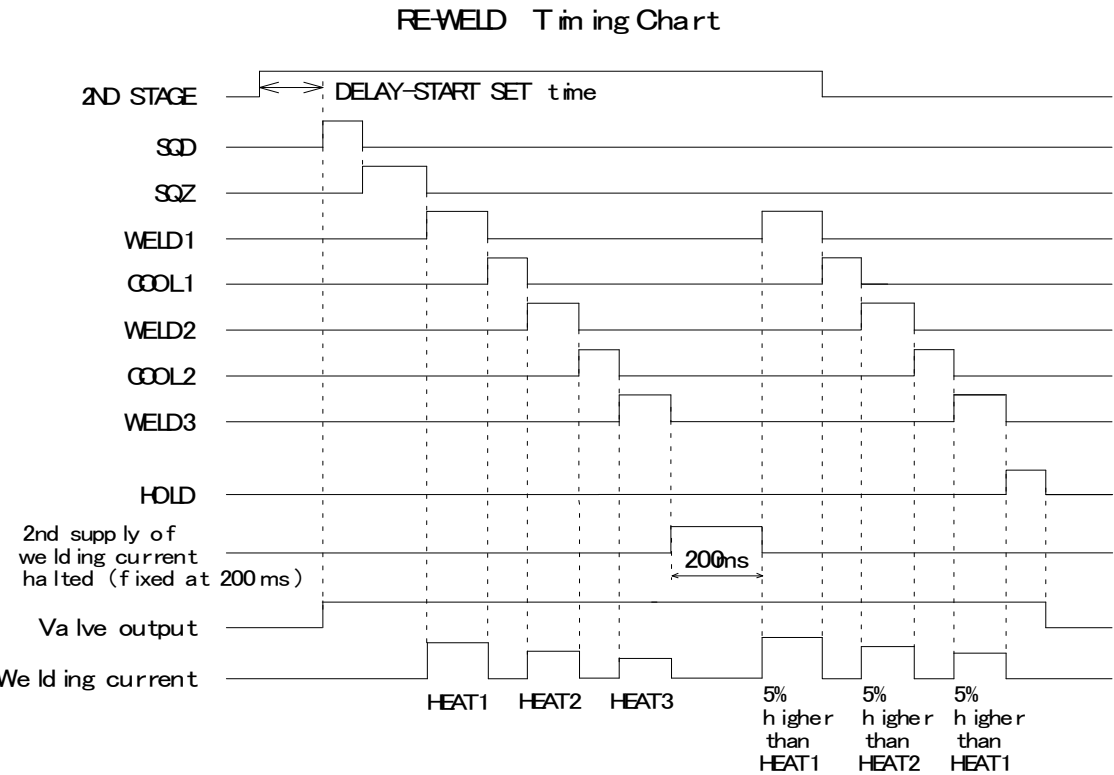
Even when the welding current is supplied twice with RE-ELD, each count-up is done only once.

TOTAL, WELD/WORK, and STEPPER → Once

GOOD → None (below the lower limit setting for the second time). Once (the lower limit setting or more for the second time). This cannot be used in combination with the off time (OFF).

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When the off time is set, **RE-WELD** works as **OFF** even if **ON**. When **RE-WELD** is combined with **STEPPER**, the welding current will be 5% greater than the value set for **STEPPER**.



p. COUNTER

Sets the mode of counter. There are three modes (**TOTAL/GOOD/WORK**). The counter value returns to “0” at the time the setting is changed. Count-up is done in all cases only when **WELD** is **ON**.

TOTAL: Count-up (increment of +1) is done despite the result of the upper/lower limit judgment in monitoring when the current is supplied.

In case of errors other than upper/lower limit monitor and counter error (device error, setting error, no-current error (**ERROR/CAUTION**), work piece error (**ERROR/CAUTION**)), count-up is not done. When the welding is interrupted, count-up is not done.

Judgment in Monitor		Counting Manner
GOOD (normal)		Count-up
Upper/lower limit monitor	CAUTION	
	ERROR	
Error / Interrupt		No Count-up

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GOOD: Count-up is done if the judgment is **GOOD** in current-supplied monitoring. In case of errors other than the counter error, count-up is not done. Also, when the welding is interrupted, count-up is not done.

Judgment in Monitor		Counting Manner
GOOD (normal)		Count-up
Upper/lower limit monitor	CAUTION	No Count-up
	ERROR	
Error / Interrupt		

WORK: Count-up is not done if the judgment is **ERROR** in current-supplied monitoring.

Judgment in Monitor		Counting Manner
GOOD (normal)		WELD Counter counts-up.
Upper/lower limit monitor	CAUTION	WORK Counter counts-up (increment of+1) when WELD Count reached the set value.
	ERROR	WELD Counter does not count-up.
Error		WELD Counter is reset to 0 (zero) when NG is reset. WORK Counter does not count-up.
Interrupt		WELD Counter does not count-up. Since an error does not occur, the error reset is not received.

q. SCAN MODE

Cannot be used. Select OFF.

r. COMM CONTROL

Selects a communication function.

OFF	No communication
→	One-way communication
↔	Both-way communication

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s. COMM MODE

Selects a communication mode.

RS-485 (optional)	Communication by RS-485
RS-232C	Communication by RS-232C

t. COMM SPEED

Selects a communication speed.

9.6k	Communication at 9,600 bps
19.2k	Communication at 19,200 bps
38.4k	Communication at 38,400 bps

For details of the external communication, see **External Communication Function**.

u. DISPLC SENSOR STEP

Sets the resolution of displacement sensor.

(Example) **LGK-110**: 1.0 μm

v. REV

When the cursor () is displayed, pressing the **ENTER** key will change the display to the **MODE SELECT (1)** screen.

10. MONITOR MODE Screen



NOTE: This screen shows initial settings. The display surrounded with frame changes depending on the setting of **WELD2 STOP/WELD COUNT** and **COUNTER** on the **MODE SELECT** screen.

a. PRESET TOTAL COUNT

The display changes depending on the setting of WELD2 STOP/WELD COUNT and COUNTER on the MODE SELECT screen. The preset count is the count value set in advance. When each count reaches the set value, E-28 (Count-up) is displayed and the **COUNT UP** signal is output.

When WELD2 STOP/WELD COUNT is WELD2 STOP and COUNTER is TOTAL, the PRESET TOTAL COUNT is displayed.

The screenshot shows the 'MONITOR MODE' screen with a green header. A red box highlights the 'PRESET TOTAL COUNT' field, which displays '000000'. Below this, several parameters are listed with their values and units: 'NO CURRENT TIME' (50 ms), 'NO CURRENT LEVEL' (0.20 kA), 'NO VOLTAGE LEVEL' (0.10 V), 'MONITOR FIRST TIME' (15 ms), and 'MONITOR SLOPE MODE' (EXCLUDE). At the bottom, 'WELD STOP OFF TIME' is shown for WELD1, WELD2, and WELD3, all set to 000 ms.

Parameter	Value	Unit
NO CURRENT TIME	50	ms
NO CURRENT LEVEL	0.20	kA
NO VOLTAGE LEVEL	0.10	V
MONITOR FIRST TIME	15	ms
MONITOR SLOPE MODE	EXCLUDE	
WELD STOP OFF TIME (WELD1)	000	ms
WELD STOP OFF TIME (WELD2)	000	ms
WELD STOP OFF TIME (WELD3)	000	ms

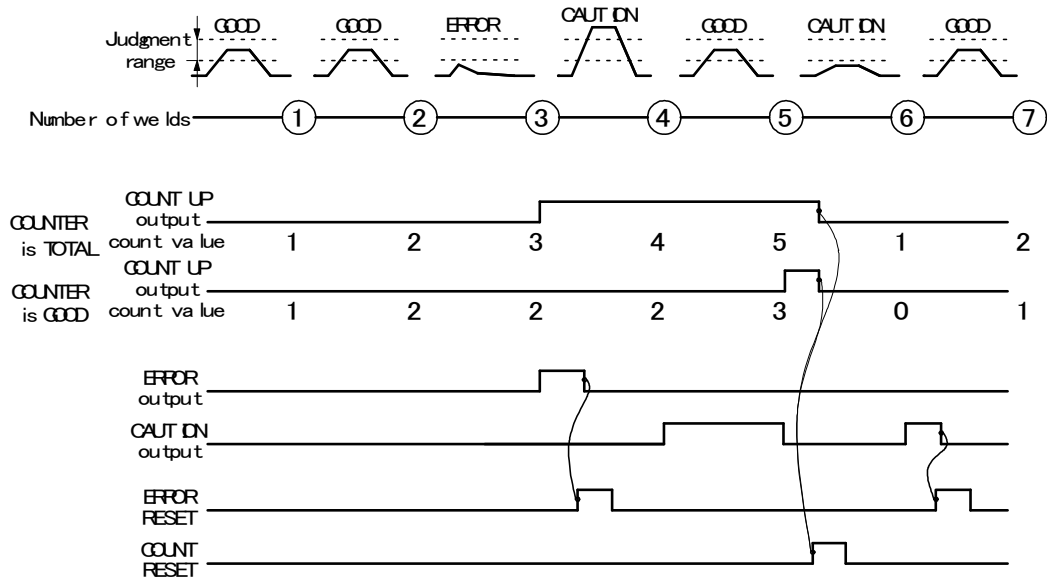
When WELD2 STOP/WELD COUNT is WELD2 STOP and COUNTER is GOOD, the PRESET GOOD COUNT is displayed.

The screenshot shows the 'MONITOR MODE' screen with a green header. A red box highlights the 'PRESET GOOD COUNT' field, which displays '000000'. The rest of the screen is identical to the previous screenshot, showing the same parameters and values.

Parameter	Value	Unit
NO CURRENT TIME	50	ms
NO CURRENT LEVEL	0.20	kA
NO VOLTAGE LEVEL	0.10	V
MONITOR FIRST TIME	15	ms
MONITOR SLOPE MODE	EXCLUDE	
WELD STOP OFF TIME (WELD1)	000	ms
WELD STOP OFF TIME (WELD2)	000	ms
WELD STOP OFF TIME (WELD3)	000	ms

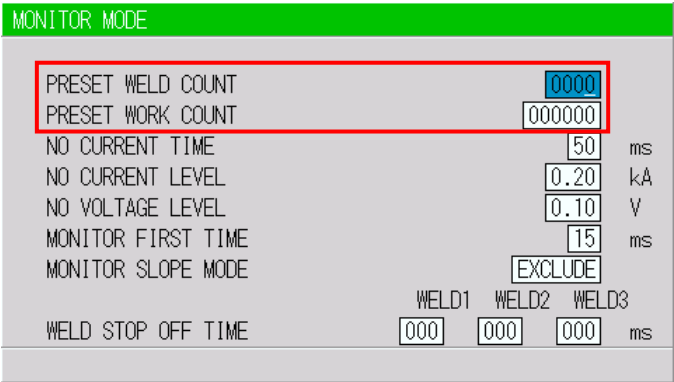
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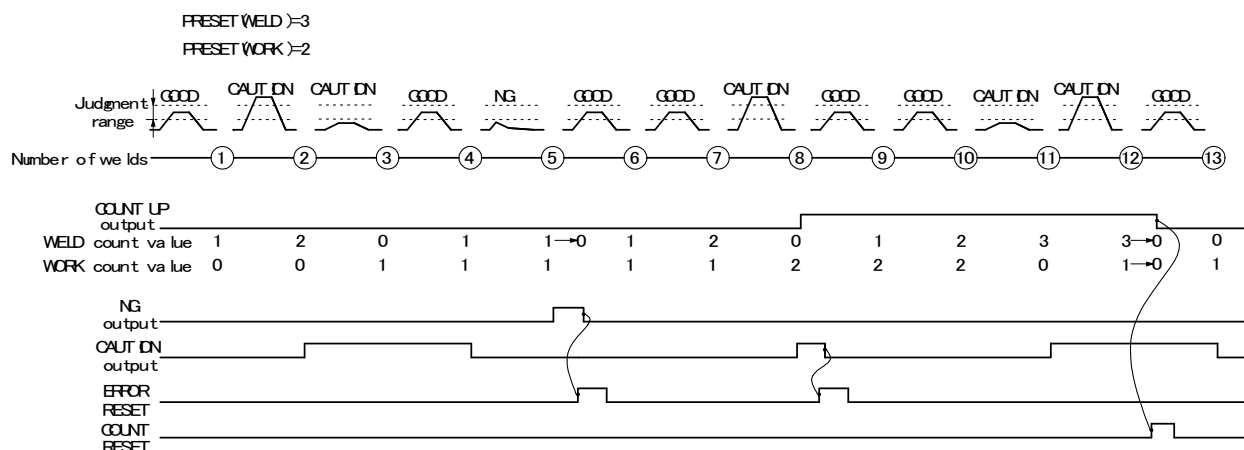
Example) PRESET COUNT=3



NOTES:

- When ERROR RESET is input, display of the **Pendant**, **TROUBLE** lamp on panel and ERROR/CAUTION output are turned OFF, but COUNT UP output is not turned OFF.
- When COUNT RESET is input, display of the **Pendant**, **TROUBLE** lamp on panel and COUNT UP output are turned OFF, but CAUTION output is not turned OFF.
- The chart above represents the occasion where ERROR/CAUTION output is set to N.O. (NORMAL OPEN): Open at normal / Closed at error.
- WELD2 STOP/WELD COUNT is WELD2 STOP and COUNTER is WORK**
Set WELD COUNT and WORK COUNT. When PRESET WELD COUNT is set to 0, the weld count is not incremented. Also, when the PRESET WORK COUNT is set to 0, count-up is not done.





NOTES:

- The **WELD** count becomes “0” at the same time as the **WORK** count is increased by +1, not “3” (**PRESET COUNT** value).
- When **ERROR RESET** is input, display of the Pendant, **TROUBLE** lamp on panel and **NG/CAUTION** output are turned **OFF**, but **COUNT UP** output is not turned **OFF**.
- When **COUNT RESET** is input, display of the Pendant, **TROUBLE** lamp on panel and **COUNT UP** output are turned **OFF**, but **CAUTION** output is not turned **OFF**.
- The chart above represents the occasion where **NG/CAUTION** output is set to **N.O.** (**NORMAL OPEN**): Open at normal / Closed at error.

• WELD2 STOP/WELD COUNT is WELD COUNT

MONITOR MODE

WELD COUNT
0000

NO CURRENT TIME

50 ms

NO CURRENT LEVEL

0.20 kA

NO VOLTAGE LEVEL

0.10 V

MONITOR FIRST TIME

15 ms

MONITOR SLOPE MODE

EXCLUDE

WELD STOP OFF TIME

000

000

000

ms

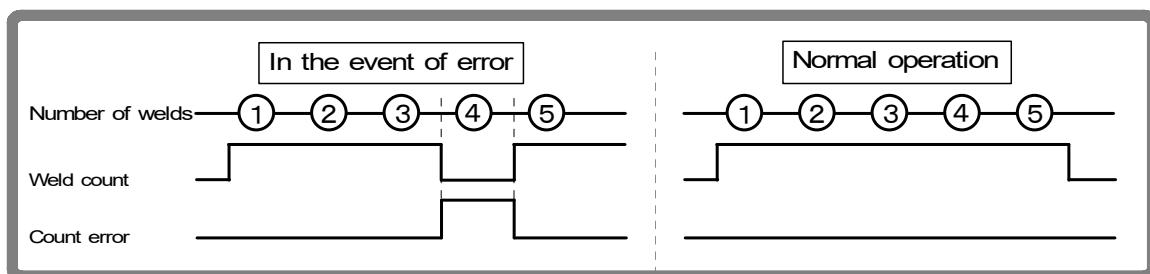
A count error signal is output if the number of welds deposited while the external weld count signal is input is smaller than the value set for **PRESET COUNT** (weld count signal is turned off before the number of welds set for **PRESET COUNT** is not deposited). See the following diagram.

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For example, if you set the number of welds to 5 from the programmable logic controller, select “5” for **PRESET COUNT** as well.

This function can be turned on or off through **WELD2 STOP/WELD COUNT** on the **MODE SELECT** screen. To clear the count error signal, you need to input the weld count signal again or add required number of welds to make up for insufficiency. The count error signal is not cleared if the error reset signal is input. Also, when required number of welds are added to make up for insufficiency, the count error signal is output until the insufficient number of welds is complete.

NOTE: **OFF/Off** time and **WELD COUNT** do not work simultaneously. When **WELD COUNT** is set, **OFF** is invalid.



b. NO CURRENT TIME

The absence of welding current will not be detected as a no-current or no-voltage error (see *Chapter 5, Troubleshooting*) as long as the absence lasts for a period within the time set here.

For example, if you select 3 ms, the absence of current will not be detected as an error as long as it lasts no more than 3 ms. An absence of current will be detected as an error if it lasts for 4 ms or more.

At this time, the **TROUBLE** lamp lights up. When the Pendant is connected, the fault code is displayed on the monitor. **COOL**, **HOLD**, **OFF**, and **INT** times are not included in the time for the no-current to be detected.

c. NO CURRENT LEVEL / d. NO VOLTAGE LEVEL

Set the current or voltage level for determining the absence of current or voltage as a no-current or no-voltage error. The **TROUBLE** lamp will light up, and operation will stop if the monitored current or voltage falls below the level set here.

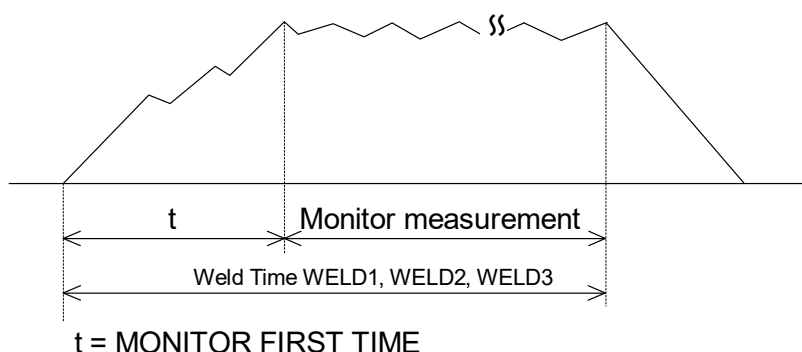
In the case of primary current control, supplying current with the welding transformer's secondary side open will cause an excitation current to flow through the primary side. Set the current level slightly higher than the monitored current.

NOTE: No judgment as to no-current or no-voltage error will be made if you select **00.0kA/0.00 V**. If the toroidal coil and the voltage detecting cable are disconnected in the second control, excessive current may flow.

e. MONITOR FIRST TIME

Use this setting to specify the start time to measure the monitored value (current, voltage, power, pulse width). The start time can be set in a range from 0 to 15 ms. Use this setting to exclude the initial rise of current from measurement.

The monitored value will not be displayed if the weld time is shorter than **MONITOR FIRST TIME**. The monitored value will not be also checked against the upper and lower tolerance limits.



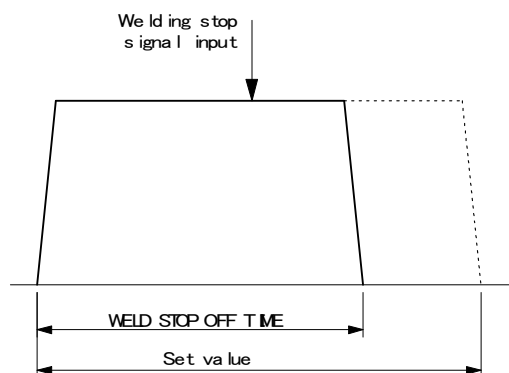
f. MONITOR SLOPE MODE

Select whether or not to include a slope period in the monitored value to be displayed.

EXCLUDE	Slope period will not be included.
INCLUDE	Slope period will be included.

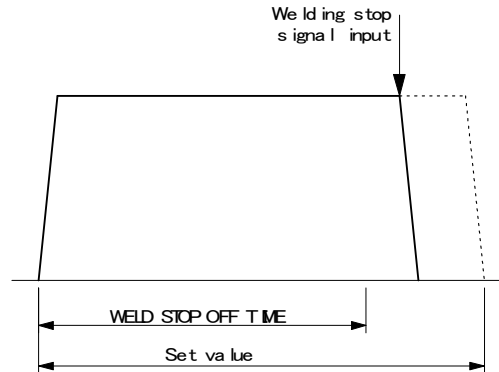
g. WELD STOP OFF TIME

Sets the neglecting time of the welding stop signal for each of **WELD1**, **WELD2** and **WELD3**. Even if the welding stop signal is input during welding, the current is supplied for the set time and the sequence will switch to the next. When the welding stop signal is input within WELD STOP OFF TIME. The welding is stopped at the end of WELD STOP OFF TIME.



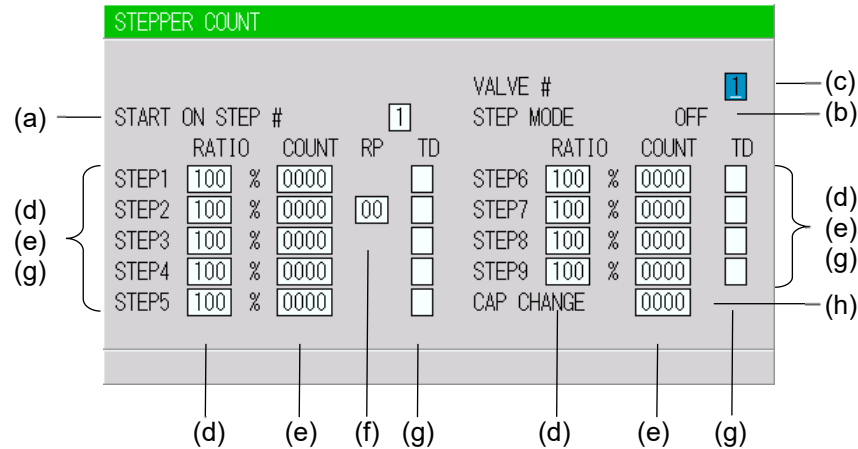
CHAPTER 3: USING PROGRAMMING FUNCTIONS

When the welding stop signal is input after WELD STOP OFF TIME
The welding is stopped when the welding stop signal is input.



11. STEPPER COUNT Screen

The Power Supply can change the level of the welding current depending on the welding conditions. The function to increase the welding current is called the “step-up” function, and that to decrease the welding current is called the “step-down” function. Set the step-up or step-down timing based on the number of welds. When the set number of welds is complete, the step end signal (**STEP END**) is output.



a. START ON STEP

The counting of welds starts from the **STEP** set here.

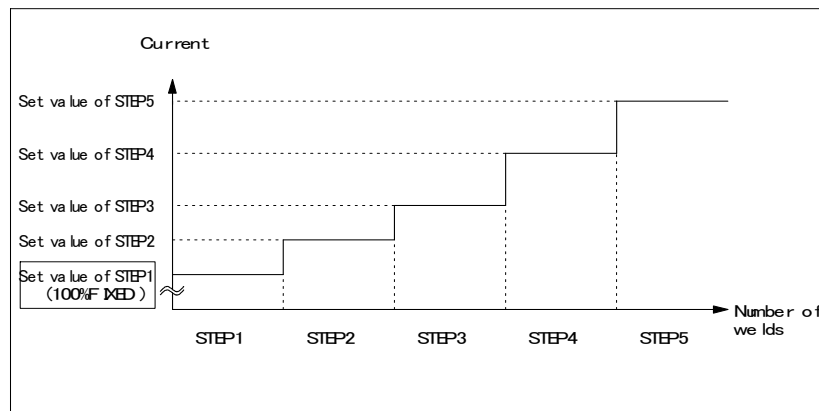
If, for example, you select **START ON STEP #3** as shown above, welds will be counted from the first weld in **STEP3**, even if welding for the first time. Further, the welding current will be increased (or reduced) by the extent you have set this value for **STEP3**.

Set the desired **STEP** No. 1–9 for **VALVE1** and **VALVE2**, or **SOL 1 – 4**, respectively, depending on the valve mode selection.

b. STEP MODE

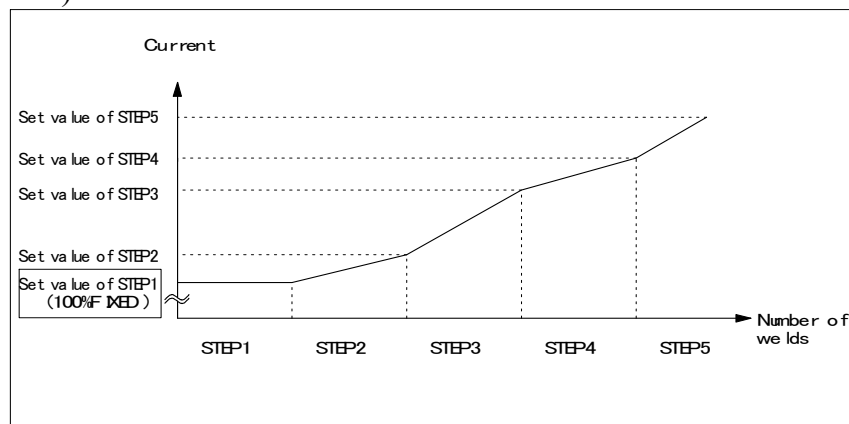
There are two types for step-up (step-down), stepwise (**FIXED**) and linear (**LINER**). When step-up (step-down) is not used, **OFF** is displayed. The setting is made on the **MODE SELECT** screen.

FIXED



As shown in the above figure, the current is stepped up or down to the value for **STEP2** following completion of the specified number of welds for **STEP1**. Similarly, the current is stepped up or down to the value for **STEP3** following completion of the specified number of welds for **STEP2**.

LINER (linear)



As shown in the above figure, the current is stepped up or down to the value for **STEP2** with the specified number of welds for **STEP2** following completion of the specified number of welds for **STEP1**. Similarly, the current is stepped up or down to the value for **STEP3** the specified number of welds for **STEP3** following completion of the specified number of welds for **STEP2**.

For example, the settings are **COUNT: 2** for **STEP1**, **RATIO: 200%** and **COUNT: 4** for **STEP2**, and 2 kA for current, the current is stepped up in a stepwise manner from Weld 3 to Weld 6 as shown below.

Weld 1:2 kA	Weld 2:2 kA	Weld 3:2.5 kA	Weld 4:3.0 kA	Weld 5:3.5 kA	Weld 6:4.0 kA
----- STEP1 ----->		<----- STEP2 ----->			

START ON STEP

The counting of welds starts from the **STEP** set here. For example, if you select **START ON STEP #3** as shown above, welds will be counted from the first weld in **STEP3**, even if welding for the first time. Further, the welding current will be increased (or reduced) by the extent you have set this value for **STEP3**. Set the desired **STEP** number. 1 – 9 for **VALVE1** and **VALVE2** respectively.

STEP 1–9. Set the welding current step-up ratio (**RATIO**) and the number of welds (**COUNT**) for each **STEP**. The sequence will proceed to the next **STEP** when the set number of welds is reached.

VALVE # Make settings for (a) and (b) above for each valve number. Change the number to set the schedule for each valve.

NOTE: Upper/Lower limit judgment value when **STEPPER MODE** is set to ON. The upper/lower limit judgment value set here is for the current when a welding is performed, not for the initial setting. Therefore, when **STEPPER MODE** is set to ON to perform step-up (step-down) for the initial setting, the upper/lower limit judgment value is stepped up or down automatically.

RATIO has an effect on **HEAT** only. Fixed for **UF/DL**. When the **HEAT** value multiplied by **RATIO** falls below the **UF/DL** value, an error occurs.

Example: When the current is set to **2 kA, H; 2.2 kA, L; 1.8 kA**. When the step becomes **150%**, **H** and **L** become as follows.

$$\begin{aligned}\mathbf{H:} & 2.2 \times 1.5 = 3.3 \text{ kA} \\ \mathbf{L:} & 1.8 \times 1.5 = 2.7 \text{ kA}\end{aligned}$$

c. VALVE

Make settings for (a) and (b) above for each valve number. Change the number to set the schedule for each valve.

NOTE: Upper/Lower limit judgment value when **STEPPER MODE** is not OFF. The upper/lower limit judgment value set here is for the current when a welding is performed, not for the initial setting.

Therefore, when **STEPPER MODE** is not OFF to perform step-up (-down) for the initial setting, the upper/lower limit judgment value is stepped up or down automatically.

RATIO has an effect on **HEAT** only. Fixed for **UF/DL**. When the **HEAT** value multiplied by **RATIO** falls below the **UF/DL** value, an error occurs.

Example: When the current is set to **2 kA, HIGH; 2.2 kA, LOW; 1.8 kA**.

When the step becomes **150%**, **HIGH** and **LOW** become as follows.

$$\begin{aligned}\mathbf{HIGH:} & 2.2 \times 1.5 = 3.3 \text{ kA} \\ \mathbf{LOW:} & 1.8 \times 1.5 = 2.7 \text{ kA}\end{aligned}$$

d. STEP 1–9

Set the welding current up (-down) ratio (**RATIO**) for each **STEP**.

e. COUNT 1–9

Set the number of welds (**COUNT**) for each **STEP**. The sequence will proceed to the next **STEP** following completion of the specified number of welds.

f. RP2 (Advanced Models ONLY)

Set the number of repetition (**COUNT**) for **STEP2**. The sequence will proceed to the next **STEP3** following completion of the specified number of welds. **STEP2** is repeated the set number of times, and the sequence will proceed to the next **STEP3**.

g. TD 1–9 (Advanced Models ONLY)

Set the chip dress for each **STEP**. When TD is set, X is displayed. For **STEP** with the tip dress setting, the tip dress error occurs following completion of the specified number of welds.

STEPPER COUNT									
START ON STEP #					VALVE #				
STEP MODE					LINEAR				
	RATIO	COUNT	RP	TD		RATIO	COUNT	TD	
STEP1	100 %	0002		X	STEP6	100 %	0000		
STEP2	110 %	0003	00	X	STEP7	100 %	0000		
STEP3	115 %	0004		X	STEP8	100 %	0000		
STEP4	120 %	0002		X	STEP9	100 %	0000		
STEP5	110 %	0005		X	CAP CHANGE		0000		

TD setting

h. CAP CHANGE (Advanced Models ONLY)

Set the cap change (**COUNT**) for **STEP9**.

The cap change error occurs following completion of the specified number of welds for **STEP9**.

When the number of welds is set in **CAP CHANGE**, prior notice for cap change will be given before the cap change error occurs.

Specify the number of welds to give prior notice how many numbers before the number of welds (**STEP9 COUNT**) that the cap change error occurs.

For example, when **STEP9 COUNT** is 1,000 (the number of welds that the cap change error occurs) and **CAP CHANGE** is 10, prior notice is given when the stepper count is 990.

12. PRECHECK Screen

Screen for setting the weld time and pulse width for resistance pre-check welding. The resistance pre-check welding is a function to apply a small current under constant voltage control before regular welding to confirm that the part to weld is set correctly by means of the measured current value. To use the pre-check function, the secondary current (voltage) needs to be monitored.

PRECHECK		SCHEDULE # 001	
(b)	PRECHECK TIME	000	ms
(c)	PRECHECK HEAT	10.0	%
(d)	PRECHECK RESISTANCE HIGH	00.00	mΩ
(e)	PRECHECK RESISTANCE LOW	00.00	mΩ
(f)	PRECHECK MONITOR	00.00	mΩ

a. SCHEDULE #

Select from #1 to #255 to set the **SCHEDULE**. Normally select #1 first, then select additional schedules in sequential order.

b. PRECHECK TIME

Set the weld time. Pre-check is not performed at 0 ms.

c. PRECHECK HEAT

Set the welding pulse width.

d. PRECHECK RESISTANCE HIGH

Set the upper limit of resistance value for pre-check.

e. PRECHECK RESISTANCE LOW

Set the lower limit of resistance value for pre-check.

f. PRECHECK MONITOR

Displays the monitor resistance value at the pre-check welding.

13. I/O CHECK Screen

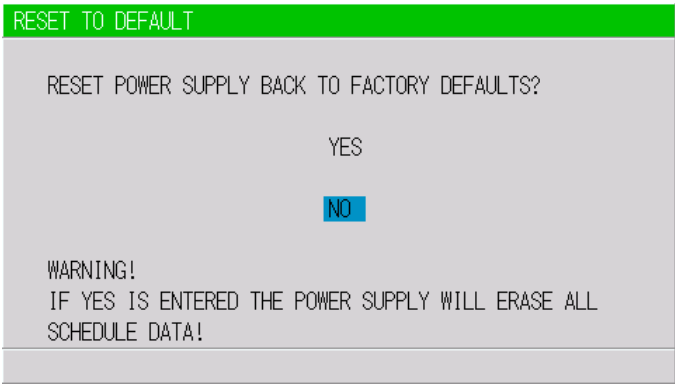
This screen is used to check the status of the external I/O signals. The “*” symbol appears when the corresponding input signal is ON. The asterisk disappears if the signal is OFF. Set the cursor reading to “0” to turn OFF the output signal, and “1” to turn it ON. Reception of an input signal while this screen is showing will not activate the corresponding function. You cannot move to another screen while the 1ST or 2NDSTAGE signal is input.

I/O CHECK									
SCH001 *	WE CNT	TR TH1	ERROR	<input type="text" value="0"/>	EX SOL1	<input type="text" value="0"/>			
SCH002	WELD ON *	TR TH2	CAUTION	<input type="text" value="0"/>	EX SOL2	<input type="text" value="0"/>			
SCH004	THERMO *	TR TH3	OUT1	<input type="text" value="0"/>	EX SOL3	<input type="text" value="0"/>			
SCH008	FLW SW *	TR TH4	OUT2	<input type="text" value="0"/>	EX SOL4	<input type="text" value="0"/>			
SCH016	ERR RST	TR TH5	OUT3	<input type="text" value="0"/>	RETRAC1	<input type="text" value="0"/>			
SCH032	STP RST	RETRAC1	OUT4	<input type="text" value="0"/>	RETRAC2	<input type="text" value="0"/>			
SCH064	CNT RST	RETRAC2	OUT5	<input type="text" value="0"/>	RELAY	<input type="text" value="0"/>			
SCH128	1ST	BACKSTP	SOL1	<input type="text" value="0"/>	DISP MON				
PARITY	2ND	STEPMDE	SOL2	<input type="text" value="0"/>	+00.000 mm				

NOTE: Not all fields are present on **Basic** Models.

14. RESET TO DEFAULT Screen

This screen is used to initialize the Power Supply's memory (i.e., to restore the initial settings). Initialization will not clear the memory of the Pendant. To initialize, move the cursor over **YES** or **NO** and press the **ENTER** key.



(a) YES	Initializes the Power Supply memory (restores the initial settings). After initialization, the screen will reflect the settings shown in this chapter.
(b) NO	Returns the display to the MENU screen without initializing the Power Supply memory.

15. PROGRAM PROTECT MODE Screen

When this function is used, set values cannot be changed by any person other than the supervisor. **PROGRAM PROTECT** is usually set to OFF. When it is set to ON, set values cannot be changed until **PROGRAM PROTECT** is set to OFF again.

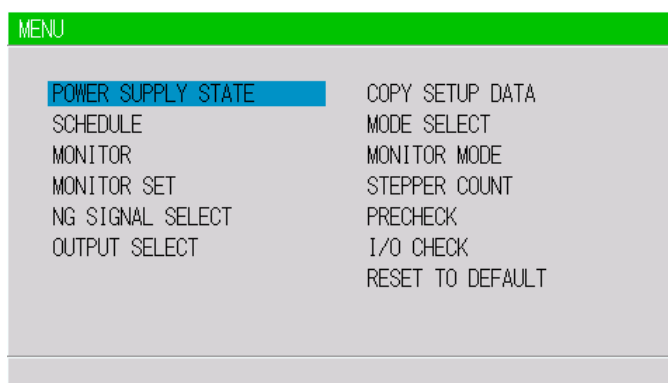
Follow the procedure below to change the setting of **PROGRAM PROTECT**.

1. Turn the power supply ON using the ▼ key pressed or connect the MA-660A to the circuit cable with the power supply turned ON. The following screen is displayed:

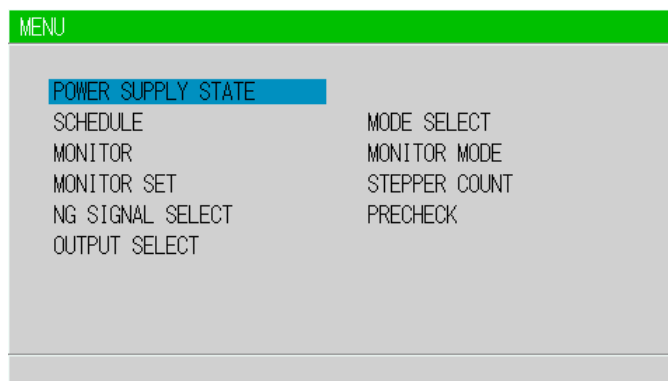


2. When the **ENTER** key is pressed after the **+ON** key is pressed, **ON** is displayed. You cannot go to other screens from this screen. Also, the external signals cannot be received.
3. Turn off the power supply and turn on it again, or disconnect the MA-660A with the power supply turned on and connect to the circuit cable again. When **PROGRAM PROTECT** is ON, the display of the **MENU** screen changes. **COPY SETUP DATA**, **I/O CHECK** and **RESET TO DEFAULT** are not displayed. On the other screens, the cursor can be moved and the settings can be checked, but the settings cannot be changed.

<When the PROGRAM PROTECT is OFF>



<When the PROGRAM PROTECT is ON>



Section III. Options Available On Advanced Models Only

16. FORCE SETUP & MONITOR Screen

This screen is used to set and monitor the force of the electro pneumatic proportional valve. Two electro pneumatic proportional valves can be used. The ANALOG OUT output terminal (voltage output proportional to force) for electro pneumatic proportional valve and the ANALOG IN input terminal (voltage input proportional to force) for force measurement have two channels, respectively. Also, chaining, successive and forge force functions can be set.

FORCE SETUP & MONITOR

SCHEDULE # 001 (a)

STEP MODE ON CONTINUE (c)

(b) PROP VALVE # 1

SQD	SQZ	WE1	CO1/WE2	CO2/WE3	HOLD
00000	00000	00000	00000	00000	00000 N

MONITOR

00000	00000	00000	00000	00000	00000 N
-------	-------	-------	-------	-------	---------

(j) VALVE # 1

(k) FORGE VALVE # 1

(l) CHAINING OFF

(m) SUCCESSIVE OFF

FORGE DELAY 00000 ms (n)

FORGE MODE OFF (o)

a. SCHEDULE #

Select from #001 to #255 to set the **SCHEDULE**.
Normally select #001 first, then select additional schedules in sequential order.

b. PROP VALVE #

Two electro pneumatic proportional valves can be connected.
Select an electro pneumatic proportional valve to use.

c. STEP MODE (CONTINUE)

This is the mode to check the force operation of the electro pneumatic proportional valve. In this mode, the force operation can be checked without flowing the welding current. The sequence proceeds to the next in order of SQD, SQZ, WE1, CO/WE2, CO2/WE3, and HOLD by pressing the ENTER key or input the STEP MODE signal. Do not move the cursor from STEP MODE during this mode. Settings cannot be changed. Valid only when FORCE CONTROL MODE on the PRESSURE REGULATOR screen is not 0.

Turning on the step operation mode. Set STEP MODE to ON.

SQD

Closes the 1ST signal. When the 1ST signal is input, the force set in SQD is output to the electro pneumatic proportional valve (ANALOG OUT), and SQD and CONTINUE blink. The measured value input in the force input (ANALOG IN) is displayed at the monitor of SQD.

FORCE SETUP & MONITOR						SCHEDULE #
						001
STEP MODE						OFF
CONTINUE						
PROP VALVE #						1
SQD	SQZ	WE1	CO1/WE2	CO2/WE3	HOLD	
00000	00000	00000	00000	00000	00000	N
MONITOR						
00000	00000	00000	00000	00000	00000	N
VALVE #						1
FORGE VALVE #						1
CHAINING	FORGE DELAY					00000 ms
SUCCESSIVE	FORGE MODE					OFF

SQZ

The sequence proceeds from SQD to SQZ by press the ENTER key or input STEP MODE signal. The force set in SQZ is output to the electro pneumatic proportional valve (ANALOG OUT), and SQZ and CONTINUE blink.

The measured value input in the force input (ANALOG IN) is displayed at the monitor of SQZ.

WE1

The sequence proceeds from SQZ to WE1 by pressing the ENTER key or input the STEP MODE signal. The force set in WE1 is output to the electro pneumatic proportional valve (ANALOG OUT), and WE1 and CONTINUE blink.

The measured value input in the force input (ANALOG IN) is displayed at the monitor of WE1.

CO1 / WE2

The sequence proceeds from WE1 to CO1/WE2 by pressing the ENTER key or input the STEP MODE signal. The force set in CO1/WE2 is output to the electro pneumatic proportional valve (ANALOG OUT), and CO1/WE2 and CONTINUE blink.

The measured value input in the force input (ANALOG IN) is displayed at the monitor of CO1/WE2.

CO2 / WE3

The sequence proceeds from CO1/WE2 to CO2/WE3 by pressing the ENTER key or input the STEP MODE signal. The force set in CO2/WE3 is output to the electro pneumatic proportional valve (ANALOG OUT), and CO2/WE3 and CONTINUE blink.

The measured value input in the force input (ANALOG IN) is displayed at the monitor of CO2/WE3.

HOLD

The sequence proceeds from CO2/WE3 to HOLD by pressing the ENTER key or input the STEP MODE signal. The force set in HOLD is output to the electro pneumatic proportional valve (ANALOG OUT), and HOLD and CONTINUE blink.

The measured value input in the force input (ANALOG IN) is displayed at the monitor of HOLD.

Turning off the step operation mode

The step operation mode ends by pressing the **ENTER** key or input the **STEP MODE** signal. Open the 1ST signal. The force output to the electro pneumatic proportional valve (ANALOG OUT) becomes the setting on the setting on the PRESSURE REGULATOR screen, and **HOLD** and **CONTINUE** stops blinking.

d. SQD

Set the force of the electro pneumatic proportional valve (ANALOG OUT) output during SQD.

e. SQZ

Set the force of the electro pneumatic proportional valve (ANALOG OUT) output during SQZ.

f. WE1

Set the force of the electro pneumatic proportional valve (ANALOG OUT) output during WE1.

g. CO1/WE2

Set the force of the electro pneumatic proportional valve (ANALOG OUT) output during CO1/WE2.

h. CO2/WE3

Set the force of the electro pneumatic proportional valve (ANALOG OUT) output during CO2/WE3.

i. HOLD

Set the force of the electro pneumatic proportional valve (ANALOG OUT) output during HOLD.

j. VALVE #

Two or four valves (welding heads) can be connected to the Power Supply. Use this setting to select which of the two valves to use. Operation differs according to the VALVE MODE setting on the MODE SELECT screen.

When VALVE MODE is 1 VALVE

Set the valve # in the range of 1 to 4.

EX SOL1 to EX SOL4 on the I/O terminal block.

VALVE #1: EX SOL1 VALVE #3: EX SOL3

VALVE #2: EX SOL2 VALVE #4: EX SOL4

When VALVE MODE is 2 VALVE

Set the valve # in the range of 1 to 2.

SOL1 and SOL2, and EX SOL1 to EX SOL2 on the I/O terminal block are used for valve output.

VALVE #1: SOL1, SOL2

VALVE #2: EX SOL1, EX SOL2

k. FORGE VALVE #

The forge force function can be used. The forge valve can be used at the given timing (the head force can be changed) except the valve selected in **VALVE #**. Select a valve to output the forge force. Operation differs according to the VALVE MODE setting on the MODE SELECT screen.

When VALVE MODE is 1 VALVE

The forge valve No. is set in the range of 1 to 4.

Do not set the same number as that used for the valve No.

EX SOL1 to EX SOL4 on the I/O terminal block are used for valve output.

FORGE VALVE #1: EX SOL1 FORGE VALVE #3: EX SOL3

FORGE VALVE #2: EX SOL2 FORGE VALVE #4: EX SOL4

When VALVE MODE is 2 VALVE

FORGE VALVE # is fixed to 4.

EX SOL4 on the I/O terminal block is used for valve output.

Valid only when FORGE MODE is ON.

I. CHAINING

Used for the chaining function. The welding is performed with SCHEDULEs with the chaining setting in order while the start signal (1ST and 2ND) is input.

All values of the chained schedules must be entered, especially the turns ratio, to ensure proper weld output.

For example, when CHAINING for SCHEDULE 1, 2, 5, and 6 are ON, the welding is performed sequentially in order of SCHEDULE 1 → SCHEDULE 2 → SCHEDULE 5 → SCHEDULE 6 by the start signal (1ST and 2ND) input.

CHAPTER 3: USING PROGRAMMING FUNCTIONS

m. SUCCESSIVE

Used for the successive function.
The welding is performed with SCHEDULEs with the successive setting in order each time the start signal (1ST and 2ND) is input.
For example, when SUCCESSIVE for SCHEDULE 1, 2, 5, and 6 are ON, the welding is performed singly in order of SCHEDULE 1 → SCHEDULE 2 → SCHEDULE 5 → SCHEDULE 6 each time the start signal (1ST and 2ND) is input.
The CHAINING setting has a priority to the SUCCESSIVE setting.

n. FORGE DELAY

The forge force function can be used. The forge valve can be used at the given timing (the head force can be changed) except the valve selected in VALVE #.
Set the timing to output the forge force. Operation differs according to the VALVE MODE setting on the MODE SELECT screen.

When VALVE MODE is 1 VALVE
The forge valve operates from the end of SQD through the forge delay time elapses.

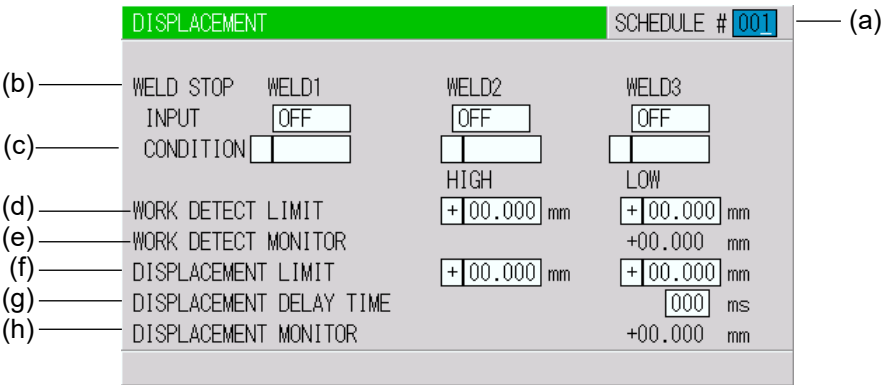
When VALVE MODE is 2 VALVE
The forge valve operates from the beginning of WE1 through the forge delay time elapses.
Valid only when FORGE MODE is set to ON.

o. FORGE MODE

The forge force function can be used. The forge valve can be used at the given timing (the head force can be changed) except the valve selected in VALVE #. Set whether or not to use the forge force.

17. DISPLACEMENT Screen

This screen is used to make a measurement using a displacement gauge and set the weld stop function.



a. SCHEDULE

Select from #001 to #255 to set the **SCHEDULE**.

Normally select #001 first, then select additional schedules in sequential order.

b. WELD STOP INPUT

Select items for weld stop.

OFF: External Input, **WE1** to **WE3** Stop Input are effective.

DISPLC: Weld Stop works at the set displacement value.

CURR: Weld Stop works at the set current value.

VOLT: Weld Stop works at the set voltage value.

POWER: Weld Stop works at the set power value.

PULSE: Weld Stop works at the set pulse width.

c. WELD STOP CONDITION

Set values for items selected in **WELD STOP INPUT**.

OFF: Not displayed.

DISPLC: Set the value of displacement.

CURR: Set current value.

VOLT: Set voltage value.

POWER: Set power value.

PULSE: Set pulse width.

d. WORK DETECT LIMIT

e. WORK DETECT MONITOR

The presence or absence of work piece can be detected by measuring the head travel distance from the beginning of SQD through the end of SQZ. The presence or absence and overlapping of work piece can be detected.

In **WORK DETECT LIMIT**, set the upper limit (HIGH) and the lower limit (LOW) in consideration of the difference between the head travel distance from the beginning of SQD through the end of SQZ and the presence or absence of a work piece to detect.

In **WORK DETECT MONITOR**, the measured value of the head travel distance from the beginning of SQD through the end of SQZ at welding is displayed.

In **WORK DETECT LIMIT**, you can set a value checking the measured value of work piece detection when the head is actually operated. To use the work piece detection function, the used displacement gauge should be ready at any time to measure the displacement from force releasing to force applying (the measurement range of the displacement gauge is larger than distance between electrodes at force releasing). Otherwise, the work piece detection will not be done properly.

CHAPTER 3: USING PROGRAMMING FUNCTIONS

- f. **DISPLACEMENT LIMIT**
- g. **DISPLACEMENT DELAY TIME**
- h. **DISPLACEMENT MONITOR**

Measures the degree of work piece collapse by measuring the head travel distance from the pre-check start to the displacement delay time elapses.
The degree of collapse in fusing welding can be controlled.

In **DISPLACEMENT LIMIT**, set the upper limit (HIGH) and the lower limit (LOW) to control the head travel distance (the degree of work piece collapse) from the pre-check start to the displacement delay time elapses.

In **DISPLACEMENT DELAY TIME**, set the delay time from the end of WE3 to the displacement measurement. Since the degree of work piece collapse changes by remaining heat of electrode even after welding, set the time in consideration of the timing to make a displacement measurement. Up to the time set in HOLD can be set.

In **DISPLACEMENT MONITOR**, the head travel distance (the degree of work piece collapse) from the pre-check start to the displacement delay time elapses is displayed.

18. PRESSURE REGULATOR Screen

This screen is used to set the units of force and air pressure, set the maximum force, and calibrate force.

PRESSURE REGULATOR					
(a)	FORCE CONTROL MODE	0			
(b)	FORCE UNIT	N	AIR PRESSURE UNIT	MPa	(c)
		PROP VALVE1	PROP VALVE2		
(d)	AIR CYLINDER DIAMETER	000.0	mm	000.0	mm
(e)	MAX AIR PRESSURE	0.00	MPa	0.00	MPa
(f)	MAX FORCE	00000	N	00000	N
	CALIBRATION				
(g)	CONSTANT FORCE	UP	00000	N	UP
(h)	LOW	UP	00000	N	UP
(i)	HIGH	UP	00000	N	UP

a. FORCE CONTROL MODE

Sets the control mode of the electro pneumatic proportional valve.

- 0: Mode not using the electro pneumatic proportional valve. The electro pneumatic proportional valve (ANALOG OUT) is not output.

- 1: Mode using the electro pneumatic proportional valve. The electro pneumatic proportional valve (ANALOG OUT) is output.
 - At the operation of welding sequence, SQD, SQZ, WE1, CO1/WE2, CO2/WE3, and HOLD settings are output to the electro pneumatic proportional valve (ANALOG OUT).
 - After the completion of welding sequence, the CALIBRATION CONSTANT FORCE setting is output to the electro pneumatic proportional valve (ANALOG OUT).
 - Set AIR CYLINDER DIAMETER and MAX AIR PRESSURE to set the maximum force. (CALIBRATION LOW and HIGH settings are not used.)
 - Check the force before using this.
- 2: Mode using the electro pneumatic proportional valve. The electro pneumatic proportional valve (ANALOG OUT) is output.
 - At the operation of welding sequence, SQD, SQZ, WE1, CO1/WE2, CO2/WE3, and HOLD settings are output to the electro pneumatic proportional valve (ANALOG OUT).
 - After the completion of welding sequence, the HOLD setting is output to the electro pneumatic proportional valve (ANALOG OUT).
 - Set AIR CYLINDER DIAMETER and MAX AIR PRESSURE to set the maximum force. (CALIBRATION LOW and HIGH settings are not used.)
 - Check the force before using this.
- 3: Mode using the electro pneumatic proportional valve. The electro pneumatic proportional valve (ANALOG OUT) is output.
 - Regardless of welding sequence operation, the CALIBRATION CONSTANT FORCE setting is output to the electro pneumatic proportional valve (ANALOG OUT).
 - Set AIR CYLINDER DIAMETER and MAX AIR PRESSURE to set the maximum force. (CALIBRATION LOW and HIGH settings are not used.)Check the force before using this.
- 4: Mode using the electro pneumatic proportional valve. The electro pneumatic proportional valve (ANALOG OUT) is output.
 - At the operation of welding sequence, SQD, SQZ, WE1, CO1/WE2, CO2/WE3, and HOLD settings are output to the electro pneumatic proportional valve (ANALOG OUT).
 - After the completion of welding sequence, the CALIBRATION CONSTANT FORCE setting is output to the electro pneumatic proportional valve (ANALOG OUT).
 - Set CALIBRATION LOW and HIGH to set the maximum force. (AIR CYLINDER DIAMETER, MAX AIR PRESSURE and AIR PRESSURE UNIT settings are not used.)Check the force before using this.

b. FORCE UNIT

Select the unit of force among N, kgf and lbf.

c. AIR PRESSURE UNIT

Select the unit of pneumatic pressure among Mpa, bar and psi.

d. AIR CYLINDER DIAMETER

Used when FORCE CONTROL MODE is 1 to 3.
Set the diameter of pneumatic cylinder.

e. MAX AIR PRESSURE

Used when FORCE CONTROL MODE is 1 to 3.
Set the maximum pneumatic pressure supplied to the electro pneumatic proportional valve.

f. MAX FORCE

Displays the maximum force of the set electro pneumatic proportional valve.

g. CALIBRATION CONSTANT FORCE

Used when FORCE CONTROL MODE is 1, 3 or 4.

FORCE CONTROL MODE is 1 or 4:

Set the force output to the electro pneumatic proportional valve (ANALOG OUT) after the completion of welding sequence.

FORCE CONTROL MODE is 3:

Set the force output to the electro pneumatic proportional valve (ANALOG OUT) Regardless of welding sequence operation.

UP and DW at the left side of CALIBRATION CONSTANT FORCE can be used when FORCE CONTROL MODE is 3.

The force can be checked with this setting when FORCE CONTROL MODE is 3.

Set AIR CYLINDER DIAMETER and MAX AIR PRESSURE.

Set the force used to CALIBRATION CONSTANT FORCE.

The force is applied by changing UP on the left side of CALIBRATION CONSTANT FORCE into DW and released by returning the setting to UP.

The force setting and the force can be checked by measuring the force while the force is applied.

When there is difference between the set value and the measured value, adjust either AIR CYLINDER DIAMETER or MAX AIR PRESSURE so that the set value and the measured value become the same.

h. CALIBRATION LOW

i. CALIBRATION HIGH

Used when FORCE CONTROL MODE is 4.

Set CALIBRATION LOW and HIGH to set the maximum force.

UP and DW on the left side of CALIBRATION LOW and HIGH can be used when FORCE CONTROL MODE is 4.

The force can be checked with these settings when FORCE CONTROL MODE is 4.

CHAPTER 3: USING PROGRAMMING FUNCTIONS

The force is applied by changing UP on the left side of CALIBRATION LOW into DW and released by returning the setting to UP. About 30% of the maximum force is applied.

Measure the force while the force is applied, and input the measured value in CALIBRATION LOW.

The force is applied by changing UP on the left side of CALIBRATION HIGH into DW and released by returning the setting to UP. About 80% of the maximum force is applied.

Measure the force while the force is applied, and input the measured value in CALIBRATION HIGH.

CHAPTER 4

OPERATING INSTRUCTIONS

Section I: Introduction

Operator Safety



WARNING

- DEATH ON CONTACT may result if personnel fail to observe the safety precautions labeled on the equipment and noted in this manual. **HIGH VOLTAGE** is used in the operation of this equipment.
- To prevent blindness or eye injury, ***wear safety goggles at all times during welding.***
- ***Be careful of moving parts.*** You can be injured by moving parts during welding.
- Do ***not*** wear loose clothing or jewelry around moving parts. They could get caught and cause injury.

Before You Start

Before operating the Power Supply, you ***must*** be familiar with the following:

- The principles of resistance welding and the use of programmed weld schedules.
- The location and function of Controls and Indicators (see *Chapter 1*).
- How to select and use the Power Supply functions for your specific welding applications. For more information (see *Chapter 3*).
- Check that the display screen and lamps are turned on normally.

Preparing for Operation

Verify that the electrical and water supplies meet the electrical and cooling (water) requirements, as shown in *Appendix A, Technical Specifications*. The electrical and water supplies must also meet all applicable local, state, and federal safety standards.

Section II: Operation



CAUTION

If no secondary toroidal coil is connected, make sure that the Power Supply mode is set to **PRIMARY RMS** or **PRIMARY LIMIT** or you may damage the Power Supply.

Starting Welding Operation

1. Turn the cooling water supply ON at the temperature and flow rate shown in *Chapter 2*.
2. Turn the input power ON. Observe that the red **WELD POWER** lamp lights and green **READY** lamp blinks for 7 seconds, then goes off.
3. Press the **MENU** key on the Pendant to see the **MENU** screen.
4. Move the cursor to **SCHEDULE MODE** and press the **ENTER** key.
5. Set each item as described in *Chapter 3*.
6. Again press the **MENU** key to bring back the Menu screen.
7. Move the cursor to **SCHEDULE** and press the **ENTER** key.
8. Set each item as described in *Chapter 3*.
NOTE: For initial set-up, current settings should be a little lower than predicted to prevent damage from excessive settings.
9. Re-set the schedule so that the work piece will be welded adequately.
10. When welding plural work pieces according to plural schedules, change **SCHEDULE #** and set new time and welding current.
11. Set the upper and lower limits on **MONITORSET** screen for each **SCHEDULE#**.

Check the Valve Sequence

1. Press and hold the Power Supply **WELD ON/OFF** switch until the green LED goes out.
2. Initiate a start signal while the **READY** lamp is *not* on, and check each sequential operation.
WARNING: When confirming the operation, check that the Squeeze time (SQZ) is sufficient. If the welding current begins before the welding electrodes have reached sufficient force, expulsion is produced.

3. If no error is detected in Step 2, ensure that the three **READY** requirements are met:
 - The Power Supply **WELD ON/OFF LED** must be ON.
 - The **ON/OFF** setting of the Pendant must be set to ON.
 - An external **WELD ON/OFF** signal must be present at the I/O terminal block.
4. Check that the Power Supply green **READY** lamp is lit
5. Start the weld sequence and confirm that the welding current is flowing normally by checking the red **WELD** lamp and the Monitor screen.
6. Make any necessary adjustments to the schedule so that the work piece will be properly welded.
7. When welding multiple work pieces according to multiple schedules, change the **SCHEDULE #** and set new time and welding current.
8. Set the upper and lower limits on the Pendant **MONITOR SET** screen for each **SCHEDULE #**.
9. Begin welding following normal procedures. Adjust the **SCHEDULE** settings as necessary.

Section III: Shutdown

Turning the Power Supply OFF

Rotate breaker handle to the OFF position. If servicing of power module inside the enclosure is required, wait 20 minutes to avoid electric shock.

CHAPTER 5 MAINTENANCE

Section I: Troubleshooting

The table below lists the **ERROR** messages that may be displayed on the Pendant and what those messages mean, and corrective actions you can take.

FAULT CODE	CONTENTS	CAUSE	MEASURES
E-01	SYSTEM ERROR	An Error has been detected in the IS-800CA/1400CA .	Re-cycle the power. If E-01 SYSTEM ERROR is displayed again, repair is required. Contact AMADA WELD TECH.
E-02	MEMORY ERROR	The welding schedule data is different than the programmed schedule.	Check all settings. If the data in the memory is corrupt, the possible causes are: Abnormal Power Supply voltage from power surge or electrostatic discharge Flash memory's rewrite limit has been exceeded If the error occurs again after initialization, the Power Supply will need repair. Contact AMADA WELD TECH.
E-03	MEMORY TROUBLE		
E-04	PARITY ERROR	Input "Start" signal cable is open/broken, and a parity check error is detected.	Check the start signal input cable.
E-05	TRIP OF EXTERNAL THERMO	Welding transformer temperature rises and opens the external thermostat input circuit.	Low transformer temperature. When using a water-cooled transformer, properly adjust the temperature and flow rate of the cooling water.
		External signal input power is not connected.	Check the external input signal for proper connection.
E-06	TRIP OF INTERNAL THERMO	High equipment temperature causing the power transistor thermostat to open.	Ensure that the duty cycle does not exceed the specified value.
E-07	NO CURRENT	Squeeze of welding electrode is not sufficient.	Adjust the squeeze of the welding electrode.
		SQD or SQZ time is too short.	Check the setting of the SQD or SQZ time to determine whether it is too short. (Note: Set the SQD or SQZ time to a period longer than the stroke time of the electrode)
		NO CURRENT LEVEL is high.	Set a lower NO CURRENT LEVEL .
		Fuse inside the equipment is blown.	The fuse needs replacement. Contact AMADA WELD TECH
		Toroidal coil is not connected.	Connect the toroidal coil.
E-08	OUT LIMIT OF CURRENT ERROR	Welding current is out of CURRENT setting range on the MONITOR SET screen.	Check for stained welding electrode or loose cable connection.

CHAPTER 5: MAINTENANCE

FAULT CODE	CONTENTS	CAUSE	MEASURES
E-09	OUT LIMIT OF PULSE WIDTH ERROR	Welding Current pulse width is out of PULSE HI setting range on MONITOR SET screen.	Check that the transformer capacity is sufficient. Check workpiece and welding electrode.
E-10	SET ERROR	<p>Primary current of turns ratio is out of range of the following formula:</p> $X \leq \left(\frac{\text{HEAT setting}}{\text{TURNS RATIO}} \right) \leq Y$ <p>IS-800CA: X = 15, Y = 800 IS-1400CA: X = 30, Y = 1400</p> <p>The WELD1, WELD2, and WELD3 values are all “0.”</p> <p>The total time of UP SLOPE and DOWN SLOPE is longer than the WELD time.</p> <p>HEAT setting, including RATIO setting is equal to or lower than UF or DL setting.</p> <p>Although STEPPER MODE is set to LINER or FIXED, STEPPER COUNT of STEP number set for START ON STEP # are all “0.”</p> <p>The series of welding currents in WELDS without COOL are different than the consecutive UP/DOWN settings.</p> <p>UP/DOWN is set in the consecutive portion of a series of WELDS without COOL and the portion meets specific conditions.</p> <p>On Advanced Power Supply models the transformer weld frequency was set greater than 1000Hz</p>	Correct each setting.
E-11	SET OVER	<p>HEAT setting (including RATIO setting) is equal to or lower than UF or DL setting.</p> <p>HEAT setting (including RATIO setting) is larger than the maximum current, voltage, or power setting.</p> <p>HEAT setting (including RATIO setting) is lower than the minimum value of current, voltage, or power setting.</p>	Correct each setting.
E-12	STOP	<p>External STOP input circuit is open.</p> <p>Power supply for external input is not connected.</p>	<p>Rectify cause of the STOP, and then close the STOP circuit.</p> <p>Check the external input signal for proper connection.</p>

FAULT CODE	CONTENTS	CAUSE	MEASURES
E-13	OVER CURRENT	Primary current above the limit is detected.	Check for welding transformer and welding electrode problems.
			Check that the toroidal coil or the voltage detection cable is connected in the secondary control.
E-14	SHORT WITH GROUND	The output cable between the welding transformer and the power supply is grounded.	Check the output cable.
E-15	LACK OF COOLING WATER	Cooling water flow is low.	Increase the cooling water flow rate to meet specifications.
		Power supply for external input is not connected.	Check external input signal for proper connection.
E-16	START ERROR	Schedule signal has not been entered when the external start signal is present.	Input the schedule before the start signal.
E-17	AC 50/60 FREQUENCY FAILURE	Frequency of incoming power supply is not stable, and equipment cannot determine whether it is at 50 Hz or 60 Hz.	Check power source.
E-18	OUT LIMIT OF VOLTAGE ERROR	Secondary voltage is out of the VOLT setting range on the MONITOR SET screen.	Check for stained welding electrodes and low electrode force.
E-19	OUT LIMIT OF POWER ERROR	Welding power is out of the POWER setting range on the MONITOR SET screen.	
E-20	INTERRUPT ERROR	The current shutoff signal is present before the start signal.	Check interrupt input signal.
E-21	NO VOLTAGE	No detection of voltage across welding electrodes.	Make sure that the cable detecting the voltage across welding electrodes is connected.
		NO VOLTAGE LEVEL is too high.	Set a lower NO VOLTAGE LEVEL .
E-22	OVER CURRENT (DC 24 V)	Built-in 24 VDC power supply on the rear panel is shorted and overloaded.	Turn off the power and check the I/O connection on the rear panel.
E-23	SHORT CIRCUIT	The output cable is shorted.	Check the output cable.
E-24	PRECHECK ERROR	Current is outside of the upper / lower limit setting on the PRECHECK screen (when the PRECHECK Current Supply is used).	Check for contamination on the weld pickup electrodes, electrodes and workpieces. Check range set on the PRECHECK Screen.
E-25	RAM MEMORY ERROR	Count data or schedule number data stored in memory is corrupt.	Memory was erased because the period for retaining memory of the count data elapsed over the specified period. Count data memory is retained up to 10 days after the power supply is turned off.
E-26	LACK OF WELD COUNT	The counted number of welds is less than the WELD COUNT setting.	Add more welds to equal the WELD COUNT setting.

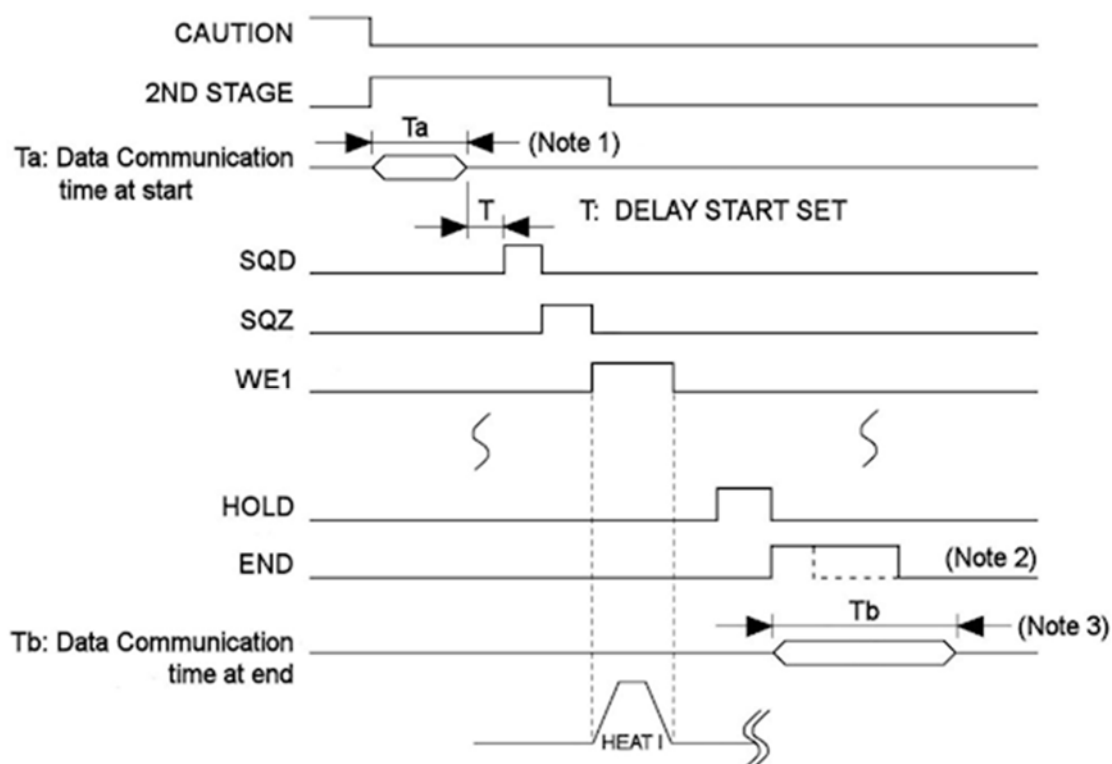
CHAPTER 5: MAINTENANCE

FAULT CODE	CONTENTS	CAUSE	MEASURES
E-27	END OF STEP	The STEPPER COUNT has completed its final step.	Dress or replace the tip, then reset the step.
E-28	COUNT UP	The total weld count is equal to the preset count value.	Reset the counter.
E-29	PHASE MISSING	A welding power supply error is present.	Confirm that the welding power supply is connected correctly.
E-30	POWER FAILURE	The power was out during welding.	Check for the cause of the instantaneous power failure.
E-31	OUT LIMIT OF TIME ERROR	Weld time is out of the TIME setting range on the MONITOR SET screen.	Check the welding stop input of the external interface.
E-32	COMM SETTING ERROR	The bi-directional data write (in external communications), is either out of the range or the data format is wrong.	Check the write data.
E-33	SUCCESSIVE BACK STEP ERROR	The first SCHEDULE is selected. SCHEDULE cannot be returned any more.	Check the back step input. Check that SCHEDULE is returned to the first one.
E-34	TIP DRESS REQUIRED	Counting has arrived at the tip dress setting value. This occurs when the tip dress is set for stepper.	Dress the tip, then reset it.
E-35	APPROACHING CAP CHANGE	Capacitor change count is approaching the change setting value.	The time for a capacitor change is approaching. Check and reset it.
E-36	CAP CHANGE REQUIRED	STEPPER COUNT has completed its final step.	Dress or replace the tip, then reset step.
E-37	OUT LIMIT OF DISPLACEMENT ERROR	IS-800CA/1400CA Advanced ONLY : The displacement is out of the DISPLACEMENT LIMIT setting range on the DISPLACEMENT screen.	Check work pieces, welder and welding power supply voltage. Check range set at DISPLACEMENT LIMIT .
E-38	WORK DETECTERROR	IS-800CA/1400CA Advanced ONLY : The workpiece detection is out of the WORK DETECT LIMIT setting range on the DISPLACEMENT screen.	Check work piece setting and positioning. Check range set at WORK DETECT LIMIT .
E-39	WITHOUT EXTENSION BOARD	IS-800CA/1400CA Advanced ONLY : The optional extension board is not connected.	Recycle power. If the E-39 error WITHOUT EXTENSION BOARD is displayed again, repair is required. Contact AMADA WELD TECH

When the Welding Does not Start, Even if the Start Signal is present

When welding does not start even if the Start signal **2ND STAGE** signal is present, the following causes may be occurring:

- The Welder is not ready as indicated by the READY light.
- Start signal is shorter than DELAY START SET time setting.
- Start signal is input while the END signal is output.
- Start signal is input during communicating with the Pendant.



CHAPTER 5: MAINTENANCE

NOTES:

- When the next start signal is received while the monitor error is displayed on the Pendant, the **CAUTION** signal is turned OFF and the previous screen is displayed. At this time, the data is transferred to the Pendant from the Power Supply. The start signal is not received while the data is transferred. (Ta: 40 ms max. in the figure above.) When the monitor error is displayed, input the start signal more than (Ta) time.
- When the sequence ends, the **END** signal is output after **HOLD**. To make the cycle time faster, lower the output time of END signal. (Can be set in 10 ms increment. The minimum value is 10 ms.)
- When the **MONITOR** screen is displayed, the monitor data is transferred to the Pendant simultaneously with the **END** signal output (transmission time Tb1). The monitor data is not transferred when the screen other than **MONITOR** screen is displayed.

The next Start signal is not received while the monitor data is transferred. Also, on every screen, the data is transferred to the Pendant from the Power Supply to display the monitor error when the monitor data is beyond/below the upper/lower limit (data communication time Tb2). The data communication time at end “Tb” is shown in the table below.

	MONITOR ERROR OCCURS	MONITOR ERROR DOES NOT OCCUR
MONITOR screen	Tb1: 164 ms max.	Tb1+Tb2+α: 280 (438) ms max.
Screens other than MONITOR screen	0 ms	Tb2: 113 (144) ms max.

* Time in () is the time with RS-232C communication.

- When the RS-232C external communication function is set to the single-directional communication mode (**MODE SELECT** Screen), the monitor data is transferred to the host computer after the completion of welding (transmission time **Tc1**).

Also, when the monitored value is outside the upper/lower limit on the **MONITOR SET** screen, the monitor error code is transferred to the host computer (transmission time **Tc2**). The Start signal is not received while during transmitting.

To make start time faster, set the external communication function to OFF. Shown below is the data transmission time **Tc1** and **Tc2** when the communication speed is 9,600 bps. When the communication speed is 19,200 bps or 38,400 bps, the transmission time will be short.

- Data transmission time when the communication speed is 9,600 bps

Tc1	132 ms maximum
Tc2	42 ms maximum

Section II. Before You Start

IS-800CA / IS-1400CA Cleaning



CAUTION

When cleaning the exterior of the Power Supply, do **not** use paint thinner, benzene, or acetone. These chemicals can damage the surface finish on the Power Supply. Use a dry cloth or, if it is heavily soiled, use a cloth moistened with a mild detergent or alcohol.

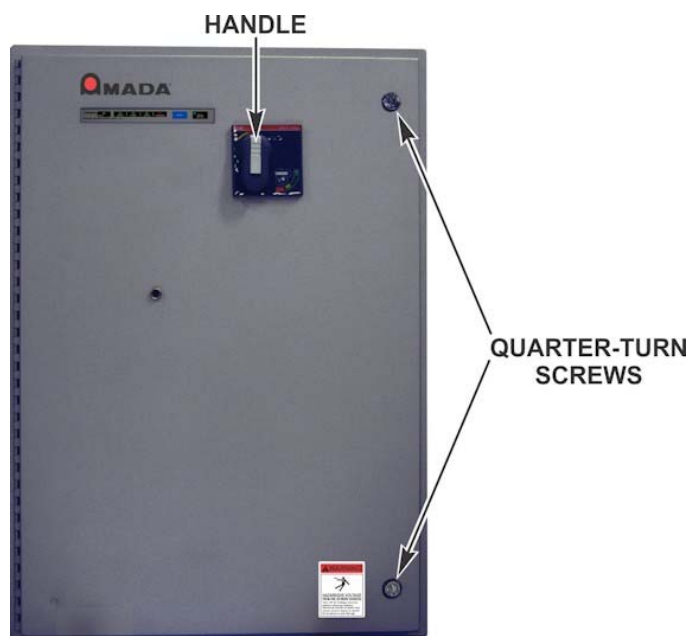
IS-800CA / IS-1400CA Safety Precautions



DANGER

DEATH ON CONTACT may result if you fail to observe all safety precautions. **Lethal voltages** are present in the Power Supply. Perform the following steps to eliminate electrical shock hazard. Make sure external power is turned OFF before performing any maintenance procedures.

1. Turn the power to the Power Supply OFF.
2. Open the front door by turning the two quarter-turn screws.
3. Turn circuit breaker to OFF.



Section III: Fuse Failure and Replacement

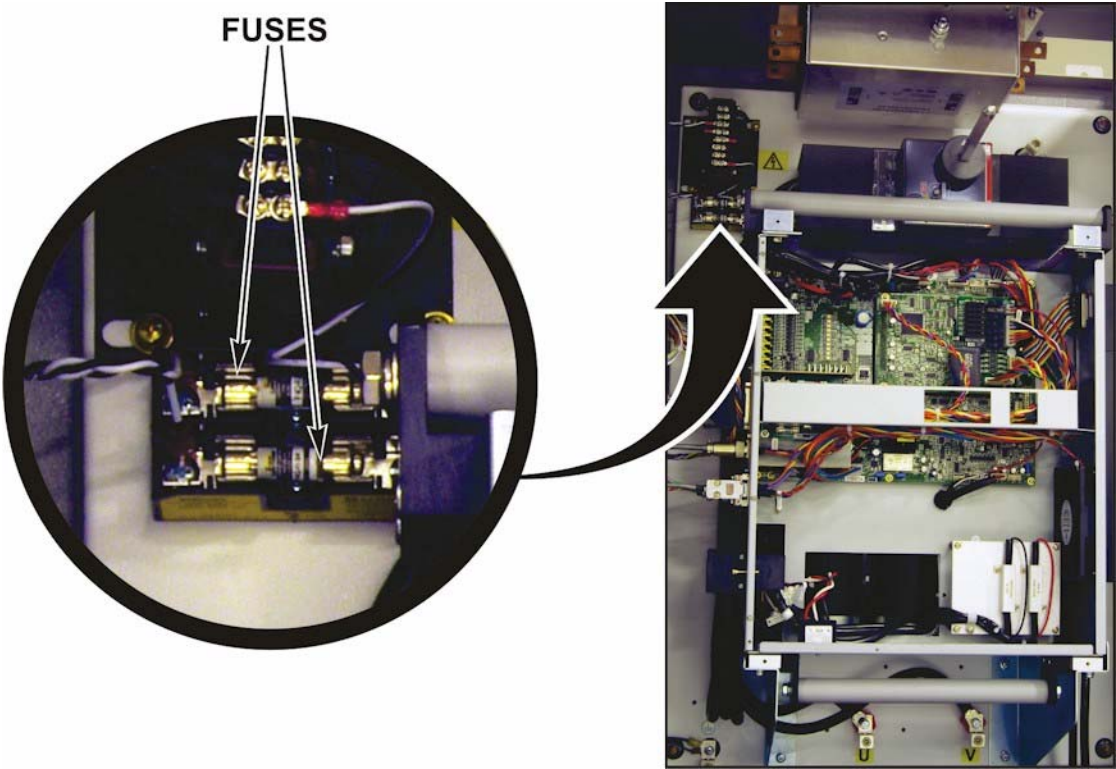


CAUTION

Do **not** attempt to replace any fuses other than those described below. All other fuses in the Power Supply should **only** be serviced by factory-authorized technicians or serious damage to the Power Supply could result.

Power Supply

The Power Supply contains fuses located on the top left of the cabinet as shown below. Before replacing either fuse, determine what caused it to fail and make appropriate repairs.



FUSE	DESCRIPTION	150 VA valve transformer	250 VA valve transformer
2	Power Supply Transformer Fuse	P/N 330-175 0.75 amps, slow-blow	P/N 330-120 1.50 amps, slow-blow

Section IV: Maintenance Procedures

Cooling Maintenance

Perform the following maintenance on the cooling system:

- **Monthly** – Check the water hoses to assure there is no leakage.
- **Any time there is a chance that the water might freeze** – Drain the water.
- **Any time you believe that there is a build-up of sediment that might decrease the water flow and cause the Power Supply to overheat** – Drain and flush the hoses and heat sink/IGBT cooling chamber.

Checking Water Hoses

1. Disconnect power to the Power Supply then wait for 20 minutes after the power is removed before maintenance.
2. Check the input/output hoses on the right side of the Power Module and the interconnecting hoses on the left side for any sign of water leakage.
3. Turn off the water supply and squeeze the hoses to check for brittleness. Restore water flow.
4. Re-install the plastic high voltage protective cover with the four screws that secure it.
5. Close the Power Supply door and secure it with the two quarter-turn screws.
6. Reconnect power to the Power Supply, then set the circuit breaker to ON.

Draining Water Hoses

1. Turn off and tag the Power Supply circuit breaker, so the Power Supply cannot be operated while the water is drained.
2. Turn off the water source, wherever convenient.
NOTE: Be sure to have a bucket or other receptacle handy to collect the drained water.
3. Disconnect both hoses at the bottom of the Power Supply and allow the water to drain into the bucket.
4. Allow the input and output hoses to drain into the bucket.
5. Leave the hoses disconnected until danger from freezing has passed.

Flushing Water Hoses and Cooling Chambers

1. Turn off and tag the Power Supply circuit breaker, so the Power Supply cannot be operated during flushing.
2. Turn off the water source, wherever convenient.
NOTE: Be sure to have a bucket or other receptacle handy to collect the drained water.
3. Disconnect one of the hoses at the bottom of the Power Supply and allow the water to drain into the bucket.

4. Turn the water back on slightly, but enough to flush the system. When the water is running clean, turn the water OFF.
5. Reconnect the hose back onto the Power Supply and restore power and water.
6. Close the Power Supply door and secure it with the two quarter-turn screws.

NOTE: To reduce damage to the Power Supply, should there be an external problem, reconnect external power to the Power Supply before turning the circuit breaker ON.

7. Turn the circuit breaker ON.

Section V: Power Module Replacement

Remove the Power Module

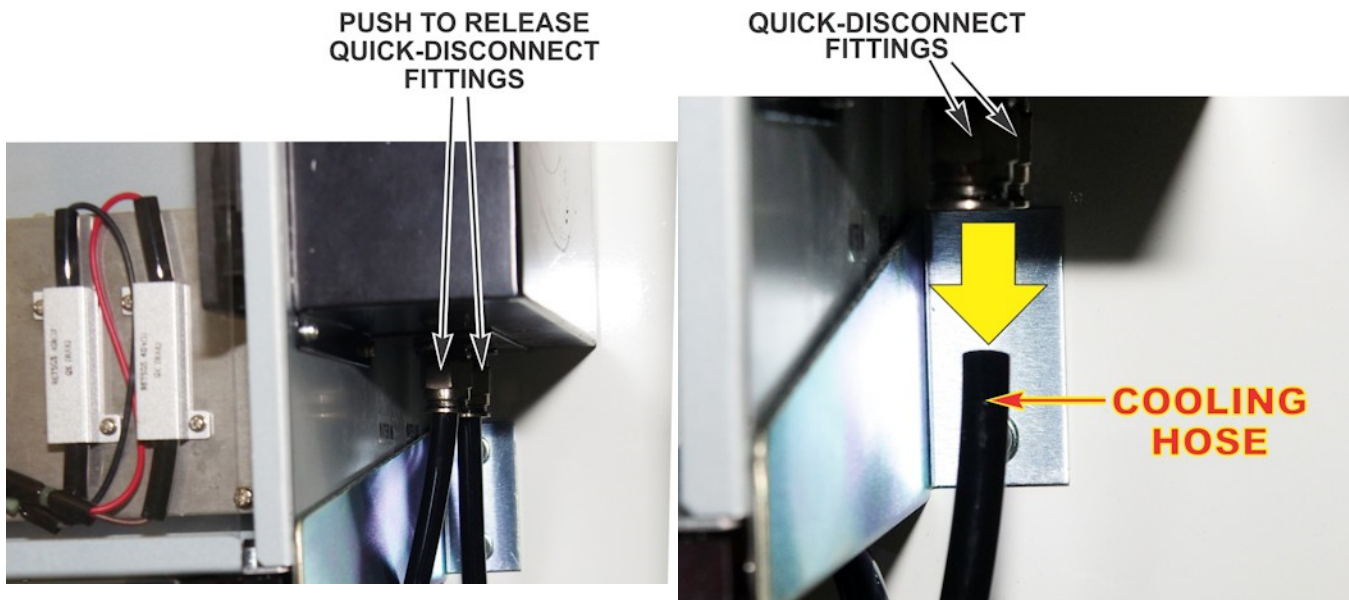
The Power Module is a one-piece assembly that can quickly and easily be removed, serviced, and replaced. ***Before you start***, disconnect power to the Power Supply, then wait for 20 minutes after the power is removed before removing the Power Module.

Cooling Water Hoses

1. Turn the water source OFF.

NOTE: Place a bucket or other receptacle under the quick-disconnect fittings to collect any residual drained water.

2. Push the quick-disconnect fittings at the bottom of the Power Module to disconnect both hoses and allow the water to drain into the bucket.

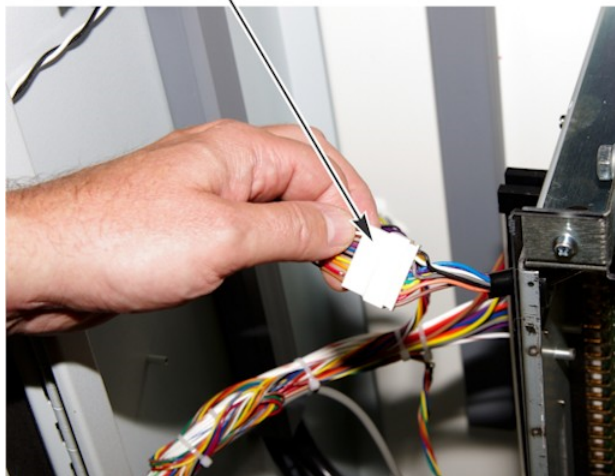


CHAPTER 5: MAINTENANCE

Disconnect the Wire Harness from the Main Board Connectors

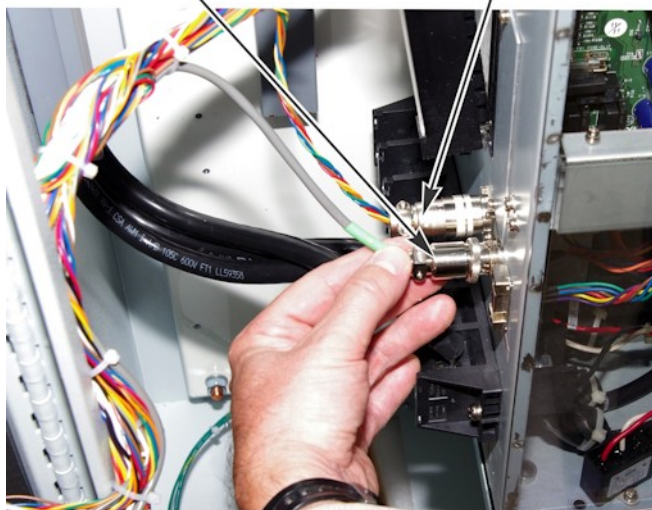
Disconnect wire harness connectors from the Power Supply as shown below.

DISPLAY CONNECTOR

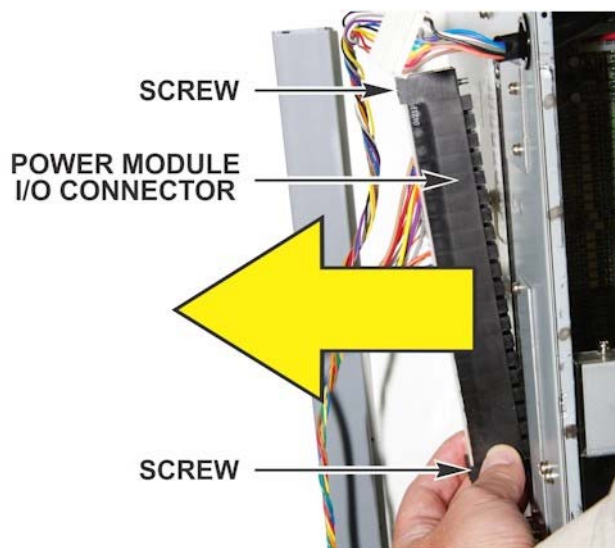


CURRENT COIL CONNECTOR

PENDANT CONNECTOR



POWER MODULE POWER INPUT CONNECTIONS (3)



On the IS-800CA/1400CA Advanced power module also remove the 25-pin D-sub connector and displacement sensor connector (not shown)

Remove the Power Module



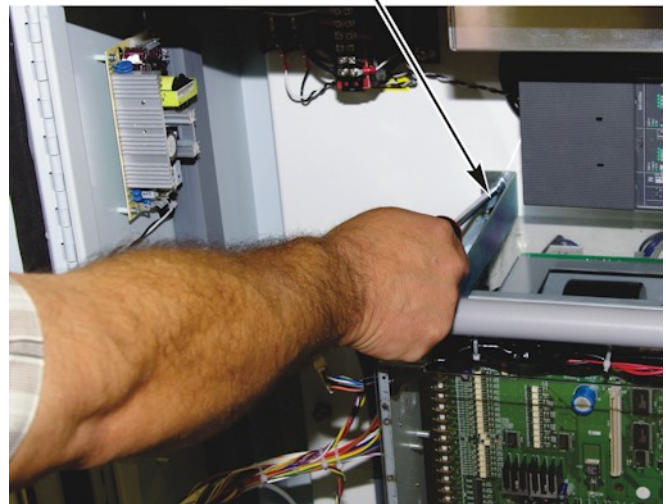
CAUTION

Before attempting to remove the Power Module, verify that **all** electrical connectors have been disconnected and are positioned so they will **not** be snagged during removal or you may damage the equipment.

NOTE: The weight of the Power Module is supported by the two support rails shown below. Remove the screws shown below in order to remove the Power Module from the cabinet.



POWER MODULE SCREWS
(1 each on left & right sides.)



4 POWER MODULE SCREWS
(2 each on left & right sides.)



POWER MODULE POWER INPUT CONNECTIONS (3)





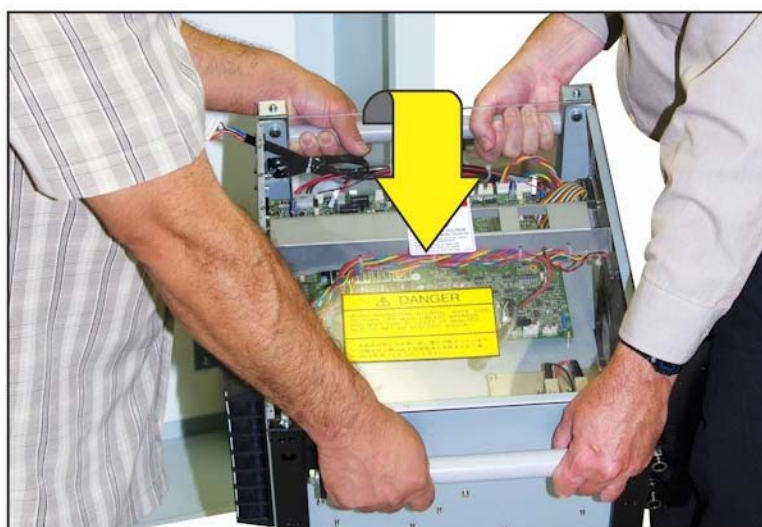
CAUTION: 2-PERSON LIFT

When all screws are removed, use at least one hand to hold the **POWER MODULE** on the support rails until you are ready to remove it to avoid dropping or damaging the unit.

When you are ready to remove the unit, use a 2-person lift as shown below.

POWER MODULE
HANDLE

POWER MODULE
HANDLE



Replace the Power Module

1. Replace or re-install the Power Module by carefully sliding it back onto the support rails.
2. While holding the Power Module in place with one hand, re-attach the screws securing the Power Module to the cabinet.
3. Re-install **all** connectors to the Power Module. Make sure the appropriate connectors on the wire harness are plugged into terminal strip TB1 on the door.
4. If necessary, re-install the cable bundles into the cable ties and secure them in place.
5. Reconnect the cooling water lines to the fittings on the bottom of the box. Use a 17 mm open end wrench to tighten the two compression nuts
6. Restore water flow.
7. Close the Power Supply door and secure it with the two latching screw-fasteners.
8. Reconnect power to the Power Supply, then set the circuit breaker ON.

Section VI: Repair Service, Storage, Shipment

Repair Service

If you have problems with your Control that you cannot resolve, please contact our service department at the address, phone number, or e-mail address indicated in the Foreword of this manual.

Preparation for Storage or Shipment

1. Disconnect power to the Power Supply then wait 20 after power is removed before the following procedures.
2. Turn off water source and disconnect the water hoses to the Power Supply. Using shop air, dry out the hoses.
3. Remove the circuit breaker line terminal cover and disconnect all line wires. Replace cover.
4. Disconnect all load wires.
5. Disconnect all signal wires
6. Remove any conduits from the top and bottom of the Power Supply as necessary.
7. If a secondary current sensor is used, disconnect the signal cable from the connector on the bottom of the Power Supply.
8. Replace the plastic cover and secure it with the four mounting screws.
9. Remove the Power Supply from its mounting location.
10. Repack the Power Supply into the original packing materials and packing box in which you originally received the Power Supply.

APPENDIX A

TECHNICAL SPECIFICATIONS

Specifications

Model No.		IS-800CA	IS-1400CA
Dimensions: (W x H x D) inches (mm) <i>(see isometric images on page 2-1)</i>		30.4" x 39.0" x 13.0" (772 mm x 991 mm x 330 mm)	31.0" x 52.0" x 13.0" (796 mm x 1,321 mm x 330 mm)
Weight		250 lb. (109 kg)	340 lb. (160 kg)
Max. input voltage (voltage level is factory set and is not field selectable)		3-phase, 380 – 480 VAC ±10% (50/60 Hz)	3-phase, 380 – 480 VAC ±10% (50/60 Hz)
Max. output current		800 A (peak value)	1,400 A (peak value)
Average max. duty cycle	Output current [() indicates duty cycle.] (at 40 °C, 1 kHz of welding frequency)	800 A (3%) 500 A (10.5%) 350 A (20%) 100 A (100%)	1400 A (3%) 1000 A (7%) 500 A (26%) 100 A (100%)
Number of schedules		255	
Control method *		Primary constant-current effective value control Secondary constant-current effective value control Secondary constant-power effective value control Primary constant-current peak value control Secondary constant-voltage effective value control Constant-phase control	
Transformer turns ratio * (TURN RATIO)		1.0 – 199.9	
Transformer frequency * (WELD TRANS FREQ)		600 – 3000 Hz (in units of 100 Hz) Basic unit 600 – 1000 Hz (in units of 100 Hz) Advanced unit	
Timer setting range *	SQD / squeeze delay time SQZ / squeeze time U1 / upslope 1 time WE1 / weld 1 time D1 / downslope 1 time COOL1 / cooling 1 time U2 / upslope 2 time WE2 / weld 2 time D2 / downslope 2 time COOL2 / cooling 2 time U3 / upslope 3 time WE3 / weld 3 time D3 / downslope 3 time HOLD / hold time OFF / off time (Note 1)	0000 – 9999 (ms) / 0000 – 9999 (CYC) 0000 – 9999 (ms) / 0000 – 9999 (CYC) 000 – 999 (ms) / 00 – 50 (CYC) 000 – 999 (ms) / 00 – 50 (CYC) 000 – 999 (ms) / 00 – 50 (CYC) 000 – 999 (ms) / 00 – 50 (CYC) 0000 – 9999 (ms) / 0000 – 0999 (CYC) 000 – 999 (ms) / 00 – 50 (CYC) 000 – 999 (ms) / 00 – 50 (CYC) 000 – 999 (ms) / 00 – 50 (CYC) 0000 – 9999 (ms) / 0000 – 0999 (CYC) 000 – 999 (ms) / 00 – 50 (CYC) 000 – 999 (ms) / 00 – 50 (CYC) 000 – 999 (ms) / 00 – 50 (CYC) 00000 – 20000 (ms) / 00000 – 00999 (CYC) 0 or 0010 – 9990 (ms) / 0000 – 0099 (CYC)	

APPENDIX A: TECHNICAL SPECIFICATIONS

Model No.			IS-800CA	IS-1400CA
Pulsation setting * (PULSATION)			01 – 19 (settable for WELD1 to WELD 3, respectively)	
Valve setting * (VALVE)			2 valves (VALVEx (SOLx), 1 and 2 Basic unit 8 valves (VALVEx (SOLx), 1 and 2; EX VALVEx (EX SOLx), 1 thru 4; RET VALVEx (RET SOLx); VALVE RELAY (SOL RELAY) Advanced unit	
Control gain * (GAIN)			1 – 9	
Current monitor * (CURRENT H/L)			00.0 – 99.9 kA 0.00 – 9.99 kA	
Power monitor * (POWER H/L)			000.0 – 999.9 kW 00.00 – 99.99 kW	
Voltage monitor * (VOLT H/L)			0.00 – 9.99 V	
Pulse width monitor * (PULSE H)			010.0 – 100.0%	
Step-up/-down (STEPPER COUNT)			STEP Up (down) ratio (RATIO) Counter setting (COUNT) } Selectable for each valve	
Weld count monitor (PRESET COUNT)			0000 – 9999	
Setting range* (HEAT)	Constant current control (Note 2)	80 kA range	---	04.0 – 80.0 kA
		40 kA range	02.0 – 40.0 kA	02.0 – 40.0 kA
		20 kA range	01.0 – 20.0 kA	01.0 – 20.0 kA
		10 kA range	0.50 – 9.99 kA	0.50 – 9.99 kA
		5 kA range	0.05 – 5.00 kA	0.05 – 5.00 kA
	Constant power control	80 kA range	---	04.0 – 120.0 kW
		40 kA range	02.0 – 60.0 kW	02.0 – 60.0 kW
		20 kA range	01.0 – 20.0 kW	01.0 – 20.0 kW
		10 kA range	0.50 – 9.99 kW	0.50 – 9.99 kW
		5 kA range	0.05 – 5.00 kW	0.05 – 5.00 kW
	Constant voltage control		0.20 – 9.99 V	
	Constant phase control		10.0 – 99.9%	
Cooling method			Water cooled for IGBT's and power components. <ul style="list-style-type: none">Flow Rate: 6 liters/minute minimum.Water Temperature: 35°C maximum.Water Pressure: 40 psi maximum.Maximum ambient humidity ≤ 85% (non-condensing)	

APPENDIX A: TECHNICAL SPECIFICATIONS

Model No.		IS-800CA	IS-1400CA
State indicator LED		[WELD POWER] lamp [READY] lamp [START] lamp [WELD] lamp [TROUBLE] lamp [WELD ON/OFF] lamp	
Operating environment	Ambient temperature Humidity Altitude Pollution degree	+5 to °C +40 °C 90% max. (no condensation) 1000 m max. 3	
Transport and storage conditions	Ambient temperature Humidity	-10 to +55 °C 90% max. (no condensation)	
Heat-resistant class		E	
Case protection		IP20	
Protective functions	Over current	200 A Fuse	200 A Fuse (per leg)
	No-current	Power is turned off in the following cases: a. When a secondary current is not detected in Secondary constant-current effective value control, Secondary constant-power effective value control, or Constant-phase control. b. When a primary	
	No-voltage	Under Secondary constant-voltage effective value control or Secondary constant-power effective value control, the supply of current is stopped when a secondary voltage cannot be detected.	
	Temperature	Overheating of power unit of inverter and welding transformer are detected.	
	Self-diagnostic error	Setting dates (e.g., schedule settings) are diagnosed.	
Setting accuracy (Note 3)		Within ± 3% of full scale	
Repetition accuracy (Note 3)		Within 4% of full scale	
FORCE Monitor Accuracy		Within 2% of full scale	
Accessory		Operation manual: 1 copy	

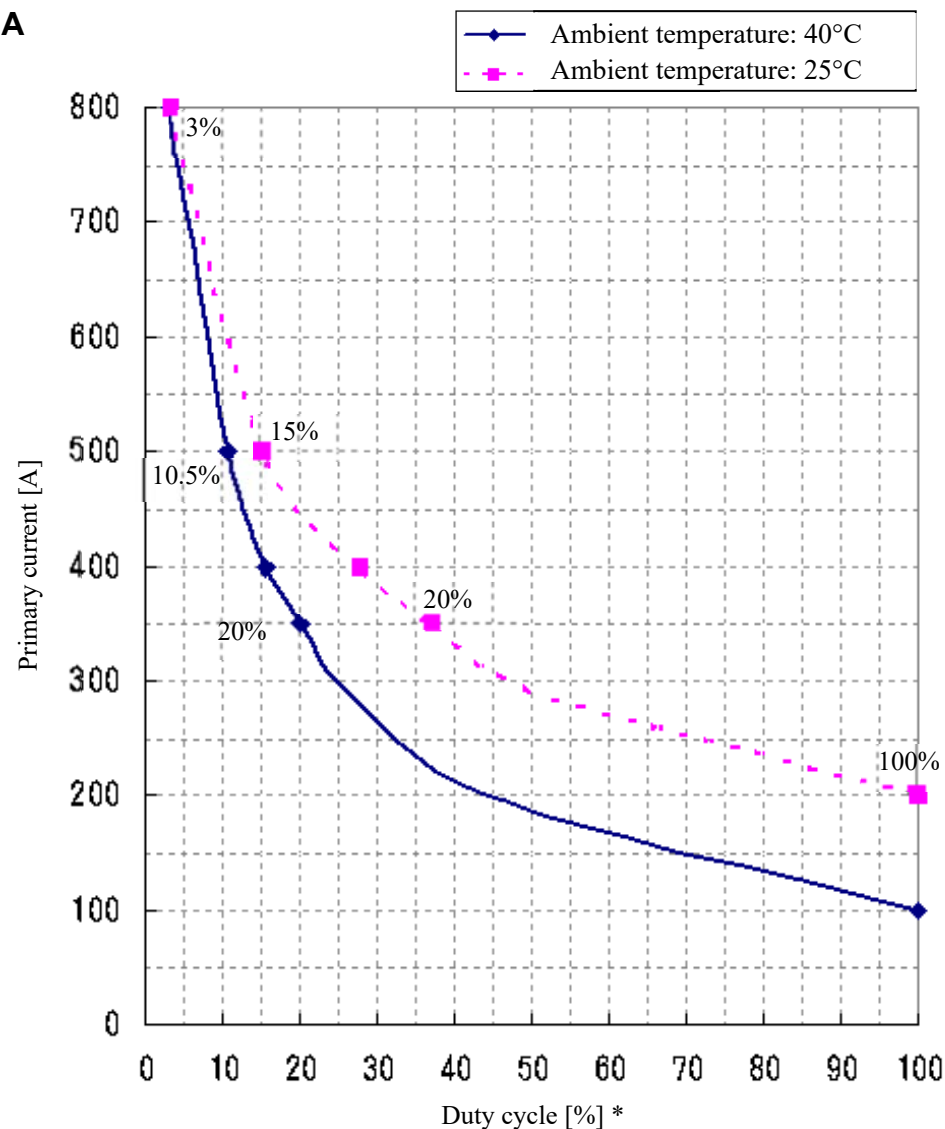
*: selectable for every 255 schedules

NOTES:

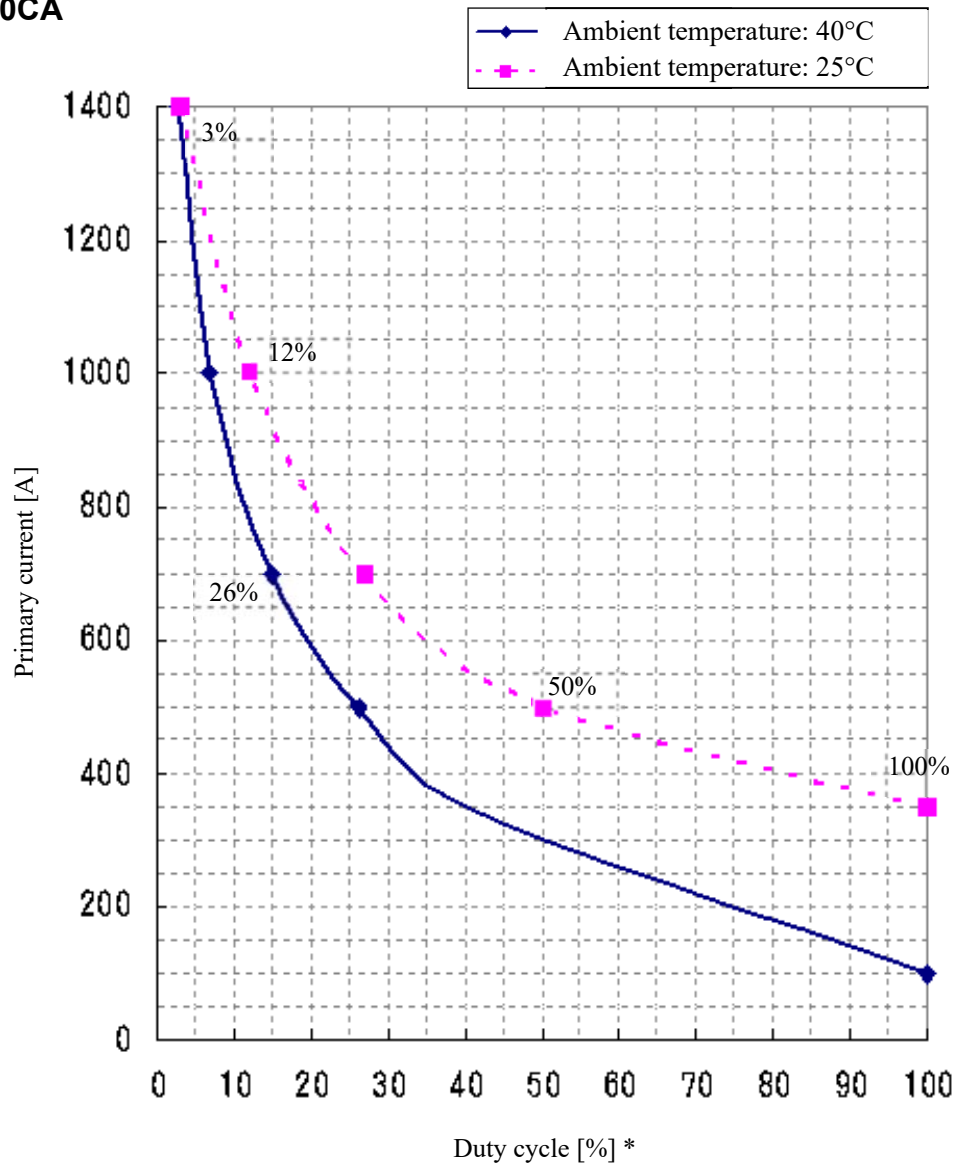
- No repetitive operation will be performed if “0” is selected for OFF (off time).
- Primary current can be set up to 800 A for **IS-800CA** and 1400 A for **IS-1400CA**.
- Using the fixed load and the specified transformer
 - The weld time is 100 ms. The measurement range is from 60 ms to 100 ms.
 - The voltage may be out of the range due to the induced electromotive force.

Duty Cycles

IS-800CA



ISA-1400CA



* This duty cycle graph is applied when the frequency is set to 1 kHz. Decrease the duty cycle by 0.5% (from the above graph) for each additional 100 Hz of frequency. (Example: when the frequency is increased to 3 kHz, the duty cycle needs to be decreased by 10%.)

APPENDIX A: TECHNICAL SPECIFICATIONS

Weld Time Limit

Use the Power Supply with the weld time calculated with the following formula or less for the primary current.

IS-800CA: For 600 A or more of the primary current, the maximum weld time [ms] = $-4 \times (\text{IGBT primary current value}) + 3400$.

Example: Primary current is 700 A on **IS-800CA**- $4 \times 700 + 3400 = 600$ [ms].
Therefore, the maximum weld time is 600 ms.



APPENDIX A: TECHNICAL SPECIFICATIONS

IS-1400CA: For 1000 A or more of the primary current

Maximum weld time [ms] = $-2 \times (\text{IGBT primary current value}) + 3000$

Example: Primary current is 1100 A on **IS-1400CA**- $2 \times 1100 + 3000 = 800$ [ms].

Therefore, the maximum weld time is 800 ms.

