OPERATOR MANUAL 990-380
Revision A January 2015

AMADA MIYACHI AMERICA, INC.

OPERATORS MANUAL

FOR THE

IS-800CR/1400CR INVERTER POWER SUPPLY

Model IS-1400CR

BASIC model: IS-1400CR-AX-XX

ADVANCED model: IS-1400CR-BX-XX

Model IS-800CR

BASIC model: IS-800CR-AX-XX

ADVANCED model: IS-800CR-BX-XX

Printed in the United States of America

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About This Equipment

Thank you for purchasing a Miyachi Unitek IS-800CR/1400CR Inverter Power Supply. This Power Supply has a wide variety of options, some are installed at the time of purchase, some may be added later. For the rest of this manual, the **IS-800CR/1400CR** will be referred to simply as ***the Power Supply***.

Upon receipt of the unit, please thoroughly inspect it for shipping damage prior to its installation. Should there be any damage, please immediately contact the shipping company to file a claim, and notify us at:

Amada Miyachi America
1820 South Myrtle Avenue
P. O. Box 5039
Monrovia, California 91016
Phone: (626) 256-4128
FAX: (626) 303-5396
URL: www.amadamiyachi.com

Amada Miyachi America is not responsible for any losses due to improper use of this product.

About This Manual

The contents of this manual are subject to change without notice. If you have any questions, find any errors/omissions, or if you have suggestions for improving this manual, please contact us.

SAFETY PRECAUTIONS

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.

WHEN WELDING always wear safety glasses.

General

This instruction manual describes the operation and maintenance of the Power Supply and provides instructions relating to its SAFE use. Procedures described in this manual ***must*** be performed as detailed by QUALIFIED and TRAINED personnel.

For SAFETY, and to effectively take advantage of the full capabilities of the Power Supply, please read this instruction thoroughly ***before*** attempting to use it.

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

Operation

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

When operating any welder, ***always*** wear appropriate personal protective gear.

Maintenance/Service

Before performing any maintenance on the Inverter Power Supply, read *Chapter 5, Maintenance* thoroughly. Use the appropriate tools for terminating the connecting cables, being careful not to nick the wire conductors.

Do ***not*** modify the Power Supply without prior written approval from Amada Miyachi America.

Before using this equipment, read the **SAFETY PRECAUTIONS** carefully to understand the correct usageof the equipment.

- These precautions are given for safe use of the Inverter Power Supply and for prevention of injury to operators or others.
- Be sure to read each of the instructions, as they are all important for safe operation.
- The meanings of the words and symbols are as follows:

⚠ WARNING

Denotes operations and practices that may result in serious injury or loss of life if not correctly followed.

⚠ DANGER

Denotes operations and practices that may imminently result in serious injury or loss of life if not correctly followed.

⚠ CAUTION

Denotes operations and practices that may result in personal injury or damage to the equipment if not correctly followed.

These symbols denote **PROHIBITION.** They are warnings about actions that should ***not*** be performed because they can damage the equipment and will void the warranty.

These symbols denote actions which operators ***must*** take.

Each symbol with a triangle denotes that the contents gives notice of **DANGER, WARNING,** or **CAUTION** to the operator.

⚠ DANGER

DO NOT TOUCH THE INSIDE OF THE POWER SUPPLY UNNECESSARILY.

High Voltages are present inside the Power Supply Cabinet. Do not touch the inside of the Power Supply unnecessarily wit the power turned ON. You may receive an electric shock. When inspecting the inside of the Power Supply, be sure to turn the power source OFF and push and hold the **DISCHARGE** switch until the **CHARGE** light goes OFF.

NEVER DISASSEMBLE, REPAIR, OR MODIFY THE POWER SUPPLY.

These actions can cause electric shock and fire. Do ***not*** do anything other than the maintenance described in the Operator Manual.

WARNING

Do NOT put your hands or fingers between the electrodes.

When welding, keep your hands and fingers away from the electrodes.

Do NOT touch any welded part or electrode during, or just after welding.

The welded parts and electrodes are very ***hot***. If you touch them you will be burned.

Ground the equipment.

If the equipment is not grounded, you may get an electric shock.

Use a ground fault breaker.

Use a ground fault breaker to prevent an electric shock.

Only use specified cables.

A cable with insufficient capacity or loose connections can cause electric shock or fire.

Do NOT use a damaged power cable, connecting cables, or plugs.

Do ***not*** step on, twist, or tense any cable. The power cable and connecting cables may be damaged which can cause electric shock, short circuit, or fire. If any part needs to be repaired or replaced, consult Amada Miyachi America or your distributor.

Stop operation if any trouble occurs.

If you detect a burning smell, abnormal sounds, abnormal heat, smoke, etc., turn power OFF immediately to prevent fire or electric shock. Contact Amada Miyachi America or your distributor for help.

People with pacemakers MUST stay away from the Power Supply.

When the Power Supply is operating, it generates a magnetic field, which adversely affects pacemakers. People who use a pacemaker must ***not*** approach the Power Supply, or walk around the welding shop while the Power Supply is operating, ***unless*** their medical doctor has deemed it safe to do so.

Wear protective gear.

Put on protective gear such as protective gloves, long sleeved jacket, and leather apron to avoid being burned.

CAUTION

Apply the specified source voltage.

Applying the ***wrong*** voltage can cause fire and electrical shock.

Keep water and water containers away from the Power Supply.

Water spilled on the Power Supply can cause a short circuit, electrical shock, or fire.

Use proper tools (wire strippers, pressure wire connectors, etc.) for terminations of the connecting cables.

Do ***not*** nick the wire conductor. Doing so can cause a short circuit, electric shock, or fire.

Install the Power Supply on a firm, level surface.

Injury may result if the Power Supply falls over or drops from an uneven surface.

Keep combustible matter away from the Power Supply.

Spatter can ignite combustible materials. If you cannot remove all combustible materials, cover them with a non-combustible material.

Do NOT cover the Power Supply with a blanket, cloth, etc.

Heat generated by the operating Power Supply may ignite a blanket or cover.

Wear ear protectors.

Loud noises can damage hearing.

Keep a fire extinguisher nearby.

Make sure there is a fire extinguisher in or near the welding shop in case of fire.

Regularly inspect and maintain the Power Supply.

Regular inspection and maintenance is essential to safe operation and long life of the equipment. If you see any damage, make necessary repairs before operation.

CHAPTER 1
SYSTEM DESCRIPTION
Section I: Features

Features

The Miyachi Unitek IS-800CR/1400CR, which is a highly configured version of Amada Miyachi's ISB-800A/1400A products, is an inverter-type power supply specially designed to be used for spot welding and fusing. Most of the features and functions for these two power supplies are identical, however the IS-800CR provides 800 amps primary current, while the IS-1400CR provides 1400 amps primary

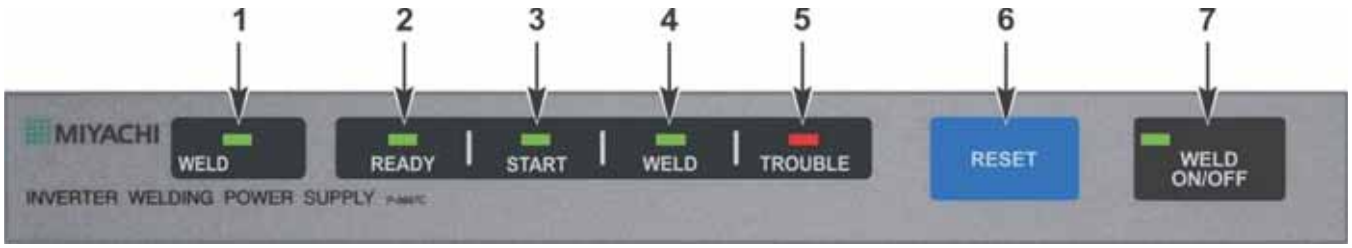
The IS-800CR/1400CR can be ordered as a BASIC (IS-800CR/1400CR-Ax-xx) or ADVANCED (IS-800CR/1400CR-Bx-xx) unit current. The feature differences are highlighted below and throughout the manual. For the rest of this manual, the Miyachi Unitek IS-800CR/1400CR will simply be referred to **as *the Power Supply***, unless a feature or procedure unique to a specific model is described.

- The power supply accepts 3-phase voltage from 380VAC to 480VAC
- 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 600-3000Hz 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 (600Hz to 3000Hz in units of 100Hz).
- 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-800CR: 250 amps, IS-1400CR: 400 amps)
- 120VAC 150VA valve transformer standard, 250VA optional
- 24VDC valve voltage: 2 amps (optional), 5 amps (optional)
- Output contactors optional
- CE compliance optional
- RS-232 communications standard, RS-485 optional
- IS-800CR/1400CR ADVANCED ONLY: 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-800CR/1400CR ADVANCED ONLY: 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.
Lights up when the power is supplied to the Power Supply.

2. READY Lamp
Lights up when the system is ready to start welding.To turn this lamp ON:

- **WELD ON/OFF** key
- **WELD ON/OFF** setting of program unit MA-627A and
- External **WELD ON/OFF** signal must all be turned ON.

3. START Lamp
Stays lit while the start signal is input.

4. WELD Lamp
Stays lit while the welding current is flowing.

5. TROUBLE Lamp
Lights up when trouble is detected. At this time, the program unit makes a beeping sound, and the work done by the Power Supply is interrupted.

6. RESET Key
If this key is pressed while the **TROUBLE** lamp is lit, that lamp is turned off.
The **TROUBLE** lamp lights up again, however, as long as there is trouble. Accordingly, remove the cause of the trouble before pressing this **RESET** key.
If the **TROUBLE** lamp lights up while work is being done, press the **RESET** key, then input the start signal again, and the work continues.

7. WELD ON/OFF Key
This key is one of those which are required for turning on the **READY** lamp.
Each time this key is pressed, it is turned ON and OFF alternately. If it is turned on, **READY** lamp lights up, and if the key is turned off, the lamp goes off. Hold down this key to toggle ON and OFF.

PROGRAM UNIT Connector

IS-800CR BASIC uses the MA-627A Program Unit (Pendant) to set the weld schedules and see the monitored result.

NOTE: The IS-800CR/1400CR is a configured version of Amada Miyachi's ISB-800A/1400A and the MA-627A pendant will display "ISB-800A" or "ISB-1400A")

IS-800CR ADVANCED uses the MA-660A Program Unit (Pendant) to set the weld schedules and see the monitored result.

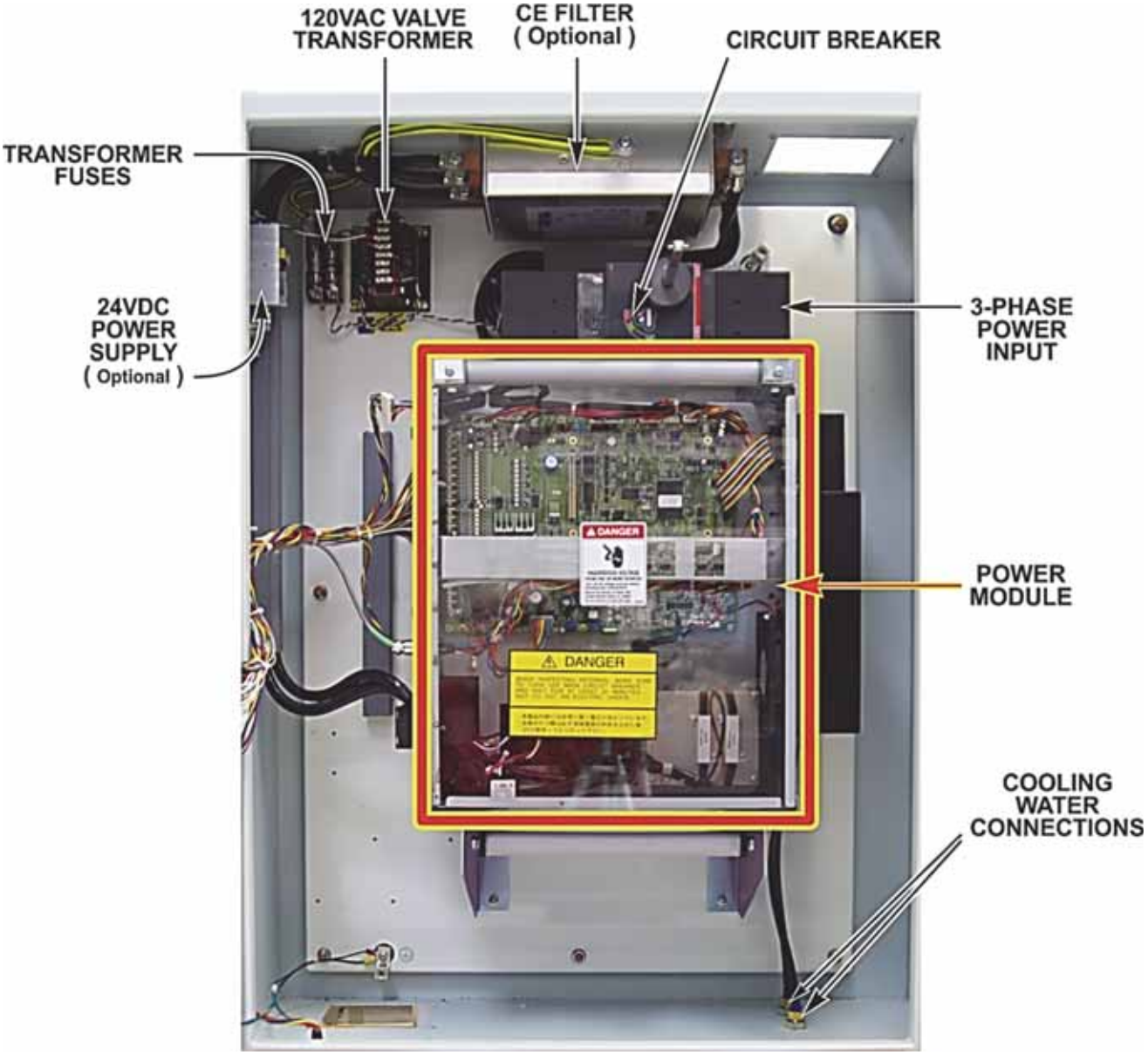
NOTE: The IS-800CR/1400CR is a configured version of Amada Miyachi's ISB-800A/1400A and the MA-660A pendant will display "ISB-800A" or "ISB-1400A")

Internal and Rear Panel

DANGER

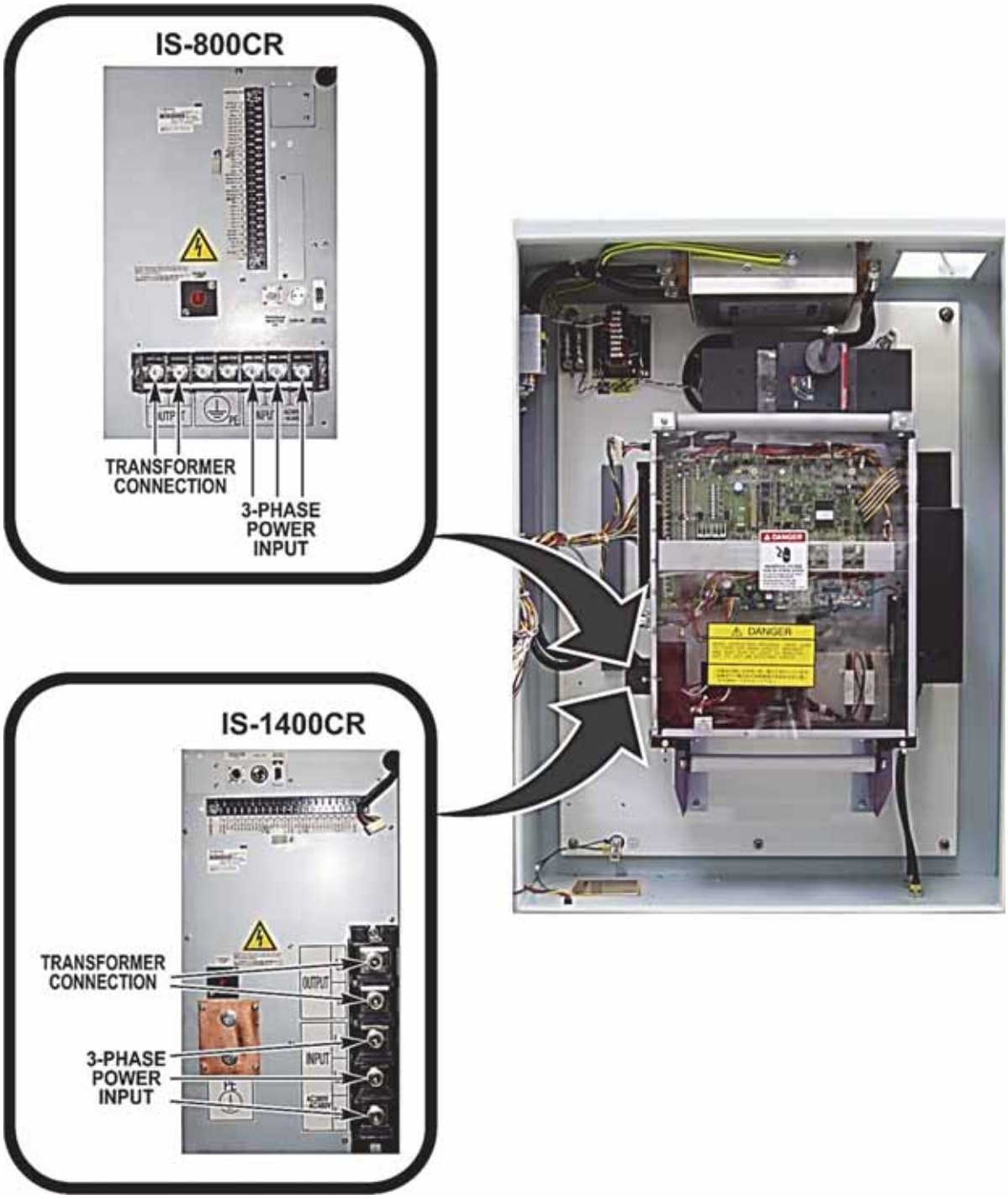
Do ***not*** touch the inside of the body for at least 20 minutes after power down, since you may get a severe electric shock.

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


120VAC VALVE TRANSFORMER
CE FILTER (Optional)
CIRCUIT BREAKER
TRANSFORMER FUSES
24VDC POWER SUPPLY (Optional)
3-PHASE POWER INPUT
POWER MODULE
COOLING WATER CONNECTIONS
DANGER
DANGER

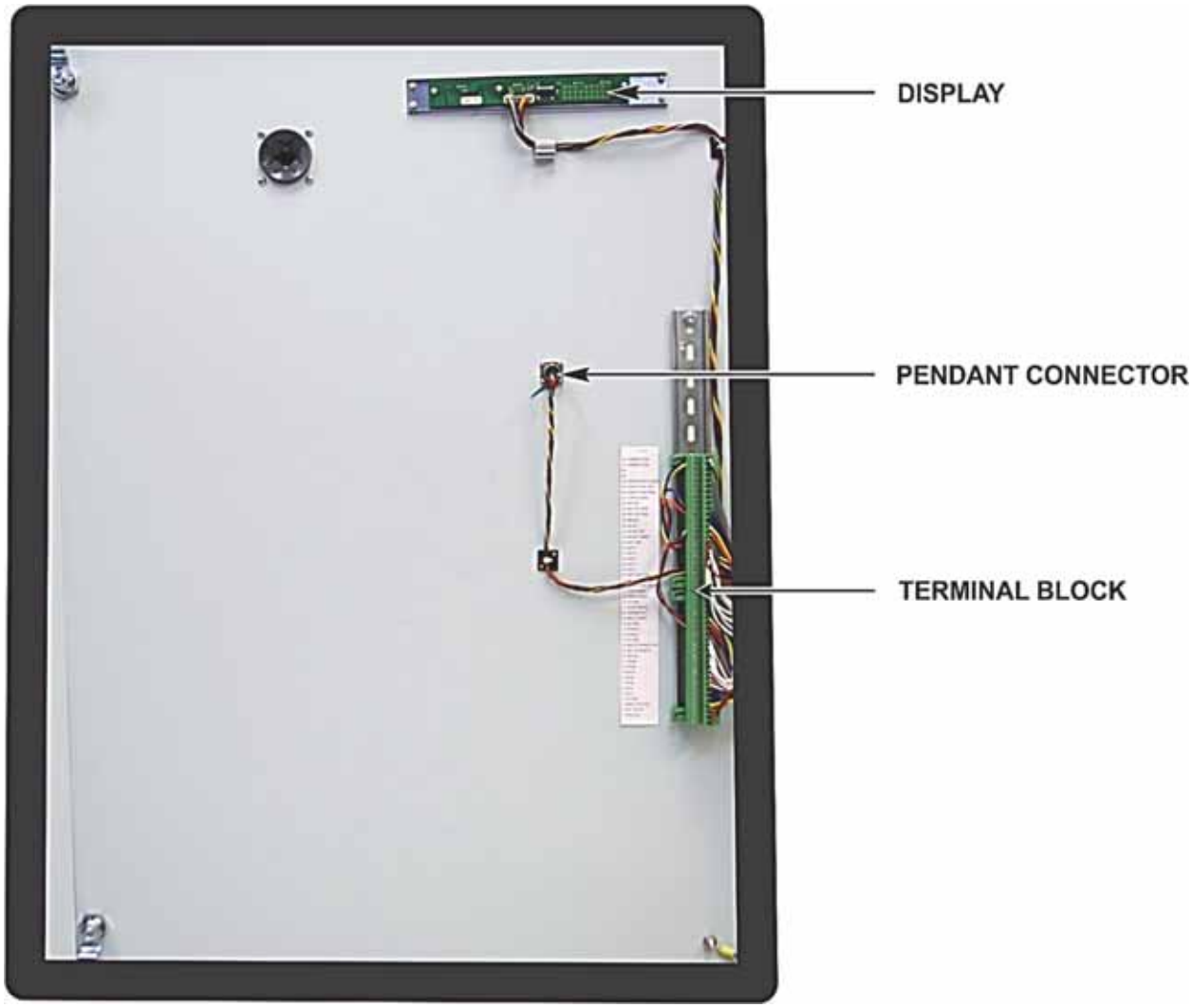
Terminal Block for Welding Power Input
Used to accept the three-phase power supply for welding. Do not connect the power supply with voltage other than the specified.

Terminal Block for Welding Power Output
Used to connect to the input of the welding transformer.



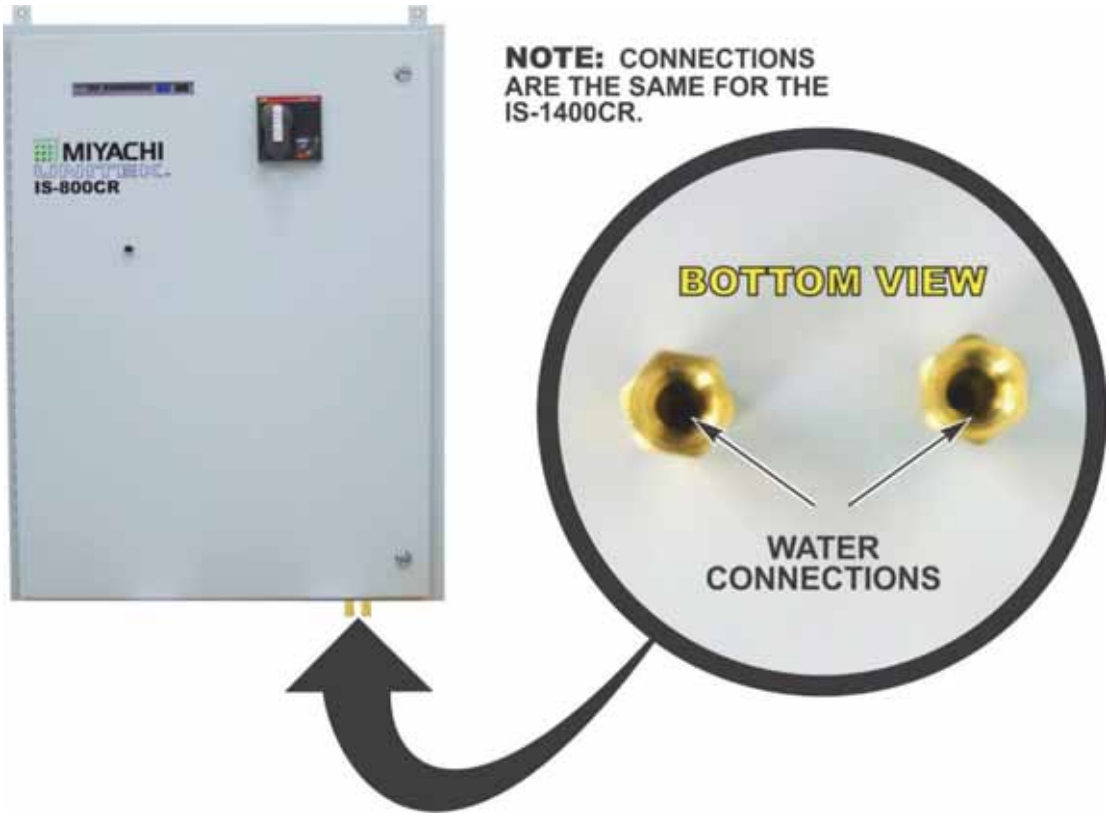
Connecting Terminal Strip for External Input/Output Signals
Used to input start signals and output trouble signals.

IS-800CR BASIC shown. IS-800CR ADVANCED has more I/O connections



Cooling Water Pipe Connectors

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



DANGER

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

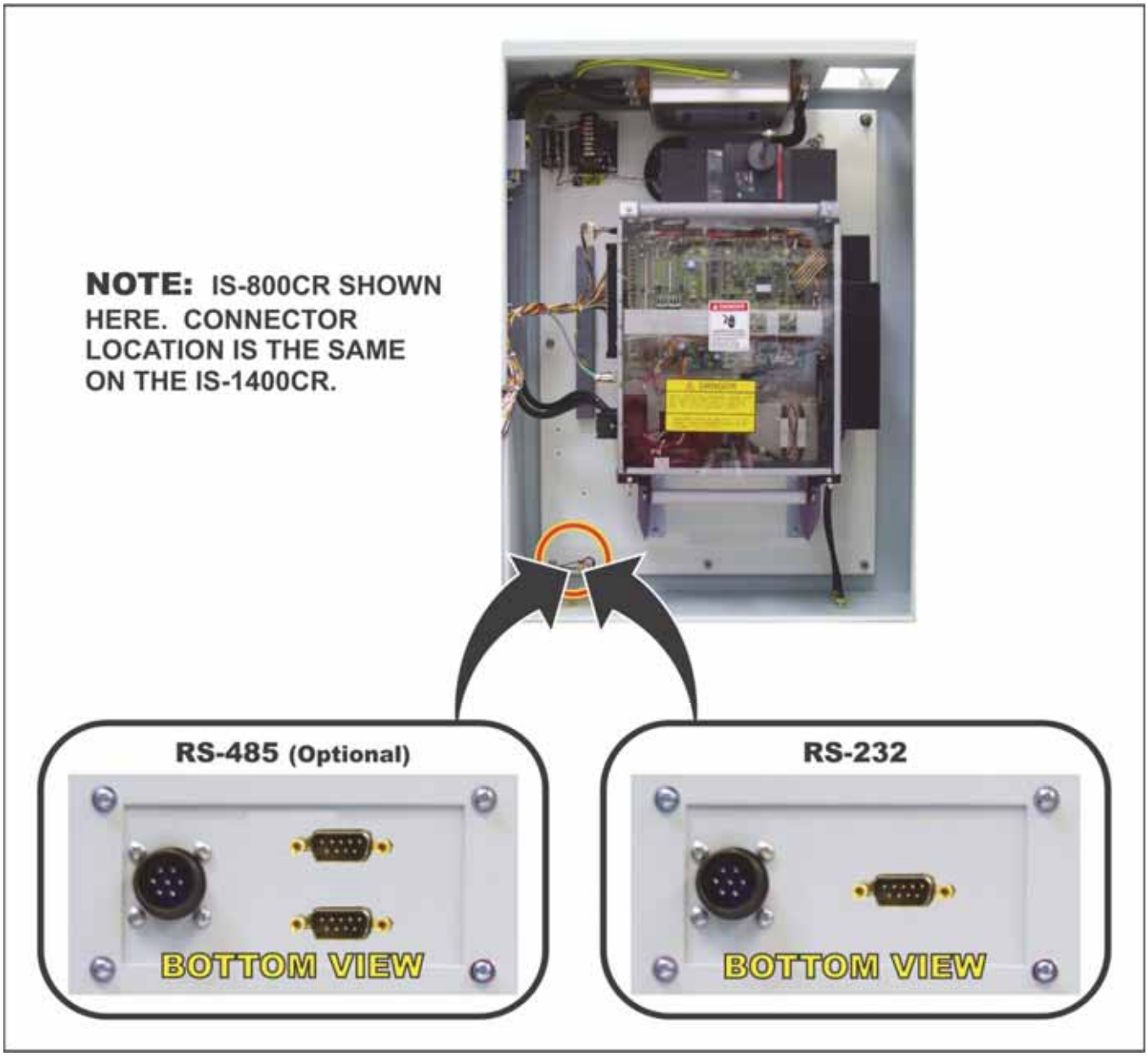
CHARGE INDICATOR Lamp

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 is.

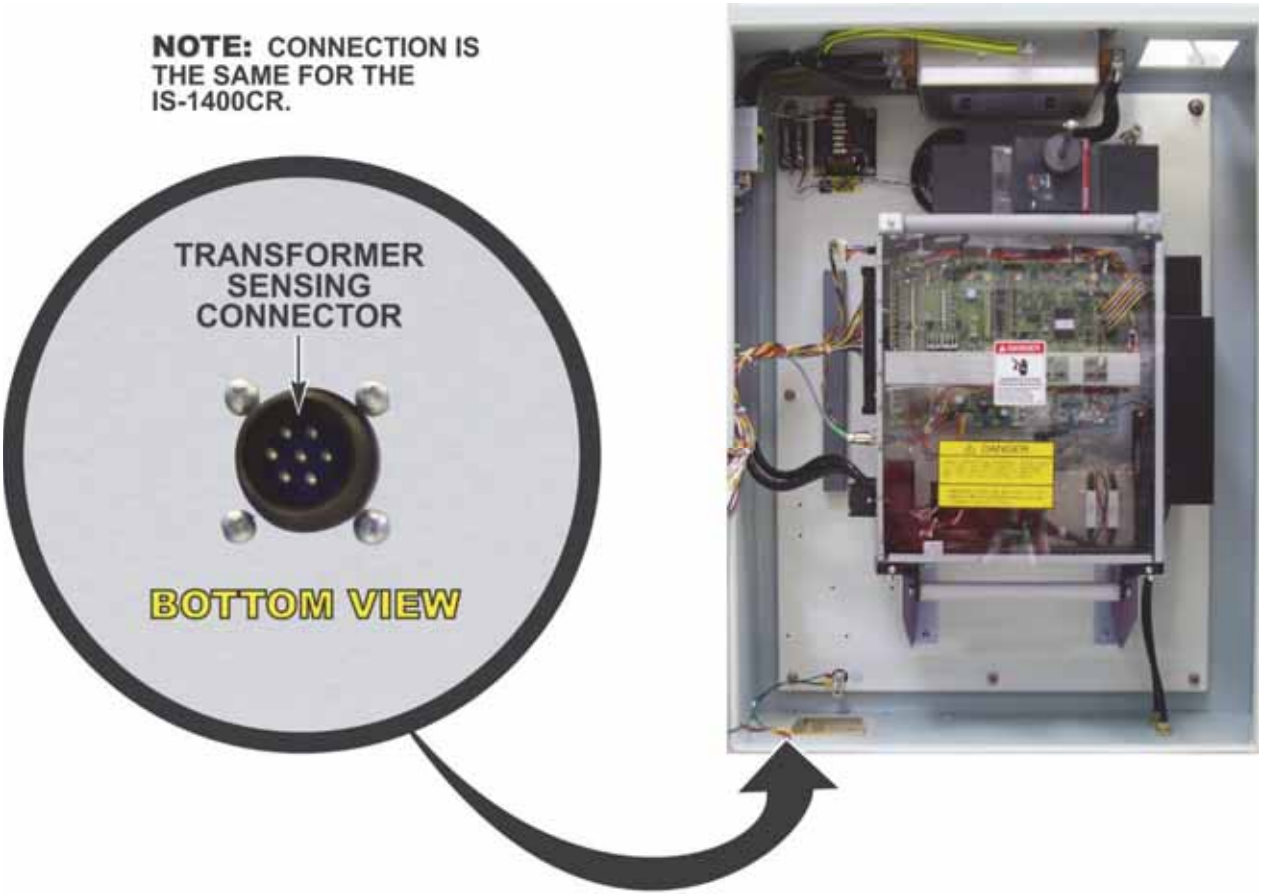
RS485/RS232C Connector

For external communication see *Appendix F, Communications*.



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.



MA-627A (Sold Separately) used for IS-800CR/1400CR BASIC

TROUBLE RESET Key
Pressing this key after the cause of trouble is eliminated while an error message is indicated turns off the error massage.

CURSOR Keys
Used to move the cursor or to select an item.

CAUTION

No settings or changes may be made to any item from the receipt of the **START** signal through the end of the weld sequence and turning off the **START** signal.

If setting is performed while the start signal is input, the following screen appears. Turn off the start signal and press **TROUBLE RESET** key.

```
ISB-800A IS BUSY OR NOT CONNECTED
Please RESET key in
```

+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-627A. 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-627A does not recognize the set data.

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 at longest to change a setting, about 125 seconds to copy a schedule, and about 5 seconds at longest 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 screens.

Connector
Used to connect the circuit cable.
Connect the other end of the cable to the PROGRAM UNIT connector of the Power Supply.

CAUTION

No settings or changes may be made to any item from the receipt of the start signal through the end of the welding sequence and turning off the start signal.

If setting is performed during the welding sequence, the following screen appears. Press the **TROUBLE RESET** key.

Also, when changing a screen to call up another setting schedule during the welding sequence, the **TROUBLE RESET** key does not work even if the following screen appears. In this case, you need to turn on the power again.

(When connecting to the Power Supply,**IS-800CR/1400CR BASIC**)

MA-660A (Sold Separately) used for IS-800CR/1400CR ADVANCED

TROUBLE RESET key
Pressing this key after the cause of trouble is eliminated while an error message is indicated turns off the error massage.

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 does not recognize the set data.

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

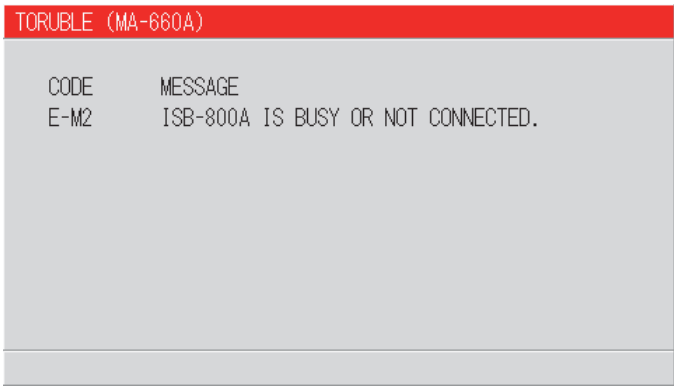
MENU Key
Used to display the **MENU** screen. Press this key to return to **MENU** screen from any other screens.

CAUTION

No settings or changes may be made to any item from the receipt of the start signal through the end of the welding sequence and turning off the start signal.

If setting is performed during the welding sequence, the following screen appears. Press the **TROUBLE RESET** key.

Also, when changing a screen to call up another setting schedule during the welding sequence, the **TROUBLE RESET** key does not work even if the following screen appears. In this case, you need to turn on the power again.



(When connecting to the Power Supply,**IS-800CR/1400CR 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

IS-800CR

IS-1400CR

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-800CR 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 Miyachi America IT- series 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-800CR 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!
- Protect electronic components from metal shards when drilling pilot holes and punching holes. We recommend removal of 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 box. Carefully save and store packing materials for future storage or shipment of the Power Supply.

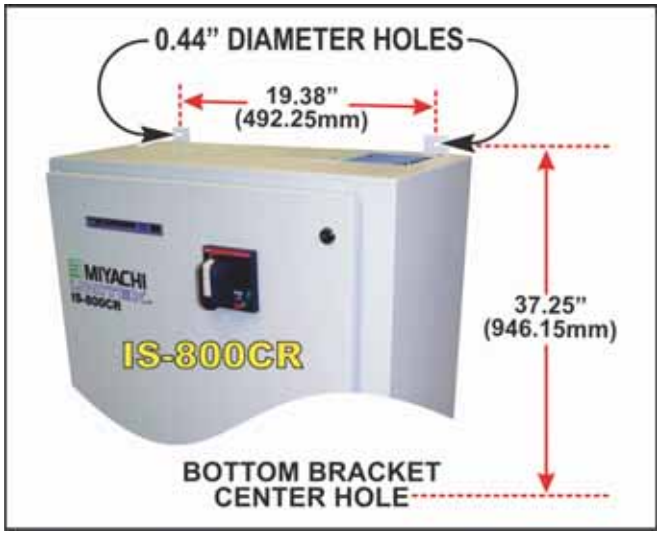
Installation

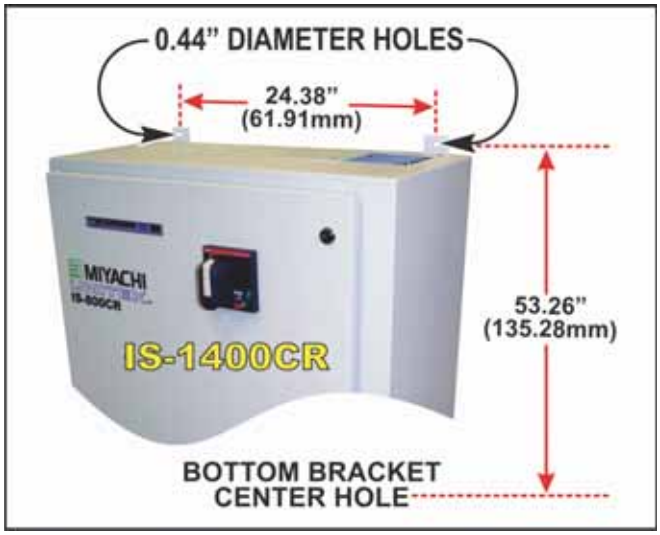
Installation consists of mounting the unit and making power, signal, and cooling water connections.

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 for the box. 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.





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 **X** and **Y** in the power module.

Breaker

Breaker Rated Current

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

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

(I : Output current (momentary maximum current) of **IS-800CR/1400CR**
α : Duty cycle (%))

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

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

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

(I : Output current (momentary maximum current) of **IS-800CR/1400CR**
α : Duty cycle (%))

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) = 300A / Duty cycle = 15%

Average input current is as follows.

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

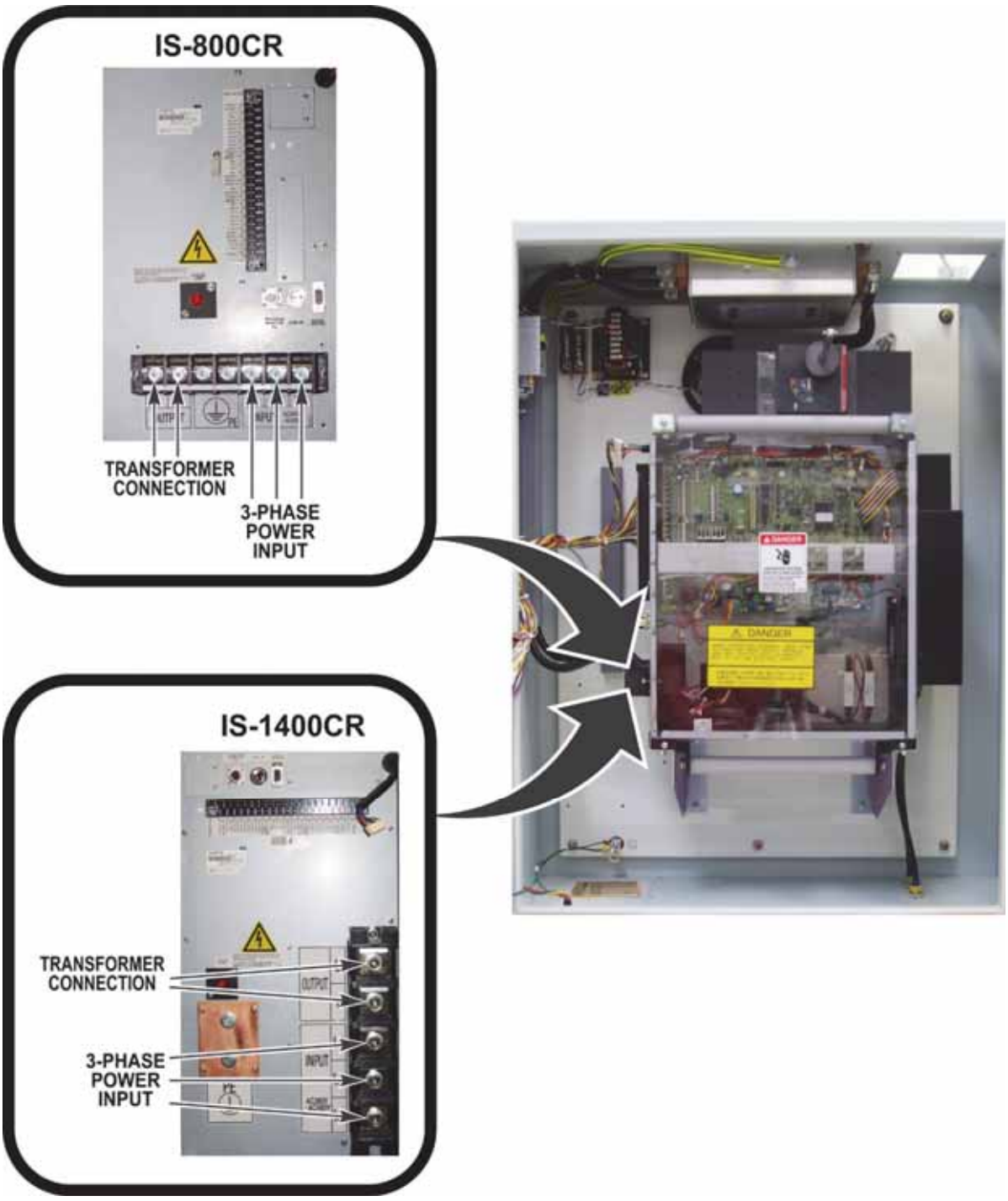
Average output current is as follows.

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

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.

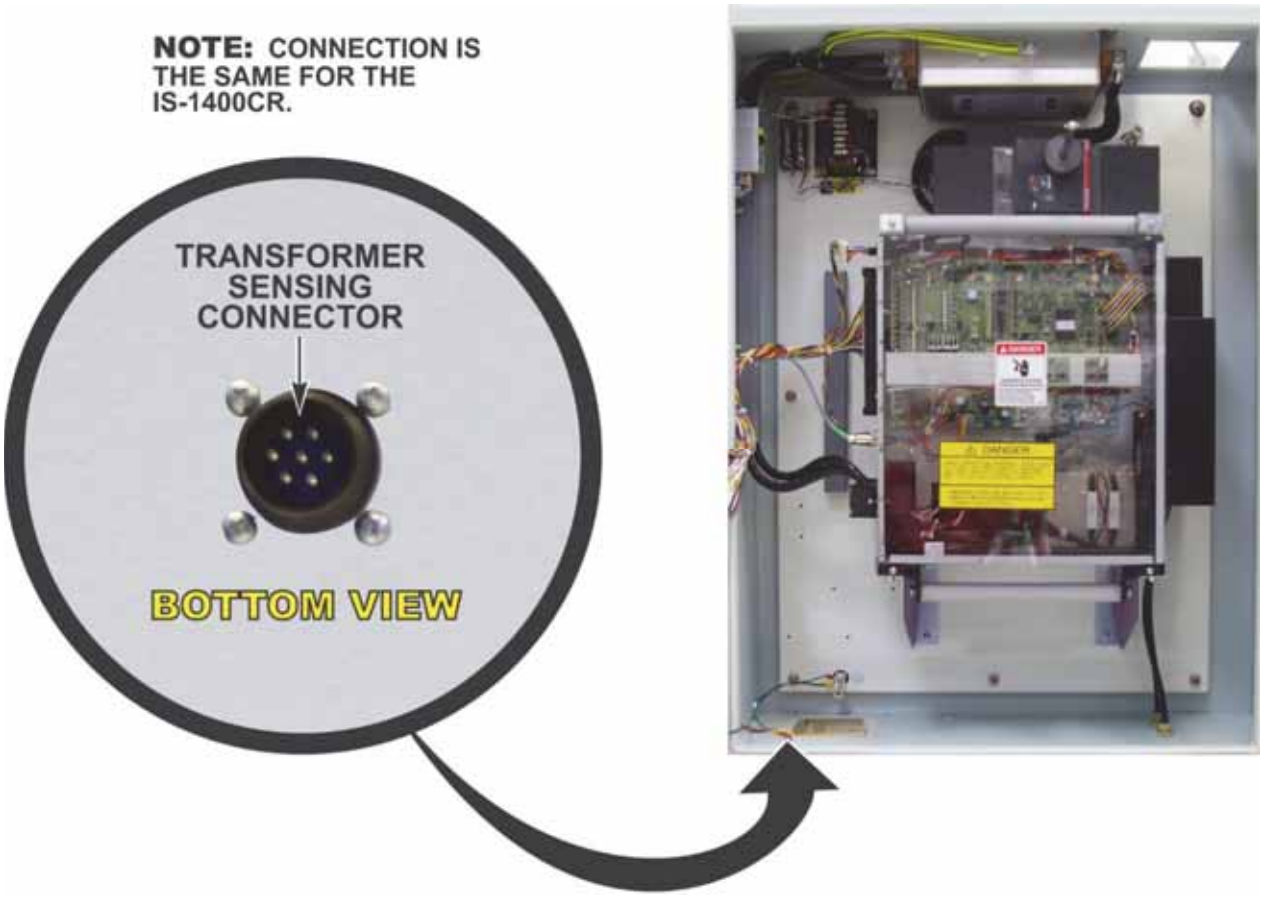
Output Power Connections

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.



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.



Section III: Cooling Water

Cooling Water Requirements

The connections to the Power Supply are made with ⅜" 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.

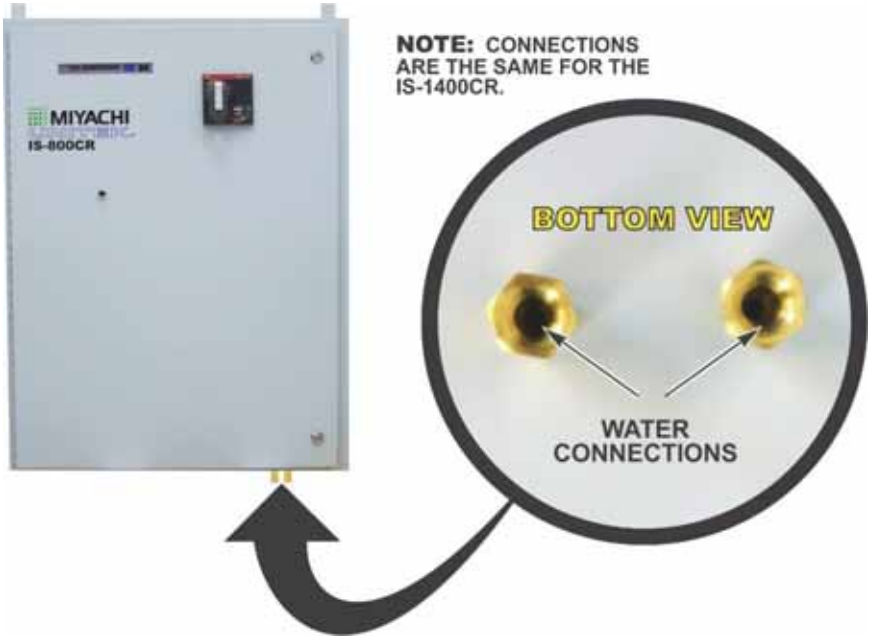
CAUTION: If the temperature drops below 32°F (0°C), the water inside the Power Supply can freeze, 32°F (0°C). If the temperature is likely to drop ***below*** 32°F (0°C), drain the water in accordance to the procedure in *Chapter 4, Maintenance*. To prevent condensation, which may cause unit failure, do ***not*** run cooling water if the unit is not in use unless the water is ***not lower than*** 4°F (2.2°C) below ambient temperature thus damage the unit. Therefore, take special care to keep the ambient temperature above

Cooling Water Hose Connections

CAUTION: Do ***not*** perform service on cooling system unless the Power Supply is turned OFF and breaker handle tagged!

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. (See *Appendix F, Communications*.)



2. ***After*** you connect all cooling water hoses, turn the water ON and check for leaks.
3. Connect a hose to the **Cooling water pipe connector** on the bottom of the Power Supply.

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

CHAPTER 3A
IS-800CR/1400CR BASIC: USING PROGRAMMING FUNCTIONS

Introduction

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. Check that the **READY** lamp is turned on to start welding. It takes about 2 seconds to change a setting and about 1 minute to copy a schedule into FLASH ROM. During that time, do ***not*** turn the power OFF.

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.

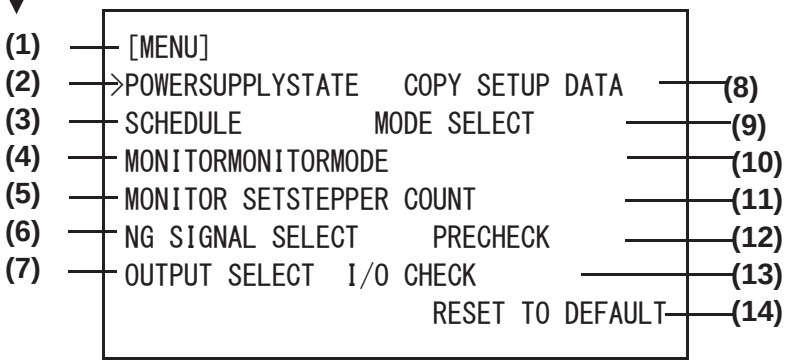
WARNING

It is possible that weld current is flowing even though error message **E-05** (**NO CURRENT**) is displayed. ***To avoid electrocution use extreme caution.***

1. MENU Screen

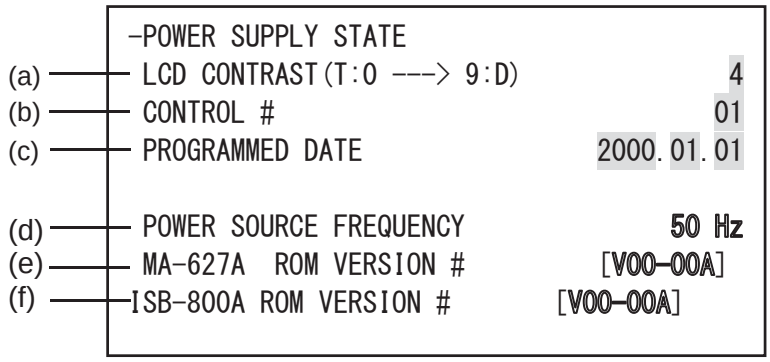
The **MA-627A** has various functions that are set from the respective screens. The **[MENU] screen** displays these functions in menu form.Move the cursor (>) to the desired item; press the **[ENTER]** key to move to the selected screen.

The numbers **(1)** to **(14)** indicate the paragraph No. within the chapter.



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) MA-627A ROM VERSION #
Indicates the ROM version No. of program unit MA-627A.

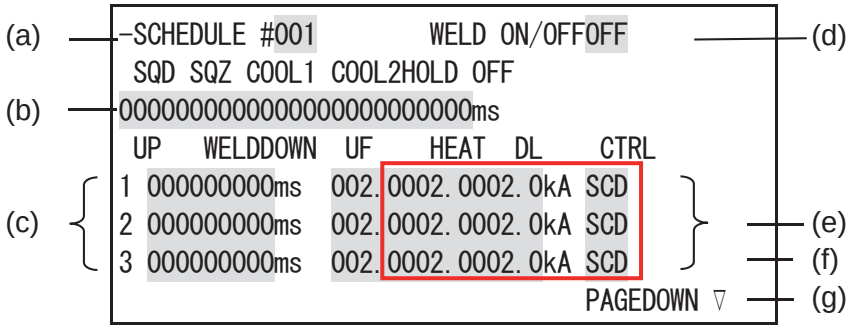
(f) ISB-800A (ISB-1400A) ROM VERSION #
Indicates the ROM version No. of the Power Supply.

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 are Current and time setting screen and 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 on the MODE SELECT screen.



NOTE: The screen shows the settings for **IS-800CR**.The settings surrounded with frames are 04.0kA for **IS-1400CR**. 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.
For each operation, see the Timing Chart.

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 work piece
COOL1 and **COOL2** / Cooling time 1 and Cooling time 2	Length of time to cool work piece after turning off welding current
HOLD / Hold time	Length of time to hold work piece 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/Off time. When OFF/Off time is set, RE-WELD becomes invalid.
- START SIG.MODE haslimitations. When OFF/Off time 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).

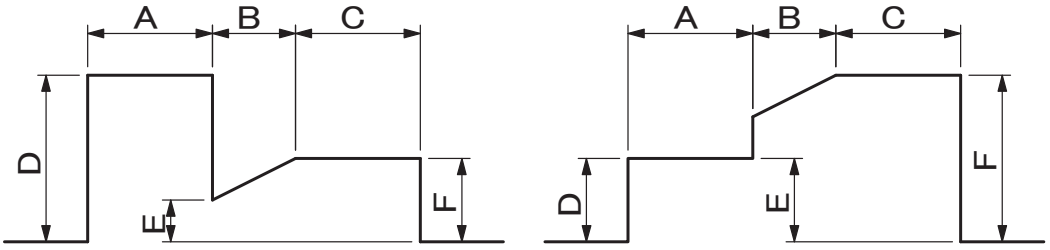
DOWN (1, 2, 3)

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

NOTE: Upslope / Downslope waveform when COOL (cooling time) is set to 0.

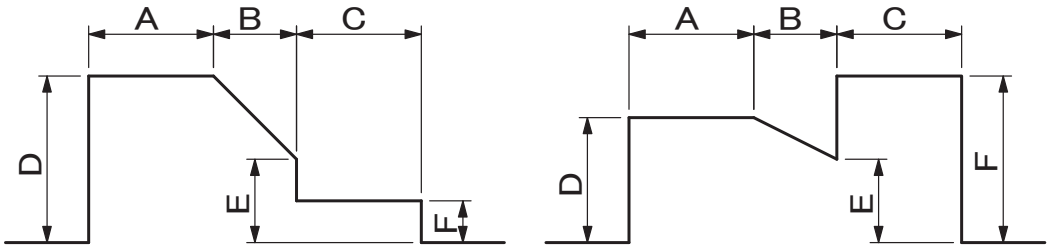
The welding current normally increases from the UF set value to the HEAT set value and decreases from the HEAT set value to the UF set value, but E-10 (Schedule setting error) will occur when the Power Supply starts with the following setting.

- 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.



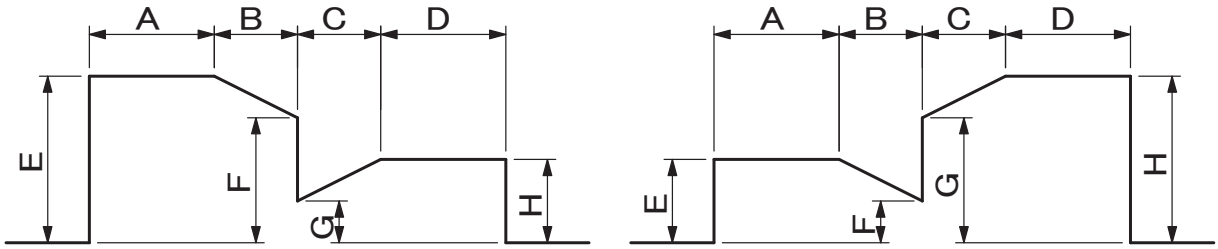
A: WELD1 time or WELD2 time
B: UP2 time or UP3 time
C: WELD2 time or WELD3 time
D: WELD1 HEAT or WELD2 HEAT
E: UF2 HEAT or UF3 HEAT
F: WELD2 HEAT or WELD3 HEAT

- 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.

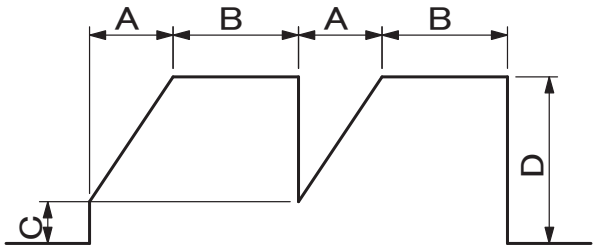


A: WELD1 time or WELD2 time
B: DOWN1 time or DOWN2 time
C: UP2 time or UP3 time
D: WELD2 time or WELD3 time
E: WELD1 HEAT or WELD2 HEAT
F: DL1 HEAT or DL2 HEAT
G: UF2 HEAT or UF3 HEAT
H: WELD2 HEAT or WELD3 HEAT

NOTES:

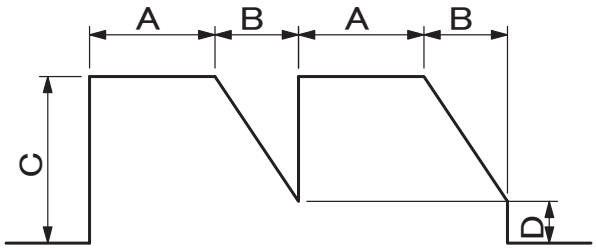
- Set 1 (ms/CYC) or more for at least one of **WELD1**, **WELD2** and **WELD3**. Also, set the total time of **UP** and **DOWN** to be shorter than **WELD**. If not, **E-10** (Schedule setting error) will be displayed.
- Upslope / Downslope waveform when INT (downtime) is set to 0.
- E-10 (Schedule setting error) will occur when the Power Supply starts with the following setting.

- 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.



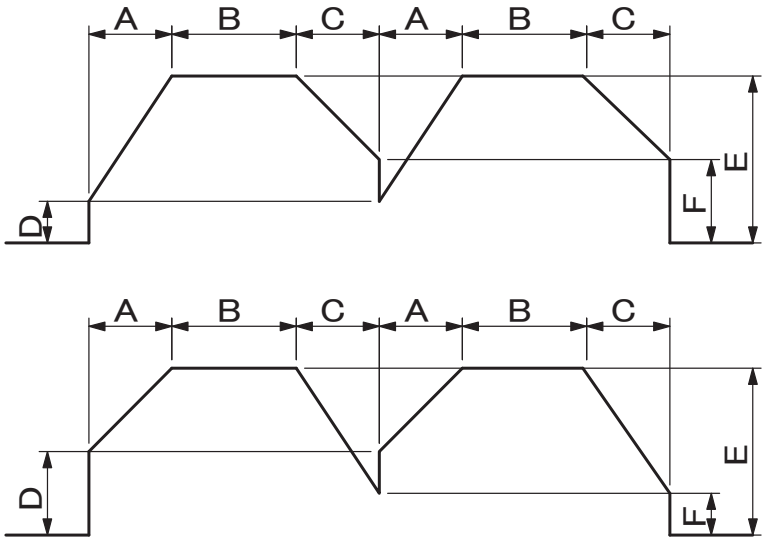
A: UP1 to 3 time
B: WELD1 to 3 time
C: UF1 to 3 HEAT
D: HEAT1 to 3

- 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.



A: WELD1 to 3 time
B: DOWN1 to 3 time
C: HEAT1 to 3
D: DL1 to 3 HEAT

- 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.



A: UP1 to 3 time
B: WELD1 to 3 time
C: DOWN1 to 3 time
D: UF1 to 3 HEAT
E: HEAT1 to 3
F: DL1 to 3 HEAT

(d) WELD ON/OFF

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

ON: WELD ON OFF: WELD OFF

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) 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.

Primary constant-current effective value control	Effective value of current
Secondary constant-current effective value control	Effective value of current
Secondary constant-power effective value control	Effective value of electric power
Primary constant-current peak value control	Peak value of current
Secondary constant-voltage effective value control	Effective value of voltage
Constant-phase control>	Pulse width when full wave is 100%

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-05 (No Current error) is displayed, current ***is*** flowing. Use extreme caution to avoid electrocution.

(f) CTRL

Select one from the following six welding current control methods for WELD1, WELD2 and WELD3, 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

NOTE: Control method of the inverter-type welding power supply

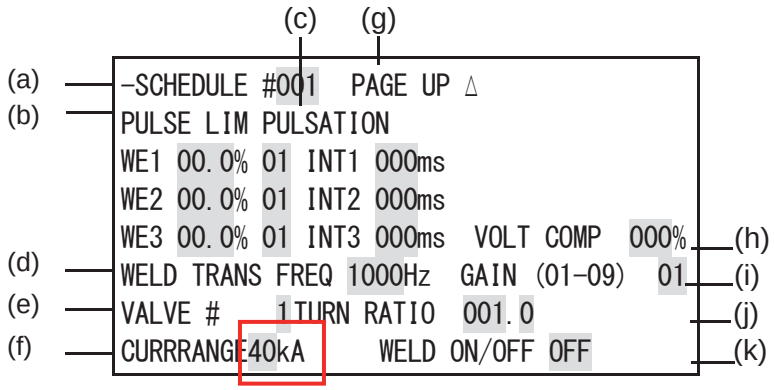
Control method	Feature	Application	Control mechanism
Primary constant-current control (PWM effective value control) (PRI)	Requires no connection of toroidal coil on the secondary side of the transformer. Requires turn ratio setting of the inverter-type transformer. The loss inside the transformer is 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) (SCD)	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) (PWR)	Controls so that the power between electrodes becomes constant. Responds to change in workpiece state during welding to make heat input constant.	Used when you want to reduce explosion in early welding, shunt current is occurred at welding, or make heat generation constant.	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.
Primary constant-current	Requires no connection of toroidal coil on the	Used for welding of coated metal	Sets the primary current obtained by the set current and

Control method	Feature	Application	Control mechanism
peak value control (PWM peak value control) (PLM)	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.	or dissimilar metal.	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) (VLT)	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 workpiece such as cross wire, and projection welding, which has resistance change in early welding to reduce explosion.	Detects the voltage between electrodes with the volt-sensing 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) (FPL)	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.

(g) PAGE DOWN

When the cursor is at▼, moving the cursor down will change the display to 2 PULSATION and transformer screen.

PULSATION and Transformer Screen



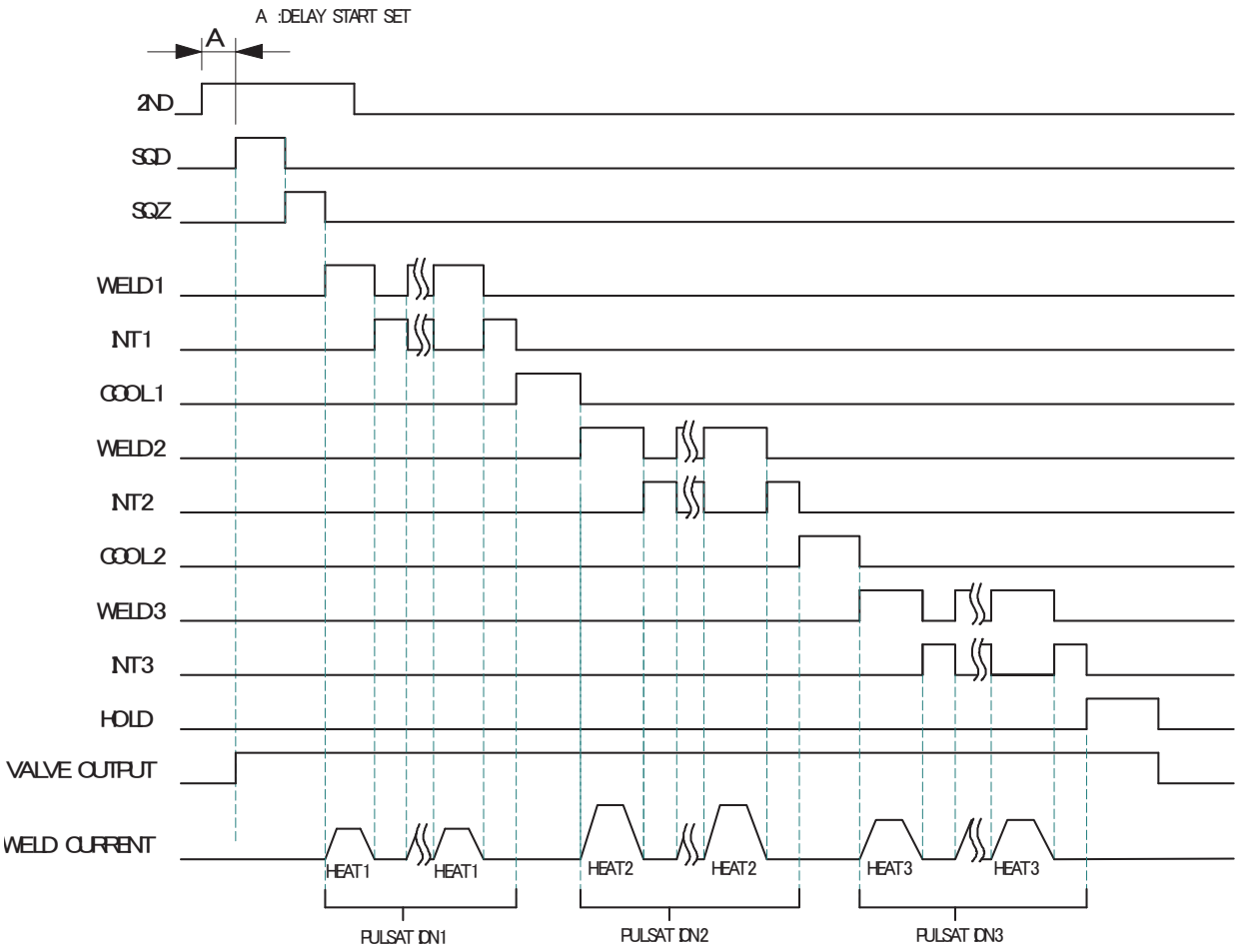
NOTE: The screen shows the settings for **IS-800CR**. The settings surrounded with frames are 80.0kA for **IS-1400CR**.

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

(b) PULSE LIM
When limiting the pulse width in Primary constant-current peak value control, set the limit for each of WE1, WE2and WE3.

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

See the figure on the next page.



- 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. Also, 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.

(d) WELD TRANS FREQ

Sets the frequency of the welding transformer to be used. It can be set 600 Hz to 3000 Hz in units of 100 Hz.

CAUTION

When setting the output frequency of the inverter power supply, check the frequency of the welding transformer. Do ***not*** use the welding transformer whose frequency is higher than the output frequency of the inverter power supply.Doing so will cause a malfunction and may damage equipment.

(e) VALVE #

Two valves (welding heads) can be connected to the Power Supply. Use this setting to select which of the two valves to use.

(f) CURRRANGE

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

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

(g) PAGE UP

When the cursor is at▲, moving the cursor up will return the display the Current and time setting screen.

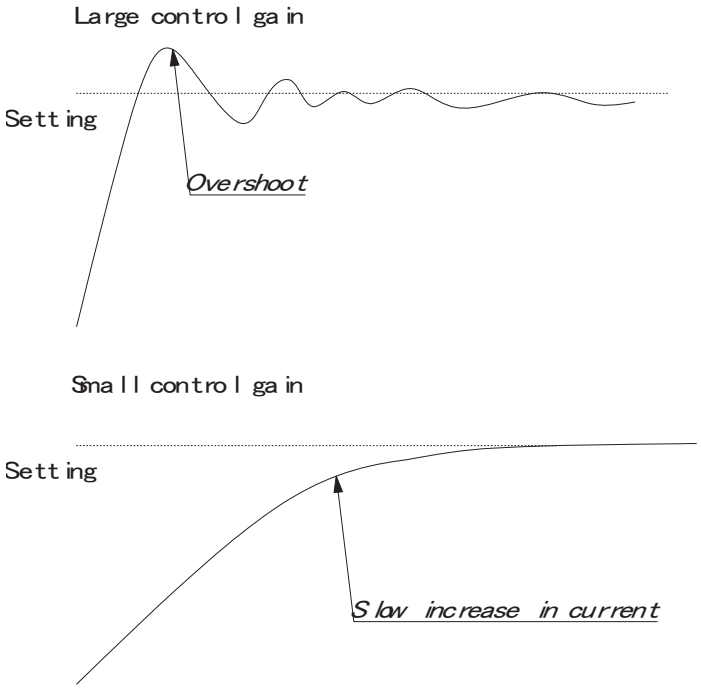
(h) VOLT COMP (effective when PULSE LIM is set)

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%.

(i) 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 (1–9).



(j) TURN RATIO

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

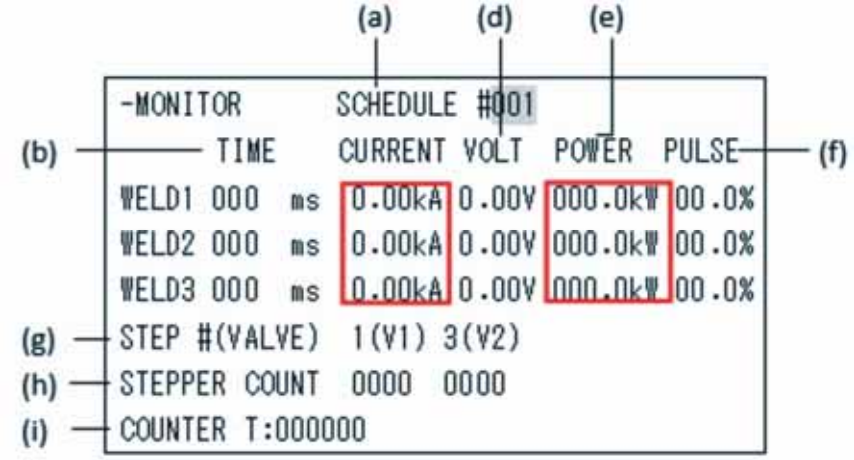
When using the primary constant-current effective value control or primary constant-current peak value control, always set the correct turns ratio. An incorrect ratio will result in malfunction.

(k) WELD ON/OFF

One of the settings required to turn ON the [READY] lamp of the Power Supply.
ON: WELD ON OFF: WELD OFF

4. MONITOR Screen

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



NOTE: The screen shows the settings for 20 kA, 40 kA, or 80 kA (**IS-1400CR** only) range. The settings surrounded with frames change as follows for 05 kA or 10 kA range: 00.0 kA -> 0.00 kA and 000.0 kW -> 00.00 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**No.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. As units of time, ms and CYC may be selected. Either unit can be selected via the MODE SELECT screen.

(c) CURRENT
The welding current is displayed.

(d) VOLT
The measured voltage is displayed when the voltage detection cord is connected and the secondary voltage is input.

(e) POWER
The measured electric power (measured current x measured voltage) is displayed when the toroidal coil and voltage detection cord are connected and the secondary current and secondary voltage are input.

(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).

(g) STEP #

The present number of steps is displayed when **STEPPER MODE** is activated on the **MODE SELECT screen**. (In the example above, the VALVE 1 is set to STEP 1, the VALVE 2; STEP 3.)

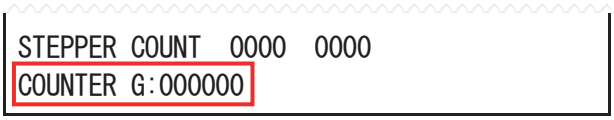
(h) STEPPER COUNT

The number of welds in the present step is displayed when STEPPER MODE is activated on the MODE SELECT screen.

(i) COUNTER

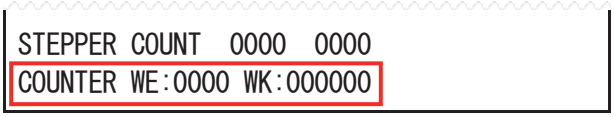
When the WELD2 STOP/WELD COUNT is WELD2 STOP and COUNTER is TOTALon the MODE SELECT screen, TOTAL count (T:******) is displayed.
Count-up (increment of +1) is done despite the result of the upper/lower limit judgment in monitoring.As shown below, the display of COUNTER changes depending on the setting.

- When WELD2 STOP/WELD COUNT is WELD2 STOP and COUNTER is GOOD



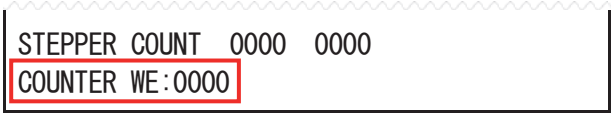
GOOD counter is displayed in COUNTER. Count-up (increment of +1) is done when the monitored value is within the range of the upper/lower limit.

- When WELD2 STOP/WELD COUNT is WELD2 STOP and COUNTER is WORK



WELD and WORK counters are displayed in COUNTER. When the count reaches the set WELD count value, WORK counter is increased (increment of +1).

When WELD2 STOP/WELD COUNT is WELD COUNT



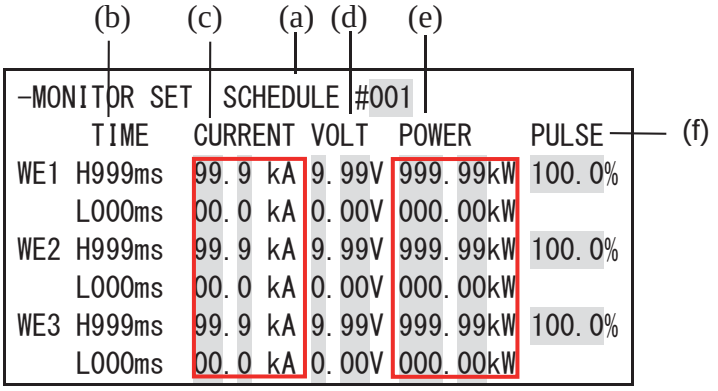
Weld count value is displayed in COUNTER.

NOTES on Monitored Value:

- 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 **MONI DISP MODE** setting.

5. MENU 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.



NOTE: The screen shows the settings for 20 kA, 40 kA, or 80 kA (**IS-1400CR** only) range. The settings surrounded with frames change as follows for 05 kA or 10 kA range:
99.9 kA ➔9.99 kA, 00.0 kA ➔0.00 kA, 999.9 kW ➔99.99 kW, and 000.0 kW ➔00.00 kW.

(a) SCHEDULE #
Input the No. of the **SCHEDULE** to monitor (to set the schedules).

(b) TIME
Set the upper limit (H) and lower limit (L) of the weld time for each of WE1, WE2and WE3. Use this function to monitor the weld time when it becomes unstable by the welding stop input.

(c) CURRENT
Set the upper limit (H) and lower limit (L) of the welding current for each of WE1, WE2and WE3.

(d) VOLT
Set the upper limit (H) and lower limit (L) of the secondary voltage for each of WE1, WE2and WE3.

(e) POWER
Set the upper limit (H) and lower limit (L) of the electric power for each of WE1, WE2and 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.

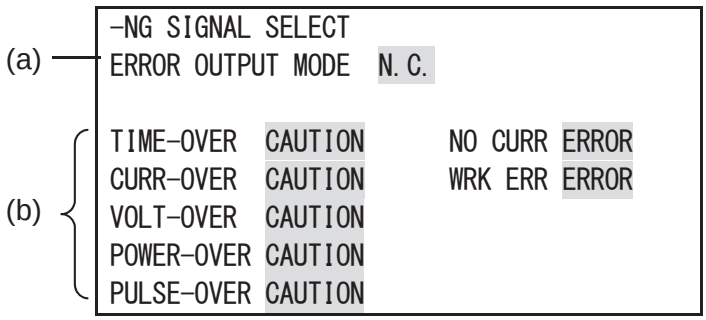
Example: When the current is set to 2kA, H; 2.2kA, L; 1.8kA.

When the step becomes 150%, H and L become as follows.

H: 2.2 x 1.5 = 3.3kA
L: 1.8 x 1.5 = 2.7kA

6. NG SIGNAL SELECT Screen

Sets the output mode and the signal for each item to output, NG1 ERROR or NG2 CAUTION, in an error occurring.



(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 set for N.O.

(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
CURR-OVER	When the current exceeds the upper/lower limit
VOLT-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
NO CURR	When the no-current error occurs (For the no-current error, see **Troubleshooting**.)
WRK ERR	When the workpiece error occurs

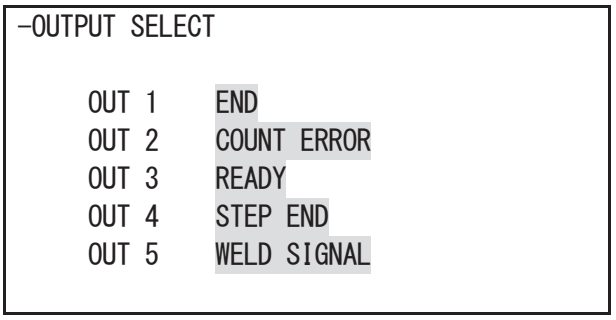
When two or more items are the same settings, the ERROR signal or the CAUTION signal is output if either one meets the condition above.For example, when CURR-OVER and VOLT-OVER are set to ERROR, the ERROR signal is output when the current value exceeds the upper limit or the voltage value falls below the lower limit.

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, Workpiece 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.



(This screen shows initial settings.)

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

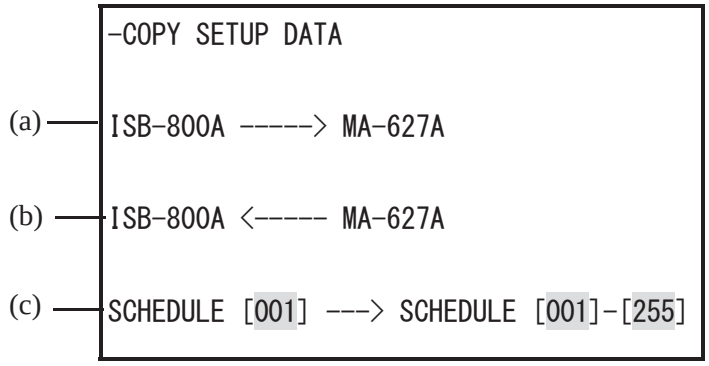
END (end signal) → COUNT ERROR (count error signal) → READY (ready signal)
→ STEP END (step end signal) → WELD SIGNAL (welding timing signal)
→ GOOD (normal signal) → COUNT UP (count up signal)
→ OUT I (OUT I timing output) → OUT II (OUT II timing output)

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

8. COPY SETUP DATA Screen

The **MA-627A** can store data. (Refer to the figure shown below.)
When the **MA-627A** 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.

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 **MA-627A** temporarily, then copy this data to the second unit.



Move the cursor ▶to the required item among (a) to (c), then press the **[ENTER] key**; the data will be copied.

(a) ISB-800A (ISB-1400A) → MA-627A
The data in **IS-800CR/1400CR** is copied to MEMORY of **MA-627A**.

(b) ISB-800A (ISB-1400A) ← MA-627A
The data in MEMORY of **MA-627A** is copied to **IS-800CR/1400CR**.

(c) SCHEDULE[001] → SCHEDULE[001]-[255]
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.

For example, **SCHEDULE #2** can be set by switching from **SCHEDULE #1** as follows:

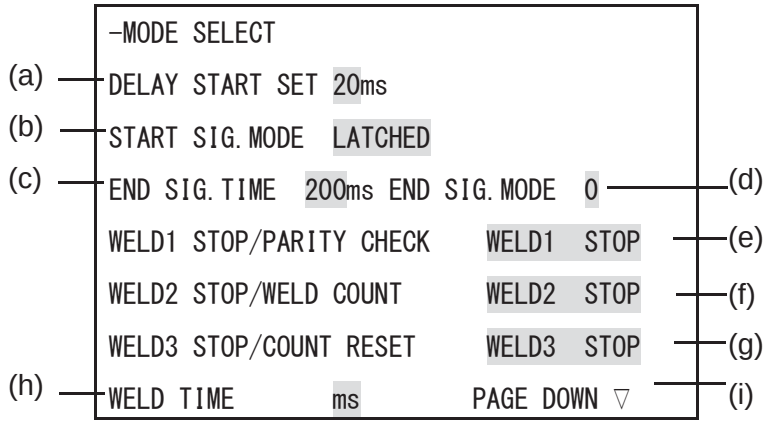
- **SCHEDULE [001] → SCHEDULE [002]-[002]**
  (Be sure to press the **[ENTER]** key before moving the cursor)
- Move the cursor to the left of the letters of **SCHEDULE** and press the **[ENTER]** key.
  The data for **SCHEDULE #1** is copied to **SCHEDULE#2** through this operation. Call up #2 on the **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]

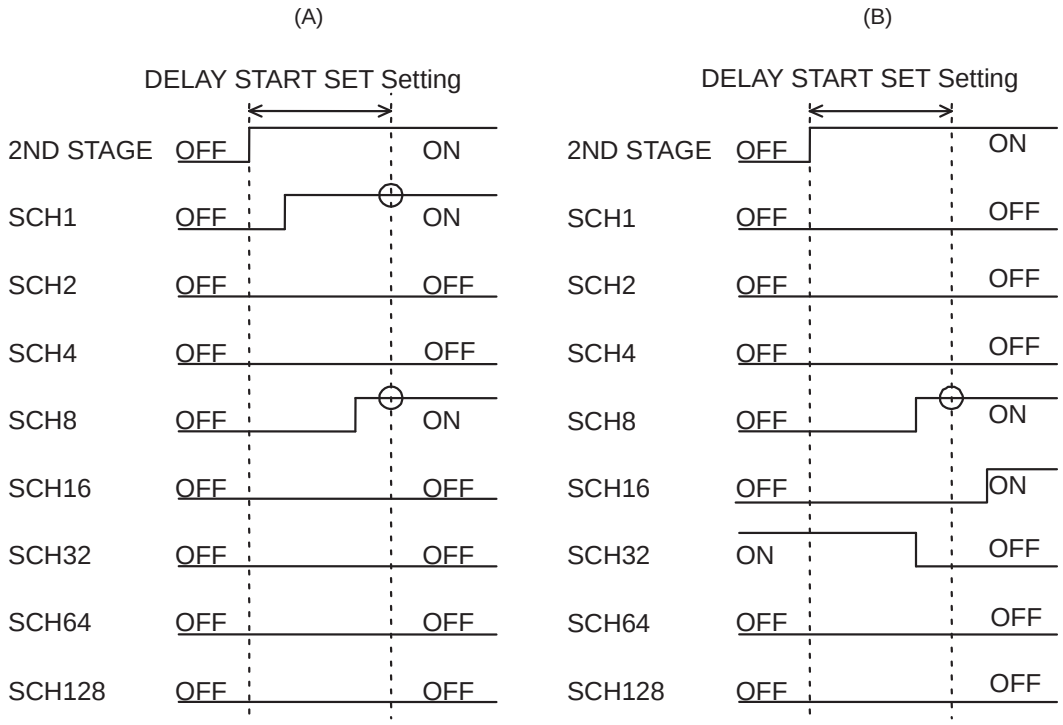
NOTE: Do ***not*** operate the program unit until the copy is complete.

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 Fig. (A), schedule signals 1 and 8 are **ON**. Therefore, welding is performed using schedule No. 9. In Fig. (B), only schedule signal 8 is **ON**. As a result, welding is performed using schedule No. 8.

Schedule signals 16 and 32 are invalid because they are OFF when the schedule is determined.

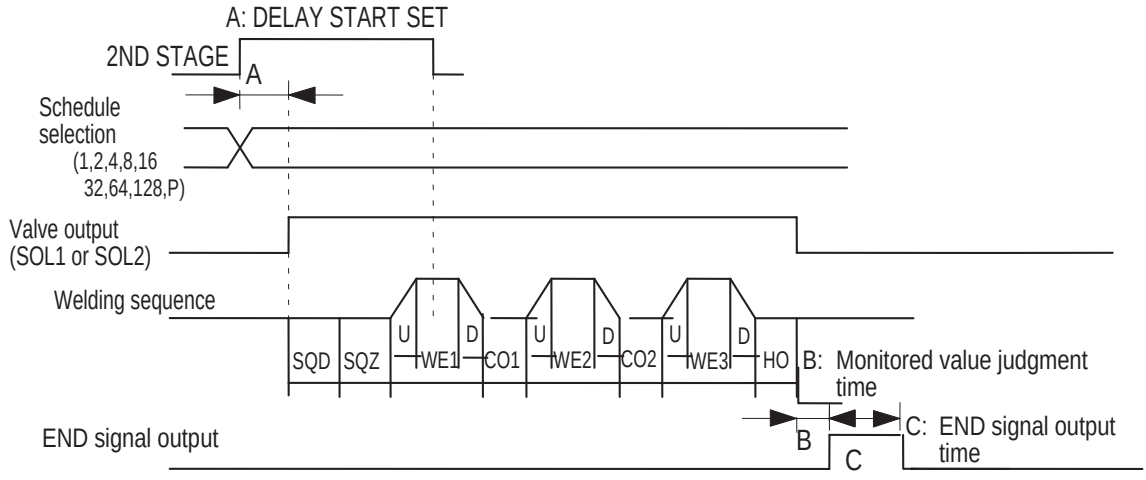
NOTE: When **DELAY START SET** is 1 ms or 2 ms. The schedule number when the 2ND STAGE signal is received is selected. Therefore, in Fig. (A) above, the schedule number is not selected and the schedule signal input error occurs. When **DELAY START SET** is 1 ms or 2 ms, input the schedule signal in advance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

(b) START SIG.MODE

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

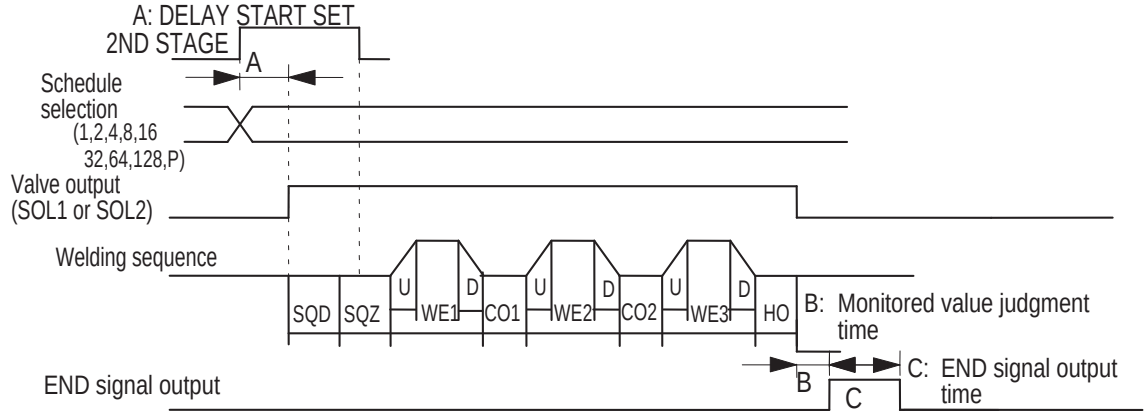
1) When latched

- 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.



2) When pulsed

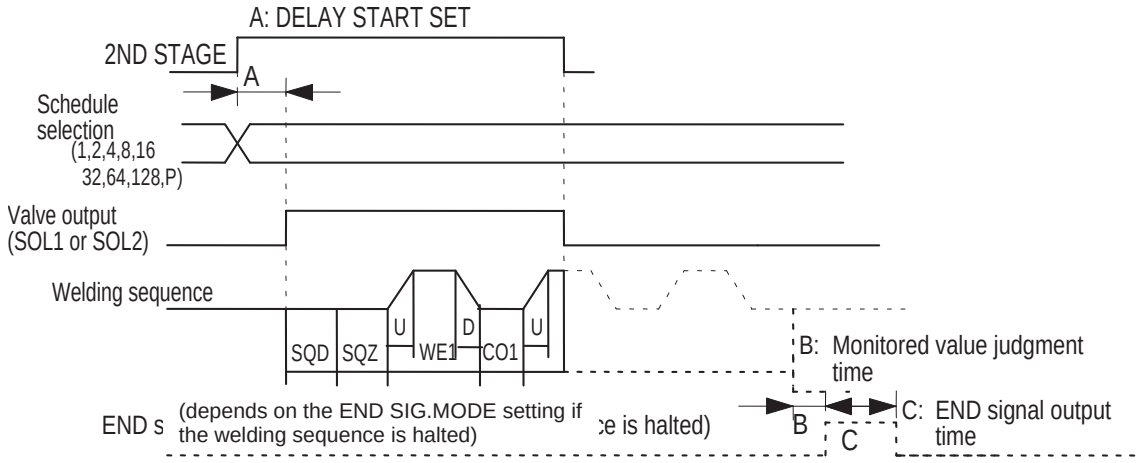
When the 2ND STAGE signal is input for more than the time set through **DELAY START SET** and then stops, the welding sequence will proceed to completion.



3) 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 that the END signal depends on the END SIG.MODE setting.



(c) END SIG.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 SIG.MODE setting.

- END SIG.TIME is 0ms
  1) OFF is 0ms (OFF time = 0ms)
     a) When the start input time is longer than the sequence time, the end signal time is the start input time (Sequence time ≤ start input time → END time = start input time)
     b) When the start input time is shorter than the sequence time, the end signal time is the 10ms. (Sequence time > start input time → END time = 10ms)
  2) OFF time is 10 ms to 200 ms (10ms ≤ OFF time ≤ 200 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)

- END SIG.TIME is 10 to 200 ms
  1) OFF is 0 ms (OFF time = 0ms)
     End signal time is the set END SIG.TIME time. (END time = END SIG.TIME time)

2) OFF time is set (10 ms ≤ OFF time)
   a) END SIG.TIME time is shorter than OFF time (END SIG.TIME time < 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 ≥ OFF time). End signal time is the OFF time. (END time = OFF time)

(d) END SIG.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 SIG.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 SIG.MODE (MAINTAINED).

* 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

* For a list of fault codes, see *"Troubleshooting"* in *Chapter 5, Maintenance*.
Priority is "Stopped halfway" = "Other errors at welding" > "Upper/lower limit error" > "Count-related error".

(e) 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 Nos. and Schedule Selection Pins."**)

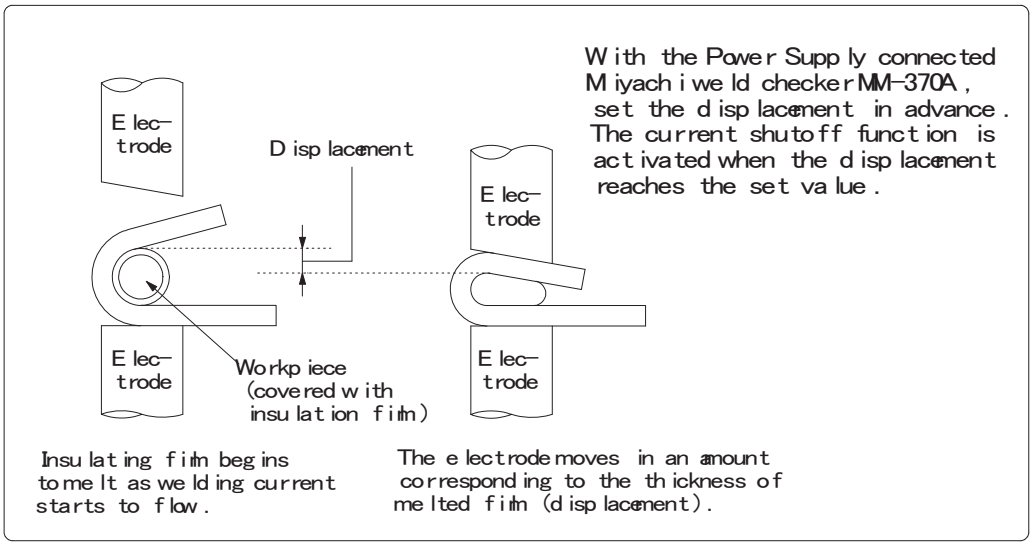
NOTE #1: Schedule Nos. and Schedule Selection Pins

● = Closed BLANK = Open

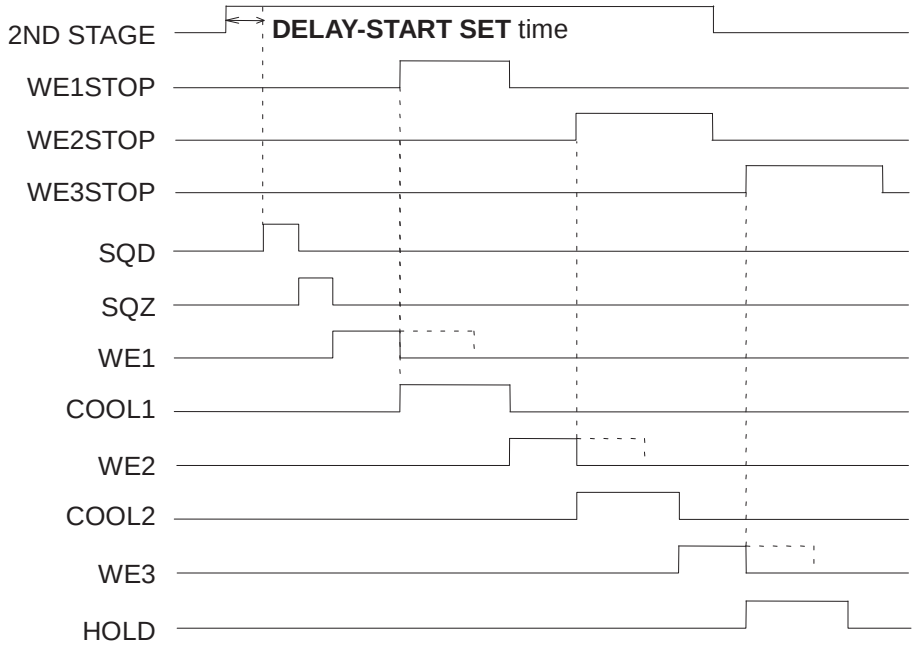
SCHEDULE#	SCH 1	SCH 2	SCH 4	SCH 8	SCH 16	SCH 32	SCH 64	SCH 128	PARITY
1	●								
2		●							
3	●	●							●
4			●						
5	●		●						●
6		●	●						●
7	●	●	●						
8				●					
9	●			●					●
10		●		●					●
11	●	●		●					
12			●	●					●
13	●		●	●					
14		●	●	●					
15	●	●	●	●					●
16					●				
17	●				●				●
18					●				●
19	●				●				
20		●			●				●
:									
:									
:									
:									
:									
238		●	●	●		●	●	●	●
239	●	●	●	●		●	●	●	
240					●	●	●	●	●
241	●				●	●	●	●	
242		●			●	●	●	●	●
243	●	●			●	●	●	●	●
244			●		●	●	●	●	
245	●		●		●	●	●	●	●
246		●	●		●	●	●	●	●
247	●	●	●		●	●	●	●	
248				●	●	●	●	●	
249	●			●	●	●	●	●	●
250		●		●	●	●	●	●	●
251	●	●		●	●	●	●	●	
252			●	●	●	●	●	●	●
253	●		●	●	●	●	●	●	
254		●	●	●	●	●	●	●	
255	●	●	●	●	●	●	●	●	●

Note #2: 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.

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: 60ms, WELD: 15ms, INT: 10ms, and repetition: 3, the total time is 75ms. The welding current is supplied for at least 60ms and neglected for 15ms (WELD: 5ms + INT: 10ms).

This is also effective when the off time (OFF) is set. A welding is stopped when the signal is input before each WE. A welding is performed when the signal is released before each WE.

(f) WELD2 STOP/WELD COUNT

Set external input 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.

(g) WELD3 STOP/COUNT RESET

Set external input 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.

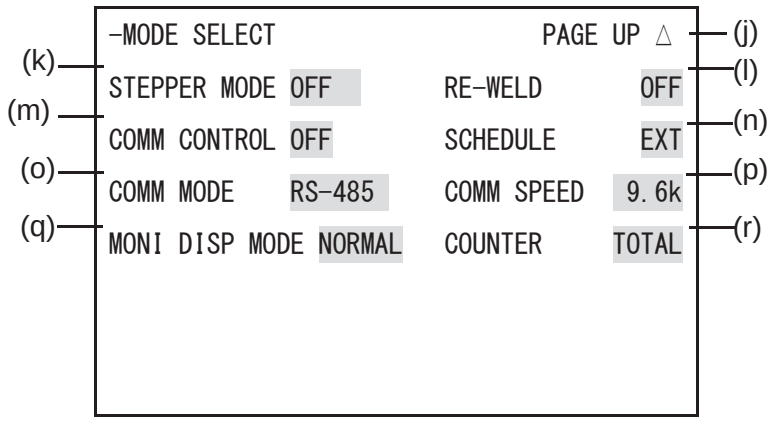
(h) WELD TIME

Use this setting to change the units for time settings available on the **(3) SCHEDULE screen**.

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

(i) PAGE DOWN

When the cursor is at ▼, moving the cursor down will change the display to the screen shown below. Use ▲ or ▼ to scroll up or down through different screens.



(j) PAGE UP

When the cursor is at △, moving the cursor up will return the display to the previous screen.

(k) STEPPER MODE

Select whether or not to perform step-up (step-down) operation. (Refer to (11)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) 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.

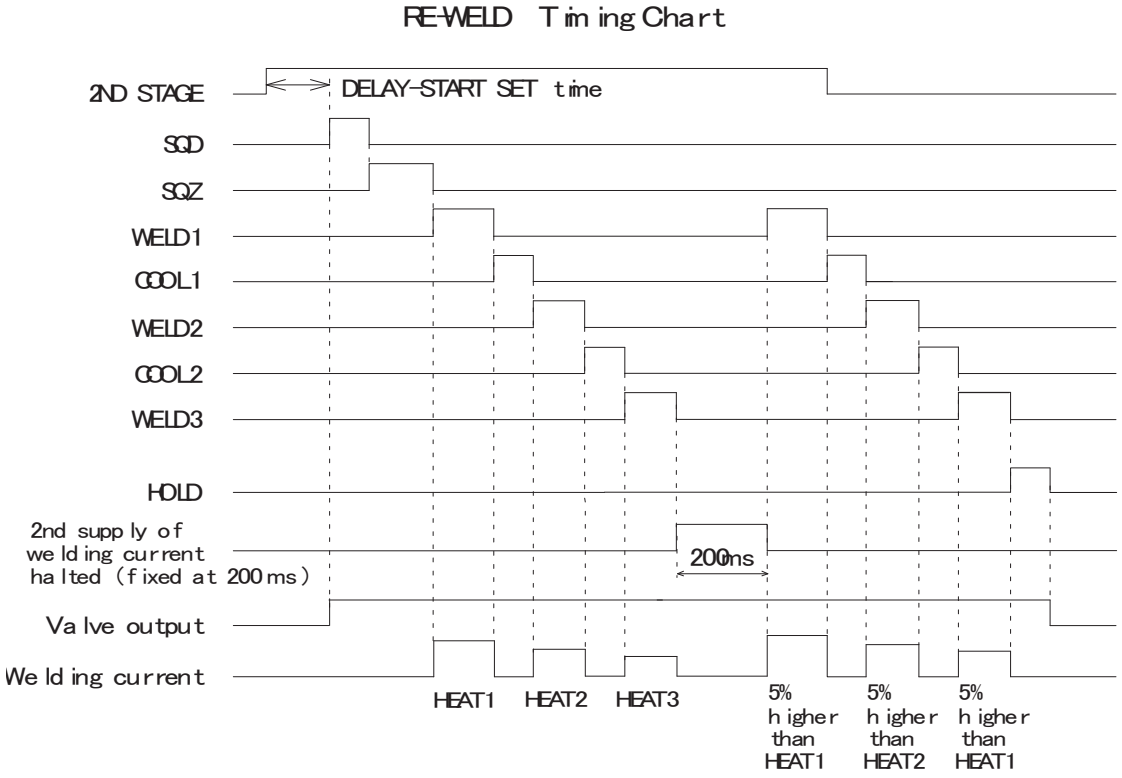
ON	Welding current will be supplied again.
OFF	Welding current will not be supplied again.

Even when the welding current is supplied twice with RE-WELD, 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).
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.



(m) COMM CONTROL

Selects a communication function.

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

(n) 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 **MA-627A**. (Note)

NOTE: When setting SCHEDULE to INT, be sure to connect the **MA-627A** and select the SCHEDULE screen or the MONITOR screen.

(o) COMM MODE

Selects a communication mode.

RS-232C	Communication by RS-232C and optional RS-485

(p) COMM SPEED

Selects a communication speed.

9.6k	Communication at 9600 bps
19.2k	Communication at 19200 bps
38.4k	Communication at 38400 bps

For details of the external communication, see *Appendix F, Communications*.

(q) MONI DISP MODE

Sets the monitor display. This function is invalid when the program unit is disconnected.

NORMAL	The monitor display is updated each time. It takes monitored value computing time + display time (ms). Used when the takt time is relatively slow. * Communicated with the program unit 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 takt time is relatively fast. Errors are also displayed only when updated (communicated with the program unit). * Not communicated with the program unit automatically.

(r) 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), workpiece 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.

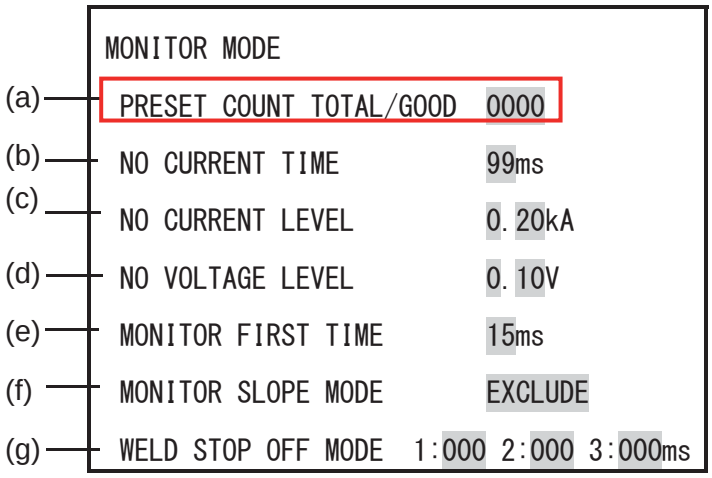
GOOD:Count-up is done if the judgment is GOOD in current-supplied monitoring.In case of errors other than the counter error, count-up is not done. Also, when the welding is interrupted, count-up is not done.

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

10. MONITOR MODE Screen



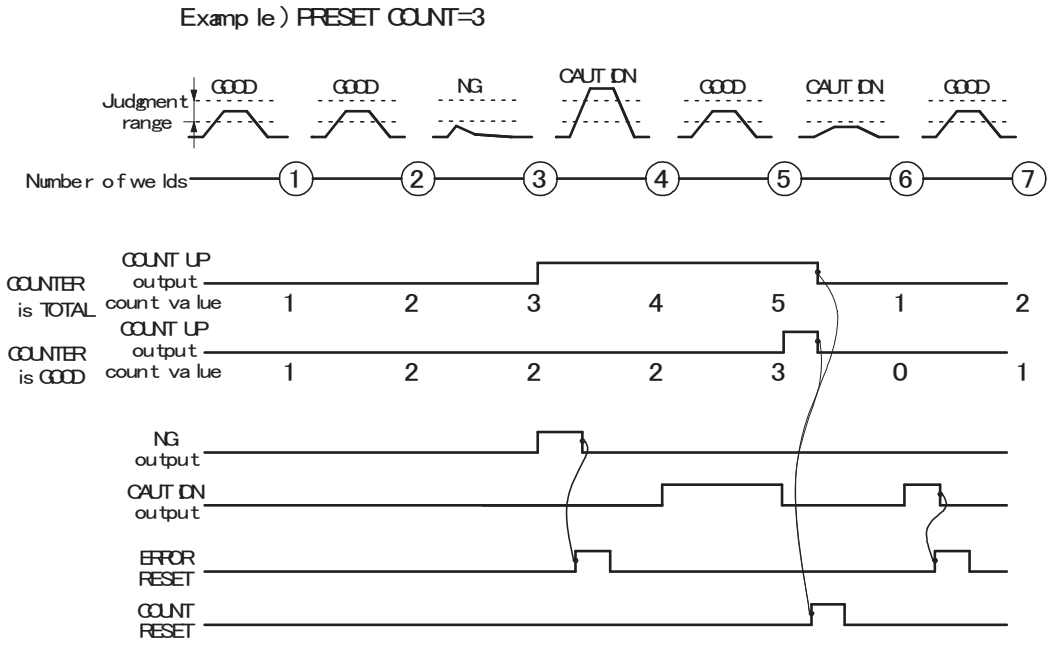
NOTE: This screen shows initial settings. The display surrounded with frame changes depending on the setting of WELD2 STOP/WELD COUNT and COUNTER on the MODE SELECT screen.

(a) PRESET COUNT TOTAL/GOOD / PRESET COUNT WELD/WORK / WELD COUNT

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

- WELD2 STOP/WELD COUNT is WELD2 STOP and COUNTER is TOTAL or GOOD

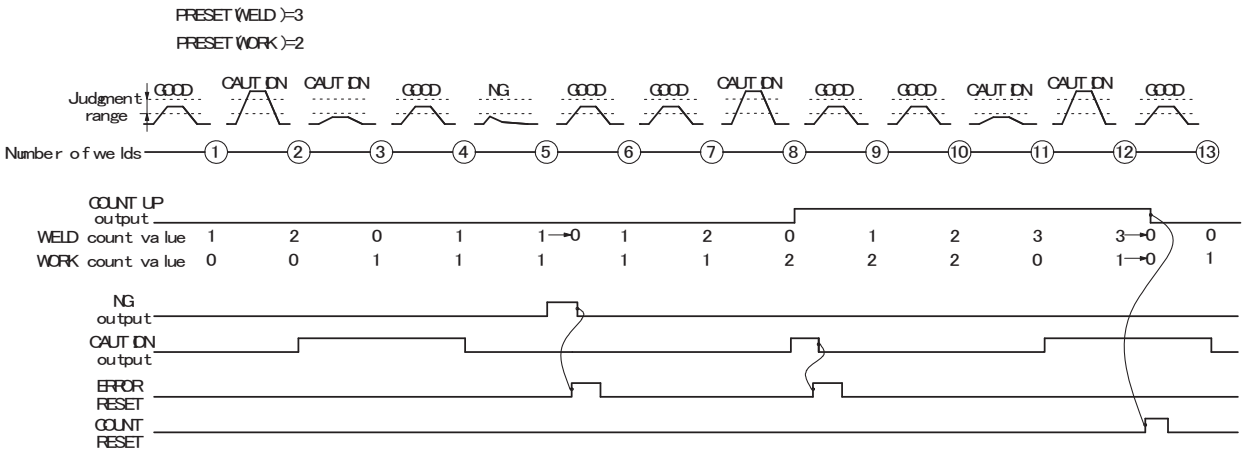
Sets the count value of TOTAL or GOOD set for COUNTER.



NOTES:

- When ERROR RESET is input, display of MA-627A, [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 MA-627A, [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 se to N.O. (NORMAL OPEN): Open at normal / Closed at error.
- WELD2 STOP/WELD COUNT is WELD2 STOP and COUNTER is WORK.

Sets WELD and WORK counters.



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 MA-627A, [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 MA-627A, [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 se to N.O. (NORMAL OPEN): Open at normal / Closed at error.
- WELD2 STOP/WELD COUNT is WELD COUNT

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). (Refer to the figure below.)

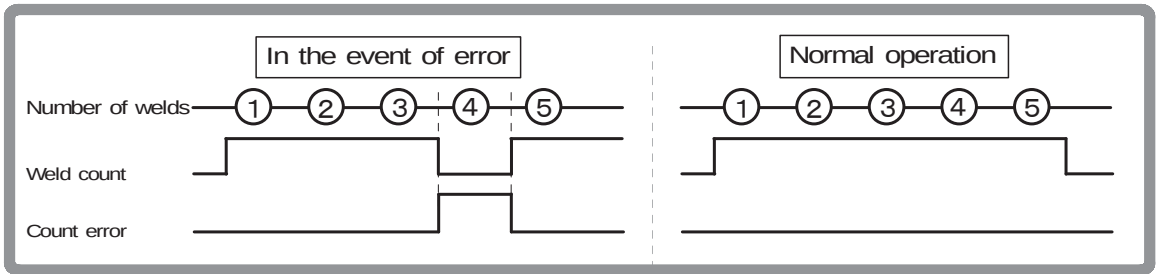
For example, if you set the number of welds to 5 from the programmable logic controller, select “5” for **PRESET COUNT** as well.

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 as long as the absence lasts for a period within the time set here.

If, for example, 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 program unit 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.

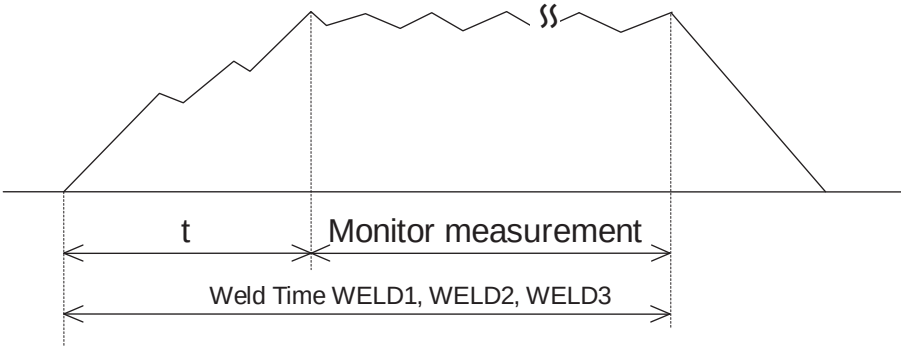
NOTE: No judgment as to no-current or no-voltage error will be made if you select 00.0kA/0.00 V. If the toroidal coil and the voltage detecting cable are disconnected in the second control, excessive current may flow.

(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 15ms.

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.



t = MONITOR FIRST TIME

(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.

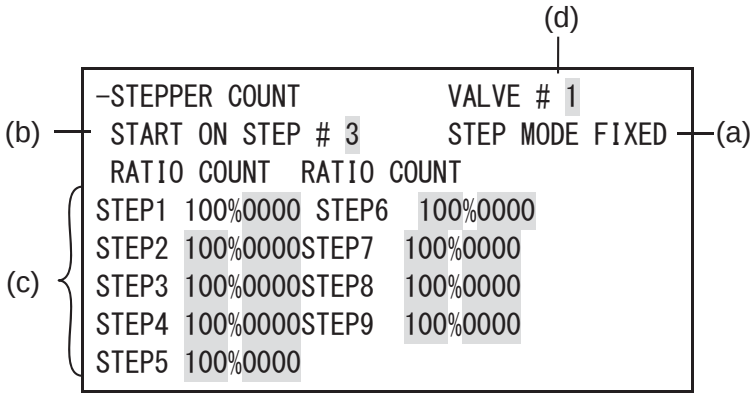
(g) WELD STOP OFF TIME

Sets the neglecting time of the welding stop signal for each of WE1, WE2and WE3.

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.

11. STEPPER COUNT Screen

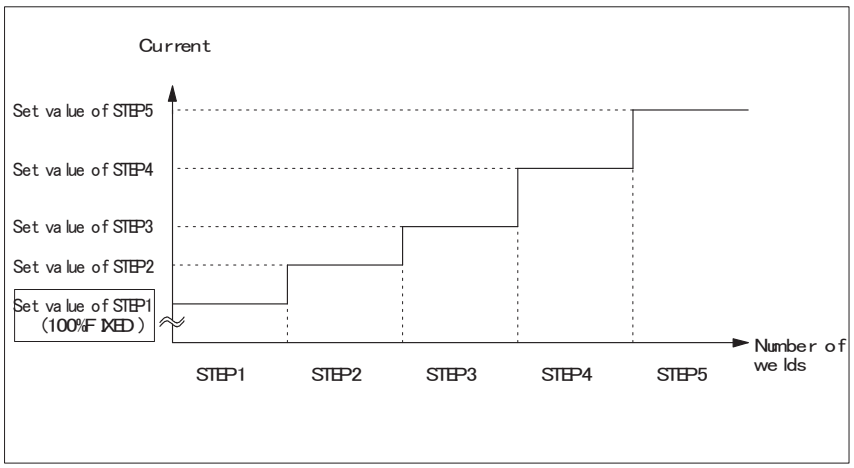
The Power Supply can change the level of the welding current depending on the welding conditions. The function to increase the welding current is called the “step-up” function, and that to decrease the welding current is called the “step-down” function. Set the step-up or step-down timing based on the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



(a) 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.

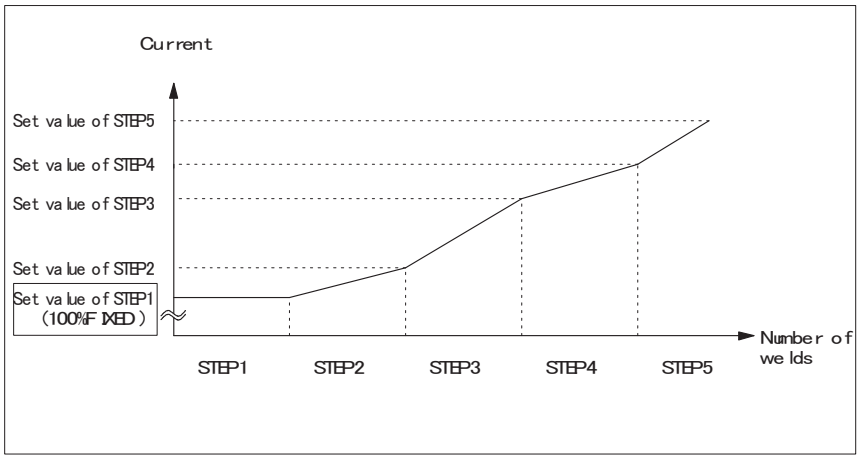
FIXED



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



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 2kA for current, the current is stepped up in a stepwise manner from Weld 3 to Weld 6 as shown below.

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

(b) 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** respectively.

(c) 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.

(d) 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 2kA, H; 2.2kA, L; 1.8kA.

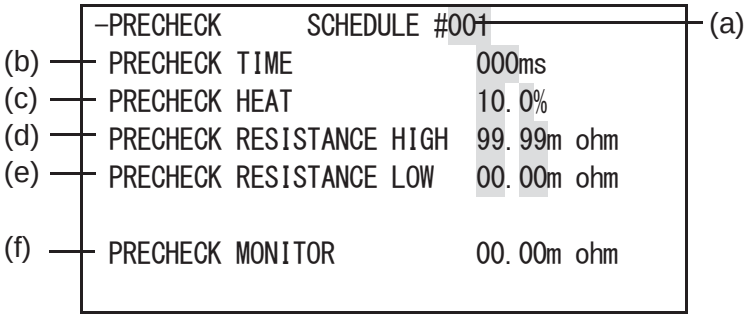
When the step becomes 150%, H and L become as follows.

H: 2.2 x 1.5 = 3.3kA
L: 1.8 x 1.5 = 2.7kA

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 constantvoltagecontrol before regular welding to confirm that the part to weld is setcorrectly by means of the measured current value.



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

(b) PRE-CHECK TIME
Set the weld time. Pre-check is not performed at 0ms.

(c) PRE-CHECK HEAT
Set the welding pulse width.

(d) PRE-CHECK RESISTANCE HIGH
Set the upper limit of resistance value for pre-check.

(e) PRE-CHECK RESISTANCE LOW
Set the lower limit of resistance value for pre-check.

(f) PRE-CHECK 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 2ND STAGE signal is input.

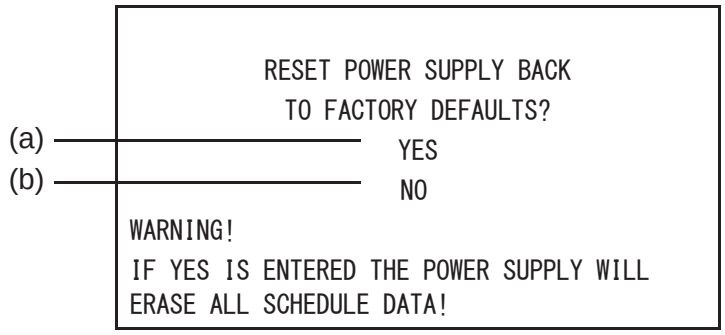
```
-I/O CHECK
SCH01* SCH128* ERR RST* NG   0 SOL1 0
SCH02* PARITY* STP RST* CATN 0 SOL2 0
SCH04* WE CNT* W3 STOP* END  0
SCH08* WELDON* 1ST STG* CTER 0
SCH16* THERMO* 2ND STG* REDY 0
SCH32* FLW SW*  STED 0
SCH64*  WESG 0
```

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 **MA-627A**.

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.

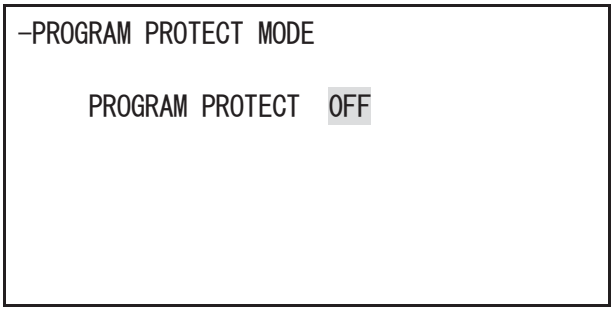
15. PROGRAM PROTECT MODE Screen

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**.

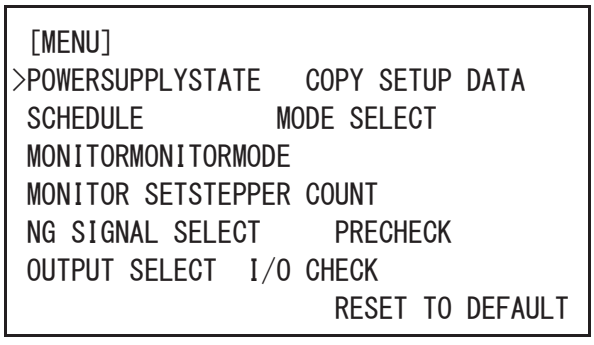
1) Turn on the power supply with the ▼**(**DOWN) key pressed or connect the **MA-627A** to the circuit cable with the power supply turned on. The following screen is displayed.



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-627A 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>

```
  [MENU]
>POWERSUPPLYSTATE
 SCHEDULE          MODE SELECT
 MONITORMONITORMODE
 MONITOR SETSTEPPER COUNT
 NG SIGNAL SELECT     PRECHECK
 OUTPUT SELECT
```

CHAPTER 3B
IS-800CR/1400CR ADVANCED: USING PROGRAMMING FUNCTIONS

Introduction

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. Check that the **READY** lamp is turned on to start welding. 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.

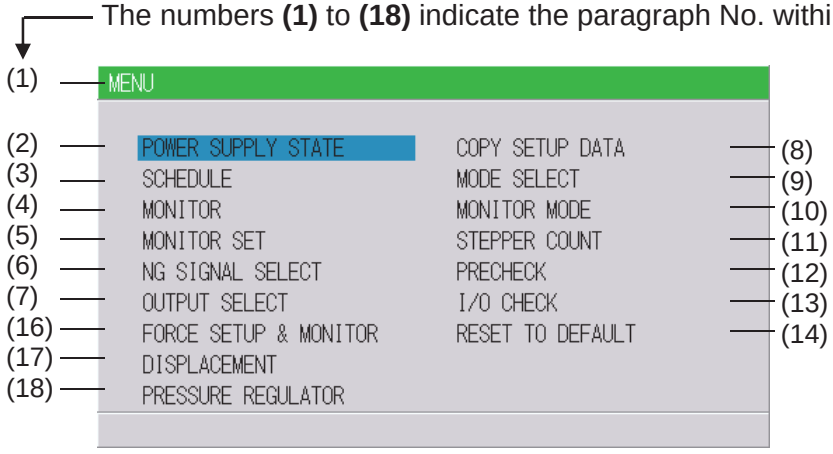
SHADED CHARACTERS Items for which a value must be input, or which must be set ON or OFF will be shaded. Move the cursor to the item and type in the appropriate changes.

WARNING

It is possible that weld current is flowing even though error message **E-05** (**NO CURRENT**) is displayed. ***To avoid electrocution use extreme caution.***

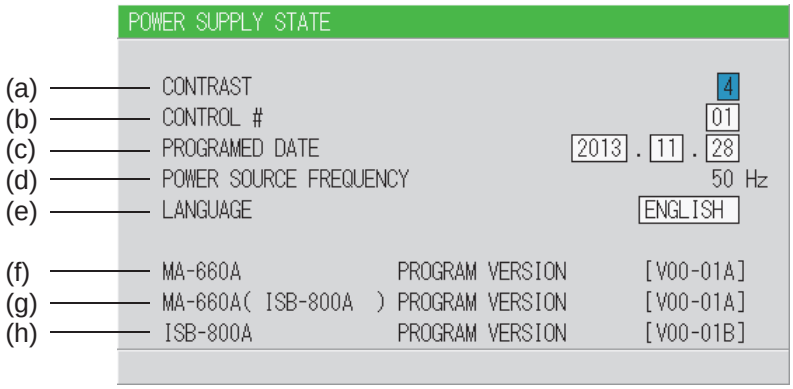
1. MENU Screen

The **MA-660A** 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 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 ROM VERSION

Indicates the ROM version No. of program unit MA-660A.

g. MA-660A (ISB-800A/1400A) PROGRAM VERSION

Indicates the program version No. of the Power Supply's screen display part.

h. ISB-800A(ISB-1400A) ROM VERSION

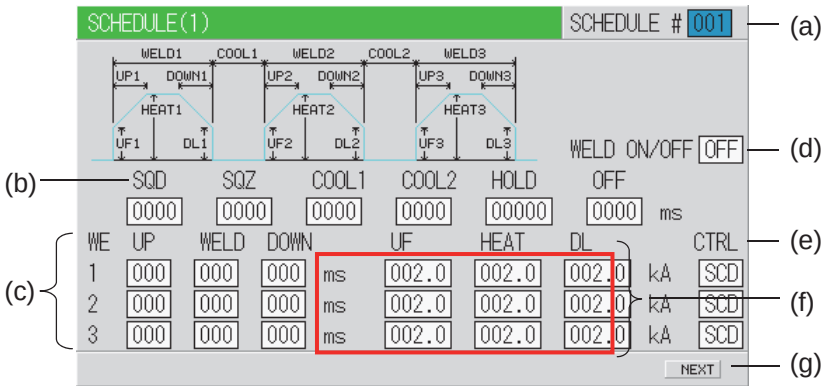
Indicates the ROM version No. of the Power Supply.

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 isa 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.



NOTE: The screen shows the settings for **IS-800CR**.The settings surrounded with frames are 004.0kA for **IS-1400CR**. 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).

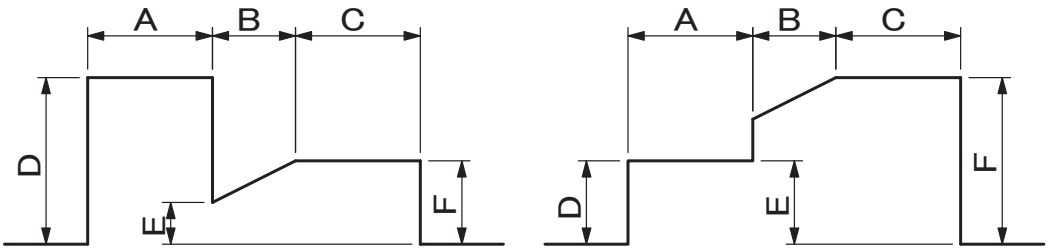
DOWN (1, 2, 3)

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.

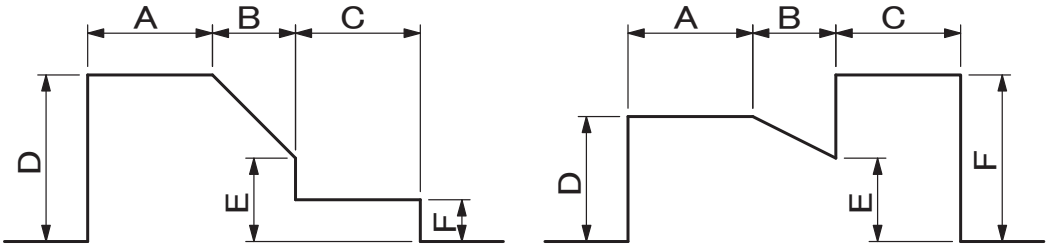
When the control methods for the previous and subsequent stages in the multi-stage welding are changed. The control method for the previous stage is different from that for the subsequent stage.

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.



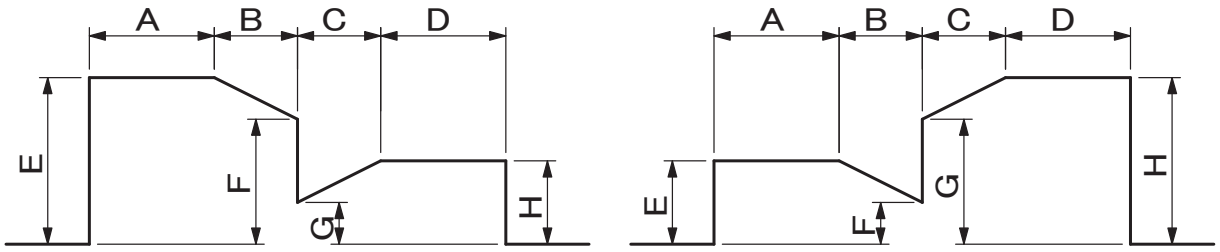
A: WELD1 time or WELD2 time
B: UP2 time or UP3 time
C: WELD2 time or WELD3 time
D: WELD1 HEAT or WELD2 HEAT
E: UF2 HEAT or UF3 HEAT
F: WELD2 HEAT or WELD3 HEAT

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.

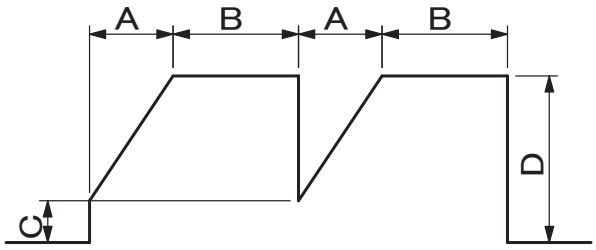


A: WELD1 time or WELD2 time
B: DOWN1 time or DOWN2 time
C: UP2 time or UP3 time
D: WELD2 time or WELD3 time
E: WELD1 HEAT or WELD2 HEAT
F: DL1 HEAT or DL2 HEAT
G: UF2 HEAT or UF3 HEAT
H: WELD2 HEAT or WELD3 HEAT

NOTES:

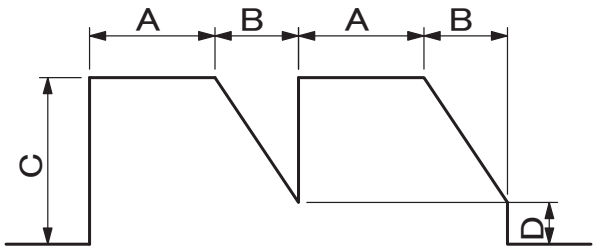
- Set 1 (ms/CYC) or more for at least one of WELD1, WELD2 and WELD3. Also, set the total time of UP and DOWN to be shorter than WELD. If not, E-10 (Schedule setting error) will be displayed.
- Upslope / Downslope waveform when INT (downtime) is set to 0.
- E-10 (Schedule setting error) will occur when 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.



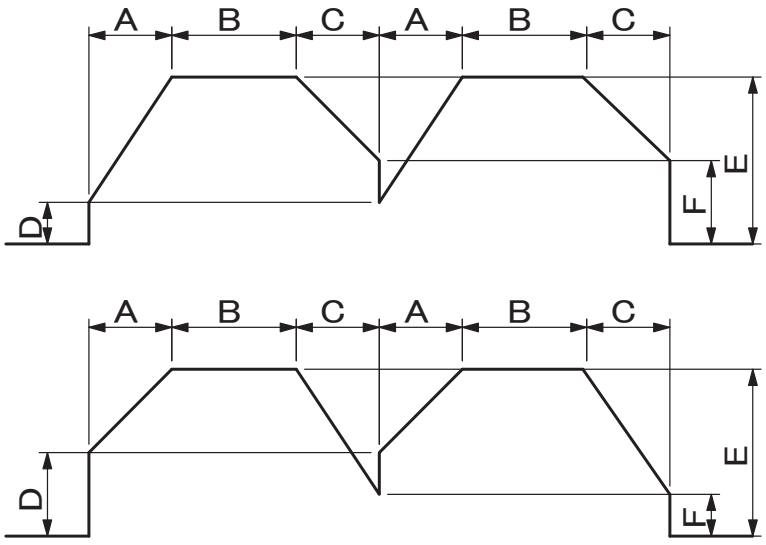
A: UP1 to 3 time
B: WELD1 to 3 time
C: UF1 to 3 HEAT
D: HEAT1 to 3

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.



A: WELD1 to 3 time
B: DOWN1 to 3 time
C: HEAT1 to 3
D: DL1 to 3 HEAT

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.



A: UP1 to 3 time
B: WELD1 to 3 time
C: DOWN1 to 3 time
D: UF1 to 3 HEAT
E: HEAT1 to 3
F: DL1 to 3 HEAT

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

(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.

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**.

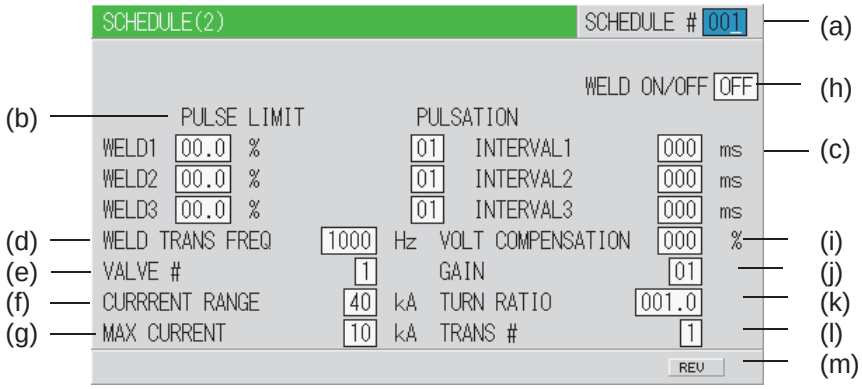
NOTE: When **UP/DOWN** is set, **UF/DL** becomes effective. It becomes a target value in the effective value control, so a difference occurs between the set value and the value of actual welding.

	**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



NOTE: The screen shows the settings for **IS-800CR**. The settings surrounded with frames are **80.0kA** for **IS-1400CR**.

a. SCHEDULE

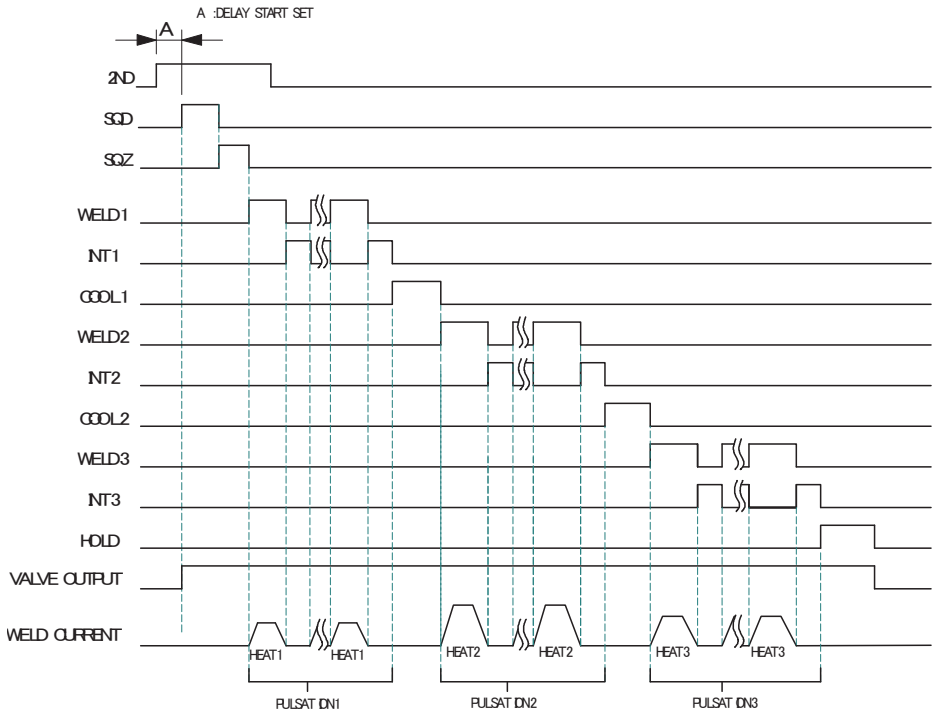
Select from #1 to #255 to set the **SCHEDULE**. Normally select #1 first, then select additional schedules in sequential order.

b. PULSE LIM

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

c. PULSATION / INT1 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. It can be set 600 Hz to 1000 Hz in units of 100 Hz. If a value greater than 1000Hz is entered, a SET ERROR will result 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

1-4 valves (welding heads) can be connected to the Power Supply. Use this setting to select which of the 4 valves to use.

f. CURRENT RANGE

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

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

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**

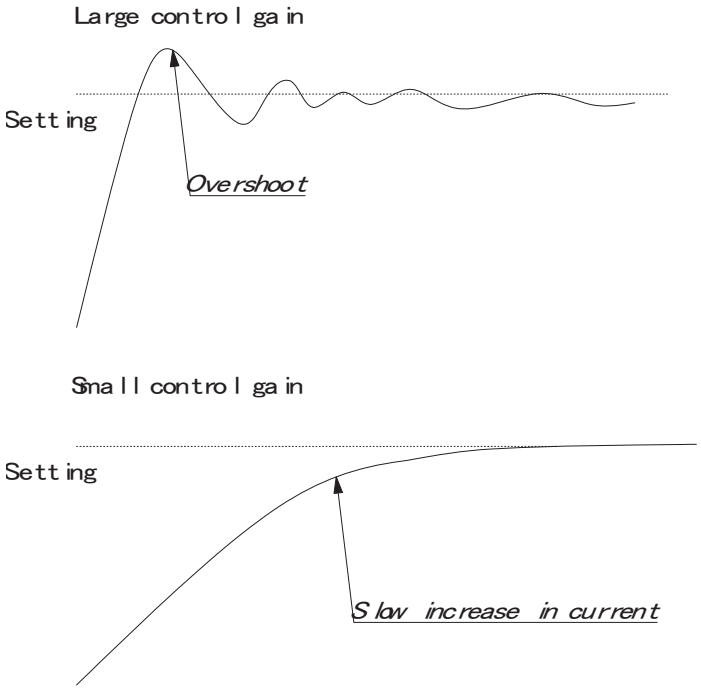
i. VOLT COMPENSATION (effective when PULSE LIM is set)

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.

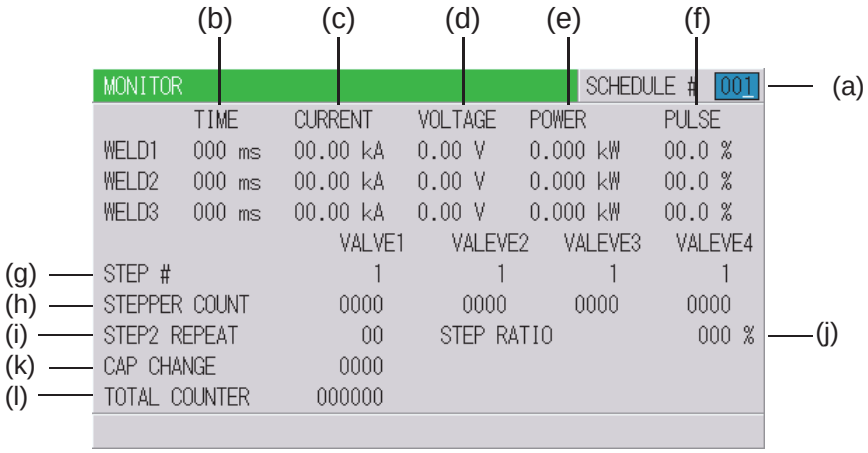
NOTE: When using the primary constant-current effective value control or primary constant-current peak value control, always set the correct turns ratio.
An incorrect ratio will result in incorrect output.

l. TRANS #
Keep set to 1. Feature is not active.

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**.



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. STEP2REPEAT

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

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.

k. CAP CHANGE

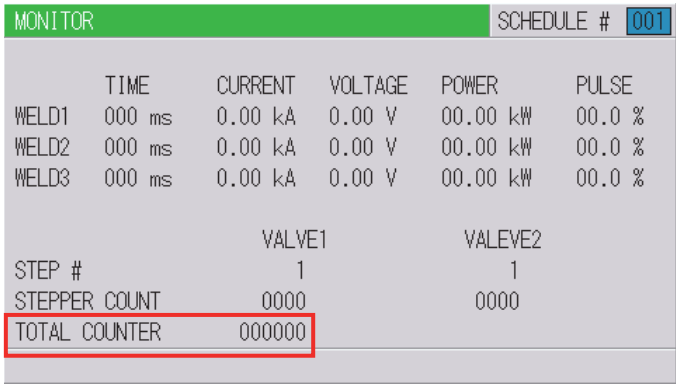
The number of times before prior notice for cap change setting for the stepper used for the displayed SCHEDULE is displayed when STEPPERMODE is not OFF on the MODE SELECT screen.

The latest measured value welded with the displayed SCHEDULE No. is displayed.

l. TOTAL COUNTER

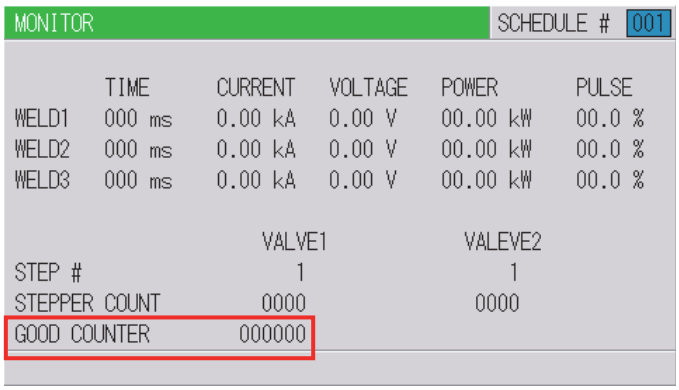
The display changes depending on the setting of WELD2 STOP/WELD COUNT and COUNTER on the MODE SELECT screen.

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



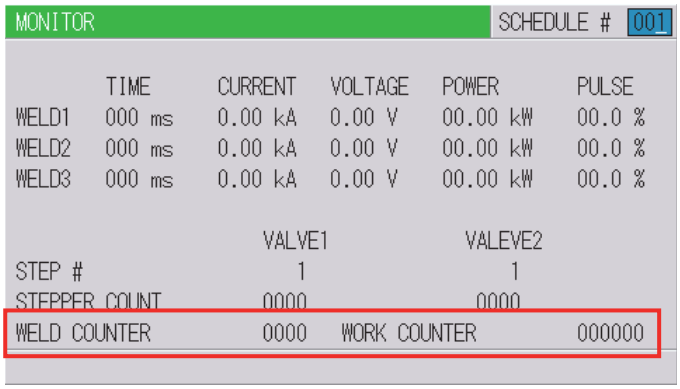
TOTAL COUNTER is displayed. The count value is incremented by one despite the result of the upper/lower limit judgment in monitoring.

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



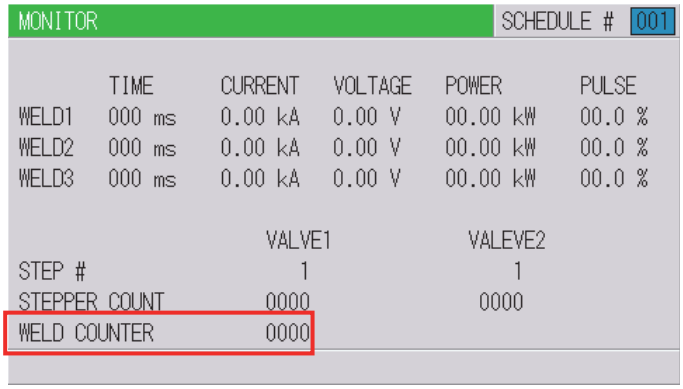
GOOD COUNTER is displayed. The count value is incremented by one when the monitored value is within the range of the upper/lower limit.

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



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:**



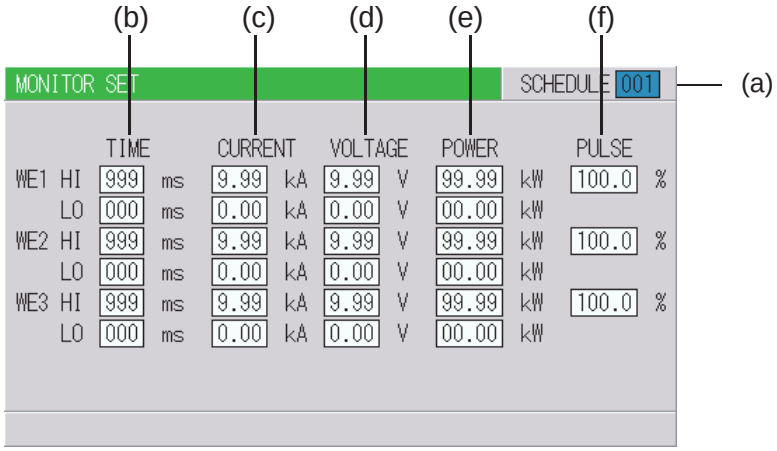
WELD COUNTER is displayed.
This is different from **WELD COUNTER** described above.

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.



(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%.

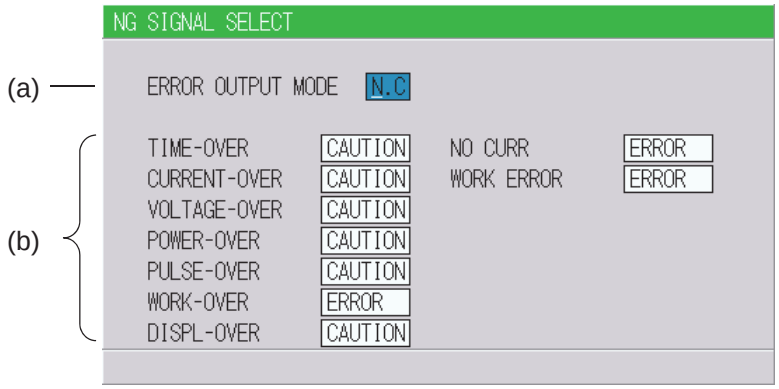
NOTE: Upper/Lower limit judgment value when **STEPPER MODE** is set to **ON**
The upper/lower limit judgment value set here is for the current when a welding is performed, not for the initial setting. Therefore, when **STEPPER MODE** is set to **ON** to perform step-up (step-down) for the initial setting,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

H: 2.2 x 1.5 = 3.3 kA
L: 1.8 x 1.5 = 2.7 kA

6. NG SIGNAL SELECT Screen

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



NOTE: This screen shows initial settings.

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

a. 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	When the work piece detection by displacement measurement exceeds the upper/lower limit
DISPL-OVER	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

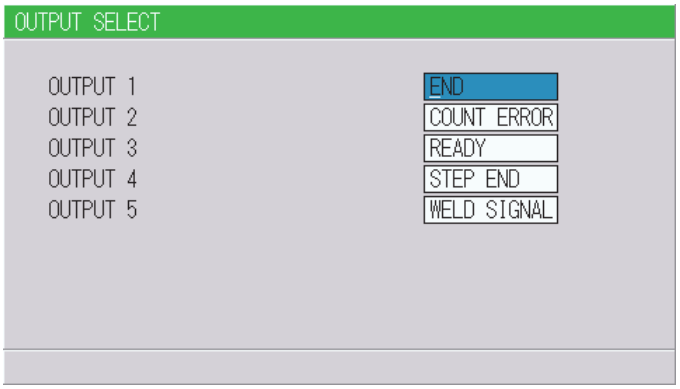
When two or more items are the same settings, the **ERROR** signal or the **CAUTION** signal is output if either one meets the condition above.

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):

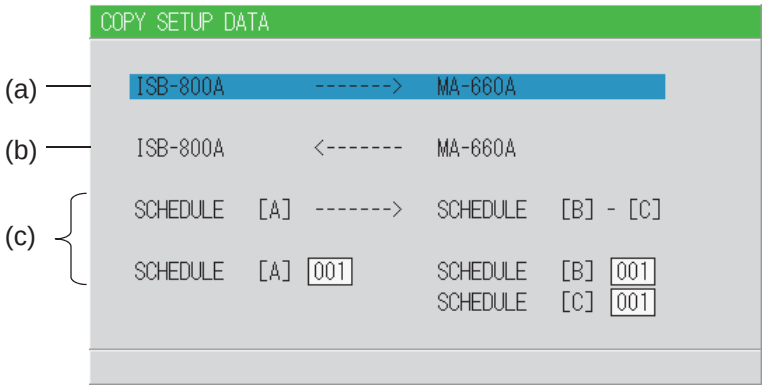
END (end signal) →**COUNT ERROR** (count error signal) →**READY** (ready signal)
→**STEP END** (step end signal) →**WELD SIGNAL** (welding timing signal)
→**GOOD** (normal signal) →**COUNT UP** (count up signal)
→**OUT I** (OUT I timing output)→**OUT II** (OUT II timing output)

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

8. COPY SETUP DATA Screen

The MA-660A can store data as shown in the figure below. When the MA-660A 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 **MA-660A** stores data for only one **IS-800CR/1400CR** 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 MA-660A 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-800CR (IS-1400CR) →MA-660A. The data in IS-800CR/1400A is copied to MEMORY of MA-660A.When copy is complete, **<END>** is displayed.

b. IS-800CR (IS-1400CR) ←MA-660A. The data in MEMORY of MA-660A is copied to IS-800CR/1400A. When copy is complete, **<END>** is displayed.

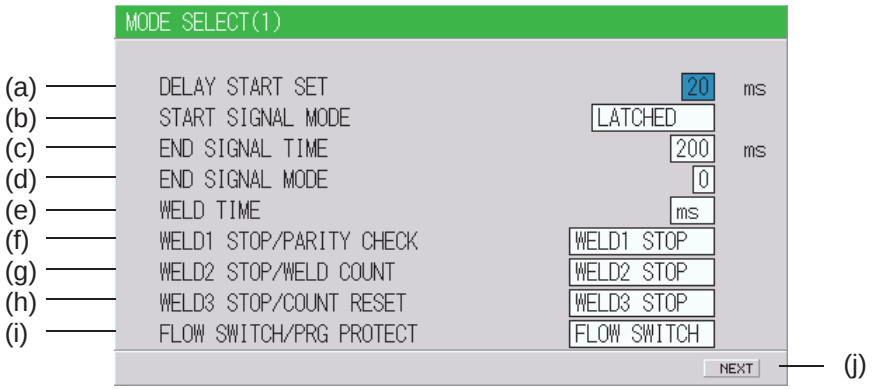
c. SCHEDULE [A]→ SCHEDULE [B]–[C]. This function is used to copy the SCHEDULE (welding condition).The Power Supply can set up to 255 schedules, indicated as SCHEDULE #1–#255.This function is also used to change from the SCHEDULE #1 setting, to perform welding according to another schedule.

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**

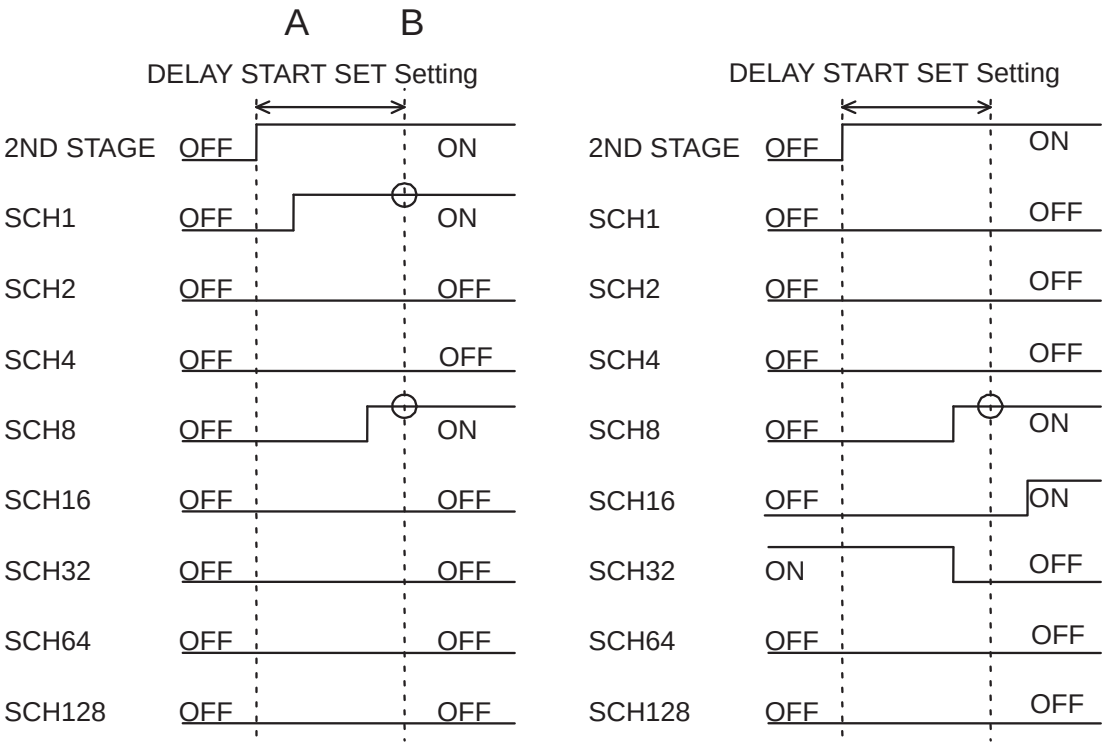
NOTE: Do ***not*** operate the program unit until the copy is complete.

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.



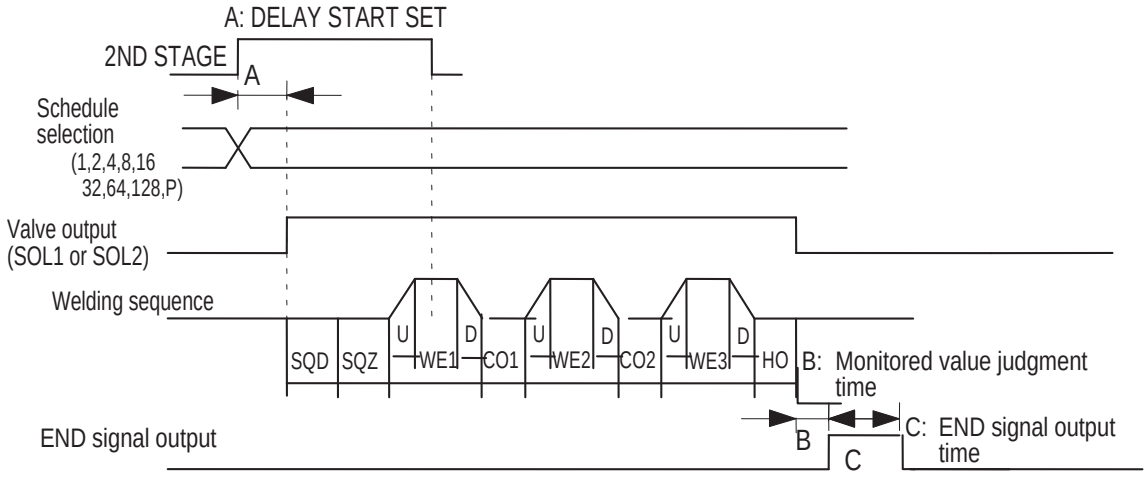
In Figure A above, the schedule signals 1 and 8 are ON. Therefore, welding is performed using schedule number. 9. In Figure B above, only schedule signal 8 is ON. As a result, welding is performed using schedule number 8.Schedule signals 16 and 32 are invalid because they are OFF when the schedule is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

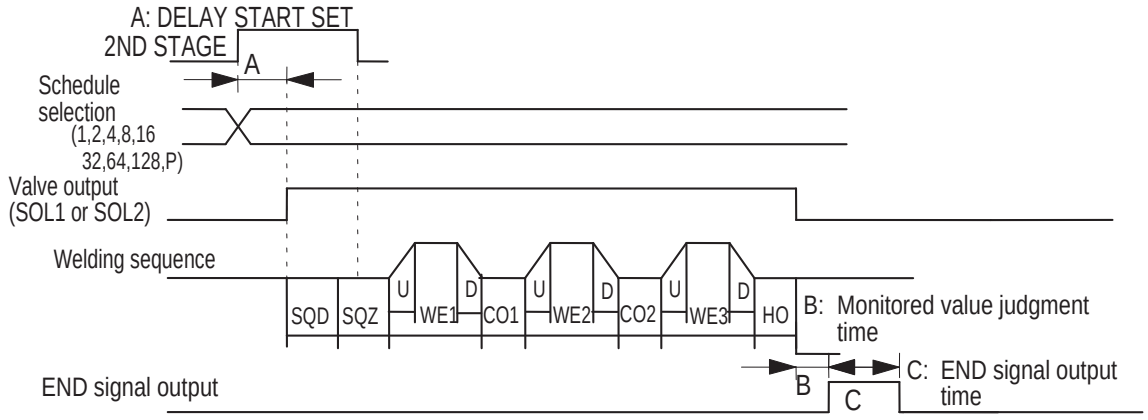
b. START SIGNAL MODE

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.

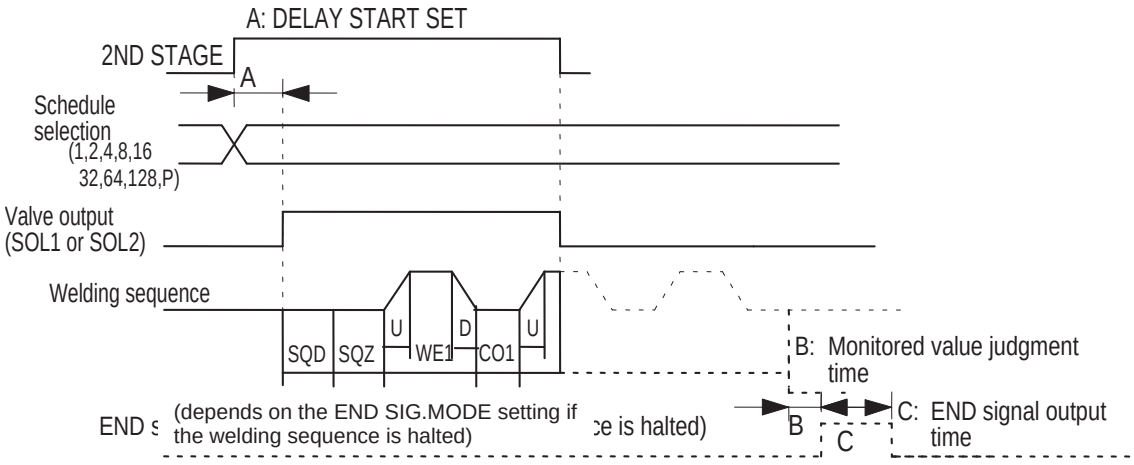


- **WHEN PULSED.** When the **2ND STAGE** signal is input for more than the time set through **DELAY START SET** and then stops, the welding sequence will proceed to completion.



- **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 0ms

1) OFF is 0ms (OFF time = 0ms)
   a) When the start input time is longer than the sequence time, the end signal time is the start input time (Sequence time ≤ start input time →**END** time = start input time)
   b) When the start input time is shorter than the sequence time, the end signal time is the 10ms. Sequence time > start input time→**END** time = 10ms)
2) OFF time is 10 ms to 200 ms (10ms ≤ **OFF** time ≤ 200 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 200ms

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

2) **OFF** time is set (10ms ≤ OFF time)
   a) **END SIG.TIME** time is shorter than **OFF** time (**END SIG.TIME** time <**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 ≥ **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	50Hz: 1CYC = 20ms 60Hz: 1CYC = 16.6ms
ms	—

f. WELD1 STOP/PARITY CHECK.

Set external input pin 13.

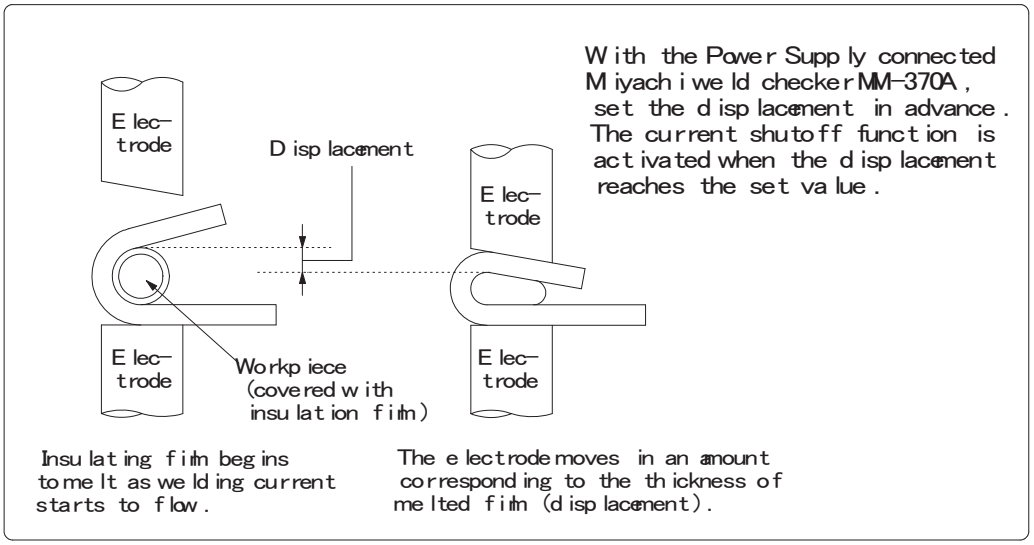
- When **WELD1 STOP** is selected. Parity check will not be performed. The sequence will proceed to COOL1 if external input pin 13 is closed during the **WELD1** sequence operation. (Refer to Note 2, "Current shutoff function.")
- When **PARITY CHECK** is selected. Parity check will be performed. This 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

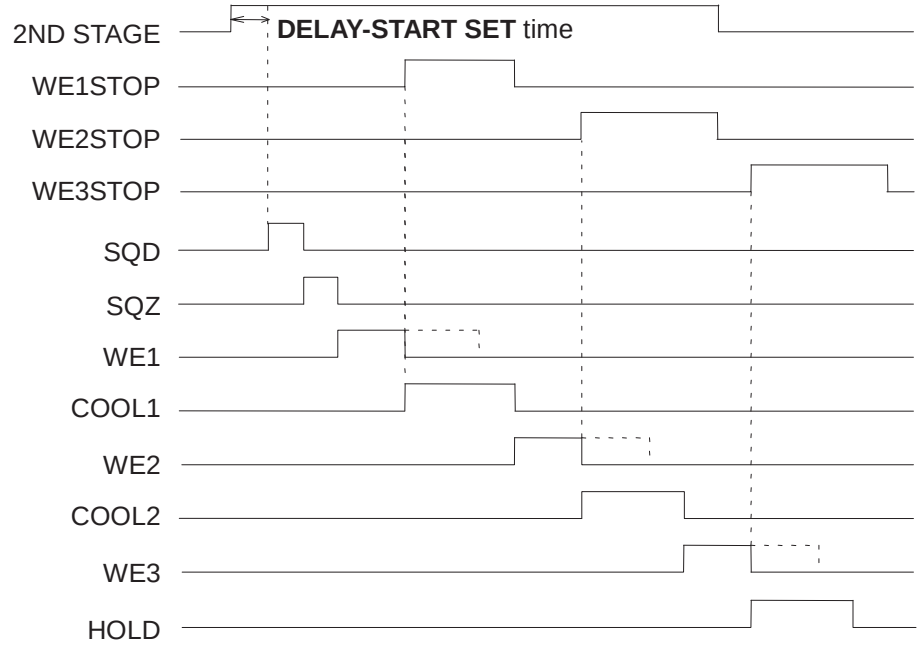
●: Closed Blank: Open

SCHEDULE#	SCH 1	SCH 2	SCH 4	SCH 8	SCH16	SCH32	SCH64	SCH128	PARITY
1	●								
2		●							
3	●	●							●
4			●						
5	●		●						●
6		●	●						●
7	●	●	●						
8				●					
9	●			●					●
10		●		●					●
11	●	●		●					
12			●	●					●
13	●		●	●					
14		●	●	●					
15	●	●	●	●					●
16					●				
17	●				●				●
18		●			●				●
19	●	●			●				
20			●		●				●
:									
:									
:									
:									
:									
238		●	●	●		●	●	●	●
239	●	●	●	●		●	●	●	
240					●	●	●	●	●
241	●				●	●	●	●	
242		●			●	●	●	●	
243	●	●			●	●	●	●	●
244			●		●	●	●	●	
245	●		●		●	●	●	●	●
246		●	●		●	●	●	●	●
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.

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: 15 ms**, **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 15 ms (**WELD: 5 ms** + **INT: 10 ms**).

This is also effective when the off time (**OFF**) is set. A welding is stopped when the signal is input before each **WE**. A 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

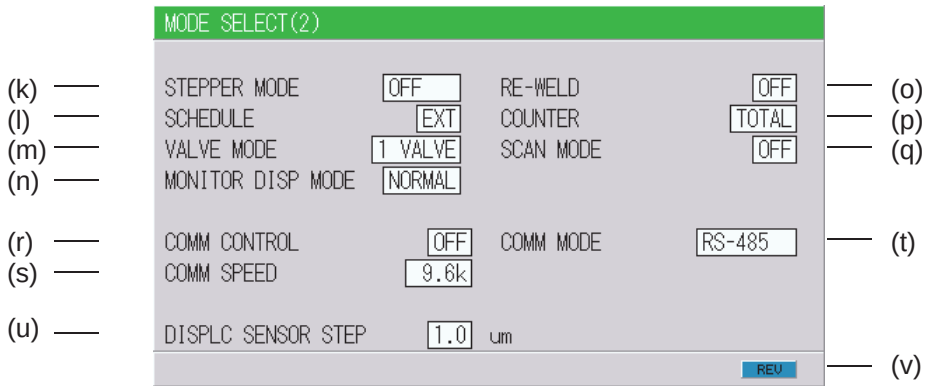
Flow switch input pin. Opening this pin will result in a flow rate error.

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. 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 **MA-660A**. (Note)

NOTE: When setting SCHEDULE to INT, be sure to connect **MA-660A** and select the SCHEDULE screen or the MONITOR screen.

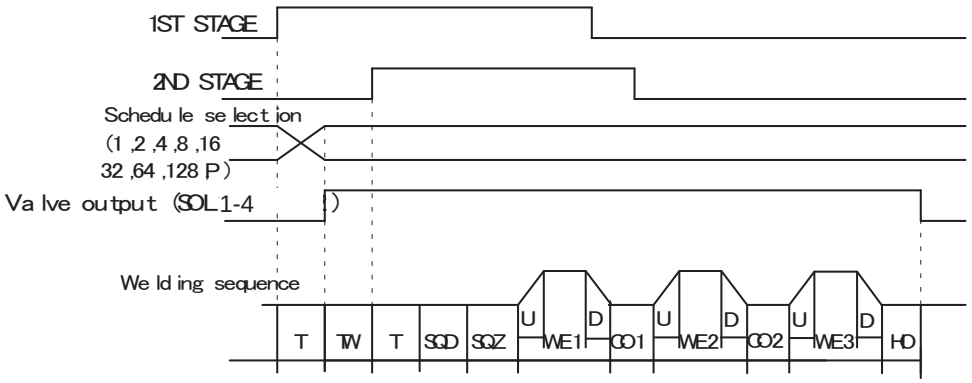
m. VALVE MODE

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

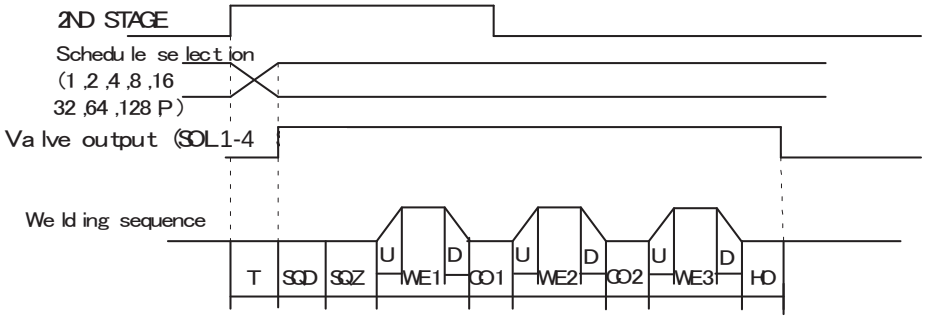
When **1 VALVE** is selected

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.

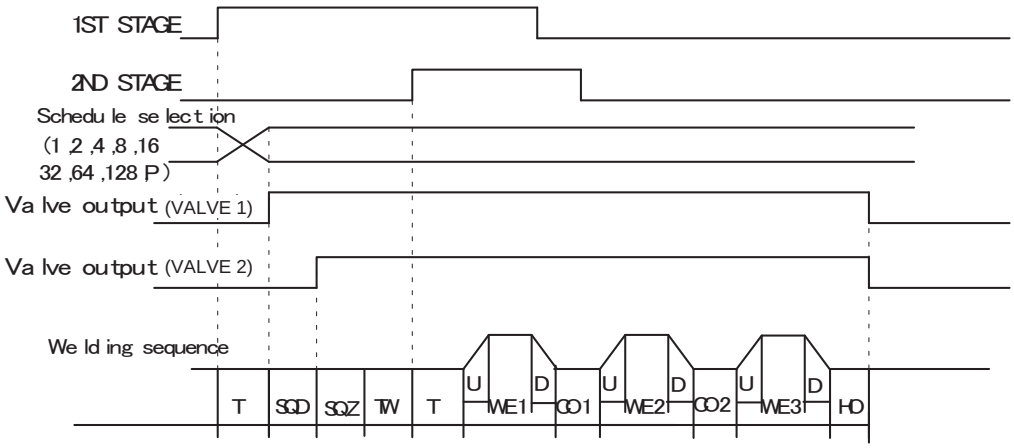


When **2 VALVE** is selected

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 Program Unit 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 Program Unit 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 Program Unit). * Not communicated with the Program Unit 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.

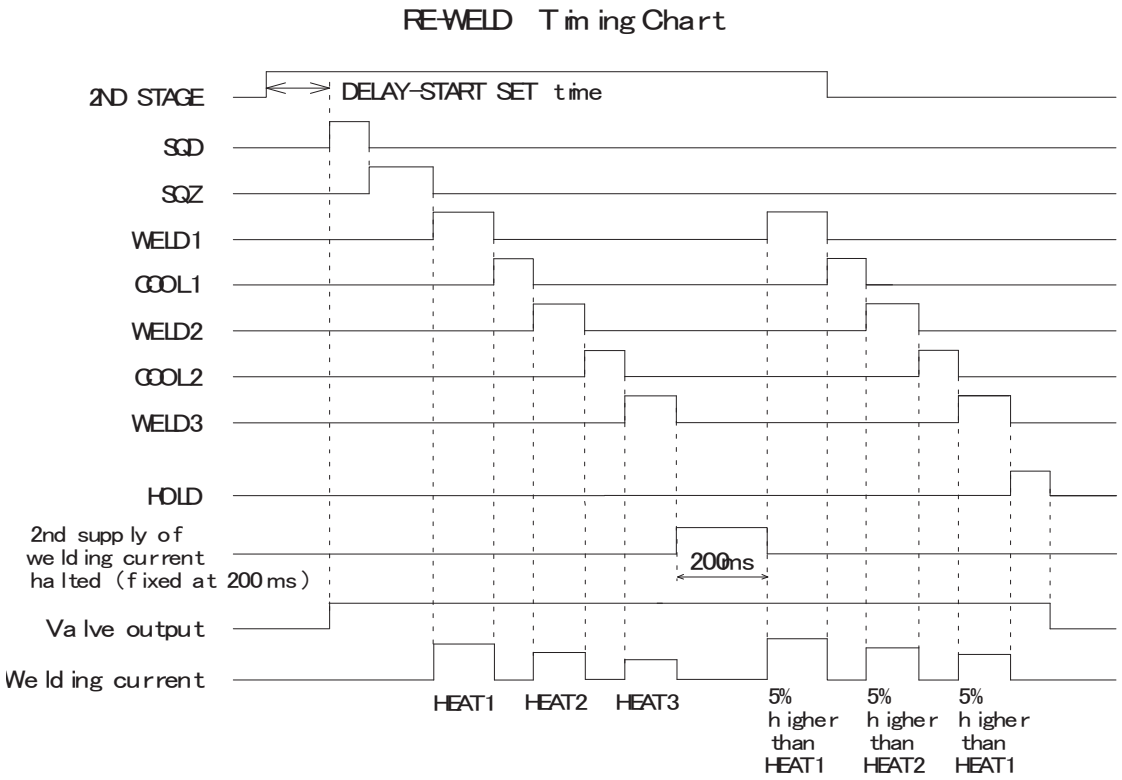
ON	Welding current will be supplied again.
OFF	Welding current will not be supplied again.

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).

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.

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. WORK Counter counts-up (increment of+1) when WELD Count reached the set value.
Upper/lower limit monitor	**CAUTION**	
	ERROR	WELD Counter does not count-up. WELD Counter is reset to 0 (zero) when NG is reset. WORK Counter does not count-up.
Error		
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

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 9600 bps
19.2k	Communication at 19200 bps
38.4k	Communication at 38400 bps

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

u. DISPLC SENSOR STEP

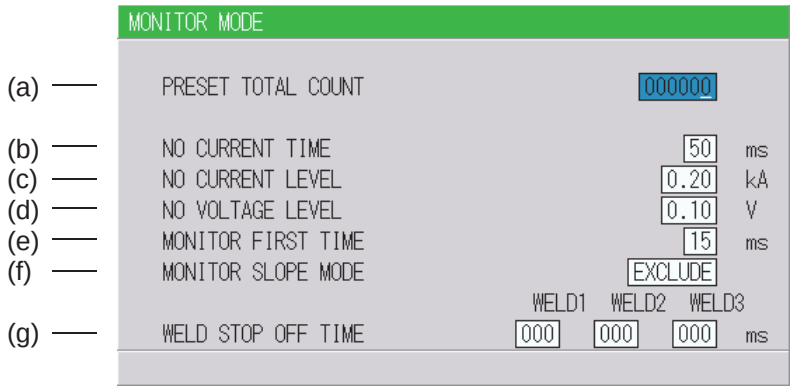
Sets the resolution of displacement sensor.

(Example) **LGK-110**: 1.0µm

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

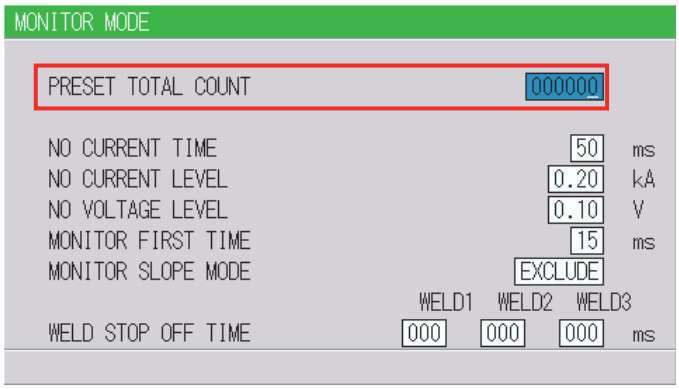


NOTE: This screen shows initial settings. The display surrounded with frame changes depending on the setting of **WELD2 STOP/WELD COUNT** and **COUNTER** on the **MODE SELECT** screen.

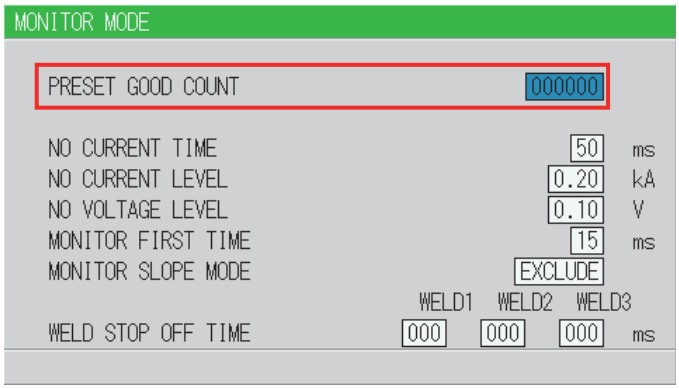
a. PRESET TOTAL COUNT

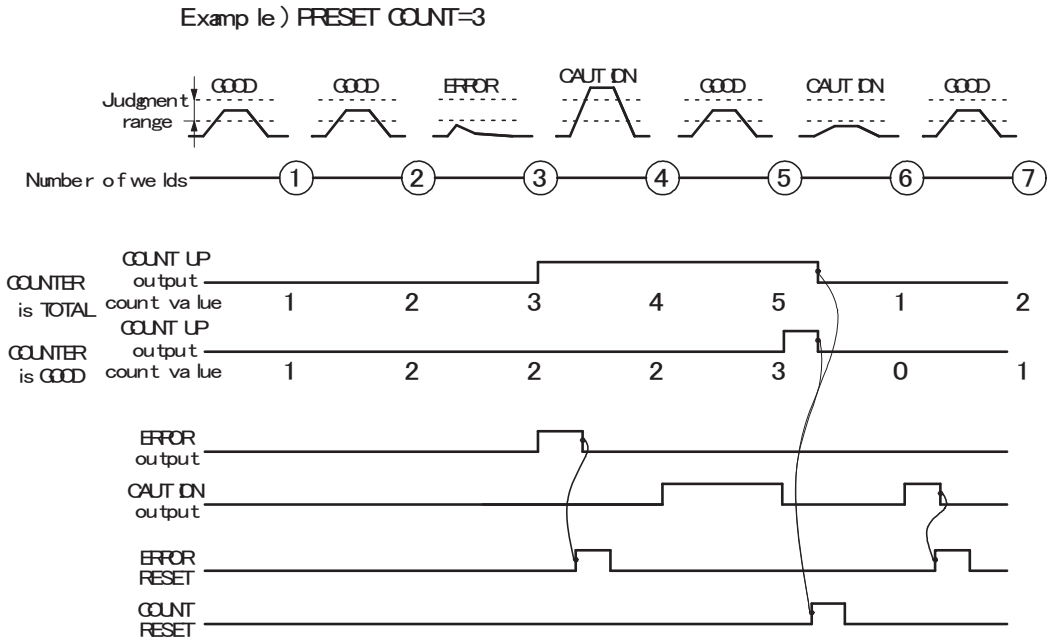
The display changes depending on the setting of WELD2 STOP/WELD COUNT and COUNTER on the MODE SELECT screen. The preset count is the count value set in advance. When each count reaches the set value, E-28 (Count-up) is displayed and the **COUNT UP** signal is output.

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



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

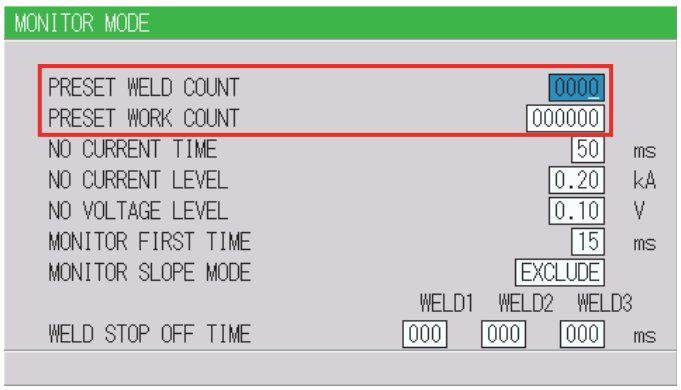


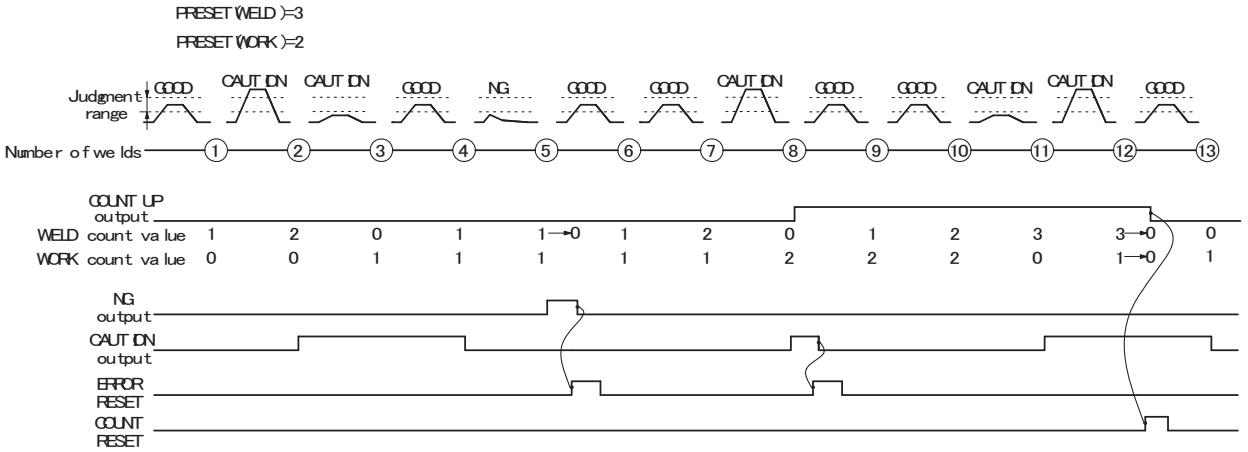


NOTES:

- When ERROR RESET is input, display of **MA-660A**, **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 **MA-660A**, **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.

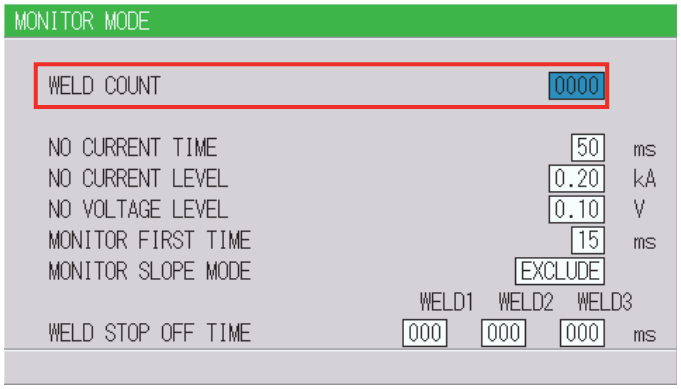




NOTES:

- 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 MA-660A, **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 MA-660A, **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 se to **N.O. (NORMAL OPEN)**: Open at normal / Closed at error.

- **WELD2 STOP/WELD COUNT is WELD COUNT**

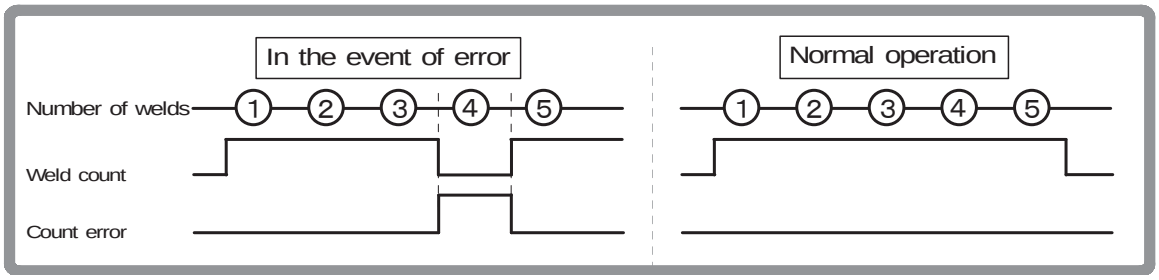


A count error signal is output if the number of welds deposited while the external weld count signal is input is smaller than the value set for **PRESET COUNT** (weld count signal is turned off before the number of welds set for **PRESET COUNT** is not deposited). See the following diagram.

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 program unit 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.

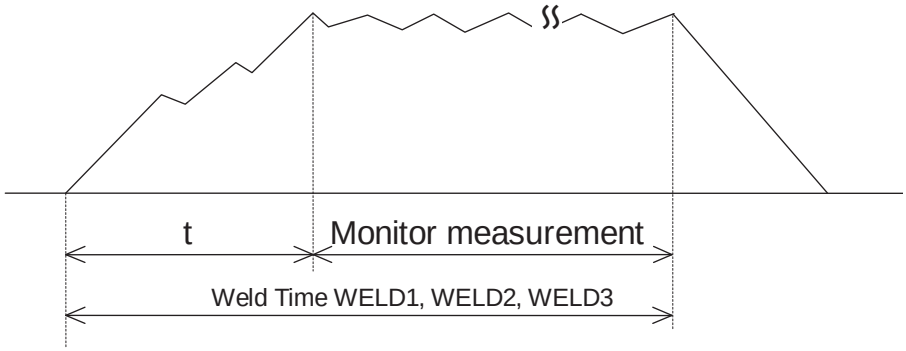
In the case of primary current control, supplying current with the welding transformer's secondary side open will cause an excitation current to flow through the primary side. Set the current level slightly higher than the monitored current.

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 15ms.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.



t = MONITOR FIRST TIME

f. MONITOR SLOPE MODE

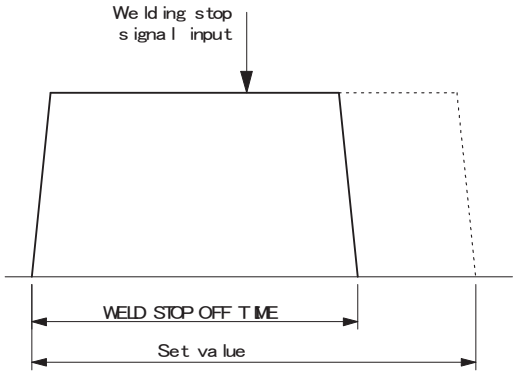
Select whether or not to include a slope period in the monitored value to be displayed.

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

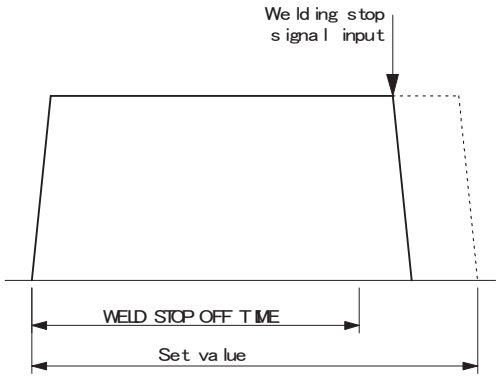
g. WELD STOP OFF TIME

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.

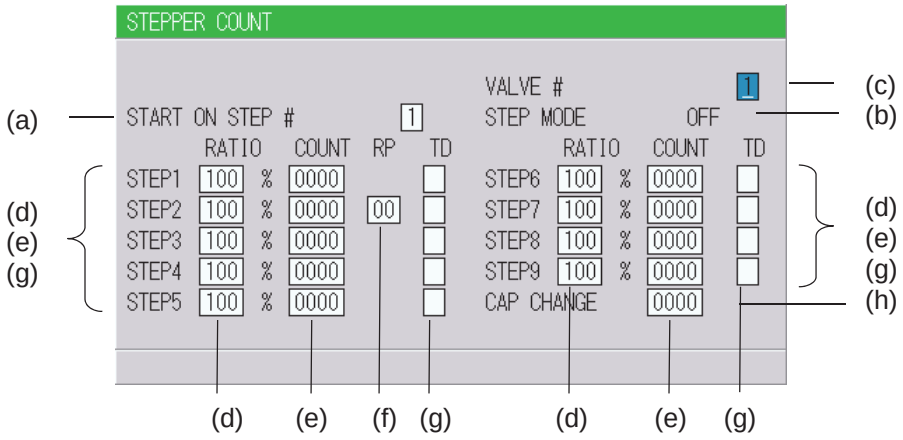


When the welding stop signal is input after WELD STOP OFF TIME
The welding is stopped when the welding stop signal is input.



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.



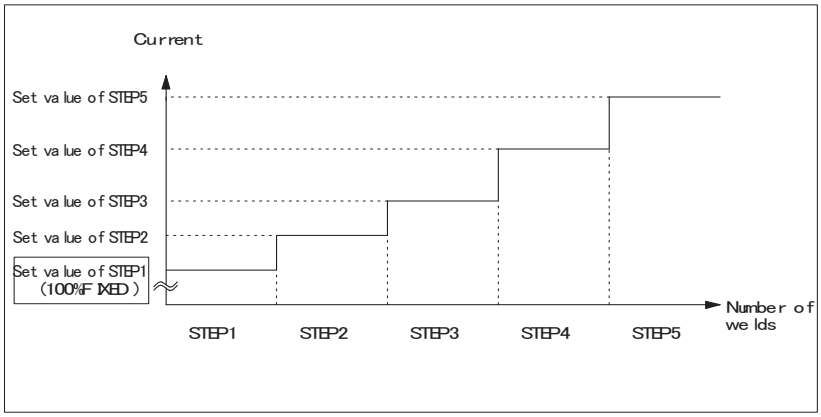
a. START ON STEP

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

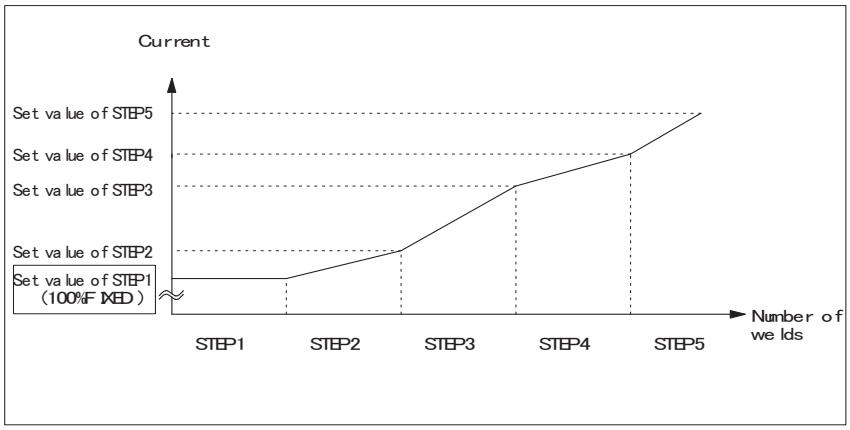
There are two types for step-up (step-down), stepwise (**FIXED**) and linear (**LINER**). When step-up (step-down) is not used, **OFF** is displayed. The setting is made on the **MODE SELECT** screen.

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



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 2kA for current, the current is stepped up in a stepwise manner from Weld 3 to Weld 6 as shown below.

Weld 1:2kA Weld 2:2kA Weld 3:2.5kA Weld 4:3.0kA Weld 5:3.5kA Weld 6:4.0kA
<--------- 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.

H: 2.2 x 1.5 = 3.3 kA
L: 1.8 x 1.5 = 2.7 kA

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 2kA, HIGH; 2.2kA, LOW; 1.8kA.

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

HIGH: 2.2 x 1.5 = 3.3kA
LOW: 1.8 x 1.5 = 2.7kA

d. STEP 1–9

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

e. COUNT1–9

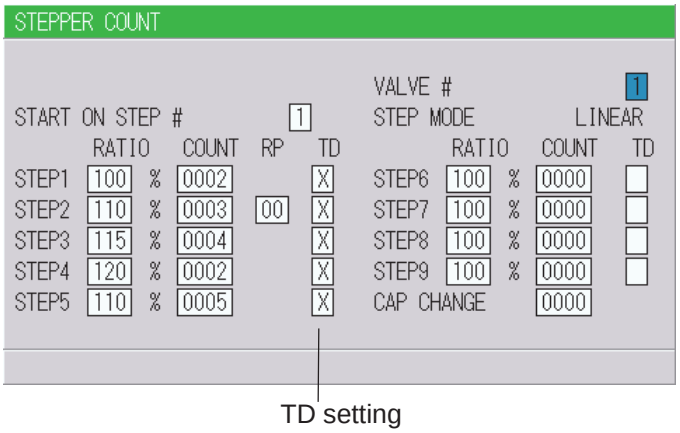
Set the number of welds (**COUNT**) for each **STEP**.
The sequence will proceed to the next **STEP** following completion of the specified number of welds.

f. RP2

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. TD1–9

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.



h. CAP CHANGE

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

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

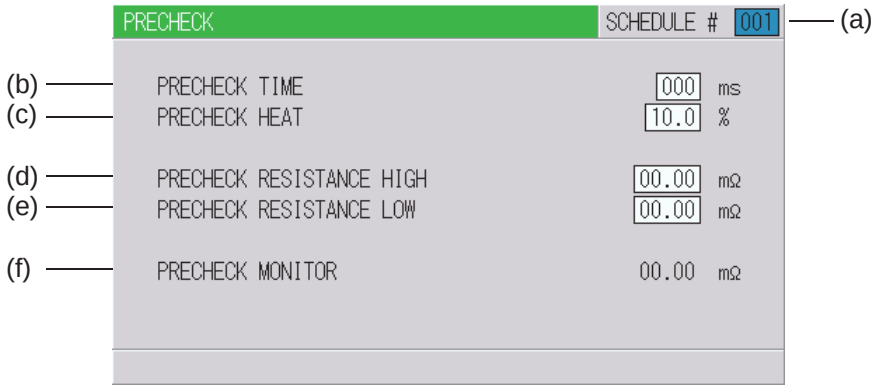
When the number of welds is set in **CAP CHANGE**, prior notice for cap change will be given before the cap change error occurs.

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 1000 (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.



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 0ms.

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

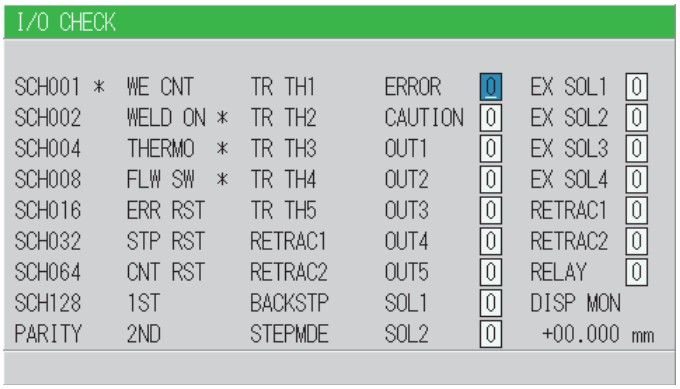
Set the lower limit of resistance value for pre-check.

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.



39-pin terminal on power module (see Appendix B for user accessible I/Os)

Input signal

SCH01:	Pin 5	SCH128:	Pin 12	ERR RST:	Pin 23
SCH02:	Pin 6	PARITY:	Pin 13	STP RST:	Pin 24
SCH04:	Pin 7	WE CNT:	Pin 14	W3 STOP:	Pin 25
SCH08:	Pin 8	WELDON:	Pin 19	1ST STG:	Pin 16
SCH16:	Pin 9	THERMO:	Pin 20	2ND STG:	Pin 17
SCH32:	Pin 10	FLW SW:	Pin 21		
SCH64:	Pin 11				

Output signal

NG1 (ERROR):	Pin 26	SOL1:	Pin 36
NG2 (CAUTION):	Pin 27	SOL2:	Pin 37
OUT1:	Pin 28		
OUT2:	Pin 29		
OUT3:	Pin 30		
OUT4:	Pin 31		
OUT5:	Pin 32		

25-pin D-Sub connector on power module (see Appendix B for user accessible I/Os)

Extended input signal

RETRAC1: Pin 10 BACKSTP: Pin 12
RETRAC2: Pin 11 STEPMDE: Pin 13

Extended output signal

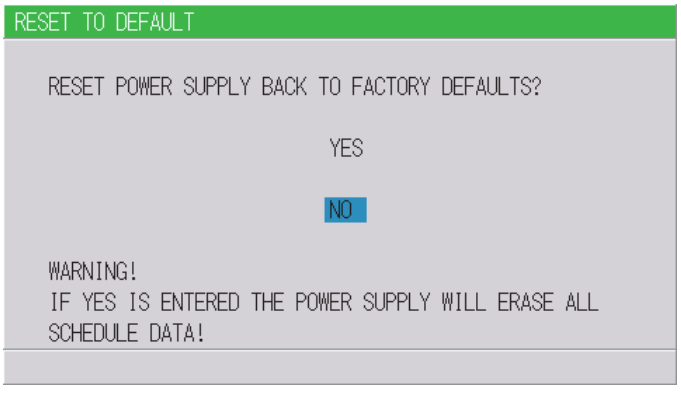
EX SOL1: Pin 2 EX SOL4: Pin 5 RELAY: Pin 8
EX SOL2: Pin 3 RETRAC1: Pin 6
EX SOL3: Pin 4 RETRAC2: Pin 7

Displacement gauge

DISP MON: The displacement gauge operation can be checked.

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 MA-660A.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

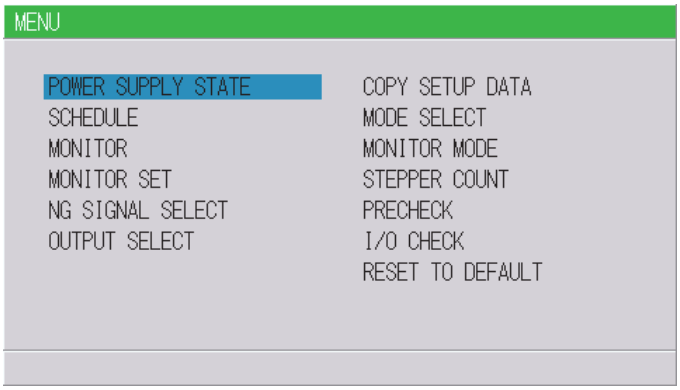
When this function is used, set values cannot be changed by any person other than the supervisor. **PROGRAM PROTECT** is usually set to OFF. When it is set to ON, set values cannot be changed until **PROGRAM PROTECT** is set to OFF again.

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

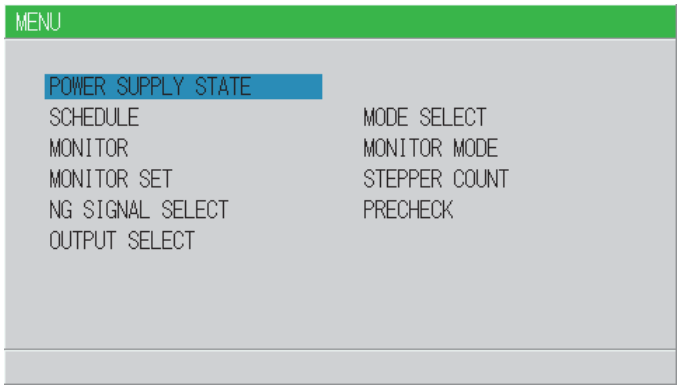
1. Turn the power supply ON using the ▼ key pressed or connect the MA-660A to the circuit cable with the power supply turned ON. The following screen is displayed:

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>

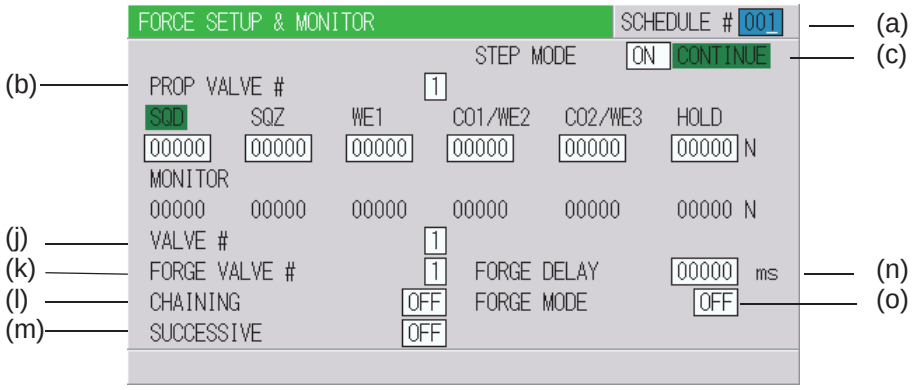


When the PROGRAM PROTECT is ON>



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.



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

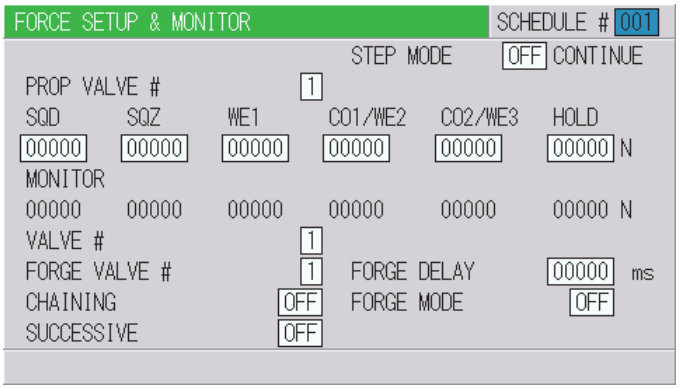
Two electro pneumatic proportional valves can be connected.
Select an electro pneumatic proportional valve to use.

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.



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.

l. 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.

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.

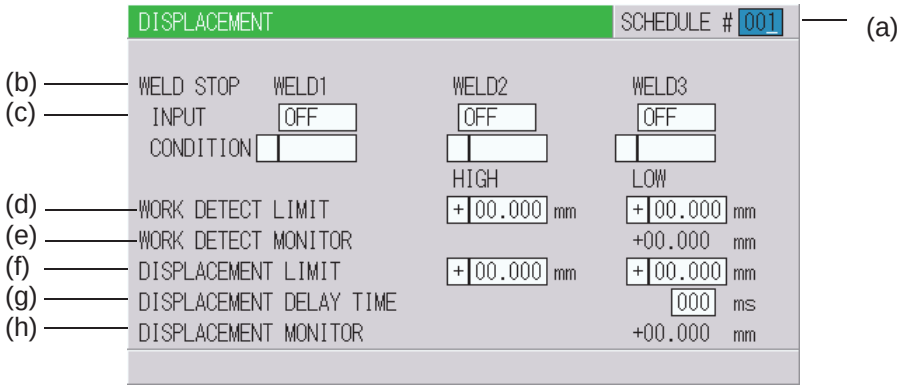
Valid only when FORGE MODE is set to ON.

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.

16. 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.

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.

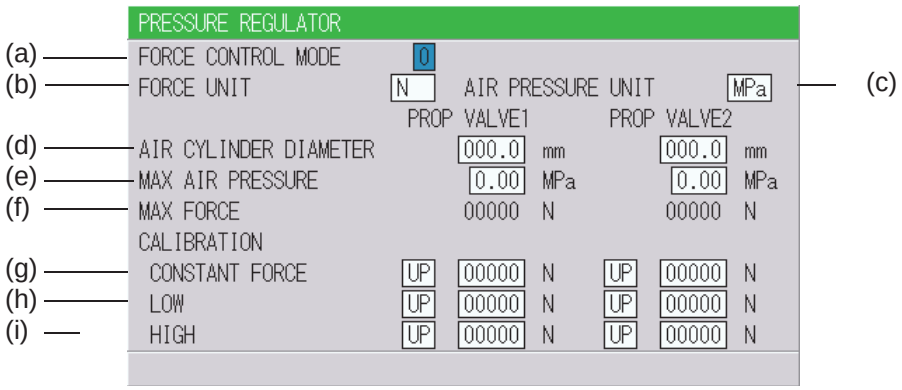
In **DISPLACEMENT LIMIT**, set the upper limit (HIGH) and the lower limit (LOW) to control the head travel distance (the degree of work piece collapse) from the pre-check start to the displacement delay time elapses.

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.

17. PRESSURE REGULATOR Screen

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



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. FORCE UNIT

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

d. AIR CYLINDER DIAMATER

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.

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 Control, 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 Control 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 control mode is set to **PRIMARY RMS** or **PRIMARY LIMIT** or you may damage the Power Supply.

Starting Welding Operation

1. Turn on cooling water supply at the temperature and flow rate shown in *Chapter 2*.
2. Turn on the input power. Observe that the red **WELD POWER** lamp lights and green **READY** lamp blinks for 7 seconds, then goes off.
3. On the Program Unit, press the **MENU** key 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 b, ensure that the three **READY** requirements are met:
4. The Power Supply **WELD ON/OFF LED** must be on,
5. The **ON/OFF** setting of the Program Unit must be set to ON, and

6. An external **WELD ON/OFF** signal must be present at the I/O terminal block.
7. Check that the Power Supply green READY lamp is lit
8. Start the weld sequence and confirm that the welding current is flowing normally by checking the red **WELD** lamp and the Monitor screen.
9. Make any necessary adjustments to the schedule so that the work piece will be properly welded.
10. When welding multiple work pieces according to multiple schedules, change the **SCHEDULE #** and set new time and welding current.
11. Set the upper and lower limits on Program Unit Monitor Set screen for each **SCHEDULE #.**
12. Begin welding following normal procedures. Adjust **SCHEDULE** settings as necessary.

Section III: Shutdown

Turning off unit

1. 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 Program Unit or Monitor Unit, what those messages mean, and corrective actions you can take.

FAULT CODE	CONTENTS	CAUSE	MEASURES
E-01	SYSTEM ERROR	Error has been detected on **IS-800CR/1400CR**.	Once turn off power and turn on again. If E-01 SYSTEM ERROR is displayed again, repair is required. Contact Amada Miyachi America Corp.
E-02	MEMORY ERROR	The welding schedule data is different from the programmed one.	Check all the settings. If the data in memory is damaged, the following are possible causes: Generation of powerful power supply or electrostatic noise Abnormal supply voltage resulting, for example, from lightening or induced lightening Flash memory's rewrite limit exceeded If the error occurs again after initialization, the Power Supply needs repair. Contact Amada Miyachi America.
E-03	MEMORY TROUBLE		
E-04	PARITY ERROR	Cable to input start signal is broken, and a parity check error is detected.	Check start signal input cable.
E-05	TRIP OF EXTERNAL THERMO	Temperature of welding transformer rises and external thermostat input circuit opens.	Lower temperature of transformer. When using water-cooled transformer, properly adjust temperature and flow rate of cooling water.
		External signal input power is not connected.	Check external input signal for proper connection.
E-06	TRIP OF INTERNAL THERMO	Internal temperature of equipment rises and thermostat for power transistor in power unit is open.	Ensure that the duty cycle does not exceed the specified value.
E-07	NO CURRENT	Squeeze of welding electrode is not sufficient.	Adjust squeeze of welding electrode adequately.
		SQD or **SQZ** time is too short.	Check setting of **SQD** or **SQZ** time to determine whether it is too short. (Set **SQD** or **SQZ** time to a period longer than the stroke time of the electrode.)
		NO CURRENTLEVELis high.	Set a lower **NO CURRENT LEVEL**.

FAULT CODE	CONTENTS	CAUSE	MEASURES
		Fuse inside the equipment is blown.	The fuse needs replacement. Contact Amada Miyachi America
		Toroidal coil is not connected.	Connect toroidal coil, referring to **5. Connection Procedures**.
E-08	OUT LIMIT OF CURRENT ERROR	Welding current is out of **CURRENT** setting range on **MONITOR SET** screen.	Check for stained welding electrode or loose cable connection.
E-09	OUT LIMIT OF PULSE WIDTH ERROR	Pulse width of welding current 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	Primary current of turn ratio is out of range of the following formula: $X \leq \frac{\textbf{HEAT setting}}{\textbf{TURN RATIO}} \leq Y$ **IS-800**CR: X = 15, Y = 800 **IS-1400**CR: X = 30, Y = 1400	Correct each setting.
		The **WELD1**, **WELD2**, and **WELD3** values are all “0.”	
		The total time of **UP SLOPE** and **DOWN SLOPE** is longer than **WELD**.	
		HEAT setting, including **RATIO** setting is equal to or lower than UF or DL setting.	
		Although STEPPER MODE is set to LINER or FIXED, STEPPER COUNT of STEP number set for START ON STEP# are all “0.”	
		The methods of welding current of a series of WELDs without COOL are different and UP/DOWN is set in the consecutive portion.	
		(The methods of welding current are the same of a series of WELDs without COOL.) UP/DOWN is set in the consecutive portion of a series of WELDs without COOL and the portion meets specific conditions. (See **4. (3)(c)**.)	
		On the ADVANCED IS unit transformer weld frequency was set greater than 1000Hz	
E-11	SET OVER	**HEAT** setting, including **RATIO** setting is equal to or lower than UF or DL setting.	Correct each setting.

FAULT CODE	CONTENTS	CAUSE	MEASURES
		HEAT setting, including **RATIO** setting is larger than max. value of current, voltage, or power setting.	
		HEAT setting, including **RATIO** setting is lower than min. value of current, voltage, or power setting.	
E-12	STOP	External STOP input circuit is open.	Rectify cause of STOP, and then close STOP circuit.
		Power supply for external input is not connected.	Check external input signal for proper connection.
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 detecting 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 at fault.	Check the output cable.
E-15	LACK OF COOLING WATER	Cooling water flow in pipe to which flow switch is installed is low.	Increase 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 is not input when external start signal is input.	Input schedule signal before start signal. (See **4. (9)(e)**.)
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 consumption to determine whether it is used at the contract level.
E-18	OUT LIMIT OF VOLTAGE ERROR	Secondary voltage is out of **VOLT** setting range on **MONITOR SET** screen.	Check for stained welding electrode and low electrode force.
E-19	OUT LIMIT OF POWER ERROR	Welding power is out of **POWER** setting range on **MONITOR SET** screen.	
E-20	INTERRUPT ERROR	The current shutoff signal is input prior to the start signal.	Check interrupt input signal.
E-21	NO VOLTAGE	No detection of the voltage across welding electrodes.	Make sure that the cable detecting the voltage across welding electrodes is connected.
		NO VOLTAGE LEVELis high.	Set a lower **NO VOLTAGE LEVEL**.
E-22	OVER CURRENT (DC24V)	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.

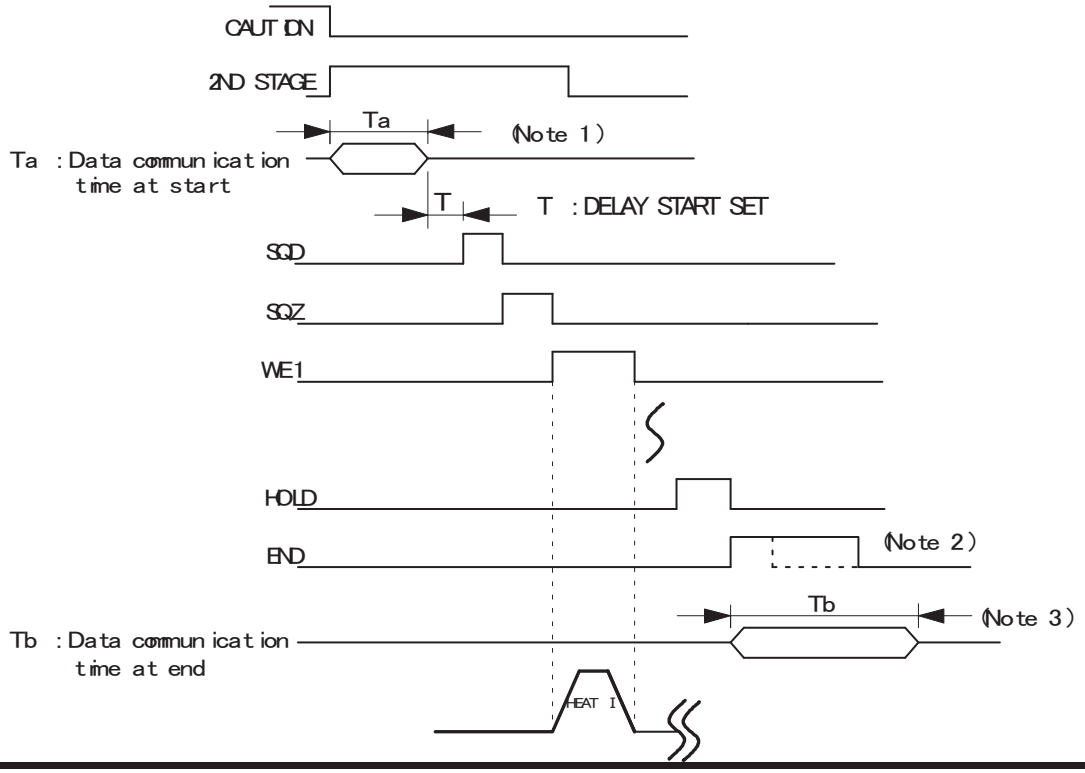
FAULT CODE	CONTENTS	CAUSE	MEASURES
E-24	PRECHECK ERROR	Current is out of range between upper limit and lower limit set on the **PRECHECK** screen when PRECHECK Current Supply is used.	Check weld pickup (contamination) of electrodes, contact of electrodes and workpieces. Check range set on PRECHECK Screen.
E-25	RAM MEMORY ERROR	Count data or schedule number data stored in memory are damaged.	Memory was erased because period for retaining memory of count data elapsed over specified period. The period for retaining the memory of count data is approximately 10 days since the day when a power supply is turned off at latest.
E-26	LACK OF WELD COUNT	Counted number of welds is less than **WELD COUNT** setting.	Add required number of welds to make up for insufficiency.
E-27	END OF STEP	**STEPPER COUNT** has completed final step.	Dress or replace tip, then reset step.
E-28	COUNT UP	Counting has arrived at set pre-set count value.	Reset the counter.
E-29	PHASE MISSING	An error is detected on the welding power supply.	Confirm that the welding power supply is input correctly.
E-30	POWER FAILURE	The power is out during welding.	Check the cause for instantaneous power failure.
E-31	OUT LIMIT OF TIME ERROR	Weld time is out of **TIME** setting range on **MONITOR SET** screen.	Check the welding stop input of the external interface.
E-32	COMM SETTING ERROR	When writing data in bi-directional communication mode at external communication, data which is out of the range is written or 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 tip, then reset it.
E-35	APPROACHING CAP CHANGE	Counting has arrived at the tip change setting value.	The time for cap change is approaching. Check and reset it.
E-36	CAP CHANGE REQUIRED	STEPPER COUNT has completed final step.	Dress or replace tip, then reset step.

FAULT CODE	CONTENTS	CAUSE	MEASURES
E-37	OUT LIMIT OF DISPLACEMENT ERROR	IS-800/1400CR ADVANCED ONLY: The displacement is out of 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-800/1400CR ADVANCED ONLY: The workpiece detection is out of WORK DETECT LIMIT setting range on the DISPLACEMENT screen.	Check work pieces setting and positioning. Check range set at WORK DETECT LIMIT.
E-39	WITHOUT EXTENSION BOARD	IS-800/1400CR ADVANCED ONLY: The optional extended board has not been connected.	Once turn off power and turn on again. IfE-39 WITHOUT EXTENSION BOARD is displayedagain, repair is required. Contact Amada Miyachi America

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

When the welding does not start even if the Start signal **2ND STAGE** signal is input, the following causes can be thought.

- READY does not light up.
- 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 MA-627A or MA-660A.



NOTES:

- When the next start signal is received while the monitor error is displayed on MA-627A or MA-660A, the **CAUTION** signal is turned OFF and the previous screen is displayed. At this time, the data is transferred to MA-627A or MA-660A 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 start takt 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 MA-627A or MA-660A 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 MA-627A or MA-660A 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: 164ms max.	Tb1+Tb2+α: 280 (438) ms max.
Screens other than MONITOR screen	0ms	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 9600 bps. When the communication speed is 19200bps or 38400bps, the transmission time will be short.

- Data transmission time when the communication speed is 9600 bps

Tc1	132ms max.
Tc2	42ms max.

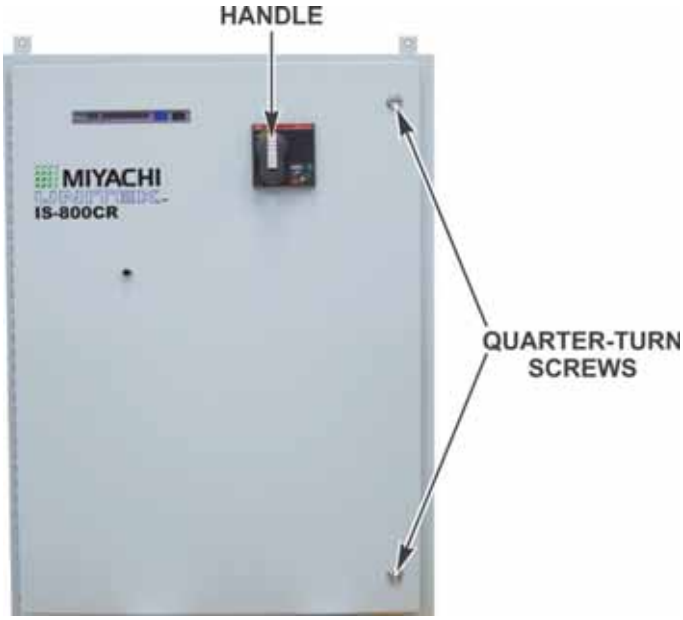
Section II. Before You Start

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.



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.

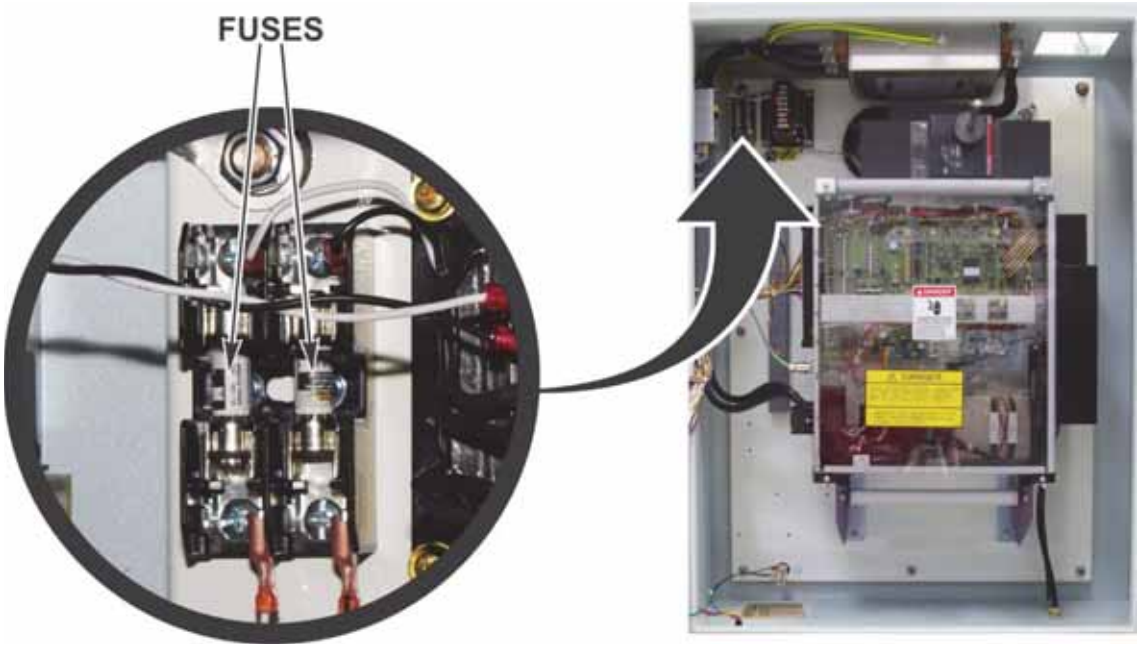
Section III: Fuse Failure and Replacement

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	150VA valve transformer	250VA 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 unit 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 unit 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 unit 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

1. 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.

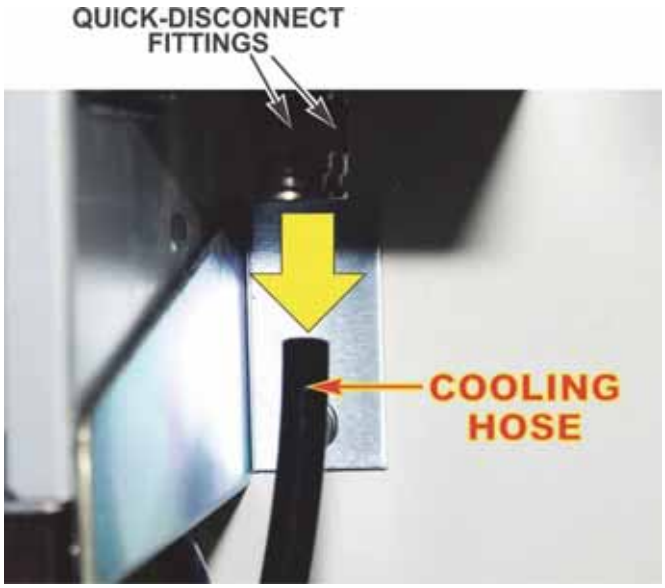
Cooling Water Hoses

1. Turn the water source OFF.

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

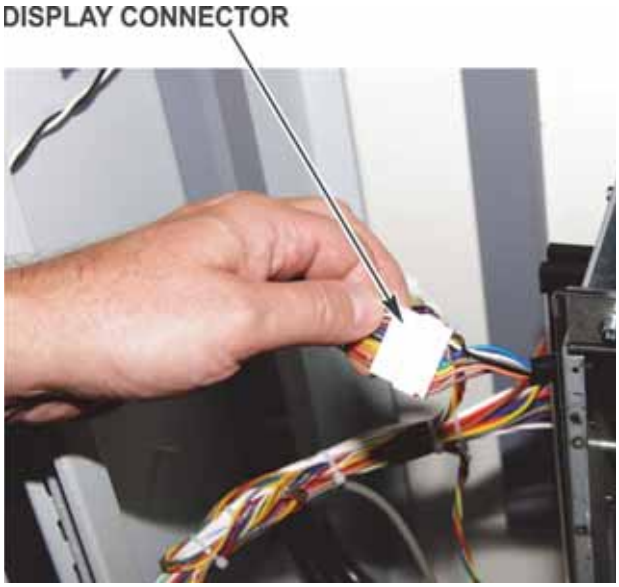
2. Push the quick-disconnect fittings at the bottom of the Power Module to disconnect both hoses and allow the water to drain into the bucket.

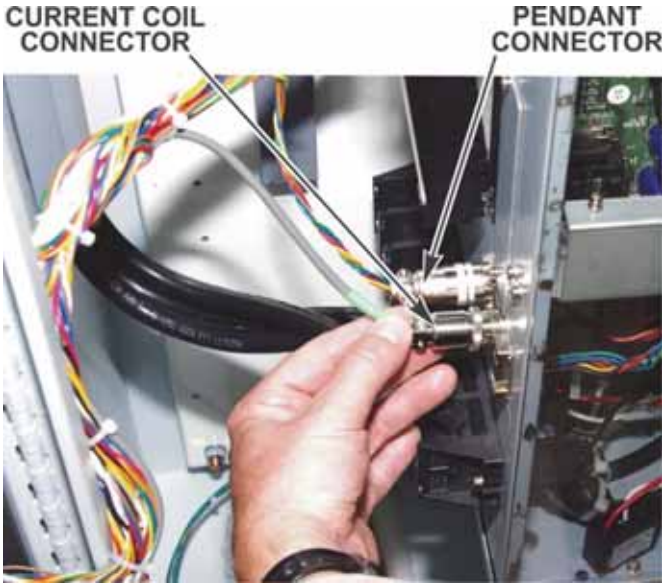
3.

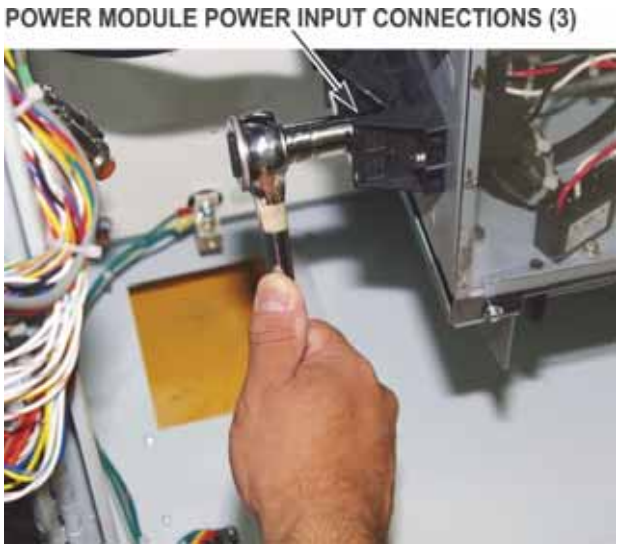


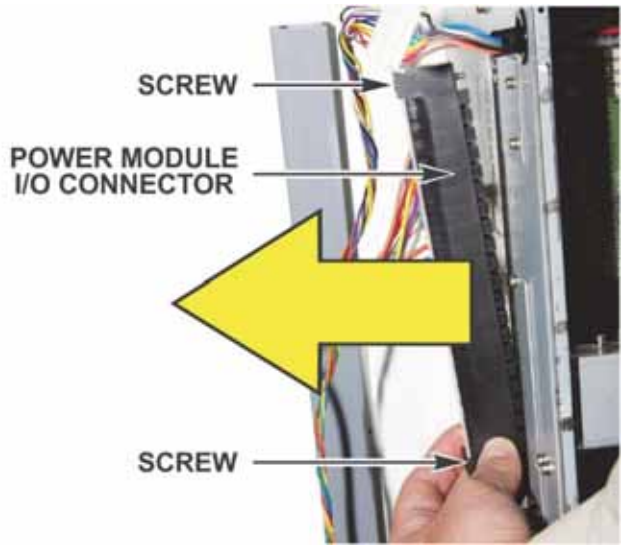
Disconnect the Wire Harness from the Main Board Connectors

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









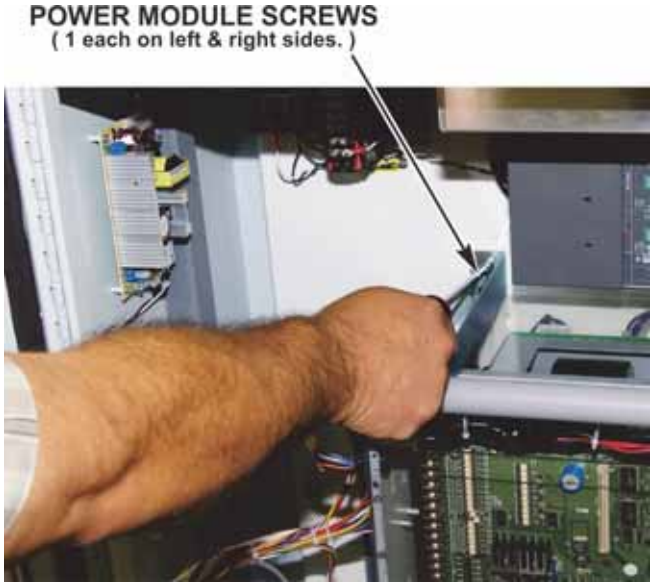
On the IS-800/1400CR ADVANCED power module also remove the 25-pin D-sub connector and displacement sensor connector (not shown)

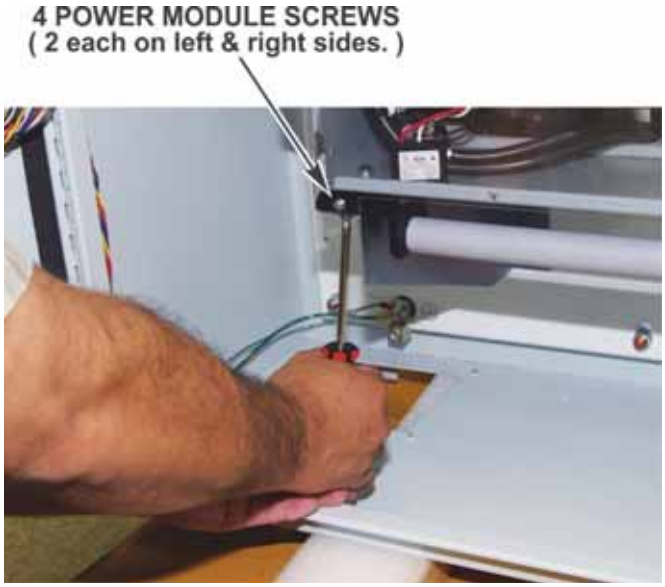
Remove the Power Module

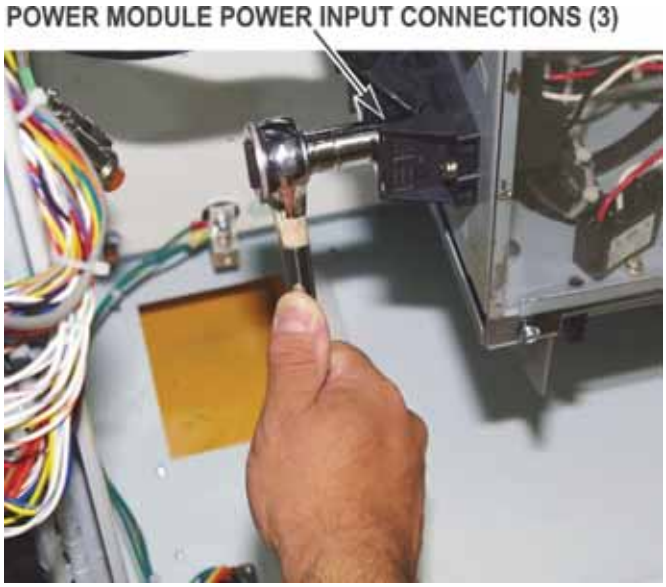
CAUTION

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 HANDLE

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

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 17mm 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 unit.

APPENDIX A
TECHNICAL SPECIFICATIONS

Specifications

Model No.		IS-800CR	IS-1400CR
Dimensions			
Weight		250 lbs (109 kg)	340 lbs (160 kg)
Max. output current		3-phase, 380–480 V AC ±10% (50/60 Hz)	3-phase, 380–480 V AC ±10% (50/60 Hz)
		(Voltage level is factory-set and is not field selectable.)	
Max. output current		800 A (peak value)	1400 A (peak value)
		(Note) There is a limit of weld time. (See **10. (4)**.)	
Average max. duty cycle (See **10. (3)**.)	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	

Model No.			IS-800CR	IS-1400CR
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) 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)	
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	
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	
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

Model No.			IS-800CR	IS-1400CR
		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%	
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)		1–9 (9 steps) 50–200% 0000–9999 } Selectable for each valve	
Weld count monitor (PRESET COUNT)			0000–9999	
State indicator LED			[WELD POWER] lamp [READY] lamp [START] lamp [WELD] lamp [TROUBLE] lamp [WELD ON/OFF] lamp	

APPENDIX A: TECHNICAL SPECIFICATIONS

Model No.		IS-800CR	IS-1400CR
Cooling method		Air-cooled (fan motor)	
Operating environment	Ambient temperature Humidity Altitude Pollution degree	+5 to +40°C 90% max. (no condensation) 1000 m max. 3	
Transportation 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	

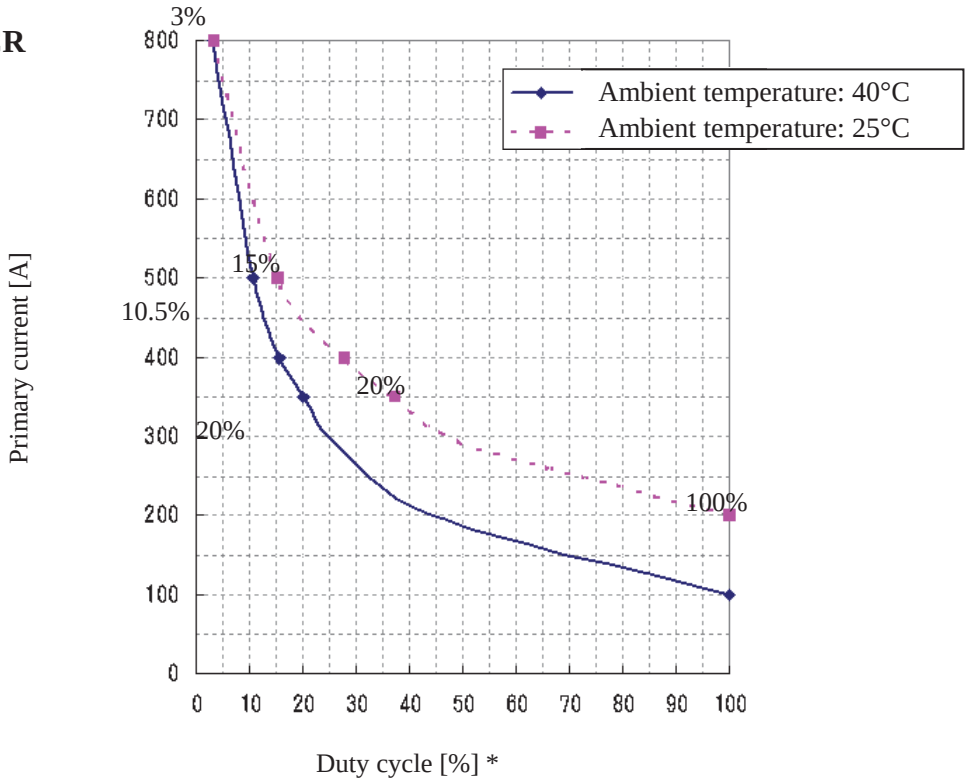
*: selectable for every 255 schedules

NOTES:

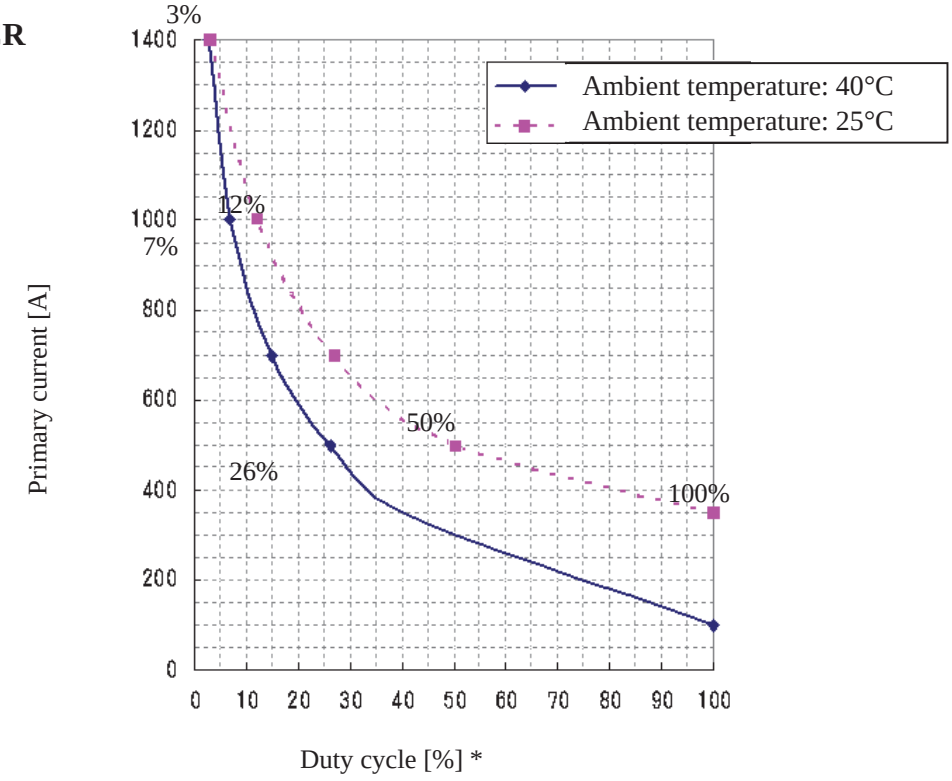
- No repetitive operation will be performed if “0” is selected for OFF (off time).
- Primary current can be set up to 800 A for **IS-800CR** and 1400 A for **IS-1400CR**.
- Using the fixed load and the specified transformer
  - The weld time is 100 ms. The measurement range is from 60 ms to 100 ms.
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

Duty Cycles

IS-800CR



IS-1400CR



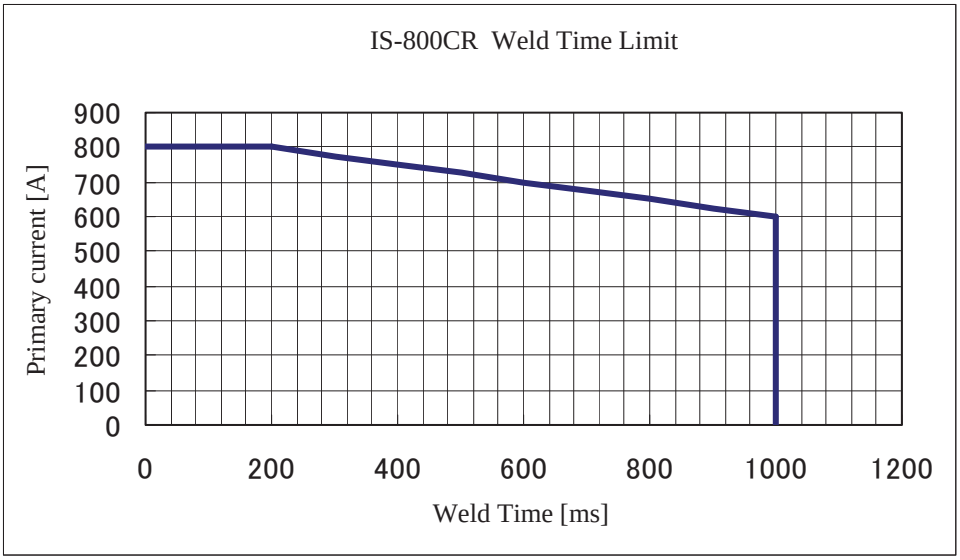
* This duty cycle graph is applied when the frequency is set to 1kHz. Decrease the duty cycle by 0.5% (from the above graph) for each additional 100Hz of frequency. (Example: When the frequency is increased to 3kHz, the duty cycle needs to be decreased by 10%.)

Weld Time Limit

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

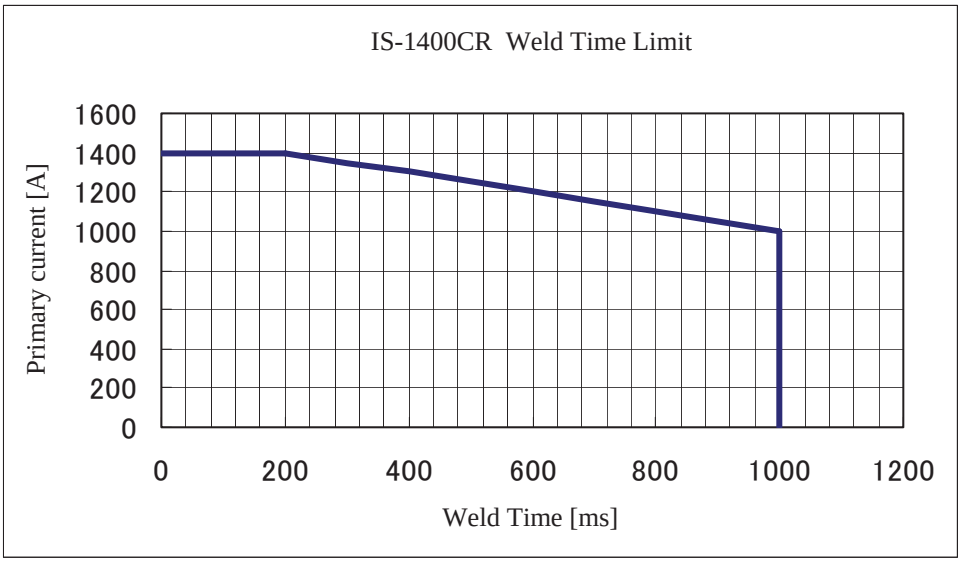
IS-800CR: For 600A or more of the primary current, the maximum weld time [ms] = -4× (IGBT primary current value) + 3400.

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



IS-1400CR: For 1000A or more of the primary current
Maximum weld time [ms] = -2× (IGBT primary current value) + 3000

Example: Primary current is 1100A on **IS-1400CR**-2×1100 + 3000 = 800 [ms].
Therefore, the maximum weld time is 800ms.

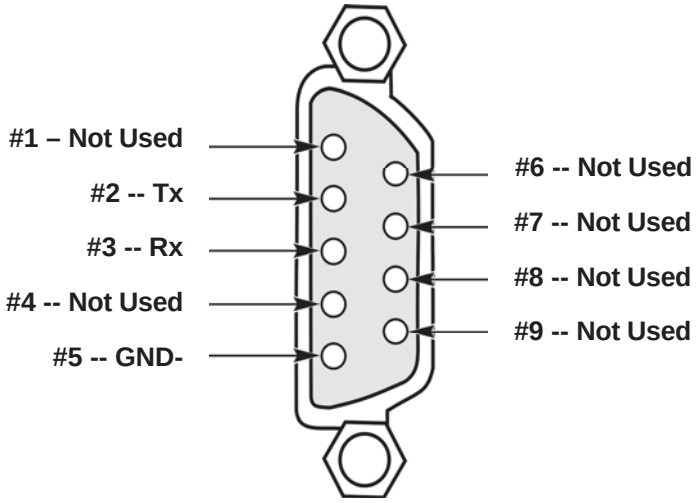


APPENDIX B
ELECTRICAL AND DATA CONNECTIONS

CAUTION
Use the shielded cable for the external input/output signals and connect the shielded part to the ground.

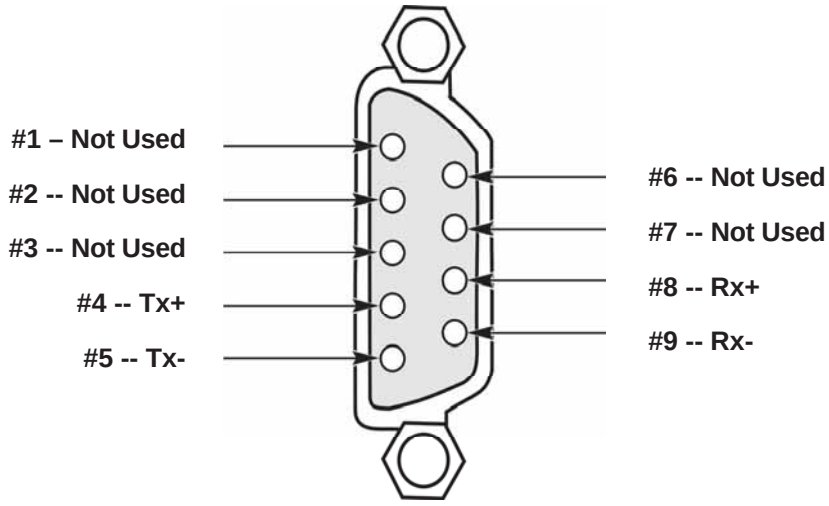
Section I. Data Connectors

RS-232 (standard): one DB-9 (female) connector wired as follows:



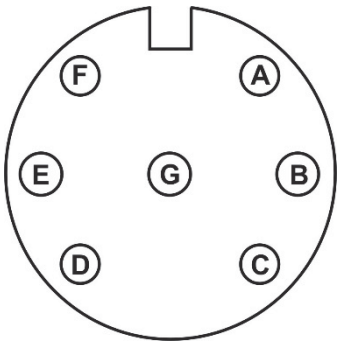
RS-232 only allows one unit at a time to be connected to a host

RS-485 (optional): two DB-9 (female) connector wired as follows:



RS-485 allows multiple units to be daisy chained to a host

TRANSFORMER SENSING CONNECTOR



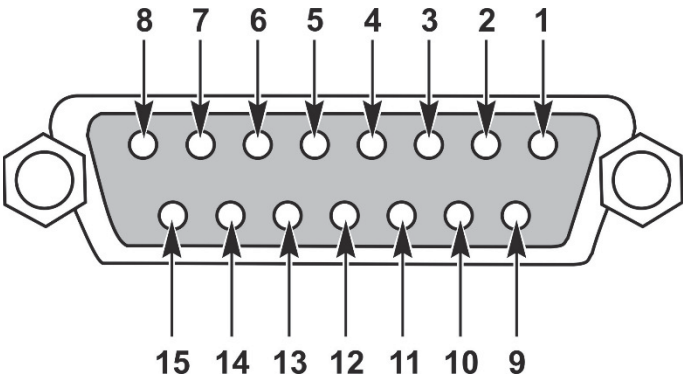
FRONT VIEW

PIN	DESCRIPTION
A	Common (Thermostat)
B	Thermostat
C	Voltage
D	Current
E	Current
F	Voltage
G	Ground

DISPLACEMENT SENSOR CONNECTOR

Recommended Displacement Sensor: Heidenhain St3078

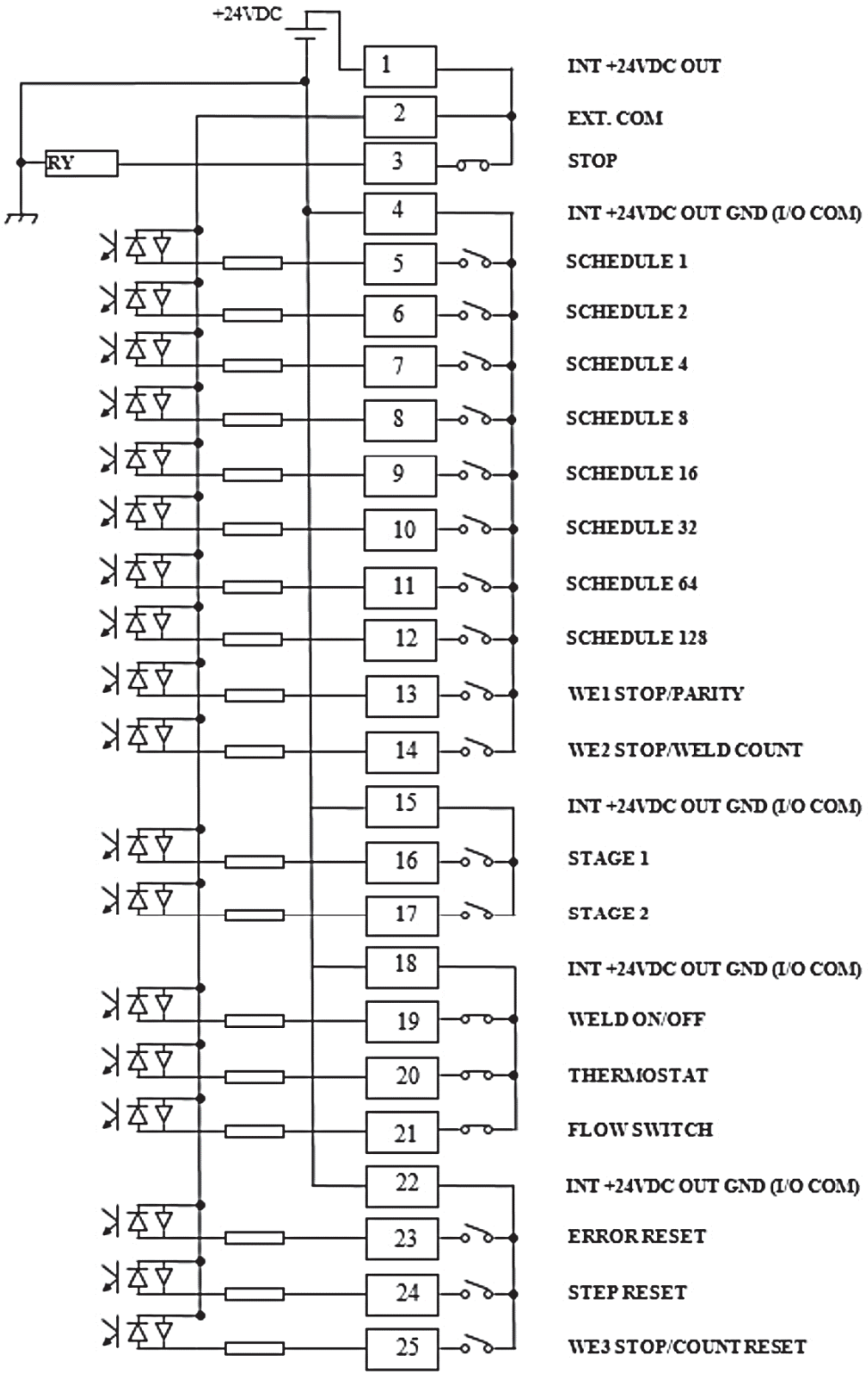
15-pin D-sub (female)

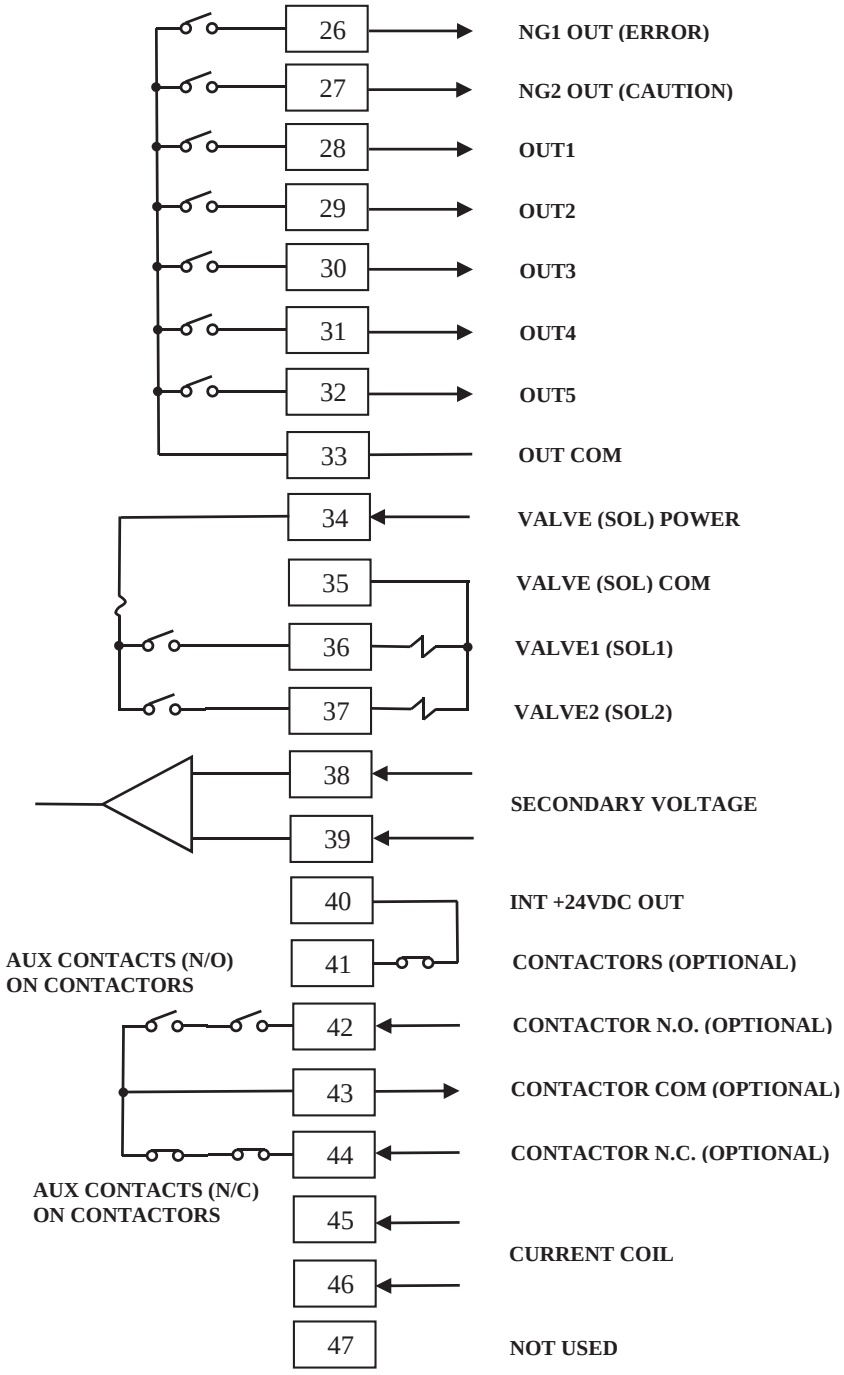


PIN	DESCRIPTION
1	A_{sig}
2	5 VOLT
3	B_{sig}
4	GROUND
5-8	UNUSED
9	A'sig
10	5 VOLT
11	B'_{sig}
12	GROUND
13-15	UNUSED

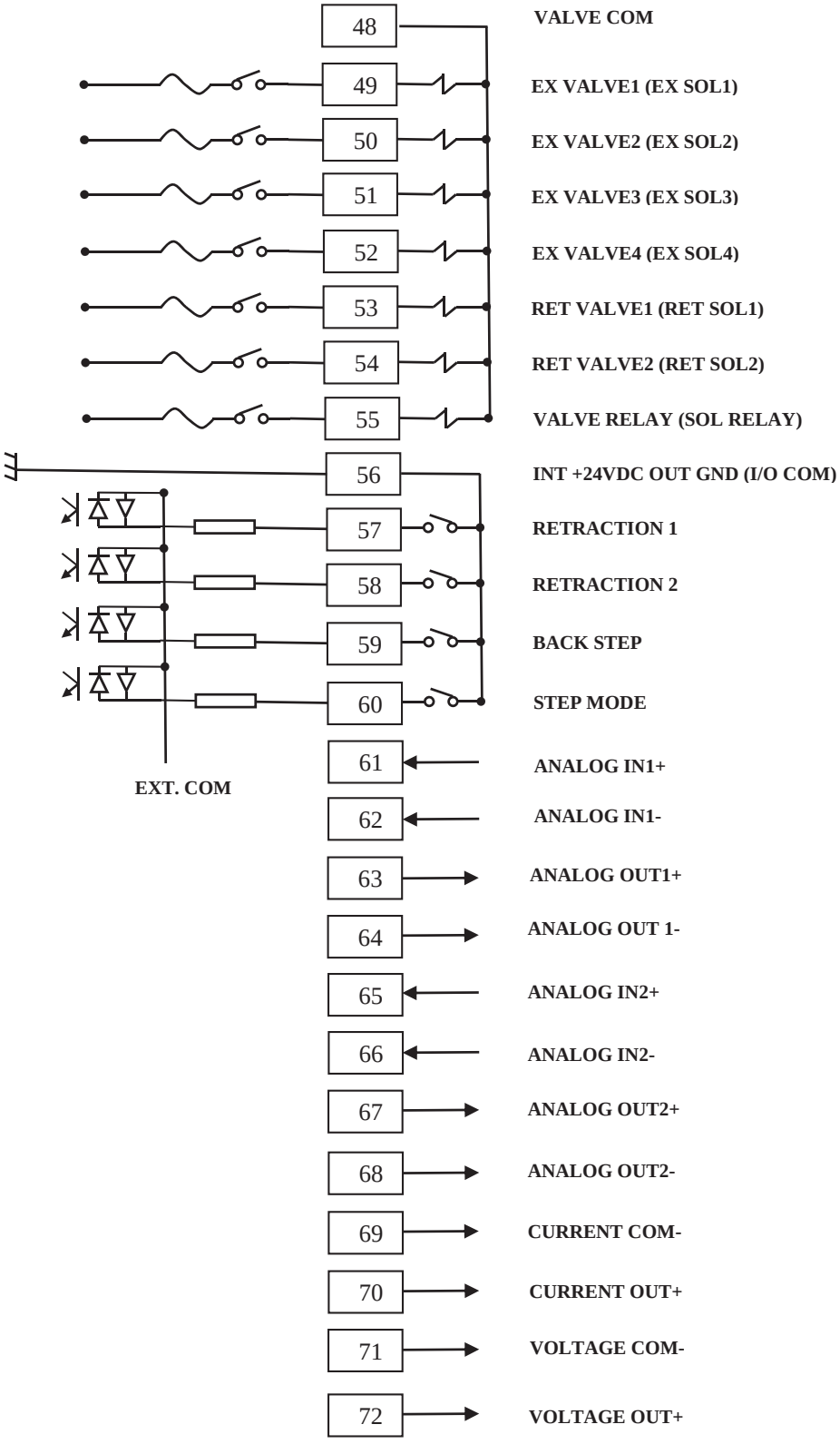
I/O Terminal Block

NEGATIVE LOGIC




26
NG1 OUT (ERROR)
27
NG2 OUT (CAUTION)
28
OUT1
29
OUT2
30
OUT3
31
OUT4
32
OUT5
33
OUT COM
34
VALVE (SOL) POWER
35
VALVE (SOL) COM
36
VALVE1 (SOL1)
37
VALVE2 (SOL2)
38
SECONDARY VOLTAGE
39
40
INT +24VDC OUT
AUX CONTACTS (N/O)
ON CONTACTORS
41
CONTACTORS (OPTIONAL)
42
CONTACTOR N.O. (OPTIONAL)
43
CONTACTOR COM (OPTIONAL)
44
CONTACTOR N.C. (OPTIONAL)
AUX CONTACTS (N/C)
ON CONTACTORS
45
CURRENT COIL
46
47
NOT USED

The following I/O connections are for the IS-800CR/1400CR ADVANCED ONLY



External I/O Signals

PIN	NAME	DESCRIPTION
1	INT +24VDC OUT	**NOTE:** Do not use pin 1 unless connecting it to pin 2 or 3. Failure to observe this precaution will result in malfunction. **MAX CURRENT DRAW:** 100mA
2	EXT. COM	When using a contact, open collector (sink type), or PLC (programmable logic controller) as an input signal (e.g., for startup or schedule selection), connect pins 1 and 2. See INPUT SIGNAL CONNECTIONS at end of chapter
3	STOP	Normally, connect pins 3 and 1.
4	INT +24VDC GND (I/O COM)	COM pin. This pin is internally connected to the internal +24VDC GND. NOTE: DO NOT CONNECT TO PIN 1 (INT +24VDC OUT)
5 **6** **7** **8** **9** **10** **11** **12**	SCHEDULE 1 SCHEDULE 2 SCHEDULE 4 SCHEDULE 8 SCHEDULE 16 SCHEDULE 32 SCHEDULE 64 SCHEDULE 128	Schedule input pins. 5: Schedule 1; 6: Schedule 2; 7: Schedule 4; 8: Schedule 8; 9: Schedule 16; 10: Schedule 32; 11: Schedule 64; 12: Schedule 128
13	WE1 STOP/ PARITY	WE1 stop input or Parity input pin. <u>When WE1 STOP is selected</u> Closing this pin during the WELD1 sequence will switch the sequence to COOL1. The interrupt error occurs when the WELD1 STOP signal is input before the start signal is input. When this pin is closed before WELD1 welding start after startup, the current is supplied for at least a control cycle and WELD1 is stopped to switch the sequence to COOL1. <u>When PARITY CHECK is selected</u> This pin allows for detection of 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.

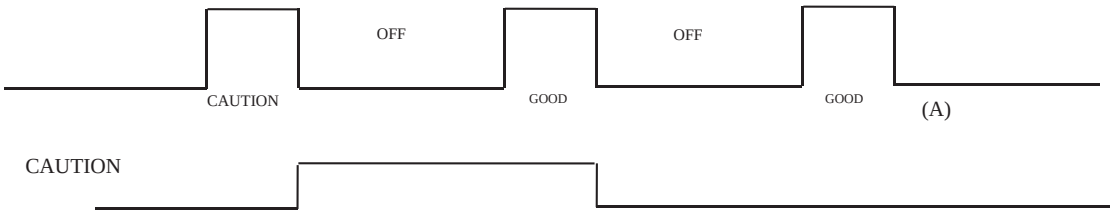
PIN	NAME	DESCRIPTION
14	WE2 STOP/ WELD COUNT	WE2 stop input or Weld count input pin. When WE2 STOP is selected Closing this pin during the WELD2 sequence will switch the sequence to COOL2. Closing this pin in the sequence other than WELD2 is neglected. The sequence will switch to COOL2 if this signal is closed during the WELD2 sequence operation. When this pin is closed before WELD2 welding start after startup, the current is supplied for at least a control cycle and WELD2 is stopped to switch the sequence to COOL2. When WELD COUNT is selected This pin allows you to determine whether or not the number of deposited welds has reached the WELD COUNT setting. 20 ms or more is required for receiving the WELD COUNT input signal.
15	INT +24VDC GND (I/O COM)	COM pin. This pin is internally connected to the GND chassis.
16	STAGE1	1ST STAGE input pin. Closing this pin will close SOL1 of pin 36 or SOL2 of pin 37. Since the welding sequence does not start, you can adjust or check the position. When the 2ND STAGE pin is closed after this, a welding can be done.
17	STAGE2	2ND STAGE input pin. Closing this pin will start the sequence.
18	INT +24VDC GND (I/O COM)	COM pin. This pin is internally connected to the GND chassis.
19	WELD ON/OFF	Weld ON pin. Close this pin to turn ON the WELD ON/OFF signal, and open it to turn it OFF. Leaving this pin open will shut off welding current even when the sequence operation is performed. Use this pin, for example, to start the sequence experimentally.
20	THERMOSTAT	Thermostat input pin. Connect to the transformer thermostat or diode thermostat. Opening the pin will result in a thermostat error.
21	FLOWSWITCH	Flow switch input pin. Opening this pin will result in a flow rate error.
22	INT +24VDC GND (I/O COM)	COM pin. This pin is internally connected to the GND chassis.
23	ERROR RESET	Error/caution reset input pin. Eliminate the cause of error or caution and close this pin to reset the error or caution indication. 20 ms or more is required for receiving the input signal.
24	STEP RESET	Step reset input pin. Closing this pin while the STEPPER is ON will reset the STEP number to 1. 20 ms or more is required for receiving the input signal.

PIN	NAME	DESCRIPTION
25	WE3 STOP/ COUNT RESET	WE3 stop input or Count reset input pin. When WE3 STOP is selected Closing this pin during the WELD3 sequence will switch the sequence to HOLD. The interrupt error occurs when the WELD3 STOP signal is input before the start signal is input. When this pin is closed before WELD3 welding start after startup, the current is supplied for at least a control cycle and WELD3 is stopped to switch the sequence to HOLD. When COUNT RESET is selected Closing this pin allows you to reset the counter. 20 ms or more is required for receiving the COUNT RESET input signal.
26	NG1 OUT (ERROR)	Error signal output pin. This signal is output upon completion of the welding sequence in the event of an operational error. If an error occurs, operation will halt until the reset signal is input. In NORMAL CLOSE, the pin is closed with the power turned on, but becomes open with an error occurring. In NORMAL OPEN, the pin is open with the power turned on, but becomes closed with an error occurring. The contact is rated at 24V DC at 20mA (semiconductor switch).
27	NG2 OUT (CAUTION)	Caution signal output pin. This pin is closed upon completion of the welding sequence if the measured value is outside the range set on the MONITOR SET screen. (In the case CAUTION is set, the status will be “ERROR” depending on the NG SIGNAL SELECT setting.) You can continue with your welding task even if a caution signal is activated. To cancel this caution output, input the reset or start signal. The contact is rated at 24V DC at 20mA (semiconductor switch). In the case the off time (OFF) is set, when CAUTION is output, the signal is maintained until the next welding result is obtained. (*1)
28	OUT1	Contact output pins. (semiconductor switch. The contact is rated at 24V DC at 20mA.) The contact is open or closed corresponding to the function. Can be assigned to each pin. END,COUNT ERROR,READY,STEP END,WELD SIGNAL,GOOD,COUNT UP,OUT I,OUT II
29	OUT2	
30	OUT3	
31	OUT4	
32	OUT5	
33	OUT COM	Common pin for output pins. This pin is the common pin for the NG, CAUTION, END, COUNT ERROR, READY, STEP END, and WELD ON pins.
34	VALVE (SOL) POWER	Power input pins to drive the solenoid valve. Input 120VAC or 24VDC power.
35	VALVE (SOL) COM	COM pin for the solenoid valve.

PIN	NAME	DESCRIPTION
36 **37**	VALVE1 (SOL1) VALVE2 (SOL2)	Solenoid valve output pins. 36: VALVE1 (SOL1); 37: VALVE2 (SOL2) These pins are closed for the duration of the STAGE 2 input. Output between SQD and HOLD. When the off time (OFF) is set, this pin is output between SQZ and HOLD after the second sequence. The contacts are rated at 120V AC or 24V AC/DC at 0.5A (semiconductor switches). Use a solenoid valve with a current capacity of 0.5A or less.
38 **39**	SECONDARY VOLTAGE	Secondary voltage input pins. Connect to the electrodes of the welding head during constant-power or constant-voltage control.
40	INT +24VDC OUT	+24VDC from +24VDC power supply (optional)
41	CONTACTORS	+24VDC from external +24VDC power supply turns on optional contactors (optional)
42	CONTACTOR N.O.	Detect position of contactors between pin 42 and 43: contactors normally open (optional)
43	CONTACTOR COM	Contactor Aux contact common (optional)
44	CONTACTOR N.C.	Detect position of contactors between pin 44 and 43: contactors normally closed (optional)
45 **46**	CURRENT COIL	Current coil input, used for secondary current feedback. Connected to transformer sense input connector.
47	N/A	UNUSED
	Pin out below is for IS-800/1400CR ADVANCED only	
48	VALVE COM	COMMON for all valves
49 **50** **51** **52** **53** **54** **55**	EX VALVE1 (EX SOL1) EX VALVE2 (EX SOL2) EX VALVE3 (EX SOL3) EX VALVE4 (EX SOL4) RET VALVE1 (RET SOL1) RET VALVE2 (RET SOL2) VALVE RELAY (SOL RELAY)	Solenoid valve output pins. 49: EX VALVE1 (EX SOL1); 50: EX VALVE2 (EX SOL2); 51: EX VALVE (EX SOL3); 52: EX VALVE4 (EX SOL4) Retraction Solenoid valve output pins. 53: RET VALVE1 (RET SOL1); 54: RET VALVE2 (RET SOL2); 55: VALVE RELAY (SOL RELAY) The contacts are rated at 120V AC or 24V AC/DC at 0.5A (semiconductor switches). Use a solenoid valve with a current capacity of 0.5A or less.

PIN	NAME	DESCRIPTION
56	INT +24VDC GND (I/O COM)	COM pin. This pin is internally connected to the GND chassis.
57 **58** **59** **60**	RETRACTION 1 RETRACTION 2 BACK STEP STEP MODE	
61 **62**	ANALOG IN1+ ANALOG IN1-	0-10VDC Analog input 1
63 **64**	ANALOG OUT1+ ANALOG OUT1-	0-10VDC Analog output 1*[2]
65 **66**	ANALOG IN2- ANALOG IN2-	0-10VDC Analog input 2
67 **68**	ANALOG OUT2+ ANALOG OUT2-	0-10VDC Analog output 2*[2]
69 **70**	CURRENT COM- CURRENT OUT+	Current output (0-10 VDC)*[2] $V_{out} = I_{out} / 5000$
71 **72**	VOLTAGE COM- VOLTAGE OUT+	Voltage output (0-10 VDC)*[2] $V_{out} = V_{feedback} / 2$

*[1] When the sequence is stopped at (A), error (CAUTION) is not displayed. It's because the contents when stopped is displayed on the program unit.



*[2] Maximum combined current draw from all analog outputs: 75 mA

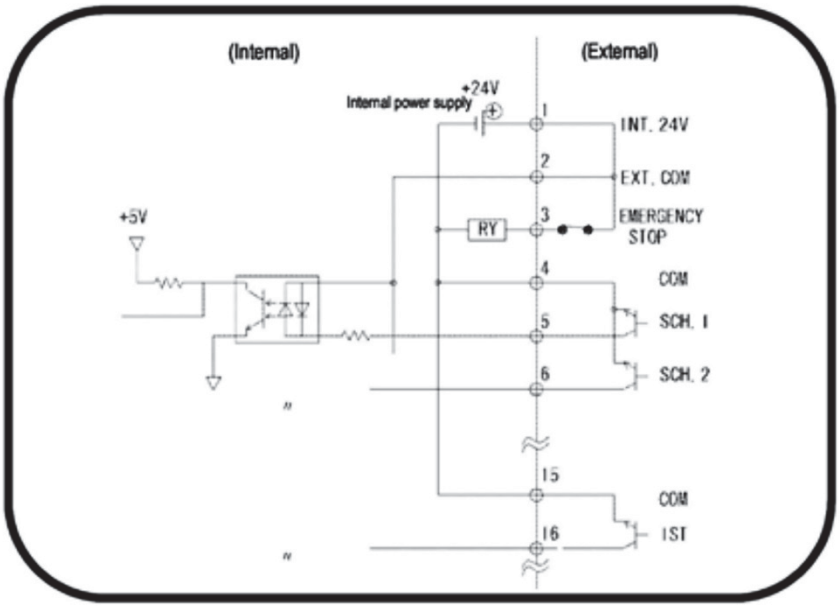
External Output Signals

The following signals can be assigned on the OUTPUT SELECT screen to output pins 28 to 32 (OUT1 to 5)

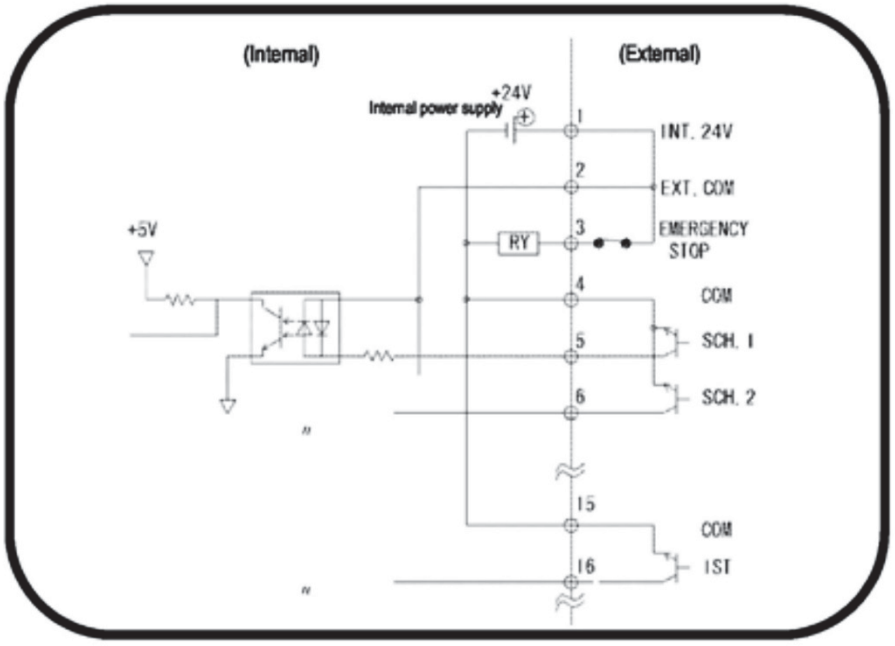
NAME	DESCRIPTION
END	Closed each time the sequence is complete and output the END signal. Output time selection (10 to 200 ms, HOLD) When the off time (OFF) is set and the END signal time is set to time longer than OFF time, the END signal time will be equal to OFF time.
COUNT ERROR	Weld count error output. In the case WELD COUNT is ON, this signal is closed when the weld count terminal is open before the set number of welds is not deposited. This signal is also closed when the weld count terminal is open before welds are counted. When the weld count is larger than the set number of welds, this signal is not output. 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.
READY	Closed when no error occurs and the WELD ON/OFF is ON.
STEP END	Closed when the last step ends in step-up operation. Closed until the step reset signal is input or the step setting (value) is changed. Even if VALVE1 and VALVE 2 are switched, the signal remains closed when the either one reaches the set number of welds. The error is displayed only when the VALVE where the current is supplied has reached (reaches) the set number of welds.
WELD SIGNAL	Welding timing signal. Closed during welding. Not output at COOL. Closed even if start with the WELD OFF state (with time set and HEAT not set).
GOOD	Closed when the measured value is judged to be within the range set on the MONITOR SET screen after the completion of welding sequence. Output time selection: 10 to 200 ms, 0 ms (Hold)
COUNT UP	Closed when the count reaches the preset counter value. To cancel the count up output, input the reset signal to the count reset pin.
OUT I	WELD1 weld end output. Closed between the WELD1 weld end and the beginning of HOLD.
OUT II	WELD2 weld end output. Closed between the WELD2 weld end and the beginning of HOLD.

Input Signal Connections

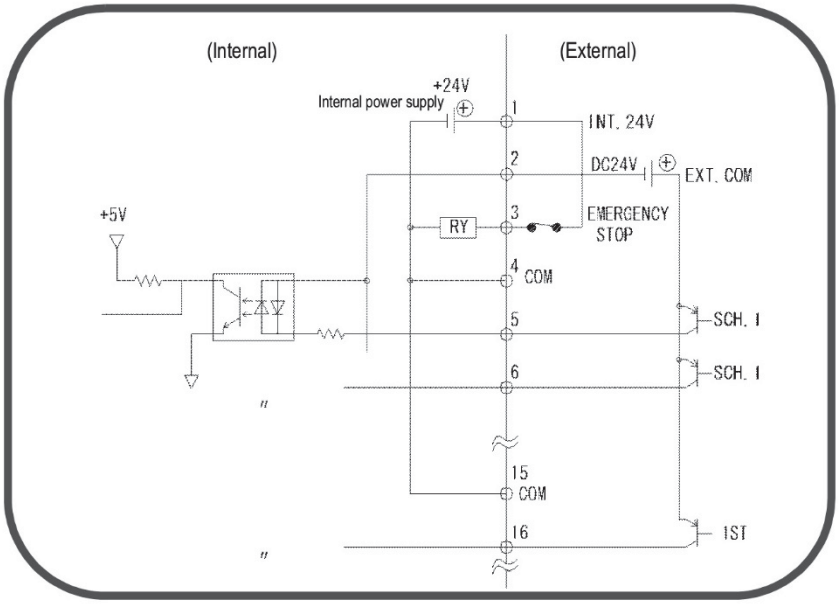
1. Connection with equipment having a contact input. Connect pins 1 and 2.



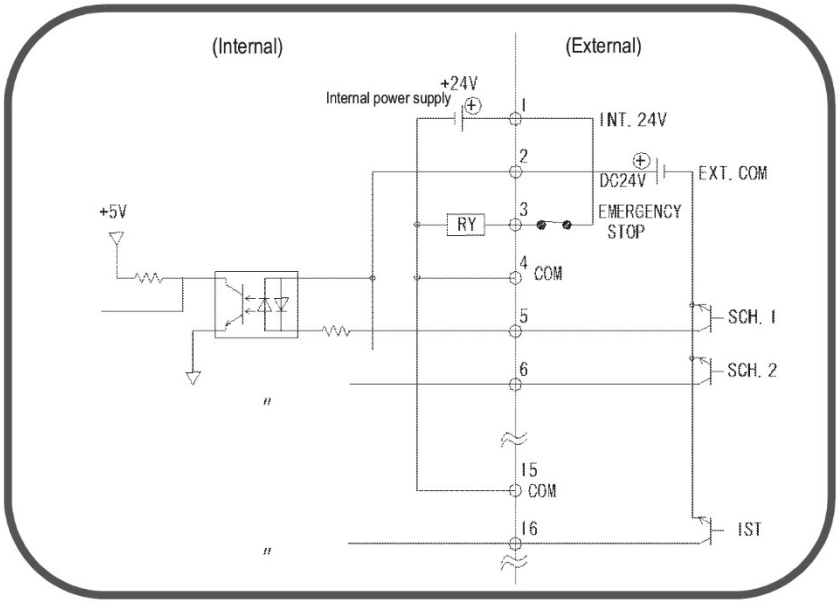
2. Connection with equipment featuring NPN open collector output (when using internal power supply). Connect pins 1 and 2.



3. Connection with equipment featuring PNP current output (when using external power supply). Connect the negative side of an external 24 VDC power supply to pin 2.



Connection with equipment featuring NPN open collector output (when using external power supply). Connect the positive side of an external 24 VDC power supply to pin 2.



APPENDIX C
SYSTEM TIMING

Input and Output Timing Signals

The following illustrations show the timing signals for different functions of the Power Supply.

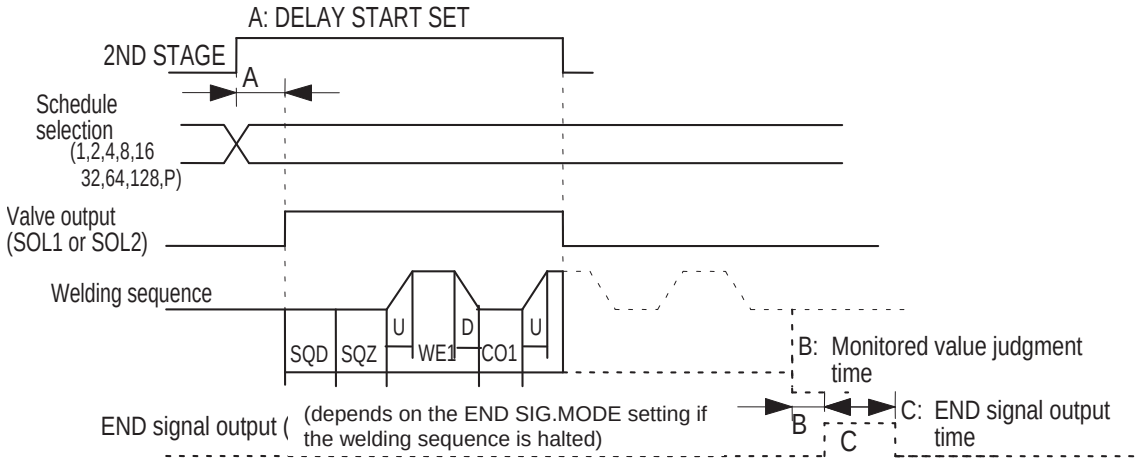
Start Signal Input

Weld sequence operation varies by the setting of **START SIG. MODE** on the Mode Select screen.

Maintained Mode

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.

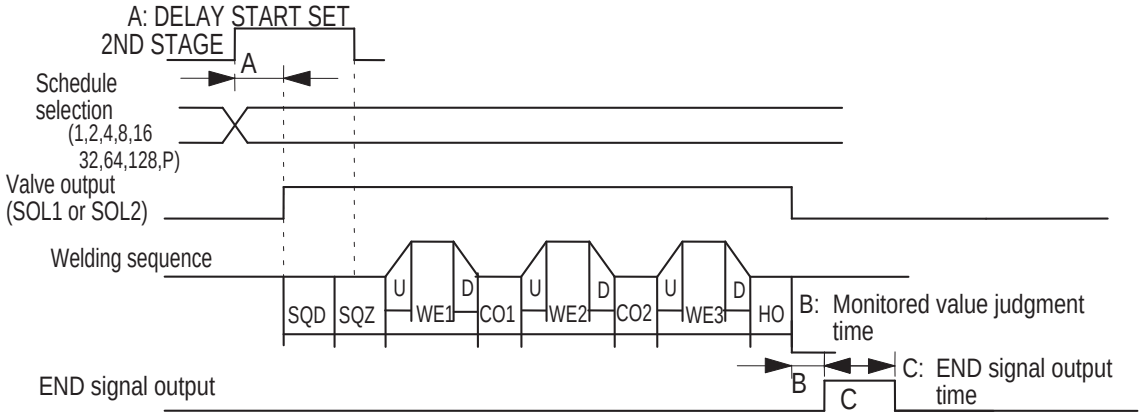
Note that the **END** signal depends on the **END SIG.MODE** setting.



Start Signal Input in Maintained Mode

Pulsed Mode

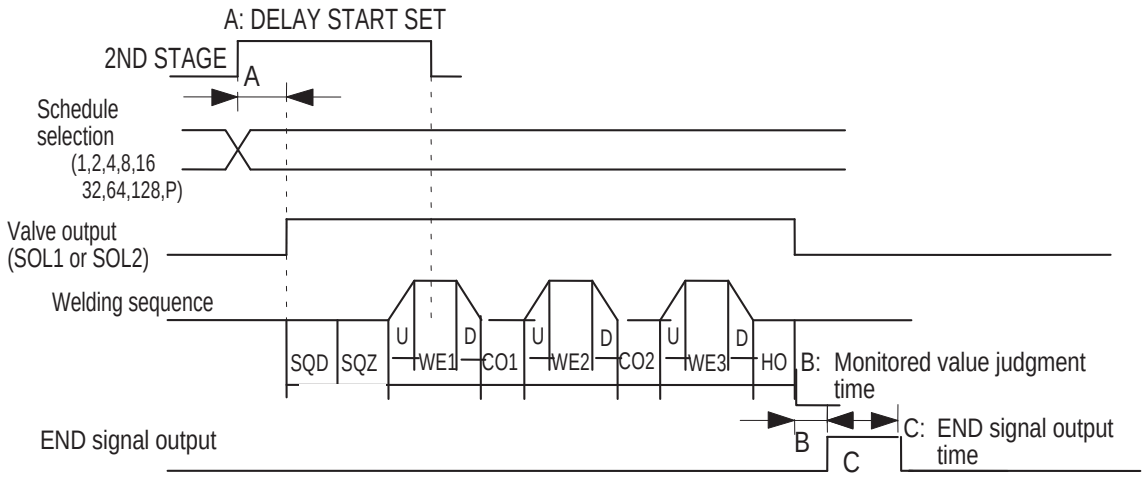
When the 2ND STAGE signal is input for more than the time set through DELAY START SET and then stops, the welding sequence will proceed to completion.



Start Signal Input in Pulsed Mode

Latched Mode

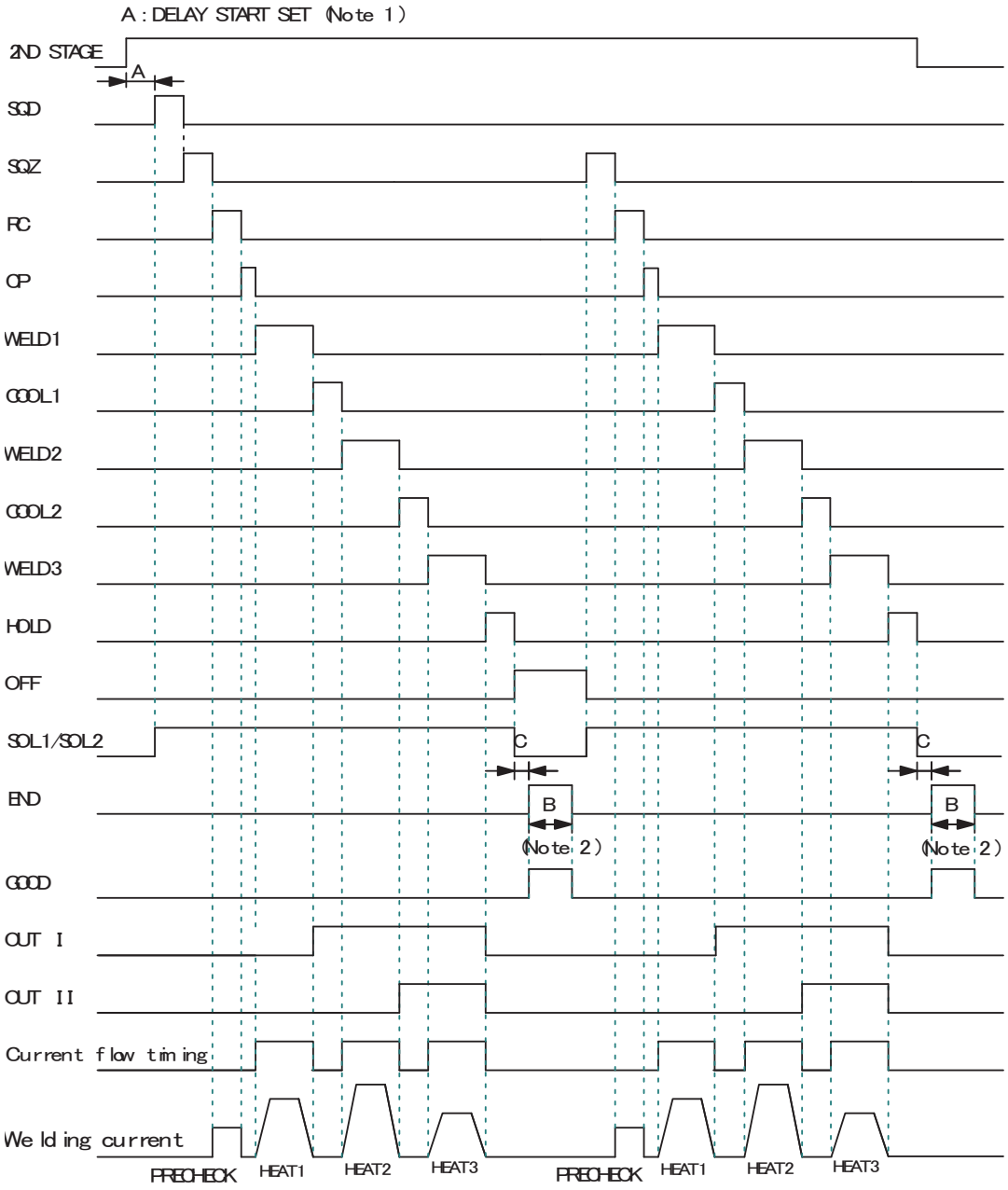
- The welding sequence halts if the 2ND STAGE signal stops during squeeze time (**SQZ**).
- The welding sequence proceeds to completion when the 2ND STAGE signal stops during Weld 1 time (**WE1**) or later.



Start Signal Input in Latched Mode

One-Stage Start

Stage 2 signal will begin the welding sequence with the selected Schedule #.



SQD: Squeeze delay time
SQZ: Squeeze time
RC: Resistance pre-check time
CP: Resistance judgment time (2ms)
WELD1: 1st weld time
COOL1: Cooling time 1
WELD2: 2nd weld time
COOL2: Cooling time 2
WELD3: 3rd weld time
HOLD: Hold time
OFF: Off time

One-Stage Start

A: DELAY START SET setting + Welding preparation time

The welding preparation time changes depending on the WELD TRANS FREQ(frequency) setting.

Frequency [Hz]	Welding preparation time [ms]	Frequency [Hz]	Welding preparation time [ms]
600	1.1	1000 to 1200	0.7
700	1.0	1300 to 1600	0.6
800	0.9	1700 to 2400	0.5
900	0.8	2500 to 3000	0.4

B: END SIG. TIME setting
The output time changes depending on the OFF time. See **4.(9)(c)**.

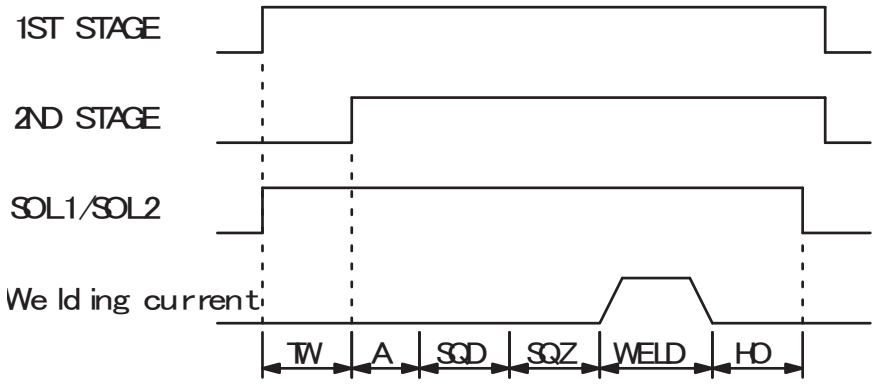
C: Monitored value judgment time 200μs max.

(Note 1) To stop the sequence during **SQD** or **SQZ**(possible only when LATCHED or MAINTAINED is selected for **START SIG. MODE**; see **4.(9)(b)**), stop the 2ND STAGE input for a period longer than that set for **DELAYSTART SET**.

(Note 2) When the current gets out of the range of upper/lower limit judgment (ERROR) in a sequence, repetition operation ends even if the OFF time is set.

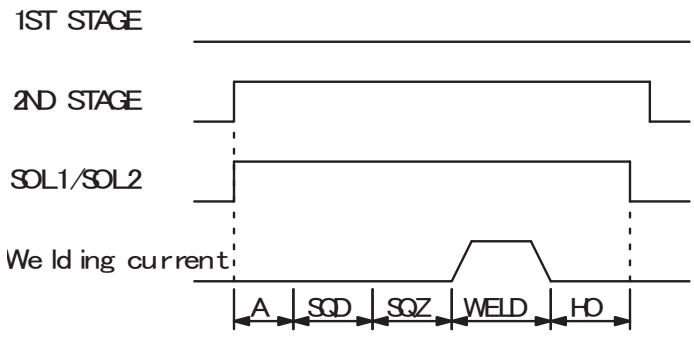
Two-Stage Start

When the 1ST STAGE is input, the solenoid valve output (SOL1 or SOL2) is turned ON and goes in to the standby state of the 2ND STAGE input. When the 2ND STAGE is input, welding sequence starts.



TW: 2ND STAGE input standby state.
A: DELAY START SET setting + Welding preparation time.

When the 2ND STAGE is input before the 1ST STAGE input, welding sequence starts.When welding sequence starts, 1ST STAGE signal is not received until welding sequence ends.

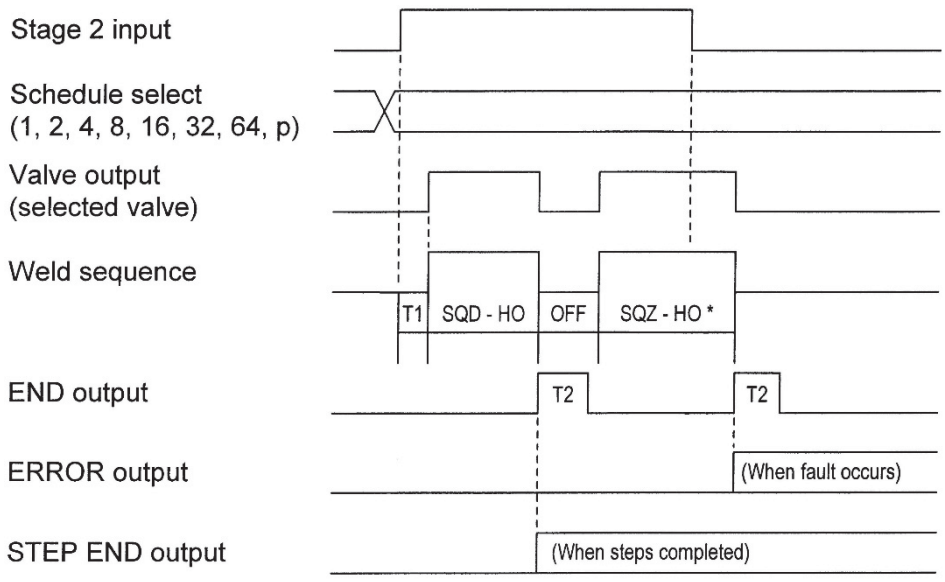


A: DELAY START SET setting + Welding preparation time.

Two-Stage Start

Repeat Operation

Repeat operation will occur whenever the Off time is set to any value other than zero (0.



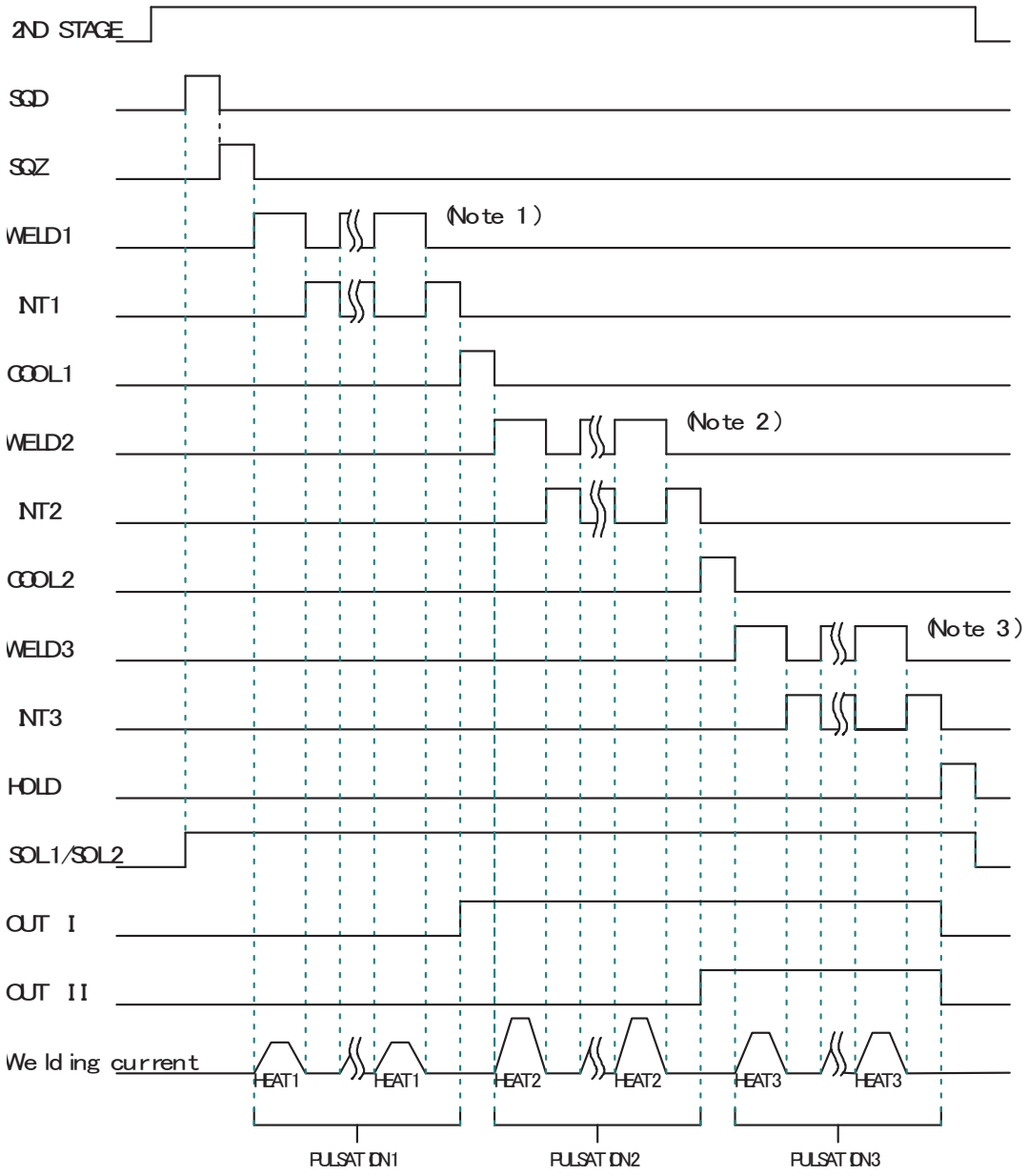
***NOTE:** The first weld sequence is from Squeeze Delay (SQD), *but* the second weld sequence is only from Squeeze (SQZ).

T1 : Time set to Delay Start Set
T2 : 180 – 220ms (End signal output time)
SQD : Squeeze Delay time
SQZ : Squeeze time
HO : Hold time
OFF : Off time

Repeat Operation

Pulsation

Operation is repeated in **WELD** and **INT** set times.



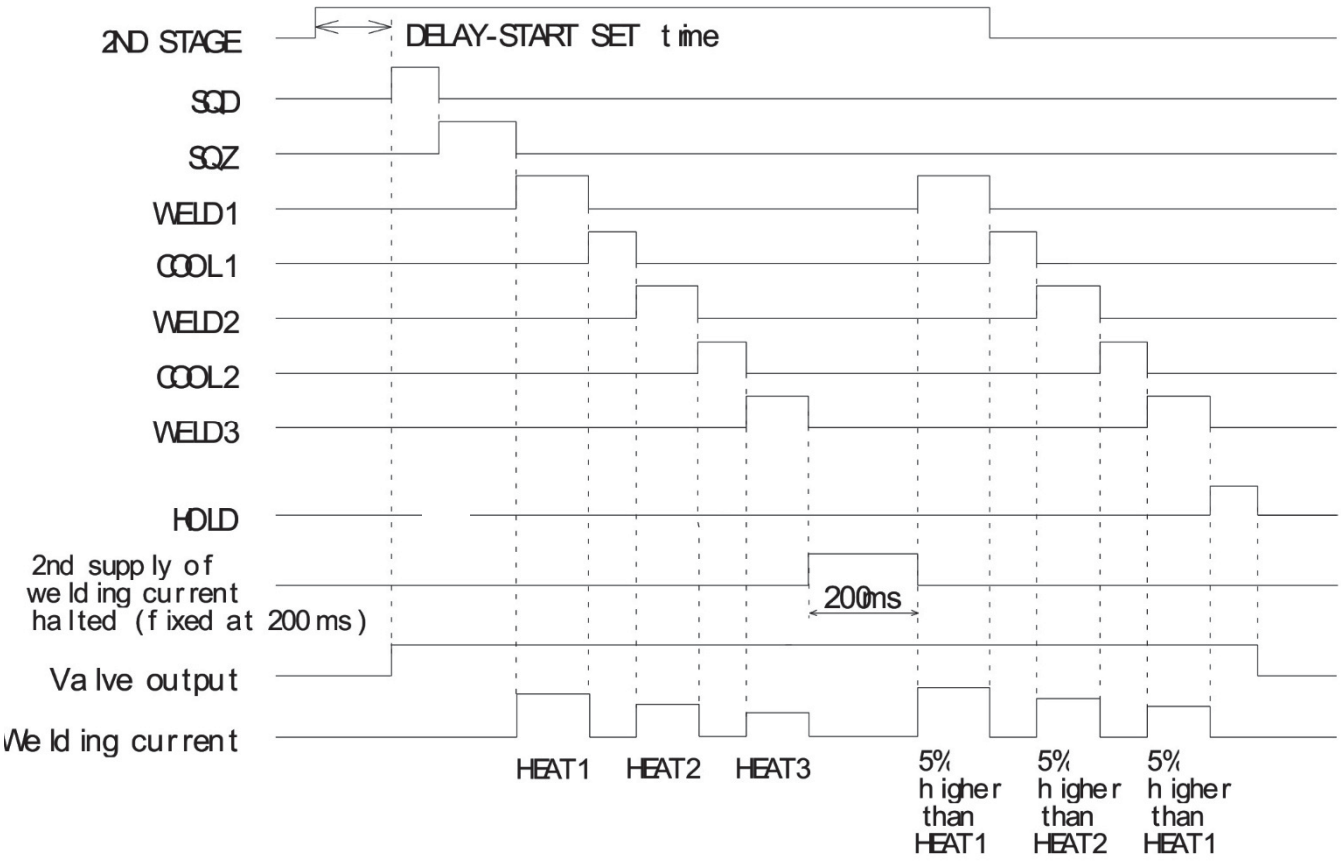
(Note 1) Repeat operation times set for PULSATION1 in WELD1 and INT1 set times. When PULSATION is set to 3, WELD to INT are repeated 3 times as follows; SQZ→ WELD1→ INT1→ WELD1→ INT1→ WELD1→ INT1→ WELD2...

(Note 2) Repeat operation times set for PULSATION2 in WELD2 and INT2 set times.

(Note 3) Repeat operation times set for PULSATION3 in WELD3 and INT3 set times.

Re-Weld

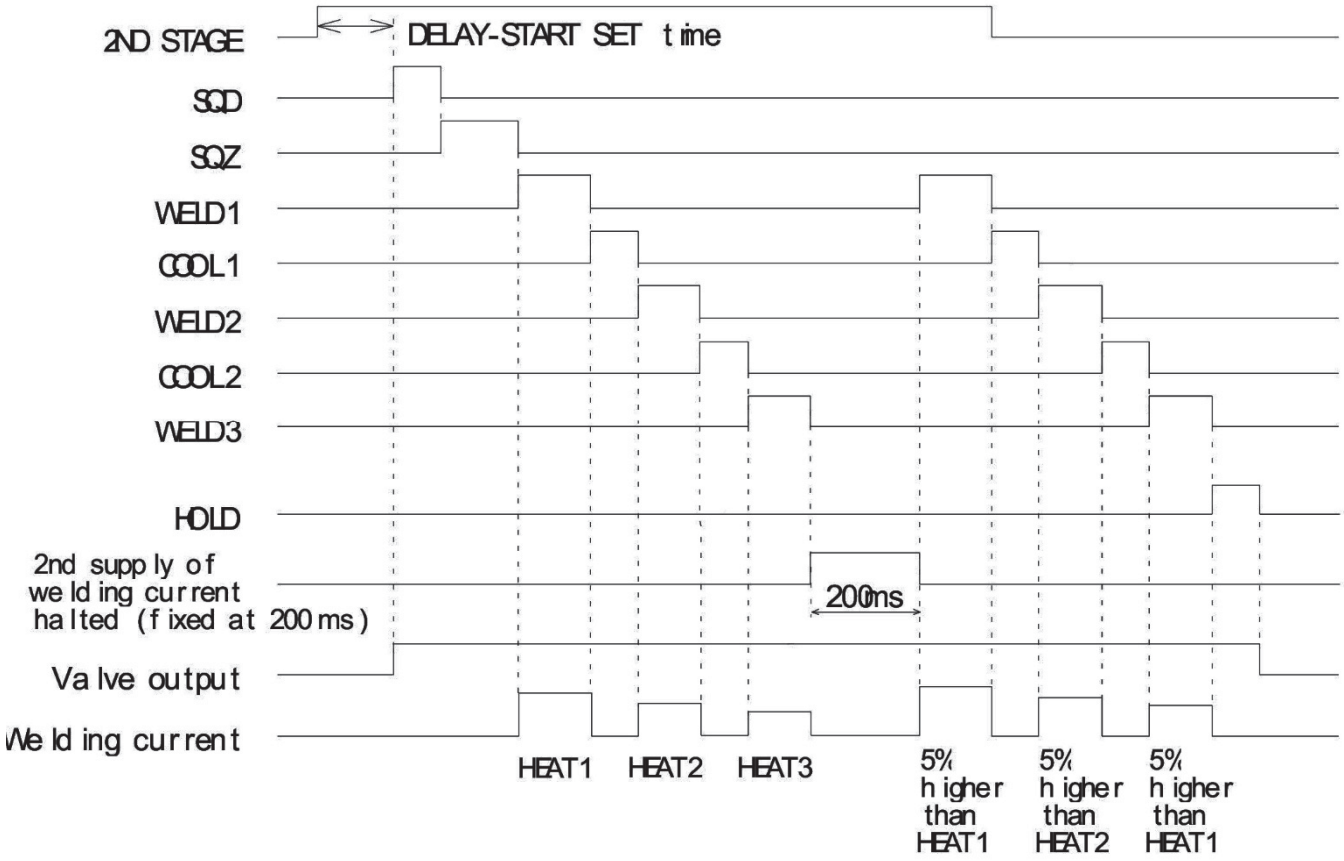
Re-weld will occur when Re-Weld is set On (Mode Select screen), and a current monitor error occurs as a low weld current shown below. Under that circumstance, a re-weld will occur with a 5% increase in weld current.



Re-Weld

Interrupt

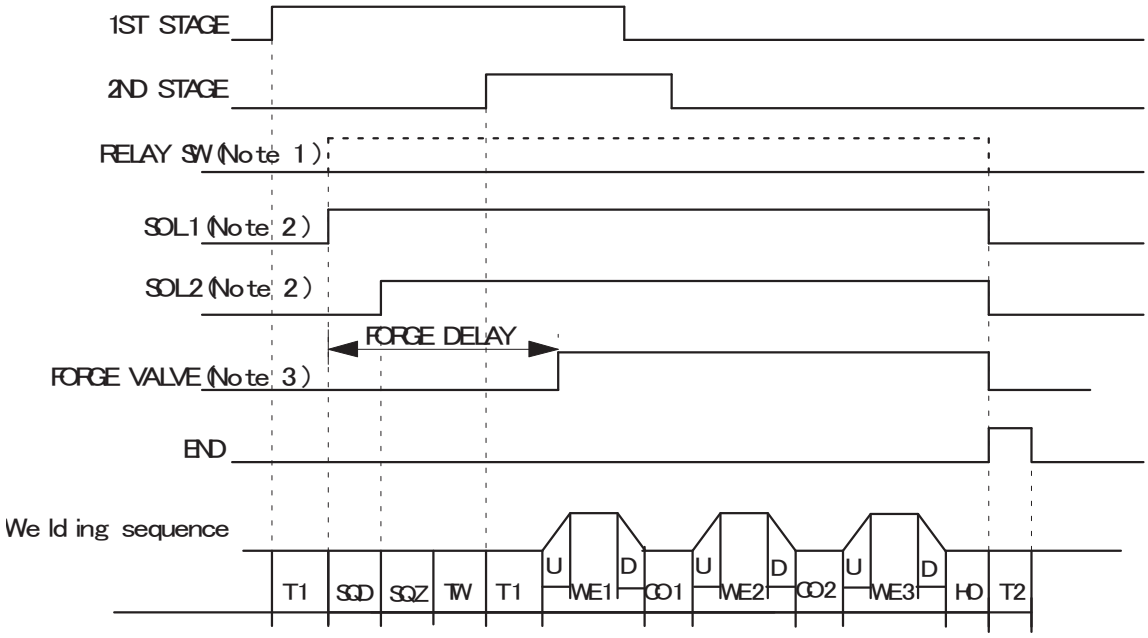
Interrupt will occur when Interrupt is set On (Mode Select screen), and an Interrupt signal is applied during a weld sequence. The weld cycle is immediately stopped and shifted to Hold (HO).



Interrupt

VALVE MODE- specific difference in sequence

When VALVE MODE is changed to “2 VALVE” from “1 VALVE”, two valve signals (SOL1 and SOL2) are output in a sequence. In this case, the settable VALVE No. is 1 or 2.



(Note 1) The RELAY SW signal is not output when VALVE# is set to “1”. It is output from SQD to HOLD only when VALVE# is set to “2”.

(Note 2) When VALVE# is set to “1”, the output signal No. of SOL1 is 36 and that of SOL2 is 37 on the 39-pin terminal strip. When VALVE# is set to “2”, the output signal No. of SOL1 is 2 (EX SOL1) and that of SOL2 is 3(EX SOL2) on the 25-pin D-Sub connector.

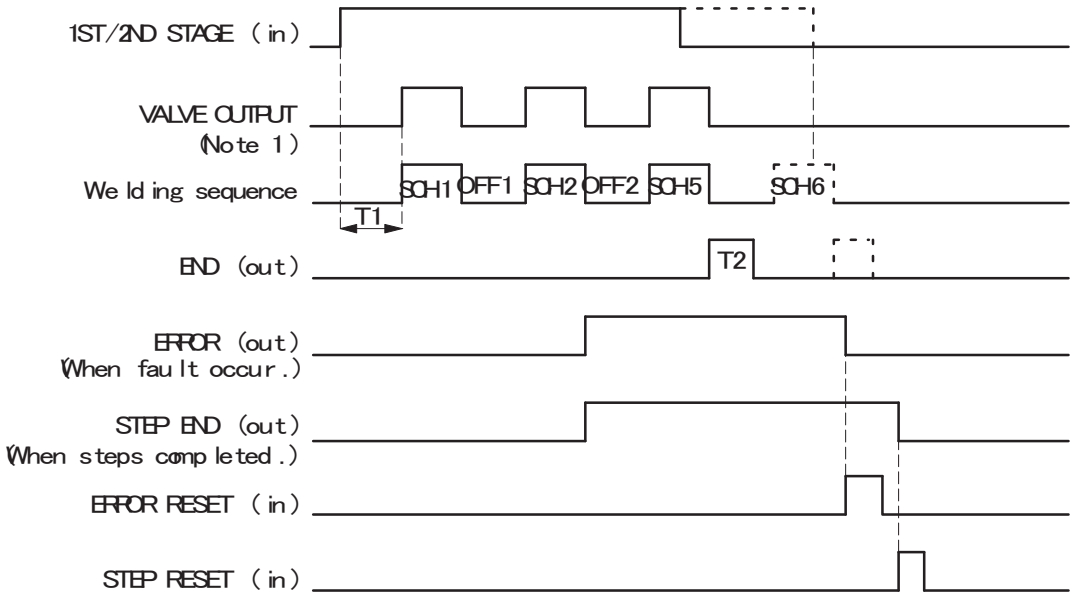
(Note 3) The output signal No. of FORGE VALVE is 4 (EX SOL3) when VALVE# is set to “1”, and 5(EX SOL4) on the 25-pin D-Sub connector when VALVE# is set to “2”.

The timing charts below are for IS-800CR/1400CR ADVANCED ONLY

CHAINING Function

This function can call up welding multiple SCHEDULEs in order to perform them while the 1ST STAGE signal and the 2ND STAGE signal are input.
The SCHEDULE used in the chaining function is set in CHAINING on the FORCE SETUP & MONITOR screen. For details, see **(16)** in Chapter 4.
Even if start is maintained, the sequence executes the final SCHEDULE and ends.

[Example] At 1-stage start operation
(For 2-stage start, the start method is different, but the operation after start is the same.)
In this example, the CHAINING settings for SCHEDULE1, 2, 5, and 6 are ON, and those for other SCHEDULEs are OFF.
Since the 2ND STAGE signal is OFF when the sequence of SCHEDULE5 ends, SCHEDULE6 is not executed.
Next, when the 2ND STAGE signal is input, the sequence starts from the first SCHEDULE1.



T1 : Time set by [DELAY START SET]
T2 : Duration of END output signal
OFF1 : OFF time set by [SCHEDULE1]
OFF2 : OFF time set by [SCHEDULE2]

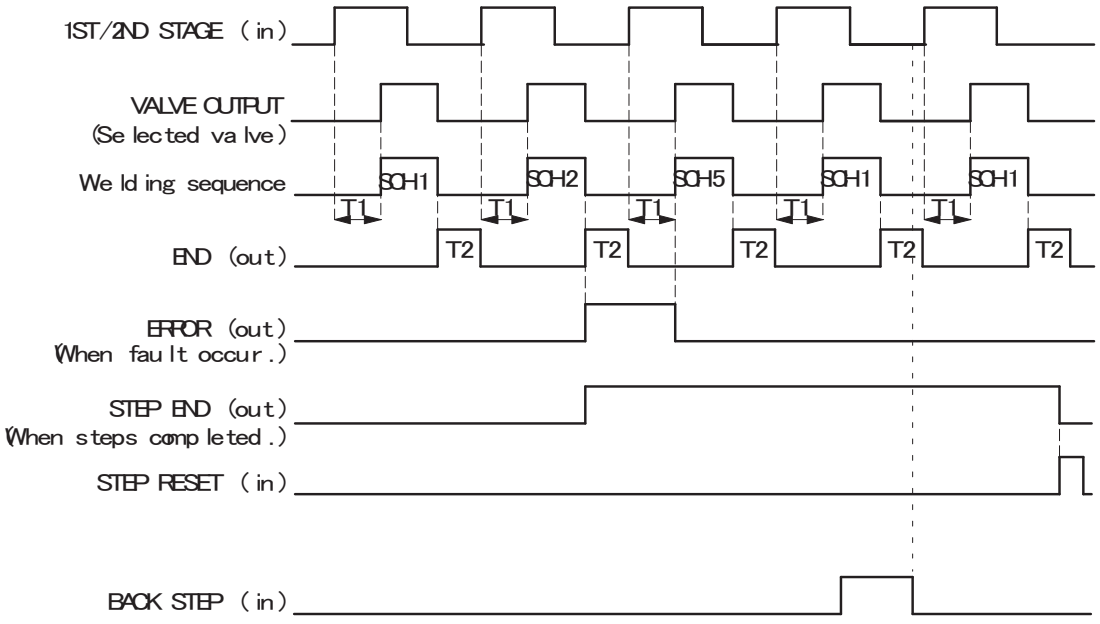
(Note 1) When the VALVE MODE setting is 1 VALVE, the valve selected from EXSOL1to4 is output.

Successive and Back Step Function

This function can switch welding multipleSCHEDULEs in order to perform them each time the 1ST STAGE signal and the 2ND STAGE signal are input.
The SCHEDULE used in the successive function is set in SUCCESSIVE on the FORCE SETUP & MONITORscreen. For details, see **(16)** in Chapter 4.
When the back step signal is input, SCHEDULE returns to the previous one.
Also, when the back step signal is input over 1.5 seconds, SCHEDULE returns to the first one.
The END signal is output at the end of each SCHEDULE.

[Example] At 1-stage start operation

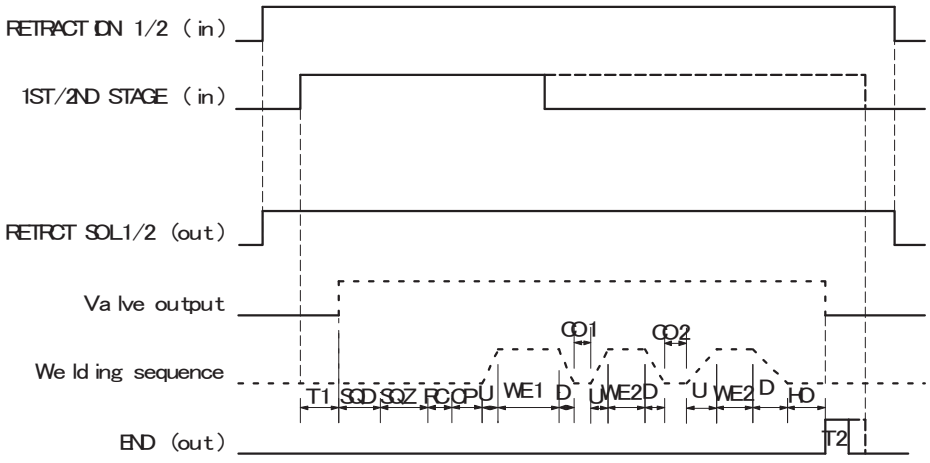
(For 2-stage start, the start method is different, but the operation after start is the same.)
In this example, the SUCCESSIVE settings for SCHEDULE1, 2 and 5 are ON, and those for other SCHEDULEs are OFF.
SCHEDULE1 comes after SCHEDULE5.
Next, when the 2ND STAGE signal is input, the sequence starts from the first SCHEDULE1.
The sequence also starts from SCHEDULE1 once the power supply is turned off.



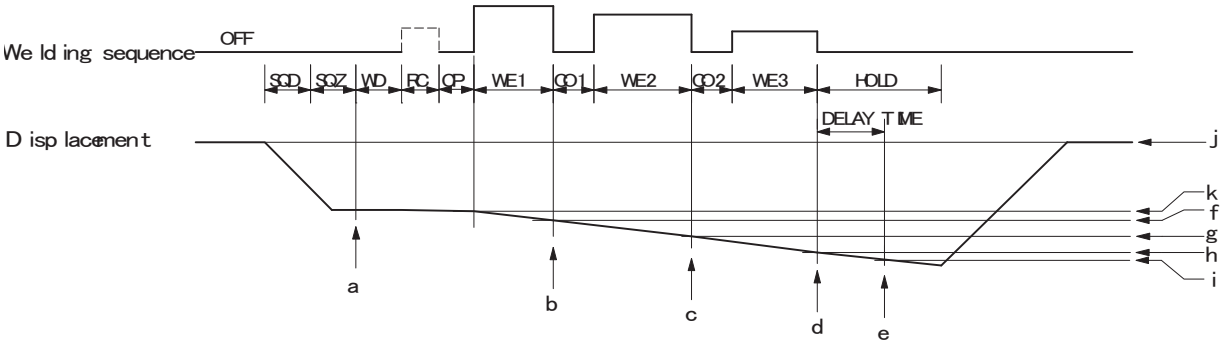
T1 : Time set by [DELAY START SET]
T2 : Duration of END output signal

Retraction Function

This function can output the retraction valve signal while the retraction signal is input. Since the electrode opening can be temporarily extended during welding, the direction of workpiece can be easily changed. However, the retraction valve signal cannot be turned ON/OFF during welding sequence.



T1 : Time set by [DELAY START SET]
T2 : Duration of END output signal



WD : Work detect time
RC : Resistance precheck time
CP : Resistance judgment time

a: Work detection — When the work detection is set on the DISPLACEMENT screen, the workpiece detection is done after the end ofSQZ. When ±00.00mm is set, the work detection is not done.

b: Weld1 stop (WE1) — When the displacement weld stop (DISPLC) is set to the weld1 stop on the DISPLACEMENT screen and the displacement sensor arrives at the set displacement (f at the above figure), the weld1 stop is stopped to make the sequence move to the next cool time(CO1).

c: Weld2 stop (WE2) — When the displacement weld stop (DISPLC) is set to the weld2 stop on the DISPLACEMENT screen and the displacement sensor arrives at the set displacement(g at the above figure), the weld2 stop is stopped to make the sequence move to the next cool time(CO2).

d: Weld3 stop (WE3) — When the displacement weld stop (DISPLC) is set to the weld3 stop on the DISPLACEMENT screen and the displacement sensor arrives at the set displacement(h at the above figure), the weld3 stop is stopped to make the sequence move to HOLD.

e: Delay time — When the delay time is set on the DISPLACEMENT screen, the displacement (i at the above figure)after the delay time elapses is measured.

(Notes)

- The displacement of work detection is set as 0mm (reference point) at “j” (right beforeSQD).
- “k” at the end of work detection is set as 0mm (reference point) of weld stop and the

final displacement (0mm for work detection and 0mm for the final displacement monitor are different.)

- The displacement between “k” and “j” is the monitor displacement (WORK DETECT MONITOR) for work detection.
- The displacement between “j” and “i” is the monitored value of the final displacement (DISPLACEMENT MONITOR).

APPENDIX D
WIRE GAUGE SELECTION AND CIRCUIT BREAKER SETTING

Sizing Power Input Lines and Transformer Input Lines

Due to the many possible combinations of transformer ratios, total secondary resistance and weld voltages, all which have a direct relationship for cable sizing, this section assumes that the secondary current is at its maximum peak current during the weld.

Wire gauges for the AC Mains and Output lines to the transformer must meet the following criteria:

a. For the 480 VAC or 380 VAC 3 phase lines, the voltage drop must be less than 5%. Note also, that if the input source drops by 1% then the cable allowance is reduced to 4% maximum. A table is provided that gives the maximum length for the gauge selected (calculation is linear). Ampacity must be equal to, or larger than the effective current based on NEC table 310-16.

b. For the Output lines to the transformer it is recommended that voltage loss does not exceed 1%. A table is provided that gives the maximum length for the gauge selected (calculation is linear). Ampacity must be larger than the effective current based on NEC table 310-16.

In general:

Size all cables for the maximum secondary current anticipated for your installation. Preferred would be at full capability of 100 amps at 100% duty cycle.

Minimize cable length as much as possible.

If in doubt use a larger gauge cable.

Use the minimum number of connections as possible.

Insure that all connections are tight.

Formulas used:

I_{Eff} = Output current times the square root of the duty cycle.

I_{ph} = Resultant (I_{Eff} x 0.817) current in each phase of the 3-phase input source.

Example:

Using the table below:

- If a 100amp output current at 100% duty cycle is required, the I_{Eff} is 100amps.
- For the Transformer lines: use a 3/0 cable with a maximum length of 80 feet.
- For the AC lines: use 1/0 cable with a maximum length of 282 feet.

PRIMARY CURRENT VS WELD DUTY CYCLE				CABLE TO OUTPUT TRANSFORMER		CABLE TO UNIT (480 VAC INPUT)	
Output Current	**Weld Duty Cycle (%)**	**I_{Eff}**	**I_{Ph}**	**AWG @ I_{Eff} Amps**	**1% Drop (feet)**	**AWG @ I_{Ph}**	**5% Drop (feet)**
*500	15	194	158	3/0	80	1/0	282
*400	24	196	160	3/0	80	1/0	282
*280	50	198	162	3/0	80	1/0	282
*200	100	200	163	3/0	80	1/0	282
150	100	150	123	1	40	2	170
100	100	100	82	3	25	4	110
50	100	50	41	8	8	8	45

* Maximum output current at rated duty cycle.

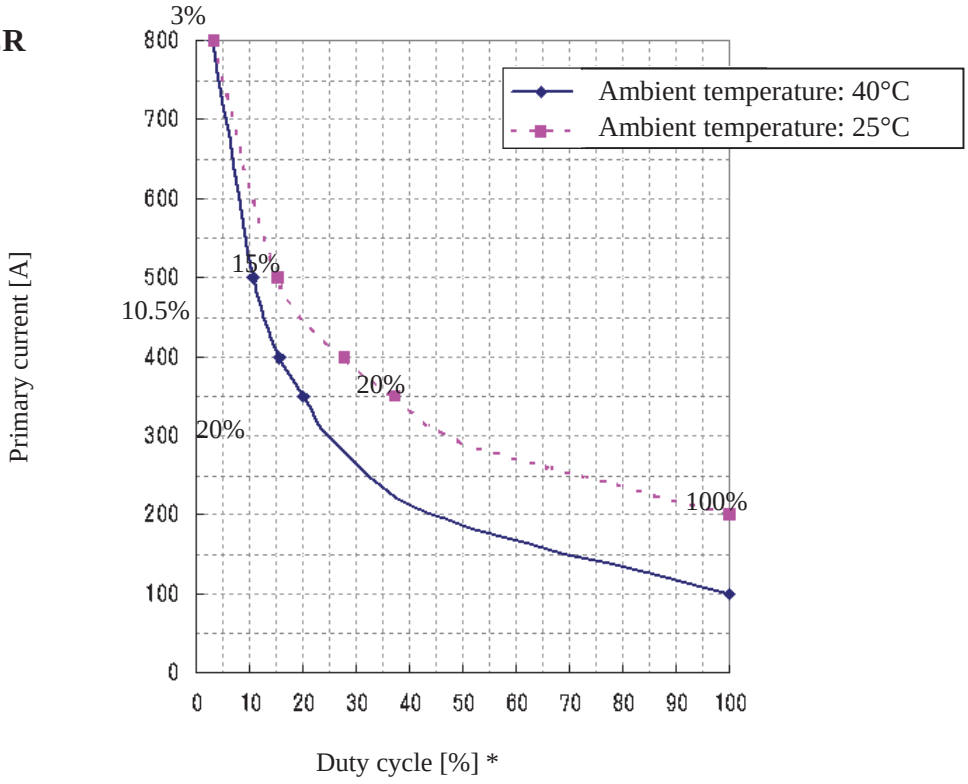
* Rated capacity at 25c.

NOTES:

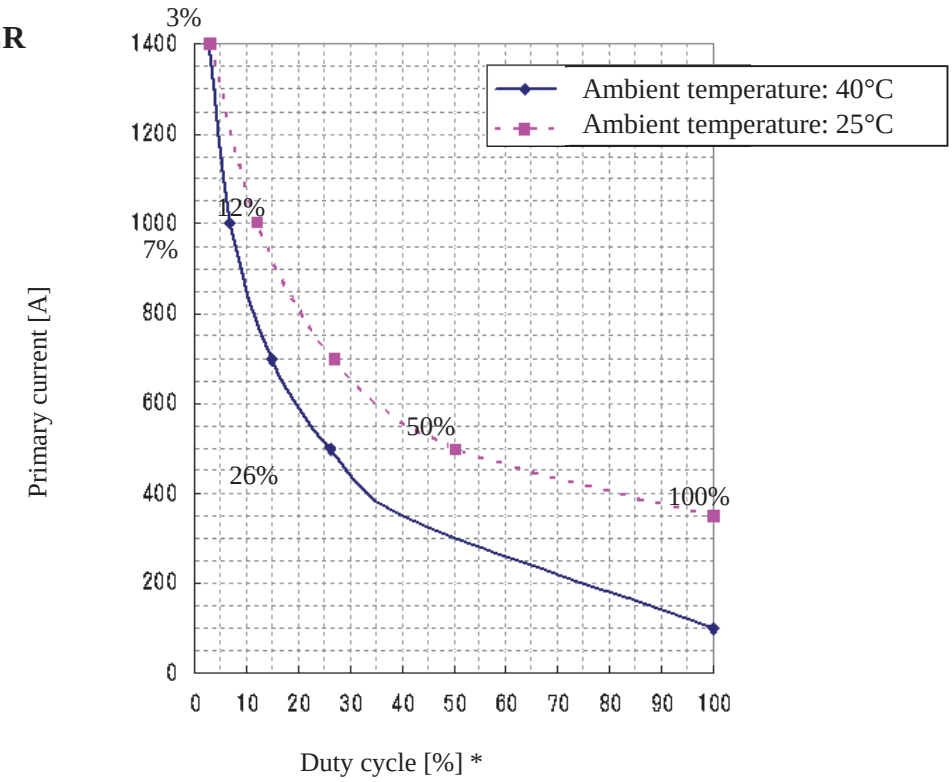
- For other output currents see the table on the next page.
- For other output currents at different duty cycles, apply the above formula to find the new I_{Eff}, the use the following table for cable sizes and maximum lengths.
- If I_{Eff} is not in the table, use the next higher current.

Duty Cycles

IS-800CR



IS-1400CR



CABLE TO OUTPUT TRANSFORMER		
I_{Eff}	AWG @ I_{Eff} amps	1% Drop (feet)
410	500 MCM	77
350	500 MCM	80
200	3/0	80
190	2/0	62
180	2/0	62
170	1/0	50
155	1/0	50
150	1	40
135	1	40
130	2	31
115	2	31
110	3	25
105 100	3 3	25 25
95	4	20
90	4	20
75	6	13
55	8	8

CABLE TO UNIT (480 VAC INPUT)		
I_{Ph}	AWG @ I_{Ph}	5% drop (feet)
335	300 MCM	380
286	300 MCM	449
163	1/0	282
155	1/0	282
147	1	211
139	1	211
127	2	170
123	2	170
110	3	135
106	3	135
94	4	110
90	4	110
86 82	4 4	110 110
78	4	110
74	6	70
61	6	70
45	8	45

Circuit Breaker Settings

The dipswitches referred to in his section are located on the ABB circuit breaker, ***not*** on the IS motherboard. The dipswitches are clearly labeled on the circuit breaker. Please refer to this manual if you need more information on the circuit breaker.

The circuit breaker has three adjustments:

ADJUSTMENT	TRIP FUNCTION	RANGE	INDIVIDUAL SETTINGS
L	Long time pick-up	0.4 - 1.0	0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 0.95, 1.0 X I_n
t1	Long time delay	3.0 - 18 sec	A = 3, B = 6, C = 12, D = 18 seconds
I	Instantaneous trip	1.5 - 12.0	1.5, 2.0, 4.0, 6.0, 8.0, 10.0, 12.0 X I_n

I_n = 250 Amps for IS-800CR

I_n = 400 Amps for IS-1400CR

*See circuit breaker front panel for dipswitch settings.

Setting L

Calculate the breaker rated current using the Effective secondary current and duty cycle of the weld schedule.

Circuit Breaker setting = Output Current $\times \sqrt{DC/100} \times 0.817$

DC is the duty cycle of the weld schedule in percent.

Example: Output current is 500amps @ a duty cycle of 15%.
Breaker should be set at 114 amps or more.
Set the L dipswitch to 125 amps (.5) or 150 amps (.6).

Example: Output current is 350 amps @ a duty cycle of 20%.
Breaker should be set at 128 amps or more.
Set the L dipswitch to 150 amps (.6) or 175 amps (.7).

Setting t1 Set to 3 seconds (A). This setting should require no further adjustment.

Setting I Set to 4.0 as the maximum peak current is 1000 amps.

NOTE: If circuit breaker nuisance trips, set L higher or set I to 6.

APPENDIX E
OPTIONS

Overview

Chapters 1 through *5* and *Appendices A* through *D* of this manual describe the standard configuration of the Power Supply. You may also order Power Supplies with these Options:

- Isolation Contactors
    - Larger Control Transformer
    - 24 Volt DC Power Supply
    - CE compliance
    - Communications option that allows the Power Supply to be used with a host computer or with automation control systems. Detailed descriptions for this option are in *Appendix F, Communications. (In Section 1: Data Connections it refers to DB-9 connectors as if they were standard on every unit. They only come with the Communications Option*

Control Transformer

The control transformer provides 120 VAC to power the valves and to the 24 VDC Power Supply if installed (option). The standard Control Transformer is rated at 150VA; an optional 250 VA transformer is available.

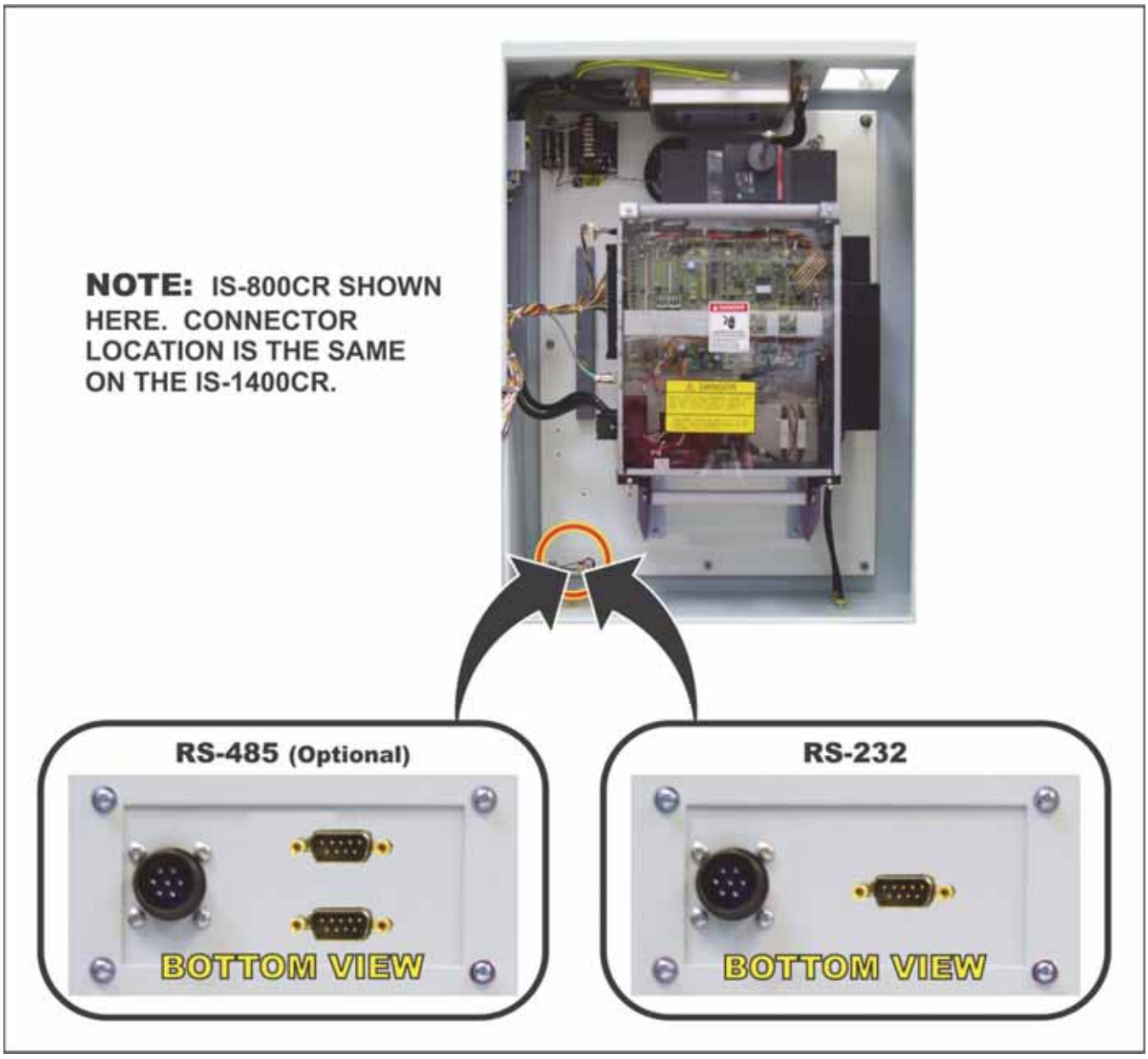
24 Volt DC Power Supply (Not Shown)

The 24 Volt DC Power Supply is only available as an option. When installed it provides 24 VDC to power the valves. Two options are available: 2.0amps (50 watts) and 6.0amps (150 watts). Note: There must be a Control Transformer (of the correct VA) installed to provide AC power to 24 Volt DC Power Supply.

Solid-State Relay

This solid-state-relay drives the isolation contactors. Only when TB1 pin 41 (Contactor) is at a **HIGH** (nominal 24 VDC) referenced to pin 0 will the contacts close. This can be accomplished either with switch, jumper, PLC, Transistor or FET that can source a positive 24 volts DC of least 20mA. (Voltage source at TB1 pin 40 can be used)

External Communications Connectors



Isolation Contactors

	CAUTION

- Do ***not*** **OPEN** or **CLOSE** the isolation contactors during any welding. The contacts are designed for dry switching only and may be damaged if switched when welding current is flowing.
- Do ***not*** use the isolation contactors as a substitute for an Emergency Stop Switch. The isolation contactors will ***only*** open the two output lines to the welding transformer.

This option adds two internal Normally Open (N/O) contactors to the Power Supply. One contactor is connected in series with the positive side terminal that connects to the external welding transformer the other contactor is connected in series with the negative terminal that connects to the external welding transformer. The isolation contactors provide a means to disconnect the Power Supply pulse DC (IGBTs) output to the welding transformer. The isolation contactors should never be operated during a weld process!

In addition to the N/O main contacts there are two Normally Closed (N/C) auxiliary contacts and two Normally Open (N/O) auxiliary contacts that are wired in series, respectively. These lines brought out to TB1 pins 42 (Contactor N/O), 43 (Contactor Com) and 44 (Contactor N/C) to be used by the user as sense lines to ensure that both contactors are Open or Closed depending on the input command at TB1 as shown in the table below.

CONTACTORS COMMAND PINS TB1 40, 41	MAIN CONTACTS (N/O) L1 L2 L3	AUXILIARY CONTACTS (N/O) PINS TB1 42, 43	AUXILIARY CONTACTS (N/C) PINS TB1 43, 44
OPEN	OPEN	OPEN	SHORTED
SHORTED	CLOSED	SHORTED	OPEN

After the command to close the contactors is given, allow not less than 40ms before applying weld current. This will provide sufficient time for the solid-state relay, coils, and contacts to settle before current is applied to the welding transformer.

CAUTIONS:

- Do ***not*** **OPEN** or **CLOSE** the isolation contactors during any welding. The contacts are designed for dry switching only and may be damaged if switched when welding current is flowing.
- Do ***not*** use the isolation contactors as a substitute for an Emergency Stop Switch. The isolation contactors will ***only*** open the two output lines to the welding transformer.

NOTES:

- If the weld command is given with the contactors are OPEN, no current will flow to the welding transformer. The Power Supply will give an error and stop all operations.
- The Power Supply does not have any automatic means to know if the contactors are installed. All commands and contact OPEN/CLOSURE sense lines states must be provided and detected by the user.

CE Compliance

The weld control can be purchased with special CE filter and shields to be CE compliant.

APPENDIX E
OPTIONS

Overview

Chapters 1 through *5* and *Appendices A* through *D* of this manual describe the standard configuration of the Power Supply. You may also order Power Supplies with these Options:

- Isolation Contactors
    - Larger Control Transformer
    - 24 Volt DC Power Supply
    - CE compliance
    - Communications option that allows the Power Supply to be used with a host computer or with automation control systems. Detailed descriptions for this option are in *Appendix F, Communications. (In Section 1: Data Connections it refers to DB-9 connectors as if they were standard on every unit. They only come with the Communications Option*

Control Transformer

The control transformer provides 120 VAC to power the valves and to the 24 VDC Power Supply if installed (option). The standard Control Transformer is rated at 150VA; an optional 250 VA transformer is available.

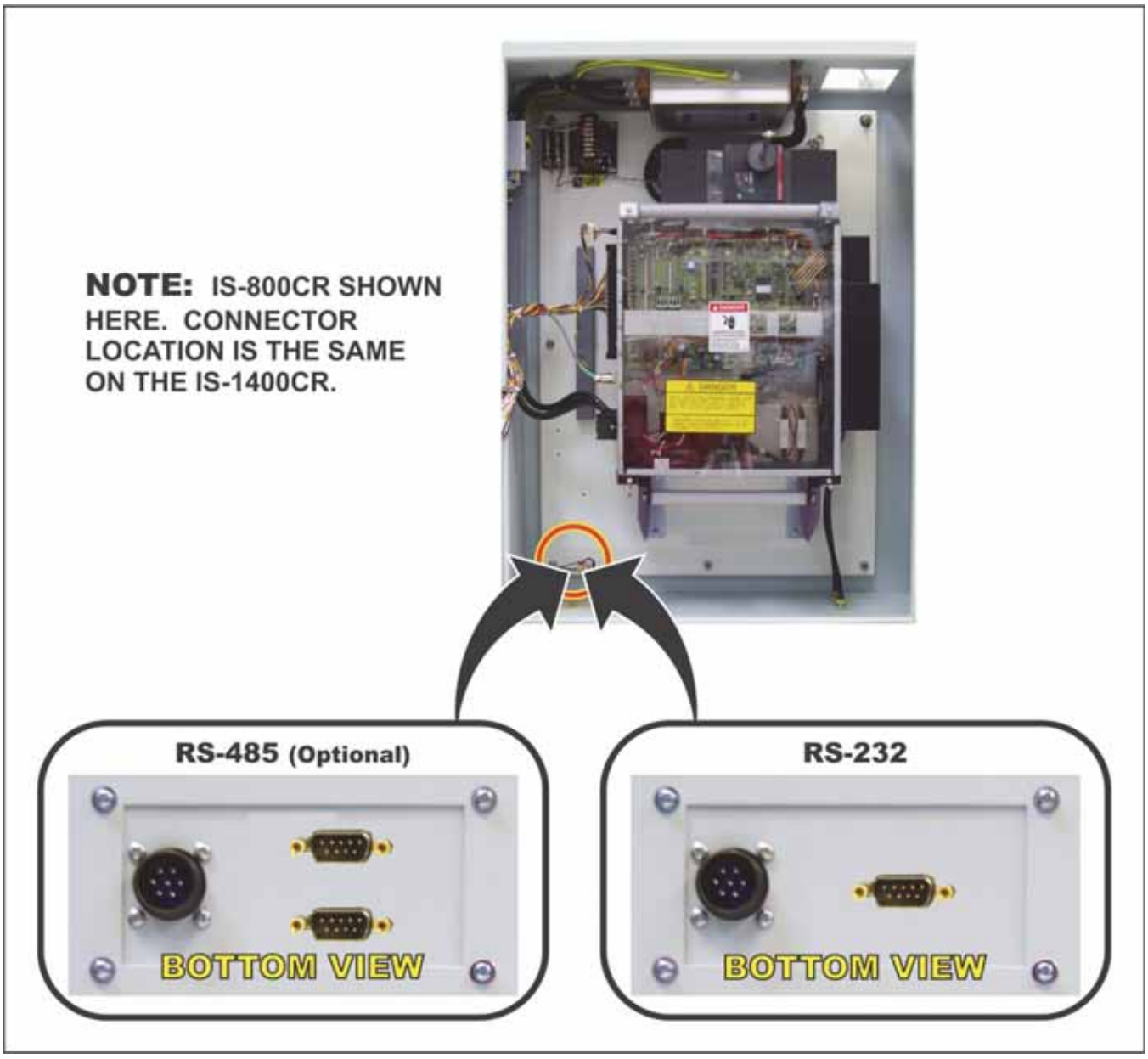
24 Volt DC Power Supply (Not Shown)

The 24 Volt DC Power Supply is only available as an option. When installed it provides 24 VDC to power the valves. Two options are available: 2.0amps (50 watts) and 6.0amps (150 watts). Note: There must be a Control Transformer (of the correct VA) installed to provide AC power to 24 Volt DC Power Supply.

Solid-State Relay

This solid-state-relay drives the isolation contactors. Only when TB1 pin 41 (Contactor) is at a **HIGH** (nominal 24 VDC) referenced to pin 0 will the contacts close. This can be accomplished either with switch, jumper, PLC, Transistor or FET that can source a positive 24 volts DC of least 20mA. (Voltage source at TB1 pin 40 can be used)

External Communications Connectors



Isolation Contactors

	CAUTION

- Do ***not*** **OPEN** or **CLOSE** the isolation contactors during any welding. The contacts are designed for dry switching only and may be damaged if switched when welding current is flowing.
- Do ***not*** use the isolation contactors as a substitute for an Emergency Stop Switch. The isolation contactors will ***only*** open the two output lines to the welding transformer.

This option adds two internal Normally Open (N/O) contactors to the Power Supply. One contactor is connected in series with the positive side terminal that connects to the external welding transformer the other contactor is connected in series with the negative terminal that connects to the external welding transformer. The isolation contactors provide a means to disconnect the Power Supply pulse DC (IGBTs) output to the welding transformer. The isolation contactors should never be operated during a weld process!

In addition to the N/O main contacts there are two Normally Closed (N/C) auxiliary contacts and two Normally Open (N/O) auxiliary contacts that are wired in series, respectively. These lines brought out to TB1 pins 42 (Contactor N/O), 43 (Contactor Com) and 44 (Contactor N/C) to be used by the user as sense lines to ensure that both contactors are Open or Closed depending on the input command at TB1 as shown in the table below.

CONTACTORS COMMAND PINS TB1 40, 41	MAIN CONTACTS (N/O) L1 L2 L3	AUXILIARY CONTACTS (N/O) PINS TB1 42, 43	AUXILIARY CONTACTS (N/C) PINS TB1 43, 44
OPEN	OPEN	OPEN	SHORTED
SHORTED	CLOSED	SHORTED	OPEN

After the command to close the contactors is given, allow not less than 40ms before applying weld current. This will provide sufficient time for the solid-state relay, coils, and contacts to settle before current is applied to the welding transformer.

CAUTIONS:

- Do ***not*** **OPEN** or **CLOSE** the isolation contactors during any welding. The contacts are designed for dry switching only and may be damaged if switched when welding current is flowing.
- Do ***not*** use the isolation contactors as a substitute for an Emergency Stop Switch. The isolation contactors will ***only*** open the two output lines to the welding transformer.

NOTES:

- If the weld command is given with the contactors are OPEN, no current will flow to the welding transformer. The Power Supply will give an error and stop all operations.
- The Power Supply does not have any automatic means to know if the contactors are installed. All commands and contact OPEN/CLOSURE sense lines states must be provided and detected by the user.

CE Compliance

The weld control can be purchased with special CE filter and shields to be CE compliant.

APPENDIX F
Communications

Section I. Description

Overview

The standard communication is RS-232C. RS-485 is a hardware option (pendant needs to be set to RS-232C)

Remote Programming

Advanced users may wish to perform programming for custom welding applications. The codes needed to perform remote programming are listed in *Section II. Communications Protocol and Commands*. Using these codes, users can write customized software for controlling all functions of the welding control and interfacing the unit to automation control systems.

Section II. External Communication Function

Introduction

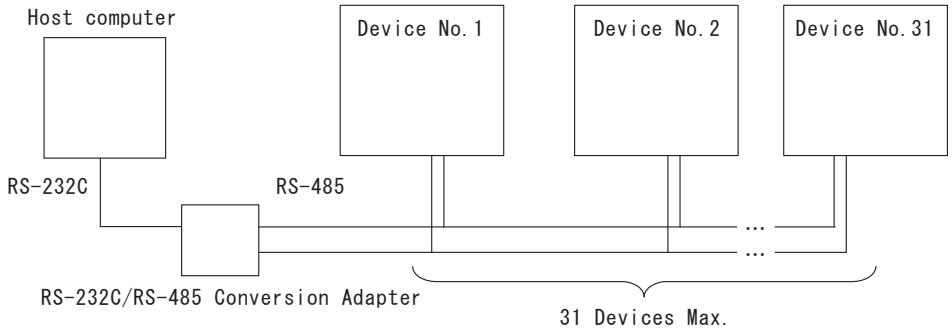
The **IS-800CR/1400CR** can be used to set schedules from an externally-connected personal computer (abbreviated as PC) or to read monitored data and several kind of status data.

Data Transmission

ITEM	CONTENT
Transmission Mode	Select only one mode at MODE SELECT screen: RS-232C (RS-485 requires factory installed RS-485 option)
Transmission Rate	Select either of the followings at MODE SELECT screen: 9600, 19200, 38400 bps
Data Format	Start bit: 1, Data bit: 8, Stop bit: 1, Parity bit: Even
Character Code	ASCII
Checksum Data	None
Connector	D-Sub 9 pins Pin Position RS-232C, 2: RXD, 3: TXD, 5: SG, 7: RTS (RS-485 requires factory installed RS-485 option)

Configuration

① RS-485

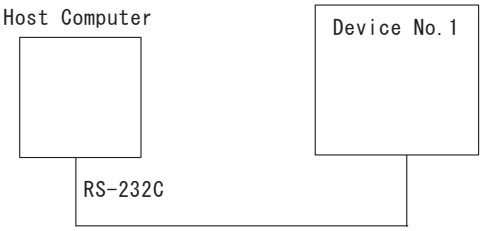


(Note 1) When controlling two or more devices with one host computer, register the device No. (**CONTROL#**) for each device. Set the device No. at **POWER SUPPLY STATE Screen** (See **4.(2)(b)**).

(Note 2) Do not assign one number to more than one device. Also, do not send data simultaneously from two or more devices in the single-directional communication mode. Otherwise, data collision and inappropriate system operations may result.

(Note 3) The RS-232C/RS-485 conversion adapter is not included in the accessories. It is required to prepare the adapter at customer's side.

② RS-232C



Only a device can be connected.

Protocol

1 Single-directional Communication Mode

(When --> is selected at **COMM CONTROL** in **MODE SELECT Screen**)

1) Monitor Data

IS-800CR/1400CR BASIC Data strings:

```
!01001:m,120,1.20,0.50,00.60,20.0,200,2.00,1.50,03.00,40.0,
 A  B C  D   E    F    G    H   I   J    K    L     M

300,2.50,2.00,05.00,50.0,2,0010,5,0100,2222,555555[CR][LF]
 N   O    P    Q     R   S T  U V    W    X
```

IS-800CR/1400CR ADVANCED Data strings:

```
!01001:m,120,01.20,0.50,00.60,20.0,200,02.00,1.50,03.00,40.0,
 A  B C  D    E    F     G    H   I   J    K    L     M

300,02.50,2.00,05.00,50.0,2,0010,5,0100,1,0000,1,0000,01,100,
 N    O    P    Q     R   S T  U V  W X  Y Z  AA AB

0100,2222,555555,05000,05000,05000,05000,05000,05000,+00.100,
 AC  AD   AE     AF    AG    AH    AI    AJ    AK     AL

+01.120[CR][LF]
  AM
```

A	Device No.	Fixed to 2 digits (01 to 31)
B	Schedule No.	Fixed to 3 digits (001 to 255)
C	Unit of monitor time	m: ms C: CYC
D	Monitor time of WE1	Fixed to 3 digits (000 to 999) (ms) Fixed to 3 digits (000 to 050) (CYC)
E	Monitor current of WE1	Fixed to 4 digits (0.00 to 9.99) (kA) Fixed to 4 digits (00.0 to 99.9) (kA)
F	Monitor voltage of WE1	Fixed to 4 digits (0.00 to 9.99) (V)
G	Monitor power of WE1	Fixed to 5 digits (00.00 to 09.99) (kW) Fixed to 5 digits (000.0 to 999.9) (kW)
H	Monitor pulse width of WE1	Fixed to 4 digits (10.0 to 99.9) (%)
I	Monitor time of WE2	Fixed to 3 digits (000 to 999) (ms) Fixed to 3 digits (000 to 050) (CYC)
J	Monitor current of WE2	Fixed to 4 digits (0.00 to 9.99) (kA) Fixed to 4 digits (00.0 to 99.9) (kA)
K	Monitor voltage of WE2	Fixed to 4 digits (0.00 to 9.99) (V)
L	Monitor power of WE2	Fixed to 5 digits (00.00 to 09.99) (kW) Fixed to 5 digits (000.0 to 999.9) (kW)
M	Monitor pulse width of WE2	Fixed to 4 digits (10.0 to 99.9) (%)

N	Monitor time of WE3	Fixed to 3 digits (000 to 999) (ms) Fixed to 3 digits (000 to 050) (CYC)
O	Monitor current of WE3	Fixed to 4 digits (0.00 to 9.99) (kA) Fixed to 4 digits (00.0 to 99.9) (kA)
P	Monitor voltage of WE3	Fixed to 4 digits (0.00 to 9.99) (V)
Q	Monitor power of WE3	Fixed to 5 digits (00.00 to 09.99) (kW) Fixed to 5 digits (000.0 to 999.9) (kW)
R	Monitor pulse width of WE3	Fixed to 4 digits (10.0 to 99.9) (%)
S	STEP No. of VALVE1	Fixed to 1 digit (1 to 9)
T	STEP COUNT of VALVE1	Fixed to 4 digits (0000 to 9999)
U	STEP No. of VALVE2	Fixed to 1 digit (1 to 9)
V	STEP COUNT of VALVE2	Fixed to 4 digits (0000 to 9999)
W	COUNTER (WELD/WELD COUNT of WORK)	Fixed to 4 digits (0000 to 9999)
X	COUNTER (WORK of TOTAL/GOOD/WORK)	Fixed to 6 digits (000000 to 999999)
The following additional commands are for IS-800CR/1400CR ADVANCED ONLY		
Y	STEP No. of VALVE4	Fixed to 1 digit (1 to 9)
Z	STEP COUNT of VALVE4	Fixed to 4 digits (0000 to 9999)
AA	STEP2 REPEAT	Fixed to 2 digits (01 to 99)
AB	STEP RATIO	Fixed to 3 digits (050 to 200)
AC	CAP CHANGE	Fixed to 4 digits (0000 to 9999)
AD	COUNTER (WELD/WELD COUNT of WORK)	Fixed to 4 digits (0000 to 9999)
AE	COUNTER (WORK of TOTAL/GOOD/WORK)	Fixed to 6 digits (000000 to 999999)
AF	FORCE of SQD	Fixed to 5 digits (00000 to 35000 (N), 00000 to 03569 (kgf), and 00000 to 07868 (lbf))
AG	FORCE of SQZ	
AH	FORCE of WELD1	
AI	FORCE of COOL1/WELD1	
AJ	FORCE of COOL2/WELD3	
AK	FORCE of HOLD	
AL	WORK DETECT	Fixed to 7 digits (-99.999 to +99.999 (mm))
AM	DISPLACEMENT	

2) Error Data

IS-800CR/1400CR BASIC Data strings:

!01000:E03,04,12,15,17[CR][LF]
A B C D E F G

A	Device No.	Fixed to 2 digits (01 to 31)
B	Schedule No.	Fixed to 3 digits (001 to 255)
C*1	Error Code 1	Fixed to 3 digits (E01 to E31)
D*1	Error Code 2	Fixed to 2 digits (01 to 31)
E*1	Error Code 3	Fixed to 2 digits (01 to 31)
F*1	Error Code 4	Fixed to 2 digits (01 to 31)
G*1	Error Code 5	Fixed to 2 digits (01 to 31)

IS-800CR/1400CR ADVANCED Data strings:

!01000:E03,04,12,15,17,19,22,26[CR][LF]
A B C D E F G H I J

A	Device No.	Fixed to 2 digits (01 to 31)
B	Schedule No.	Fixed to 3 digits (001 to 255)
C*1	Error code 1	Fixed to 3 digits (E01 to E39)
D*1	Error code 2	Fixed to 2 digits (01 to 39)
E*1	Error code 3	Fixed to 2 digits (01 to 39)
F*1	Error code 4	Fixed to 2 digits (01 to 39)
G*1	Error code 5	Fixed to 2 digits (01 to 39)
H*1	Error code 6	Fixed to 2 digits (01 to 39)
I*1	Error code 7	Fixed to 2 digits (01 to 39)
J*1	Error code 8	Fixed to 2 digits (01 to 39)

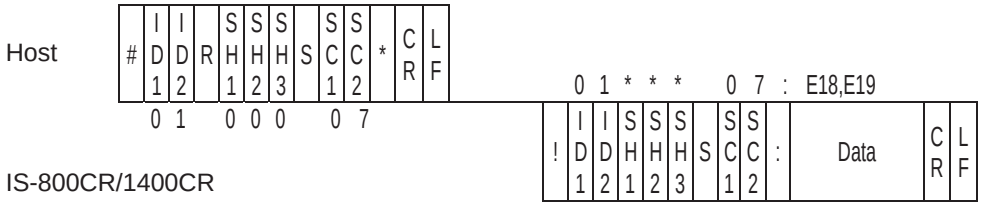
*1 The number of Error Codes is of five max. for IS-800CR/1400CR BASIC, max. 8 for ADVANCED. In the case of only one error code, the error codes D to G (BASIC) and D to J (ADVANCED) are omitted.
For Error Codes, see **12. (1) Fault Code List**.

*2 Error codes are transmitted when errors are detected.
For the monitored value error and counter error, however, the error is transmitted after the monitored data is transmitted.

2) Bi-directional Communication Mode
(When <--> is selected at **COMM CONTROL** in **MODE SELECT Screen**)

Reading of Trouble	Code: # Device No. R Schedule No. Screen No. *

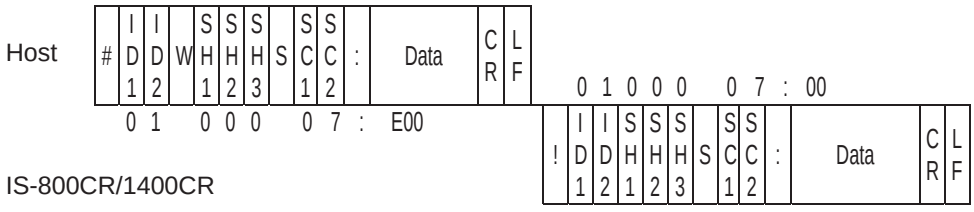
Example: Read all troubled data in the specified device, No. 01. (Schedule No. is “008” and Voltage error and Electric power error are occurring.)



1) Schedule numbers, SH1, SH2 and SH3 are fixed to 000.
   However, schedule numbers are sent from **IS-800CR/1400CR** when “E06: Current error”, “E18: Voltage error”, “E19: Electric power error” and “E07: Pulse width error” occurs.
2) Screen numbers, SC1 and SC2 are fixed to 07.
3) If there is no error, data of “00” returned.

Error Reset	Code: # Device No. W Schedule No. Screen No. Data

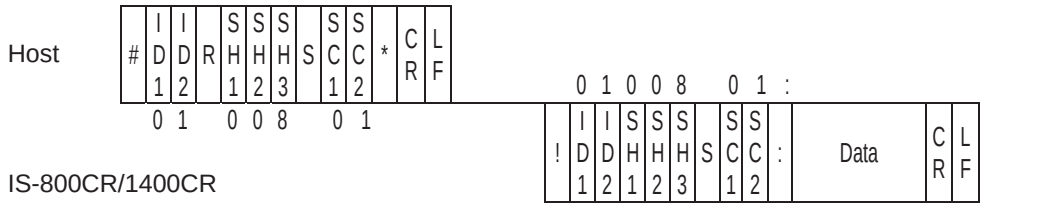
Example: Resets the trouble of the specified device, No. 01.



1) Schedule Nos, SH1, SH2 and SH3 are fixed to 000.
2) Screen Nos, SC1 and SC2 are fixed to 07.
3) “00” (no trouble) is returned as a confirmation data

Reading of Data	Code: # Device No. Screen No. R Schedule No. *

Example: Read all data of Screen No. “01” of Schedule No. “008” of the specified device No. 01.



Insert [,] between data for a schedule.

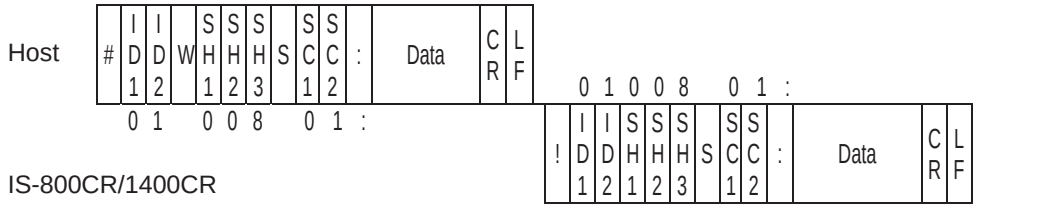
1) SH1, SH2 and SH3 are schedule numbers.
   Fixed to 3 digits (SH1=Hundred's place, SH2=Ten's place, SH3=One's place)
   However, screen 03, 05 and 07 are fixed to the schedule No. 000.

2) SC1 and SC2 are screen numbers.
   Fixed to 2 digits (SC1=Ten's place, SC2=One's place)

3) For the data order for a schedule of each screen No., see **(5) Data Code List**.

Setting of Data	Code: # Device No. W Schedule No. Screen No. Data

Example: Write data for a schedule of Screen No "01" of Schedule No. "008" of the specified device No. 01.



Insert [,] between data for a schedule.

1) SH1, SH2 and SH3 are schedule numbers.
   Fixed to 3 digits (SH1=Hundred's place, SH2=Ten's place, SH3=One's place)
   However, screen 03, 05 and 07 are fixed to 000 of schedule No.

2) SC1 and SC2 are screen numbers.
   Fixed to 2 digits (SC1=Ten's place, SC2=One's place)
   (Note) Screen 04 and 07 (1) are read only and cannot be written.

3) For the data order for a schedule and the screen No., see **(5) Data Code List**.

4) The set data is returned as a confirmation data. When data which is outside the range is set, previous data is returned.

5) It takes about 1 second at most to save data into the internal memory (READY is turned off during saving). Be careful when writing continuously.

Data Code Table

Screen 01 (SCHEDULE data) Specific data in accordance with Schedule No. (Schedule No.: 001 to 255)

Example of data writing (ADVANCED unit):

#01W001S01:0,0,0,m,0000,0000,000,000,000,0000,000,000,000,0000,000,000,000,00000,0000,1,00.50,00.50,00.50,00.50,00.50,00.50,00.50,00.50,00.50,01,000,01,000,01,000,1000,01,1,001.0,0,000,99.9,99.9,99.9,010,1[CR][LF]

Item	Contents	Character String	Range
1	Control mode of WELD1	n,	0 to 5 0: Primary constant-current effective value control 1: Secondary constant-current effective value control 2: Secondary constant-power effective value control 3: Primary constant-current peak value control 4: Secondary constant-voltage effective value control 5: Constant-phase control
2	Control mode of WELD2	n,	
3	Control mode of WELD3	n,	
4	Unit of time *1	n,	m: ms C: CYC
5	SQD / Squeeze delay time	nnnn,	0000 to 9999 (ms mode) 0000 to 0999 (CYC mode)
6	SQZ/ Squeeze time	nnnn,	0000 to 9999 (ms mode) 0000 to 0999 (CYC mode)
7	UP1 / Upslope 1 time	nnn,	000 to 999 (ms mode) 000 to 050 (CYC mode)
8	WELD1 / Weld 1 time	nnn,	000 to 999 (ms mode) 000 to 050 (CYC mode)
9	DOWN1 / Downslope 1 time	nnn,	000 to 999 (ms mode) 000 to 050 (CYC mode)
10	COOL1 / Cooling 1 time	nnnn,	0000 to 9999(ms mode) 0000 to 0999(CYC mode)
11	UP2 / Upslope 2 time	nnn,	000 to 999 (ms mode) 000 to 050 (CYC mode)
12	WELD2 / Weld 2 time	nnn,	000 to 999(ms mode) 000 to 050 (CYC mode)
13	DOWN2 / Downslope 2 time	nnn,	000 to 999 (ms mode) 000 to 050 (CYC mode)
14	COOL2 / Cooling 2 time	nnnn,	0000 to 9999 (ms mode) 0000 to 0999 (CYC mode)
15	UP3 / Upslope 3 time	nnn,	000 to 999(ms mode) 000 to 050 (CYC mode)
16	WELD3 / Weld 3 time	nnn,	000 to 999(ms mode) 000 to 050 (CYC mode)
17	DOWN3 / Downslope 3 time	nnn,	000 to 999(ms mode) 000 to 050 (CYC mode)
18	HOLD / Hold time	nnnnn,	00000 to 20000 (ms mode) 00000 to 00999 (CYC mode)
19	OFF / Off time	nnnn,	0000 to 9990 (ms mode) 0000 to 0099 (CYC mode)
20	CURR RANGE / Current range	n,	0: 051: 102: 203: 40 4: 80 (kA)

Item	Contents	Character String	Range
21	UF1 / Initial heat 1 of upslope	nnn.n,	004.0 to 120.0 (kW)*2
		nn.n,	04.0 to 80.0 (kA)*2 02.0 to 40.0 (kA) 04.0 to 60.0 (kW) 01.0 to 20.0 (kA, kW) 10.0 to 99.9 (%)
		n.nn,	0.50 to 9.99 / 0.05 to 5.00 (kA, kW) 0.20 to 9.99 (V)
22	HEAT1 / Heat 1	nnn.n,	004.0 to 120.0 (kW)*2
		nn.n,	04.0 to 80.0 (kA)*2 02.0 to 40.0 (kA) 04.0 to 60.0 (kW) 01.0 to 20.0 (kA, kW) 10.0 to 99.9 (%)
		n.nn,	0.50 to 9.99 / 0.05 to 5.00 (kA, kW) 0.20 to 9.99 (V)
23	DL1 / End heat 1 of downslope	nnn.n,	004.0 to 120.0 (kW)*2
		nn.n,	04.0 to 80.0 (kA)*2 02.0 to 40.0 (kA) 04.0 to 60.0 (kW) 01.0 to 20.0 (kA, kW) 10.0 to 99.9 (%)
		n.nn,	0.50 to 9.99 / 0.05 to 5.00 (kA, kW) 0.20 to 9.99 (V)
24	UF2 / Initial heat 2 of upslope	nnn.n,	004.0 to 120.0 (kW)*2
		nn.n,	04.0 to 80.0 (kA)*2 02.0 to 40.0 (kA) 04.0 to 60.0 (kW) 01.0 to 20.0 (kA, kW) 10.0 to 99.9 (%)
		n.nn,	0.50 to 9.99 / 0.05 to 5.00 (kA, kW) 0.20 to 9.99 (V)
25	HEAT2 / Heat 2	nnn.n,	004.0 to 120.0 (kW)*2
		nn.n,	04.0 to 80.0 (kA)*2 02.0 to 40.0 (kA) 04.0 to 60.0 (kW) 01.0 to 20.0 (kA, kW) 10.0 to 99.9 (%)
		n.nn,	0.50 to 9.99 / 0.05 to 5.00 (kA, kW) 0.20 to 9.99 (V)
26	DL2 / End heat 2 of downslope	nnn.n,	004.0 to 120.0 (kW)*2
		nn.n,	04.0 to 80.0 (kA)*2 02.0 to 40.0 (kA) 04.0 to 60.0 (kW) 01.0 to 20.0 (kA, kW) 10.0 to 99.9 (%)
		n.nn,	0.50 to 9.99 / 0.05 to 5.00 (kA, kW) 0.20 to 9.99 (V)

Item	Contents	Character String	Range
27	UF3 / Initial heat 3 of upslope	nnn.n,	004.0 to 120.0 (kW)*2
		nn.n,	04.0 to 80.0 (kA)*2 02.0 to 40.0 (kA) 04.0 to 60.0 (kW) 01.0 to 20.0 (kA, kW) 10.0 to 99.9 (%)
		n.nn,	0.50 to 9.99 / 0.05 to 5.00 (kA, kW) 0.20 to 9.99 (V)
28	HEAT3 / Heat 3	nnn.n,	004.0 to 120.0 (kW)*2
		nn.n,	04.0 to 80.0 (kA)*2 02.0 to 40.0 (kA) 04.0 to 60.0 (kW) 01.0 to 20.0 (kA, kW) 10.0 to 99.9 (%)
		n.nn,	0.50 to 9.99 / 0.05 to 5.00 (kA, kW) 0.20 to 9.99 (V)
29	DL3 / End heat 3 of downslope	nnn.n,	004.0 to 120.0 (kW)*2
		nn.n,	04.0 to 80.0 (kA)*2 02.0 to 40.0 (kA) 04.0 to 60.0 (kW) 01.0 to 20.0 (kA, kW) 10.0 to 99.9 (%)
		n.nn,	0.50 to 9.99 / 0.05 to 5.00 (kA, kW) 0.20 to 9.99 (V)
30	PULSATION of WE1 / WE1 repetition	nn,	00 to 19
31	INT1 / Interval 1	nnn,	000 to 999 (ms mode) 000 to 050 (CYC mode)
32	PULSATION of WE2 / WE2 repetition	nn,	00 to 19
33	INT2 / Interval 2	nnn,	000 to 999 (ms mode) 000 to 050 (CYC mode)
34	PULSATION of WE3 / WE3 repetition	nn,	00 to 19
35	INT3 / Interval 3	nnn,	000 to 999 (ms mode) 000 to 050 (CYC mode)
36	WELD TRANS FREQ / Welding transformer frequency	nnnn,	0600 to 3000 (Hz) Note) The last 2 digits are fixed to 00.
37	GAIN	nn,	1 to 9
38	VALVE	n,	1 to 2
39	TURN RATIO	nnn.n,	001.0 to 199.9
40	WELD ON/OF	n,	0: OFF 1: ON
41	VOLT COMP	nnn,	Fixed to 3 digits (000 to 100) (%)
42	PULSE LIM of WE1	nn.n,	Fixed to 4 digits (10.0 to 99.9) (%)
43	PULSE LIM of WE2	nn.n,	Fixed to 4 digits (10.0 to 99.9) (%)
44	PULSE LIM of WE3	nn.n	Fixed to 4 digits (10.0 to 99.9) (%)
	The following is additional data for IS-800CR/1400CR ADVANCED		
45	MAX CURRENT	nnn,	005 to 80 (kA)
46	TRANS#	n	1

*1 The setting of ms/CYC cannot be changed. You can change it via Screen 05 (SYSTEM data).

*2 **IS-1400A** only

*3 Screen 02 (MONITOR SET data) Specific data in accordance with Schedule No. (Schedule

No.: 001 to 255)

Example of data writing (BASIC and ADVANCED):
#01W001S02:999,000,99.99,00.00,9.99,0.00,99.99,00.00,100.0,999,000,99.99,00.00,9.99,0.00,99.99,00.00,100.0,999,000,99.99,00.00,9.99,0.00,99.99,00.00,100.0[CR][LF]

Item	Contents	Character String	Range
1	TIME H of WE1 (upper limit)	nnn,	000 to 999 (ms mode) 000 to 050 (CYC mode)
2	TIME L of WE1 (lower limit)	nnn,	000 to 999 (ms mode) 000 to 050 (CYC mode)
3	CURRENT H of WE1 (upper limit)	n.nn,	0.00 to 9.99 (kA)
		nn.n,	00.0 to 99.9 (kA)
4	CURRENT L of WE1 (lower limit)	n.nn,	0.00 to 9.99 (kA)
		nn.n,	00.0 to 99.9 (kA)
5	VOLT H of WE1 (upper limit)	n.nn,	0.00 to 9.99 (V)
6	VOLT L of WE1 (lower limit)	n.nn,	0.00 to 9.99 (V)
7	POWER H of WE1 (upper limit)	nn.nn,	00.00 to 99.99 (kW)
		nnn.n,	000.0 to 999.9 (kW)
8	POWER L of WE1 (lower limit)	nn.nn,	00.00 to 99.99 (kW)
		nnn.n,	000.0 to 999.9 (kW)
9	PULSE H of WE1 (upper limit)	nnn.n,	010 to 100 (%)
10	TIME H of WE2 (upper limit)	nnn,	000 to 999 (ms mode) 000 to 050 (CYC mode)
11	TIME L of WE2 (lower limit)	nnn,	000 to 999 (ms mode) 000 to 050 (CYC mode)
12	CURRENT H of WE2 (upper limit)	n.nn,	0.00 to 9.99 (kA)
		nn.n,	00.0 to 99.9 (kA)
13	CURRENT L of WE2 (lower limit)	n.nn,	0.00 to 9.99 (kA)
		nn.n,	00.0 to 99.9 (kA)
14	VOLT H of WE2 (upper limit)	n.nn,	0.00 to 9.99 (V)
15	VOLT L of WE2 (lower limit)	n.nn,	0.00 to 9.99 (V)
16	POWER H of WE2 (upper limit)	nn.nn,	00.00 to 99.99 (kW)
		nnn.n,	000.0 to 999.9 (kW)
17	POWER L of WE2 (lower limit)	nn.nn,	00.00 to 99.99 (kW)
		nnn.n,	000.0 to 999.9 (kW)
18	PULSE H of WE2 (upper limit)	nnn.n,	010 to 100 (%)
19	TIME H of WE3 (upper limit)	nnn,	000 to 999 (ms mode) 000 to 050 (CYC mode)
20	TIME L of WE3 (lower limit)	nnn,	000 to 999 (ms mode) 000 to 050 (CYC mode)
21	CURRENT H of WE3 (upper limit)	n.nn,	0.00 to 9.99 (kA)
		nn.n,	00.0 to 99.9 (kA)
22	CURRENT L of WE3 (lower limit)	n.nn,	0.00 to 9.99 (kA)
		nn.n,	00.0 to 99.9 (kA)
23	VOLT H of WE3 (upper limit)	n.nn,	0.00 to 9.99 (V)
24	VOLT L of WE3 (lower limit)	n.nn,	0.00 to 9.99 (V)
25	POWER H of WE3 (upper limit)	nn.nn,	00.00 to 99.99 (kW)
		nnn.n,	000.0 to 999.9 (kW)
26	POWER L of WE3 (lower limit)	nn.nn,	00.00 to 99.99 (kW)

		nnn.n,	000.0 to 999.9 (kW)
27	PULSE H of WE3 (upper limit)	nnn.n	010 to 100 (%)

IS-800CR/1400CR BASIC: Screen 03 (STEPPER data) Common data (Schedule No.: 000)

Item	Contents	Character String	Range
1	START ON STEP # of VALVE1	n,	1 to 9
2	STEP1 COUNT of VALVE1	nnnn,	0000 to 9999
3	STEP2 COUNT of VALVE1	nnnn,	0000 to 9999
4	STEP2 RATIO of VALVE1	nnn,	050 to 200 (%)
5	STEP3 COUNT of VALVE1	nnnn,	0000 to 9999
6	STEP3 RATIO of VALVE1	nnn,	050 to 200 (%)
7	STEP4 COUNT of VALVE1	nnnn,	0000 to 9999
8	STEP4 RATIO of VALVE1	nnn,	050 to 200 (%)
9	STEP5 COUNT of VALVE1	nnnn,	0000 to 9999
10	STEP5 RATIO of VALVE1	nnn,	050 to 200 (%)
11	STEP6 COUNT of VALVE1	nnnn,	0000 to 9999
12	STEP6 RATIO of VALVE1	nnn,	050 to 200 (%)
13	STEP7 COUNT of VALVE1	nnnn,	0000 to 9999
14	STEP7 RATIO of VALVE1	nnn,	050 to 200 (%)
15	STEP8 COUNT of VALVE1	nnnn,	0000 to 9999
16	STEP8 RATIO of VALVE1	nnn,	050 to 200 (%)
17	STEP9 COUNT of VALVE1	nnnn,	0000 to 9999
18	STEP9 RATIO of VALVE1	nnn,	050 to 200 (%)
19	START ON STEP # of VALVE2	n,	1 to 9
20	STEP1 COUNT of VALVE2	nnnn,	0000 to 9999
21	STEP2 COUNT of VALVE2	nnnn,	0000 to 9999
22	STEP2 RATIO of VALVE2	nnn,	050 to 200 (%)
23	STEP3 COUNT of VALVE2	nnnn,	0000 to 9999
24	STEP3 RATIO of VALVE2	nnn,	050 to 200 (%)
25	STEP4 COUNT of VALVE2	nnnn,	0000 to 9999
26	STEP4 RATIO of VALVE2	nnn,	050 to 200 (%)
27	STEP5 COUNT of VALVE2	nnnn,	0000 to 9999
28	STEP5 RATIO of VALVE2	nnn,	050 to 200 (%)
29	STEP6 COUNT of VALVE2	nnnn,	0000 to 9999
30	STEP6 RATIO of VALVE2	nnn,	050 to 200 (%)
31	STEP7 COUNT of VALVE2	nnnn,	0000 to 9999
32	STEP7 RATIO of VALVE2	nnn,	050 to 200 (%)
33	STEP8 COUNT of VALVE2	nnnn,	0000 to 9999
34	STEP8 RATIO of VALVE2	nnn,	050 to 200 (%)
35	STEP9 COUNT of VALVE2	nnnn,	0000 to 9999
36	STEP9 RATIO of VALVE2	nnn	050 to 200 (%)

IS-800CR/1400CR ADVANCED: Screen 03 (STEPPER data) Common data (Valve No.: 001 to 004)

Example of data writing:
#01W001S03:1,0000,0,0000,100,0,0000,100,0,0000,100,0,0000,100,0,0000,100,0,0000,100,0,0000,100,0,0000,100,0,01,0000[CR][LF]

Item	Contents	Character String	Range
1	START ON STEP #	n,	1 to 9
2	COUNT of STEP1	nnnn,	0000 to 9999
3	TIP DRESS of STEP1	n,	0:OFF 1:ON(X)
4	COUNT of STEP2	nnnn,	0000 to 9999
5	RATIO of STEP2	nnn,	050 to 200(%)
6	TIP DRESS of STEP2	n,	0:OFF 1:ON(X)
7	COUNT of STEP3	nnnn,	0000 to 9999
8	RATIO of STEP3	nnn,	050 to 200(%)
9	TIP DRESS of STEP3	n,	0:OFF 1:ON(X)
10	COUNT of STEP4	nnnn,	0000 to 9999
11	RATIO of STEP4	nnn,	050 to 200(%)
12	TIP DRESS of STEP4	n,	0:OFF 1:ON(X)
13	COUNT of STEP5	nnnn,	0000 to 9999
14	RATIO of STEP5	nnn,	050 to 200(%)
15	TIP DRESS of STEP5	n,	0:OFF 1:ON(X)
16	COUNT of STEP6	nnnn,	0000 to 9999
17	RATIO of STEP6	nnn,	050 to 200(%)
18	TIP DRESS of STEP6	n,	0:OFF 1:ON(X)
19	COUNT of STEP7	nnnn,	0000 to 9999
20	RATIO of STEP7	nnn,	050 to 200(%)
21	TIP DRESS of STEP7	n,	0:OFF 1:ON(X)
22	COUNT of STEP8	nnnn,	0000 to 9999
23	RATIO of STEP8	nnn,	050 to 200(%)
24	TIP DRESS of STEP8	n,	0:OFF 1:ON(X)
25	COUNT of STEP9	nnnn,	0000 to 9999
26	RATIO of STEP9	nnn,	050 to 200(%)
27	TIP DRESS of STEP9	n,	0:OFF 1:ON(X)
28	STEP2 REPEAT	nn,	01 to 99
29	CAP CHANGE	nnnn	0000 to 9999

IS-800CR/1400CR BASIC: Screen 04 (MONITOR data) (Data reading only) Specific data in accordance with Schedule No. (Schedule No.: 001 to 255)

Item	Contents	Character String	Range
1	Unit of time	n,	m: ms C: CYC
2	TIME of WELD1	nnn,	000 to 999 (ms mode) 000 to 050 (CYC mode)
3	CURRENT of WELD1	n.nn,	0.00 to 9.99 (kA)
		nn.n,	00.0 to 99.9 (kA)
4	VOLT of WELD1	n.nn,	0.00 to 9.99 (V)
5	POWER of WELD1	nn.nn,	00.00 to 99.99 (kW)
		nnn.n,	000.0 to 999.9 (kW)
6	PULSE of WELD1	nn.n,	00.0 to 99.9 (%)
7	TIME of WELD2	nnn,	000 to 999 (ms mode) 000 to 050 (CYC mode)
8	CURRENT of WELD2	n.nn,	0.00 to 9.99 (kA)
		nn.n,	00.0 to 99.9 (kA)
9	VOLT of WELD2	n.nn,	0.00 to 9.99 (V)
10	POWER of WELD2	nn.nn,	00.00 to 99.99 (kW)
		nnn.n,	000.0 to 999.9 (kW)
11	PULSE of WELD2	nn.n,	00.0 to 99.9 (%)
12	TIME of WELD3	nnn,	000 to 999 (ms mode) 000 to 050 (CYC mode)
13	CURRENT of WELD3	n.nn,	0.00 to 9.99 (kA)
		nn.n,	00.0 to 99.9 (kA)
14	VOLT of WELD3	n.nn,	0.00 to 9.99 (V)
15	POWER of WELD3	nn.nn,	00.00 to 99.99 (kW)
		nnn.n,	000.0 to 999.9 (kW)
16	PULSE of WELD3	nn.n,	00.0 to 99.9 (%)
17	STEP # of VALVE1	n,	1 to 9
18	STEPPER COUNT of VALVE1	nnnn,	0000 to 9999
19	STEP # of VALVE2	n,	1 to 9
20	STEPPER COUNT of VALVE2	nnnn,	0000 to 9999
21	COUNTER (WELD/WELD COUNT of WORK)	nnnn,	0000 to 9999
22	COUNTER (WORK of TOTAL/GOOD/WORK)	nnnnnn	000000 to 999999

IS-800CR/1400CR ADVANCED: Screen 04 (MONITOR data) (Data reading only) Specific data in accordance with Schedule No. (Schedule No.: 001 to 255)

Item	Contents	Character String	Range
1	Unit of time	n,	m: ms C: CYC
2	TIME of WELD1	nnn,	000 to 999 (ms mode) 000 to 050 (CYC mode)
3	CURRENT of WELD1	nn.nn,	00.00 to 9.999 (kA)
		nnn.n,	000.0 to 999.9 (kA)
4	VOLT of WELD1	n.nn,	0.00 to 9.99 (V)
5	POWER of WELD1	nn.nn,	00.00 to 99.99 (kW)
		nnn.n,	000.0 to 999.9 (kW)
6	PULSE of WELD1	nn.n,	00.0 to 99.9 (%)
7	TIME of WELD2	nnn,	000 to 999 (ms mode) 000 to 050 (CYC mode)
8	CURRENT of WELD2	nn.nn,	00.00 to 9.999 (kA)
		nnn.n,	000.0 to 999.9 (kA)
9	VOLT of WELD2	n.nn,	0.00 to 9.99 (V)
10	POWER of WELD2	nn.nn,	00.00 to 99.99 (kW)
		nnn.n,	000.0 to 999.9 (kW)
11	PULSE of WELD2	nn.n,	00.0 to 99.9 (%)
12	TIME of WELD3	nnn,	000 to 999 (ms mode) 000 to 050 (CYC mode)
13	CURRENT of WELD3	nn.nn,	00.00 to 9.999 (kA)
		nnn.n,	000.0 to 999.9 (kA)
14	VOLT of WELD3	n.nn,	0.00 to 9.99 (V)
15	POWER of WELD3	nn.nn,	00.00 to 99.99 (kW)
		nnn.n,	000.0 to 999.9 (kW)
16	PULSE of WELD3	nn.n,	00.0 to 99.9 (%)
17	STEP # of VALVE1	n,	1 to 9
18	STEPPER COUNT of VALVE1	nnnn,	0000 to 9999
19	STEP # of VALVE2	n,	1 to 9
20	STEPPER COUNT of VALVE2	nnnn,	0000 to 9999
21	STEP # of VALVE3	n,	1 to 9
22	STEPPER COUNT of VALVE3	nnnn,	0000 to 9999
23	STEP # of VALVE4	n,	1 to 9
24	STEPPER COUNT of VALVE4	nnnn,	0000 to 9999
25	STEP2 REPAT	nn,	01 to 99
26	STEP RATIO	nnn,	050 to 200(%)
27	CAP CHANGE	nnnn,	0000 to 9999
28	COUNTER (WELD/WELD COUNT of WORK)	nnnn,	0000 to 9999
29	COUNTER (WORK of TOTAL/GOOD/WORK)	nnnnnn	000000 to 999999
30	SQD FORCE	nnnnn,	00000 to 35000(N) 00000 to 03569(kgf) 00000 to 07868(lbf)
31	SQZ FORCE	nnnnn,	
32	WE1 FORCE	nnnnn,	
33	COOL1/WELD1 FORCE	nnnnn,	
34	COOL2/WELD3 FORCE	nnnnn,	
35	HOLD FORCE	nnnnn,	
36	WORK DETECT	+nn.nnn, -nn.nnn,	-99.999 to +99.999(mm)
37	DISPLACEMENT	+nn.nnn, -nn.nnn,	

Screen 05 (PRE-CHECK data) Specific data in accordance with Schedule No. (Schedule No.: 001 to 255)

Item	Contents	Character String	Range
1	PRECHECK TIME	nnn,	000 to 100 (ms)
2	PRECHECK HEAT	nn.n,	10.0 to 99.9 (%)
3	PRECHECK RESISTANCE HIGH	nn.nn,	00.00 to 99.99 (mΩ)
4	PRECHECK RESISTANCE LOW	nn.nn,	00.00 to 99.99 (mΩ)
5*1	PRECHECK MONITOR	nn.nn	00.00 to 99.99 (mΩ)

*1 Items inhibited from setting (When setting data, omit these items.)

IS-800CR/1400CR BASIC: Screen 06 (SYSTEM data) Common data (Schedule No.: 000)

Item	Contents	Character String	Range
1*1	POWER SOURCE FREQUENCY	nn,	50 or 60 (Hz)
2*1	Model name	nnnnnnnn,	ISB-800A or ISB1400A (IS-800CR/1400CR is NEMA style version of ISB-800A/1400A)
3*1	ROM VERSION	Vnn-nnn,	V00-00A ~
4	DELAY START SET	nn,	01 to 20 (ms)
5	START SIGNAL MODE	n,	0: LATCHED 1: PULSED 2: MAINTAINED
6	END SIGNAL TIME	nnn,	000, 010 to 200 (ms)
7	END SIGNAL MODE	n,	0, 1, 2
8	WELD1 STOP/PARITY CHECK	n,	0: WELD1 STOP 1: PARITY CHECK
9	WELD2 STOP/WELD COUNT	n,	0: WELD2 STOP 1: WELD COUNT
10	WELD3 STOP/COUNT RESET	n,	0: WELD3 STOP 1: COUNT RESET
11	WELD TIME	n,	0: ms 1: CYC
12	RE-WELD	n,	0: OFF 1: ON
13	SCHEDULE	n,	0: EXT 1: INT
14	STEPPER MODE	n,	0: OFF 1: FIXED 2: LINER
15	COUNTER	n,	0: TOTAL 1: GOOD 2: WORK
16	COMM CONTROL	n,	0: OFF 1: --->2: <--->
17	COMM SPEED	n,	0: 9.6k 1: 19.2k 2: 38.4k
18	COMM MODE	n,	0: RS-485 1: RS-232C
19	MONI DISP MODE	n,	0: NORMAL 1: LAST
20	PRESET COUNT	n,	0: TOTAL/GOOD 1: WELD/WORK
21	TOTAL/GOOD of PRESET COUNT	nnnnnn,	000000 to 999999
22	WELD of WELD/WORK, PRESET COUNT	nnnn,	0000 to 9999
23	WORK of WELD/WORK, PRESET COUNT	nnnnnn,	000000 to 999999
24	NO CURRENT TIME	nn,	01 to 99 (ms)
25	NO CURRENT LEVEL	n.nn,	0.00 to 9.99 (kA)
26	NO VOLTAGE LEVEL	n.nn,	0.00 to 9.99 (V)
27	MONITOR FIRST TIME	nn,	00 to 15 (ms)

Item	Contents	Character String	Range
28	MONITOR SLOPE MODE	n,	0: EXCLUDE 1: INCLUDE
29	WELD STOP OFF TIME of WELD1	nnn,	000 to 999 (ms)
30	WELD STOP OFF TIME of WELD2	nnn,	000 to 999 (ms)
31	WELD STOP OFF TIME of WELD3	nnn,	000 to 999 (ms)
32	OUTPUT MODE of NG SIGNAL SELECT	n,	0: N.C. 1: N.O.
33	TIME-OVER of NG SIGNAL SELECT	n,	0: ERROR 1: CAUTION
34	CURR-OVER of NG SIGNAL SELECT	n,	0: ERROR 1: CAUTION
35	VOLT-OVER of NG SIGNAL SELECT	n,	0: ERROR 1: CAUTION
36	POWER-OVER of NG SIGNAL SELECT	n,	0: ERROR 1: CAUTION
37	PULSE-OVER of NG SIGNAL SELECT	n,	0: ERROR 1: CAUTION
38	NO CURR of NG SIGNAL SELECT	n,	0: ERROR 1: CAUTION
39	WRK ERR of NG SIGNAL SELECT	n,	0: ERROR 1: CAUTION
40*1	PROGRAM PROTECT	n	0: OFF 1: ON

*1 Items inhibited from setting (When setting data, omit these items.)
"," is not transmitted, too. In other words, the 4th item (DELAY START SET) will be the first data.

IS-800CR/1400CR ADVANCED: Screen 06 (SYSTEM data) Common data (Schedule No.: 000)

Example of data writing:
#01W000S06:20,0,200,0,0,0,0,0,0,0,0,0,0,000000,0000,000000,0000,50,0.00,0.00,15,0,000,000,000,0,1,1,1,1,1,0,0,0,1,2014,02,27,0,0,0,0,1,2,3,4,1.0[CR][LF]

Item	Contents	Character String	Range
1*1	POWER SOURCE FREQUENCY	nn,	50 or 60 (Hz)
2*1	Model name	nnnnnnnn,	ISB-800A or ISB1400A
3*1	ROM VERSION	Vnn-nnn,	V00-00A to
4	DELAY START SET	nn,	01 to 20 (ms)
5	START SIGNAL MODE	n,	0: LATCHED 1: PULSED 2: MAINTAINED
6	END SIGNAL TIME	nnn,	000, 010 to 200 (ms)
7	END SIGNAL MODE	n,	0, 1, 2
8	WELD1 STOP/PARITY CHECK	n,	0:WELD1 STOP 1:PARITY CHECK
9	WELD2 STOP/WELD COUNT	n,	0:WELD2 STOP 1:WELD COUNT
10	WELD3 STOP/COUNT RESET	n,	0:WELD3 STOP 1:COUNT RESET
11	WELD TIME	n,	0: ms 1: CYC
12	RE-WELD	n,	0: OFF 1: ON
13	SCHEDULE	n,	0:EXT 1:INT
14	STEPPER MODE	n,	0:OFF 1:FIXED 2:LINER
15	COUNTER	n,	0:TOTAL 1:GOOD 2:WORK
16	COMM CONTROL	n,	0:OFF 1:--->2:<--->

Item	Contents	Character String	Range
17	COMM SPEED	n,	0:9.6k 1:19.2k 2:38.4k
18	COMM MODE	n,	0:RS-485 1:RS-232C
19	MONI DISP MODE	n,	0:NORMAL 1:LAST
20	PRESET COUNT	n,	0:TOTAL/GOOD 1:WELD/WORK
21	TOTAL/GOOD of PRESET COUNT	nnnnnn,	000000 to 999999
22	WELD of WELD/WORK, PRESET COUNT	nnnn,	0000 to 9999
23	WORK of WELD/WORK, PRESET COUNT	nnnnnn,	000000 to 999999
24	NO CURRENT TIME	nn,	01 to 99 (ms)
25	NO CURRENT LEVEL	n.nn,	0.00 to 9.99 (kA)
26	NO VOLTAGE LEVEL	n.nn,	0.00 to 9.99 (V)
27	MONITOR FIRST TIME	nn,	00 to 15 (ms)
28	MONITOR SLOPE MODE	n,	0: EXCLUDE1: INCLUDE
29	WELD STOP OFF TIME of WELD1	nnn,	000 to 999(ms)
30	WELD STOP OFF TIME of WELD2	nnn,	000 to 999(ms)
31	WELD STOP OFF TIME of WELD3	nnn,	000 to 999(ms)
32	OUTPUT MODE of NG SIGNAL SELECT	n,	0:N.C. 1:N.O.
33	TIME-OVER of NG SIGNAL SELECT	n,	0:ERROR 1:CAUTION
34	CURR-OVER of NG SIGNAL SELECT	n,	0:ERROR 1:CAUTION
35	VOLT-OVERof NG SIGNAL SELECT	n,	0:ERROR 1:CAUTION
36	POWER-OVER of NG SIGNAL SELECT	n,	0:ERROR 1:CAUTION
37	PULSE-OVER of NG SIGNAL SELECT	n,	0:ERROR 1:CAUTION
38	NO CURR of NG SIGNAL SELECT	n,	0:ERROR 1:CAUTION
39	WRK ERR of NG SIGNAL SELECT	n,	0:ERROR 1:CAUTION
40	WORK OVER of NG SIGNAL SELECT	N,	0:ERROR 1:CAUTION
41	DISPLOVER of NG SIGNAL SELECT	n,	0:ERROR 1:CAUTION
42*1	PROGRAM PROTECT	n	0:OFF1:ON
43*1	CONTRAST	n,	0 to 9
44*1	CONTROL#	nn,	01 to 31
45	PROGRAMD DATE YEAR	nnnn,	2000 to 2099
46	PROGRAMD DATE MONTH	nn,	01 to 12
47	PROGRAMD DATE DAY	nn,	01 to 31
48	LANGUAGE	n,	0:ENGLISH 1:JAPANESE
49	FLOW SWITCH/PRG PROTECT	n,	0:FLOW SWITCH 1:PRG PROTECT
50	VALVEMODE	n,	0:1 VALVE 1:2 VALVE
51	SCANMODE	n,	0:OFF

Item	Contents	Character String	Range
52	OUTPUT1	n,	0:END 1:COUNTERROR 2:READY 3:STEPEND 4:WELDSIGNAL 5:GOOD 6:COUNTUP 7:OUTI 8:OUTII
53	OUTPUT2	n,	
54	OUTPUT3	n,	
55	OUTPUT4	n,	
56	OUTPUT5	n,	
57	DISPL SENSOR STEP	n.n	0.5 to 5.0(um)

*1 Items inhibited from setting (When setting data, omit these items.)
"," is not transmitted, too.

IS-800CR/1400CR BASIC: Screen 07 (Error data) Common data (Schedule No.: 000)

- Error data confirmation (Data reading only)

Item	Contents	Character String	Range
1	Error code 1	nnn,	E01 to E32
2	Error code 2	nn,	01 to 32
3	Error code 3	nn,	01 to 32
4	Error code 4	nn,	01 to 32
5	Error code 5	nn	01 to 32

The number of Error Codes is of five max. In the case of only one error code, the items 2 to 5 are omitted.
For Error Codes, see **12. (1) Fault Code List**.

IS-800CR/1400CR ADVANCED: Screen 07 (Error data) Common data (Schedule No.: 000)

- Error data confirmation (Data reading only)

Item	Contents	Character String	Range
1	Error code 1	nnn,	E01 to E39
2	Error code 2	nn,	01 to 39
3	Error code 3	nn,	01 to 39
4	Error code 4	nn,	01 to 39
5	Error code 5	nn,	01 to 39
6	Error code 6	nn,	01 to 39
7	Error code 7	nn,	01 to 39
8	Error code 8	nn	01 to 39

The number of error codes is of eight max. In the case of only one error code, the items 2 to 8 are omitted.
For error codes, see **12. (1) Fault Code List**.

- Error reset (Data setting only)

Item	Contents	Character String	Range
1	Error reset	nnn	E00

IS-800CR/1400CR ADVANCED: Screen 08 FORCE SETUP screen Specific data in accordance with Schedule No. (Schedule No.: 001 to 255)

Example of data writing:
#01W001S08:1,02000,02100,02200,02300,02400,02500,1,0,0,00000,0[CR][LF]

Item	Contents	Character String	Range
1*1	STEP MODE	n,	0:OFF 1:ON
2	PROPVALVE#	n,	1 to 2
3	SQD FORCE	nnnnn,	00000 to 35000(N) 00000 to 03569(kgf) 00000 to 07868(lbf)
4	SQZ FORCE	nnnnn,	
5	WELD1 FORCE	nnnnn,	
6	COOL1/WELD2 FORCE	nnnnn,	
7	COOL2/WELD3 FORCE	nnnnn,	
8	HOLD FORCE	nnnnn,	
9*1	VALVE#	n,	1 to 4
10	FORGE VALVE#	n,	1 to 2
11	CHAINING	n,	0:OFF 1:ON
12	SUCCESSIVE	n,	0:OFF 1:ON
13	FORGE DELAY	nnnnn,	00000 to 30000(ms)
14	FORGE MODE	n	0:OFF 1:ON

*1 Items inhibited from setting (When setting data, omit these items.)
“,” is not transmitted, too.

IS-800CR/1400CR ADVANCED: Screen 09 DISPLACEMENT screen Specific data in accordance with Schedule No. (Schedule No.: 001 to 255)

Example of data writing:
#01W001S09:0,0,0,0000000,0000000,0000000,+00.000,+00.000,+00.000,+00.000,000[CR][LF]

Item	Contents	Character String	Range
1	WELD1STOP INPUT	n,	0:OFF 1:DISPLC 2:CURR 3:VOLT 4:POWER 5:PULSE
2	WELD2STOP INPUT	n,	
3	WELD3STOP INPUT	n,	
4	WELD1CONDITION	nnnnnnn, +nn.nnn, -nn.nnn, nnnn.nn, nnnnn.n,	WELD STOP INPUT: OFF 0000000 WELD STOP INPUT: DISPLC -99.999 to +99.999(mm) WELD STOP INPUT: CURR 0000.05 to 0005.00(kA) 5kA range 0000.50 to 0009.99(kA) 10kA range 00001.0 to 00020.0(kA) 20kA range 00002.0 to 00040.0(kA) 40kA range 00004.0 to 00080.0(kA) 80kA range*1 WELD STOP INPUT: VOLT 0000.20 to 0009.99(V) WELD STOP INPUT: POWER 0000.05 to 0005.00(kW) 5kA range 0000.50 to 0009.99(kW) 10kA range 00001.0 to 00020.0(kW) 20kA range 00002.0 to 00060.0(kW) 40kA range 00004.0 to 00120.0(kW) 80kA range*1 WELD STOP INPUT: PULSE 00010.0 to 00099.9(%)
5	WELD2CONDITION	nnnnnnn, +nn.nnn, -nn.nnn, nnnn.nn, nnnnn.n,	
6	WELD3CONDITION	nnnnnnn, +nn.nnn, -nn.nnn, nnnn.nn, nnnnn.n,	
7	WORKDETECTLIMIT HIGH	+nn.nnn, -nn.nnn,	-99.999 to +99.999(mm)
8	WORKDETECTLIMIT LOW	+nn.nnn, -nn.nnn,	-99.999 to +99.999(mm)
9	DISPLACEMENT LIMIT HIGH	+nn.nnn, -nn.nnn,	-99.999 to +99.999(mm)
10	DISPLACEMENT LIMIT HIGH	+nn.nnn, -nn.nnn,	-99.999 to +99.999(mm)
11	DISPLACEMENT DELAY TIME	nnn	000 to 999(ms)

*1 **ISB-1400A** only

IS-800CR/1400CR ADVANCED: Screen 10 PRESSURE REGULATOR screen Common data (Schedule No.: 000)

Example of data writing:
#01W000S10:1,0,0,200.0,0.40,00000,00000,00000,000.0,0.00,00000,00000,00000[CR][LF]

Item	Contents	Character String	Range
1	FORCE CONTROL MODE	n,	1 to 4

2	FORCE UNIT	n,	0:N 1:kgf 2:lbf
3	AIR PRESSURE UNIT	n,	0:Mpa 1:bar 2:psi
4	AIR CYLINDER DIAMETER of VALVE1	nnn.n,	000.0 to 500.0(mm)
5	MAX AIR PRESSURE of VALVE1	n.nn, nn.n, nnnn,	0.00 to 1.00(Mpa) 00.0 to 10.0(bar) 0000 to 0145(psi)
6*1	MAXFORCE of VALVE1	nnnnn,	00000 to 99999(N) 00000 to 99999(kgf) 00000 to 99999(lbf)
7*1	CONSTANT FORCE UP/DW of VALVE1	n,	0:UP 1:DOWN
8	CONSTANT FORCE of VALVE1	nnnnn,	00000 to 35000(N) 00000 to 03569(kgf) 00000 to 07868(lbf)
9*1	CONSTANT LOW UP/DW of VALVE1	n,	0:UP 1:DOWN
10	CONSTANT LOW of VALVE1	nnnnn,	00000 to 35000(N) 00000 to 03569(kgf) 00000 to 07868(lbf)
11*1	CONSTANT HIGH UP/DW of VALVE1	n,	0:UP 1:DOWN
12	CONSTANT HIGH of VALVE1	nnnnn,	00000 to 35000(N) 00000 to 03569(kgf) 00000 to 07868(lbf)
13	AIR CYLINDER DIAMETER of VALVE2	nnn.n,	000.0 to 500.0(mm)
14	MAX AIR PRESSURE of VALVE2	n,nn, nn.n, nnnn,	0.00 to 1.00(Mpa) 00.0 to 10.0(bar) 0000 to 0145(psi)
15*1	MAX FORCE of VALVE2	nnnnn,	00000 to 99999(N) 00000 to 99999(kgf) 00000 to 99999(lbf)
16*1	CONSTANT FORCE UP/DW of VALVE2	n,	0:UP 1:DOWN
17	CONSTANT FORCE of VALVE2	nnnnn,	00000 to 35000(N) 00000 to 03569(kgf) 00000 to 07868(lbf)
18*1	CONSTANT LOW UP/DW of VALVE2	n,	0:UP 1:DOWN
19	CONSTANT LOW of VALVE2	nnnnn,	00000 to 35000(N) 00000 to 03569(kgf) 00000 to 07868(lbf)
20*1	CONSTANT HIGH UP/DW of VALVE2	n,	0:UP 1:DOWN
21	CONSTANT HIGH of VALVE2	nnnnn	00000 to 35000(N) 00000 to 03569(kgf) 00000 to 07868(lbf)

*1 Items inhibited from setting (When setting data, omit these items.)
“,” is not transmitted, too.