Original instructions

DC INVERTER WELDING POWER SUPPLY

IS-800A/1400A-10-□□ EU

OPERATION MANUAL

AMADA®

Z06OM1182586-12

Thank you for purchasing our DC Inverter Welding Power Supply **IS-800A-10-☐☐ /1400A-10-☐☐**.
This operation manual describes its method of operation and precautions for use.
Read this operation manual carefully prior to use. Store appropriately for ready reference.

ATTENTION

This operation manual is common to both **IS-800A-10-☐☐** and **IS-1400A-10-☐☐**.
IS-800A-10-☐☐ is used in the explanatory drawings unless there is a significant difference.

Contents

1. Special Precautions

(1) Safety Precautions

Before using, read "Safety Precautions" carefully to understand the correct method of use.

- These precautions are shown for safe use of our products and for prevention of damage or injury to operators or others. Be sure to read each of them, since all of them are important for safety.
- The meaning of the words and symbols is as follows.

⚠ DANGER

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

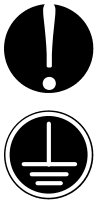
⚠ WARNING

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

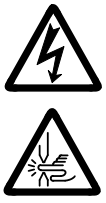
⚠ CAUTION

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 out of the scope of the warranty of the product.



These symbols denote actions which operators must take.



Each symbol with a triangle denotes that the content gives DANGER, WARNING or CAUTION to the operator.

⚠ DANGER

Do not touch the inside of the Power Supply except as instructed.
The interior of this Power Supply carries high voltage. It is very dangerous to touch any parts except as instructed. When inspecting the interior of the Power Supply, be sure to wait at least 20 minutes after turning off the power source of the Power Supply and confirm that the CHARGE LAMP lamp is turned off.

Never disassemble, attempt to repair, or modify the Power Supply.
These actions can cause electric shock and fire.
Consult us or your distributor for inspection and repair.

Never burn, destroy, cut, crush or chemically decompose the Power Supply.
This product incorporates parts containing gallium arsenide (GaAs).

⚠ WARNING

Do not insert your fingers or hands between the electrodes.
When welding, keep your fingers and hands away from the electrodes.

Do not touch any welded part or electrode during welding or just after completion of welding.
The welded parts of a workpiece, electrodes, and the arm are very hot.
Do not touch them; burns may result.

Ground the equipment.
If the Power Supply is not grounded, you may receive an electric shock in the event of malfunction or current leak. Be sure to perform grounding work.
400V AC of input voltage: at least class C, 200V AC of input voltage: at least class D

Connect the specified cables securely.
Cables of insufficient current capacities and loose connections can cause fire and electric shock.

Do not damage the power cable and connecting cables.
Do not tread on, twist, or apply force to any cable. Doing so may cause the power cable and connecting cables to become broken, leading to electric shock and fire.

Do not use any damaged power cable, connecting cable, or plug.
Failure to observe this precaution can lead to electric shock, short circuit, or fire.
If any part must be replaced or requires repair, consult us.

Stop the operation if any trouble occurs.
Continuous operation after occurrence of a trouble such as burning smell, abnormal sound, abnormal heat, smoke, etc. can cause electric shock and fire.
If such a trouble occurs, immediately consult us.

Persons with pacemakers must stay clear of the welding machine.
A person who uses a pacemaker must not approach the welding machine or walk around the welding site while the welding machine is in operation, without being permitted by his/her doctor. The welding machine generates a magnetic field and has effects on the operation of the pacemaker while it is turned on.

Protective gear must be worn.
Put on protective gear such as protective gloves, long-sleeve jacket, leather apron, etc. Surface flash and expulsion can burn the skin if they touch the skin.

Wear protective glasses.
If you look at the flash directly during welding, your eyes may be damaged.
If any surface flash and expulsion gets in your eye, you may lose your eyesight.

⚠ CAUTION

Apply the specified supply voltage.
Application of a voltage outside the specified range may result in fire or electric shock.

Do not allow water to come in contact with the equipment.
Water on the electric parts can cause electric shock and short circuit.

Use proper tools (wire strippers, pressure wire connectors, etc.) for terminal treatment of the connecting cables.
Do not cut the wire conductor; fire or electric shock may result.

Install the equipment on a firm and level surface.
Injury may result if the equipment falls or is dropped.

Do not sit on or place objects on the Power Supply.
Failure to observe this precaution may lead to malfunction.

Keep combustible matter away from the Power Supply.
Surface flash and expulsion may ignite combustible matter. If it is impossible to remove all combustible matter, cover it with non-combustible material.

Do not cover the Power Supply with a blanket, cloth, etc.
Do not cover the Power Supply with a blanket, cloth, etc. while it is in use. The cover may be overheated and burned.

Do not use this Power Supply for purposes other than welding.
Use of this Power Supply in a manner other than specified can cause electric shock and fire.

Use ear protectors.
Loud noises can damage hearing.

Keep a fire extinguisher nearby.
Keep a fire extinguisher in the welding shop in case of fire.

Maintain and inspect the Power Supply periodically.
Maintain and inspect the Power Supply periodically, and repair any damage nearby before starting operation.

(2) Precautions for Handling

- When transporting or moving the Power Supply, do not lay it down. Also, handle the Power Supply with care so as not to make an impact such as drop on it. Moving the Power Supply by hand must be done by at least two people.
- When lifting the Power Supply using a crane, set the belt to the eyebolt on the upper surface of the Power Supply.
- Install this Power Supply on a firm and level surface. If it is inclined, malfunction may result.
- Do not install the Power Supply in the following locations:
  - Damp areas (where the humidity is higher than 90%),
  - areas where temperatures are above 40°C or below 5°C
  - areas near a high noise source,
  - areas where chemicals are handled,
  - areas where water may condense,
  - dusty areas,
  - areas exposed to large amounts of vibration or shock, and
  - areas at an altitude above 1000 meters.
- Clean the exterior of the Power Supply using a soft, dry cloth or one slightly dampened with water. If the Power Supply is very dirty, use diluted neutral detergent or alcohol. Do not use paint thinner, benzine, etc., as they may discolor or deform the Power Supply.
- Do not insert a screw, coin, etc. into the Power Supply, as they may cause malfunction.
- Operate the Power Supply in accordance with the method described in this operation manual.
- Press switches/buttons carefully by hand. Handling them roughly (using a screwdriver or the tip of pen) may result in a malfunction or failure.
- Press switches/buttons one at a time. Pressing more than one switch/button at a time may result in a malfunction or failure.
- The Power Supply is not equipped with auxiliary power such as an outlet for lighting.
- Following cables are separately needed to use the Power Supply:
  - Program box, and circuit cable connecting to the Power Supply,
  - power cable, and cables connecting between the Power Supply and welding transformer,
  - welding transformer,
  - welding head, and
  - secondary conductor connecting between welding head and welding transformer.
- The RS-485/232C communication signal line is not attached. Solder the line to the RS-485/232C connector.
- The I/O signal line to start the Power Supply is not attached. Prepare the crimp-on terminal and line for wiring to the terminal block.
- The Power Supply should be used with the industry power transmission and distribution network (industrial distribution equipment). Do not connect it to the public low-voltage distribution network (distribution equipment for non-industrial office or home use).

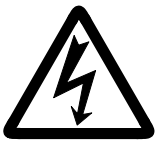
(3) On Disposal

This product incorporates parts containing gallium arsenide (GaAs). At the time of disposal, separate it from general industrial waste or domestic waste and carry out the disposal in accordance with applicable laws and regulations.

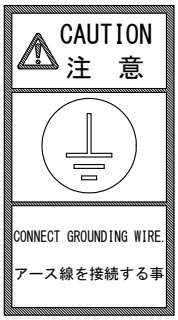
(4) Warning Labels for Safety

On the main body are warning labels for safety. Their locations and meanings are as noted below.

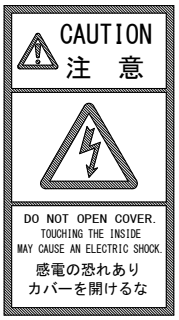
Location: Power Supply interior, side surface of acrylic cover
Meaning: **Shock hazard**



Location: Power Supply interior, front and acrylic cover
Meaning: **Shock hazard**



Location: Front door
Meaning: Caution for grounding connection



Location: Front door
Meaning: **Shock hazard**

Location: Rear panel
Meaning: Cautions for cooling water

Location: Power Supply interior, front and acrylic cover
Meaning: Caution for leakage breaker connection

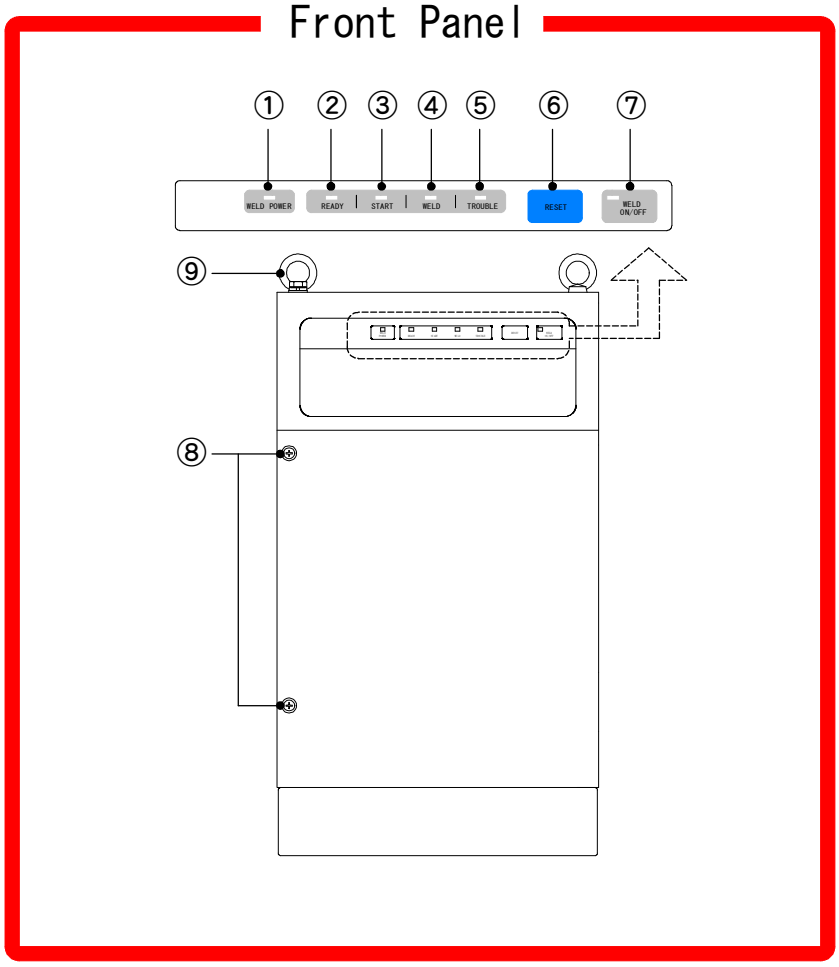
2. Features

The **IS-800A/1400A** is a DC inverter welding power supply, large in capacity and specially but small in size, specially designed to be used for spot welding and fusing.

- 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.
- Pulsation and upslope (downslope) can be set for WELD1 to WELD3, respectively.
- Since the welding transformer turn ratio, the welding frequency (600 Hz to 3000 Hz in units of 100 Hz) and the current range can be set for each schedule, the Power Supply corresponds to finer applications.
- Comes equipped with a current-shutoff function, which shuts off current in response to external input (e.g., displacement of the electrode) for WELD1 to WELD3 respectively, ensuring stable fusing.
- Use of an inverter allows for high power factor and stable power conditions
- Easy setting of a variety of items through the menu selection system
- Applicable to inverter transformers manufactured by various companies by changing the frequency (600 Hz to 3000 Hz in units of 100 Hz).
- Seven protective functions for maximum ease of operation
  - No-current / no-voltage
  - Overcurrent
  - Temperature
  - Self diagnostics error
  - Grounding error
  - Load short error
  - Phase error
- Languages available are Japanese, English, Chinese and Korean.

3. Name and Functions of Each Section

(1) Front



① **WELD POWER lamp**
Lights up when the power is supplied to **IS-800A/1400A**.

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

- **WELD ON/OFF** key
- **WELD ON/OFF** setting of Program Unit **MA-660A** and
- External **WELD ON/OFF** signal

must all be turned on.

The Power Supply writes data into the flash memory 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.

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 peeping sound, and the work done by **IS-800A/1400A** 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.

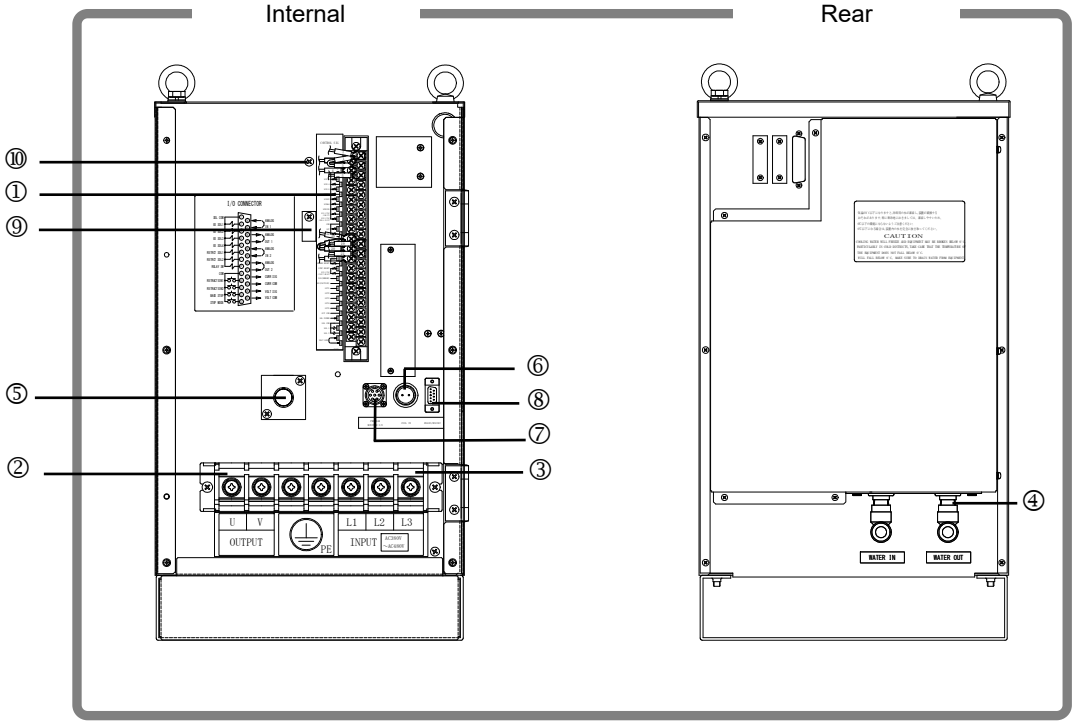
⑦ **WELD ON/OFF key**
This key is one of those which are required for turning on the **READY** lamp. Each time this key is pressed, it is turned ON and OFF alternately. If it is turned on, the **READY** lamp lights up, and if the key is turned off, the lamp goes off. Hold down this key to toggle ON and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

⑧ **Front Door Fixing Screw**
After closing the front door, secure it with this screw.
Normally, keep the front door closed.

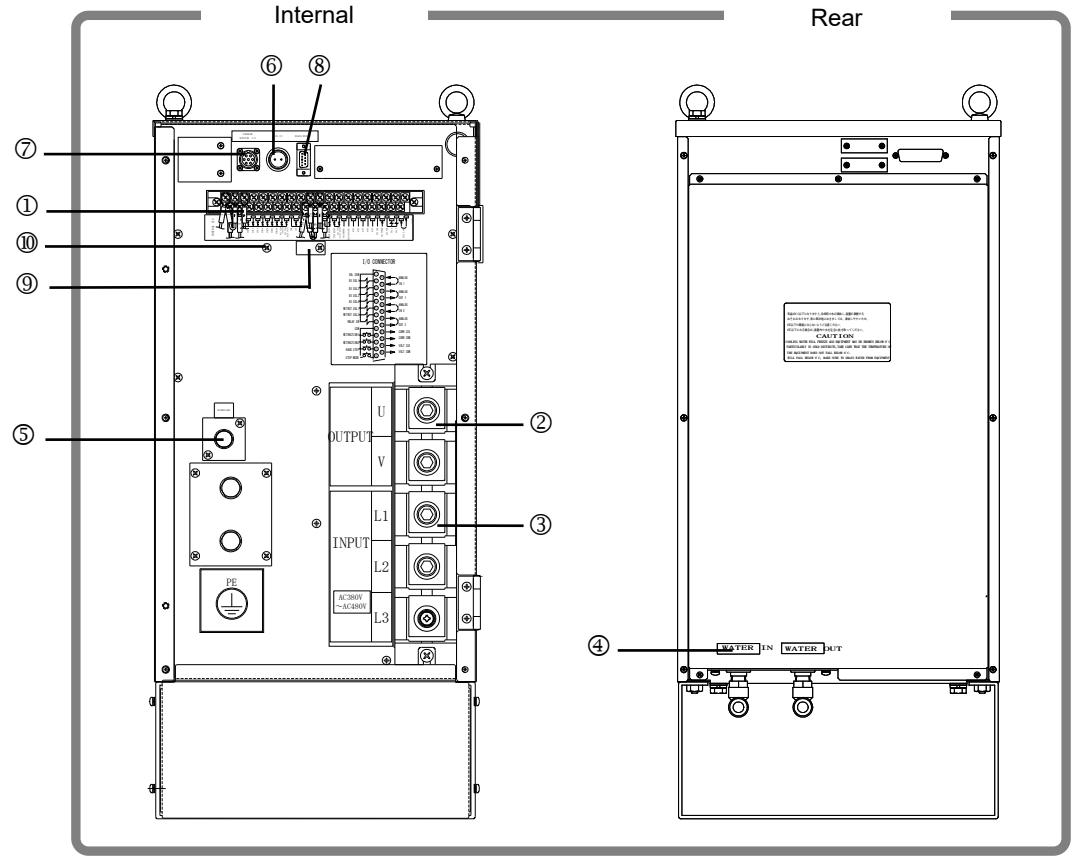
⑨ **Eyebolt**
Used to set the belt when lifting **IS-800A/1400A** using a crane.

(2) Internal and Rear Panel

IS-800A (When the front door is opened, the internal panel appears.)



IS-1400A (When the front door is opened, the internal panel appears.)



① **Connecting Terminal Strip for External Input/Output Signals**
Used to input start signals and output trouble signals.

Specifications of Terminal Strip for External Input/Output Signals	
Crimp-on terminals allowed to be installed per a terminal	2 pieces max.
Size of crimp-on terminal	M3 or M3.5 (7.1 mm wide)
Recommended cable cross-section	0.75 mm^2 min. for pin nos. 34 to 37 0.5 mm^2 min. for pin nos. 1 to 33, 38 and 39

② **Terminal Block for Welding Power Output**
Used to connect to the input of the welding transformer.

③ **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.

④ **Cooling Water Pipe Connector**
Used for supply and drain of cooling water, which cools the inside of the enclosure and power supply unit.

⑤ **CHARGE LAMP lamp**
The electrolytic capacitor in the body of **IS-800A/1400A** is charged with high voltage.
The charge level of this electrolytic capacitor is indicated by the brightness of the **CHARGE LAMP** lamp. The more the capacitor is charged, the brighter the **CHARGE LAMP** lamp is.

⚠DANGER

Do not touch the inside of the body while the **CHARGE LAMP** lamp is lit, since you may get a severe electric shock.

⑥ **COIL IN Connector**
Used to connect the toroidal coil. It is used for the secondary constant-current effective value control and secondary constant-power effective value control. (The toroidal coil is optional.)

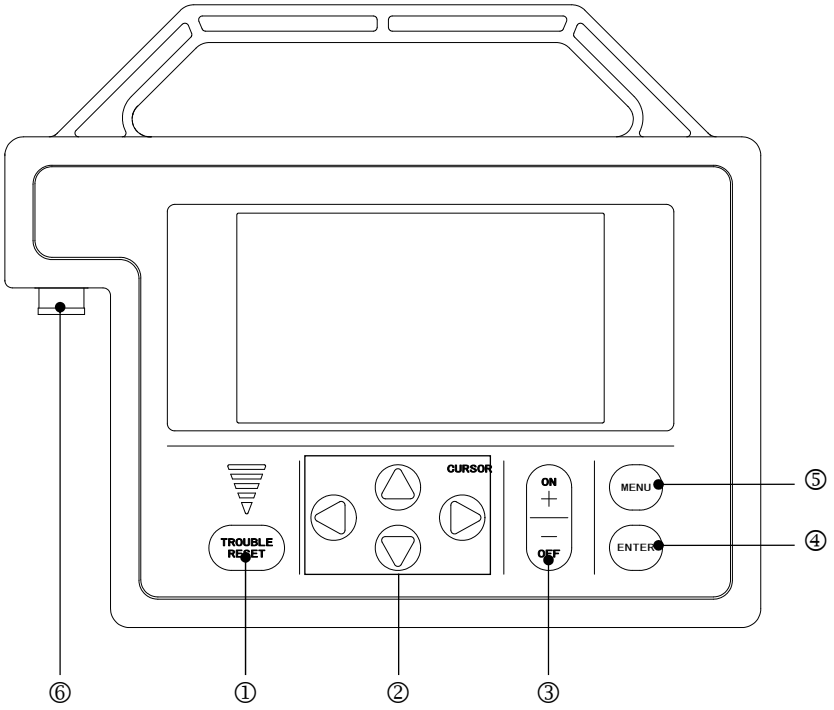
⑦ **PROGRAM MONITOR I/O Connector**
Used to connect Program Unit **MA-660A** to set the weld schedules and see the monitored result.

⑧ **RS485/232C Connector**
For external communication. (See **9. External Communication Function**.)

⑨ **Cable Clamp**
Used to dress and secure the I/O cables to **IS-800A/1400A**.

⑩ **Shielded Wire Connecting Screw**
Used to connect the I/O shielded wire.

(3) MA-660A (Sold Separately)



① **TROUBLE RESET key**
If this key is pressed while the **TROUBLE** lamp of **IS-800A/1400A** is lit, the lamp goes off. It has the same function as the **RESET** key of **IS-800A/1400A**.

② **CURSOR keys**
Used to move the cursor (▁) to select an item.

③ **+ON/-OFF keys**
Used to change the value of a selected item or turn it on and off.

④ **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 the flash memory 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 the flash memory. During that time, do not turn off the power.

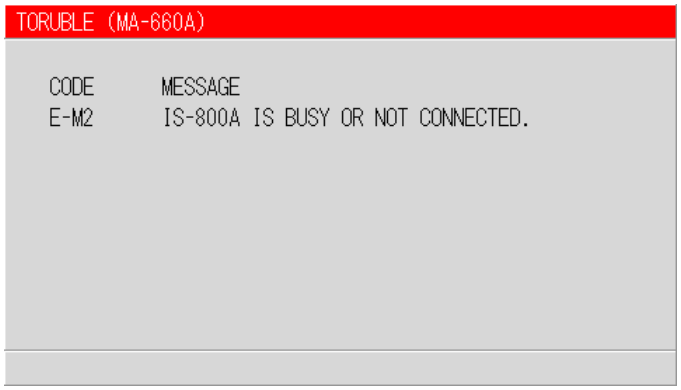
⑤ **MENU key**
Used to display the MENU screen. Press this key to return to the MENU screen from any other screens.

⑥ **Connector**
Used to connect the circuit cable. Connect the other end of the cable to the PROGRAM MONITOR I/O 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 ①.



(When connecting to the Power Supply, **IS-800A**)

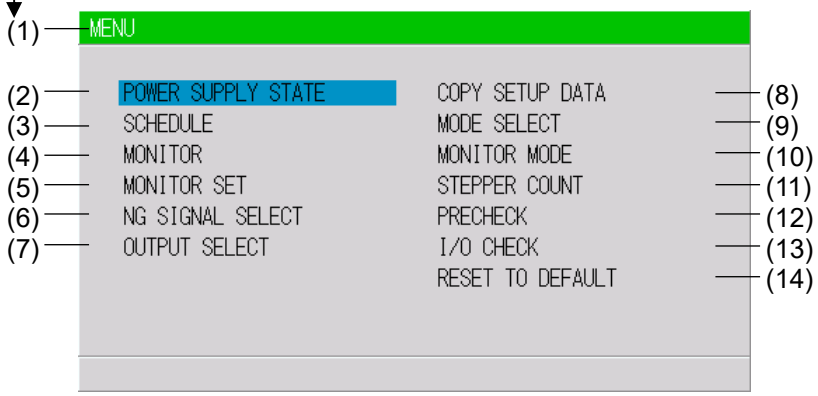
4. How to Operate Screens

ATTENTION
The Power Supply writes data into the flash memory 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 the flash memory. During that time, do not turn off the power.

(1) MENU Screen

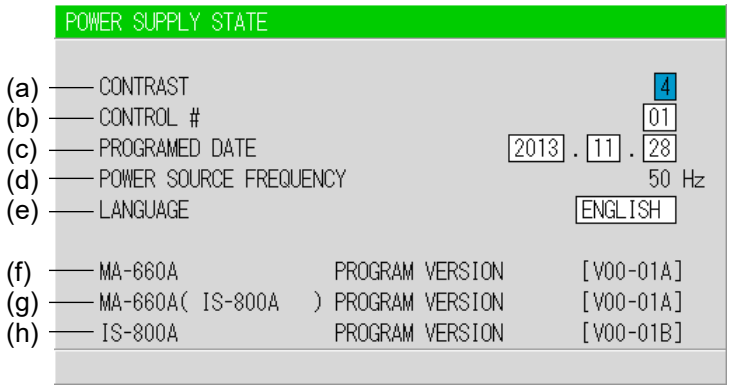
The **MA-660A** has various functions that are set from the respective screens. The MENU screen displays these functions in menu form.
Move the cursor (▁) to the desired item; press the **ENTER** key to move to the selected screen.

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.
☐ indicates settable items. Move the cursor (▁) to them to change the value. (Same for all screens.)



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

(b) CONTROL #
Input the identification No. of your Power Supply. The setting range is 1 to 31. 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) PROGRAMED 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 program version is created.

(d) POWER SOURCE FREQUENCY
The frequency of the welding power is measured and indicated automatically.

(e) LANGUAGE
Select the language among Japanese, English, Chinese, and Korean.

(f) MA-660A PROGRAM VERSION
Indicates the program version No. of Program Unit **MA-660A**.

(g) MA-660A (IS-800A/1400A) PROGRAM VERSION
Indicates the program version No. of the Power Supply's screen display part.

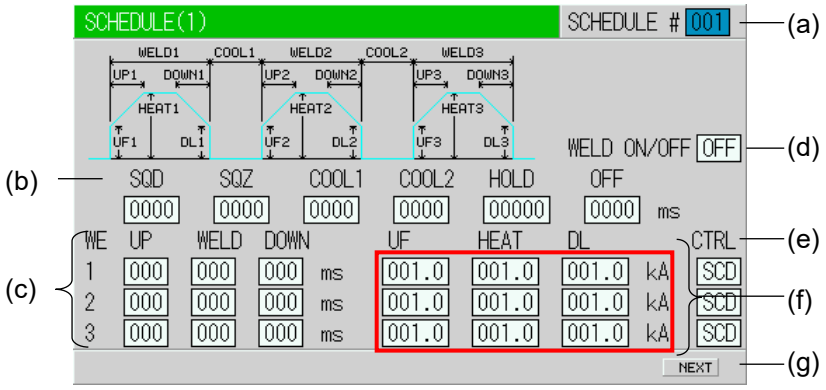
(h) IS-800A/1400A PROGRAM VERSION
Indicates the program version No. of the Power Supply's control part.

(3) SCHEDULE Screen

Up to 255 welding schedules can be set on the Power Supply.
In the SCHEDULE screen, there are ① Current and time setting screen and ② Pulsation and transformer screen.

① 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)(e)**) on the MODE SELECT screen.



(Note) Unit, resolution, and setting range surrounded with frame change depending on the settings of **CTRL**.

(a) SCHEDULE #

Select from #001 to #255 to set the **SCHEDULE**.
Normally select #001 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 **(9)(e)**.)
For each operation, see **8. Timing Chart**.

Item	Description	Setting range
SQD Squeeze delay time	Length of time added to SQZ; only for the first weld after start signal in repeat operation	0 to 9999 ms 0 to 999 CYC
SQZ Squeeze time	Length of time until proper squeeze is applied to workpiece	
COOL1 and **COOL2** Cooling time 1 and 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	0 to 2000 ms 0 to 999 CYC
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.)	0 or 10 to 9990 ms 0 to 99 CYC

* OFF/Off time

- Count and step value are increased each time OFF/Off time is over.
- RE-WELD does not work simultaneously with OFF/Off time. When OFF/Off time is set, RE-WELD becomes invalid.
- START SIGNAL MODE has limitations. When OFF/Off time is set, MAINTAINED of START SIGNAL 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. (See **(9)(e)**.)

UP (1, 2, 3)

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

DOWN (1, 2, 3)

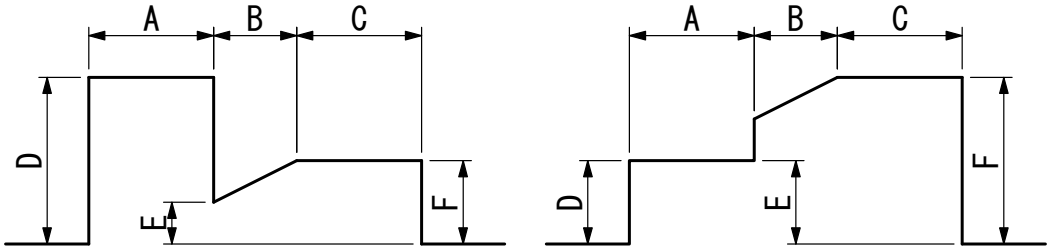
Set the downslope time (to decrease the welding current gradually).

(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.

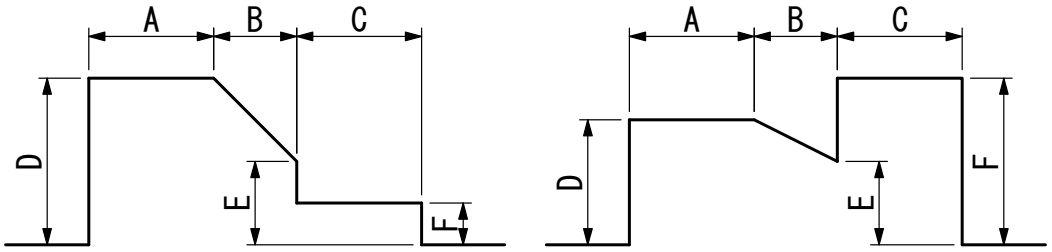
Unsettable waveform profile

① The upslope time is set for the subsequent stage, and the HEAT setting of D and the UF HEAT setting of E are different.



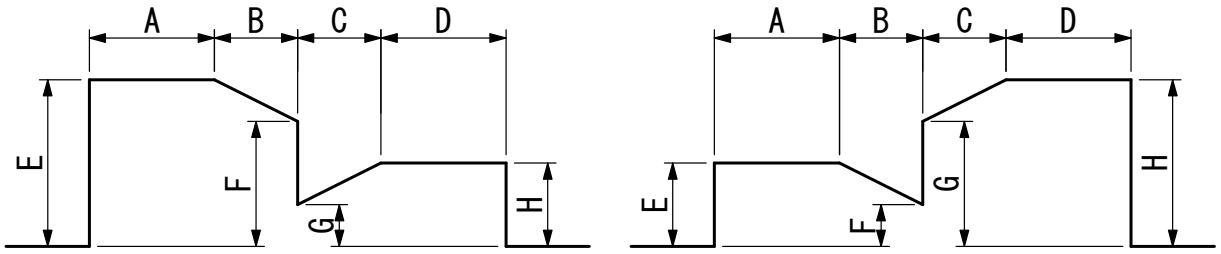
A: WELD1 time or WELD2 time
B: UP2 time or UP3 time
C: WELD2 time or WELD3 time
D: WELD1 HEAT or WELD2 HEAT
E: UF2 HEAT or UF3 HEAT
F: WELD2 HEAT or WELD3 HEAT

② 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

③ 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.



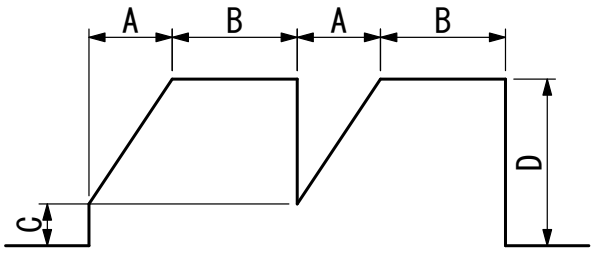
A: WELD1 time or WELD2 time
B: DOWN1 time or DOWN2 time
C: UP2 time or UP3 time
D: WELD2 time or WELD3 time
E: WELD1 HEAT or WELD2 HEAT
F: DL1 HEAT or DL2 HEAT
G: UF2 HEAT or UF3 HEAT
H: WELD2 HEAT or WELD3 HEAT

(Note) 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.

(Note) Upslope / Downslope waveform when INTERVAL (downtime) is set to 0.

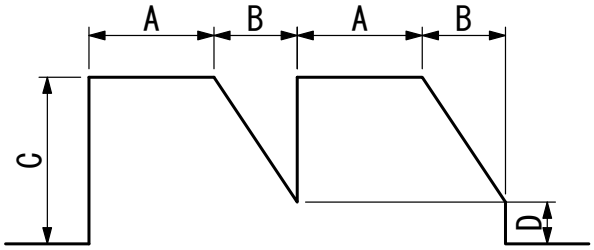
E-10 (Schedule setting error) will occur when the Power Supply starts with the following setting.

① 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.



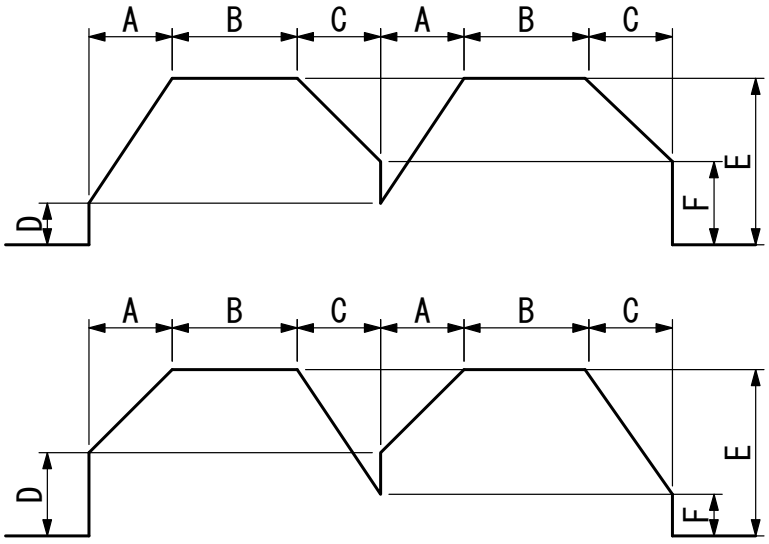
A: UP1 to 3 time
B: WELD1 to 3 time
C: UF1 to 3 HEAT
D: HEAT1 to 3

② 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

③ 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) 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 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 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 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 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 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 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 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.

Control method	Feature	Application	Control mechanism
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.

* The control may become unstable when the current flows for over 1 second continuously.

(f) HEAT

Set the welding current for **WELD1**, **WELD2**, and **WELD3**, respectively.
When **CTRL** is changed, the contents to be set also change.
Also, the settable range of welding current changes depending on the current range. (See **(3)②(f)**.)

UF (UP SLOPE FIRST)

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

DL (DOWN SLOPE LAST)

Sets the final current value of downslope.
The set value is the same 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.

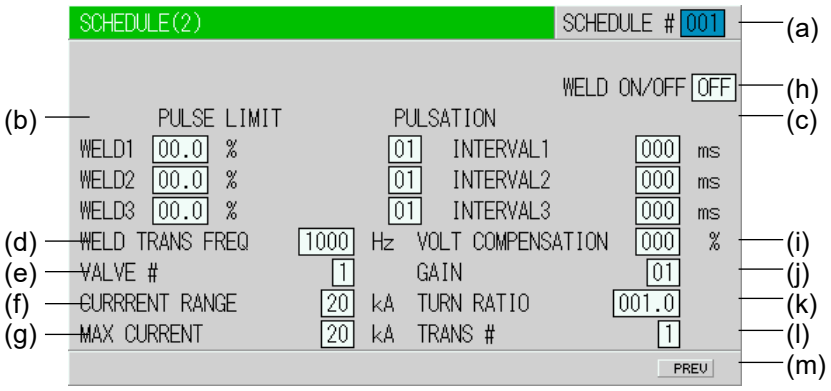
⚠ DANGER

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

(g) NEXT

When the cursor (▮) is displayed, pressing the **ENTER** key will change the display to ② Pulsation and transformer screen.

② Pulsation and transformer screen



(a) SCHEDULE #

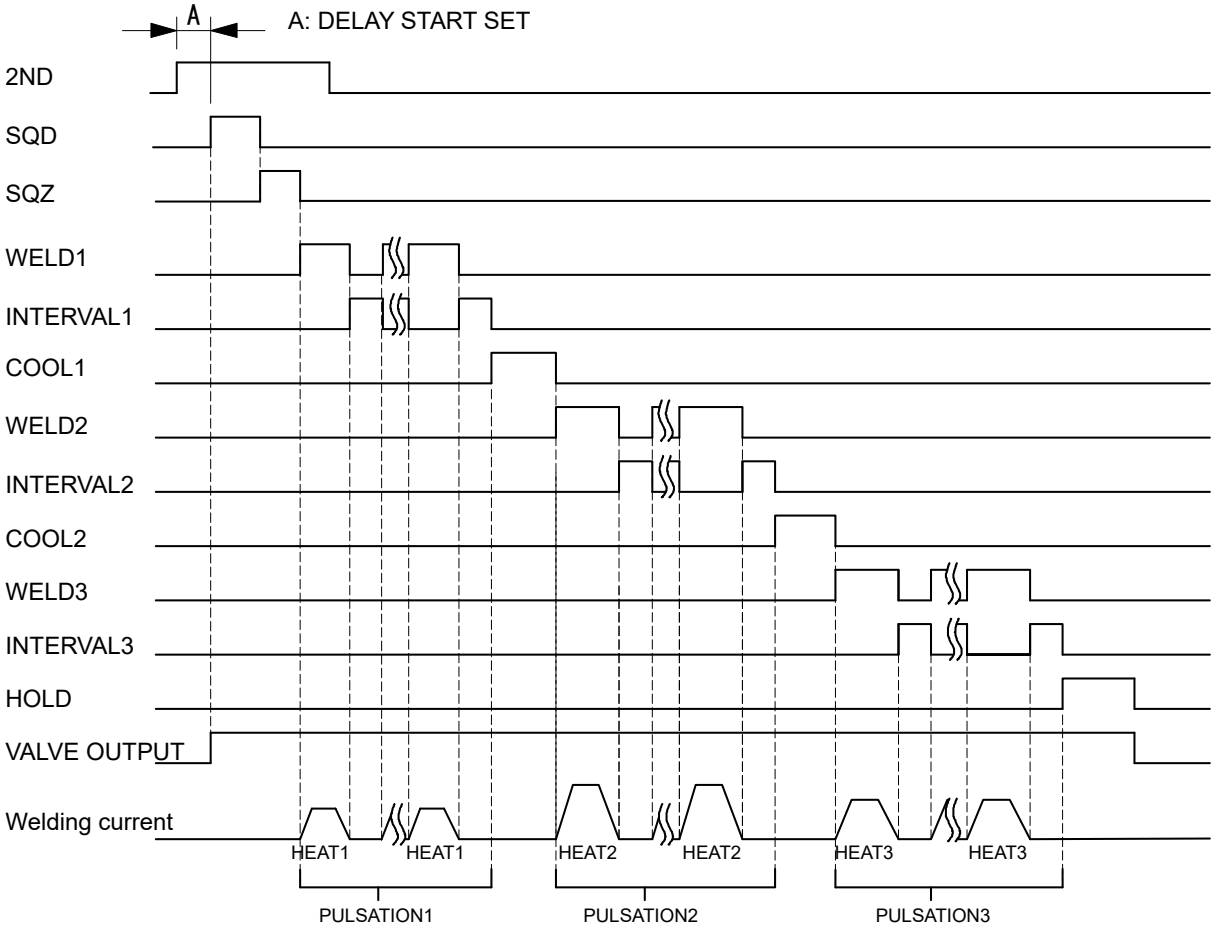
Select from #001 to #255 to set the **SCHEDULE**.
Normally select #001 first, then select additional schedules in sequential order.

(b) PULSE LIMIT

When limiting the pulse width in Primary constant-current peak value control, set the limit for each of **WELD1**, **WELD2** and **WELD3**.
The setting range is 10.0 to 99.9%.

(c) PULSATION / INTERVAL1 to 3

Set the number of repetitions (**PULSATION** (01 to 19)) and the downtime (**INTERVAL1** to **3**) in **WELD1** to **3**. (See 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 **INTERVAL1** 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 **(4) MONITOR Screen**.) 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. (See **(5) MONITOR**

SET Screen.)

- In the secondary constant-current control or the secondary constant-power control, the control may become unstable when the current flows for over 1 second continuously. In that case, use the primary constant-current control or the primary constant-current peak value control.

(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.

> **⚠ DANGER**
>
> 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. It will cause malfunction.

(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.
Operation differs according to the VALVE MODE setting on the MODE SELECT screen. (See **(9)(m)**.)

When VALVE MODE is 1 VALVE

Set the valve # in the range of 1 to 2.
VALVE #1: SOL1
VALVE #2: SOL2

When VALVE MODE is 2 VALVE

Set the valve # in the range of 1 to 2. However, it doesn't matter if it is set to 1 or 2 for valve operation. Used to select the valve No. for stepper operation.
VALVE #1: SOL1, SOL2
VALVE #2: SOL1, SOL2

(f) CURRENT RANGE

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

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

(g) MAX CURRENT

Sets the maximum current of transformer.
The setting range is 1 kA to the setting of **CURRENT RANGE**.
Valid only in the primary constant-current effective value control, secondary constant-current effective value control and secondary constant-power effective value control.

(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 LIMIT** is set)

Compensates the pulse limit for the fluctuation in the power-supply voltage on the primary side. This function is valid only in the primary constant-current peak value control (**PLM**).
However, the compensation is for power-supply voltage prior to welding, and voltage fluctuation during welding is not reflected. The setting range is 000 to 100%.

Correction value = 100% at 200 V AC

・At 190 V AC (-5%) of power-supply voltage, compensation is made so that the limit value of PULSE LIMIT will go up 5%.
・At 210 V AC (+5%) of power-supply voltage, compensation is made so that the limit value of PULSE LIMIT will go down 5%.

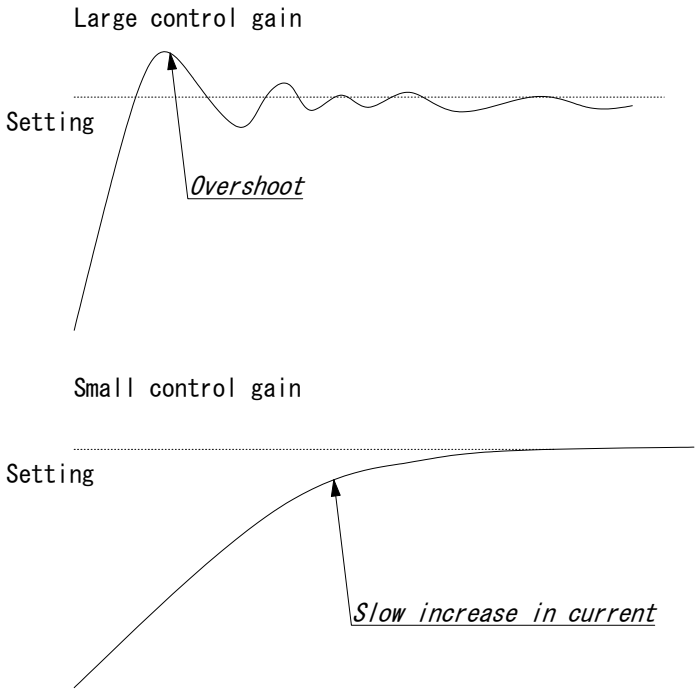
Correction value = 50% at 200 V AC

・At 190 V AC (-5%) of power-supply voltage, compensation is made so that the limit value of PULSE LIMIT will go up 2.5%.
・At 210 V AC (+5%) of power-supply voltage, compensation is made so that the limit value of PULSE LIMIT will go down 2.5%.

(j) GAIN

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).



(k) TURN RATIO

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

ATTENTION
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.

(l) TRANS #

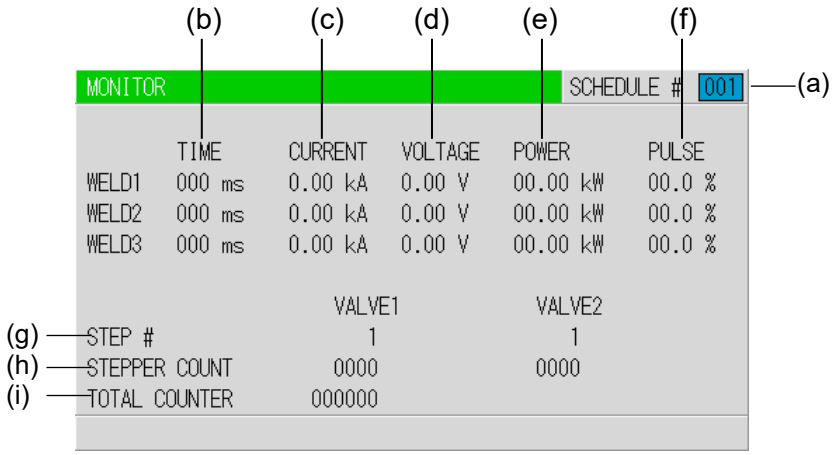
Cannot be used. Select 1.

(m) PREV

When the cursor (__) is displayed, pressing the **ENTER** key will change the display to ① 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 00.0 kA to 99.9 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** No.
The stored measurement values are not erased for about 10 days 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. (See **(9)(e)**.)

(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 pulse width during which current was supplied in the course of **WELD1**, **WELD2** and **WELD3** operations are displayed.
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**).

(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 our weld checker.

(g) STEP #

The present number of steps is displayed when **STEPPER MODE** (see **(9)(k)**) is not OFF on the MODE SELECT screen.

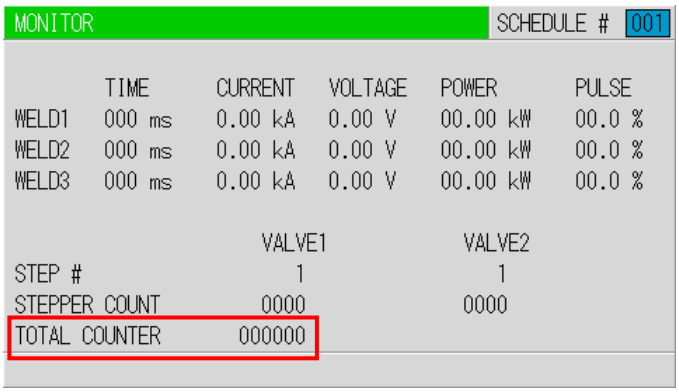
(h) STEPPER COUNT

The number of welds in the present step is displayed when **STEPPER MODE** (see **(9)(k)**) is not OFF on the MODE SELECT screen.

(i) TOTAL COUNTER

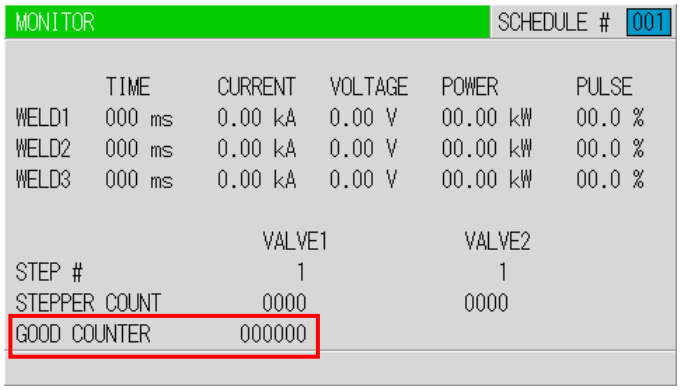
The display changes depending on the setting of WELD2 STOP/WELD COUNT and COUNTER on the MODE SELECT screen (see **(9)(g)** and **(p)**).

① When the WELD2 STOP/WELD COUNT is WELD2 STOP and COUNTER is TOTAL



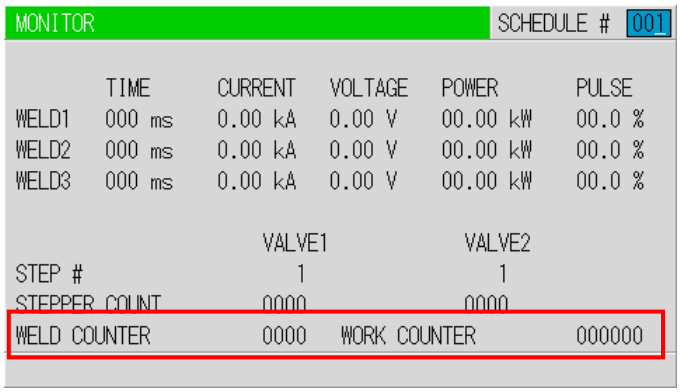
TOTAL COUNTER is displayed. The count value is incremented by one despite the result of the upper/lower limit judgment in monitoring.

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



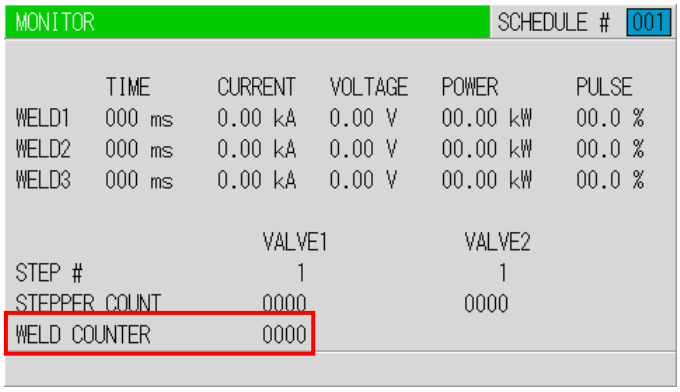
GOOD COUNTER is displayed. The count value is incremented by one when the monitored value is within the range of the upper/lower limit.

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 in ④ in meaning.

④ When WELD2 STOP/WELD COUNT is WELD COUNT



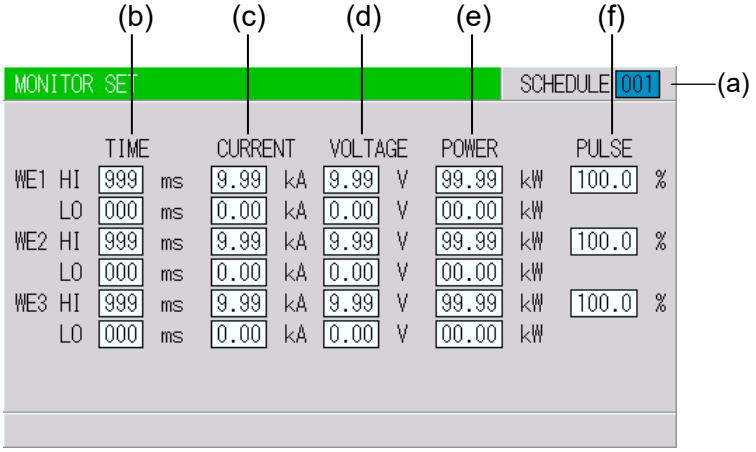
WELD COUNTER is displayed. (See **(10)(a)**.)
This is different from WELD COUNTER described in ③ in meaning.

(Note) Monitored value

- Only the last monitored value and the number of counts of each **SCHEDULE** are kept for a period of about 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. (See **(9)(n)**.)

(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 00.0 to 99.9 kA and POWER is 000.0 to 999.9 kW.

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

(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.
The setting range is 0 to 999 ms or 0 to 50 CYC.

(c) CURRENT
Set the upper limit (HI) and lower limit (LO) of the welding current for each of **WE1**, **WE2** and **WE3**.
The setting range is 0 to 9.99 kA or 0 to 99.9 kA.

(d) VOLTAGE
Set the upper limit (HI) and lower limit (LO) of the secondary voltage for each of **WE1**, **WE2** and **WE3**.
The setting range is 0 to 9.99 V.

(e) POWER
Set the upper limit (HI) and lower limit (LO) of the electric power for each of **WE1**, **WE2** and **WE3**.
The setting range is 0 to 99.99 kW or 0 to 999.9 kW.

(f) PULSE
If the ratio of welding current pulse / pulse width in full wave mode exceeds the percentage set in **PULSE HIGH**, an ERROR signal is output. Pulse width is expressed assuming that the full wave is 100%.
The setting range is 10 to 100%.

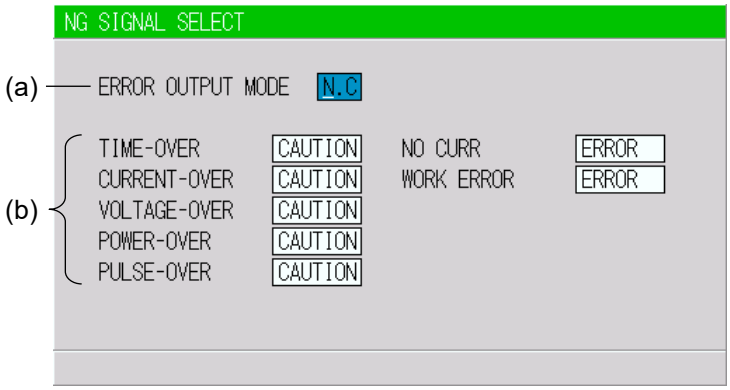
(Note) Upper/Lower limit judgment value when **STEPPER MODE** is not OFF
The upper/lower limit judgment value set here is for the current when a welding is performed, not for the initial setting.
Therefore, when **STEPPER MODE** is not OFF to perform step-up (-down) for the initial setting, the upper/lower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

Example) When the current is set to 2 kA, HI; 2.2 kA, LO; 1.8 kA.
When the step becomes 150%, HI and LO become as follows, and the monitor error does not occur even when the monitored value becomes 3.0 kA.

HI: 2.2 x 1.5 = 3.3 kA
LO: 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.



(This screen shows initial settings.)

(a) ERROR OUTPUT MODE

Sets the output mode of NG1 of the external output signals. (Refer to **6. Interface**.)

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

(b) TIME-OVER / CURRENT-OVER / VOLTAGE-OVER / POWER-OVER / PULSE-OVER / NO CURR / WORK ERROR

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
NO CURR	When the no-current or no-voltage error occurs (For the no-current and no-voltage errors, see **12. Troubleshooting**.)
WORK ERROR	When the precheck error occurs

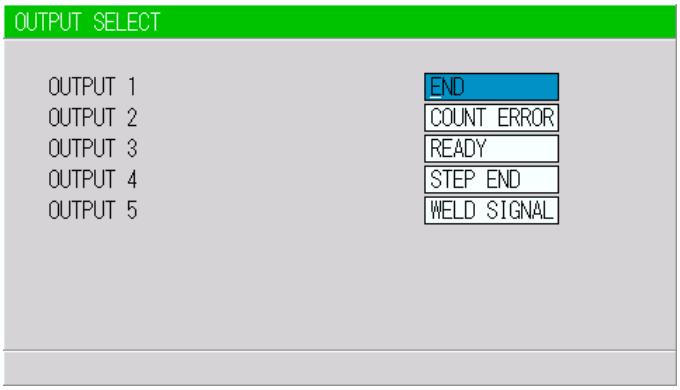
When two or more items are the same settings, the ERROR signal or the CAUTION signal is output if either one meets the condition above.

(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	Not 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. For the contents of each output signal, refer to **6.(3)**.



(This screen shows initial settings.)

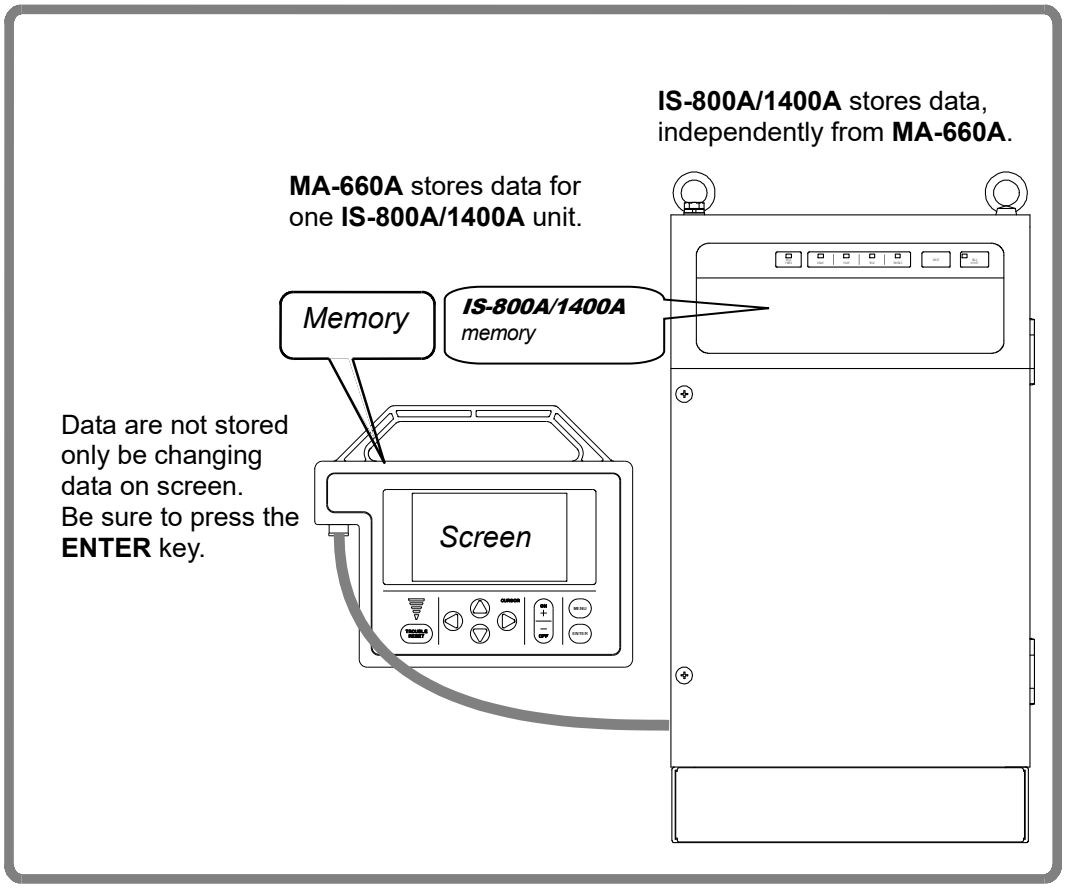
Pressing **+ON** key switches the signal in the following order (in the reverse direction when pressing **-OFF** key):

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 **8. Timing Chart**.

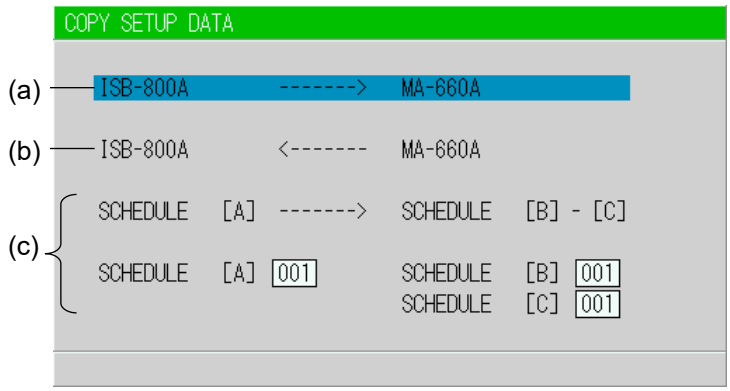
(8) COPY SETUP DATA Screen

The **MA-660A** can store data. (Refer to figure shown 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.



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.
For how to perform a schedule copy, see the next page.

The schedule copy can be performed between **IS-800A/1400A**s with the same program version of **MA-660A** (**IS-800A/1400A**). The program version of **MA-660A** (**IS-800A/1400A**) is displayed on the POWER SUPPLY STATE screen. (See **(2)(g)**.)



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

(a) IS-800A/1400A -----> MA-660A

The data in **IS-800A/1400A** is copied to memory of **MA-660A**.
When copy is complete, **<END>** is displayed.
Perform this operation on the source **IS-800A/1400A**.

(b) IS-800A/1400A <----- MA-660A

The data in memory of **MA-660A** is copied to **IS-800A/1400A**.
Perform this operation on the source **IS-800A/1400A** and then perform it on destination **IS-800A/1400A**. After copy is complete (**<END>** display), wait for about 10 seconds to turn off **IS-800A/1400A**.

(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.
This function is also used to change from the **SCHEDULE #1** setting, to perform welding according to another schedule.

For example, **SCHEDULE #2** and **#3** can be set by switching from **SCHEDULE #1** as follows:

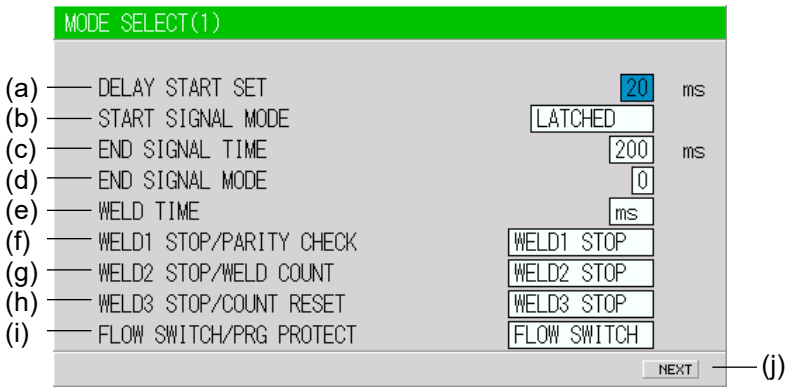
- **SCHEDULE [A] 001 -----> SCHEDULE [B] 002**
  SCHEDULE [C] 003
  (Be sure to press the **ENTER** key before moving the cursor (▮).)
- Move the cursor (▮) to the following line and press the **ENTER** key:

  SCHEDULE [A] -----> SCHEDULE [B] - [C]

  The data for **SCHEDULE #1** is copied to **SCHEDULE #2** through this operation. Call up #2 and #3 on the SCHEDULE screen, and change the values, if necessary.

(Note) Do not operate the Program Unit until copy is complete.

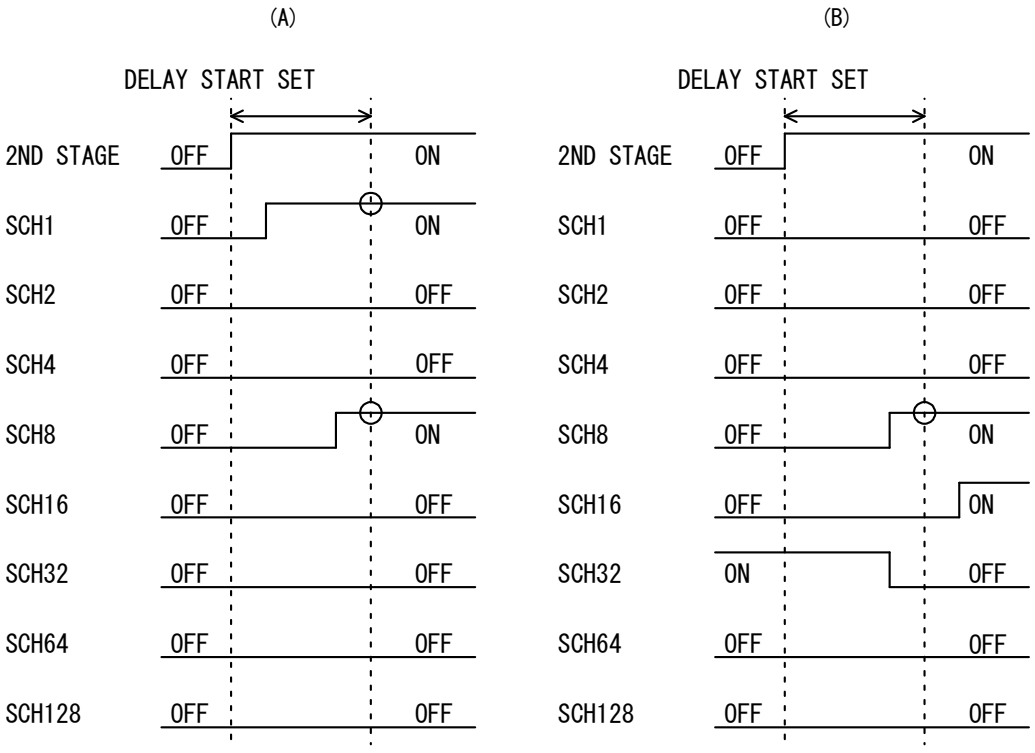
(9) MODE SELECT Screen



(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.

When the schedule signal is not input and the start signal is input within the set time, E-16 (Schedule signal input error) is displayed. However, when **SCHEDULE** is set to INT on the MODE SELECT screen, the schedule No. displayed on the **MA-660A** is selected without the schedule signal being input. For schedule selection, refer to **(9)(I)**.



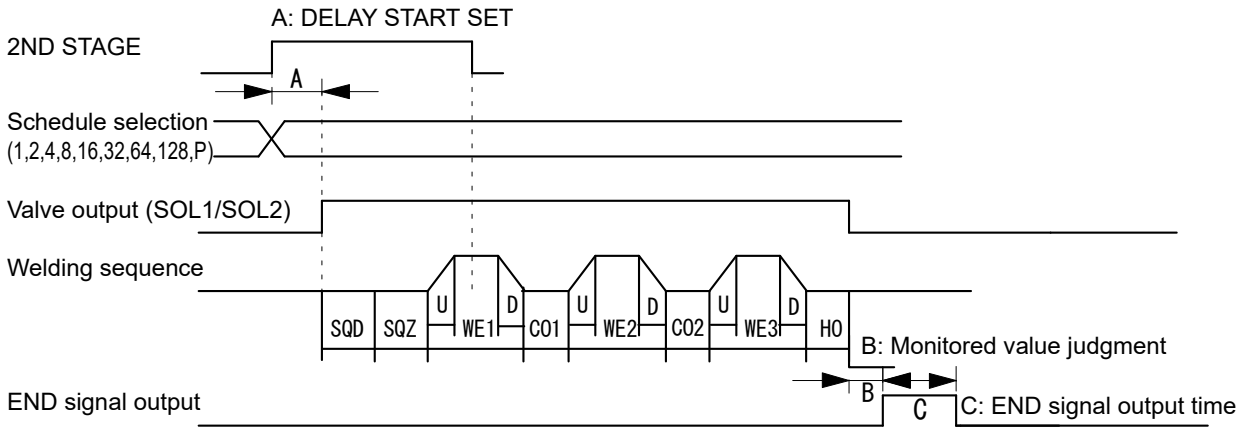
In Fig. (A), schedule signals 1 and 8 are **ON**. Therefore, welding is performed using schedule No. 9. In Fig. (B), only schedule signal 8 is **ON**. As a result, welding is performed using schedule No. 8.

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

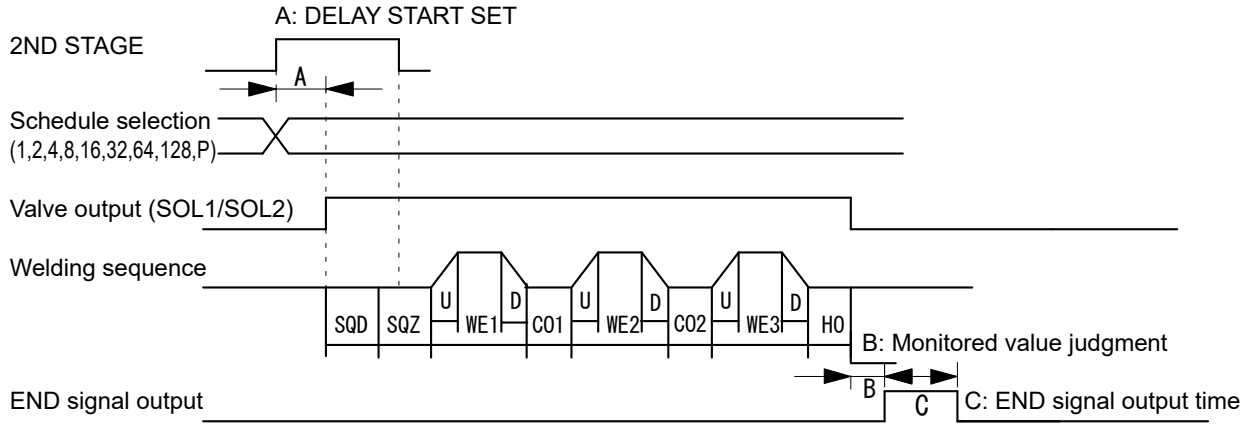
(Note) When **DELAY START SET** is 1 ms or 2 ms
The schedule number when the 2ND STAGE signal is received is selected. Therefore, in Fig. (A) above, the schedule number is not selected and the schedule signal input error occurs. When **DELAY START SET** is 1 ms or 2 ms, input the schedule signal in advance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

(b) START SIGNAL MODE
Set the input method of the start signal to activate the Power Supply.

1) 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.



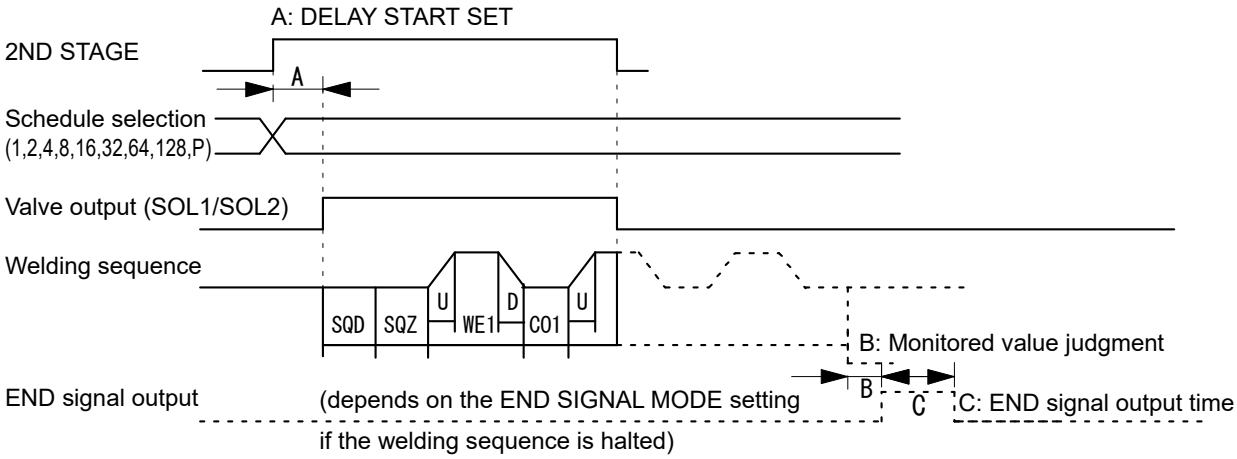
2) PULSED
When the 2ND STAGE signal is input for more than the time set through **DELAY START SET** and then stops, the welding sequence will proceed to completion.



3) 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 SIGNAL MODE setting.



(Note) When OFF/Off time is set, MAINTAINED does not work. It works as LATCHED.

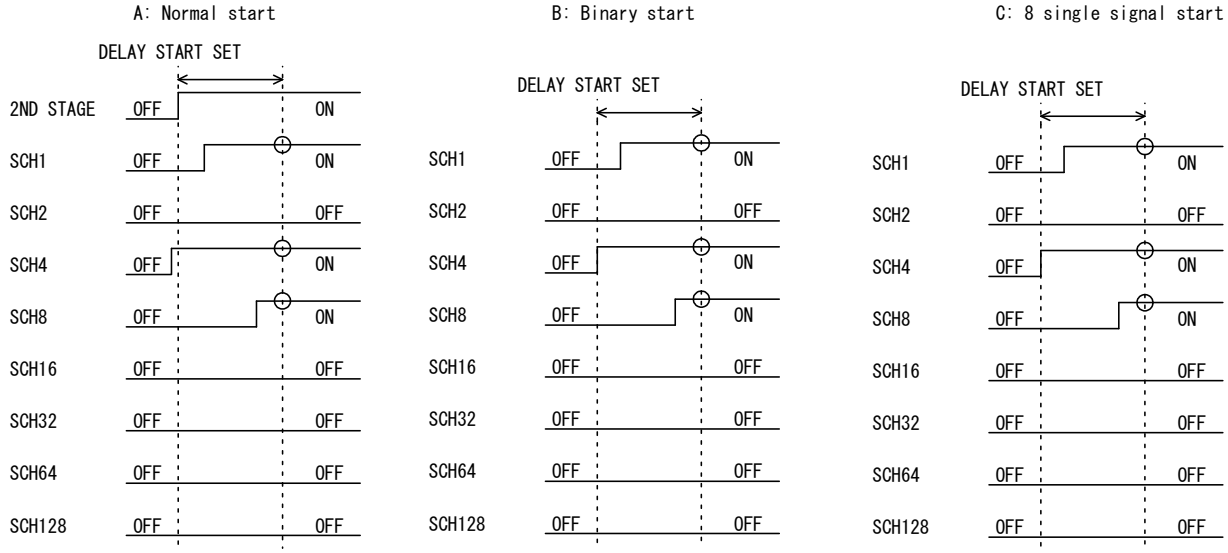
In 4) to 7) below, schedule signals double as start signals. **IS-444C/471C** has this function, and it can be used when replaced with **IS-800A/1400A**. The signal after the time of **DELAY START SET** from the first input schedule signal is determined. When VALVE MODE is set to 2 VALVE and the Power Supply starts with 4) to 7), E-10 (Schedule setting error) will occur.

4) LATCHED(B) For B: Binary start. The welding sequence halts if all schedule signals are turned off by the end of SQZ.

5) PULSED(B) For B: Binary start. The welding sequence continues even if all schedule signals are turned off by the end of SQZ.

6) LATCHED(8) For C: 8 single signal start. The welding sequence halts if all schedule signals are turned off by the end of SQZ.

7) PULSED(8) For C: 8 single signal start. The welding sequence continues even if all schedule signals are turned off by the end of SQZ.



In 4) and 5), up to 255 schedules can be used by combining schedule signals SCH1/2/4/8/16/32/64/128 in binary. In Fig. B: Binary start, schedule No. 13 is selected since signals SCH1/4/8 are determined.

In 6) and 7), a schedule of the smallest number among input schedule signals SCH1/2/4/8/16/32/64/128 can be used. In Fig. C: 8 single signal start, the smallest schedule No. 1 is selected since signals SCH1/4/8 are determined.

(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 0 ms 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 SIGNAL TIME. (See below.) Also, this is not output depending on the END SIGNAL MODE setting.

- END SIGNAL TIME is 0 ms.
  1) OFF time is 0 ms. (OFF time = 0 ms)
     a) When the start input time is longer than the sequence time, the end signal time is the start input time. (Sequence time ≤ 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 10 ms. (Sequence time > start input time → END time = 10 ms)
  2) OFF time is 10 ms to 200 ms. (10 ms ≤ 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 SIGNAL TIME is 10 to 200 ms.
  1) OFF time is 0 ms. (OFF time = 0ms)
     End signal time is the set END SIGNAL TIME time. (END time = END SIGNAL TIME time)
  2) OFF time is set (10 ms ≤ OFF time)
     a) END SIGNAL TIME time is shorter than OFF time. (END SIGNAL TIME time < OFF time)
        End signal time is the set END SIGNAL TIME time. (END time = END SIGNAL TIME time)
     b) END SIGNAL TIME time is equal to or longer than OFF time. (END SIGNAL 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 SIGNAL 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 SIGNAL MODE (MAINTAINED).
* There is no distinction between ERROR and CAUTION.

END signal output

END SIGNAL 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 faults, see **12. (1) 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 **(3) SCHEDULE Screen**.

CYC	50 Hz: 1 CYC = 20 ms 60 Hz: 1 CYC = 16.6 ms
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. If it is even, E-04 (Parity error) is displayed when the start signal is input. (Refer to **Note 1**, **“Schedule Nos. and Schedule Selection Pins.”**)

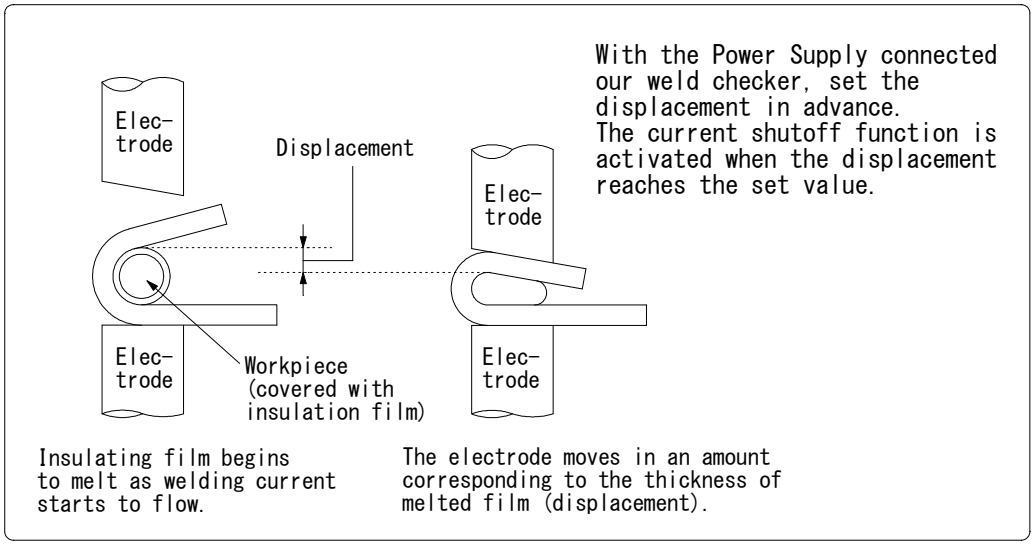
Note 1: Schedule Nos. and Schedule Selection Pins

●: Closed Blank: Open

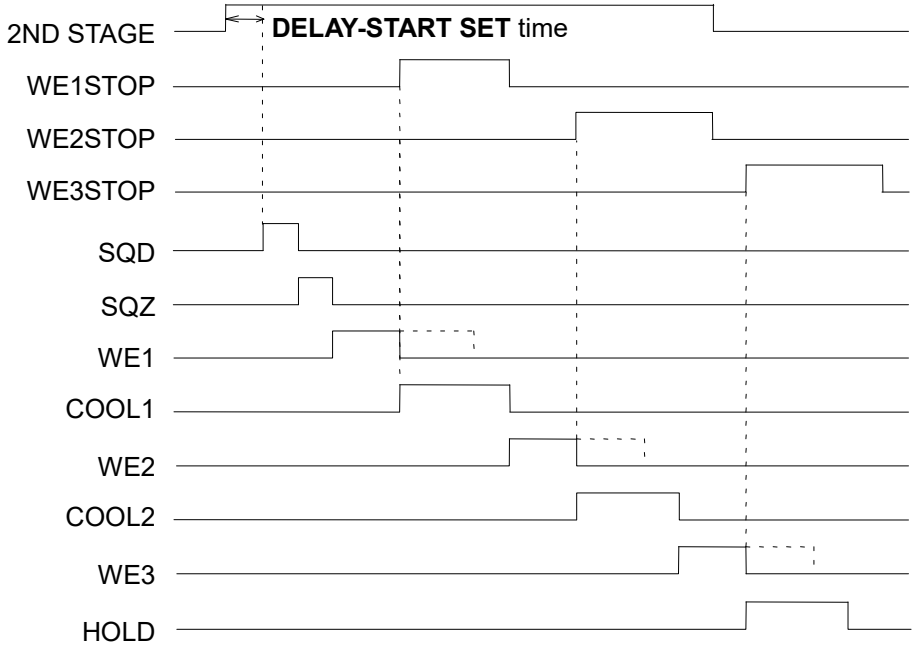
SCHEDULE#	SCH 1	SCH 2	SCH 4	SCH 8	SCH16	SCH32	SCH64	SCH128	PARITY
1	●								
2		●							
3	●	●							●
4			●						
5	●		●						●
6		●	●						●
7	●	●	●						
8				●					
9	●			●					●
10		●		●					●
11	●	●		●					
12			●	●					●
13	●		●	●					
14		●	●	●					
15	●	●	●	●					●
16					●				
17	●				●				●
18		●			●				●
19	●	●			●				
20			●		●				●
:									
:									
:									
:									
:									
238		●	●	●		●	●	●	●
239	●	●	●	●		●	●	●	
240					●	●	●	●	●
241	●				●	●	●	●	
242		●			●	●	●	●	
243	●	●			●	●	●	●	●
244			●		●	●	●	●	
245	●		●		●	●	●	●	●
246		●	●		●	●	●	●	●
247	●	●	●		●	●	●	●	
248				●	●	●	●	●	
249	●			●	●	●	●	●	●
250		●		●	●	●	●	●	●
251	●	●		●	●	●	●	●	
252			●	●	●	●	●	●	●
253	●		●	●	●	●	●	●	
254		●	●	●	●	●	●	●	
255	●	●	●	●	●	●	●	●	●

Note 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 figure below.)



Timing chart for stopping current



The **WE1 STOP** signal shuts off current immediately when input during the **WE1** period, switching the sequence to **COOL1**. The **WE1 STOP** 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 **WE1 STOP** signal will not shut off current if input during the **WE2** or **WE3** period.

The **WE2 STOP** signal shuts off current immediately when input during the **WE2** period, switching the sequence to **COOL2**. The **WE2 STOP** 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 **WE2 STOP** signal will not shut off current if input during the **WE3** period.

The **WE3 STOP** signal shuts off current immediately when input during the **WE3** period, switching the sequence to **HOLD**. The **WE3 STOP** 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 INTERVAL time.
The welding is stopped within 2 control cycles (for example, when the frequency is 1 kHz, 1 control cycle is 1 ms. Therefore, it is 2 ms.) after the welding stop signal is input.

Example)
WELD STOP OFF TIME: 60 ms, WELD: 25 ms, INTERVAL: 10 ms, and repetition: 3

① When the welding stop signal is input within the first 60 ms
The welding current is supplied in order of WELD: 25 ms, INTERVAL: 10 ms, WELD: 25 ms, INTERVAL: 10 ms, and 10 ms, and stopped. (INTERVAL is not included in WELD STOP OFF TIME.)

② When the welding stop signal is input after 60 ms
The welding is stopped at the time.

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 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. (Refer to **Note 2**, **"Current shutoff function"** in **(f)**.) When the **WE2 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. (Refer to **(10)(a)**.)

(h) 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. (Refer to **Note 2**, **"Current shutoff function"** in **(f)**.) When the **WE3 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. (Refer to **(10)(a)**.)

(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.

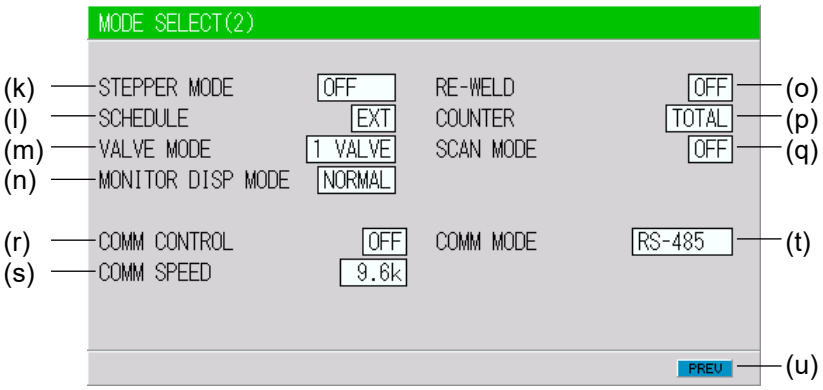
When **PRG PROTECT** is selected

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

When changing the inhibition state with the program inhibit input pin, press the **MENU** key to display the MENU screen after changing the state. Even if the MENU screen is being displayed, press the **MENU** key to refresh the MENU screen.

(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 (-down) operation. (Refer to **(11) STEPPER COUNT Screen**.)

OFF	Step-up (-down) will not be performed.
FIXED	Step-up (-down) will be performed. (Stepwise)
LINEAR	Step-up (-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 to increase stepper count 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.

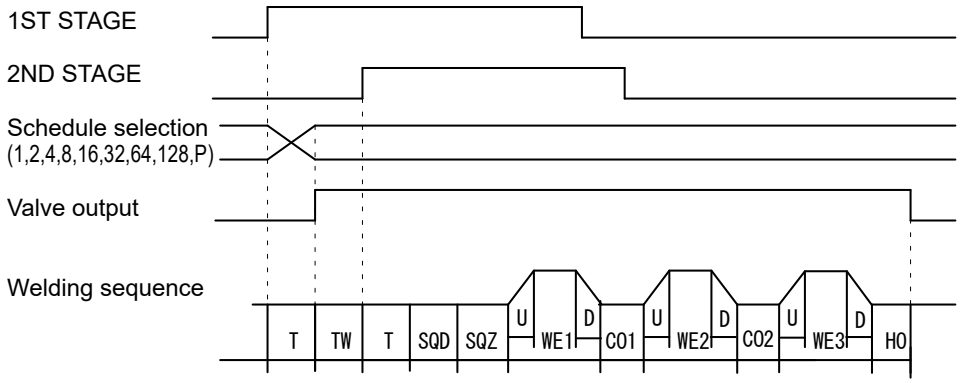
(m) VALVE MODE

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

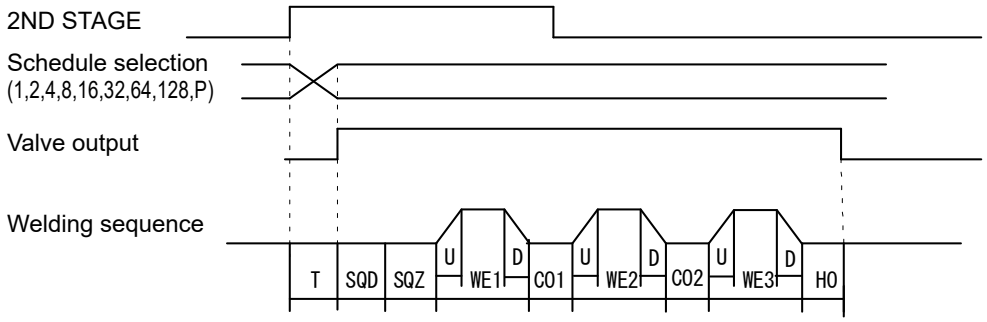
When **1 VALVE** is selected

When the 1ST STAGE signal is input, the valve signal (SOL1 or SOL2) 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 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.



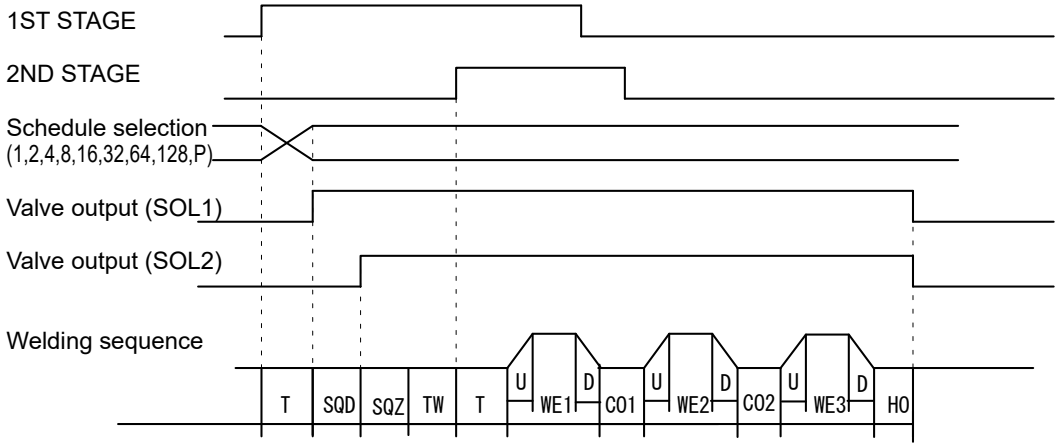
When **2 VALVE** is selected

2 valve signals (SOL1 and SOL2) are output in a sequence.
When SOL1 is used, the weld force position can be adjusted by the 1ST STAGE signal input. Adjust the output timing of SOL2 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)
- Start mode LATCHED(B), PULSED(B), LATCHED(8), PULSED(8) operation (E-10 (Schedule setting error) occurs at start up.)

When the 1ST STAGE signal is input, SOL1 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.
The STEPPER (step-up (-down) operation) is operated with the specified valve No.



(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.

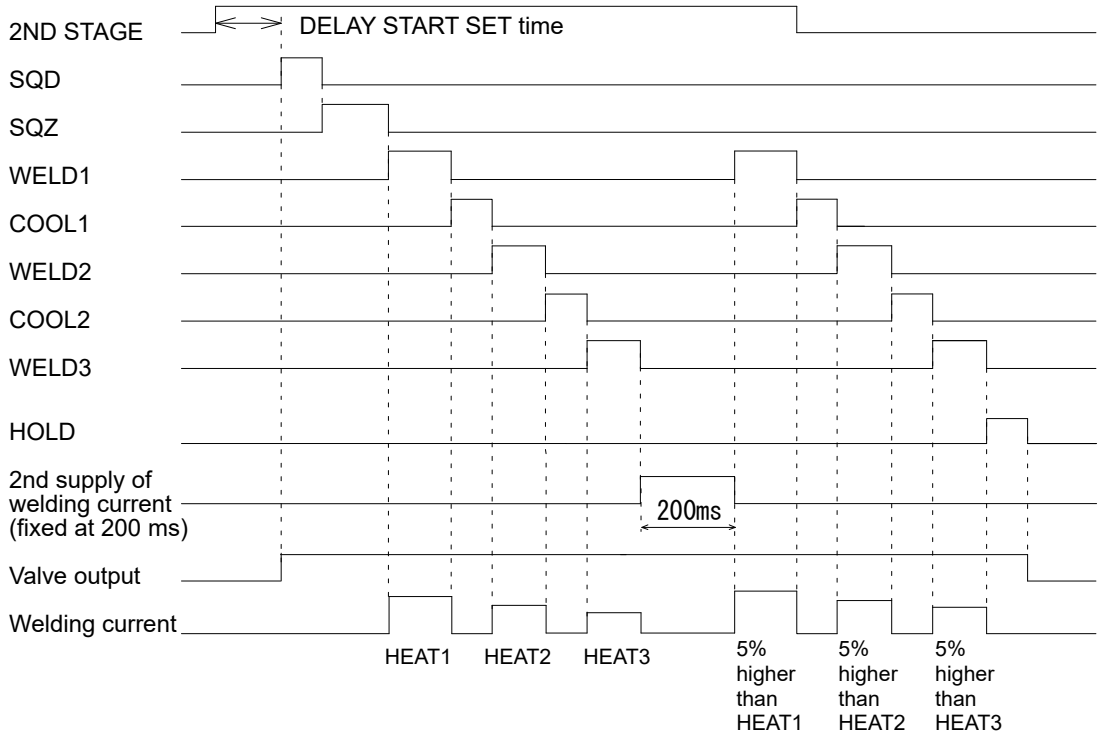
Even when the welding current is supplied twice with RE-WELD, each count value is incremented only once.

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.

RE-WELD Timing Chart



(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.
The count value is not incremented when WELD is OFF.

TOTAL: The count value is incremented by one 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)), the count value is not incremented.

Judgment		Counting Manner
GOOD (normal)		Count value is incremented.
Upper/lower limit monitor is outside the range.	CAUTION	
	ERROR	
Error		Count value is not incremented.

GOOD: The count value is incremented by one if the judgment is GOOD in current-supplied monitoring.
In case of errors other than the counter error, the count value is not incremented.

Judgment		Counting Manner
GOOD (normal)		Count value is incremented.
Upper/lower limit monitor is outside the range.	CAUTION	Count value is not incremented.
	ERROR	
Error		

WORK: If the judgment is GOOD in current-supplied monitoring or CAUTION is set to output when upper/lower limit monitor is outside the range, the count value is incremented. When the preset count is “0”, the count value is not incremented.

<table>
<tr><th colspan="2">Judgment</th><th>Counting Manner</th></tr>
<tr><td colspan="2">GOOD (normal)</td><td rowspan="2">WELD Counter is incremented.
WORK Counter is incremented by one when WELD Count reached the set value.</td></tr>
<tr><td rowspan="2">Upper/lower limit monitor is outside the range.</td><td>CAUTION</td></tr>
<tr><td>ERROR</td><td rowspan="2">WELD Counter is not incremented.
WELD Counter is reset to 0 (zero) when NG is reset. WORK Counter is not incremented.</td></tr>
<tr><td colspan="2">Error</td></tr>
</table>

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

(t) COMM SPEED

Selects a communication speed.

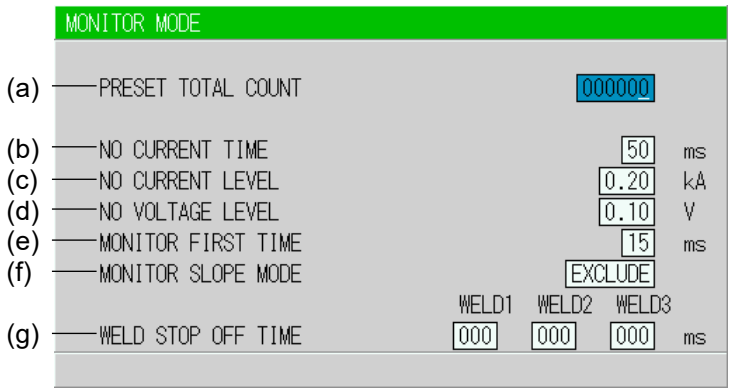
9.6k	Communication at 9600 bps
19.2k	Communication at 19200 bps
38.4k	Communication at 38400 bps

For details of the external communication, see **9. External Communication Function**.

(u) PREV

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

(10) MONITOR MODE Screen

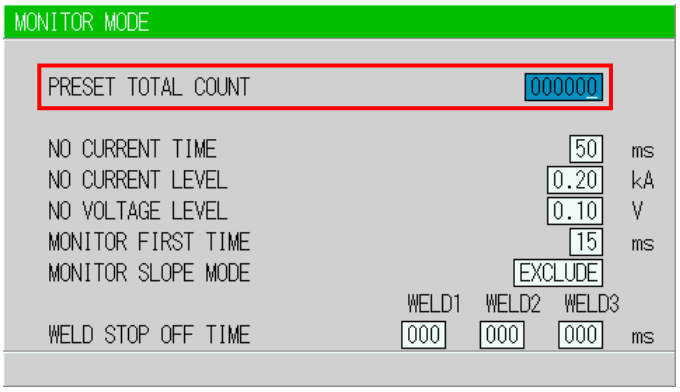


(Note) This screen shows initial settings. The display changes depending on the setting of WELD2 STOP/WELD COUNT and COUNTER on the MODE SELECT screen.

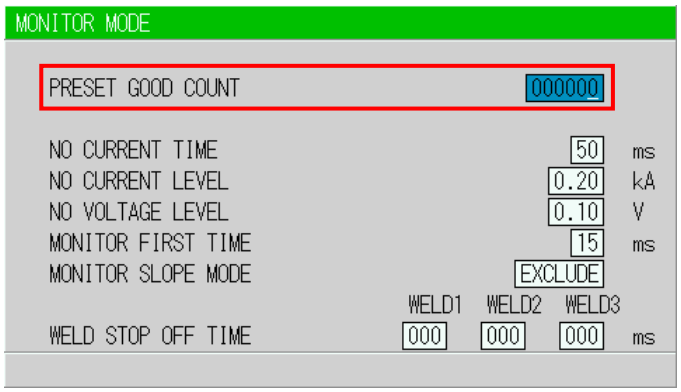
(a) PRESET TOTAL COUNT

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.

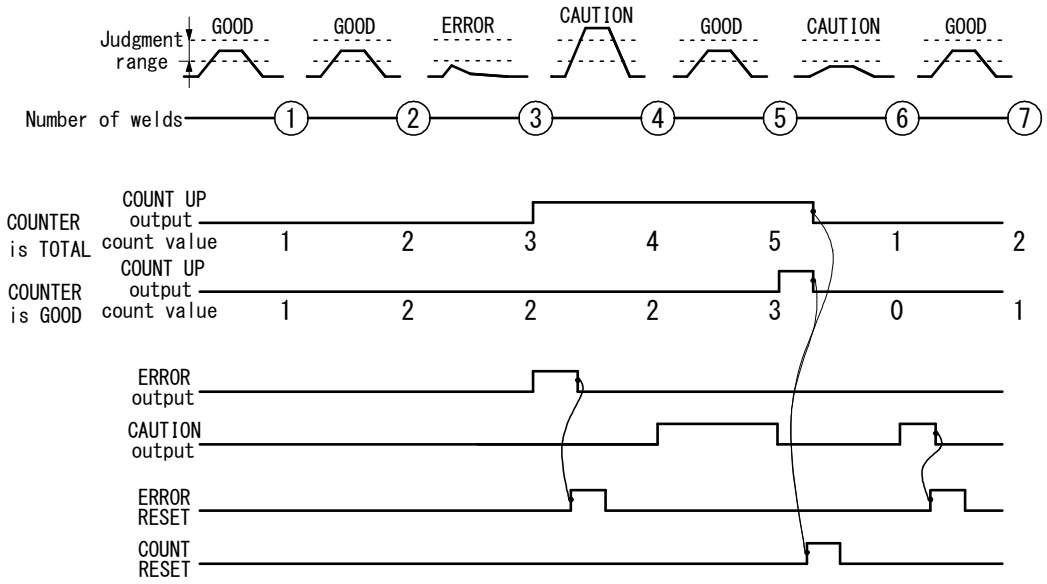
① When WELD2 STOP/WELD COUNT is WELD2 STOP and COUNTER is TOTAL, the PRESET TOTAL COUNT is displayed.
The setting range is 0 to 999999.



② When WELD2 STOP/WELD COUNT is WELD2 STOP and COUNTER is GOOD, the PRESET GOOD COUNT is displayed.
The setting range is 0 to 999999.



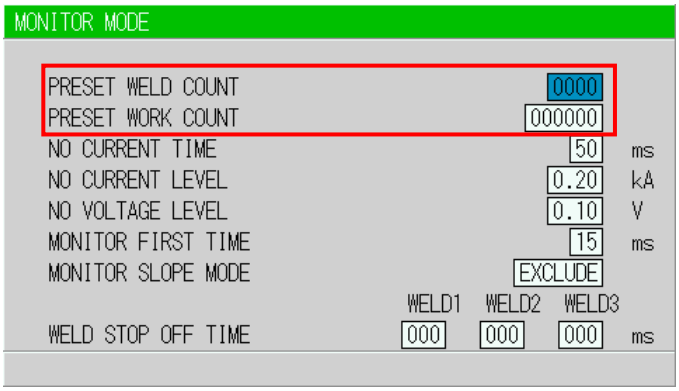
Example) PRESET COUNT=3

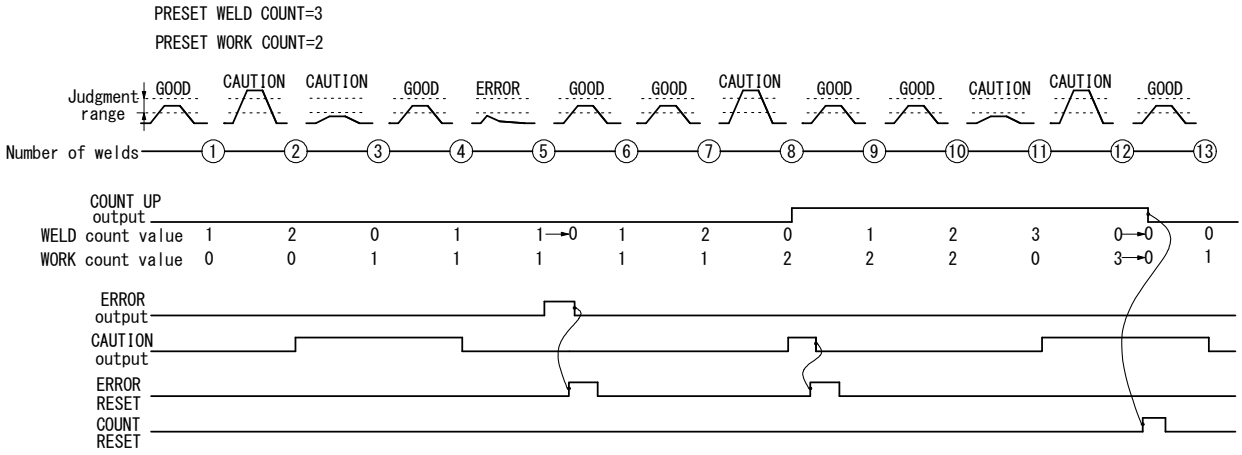


(Note)

- 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 ERROR/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.

③ When 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.
The setting range of PRESET WELD COUNT is 0 to 9999, and the setting range of PRESET WORK COUNT is 0 to 999999.

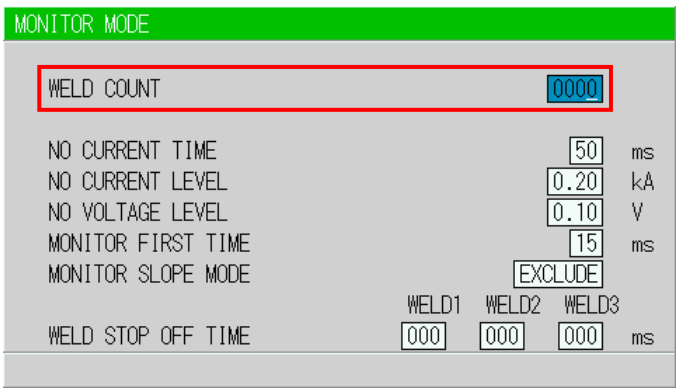




(Note)

- The WELD count becomes “0” at the same time as the WORK count is increased by one, not “3” (PRESET COUNT value).
- 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 ERROR/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.

④ WELD2 STOP/WELD COUNT is WELD COUNT

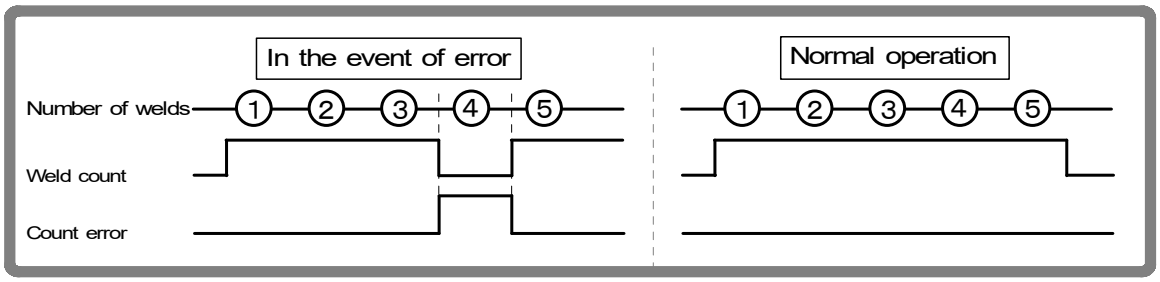


A count error signal is output if the number of welds deposited while the

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 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. (Refer to **(9)(f)**.)

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.
The setting range is 0 to 9999.

(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 **12. Troubleshooting**) 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. The setting range is 1 to 99 ms.

(c) NO CURRENT LEVEL / (d) NO VOLTAGE LEVEL

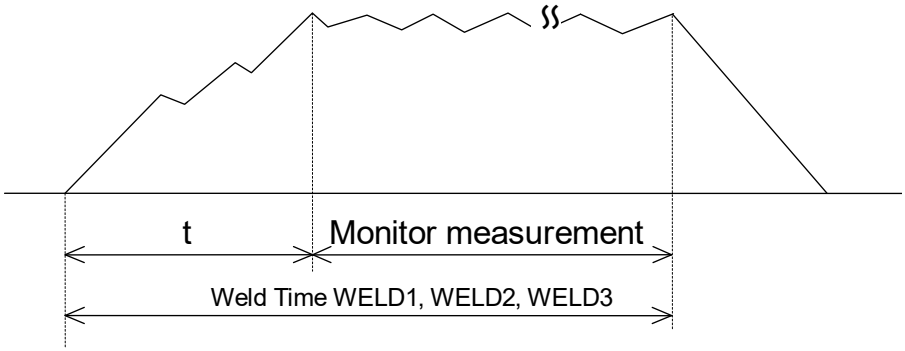
Set the current or voltage level for determining the absence of current or voltage as a no-current or no-voltage error.
The **TROUBLE** lamp will light up, and operation will stop if the monitored current or voltage falls below the level set here.
In the case of primary current control, supplying current 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.
The setting range of NO CURRENT LEVEL is 0 to 9.99 kA, and the setting range of NO VOLTAGE LEVEL is 0 to 9.99 V.

(Note) No judgment as to no-current or no-voltage error will be made if you select 00.0 kA/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 1 to 15 ms. Use this setting to exclude the initial rise of current from measurement.

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



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

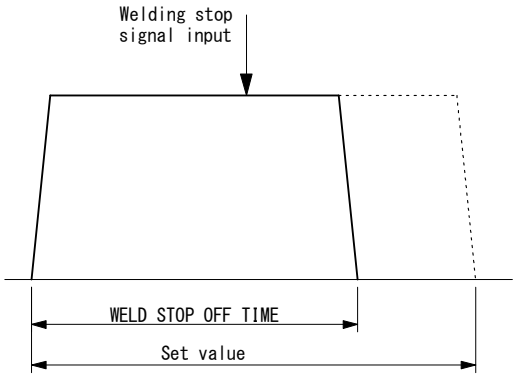
Sets the neglecting time of the welding stop signal for each of **WELD1**, **WELD2** and **WELD3**.

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.

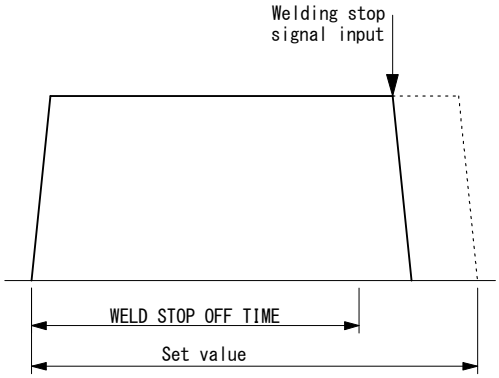
The setting range is 0 to 999 ms.

① When the welding stop signal is input within WELD STOP OFF TIME

The welding is stopped at the end of WELD STOP OFF TIME.

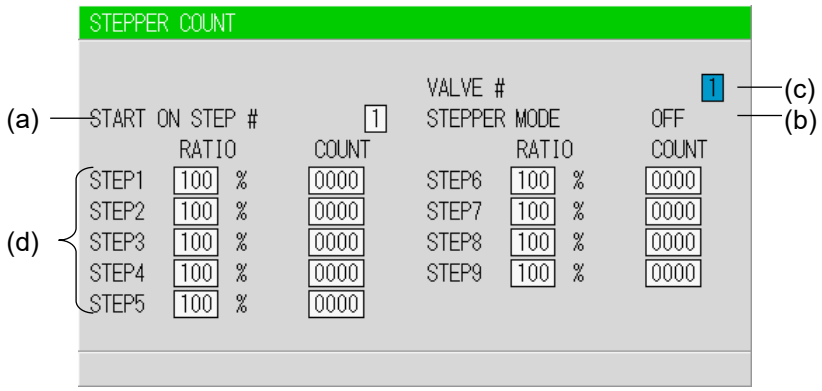


② When the welding stop signal is input after WELD STOP OFF TIME
The welding is stopped when the welding stop signal is input.



(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. (Refer to **(7) OUTPUT SELECT Screen**.)



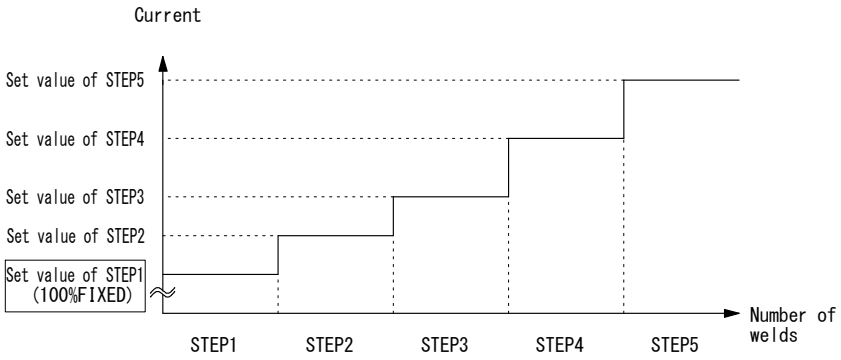
(a) START ON STEP #

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** respectively.

(b) STEPPER MODE

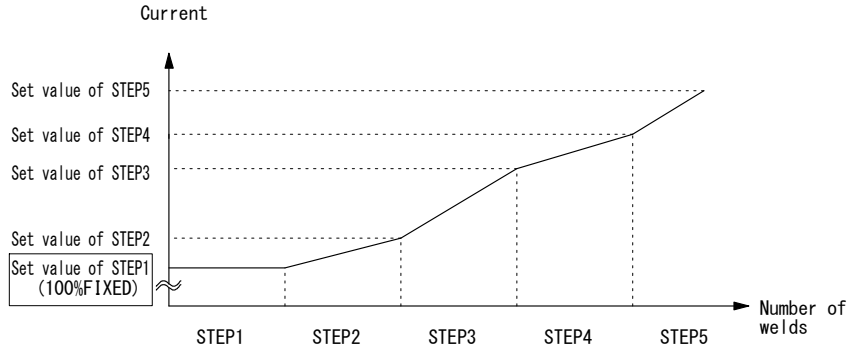
There are two types for step-up (-down), stepwise (FIXED) and linear (LINEAR). When step-up (-down) is not used, OFF is displayed.
The setting is made on the MODE SELECT screen. (Refer to **(9)(k)**.)

① 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**.

② LINEAR



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

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

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

(c) VALVE #

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

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

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

Example) When the current is set to 2 kA, HIGH; 2.2 kA, LOW; 1.8 kA.
When the step becomes 150%, HIGH and LOW become as follows.

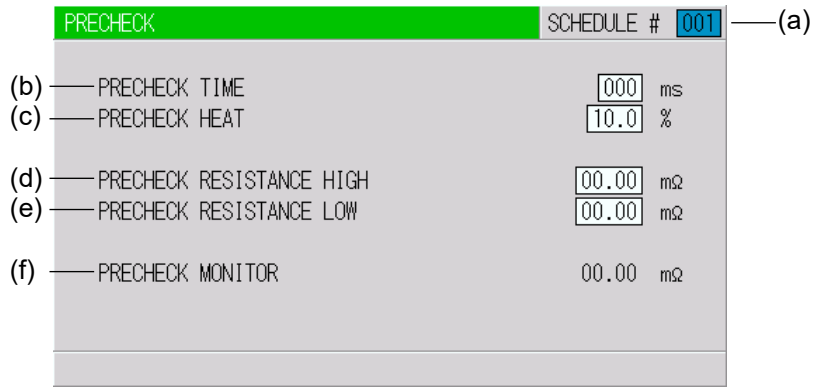
HIGH: 2.2 x 1.5 = 3.3 kA
LOW: 1.8 x 1.5 = 2.7 kA

(d) STEP 1–9

Set the welding current up-down 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. The setting range of RATIO is 50 to 200%, and the setting range of COUNT is 0 to 9999.

(12) PRECHECK Screen

Screen for setting the weld time and pulse width for resistance precheck welding. The resistance precheck 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 and voltage values. To use the precheck function, the secondary current (voltage) needs to be monitored.



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

(b) PRECHECK TIME
Set the weld time. Precheck is not performed at 0 ms.
The setting range is 0 to 100 ms.

(c) PRECHECK HEAT
Set the welding pulse width.
The setting range is 10 to 99.9%.

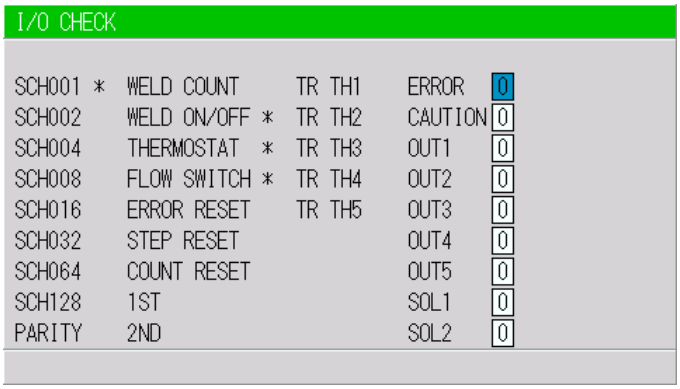
(d) PRECHECK RESISTANCE HIGH
Set the upper limit of resistance value for precheck.
The setting range is 0 to 99.99 mΩ.

(e) PRECHECK RESISTANCE LOW
Set the lower limit of resistance value for precheck.
The setting range is 0 to 99.99 mΩ.

(f) PRECHECK MONITOR
Displays the monitor resistance value at the precheck 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.



Input signal

SCH001:	Pin 5	SCH128:	Pin 12	ERROR RESET:	Pin 23
SCH002:	Pin 6	PARITY:	Pin 13	STEP RESET:	Pin 24
SCH004:	Pin 7	WELD COUNT:	Pin 14	COUNT RESET:	Pin 25
SCH008:	Pin 8	WELD ON/OFF:	Pin 19	1ST:	Pin 16
SCH016:	Pin 9	THERMOSTAT:	Pin 20	2ND:	Pin 17
SCH032:	Pin 10	FLOW SWITCH:	Pin 21		
SCH064:	Pin 11				

Output signal

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

* The ERROR signal and the CAUTION signal does not depend on the N.C/N.O setting on the NG SIGNAL SELECT screen. (See **(6)**.)

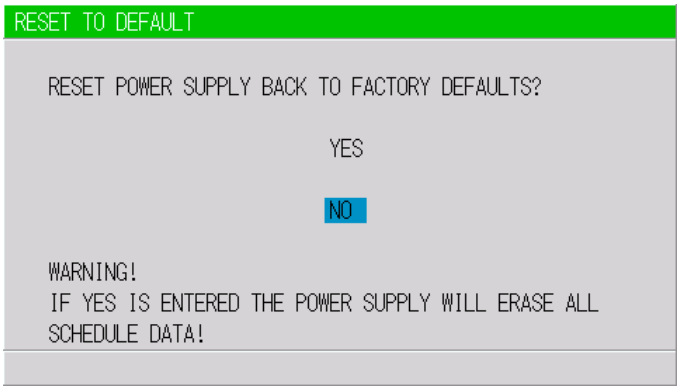
Transformer scan

Cannot be used.

TR TH1:	Not used.
TR TH2:	Not used.
TR TH3:	Not used.
TR TH4:	Not used.
TR TH5:	Not used.

(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 **MA-660A**.
To initialize, move the cursor (▁) over **YES** or **NO** and press the **ENTER** key.



YES	Initializes the Power Supply memory (restores the initial settings). After initialization, the screen will reflect the settings shown in this chapter. Wait for about 10 seconds when turning off the power supply after initialization.
NO	Returns the display to the MENU screen without initializing the Power Supply memory.

(15) PROGRAM PROTECT MODE Screen

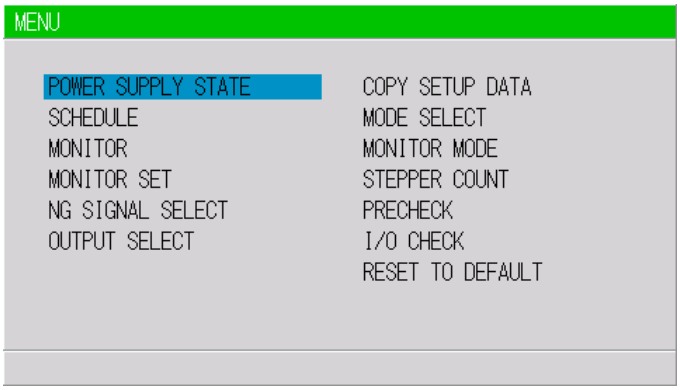
When this function is used, set values cannot be changed by any person other than the supervisor.
PROGRAM PROTECT is usually set to OFF. When it is set to ON, set values cannot be changed until **PROGRAM PROTECT** is set to OFF again.
Follow the procedure below to change the setting of **PROGRAM PROTECT**.
Also, it can be changed with the external input pin, **PRG PROTECT**.

① Turn on the power supply with the ▽ **(DOWN)** key pressed or connect the **MA-660A** to the circuit cable with the power supply turned on. The following screen is displayed.

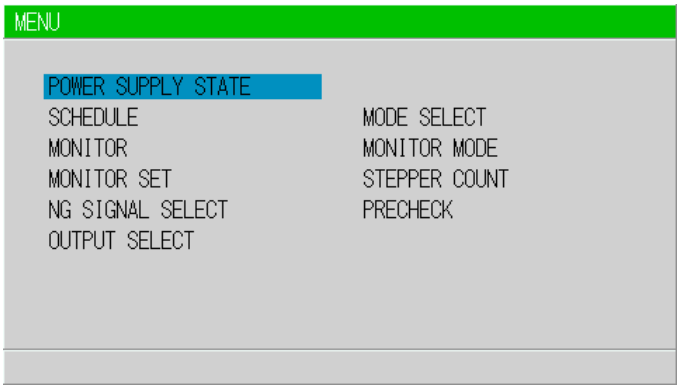
② When the **ENTER** key is pressed after the **+ON** key is pressed, ON is displayed.
You cannot go to other screens from this screen. Also, the external signals cannot be received.

③ Turn off the power supply and turn on it again.
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 by changing **SCHEDULE #** and **VALVE #**, but the settings cannot be changed.

<When PROGRAM PROTECT is OFF>



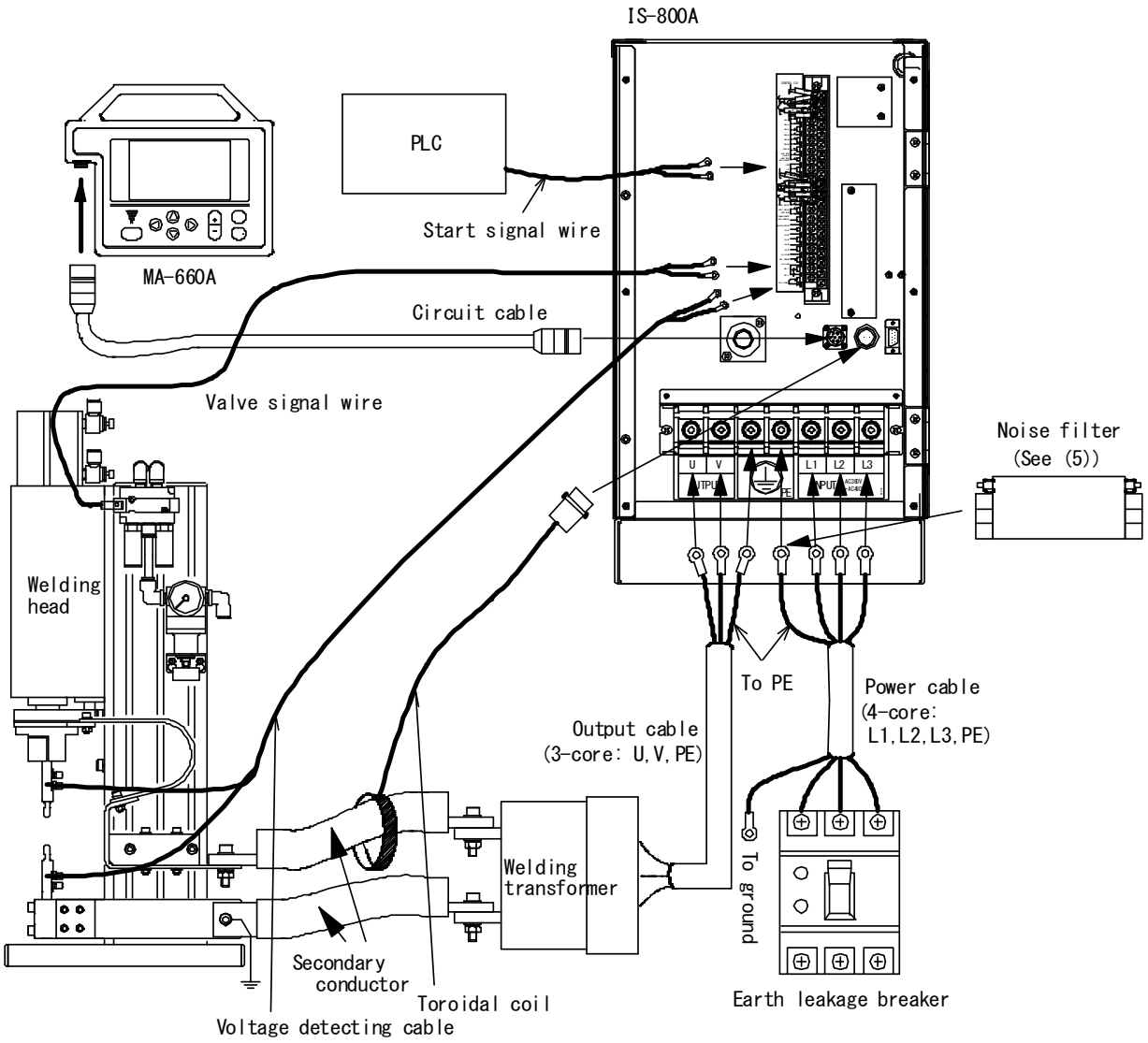
<When PROGRAM PROTECT is ON>



5. Connection Procedures

(1) Basic Configuration

IS-800A

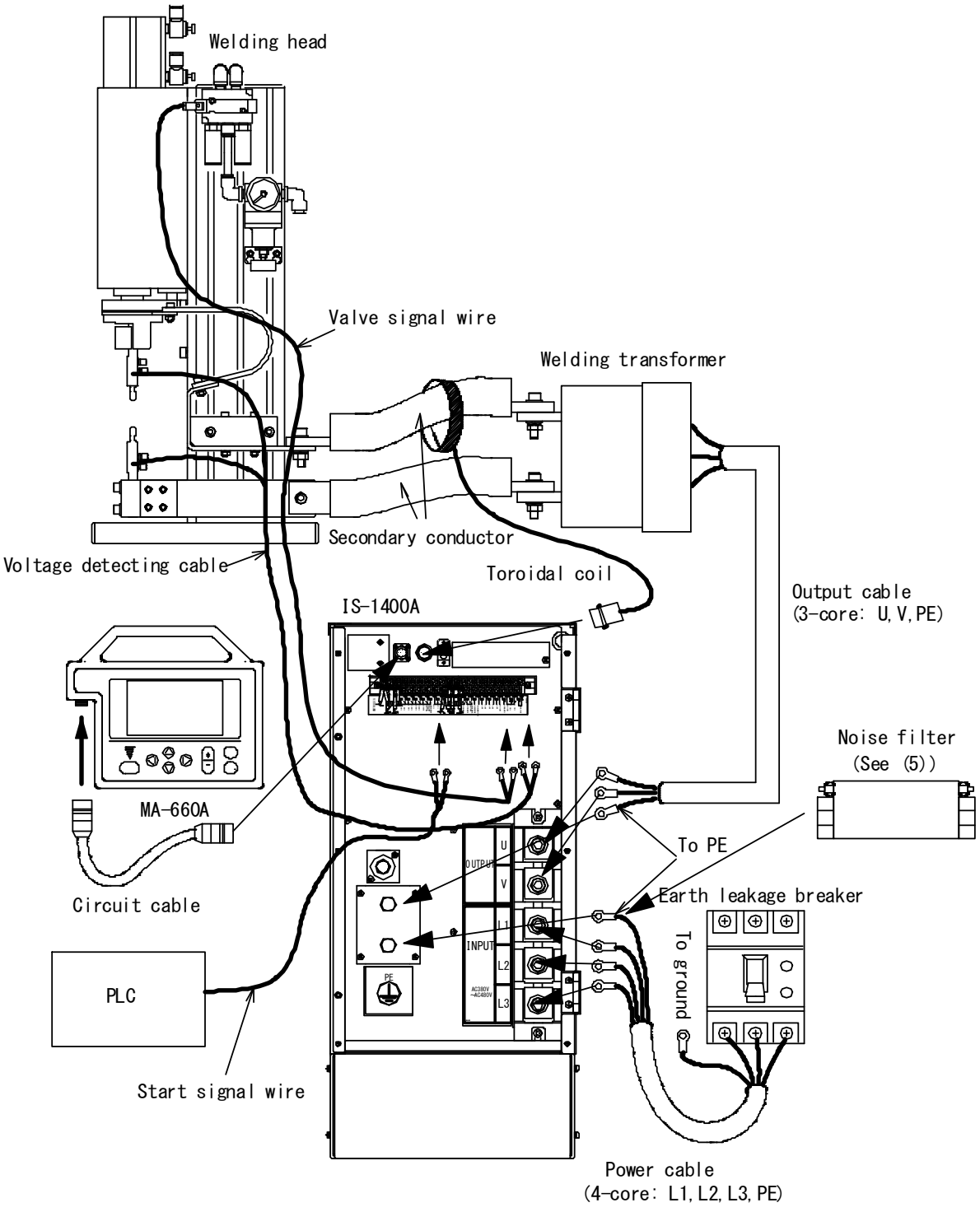


(Note 1) All items other than **IS-800A** are sold separately.

(Note 2) In the secondary constant-current effective value control and secondary constant-power effective value control, a toroidal coil and a voltage detecting cable are required. Connect the voltage detecting 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 3) The screw of **Terminal block for welding power input (output)** is M8 hexagon bolt 18 mm long with cross-recessed head.

IS-1400A



(Note 1) All items other than **IS-1400A** are sold separately.

(Note 2) In the secondary constant-current effective value control and secondary constant-power effective value control, a toroidal coil and a voltage detecting cable are required. Connect the voltage detecting 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 3) The screw of **Terminal block for welding power input (output)** is M12 hexagon bolt 20 mm long (PE wire is M10 hexagon bolt 20 mm long).

⚠ WARNING

Be sure to ground the equipment. Be sure to install the terminal cover after wiring.

Be sure to install an earth leakage breaker on electricity input part to protect from an over current and electric leak. (See **(2) Earth Leakage Breaker**.)

(2) Earth Leakage Breaker

Breaker rated current

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

$$\text{Average input current} = I \times 0.817 \times \sqrt{\frac{\alpha}{100}}$$

(I : Output current (momentary maximum current) of **IS-800A/1400A**
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 158 A (e.g., 175 A or 200 A) must be selected.

A sold-separately breaker box, **MW-130A-□□** is available. (See table below for specifications.)

	MW-130A-			
	00	**01**	**02**	**03**
Rated voltage	Three-phase, 200V AC/400V AC±10%			
Rated current	150 A	225 A	300 A	400 A
Leak-sensed current	100/200/500 mA, switching			
Rated breaking capacity	15 kA (415V AC) 35 kA (200V AC)		25 kA (415V AC) 35 kA (200V AC)	

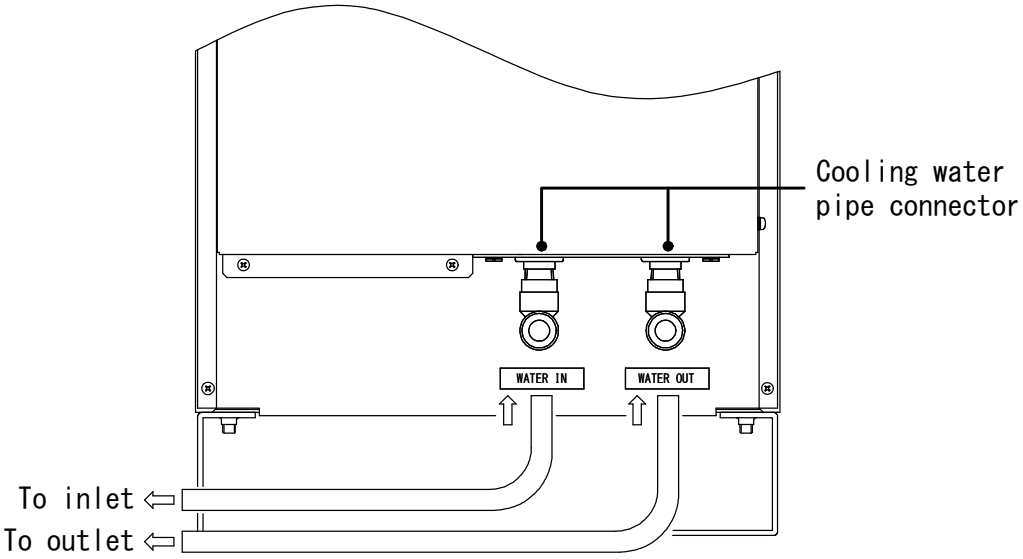
(Note 1) **MW-130A** is not dust-proof. Use it in places without dust or oily smoke, etc.

(Note 2) Use **MW-130A** with the equipment whose current is the rated breaking capacity of **MW-130A** or less when short-circuited.

(Note 3) **MW-130A** can be used in Japan only.

(3) Connection Method

IS-800A



① **Connecting a hose** (See figure above)
Connect a hose to the **Cooling water pipe connector** on the rear.

- Adapter: Easy push-connector 10 mm outer inner diameter
- Applicable hose: Braided hose 10 mm outer diameter and 7 mm inner diameter

Recommended: FS-4-10 x 7 (NITTA CORPORATION)
FW-4-10 x 7.5 (NITTA CORPORATION)

ATTENTION
Adjust the cooling water flow rate to at least 2 L/min. If it is low, E-06 (TRIP OF INTERNAL THERMO) will be detected and operation will stop.

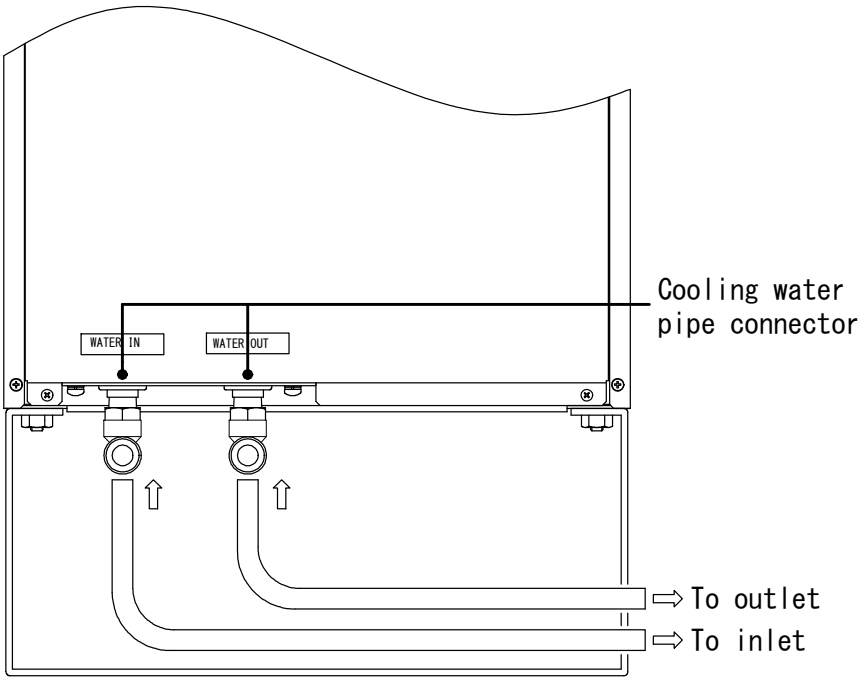
② **Connecting the transformer**
Connect the welding transformer to the **Terminal block for welding power output** and the **CABLE ERROR INPUT terminal strip** on the internal panel.

③ **Connecting the power cable**
Connect the power cable and grounding wire to the **Terminal block for welding power input** on the internal panel.

④ Connect the necessary cables to the **Connecting terminal strip for external input/output signals**.

⑤ **Connecting the program unit**
Connect the attached circuit cable to the **PROGRAM MONITOR I/O** connector on the internal panel.

IS-1400A



① **Removing the closure plate on the rear**
Connect a hose to the grommet on the closure plate.

② **Connecting a hose to the internal connector** (See figure above)
Connect a hose to the **Cooling water pipe connector** located on the inside of the closure plate.

- Adapter: Easy push-connector 10 mm outer inner diameter
- Applicable hose: Braided hose 10 mm outer diameter and 7 mm inner diameter

Recommended: FS-4-10 x 7 (NITTA CORPORATION)
FW-4-10 x 7.5 (NITTA CORPORATION)

ATTENTION

Adjust the cooling water flow rate to at least 2 L/min. If it is low, E-06 (TRIP OF INTERNAL THERMO) will be detected and operation will stop.

③ **Connecting the transformer**
Connect the welding transformer to the **Terminal block for welding power output** and the **CABLE ERROR INPUT terminal strip** on the internal panel.

④ **Connecting the power cable**
Connect the power cable and grounding wire to the **Terminal block for welding power input** on the internal panel.

⑤ Connect the necessary cables to the **Connecting terminal strip for external input/output signals**.

⑥ **Connecting the program unit**
Connect the attached circuit cable to the **PROGRAM MONITOR I/O** connector on the internal panel.

(4) Input/Output Cable

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

$$\text{Average input current} = I \times 0.817 \times \sqrt{\frac{\alpha}{100}}$$

$$\text{Average output current} = I \times \sqrt{\frac{\alpha}{100}}$$

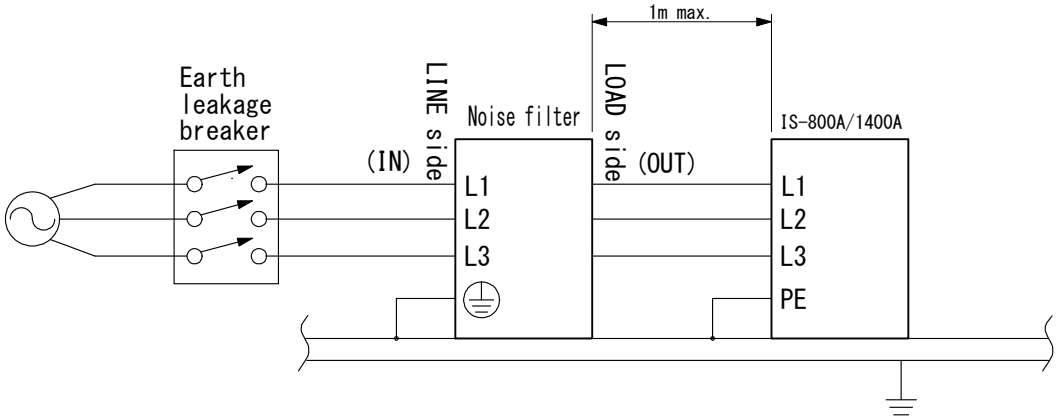
(I : Output current (momentary maximum current) of **IS-800A/1400A**
α : Duty cycle (%))

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.

(5) Noise Filter

① Connection



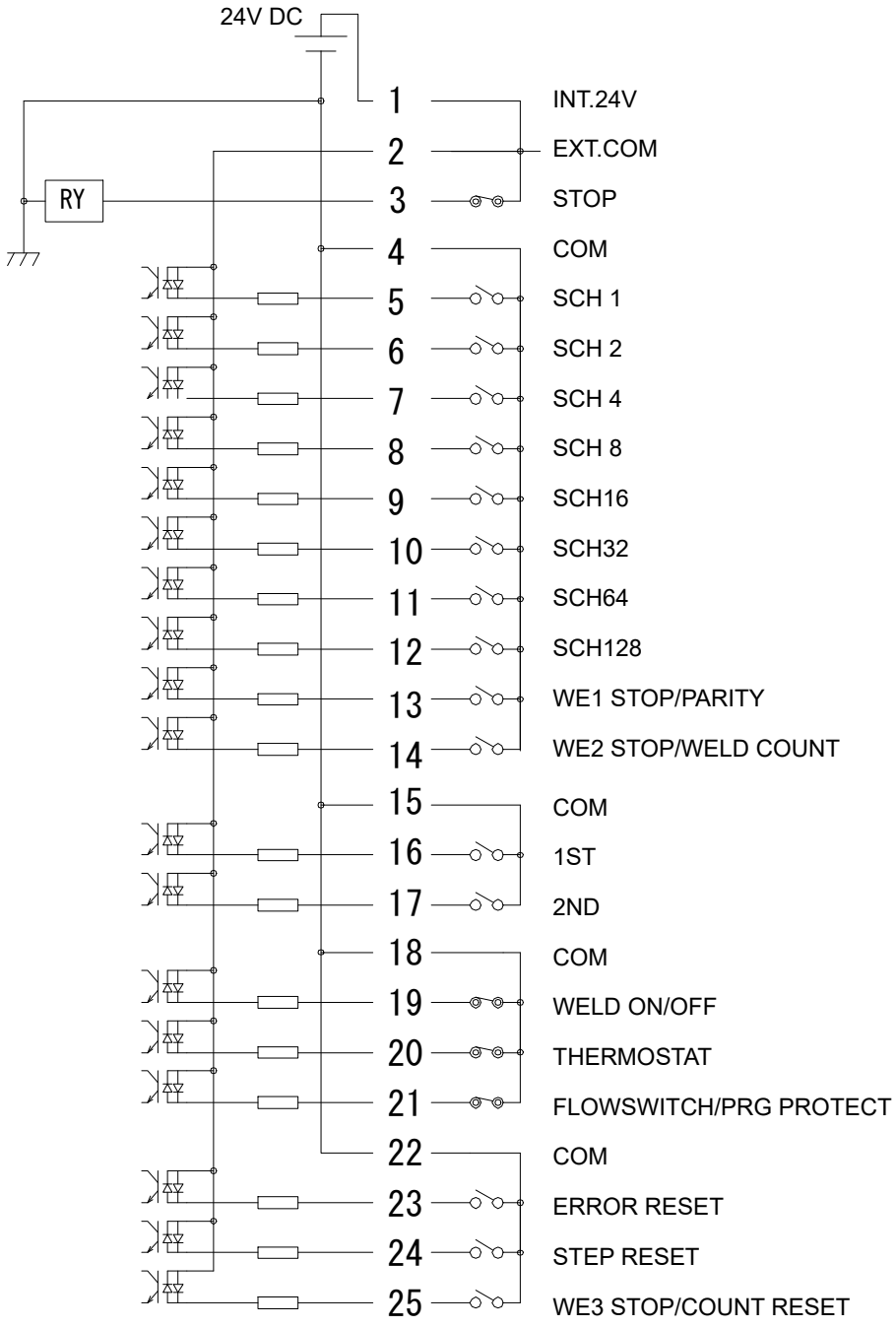
② Caution

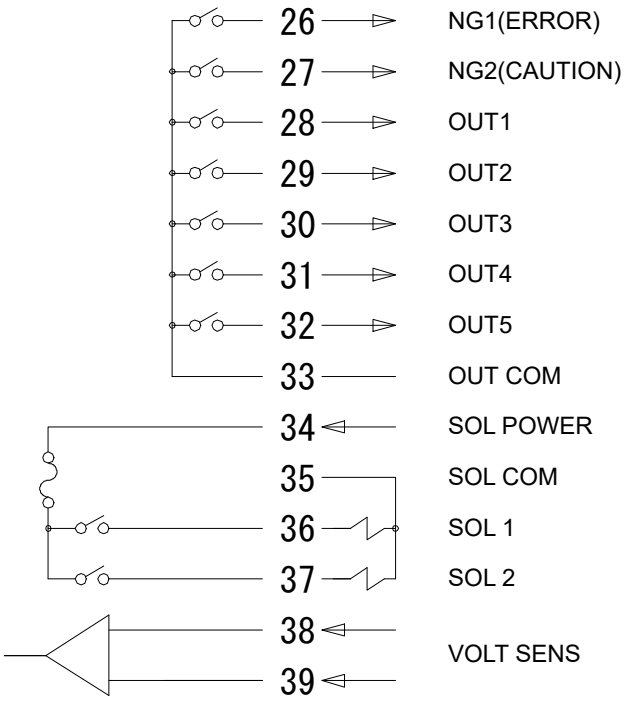
- Singly connect the protective earth terminal (⏚) of the noise filter to the ground.
- Keep the input-side cable of the noise filter away from the output-side cable of that.
- Place the noise filter with covers to avoid contact with it.

6. Interface

(1) Connection Diagram for External Input/Output Signals

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





Specifications of Terminal Strip for External Input/Output Signals	
Crimp-on terminals allowed to be installed per a terminal	2 pieces max.
Size of crimp-on terminal	M3 or M3.5 (7.1 mm wide)
Recommended cable cross-section	0.75 mm^2 min. for pin nos. 34 to 37 0.5 mm^2 min. for pin nos. 1 to 33, 38 and 39

(Note) Use the shielded cable for the external input/output signals and connect the shielded part to the shielded wire connecting screw.

(2) Description of External I/O Signals

Pin No.	Name	Description
1	INT.24V	24 V DC present. 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. (Max. load: 0.4 A) Note: Do not use pin 1 unless connecting it to pin 2 or 3, or connecting pin 34 to drive the solenoid valve. Failure to observe this precaution will result in malfunction.
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. When using an external power supply as input signal, open pin 1 and connect pin 2 and the positive pin of the DC power supply or the COM pin.
3	STOP	Normally, connect pins 3 and 1. Opening this pin will cause an error message to appear, stopping operation. Open this pin when you wish to stop the sequence halfway through when using starting signal self-hold input. Open for 20 ms or more when stopping.
4	COM	COM pin. This pin is internally connected to the GND chassis.
5 **6** **7** **8** **9** **10** **11** **12**	SCH 1 SCH 2 SCH 4 SCH 8 SCH16 SCH32 SCH64 SCH128	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 (See **4. (9) (f) Schedule Nos. and Schedule Selection Pins**.)
13	WE1 STOP/ PARITY	WE1 stop input or Parity input pin. Switch between functions via the settings described in **4. (9) (f) WELD1 STOP/PARITY CHECK**. When WE1 STOP is selected 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 the set time for WELD1 described in **4. (10) (g) WELD STOP OFF TIME** and WELD1 is stopped to switch the sequence to COOL1. When PARITY is selected 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. (See **4. (9) (f) Schedule Nos. and Schedule Selection Pins**.)

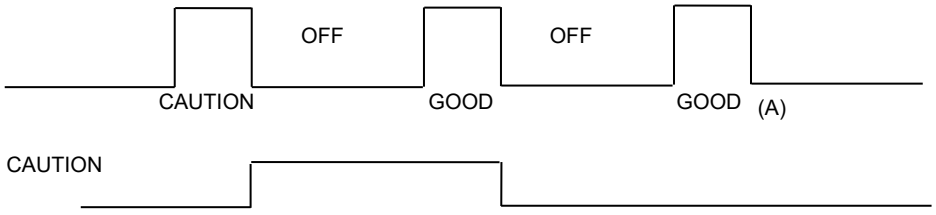
Pin No.	Name	Description
14	WE2 STOP/ WELD COUNT	WE2 stop input or Weld count input pin. Switch between functions via the settings described in **4. (9) (g) WELD2 STOP/WELD COUNT**. When WE2 STOP is selected Closing this pin during the WELD2 sequence will switch the sequence to COOL2. Closing this pin 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 the set time for WELD2 described in **4. (10) (g) WELD STOP OFF TIME** 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	COM	COM pin. This pin is internally connected to the GND chassis.
16	1ST	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 force position. When the 2ND STAGE pin is closed after this, a welding can be done at the most appropriate force position. Maintaining the 1ST STAGE input pin ends even if it is closed, and the selected SOL signal, SOL1 or SOL2, is turned OFF. The start signal stabilizing time can be changed in the range of 1 to 20 ms. (Also applied to the 2ND signal.)
17	2ND	2ND STAGE input pin. Closing this pin will start the sequence. The start signal stabilizing time can be changed in the range of 1 to 20 ms. (Also applied to the 1ST signal.)
18	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 ms or more is required for receiving the input signal.
20	THERMOSTAT	Thermostat input pin. Connect to the transformer thermostat or diode thermostat. Opening the pin will result in a thermostat error. 20 ms or more is required for receiving the input signal.

Pin No.	Name	Description
21	FLOW SWITCH/ PRG PROTECT	Flow switch input or Program inhibit input pin. Switch between functions via the settings described in **4. (9) (i) FLOW SWITCH/PRG PROTECT**. <u>When FLOW SWITCH is selected</u> Flow switch input pin. Opening this pin will result in a flow rate error. 20 ms or more is required for receiving the input signal. <u>When PRG PROTECT is selected</u> Program inhibit input pin. Closing this pin will not allow you to change the settings. When changing the inhibition state with the program inhibit input pin, press the MENU key to display the MENU screen after changing the state. Even if the MENU screen is being displayed, press the MENU key to refresh the MENU screen. Also, you can set this function on the PROGRAM PROTECT MODE screen. (See **4. (15)**.)
22	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.
25	WE3 STOP/ COUNT RESET	WE3 stop input or Count reset input pin. Switch between functions via the settings described in **4. (9) (h) WELD3 STOP/COUNT RESET**. <u>When WE3 STOP is selected</u> 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 the set time for WELD3 described in **4. (10) (g) WELD STOP OFF TIME** and WELD3 is stopped to switch the sequence to HOLD. <u>When COUNT RESET is selected</u> Closing this pin allows you to reset the counter. 20 ms or more is required for receiving the COUNT RESET input signal.

Pin No.	Name	Description
26	NG1 (ERROR)	Error signal output pin. This signal is output in the event of an operational error. For TIME-OVER, CURRENT-OVER, VOLTAGE-OVER, POWER-OVER, PULSE-OVER, WORK-OVER, DISPL-OVER, NO CURR/NO VOLT and WORK ERROR, you can select which signal to output, NG1 (ERROR) or (NG2 (CAUTION). (Refer to **4. (6) NG SIGNAL SELECT Screen**.) 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. (Refer to **4. (6) NG SIGNAL SELECT Screen**.) The contact is rated at 24 V DC at 20 mA (semiconductor switch).
27	NG2 (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 24 V DC at 20 mA (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 24 V DC at 20 mA.) 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 (Refer to **4. (7) OUTPUT SELECT Screen** and **6. (3) List of External Output Signals**.)
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	SOL POWER	Power input pins to drive the solenoid valve. Input 120 V AC or 24 V AC/DC power.
35	SOL COM	COM pin for the solenoid valve.

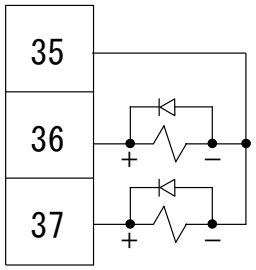
Pin No.	Name	Description
36[*2] **37**[*2]	SOL 1 SOL 2	Solenoid valve output pins. 36: SOL1; 37: SOL2 Switch between functions via the settings described in **4. (9) (m) VALVE MODE**. When 1VALVE is selected When the 1ST STAGE is input, the selected valve No. (SOL1 or SOL2) is closed and output until HOLD, or when the 2ND STAGE is input, the selected valve No. (SOL1 or SOL2) is close and output until HOLD. When the off time (OFF) is set, this pin is output between SQZ and HOLD after the second sequence. When 2VALVE is selected When the 1ST STAGE is input, the valve No. (SOL1) is closed, the valve No. (SOL2) is closed after SQZ and output till HOLD. The contacts are rated at 120 V AC or 24 V AC/DC at 0.5 A (semiconductor switches). Use a solenoid valve with a current capacity of 0.5 A or less.
38 **39**	VOLT SENS	Secondary voltage input pins. Connect to the electrodes of the welding head during constant-power or constant-voltage control or when monitoring the secondary voltage.

*1

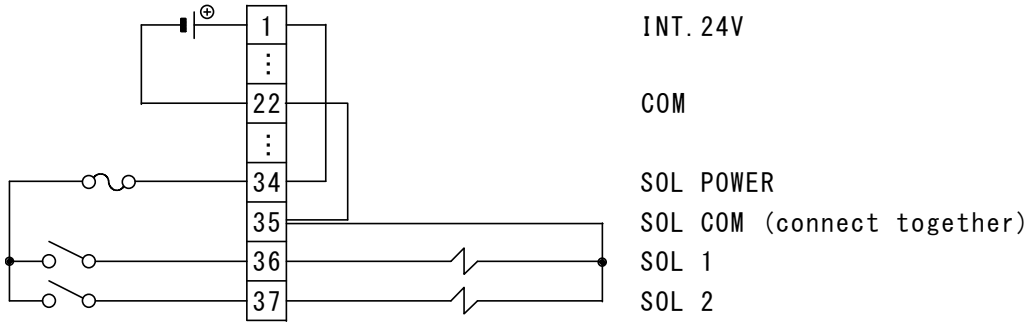


When the sequence is stopped at (A), error (CAUTION) is not displayed. It's because the contents when stopped is displayed on the program unit.

*2 When using 24 V DC solenoid, install diodes on measures to prevent surge voltage.
Example) When inputting + to Pin 34 and – to Pin 35.



*3 When solenoid valves are activated by the use of an internal power supply



(3) List of External Output Signals

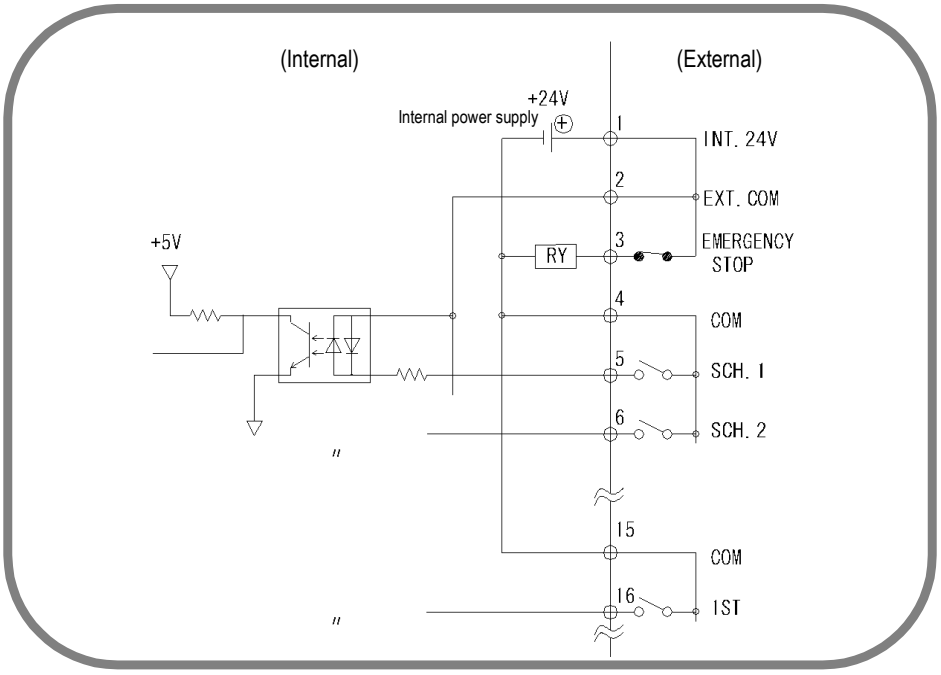
The following signals can be assigned to output pins 28 to 32 (OUT1 to 5) on the OUTPUT SELECT screen. (See **4.(7)**.)

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. (See **4.(9)(c)(d)** and **8.(1)(3)**.)
COUNT ERROR	Weld count error output. In the case WELD COUNT is ON, this signal is closed when the weld count pin is open before the set number of welds is not deposited. This signal is also closed when the weld count pin 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. (See **4.(9)(f)** and **4.(10)(a)**.)
READY	Closed when no error occurs, the WELD ON/OFF is ON and the setting is not being done. The pin becomes open with an error occurring or setting change.
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 VALVE 1 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. (See **4.(11)** and **8.(2)**③.)
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). (See **8.(1)** and **(3)**.)
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) (See **8.(1)**.)
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. (See **4.(9)(p)** and **4.(10)(a)**.)
OUT I	WELD1 welding end output. Closed between the WELD1 welding end and the beginning of HOLD. (See **8.(1)** and **(3)**.)
OUT II	WELD2 welding end output. Closed between the WELD2 welding end and the beginning of HOLD. (See **8.(1)** and **(3)**.)

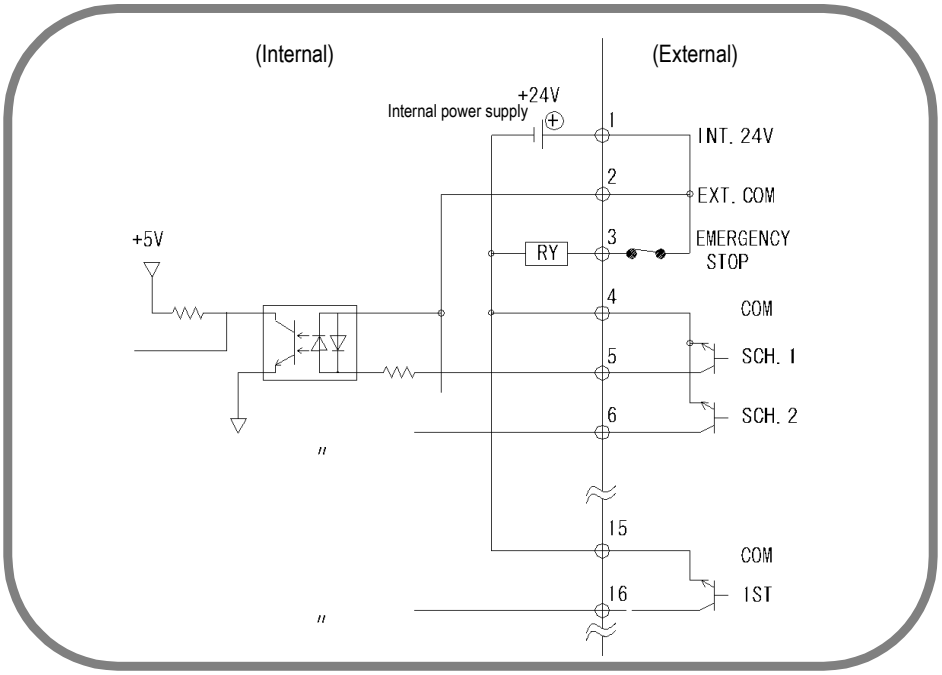
(4) Connection of Input Signals

The input signal current for all input terminals is 2.4 mA/24 V DC.

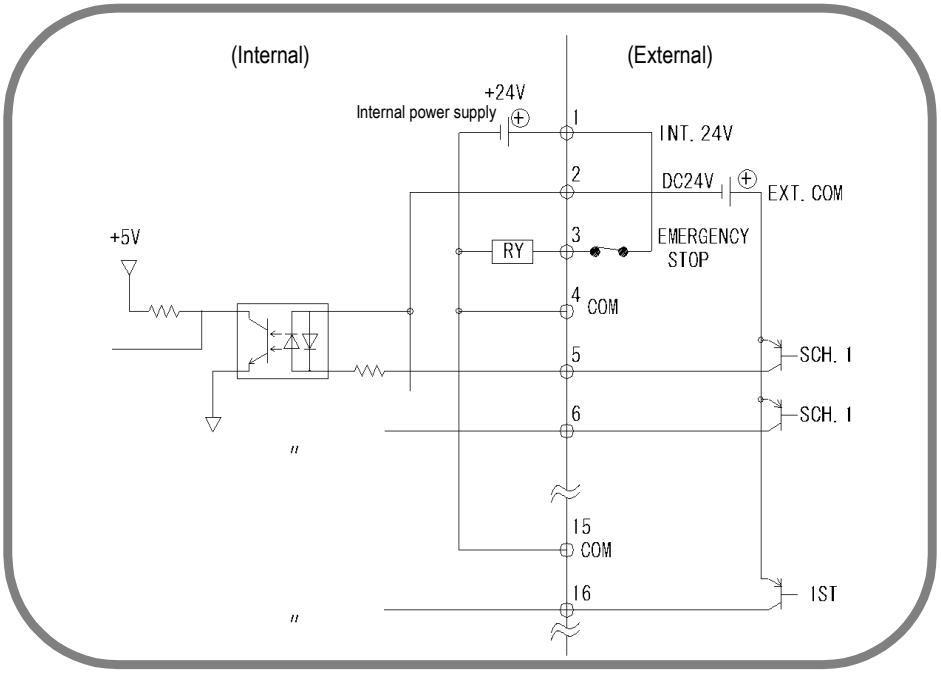
① Connection with equipment having a contact input
Connect pins 1 and 2.



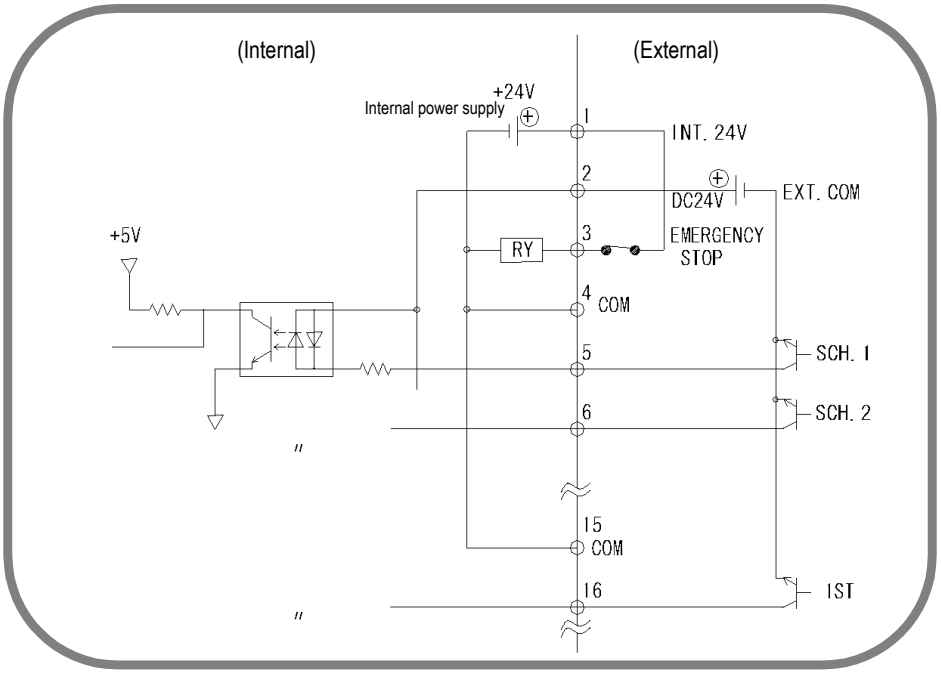
② Connection with equipment featuring NPN open collector output (when using internal power supply)
Connect pins 1 and 2.



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



④ Connection with equipment featuring NPN open collector output (when using external power supply)
Connect the positive side of an external 24 V DC power supply to pin 2.



(Note) The circuit between pins 1-2-3, 4-5, 18-19-20, and 21-22 are closed when shipped. Disconnect unnecessary jumper wires referring to each connection.

7. Basic Operation

Supplying the Cooling Water

① Supply cooling water at a temperature below 35°C at the rate of at least 2 liters/minute.

Turning on the Welding Power

② Turn on the welding power. The **WELD POWER** lamp lights up, and the **READY** lamp blinks (**IS-800A**: for 15 seconds, **IS-1400A**: for 20 seconds), then goes off.

CAUTION
Check that the display screen and lamps are turned on normally.

Setting the Program Unit

③ Call the MENU screen. If other screen is displayed, press the **MENU** key.

④ Move the cursor (_) to **SCHEDULE**, then press the **ENTER** key.

⑤ Set each item. Set it a little lower than the standard for the first welding.

Starting the Operation

⑥ Input the start signal while the **READY** lamp is not on, and check each sequential operation.

⑦ If no error is detected in ⑥ above, set a workpiece and weld it.
Turn on the **WELD ON/OFF** key on the front panel, **WELD ON/OFF** of **MA-660A** and external **WELD ON/OFF** signal. Check that the **READY** lamp lights up, then supply the welding current. At this time, confirm that the welding current is flowing normally by checking the **WELD** lamp and the MONITOR screen.

⑧ Re-set the schedule so that the workpiece will be welded adequately.

⑨ When welding plural workpieces according to plural schedules, change **SCHEDULE #** and set new time and welding current.

⑩ Set the upper and lower limits on the MONITOR SET screen for each **SCHEDULE #**.

Turning off the Welding Power

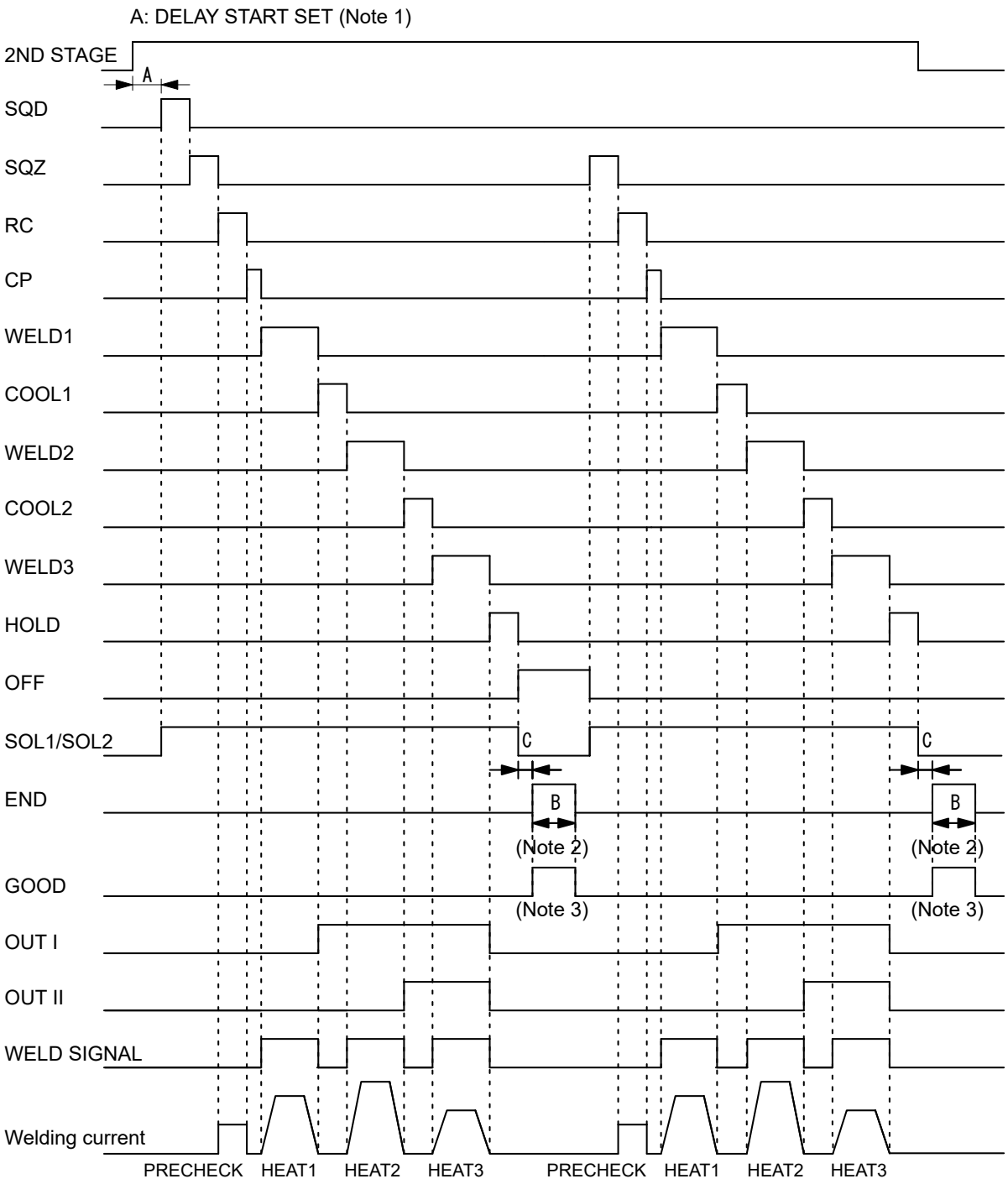
⑪ Turn off the welding power; all the LED lamps go off. (although the **CHARGE LAMP** lamp on the internal panel stays lit until the device is fully discharged.)

Turning off the Cooling Water

⑫ Turn off the cooling water.

8. Timing Chart

(1) Basic Sequence



SQD: Squeeze delay time SQZ: Squeeze time RC: Resistance precheck time
CP: Resistance judgment time (2 ms) 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

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 SIGNAL TIME setting
The output time changes depending on the OFF time. See **4.(9)(c)**.

C: Monitored value judgment time 200 µs max.

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

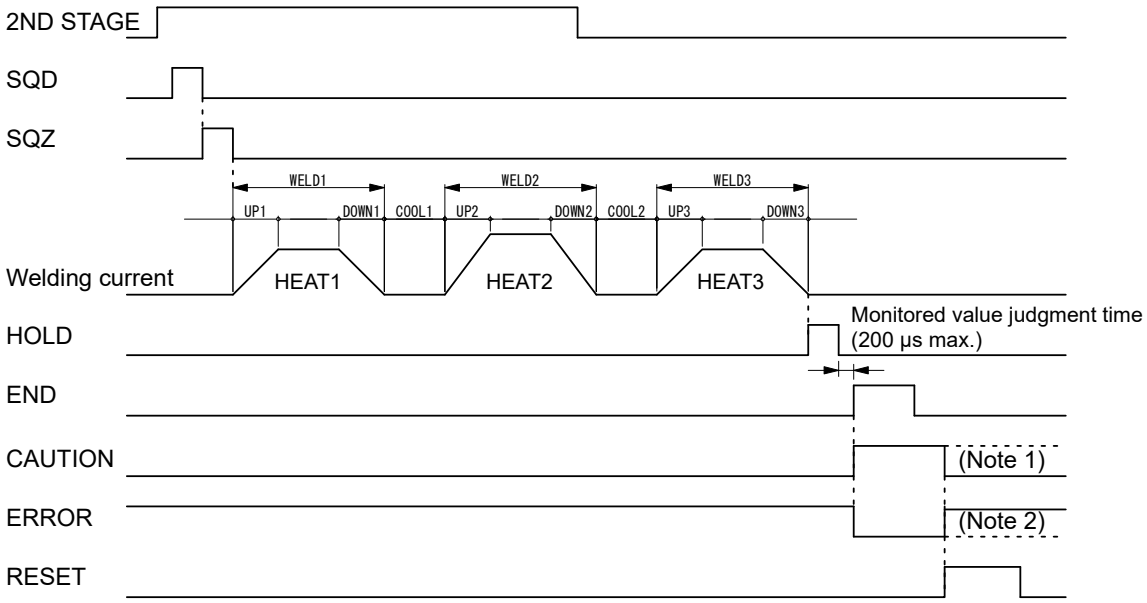
(Note 2) When the current gets out of the range of upper/lower limit judgment (ERROR) in a sequence, repetition operation ends even if the OFF time is set.

(Note 3) The GOOD signal is output simultaneously with the END signal and for the set time same as the END signal.

(2) Detailed Description of Welding Current and Sequence in the Event of an Error

① When monitored value judgment caution/error occurs

A sample weld sequence is shown, which represents the occasion where CAUTION or ERROR is produced when a monitored value goes out of the range between the upper and lower limit set in the MONITOR SET screen.

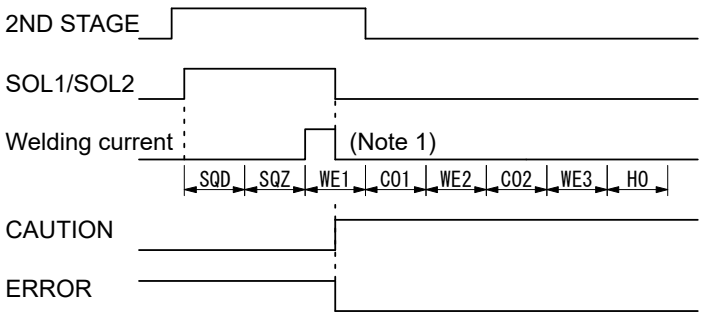


(Note 1) The CAUTION output is ON until the RESET signal or the next 2ND STAGE signal is input.
When caution occurs with the off time (OFF) setting, operation is repeated and the caution output is maintained until the result of the next welding is obtained.

(Note 2) The ERROR output is ON until the RESET signal is received.
When the off time (OFF) is set, operation is stopped without being repeated after the ERROR output.

② When caution/error occurs during welding

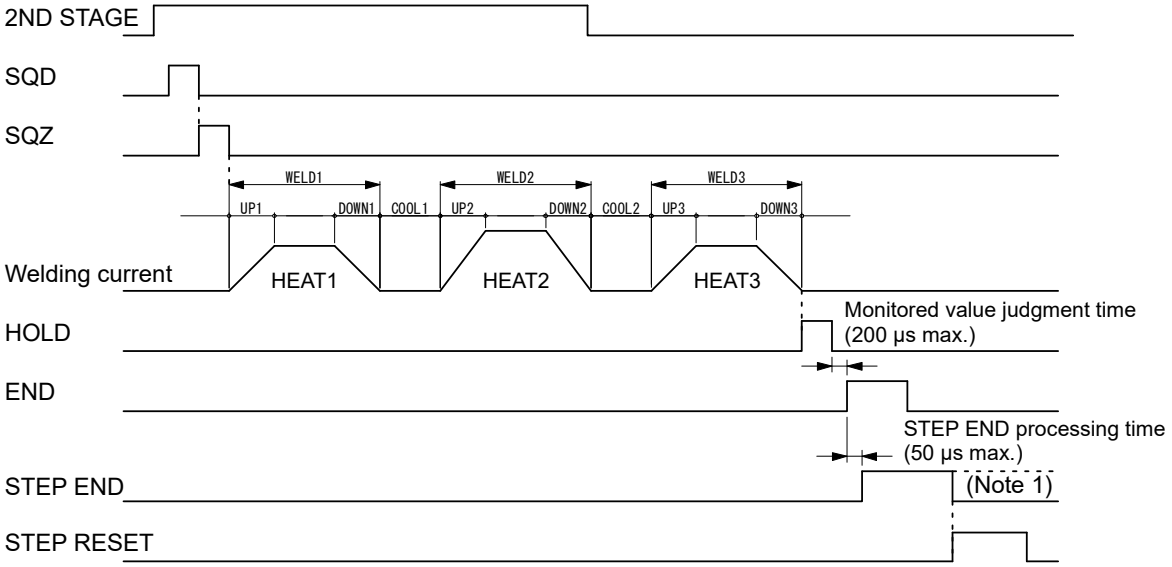
A sample weld sequence is shown, which represents the occasion where CAUTION or ERROR is produced while current is supplied.



(Note 1) When caution or error occurs, subsequent welding sequence is not performed.

③ When the step end occurs

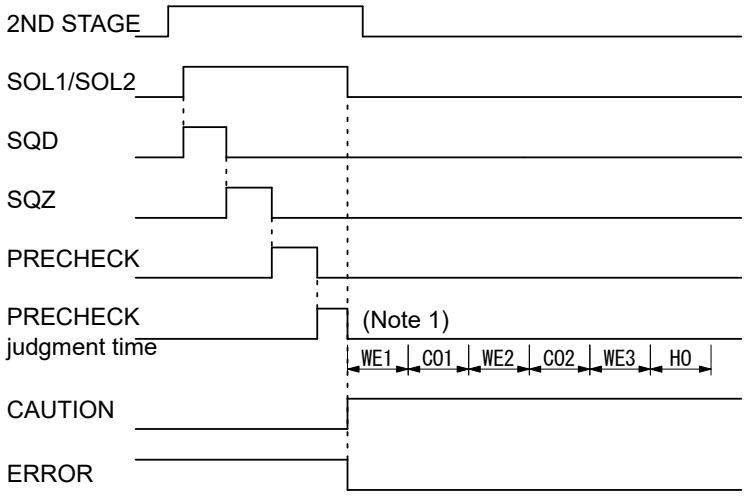
A sample weld sequence is shown, which represents the occasion where the step is complete in the step-up (-down) function set on the MODE SELECT screen and the STEPPER COUNT screen.



(Note 1) The STEP END output is ON until the STEP RESET signal is received.

④ When precheck caution/error occurs

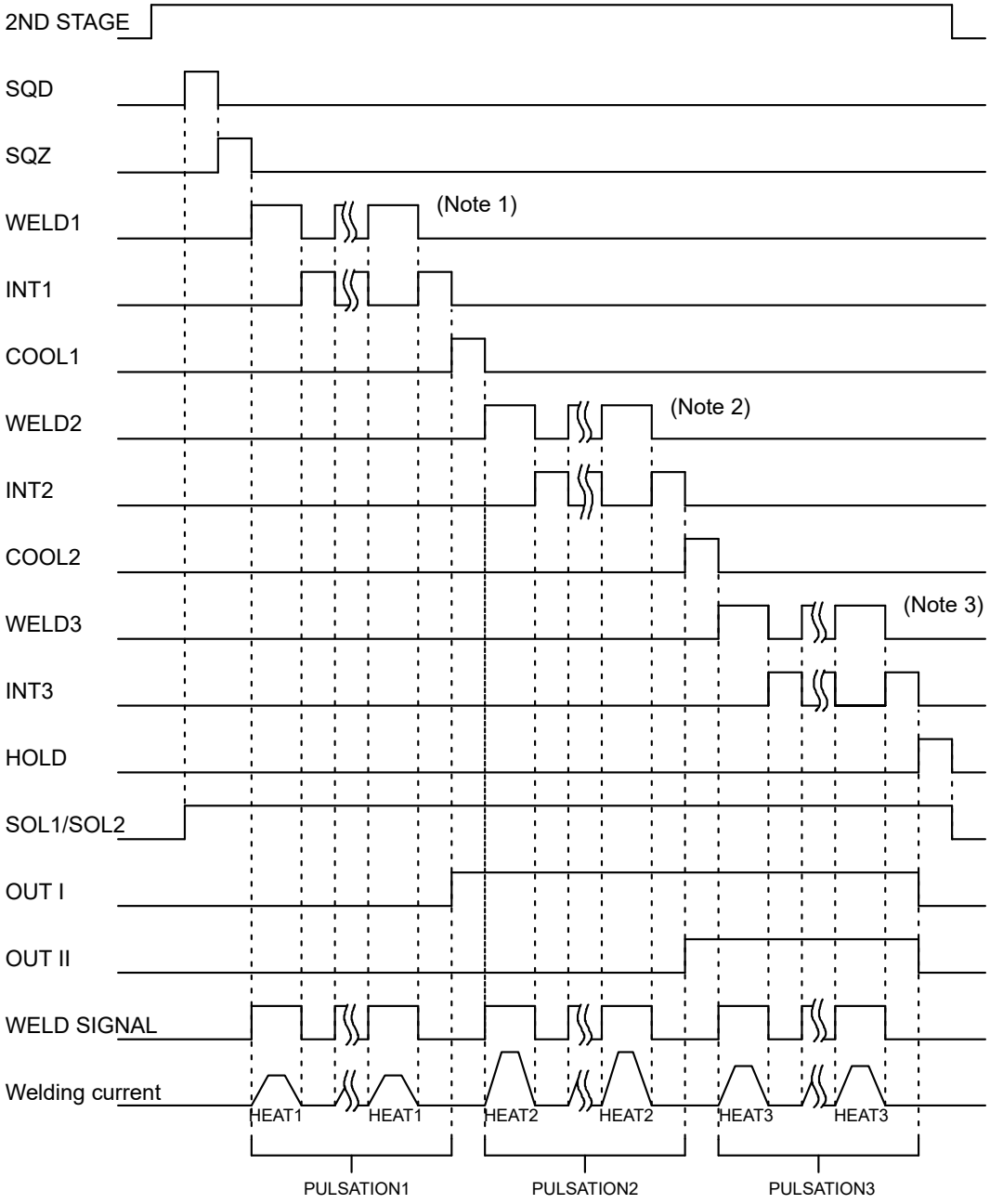
A sample weld sequence is shown, which represents the occasion where CAUTION or ERROR is produced when a monitored value goes out of the range between the upper and lower limit set in the PRECHECK screen.



(Note 1) When the precheck caution or error occurs, subsequent welding sequence is not performed.

(3) Sequence at PULSATION Setting

Operation is repeated in WELD and INT set times.



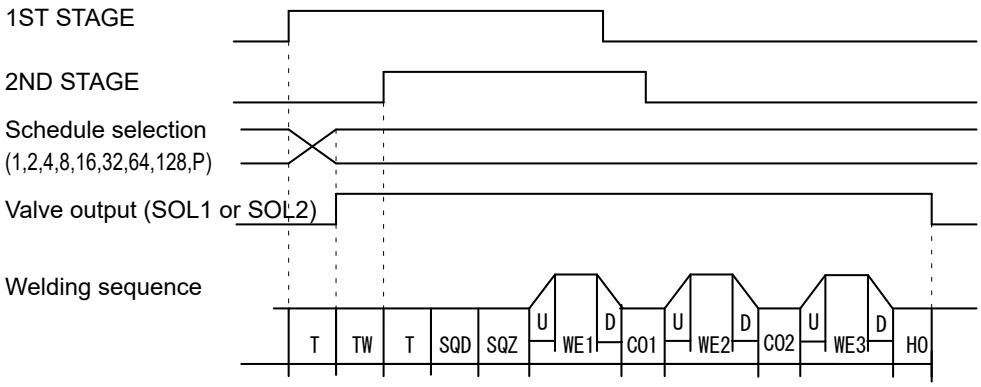
(Note 1) Repeat operation times set for PULSATION1 in WELD1 and INT1 set times.
When PULSATION is set to 3, WELD to INT are repeated 3 times as follows; SQZ→ WELD1→ INT1→ WELD1→ INT1→ WELD1→ INT1→ WELD2...

(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.

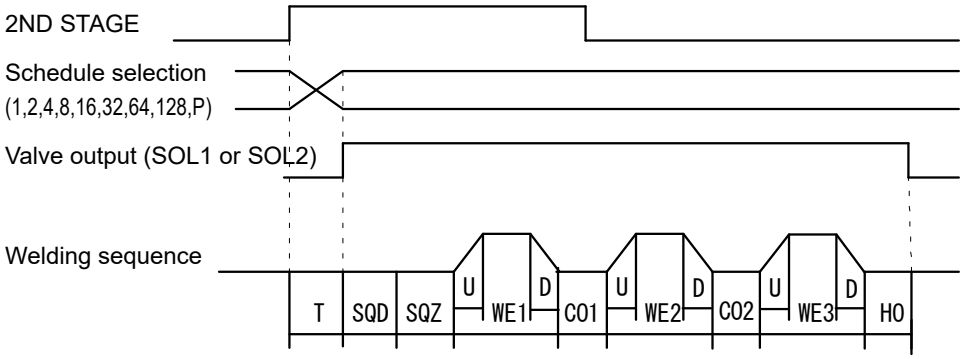
(4) Sequence at 2-Stage Start Operation

① **When VALVE MODE is 1 VALVE** (See **4. (9) (m)**.)
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.



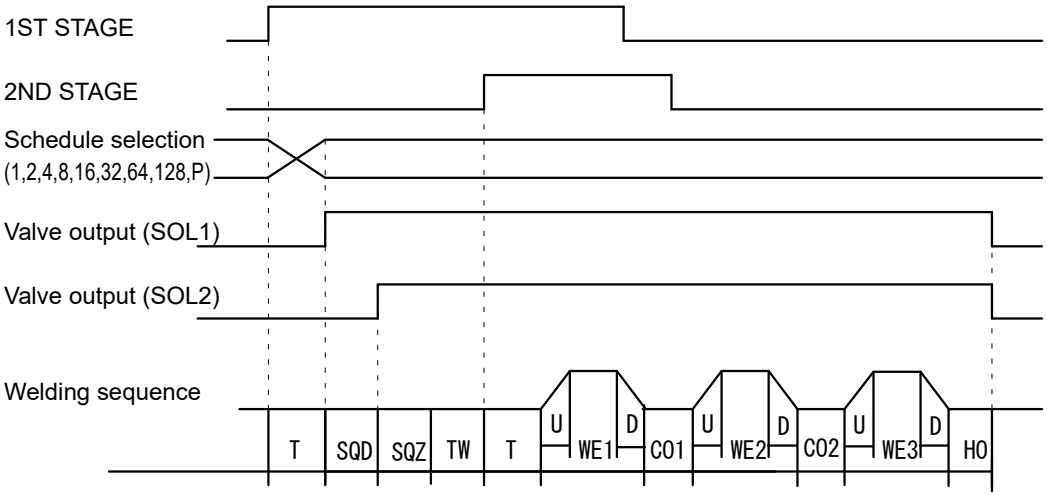
T: DELAY START SET (1 to 20 ms)
TW: 2ND STAGE signal input wait time (uncertain)

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.



T: DELAY START SET (1 to 20 ms)

② **When VALVE MODE is 2 VALVE** (See **4. (9) (m)**.)
The solenoid valve output (SOL1) is turned ON when the 1ST STAGE is input, the solenoid valve output (SOL2) is turned ON after SQD, and then the sequence goes in to the standby state of the 2ND STAGE input. When the 2ND STAGE is input, welding sequence starts.



9. External Communication Function

(1) Introduction

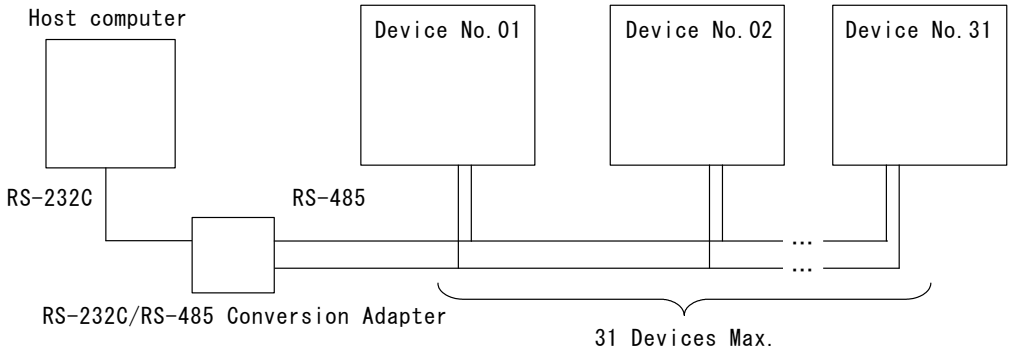
IS-800A/1400A can be used to set schedules from an externally-connected personal computer (abbreviated as PC) or to read monitored data and several kind of status data.
Prepare the program and its development environment for controlling the Power Supply on the customer side.

(2) Data Transmission

Item	Content
Transmission Mode	Select either of the followings at MODE SELECT screen: * RS-485, Asynchronous, Half-Duplex * RS-232C
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 In RS-485, 5: SG, 6: RS+, 9: RS- In RS-232C, 2: RXD, 3: TXD, 5: SG, 7: RTS

(3) Configuration

① RS-485

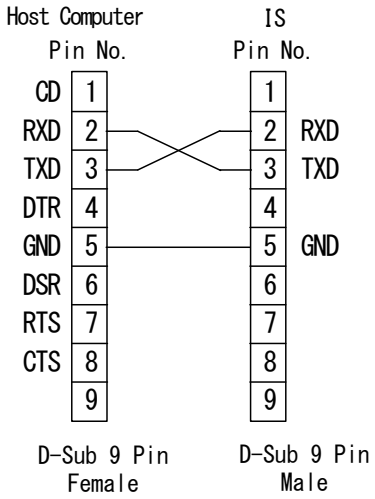


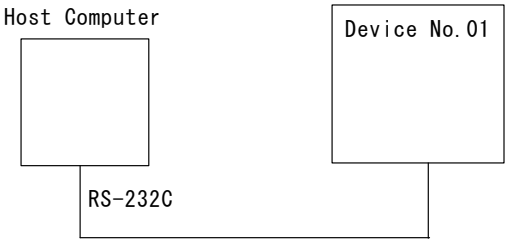
(Note 1) When controlling two or more devices with one host computer, register the device No. (**CONTROL#**) for each device. Set the device No. at POWER SUPPLY STATE screen (See **4.(2)(b)**).

(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.

(4) Protocol

① Single-directional Communication Mode
(When **-->** is selected at **COMM CONTROL** in MODE SELECT screen)

1) Monitor Data

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

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)

2) Error Data

Data strings:

!01001: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 (000 to 255)
C*1	Error code 1	Fixed to 3 digits (E01 to E32)
D*1	Error code 2	Fixed to 2 digits (01 to 32)
E*1	Error code 3	Fixed to 2 digits (01 to 32)
F*1	Error code 4	Fixed to 2 digits (01 to 32)
G*1	Error code 5	Fixed to 2 digits (01 to 32)
H*1	Error code 6	Fixed to 2 digits (01 to 32)
I*1	Error code 7	Fixed to 2 digits (01 to 32)
J*1	Error code 8	Fixed to 2 digits (01 to 32)

*1 The number of error codes is of eight max. In the case of only one error code, the error codes D to J are omitted.
For error codes, see **12. (1) Fault Code List**.
E is attached only to the Error code 1.

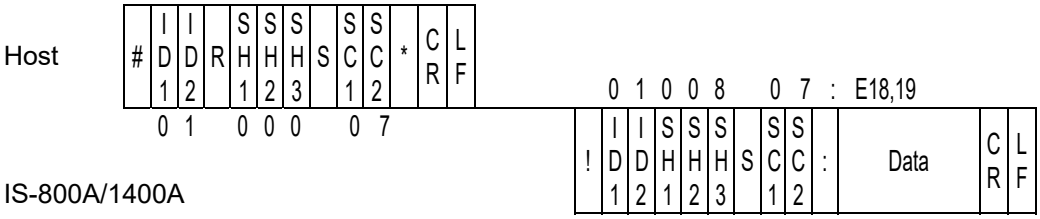
*2 Error codes are transmitted when errors are detected.
For the monitored value error and counter error, however, the error is transmitted after the monitored data is transmitted.

② Bi-directional Communication Mode

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

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

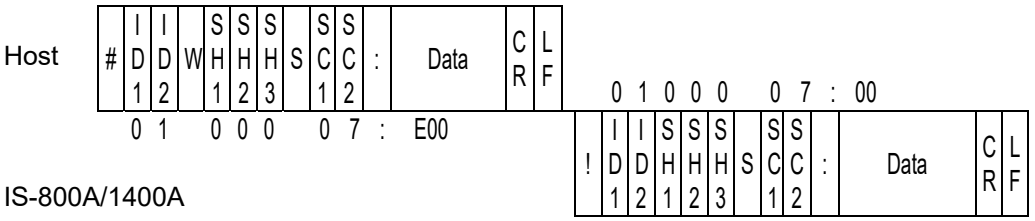
Example: Read all troubled data in the specified device, No. 01. (Schedule No. is "008" and Voltage error and Electric power error are occurring.)



1) Schedule numbers, SH1, SH2 and SH3 are fixed to 000.
   However, schedule numbers are sent from **IS-800A/1400A** 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) In no trouble, data of "00" is returned.

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

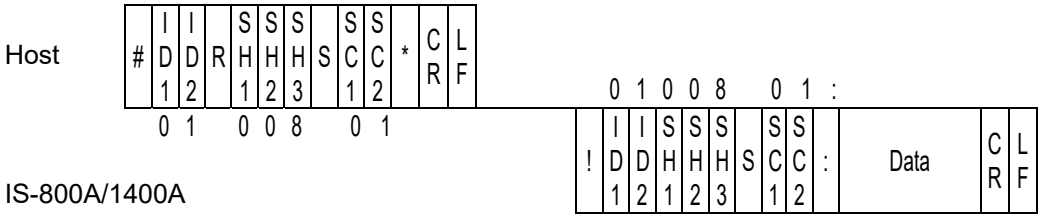
Example: Resets the trouble of the specified device, No. 01.



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

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

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

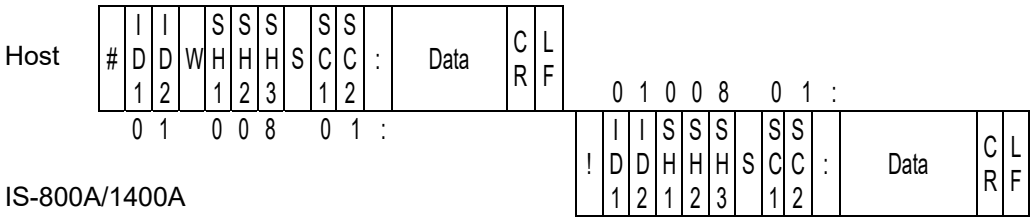


Insert [,] between data for a schedule.

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 and 06 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 Table**.

Setting of Data	Code: # Device No. W Schedule No. S 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 and 06 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 Table**.
4) The set data is returned as a confirmation data. When data which is outside the range is set, previous data is returned.
5) The display on the program unit is not updated during writing of data. Return to the MENU screen, then display the screen.
6) It takes about 3 seconds at most to save data into the flash memory (The **READY** lamp is turned off during saving). Be careful when writing continuously. The flash memory has the rewriting limit (about 100,000 times). Be careful when writing frequently.

(5) Data Code Table

① Screen 01 (SCHEDULE data) Specific data in accordance with Schedule No. (Schedule No.: 001 to 255)

Example of data writing:
#01W001S01:1,1,1,m,0000,0000,000,000,000,0000,000,000,000,0000,000,000,000,00000,0000,2,01.0,01.0,01.0,01.0,01.0,01.0,01.0,01.0,01.0,01,000,01,000,01,000,1000,01,1,001.0,0,000,99.9,99.9,99.9,20,1[CR][LF]

Item	Contents	Character String	Range
1	Control mode of WELD1	n,	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*1	Unit of time	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: 05 1: 10 2: 20 3: 40 (kA) 4: 80 (kA) *2

Item	Contents	Character String	Range
21	UF1 / Initial heat 1 of upslope	nnn.n,	CTRL: PRI, SCD, PLM 0.05 to 05.00 (kA) 5 kA range 0.50 to 09.99 (kA) 10 kA range 01.0 to 020.0 (kA) 20 kA range 02.0 to 040.0 (kA) 40 kA range 04.0 to 080.0 (kA) 80 kA range*2 CTRL: PWR 0.05 to 05.00 (kW) 5 kA range 0.50 to 09.99 (kW) 10 kA range 01.0 to 020.0 (kW) 20 kA range 02.0 to 060.0 (kW) 40 kA range 004.0 to 120.0 (kW) 80 kA range*2 CTRL: VLT 0.20 to 09.99 (V) CTRL: FPL 10.0 to 099.9 (%)
		nn.n,	
		n.nn,	
22	HEAT1 / Heat 1	nnn.n,	
		nn.n,	
		n.nn,	
23	DL1 / End heat 1 of downslope	nnn.n,	
		nn.n,	
		n.nn,	
24	UF2 / Initial heat 2 of upslope	nnn.n,	
		nn.n,	
		n.nn,	
25	HEAT2 / Heat 2	nnn.n,	
		nn.n,	
		n.nn,	
26	DL2 / End heat 2 of downslope	nnn.n,	
		nn.n,	
		n.nn,	
27	UF3 / Initial heat 3 of upslope	nnn.n,	
		nn.n,	
		n.nn,	
28	HEAT3 / Heat 3	nnn.n,	
		nn.n,	
		n.nn,	
29	DL3 / End heat 3 of downslope	nnn.n,	
		nn.n,	
		n.nn,	
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,	01 to 09
38	VALVE	n,	1 to 2
39	TURN RATIO	nnn.n,	001.0 to 199.9
40	WELD ON/OFF	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) (%) *3
43	PULSE LIM of WE2	nn.n,	Fixed to 4 digits (10.0 to 99.9) (%) *3
44	PULSE LIM of WE3	nn.n	Fixed to 4 digits (10.0 to 99.9) (%) *3
45	MAX CURRENT	nn,	01 to current range (kA) setting
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 Only when the control mode is set to the primary constant-current peak value control. For other modes, set to 99.9.

② Screen 02 (MONITOR SET data) Specific data in accordance with Schedule No. (Schedule No.: 001 to 255)

Example of data writing:
#01W001S02:999,000,99.9,00.0,9.99,0.00,999.9,000.0,100.0,999,000,99.9,00.0,9.99,0.00,999.9,000.0,100.0,999,000,99.9,00.0,9.99,0.00,999.9,000.0,100.0[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,	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,	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)

Item	Contents	Character String	Range
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	010 to 100 (%)

③ Screen 03 (STEPPER data) Common data (Schedule No.: 000)

Example of data writing:
#01W000S03:1,0000,0000,100,0000,100,0000,100,0000,100,0000,100,0000,100,0000,100,0000,100,0000,100,1,0000,0000,100,0000,100,0000,100,0000,100,0000,100,0000,100,0000,100,0000,100[CR][LF]

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 (%)

④ 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

⑤ Screen 05 (PRECHECK data) Specific data in accordance with Schedule No. (Schedule No.: 001 to 255)

Example of data writing:
#01W001S05:000,10.0,00.00,00.00[CR][LF]

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 not transmitted, too.

⑥ Screen 06 (SYSTEM data) Common data (Schedule No.: 000)

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

Item	Contents	Character String	Range
1*1	POWER SOURCE FREQUENCY	nn,	50 or 60 (Hz)
2*1	Model name	nnnnnnnn,	IS-800A␣ or IS1400A␣ (␣ indicates space)
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 3: LATCHED(B) 4: PULSED(B) 5: LATCHED(8) 6: PULSED(8)
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: LINEAR
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,	01 to 15 (ms)
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

Item	Contents	Character String	Range
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
41*1	CONTRAST	n,	0 to 9
42*1	CONTROL#	nn,	01 to 31
43	PROGRAMD DATE YEAR	nnnn,	2000 to 2099
44	PROGRAMD DATE MONTH	nn,	01 to 12
45	PROGRAMD DATE DAY	nn,	01 to 31
46	LANGUAGE	n,	0: ENGLISH 1: JAPANESE 2: CHINESE 3: KOREAN
47	FLOW SWITCH/PRG PROTECT	n,	0: FLOW SWITCH 1: PRG PROTECT
48	VALVE MODE	n,	0: 1 VALVE 1: 2 VALVE
49	SCAN MODE	n,	0: OFF
50	OUTPUT1	n,	0: END 1: COUNT ERROR 2: READY 3: STEP END 4: WELD SIGNAL 5: GOOD 6 :COUNT UP 7: OUT I 8: OUT II
51	OUTPUT2	n,	
52	OUTPUT3	n,	
53	OUTPUT4	n,	
54	OUTPUT5	n	

*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.

⑦ 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
6	Error code 6	nn,	01 to 32
7	Error code 7	nn,	01 to 32
8	Error code 8	nn	01 to 32

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**.
E is attached only to the Error code 1.

- Error reset (Data setting only)

Example of data writing:
#01W000S07:E00[CR][LF]

Item	Contents	Character String	Range
1	Error reset	nnn	E00

10. Specifications

(1) Specifications

*: selectable for every 255 schedules

Model No.		IS-800A -10-10/-10-12	IS-800A -10-11/-10-13	IS-1400A -10-10/-10-12	IS-1400A -10-11/-10-13
Welding power		3-phase, 380–480 V AC ±10% (50/60 Hz)	3-phase, 200–240 V AC ±10% (50/60 Hz)	3-phase, 380–480 V AC ±10% (50/60 Hz)	3-phase, 200–240 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 kH 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			
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 *		1.0–199.9			
Transformer frequency *		600–3000 Hz (in units of 100 Hz)			
Pulsation setting *		01–19 (settable for WELD1 to WELD 3, respectively)			
Valve setting *		2 valves (VALVE1, VALVE2)			
Control gain *		1–9			

Model No.			IS-800A -10-10/-10-12	IS-800A -10-11/-10-13	IS-1400A -10-10/-10-12	IS-1400A -10-11/-10-13
Setting range *	Constant current control (Note 2)	80 kA range	-		04.0–80.0 kA	
		40 kA range	02.0–40.0 kA		02.0–40.0 kA	
		20 kA range	01.0–20.0 kA		01.0–20.0 kA	
		10 kA range	0.50–9.99 kA		0.50–9.99 kA	
		5 kA range	0.05–5.00 kA		0.05–5.00 kA	
	Constant power control	80 kA range	-		04.0–120.0 kW	
		40 kA range	02.0–60.0 kW		02.0–60.0 kW	
		20 kA range	01.0–20.0 kW		01.0–20.0 kW	
		10 kA range	0.50–9.99 kW		0.50–9.99 kW	
		5 kA range	0.05–5.00 kW		0.05–5.00 kW	
	Constant voltage control		0.20–9.99 V			
	Constant phase control		10.0–99.9%			
Current monitor *			00.0–99.9 kA 0.00–9.99 kA			
Power monitor *			000.0–999.9 kW 00.00–99.99 kW			
Voltage monitor *			0.00–9.99 V			
Pulse width monitor *			010.0–100.0%			
Step-up/-down	STEP Up (down) ratio (RATIO) Counter setting (COUNT)		1–9 (9 steps) 50–200% 0000–9999 } Selectable for each valve			
Weld count monitor			0000–9999			
State indicator LED			WELD POWER lamp READY lamp START lamp WELD lamp TROUBLE lamp WELD ON/OFF lamp			
Cooling method			Cooling with water Flow rate: 2L/min Water temperature: 35°C max.			
Operating environment (Note 3)	Ambient temperature Humidity Altitude		+5 to +40°C 90% max. (no condensation) 1000 m max.			
Transportation and storage conditions	Ambient temperature Humidity		-10 to +55°C 90% max. (no condensation)			
Heat-resistant class			E			
Case protection			IP20			

Model No.		IS-800A -10-10/-10-12	IS-800A -10-11/-10-13	IS-1400A -10-10/-10-12	IS-1400A -10-11/-10-13
Protective functions	Overcurrent	200 A Fuse		200 A Fuse (per unit)	
	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 current is not detected in Primary constant-current effective value control or Primary constant-current peak value control.			
	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 4)		Within ±3% of full scale			
Repetition accuracy (Note 4)		Within 4% of full scale			
Outline dimensions	(H) x (W) x (D) (Not including projection)	490 mm x 280 mm x 481 mm		658 mm x 303 mm x 489 mm	
Mass		38 kg		60 kg	
Accessory		Operation manual: 1 copy			

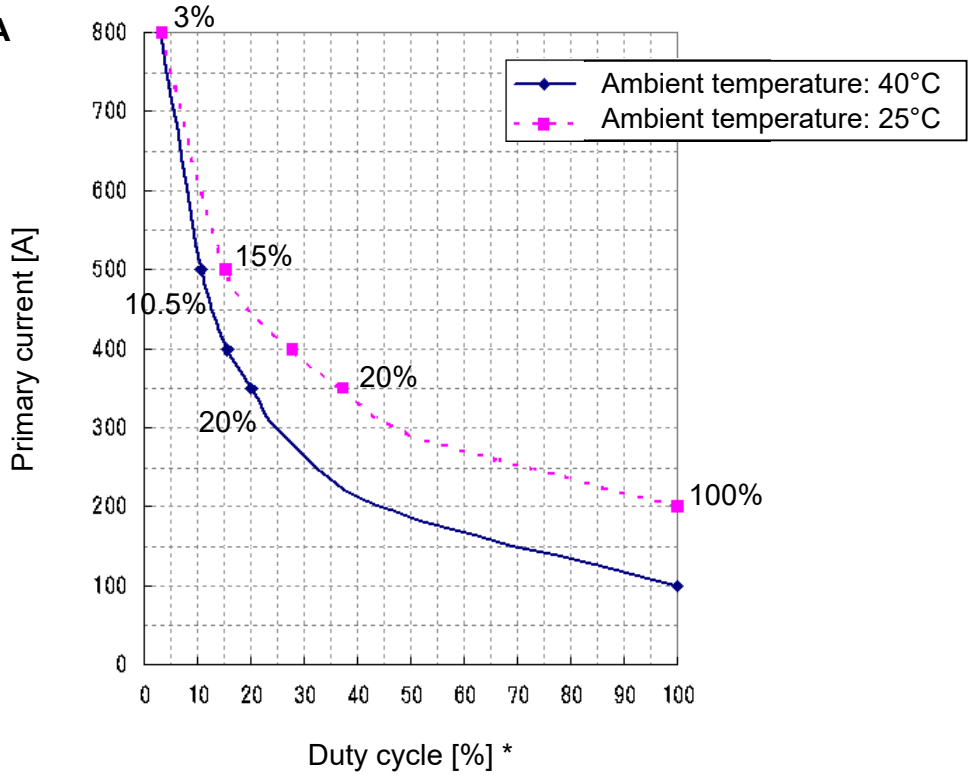
Note 1) No repetitive operation will be performed if “0” is selected for OFF (off time).
Note 2) Primary current can be set up to 800 A for **IS-800A** and 1400 A for **IS-1400A**.
Note 3) Use this product in the environment without conductive dust. If conductive dust enters in the product, this may result in a failure, electric shock, or fire. When using this product in this environment, make contact with us.
Note 4) ・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.

(2) Options (Sold Separately)

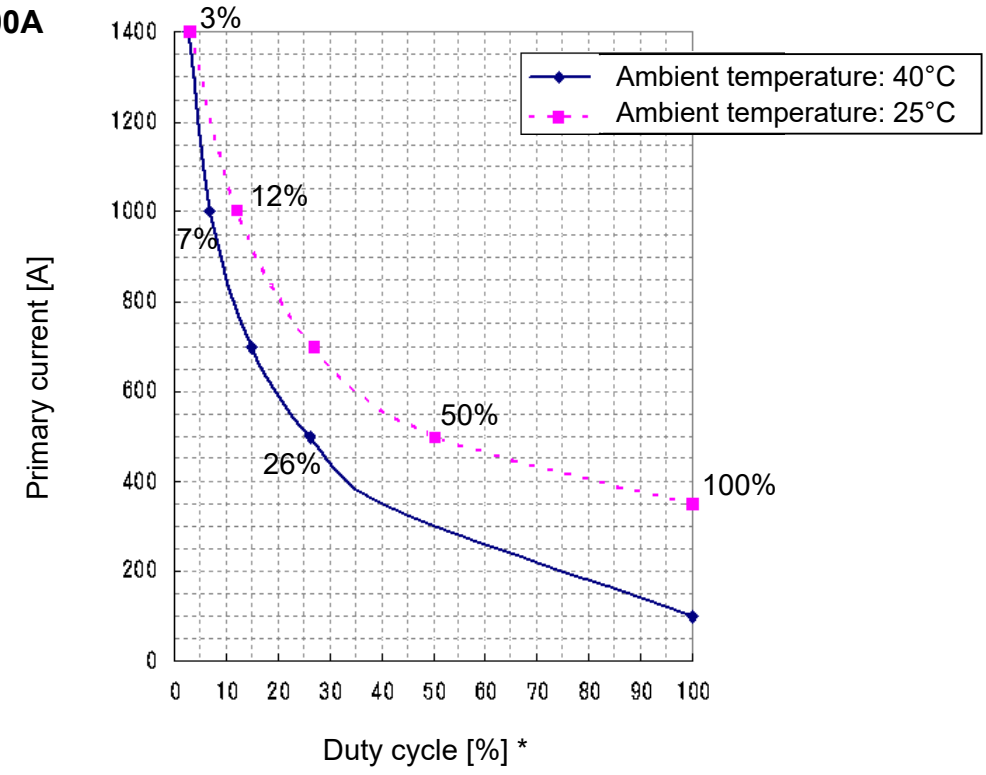
Item	Model No.	Length
Circuit cable	SK-1176504	2 m
	SK-1176505	5 m
	SK-1176506	10 m
	SK-1176507	15 m
	SK-1176508	20 m
Toroidal coil	MB-400L (Belt, 470 mm approx.)	Cable, 2.8 m
	MB-800L (Belt, 890 mm approx.)	

(3) Duty Cycle Graph

IS-800A



IS-1400A



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

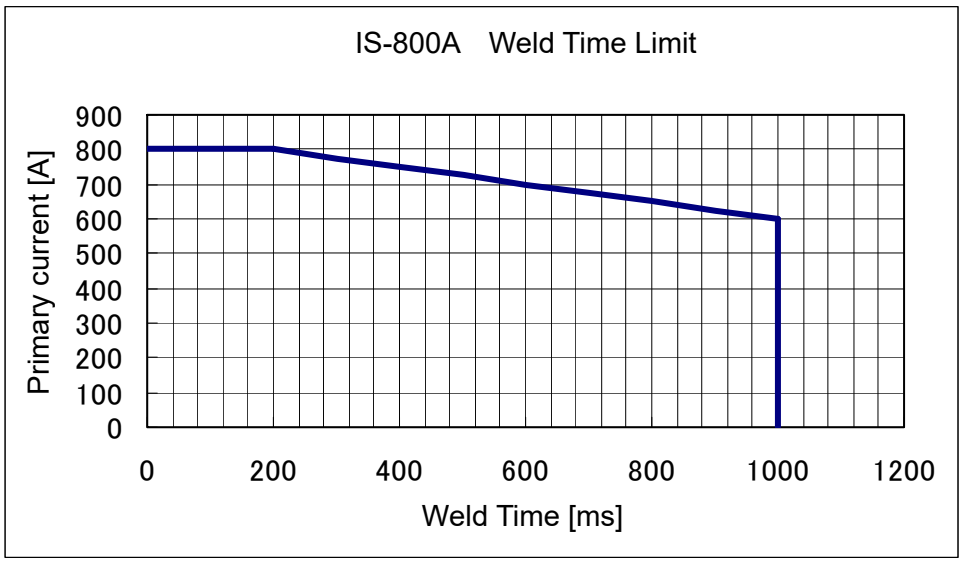
(4) Weld Time Limit

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

① **IS-800A**: For 600 A or more of the primary current
Maximum weld time [ms] = -4× (IGBT primary current value) + 3400

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

Example of ①) Primary current is 700 A on **IS-800A**
-4×700 + 3400 = 600 [ms]
Therefore, the maximum weld time is 600 ms.



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

(5) Board and Component List for Maintenance

For repair or replacement, contact us.

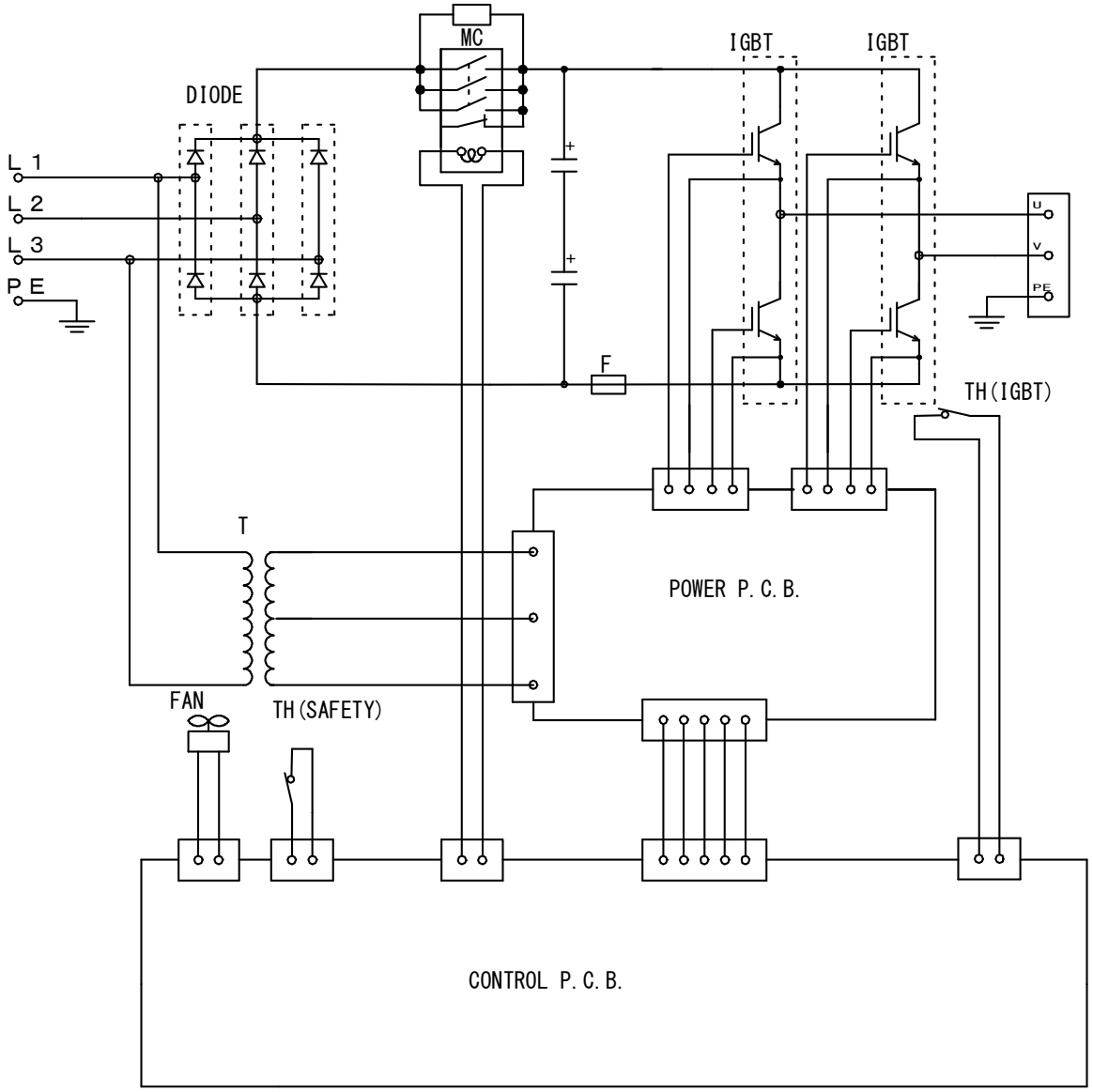
Item \ Model	IS-800A	IS-1400A
Main control board	ME-3120-02S1	
Drive board	AS1162201	
Snubber board	AS1162200	
Display board	ME-1662-02	
Fan motor assembly	AS1157254	AS1157277

(6) Major Components List

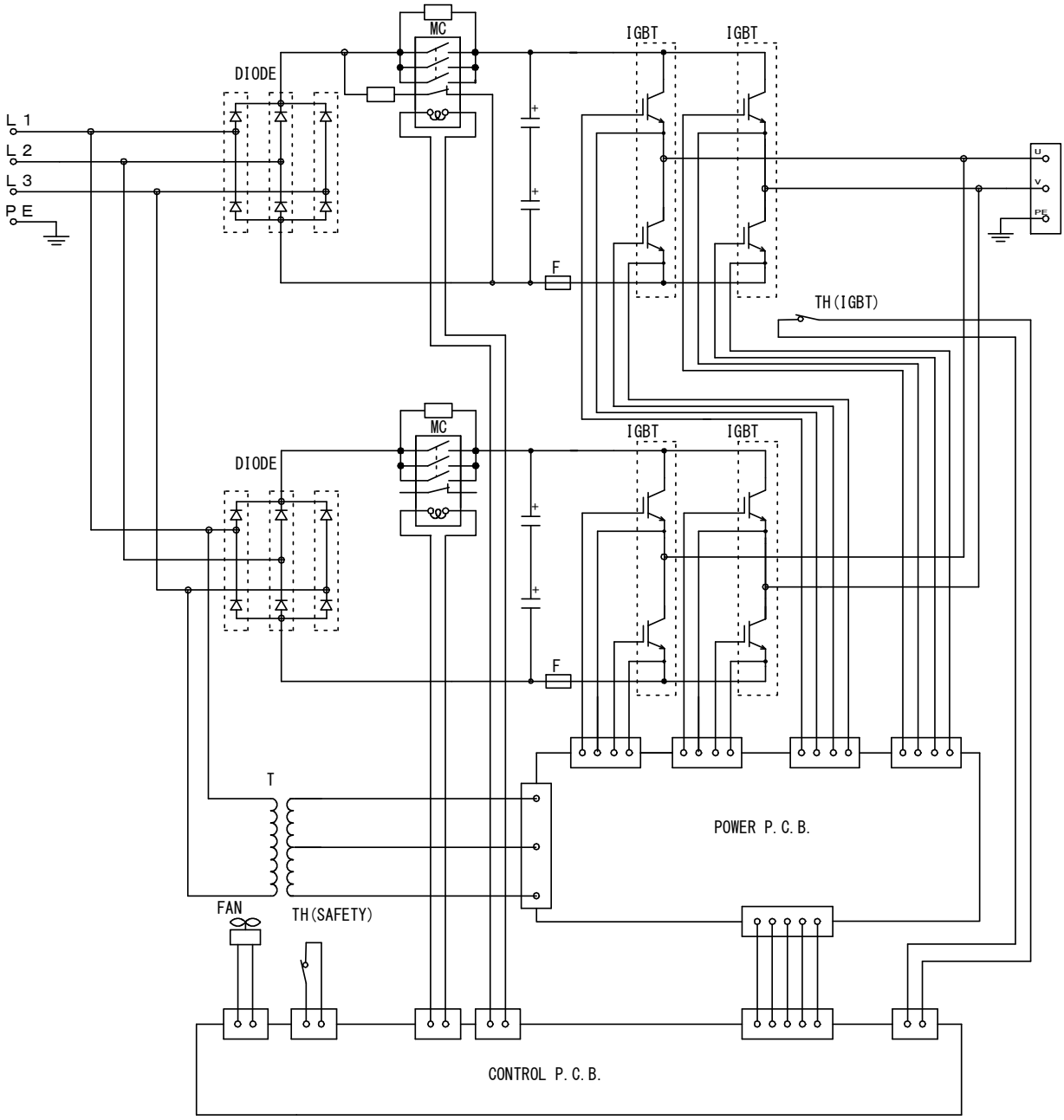
Item	Q'ty	
	IS-800A	IS-1400A
Fan motor	1	1
Power transformer	1	1
Thermal protector	2	2
Diode module	3	6
IGBT module	2	4
Fast-blow fuse	1	2
Electromagnetic contactor	1	2

(7) Schematic

IS-800A



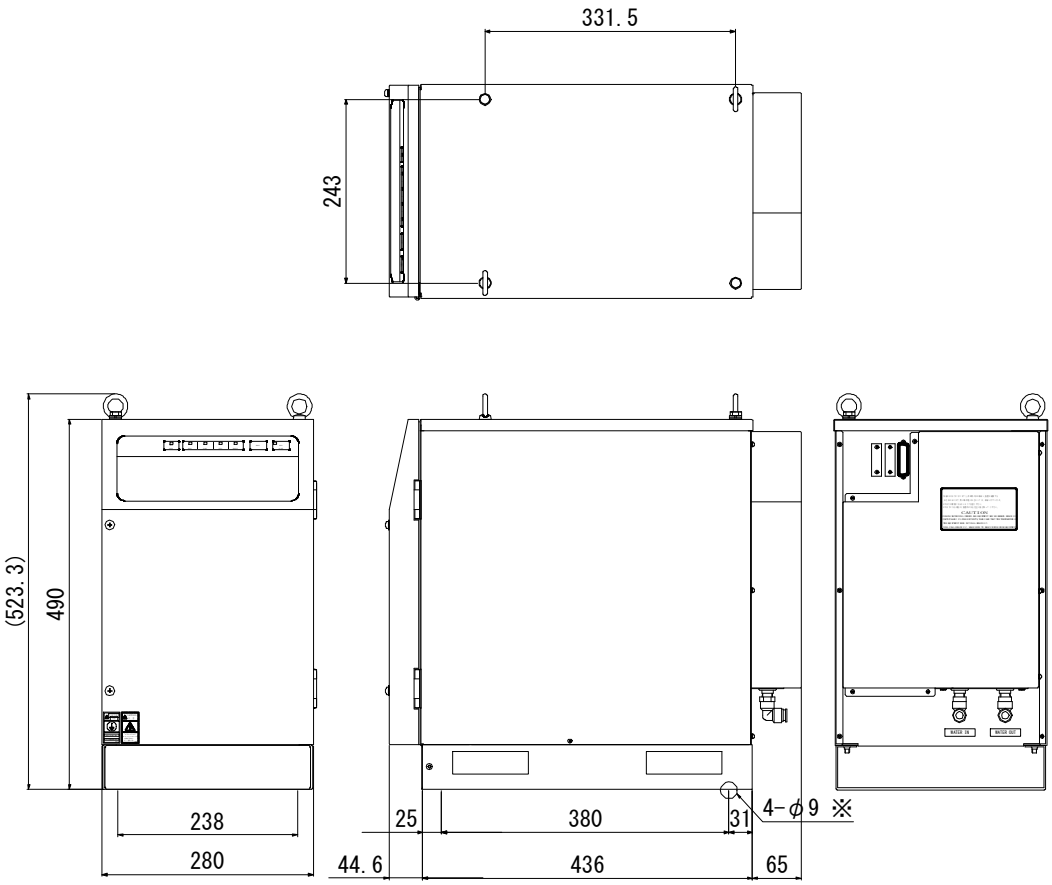
IS-1400A


MC
IGBT
IGBT
DIODE
L 1
L 2
L 3
P E
F
TH(IGBT)
MC
IGBT
IGBT
DIODE
F
T
POWER P.C.B.
FAN
TH(SAFETY)
CONTROL P.C.B.

11. Outline Drawing

(1) IS-800A

(Dimensions in mm)

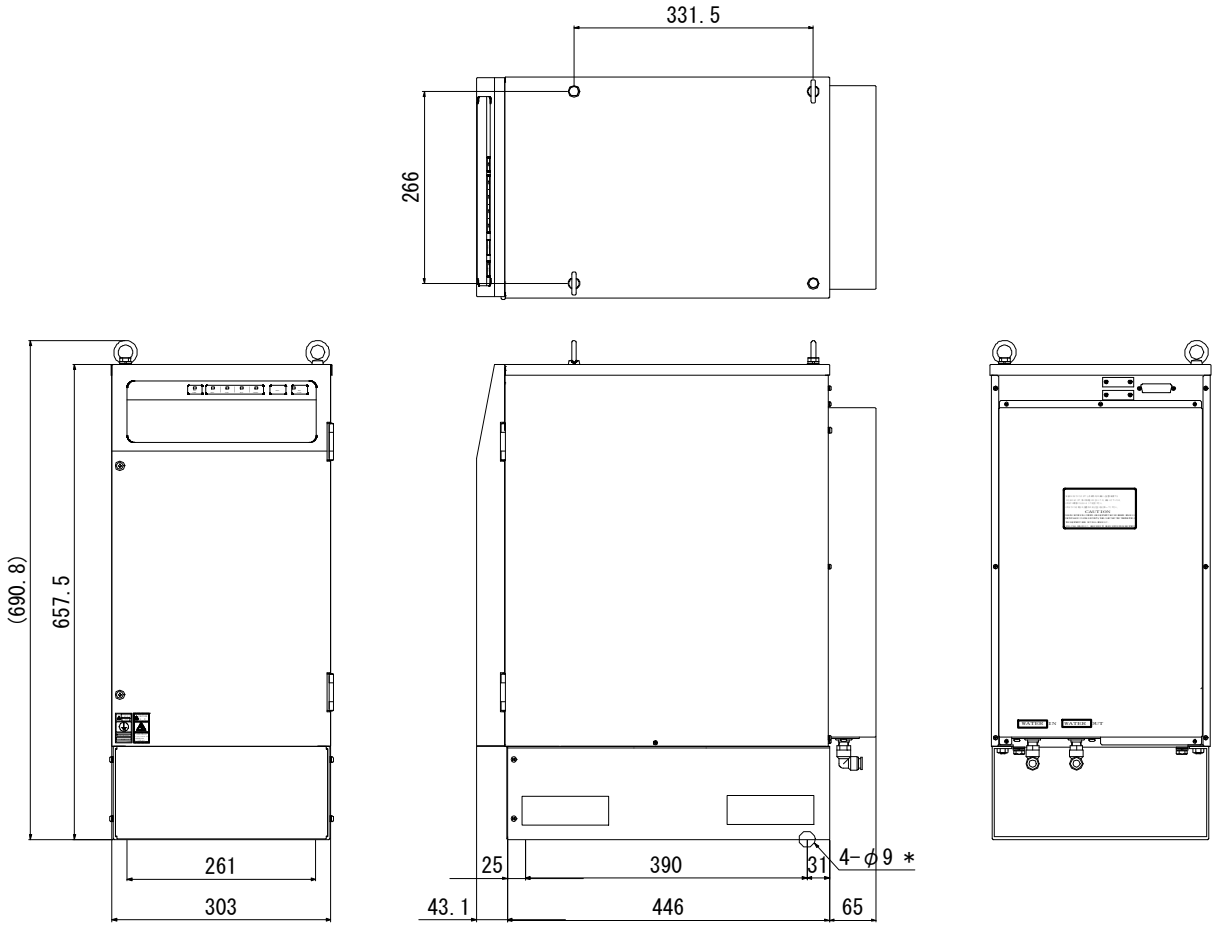


* For fixing the Power Supply. Remove the cover plate on the base front to tighten screws.

Recommended caster (M8 nut)
No.303T (without brake) TOCHIGIYA CO.,LTD.
No.303TS (with brake) TOCHIGIYA CO.,LTD.

(2) IS-1400A

(Dimensions in mm)



* For fixing the Power Supply. Remove the cover plate on the base front to tighten screws.

Recommended caster (M8 nut)
No.303T (without brake) TOCHIGIYA CO.,LTD.
No.303TS (with brake) TOCHIGIYA CO.,LTD.

12. Troubleshooting

(1) Fault Code List

In the event of a problem with the Power Supply, the **MA-660A** displays the fault code and message.
In such cases, read this section carefully, then inspect the equipment and take the necessary countermeasures. If you have any questions, consult us or your distributor.

Fault code	Contents	Cause	Measures
E-01	SYSTEM ERROR	Error has been detected on **IS-800A/1400A**.	Once turn off power and turn on again. If E-01 SYSTEM ERROR is displayed again, repair is required. Contact us.
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 us. • Occurrence of an error when a schedule is copied (E-03 only) Perform a schedule copy again. It would be useful to record the settings in preparation for data damage. To print the settings, use **13. Schedule Data Table**.
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. (See **10. (3)**.)
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.)

Fault code	Contents	Cause	Measures
E-07	NO CURRENT	**NO CURRENT LEVEL** is high.	Set a lower **NO CURRENT LEVEL**. (See **4. (10)(c)**.)
		Fuse inside the equipment is blown.	The fuse needs replacement. Contact us.
		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 the 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 the 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: $X \leq \frac{\textbf{HEAT} \text{ setting}}{\textbf{TURN RATIO}} \leq Y$ **IS-800A**: X = 15, Y = 800 **IS-1400A**: 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 lower than UF or DL setting.	
		Although STEPPER MODE is set to LINEAR 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)**.)	
E-11	SET OVER	**HEAT** setting, including **RATIO** setting is lower than UF or DL setting.	Correct each setting. (See **4. (11)**.)
		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 emergency stop input circuit is open.	Rectify cause of emergency stop, and then close stop circuit.
		Power supply for external input is not connected.	Check external input signal for proper connection.

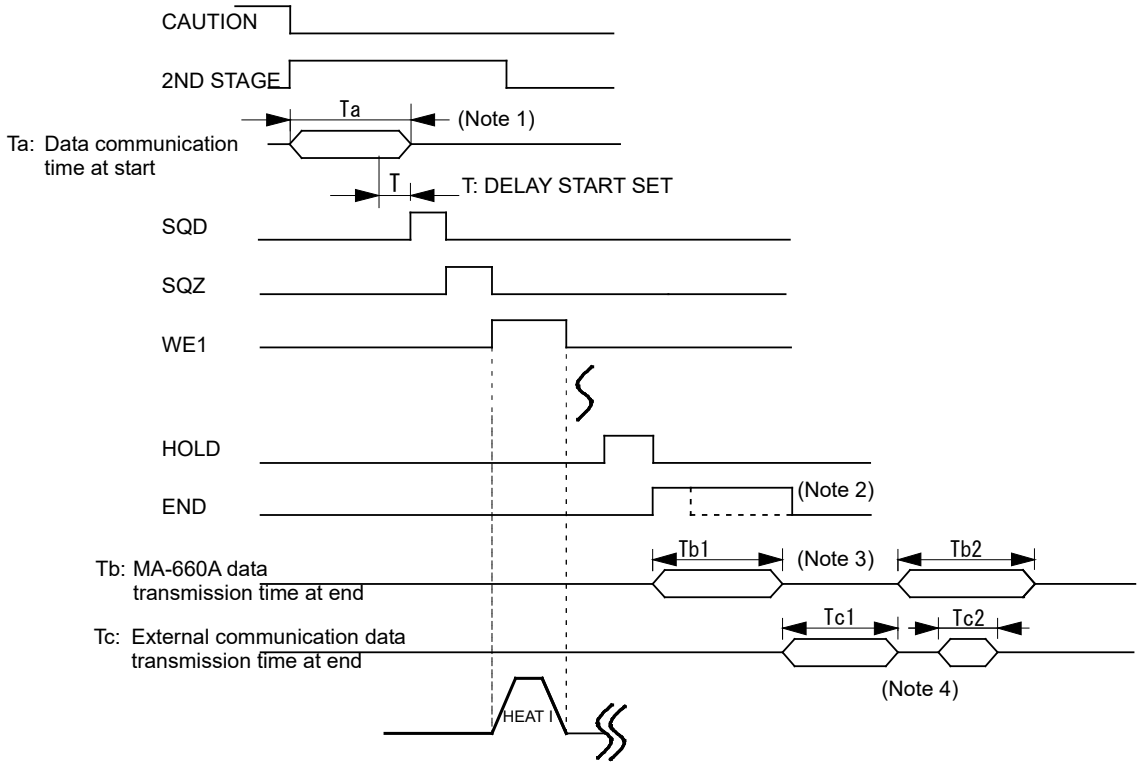
Fault code	Contents	Cause	Measures
E-13	OVER CURRENT	Primary current above the limit is detected.	Check for welding transformer and welding electrode problems.
			Check that the toroidal coil or the voltage detecting cable is connected in the secondary control.
E-14	SHORT WITH GROUND	The output cable 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)(a)**.)
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 EROR	Secondary voltage is out of **VOLT** setting range on the 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 the MONITOR SET screen.	
E-20	INTERRUPT ERROR	The current shutoff signal is input prior to the start signal.	Check interrupt input signal. (See **4. (9)(f)**.)
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 LEVEL is high.	Set a lower **NO VOLTAGE LEVEL**. (See **4. (10)(d)**.)
E-22	OVER CURRENT (DC24V)	Built-in 24 V DC power supply on the rear panel is shorted and overloaded.	Turn off the power and check the I/O connection on the rear panel.
E-23	SHORT CIRCUIT	The output cable is shorted.	Check the output cable.
E-24	PRECHECK ERROR	Current is 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 the 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. (See **4. (10)(a)**.)
E-27	END OF STEP	**STEPPER COUNT** has completed final step.	Dress or replace tip, then reset step. (See **6. (3)**.)
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.

Fault code	Contents	Cause	Measures
E-31	OUT LIMIT OF TIME ERROR	Weld time is out of **TIME** setting range on the 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.

(2) 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-660A**.



(Note 1) When the next start signal is received while the monitor error is displayed on **MA-660A**, the CAUTION signal is turned OFF and the previous screen is displayed.
At this time, the data is transferred to **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.

(Note 2) 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.)

(Note 3) When the MONITOR screen is displayed, the monitor data is transferred to **MA-660A** simultaneously with the END signal output (transmission time Tb1). The monitor data is not transferred when the screen other than the 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-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 does not occur	Monitor error occurs
MONITOR screen	Tb1: 164 ms max.	Tb1+Tb2+α: 280 (438) ms max.
Screens other than MONITOR screen	0 ms	Tb2: 113 (144) ms max.

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

(Note 4) When the RS-485/RS-232C external communication function is set to the single-directional communication mode (see **4. (9) 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 takt 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 19200 bps or 38400 bps, the transmission time will be short.

Data transmission time when the communication speed is 9600 bps

Tc1	132 ms max.
Tc2	42 ms max.

13. Schedule Data Table

Setting screen	Setting item	Initial value	Setting
POWER SUPPLY STATE screen	CONTRAST	4	
	CONTROL#	01	
	PROGRAMED DATE	-	
	LANGUAGE	ENGLISH	

Setting screen	Setting item	Initial value	SCH	SCH	SCH	SCH	SCH
SCHEDULE(1) screen	SQD	0000ms					
	SQZ	0000ms					
	COOL1	0000ms					
	COOL2	0000ms					
	HOLD	00000ms					
	OFF	0000ms					
	UP1	000ms					
	WELD1	000ms					
	DOWN1	000ms					
	UP2	000ms					
	WELD2	000ms					
	DOWN2	000ms					
	UP3	000ms					
	WELD3	000ms					
	DOWN3	000ms					
	UF1	001.0kA					
	HEAT1	001.0kA					
	DL1	001.0kA					
	UF2	001.0kA					
	HEAT2	001.0kA					
	DL2	001.0kA					
	UF3	001.0kA					
	HEAT3	001.0kA					
	DL3	001.0kA					
	CTRL1	SCD					
	CTRL2	SCD					
	CTRL3	SCD					
	WELD ON/OFF	OFF					

Setting screen	Setting item	Initial value	SCH	SCH	SCH	SCH	SCH
SCHEDULE(2) screen	PULSE LIMIT1	00.0%					
	PULSE LIMIT2	00.0%					
	PULSE LIMIT3	00.0%					
	PULSATION1	01					
	PULSATION2	01					
	PULSATION3	01					
	INTERVAL1	000ms					
	INTERVAL2	000ms					
	INTERVAL3	000ms					
	WELD TRANS FREQ	1000Hz					
	VALVE #	1					
	CURRENT RANGE	20kA					
	MAX CURRENT	20kA					
	VOLT COMPENSATION	000%					
	GAIN	01					
	TURN RATIO	001.0					
	TRANS #	1					

Setting screen	Setting item		Initial value	SCH	SCH	SCH	SCH	SCH
MONITOR SET screen	TIME	WE1 HI	999ms					
		WE1 LO	000ms					
		WE2 HI	999ms					
		WE2 LO	000ms					
		WE3 HI	999ms					
		WE3 LO	000ms					
	CUR-RENT	WE1 HI	99.9kA					
		WE1 LO	00.0kA					
		WE2 HI	99.9kA					
		WE2 LO	00.0kA					
		WE3 HI	99.9kA					
		WE3 LO	00.0kA					
	VOLT-AGE	WE1 HI	9.99V					
		WE1 LO	0.00V					
		WE2 HI	9.99V					
		WE2 LO	0.00V					
		WE3 HI	9.99V					
		WE3 LO	0.00V					
	POWER	WE1 HI	999.9kW					
		WE1 LO	000.0kW					
		WE2 HI	999.9kW					
		WE2 LO	000.0kW					
		WE3 HI	999.9kW					
		WE3 LO	000.0kW					
	PULSE	WE1	100.0%					
		WE2	100.0%					
		WE3	100.0%					

Setting screen	Setting item	Initial value	Setting
NG SIGNAL SELECT screen	ERROR OUTPUT MODE	N.C	
	TIME-OVER	CAUTION	
	CURRENT-OVER	CAUTION	
	VOLTAGE-OVER	CAUTION	
	POWER-OVER	CAUTION	
	PULSE-OVER	CAUTION	
	NO CURR	ERROR	
	WORK ERROR	ERROR	

Setting screen	Setting item	Initial value	Setting
OUTPUT SELECT screen	OUTPUT 1	END	
	OUTPUT 2	COUNT ERROR	
	OUTPUT 3	READY	
	OUTPUT 4	STEP END	
	OUTPUT 5	WELD SIGNAL	

Setting screen	Setting item	Initial value	Setting
MODE SELECT(1) screen	DELAY START SET	20ms	
	START SIGNAL MODE	LATCHED	
	END SIGNAL TIME	200ms	
	END SIGNAL MODE	0	
	WELD TIME	ms	
	WELD1 STOP/PARITY CHECK	WELD1 STOP	
	WELD2 STOP/WELD COUNT	WELD2 STOP	
	WELD3 STOP/COUNT RESET	WELD3 STOP	
	FLOW SWITCH/PRG PROTECT	FLOW SWITCH	

Setting screen	Setting item	Initial value	Setting
MODE SELECT(2) screen	STEPPER MODE	OFF	
	SCHEDULE	EXT	
	VALVE MODE	1 VALVE	
	MONITOR DISP MODE	NORMAL	
	RE-WELD	OFF	
	COUNTER	TOTAL	
	SCAN MODE	OFF	
	COMM CONTROL	OFF	
	COMM MODE	RS-485	
	COMM SPEED	9.6k	

Setting screen	Setting item	Initial value	Setting
MONITOR MODE screen	PRESET TOTAL COUNT	000000	
	PRESET GOOD COUNT	-	
	PRESET WELD COUNT	-	
	PRESET WORK COUNT	-	
	WELD COUNT	-	
	NO CURRENT TIME	50ms	
	NO CURRENT LEVEL	0.20kA	
	NO VOLTAGE LEVEL	0.10V	
	MONITOR FIRST TIME	15ms	
	MONITOR SLOPE MODE	EXCLUDE	
	WELD1 STOP OFF TIME	000ms	
	WELD2 STOP OFF TIME	000ms	
	WELD3 STOP OFF TIME	000ms	

Setting screen	Setting item	Initial value	VALVE#1	VALVE#2
STEPPER COUNT screen	STEP2 RATIO	100%		
	STEP3 RATIO	100%		
	STEP4 RATIO	100%		
	STEP5 RATIO	100%		
	STEP6 RATIO	100%		
	STEP7 RATIO	100%		
	STEP8 RATIO	100%		
	STEP9 RATIO	100%		
	STEP1 COUNT	0000		
	STEP2 COUNT	0000		
	STEP3 COUNT	0000		
	STEP4 COUNT	0000		
	STEP5 COUNT	0000		
	STEP6 COUNT	0000		
	STEP7 COUNT	0000		
	STEP8 COUNT	0000		
	STEP9 COUNT	0000		

Setting screen	Setting item	Initial value	SCH	SCH	SCH	SCH	SCH
PRECHECK screen	PRECHECK TIME	000ms					
	PRECHECK HEAT	10.0%					
	PRECHECK RESISTANCE HIGH	00.00mΩ					
	PRECHECK RESISTANCE LOW	00.00mΩ					

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CE

AMADA WELD TECH CO., LTD.

EU Declaration of Conformity

The company/manufacturer: **AMADA WELD TECH CO., LTD.**
95-3, Futatsuka, Noda-City, 278-0016 JAPAN

Herewith declares in his own sole responsibility conformity of the product

Designation: **INVERTER WELDING POWER SUPPLY**

Types/Serial Number, etc.: **IS-800A-10-12 / IS-800A-10-13**
IS-800A-20-22 / IS-800A-20-23
IS-1400A-10-12 / IS-1400A-10-13
IS-1400A-20-22 / IS-1400A-20-23

With applicable regulations below

EC Directive: **Low Voltage Directive 2014/35/EU**
EMC Directive 2014/30/EU
RoHS Directive 2011/65/EU , (EU)2015 / 863

Harmonized European/International Standards applied:
ISO 12100 : 2010 , ISO 13849-1 : 2015
IEC 60204-1 : 2016
IEC 62135-1 : 2015 / COR1 : 2016 , IEC 62135-2 : 2020

Importer Distributor in EU:
(please place distributor/importer stamp here)

AMADA WELD TECH GmbH
Lindberghstrasse 1, DE-82178 Puchheim, GERMANY
Tel: + 49 8983 9403 - 0

Division: **AMADA WELD TECH CO., LTD.**

2021.5.18

Noda-City/Japan 2021-05-18
Place and Date

T. Jingu

Toshiaki Jingu / General Manager Quality Guarantee Department
Name/Signature/Position

Note: This Declaration certifies conformity with the above mentioned Directive(s), but gives no assurances of properties within the meaning of the Law concerning product liability and ProdSG. It becomes invalid if any technical or other modification are carried out without manufacturers consent.