DC INVERTER WELDING POWER SUPPLY

IS-600A

OPERATION MANUAL

AMADA®

Z12OM1185333-04

Thank you for purchasing our DC Inverter Welding Power Supply **IS-600A**.
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.

Contents

1. Special Notes

(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.

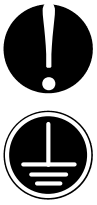
WARNING

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

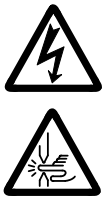
CAUTION

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. Do not touch.
When inspecting the interior of the Power Supply, be sure to turn off the power source of the Power Supply and wait at least 5 minutes.

Never disassemble, attempt to repair, or modify the Power Supply.
These actions can cause electric shock and fire. Perform only the maintenance described in the operation manual.

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.

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 or your distributor.

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 or your distributor.

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

- Any work on this Power Supply must be performed only by the personnel with sufficient knowledge and experience regarding an inverter welding power supply.

- Install this Power Supply on a firm and level surface. Operation on an incline may result in malfunction.
  For ventilation, provide 10-cm clearances at the intake and exhaust.

- When transporting or moving the Power Supply, do not lay it down and be sure to hold the underside when transporting. Holding a projection such as the terminal cover may cause damage. 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.

- 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.

- The program box, cable to supply power, the welding head, the welding transformer, and cables for connecting among the welding head, the welding transformer and the Power Supply are separately needed to use the Power Supply.

- 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.

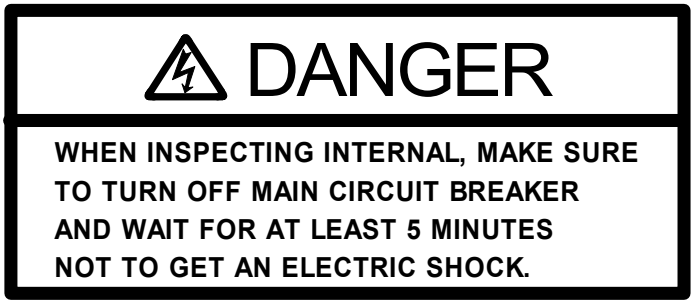
(3) On Disposal

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

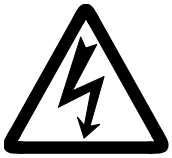
On the main body are warning labels for safety. Their locations and meanings are as noted below.

1)



Location: Power Supply interior, side surface of acrylic cover.
Meaning: **Danger.**

2)



Location: Power Supply interior, side surface of acrylic cover.
Output terminal cover.
Rear panel.
Meaning: **Shock hazard.**

2. Features

The FINE SPOT-INVERTER **IS-600A** is a DC inverter, large-capacity power supply specially designed for spot welding and fusing.

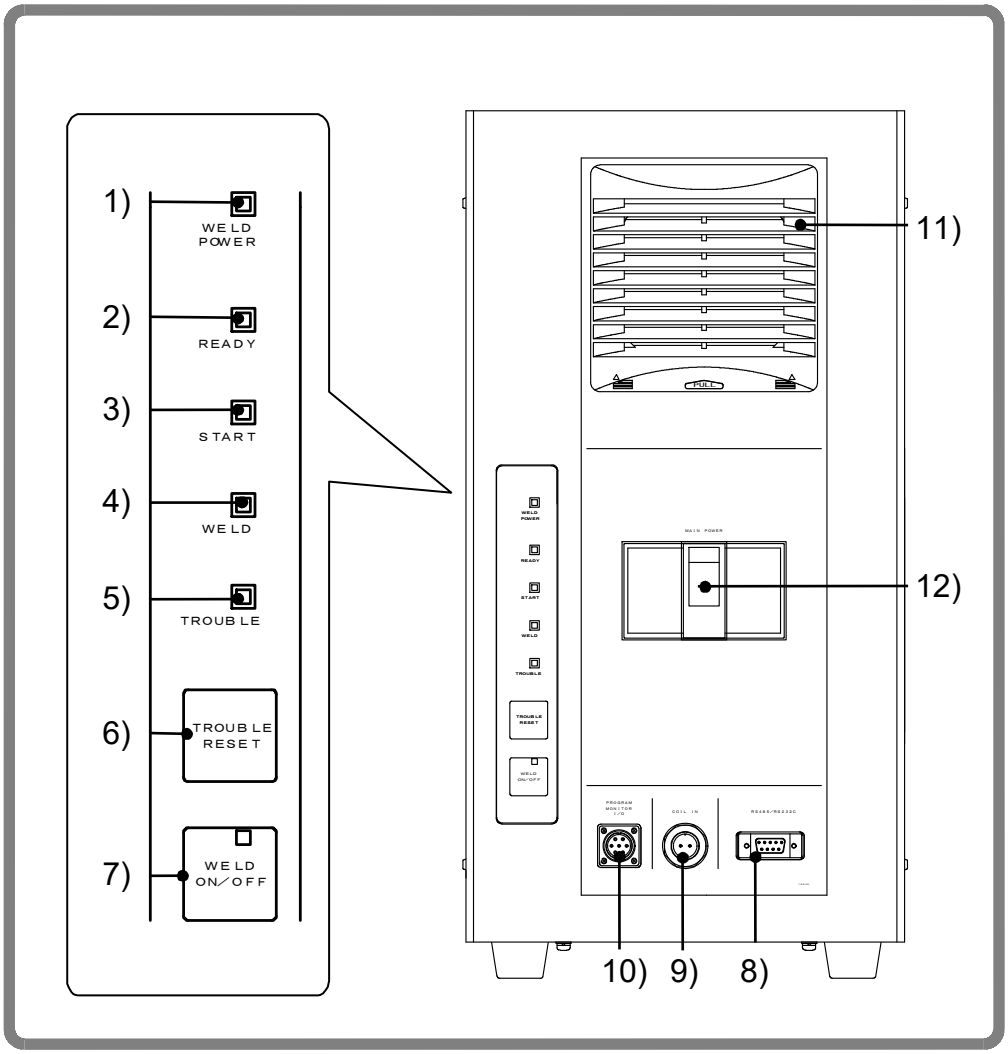
The power supply is compact and convenient to transport or reposition. A monitor function is provided to enable judgment of defective or non-defective welding.

- 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
- Comes equipped with a **current-shutoff function**, which shuts off current in response to external input (e.g., displacement of the electrode), 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
- Four protective functions for maximum ease of operation
  - ・Overcurrent-detection function
  - ・No-current / no-voltage detection function
  - ・Thermostat-fault detection function
  - ・Self diagnostics
- The model number is different depending on the current setting range.

Model No.	Current setting range
IS-600A-00-01/-00-02	02.0–20.0 kA
IS-600A-01-01	0.50–9.99 kA

3. Name and Functions of Each Section

(1) Front Panel



1) **[WELD POWER] lamp (Green LED)**
This lamp lights when the power is supplied to the Power Supply.

2) **[READY] lamp (Green LED)**
This lamp lights when the system is ready to start welding.
To turn on this lamp, writing data into the flash memory is complete and:
- **[WELD ON/OFF] key**
- **WELD ON/OFF** setting for program unit **MA-627A** and
- External **WELD ON** signal

must all be on.

3) **[START] lamp (Green LED)**
This lamp remains lit while the start signal is input.

4) **[WELD] lamp (Green LED)**
This lamp remains lit while the welding current is flowing.

5) **[TROUBLE] lamp (Orange LED)**
This lamp lights when an error is detected. At this time, the program unit emits a beeping sound, and the Power Supply operation is interrupted.

6) **[TROUBLE RESET] key**
If this key is pressed while the **[TROUBLE] lamp** is lit, the lamp is turned off.
The **[TROUBLE] lamp** lights up again, however, as long as the error remains uncorrected. Eliminate the cause of the error before pressing this **[TROUBLE RESET] key**.
If the **[TROUBLE] lamp** lights up during operation, press the **[TROUBLE RESET] key**, then input the start signal again; operation will then resume.

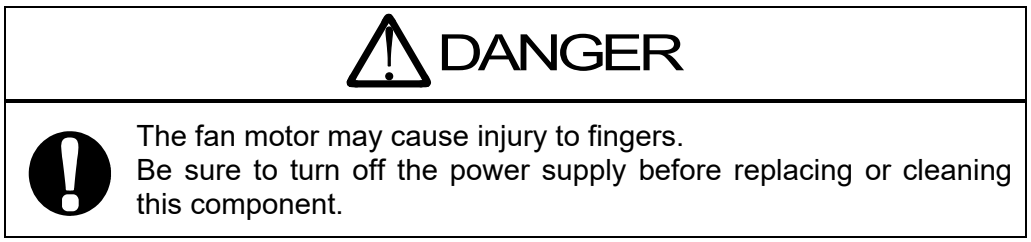
7) **[WELD ON/OFF] key**
This key is one of those required to activate the **[READY] lamp**.
Pressing this key alternately lights and shuts off this lamp. When the key is toggled on, the **[READY] lamp** lights, and when the key is toggled off, the lamp is turned off.

8) **[RS485/RS232C] connector**
For external communication. (See **11. External Communication Function**.)

9) **[COIL IN] connector**
For toroidal coil connection. Used for secondary constant-current effective value control, secondary constant-power effective value control, and constant-phase control. (The toroidal coil is an optional component.)

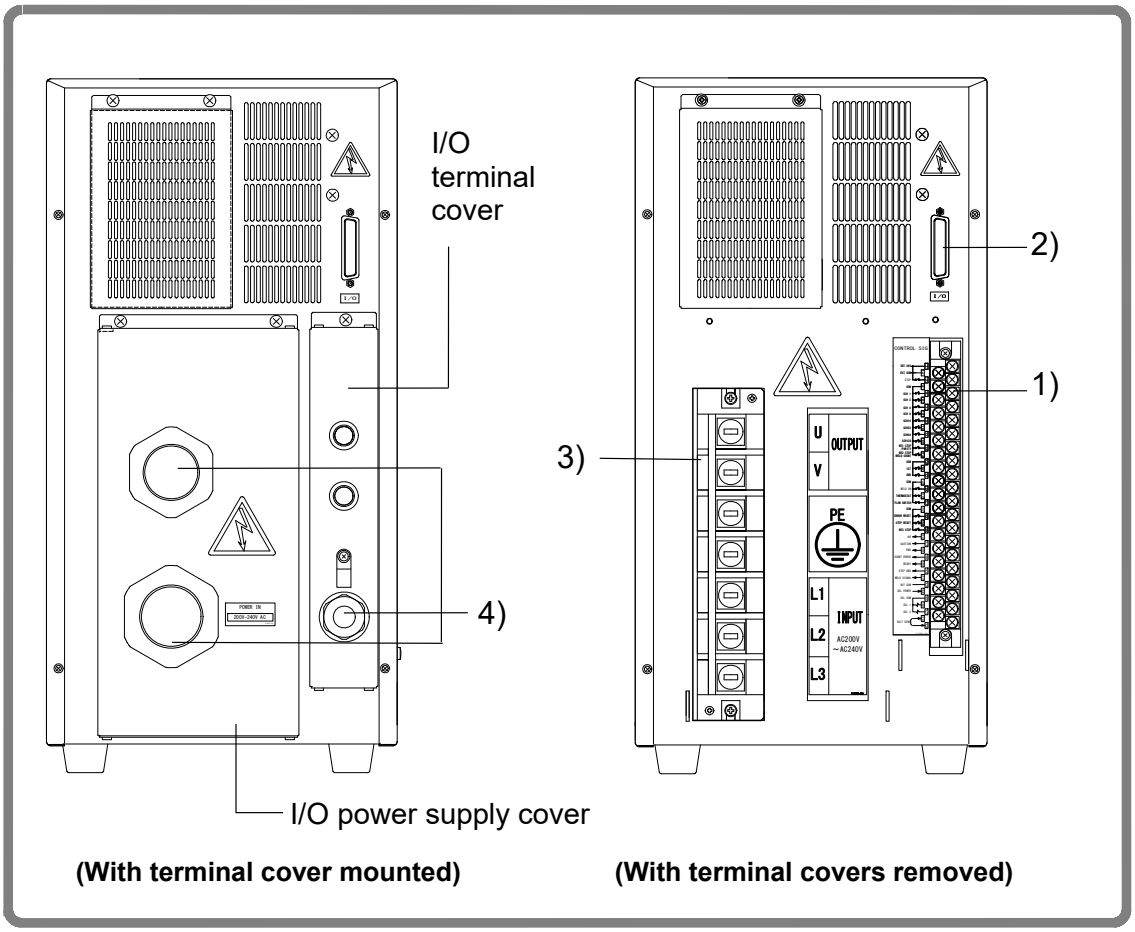
10) **[PROGRAM MONITOR I/O] connector**
Connects to Program Unit **MA-627A**. Used for welding schedule setting and/or reviewing monitor results.

11) **Filter Cover**
An air filter is provided inside this cover, which must be removed for maintenance of the air filter (See **9. Maintenance**).



12) **Welding Current Input Breaker Lever**
Raise the lever to supply power and lower it to shut off power.

(2) Rear Panel



(With terminal cover mounted) **(With terminal covers removed)**

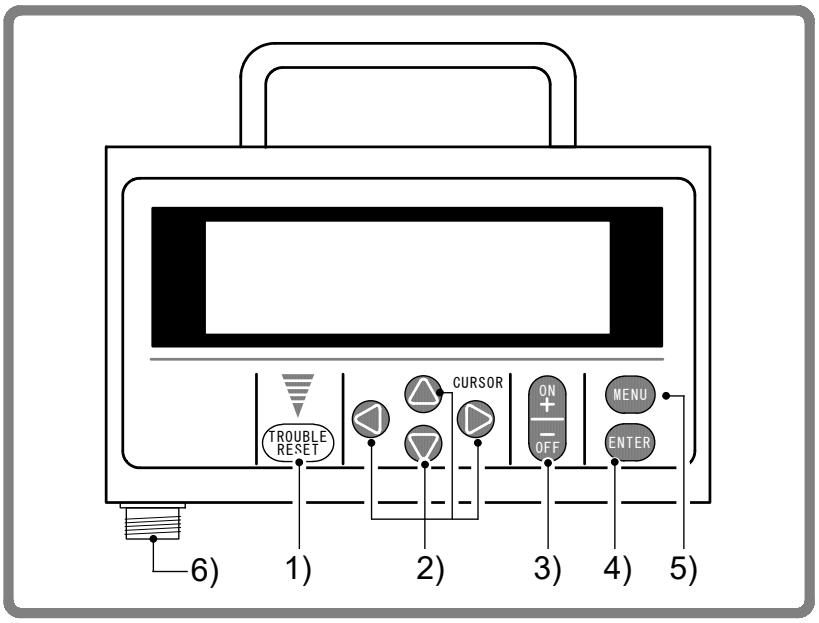
1) **Connecting terminal block for external input/output signal**
This terminal block is used to input the schedule signals and output trouble signals.

2) **Welding Transformer [I/O] connector**
For connecting the [SENS] cable for our welding transformer.

3) **Terminal block for welding power input/output**
This terminal block is used to connect to the input of the welding transformer and the welding power supply (three-phase).

4) **Cable gland**
Two pieces for Input/Output cables and one piece for I/O cable are supplied.
Insert cables into them and tighten caps to fix cables and protect the Power Supply interior.

(3) MA-627A (Sold Separately)



1) **[TROUBLE RESET] key**
If this key is pressed while the **[TROUBLE] lamp** on the Power Supply is lit, the lamp goes off. This key has the same function as the **[TROUBLE RESET] key** on the Power Supply.

2) **[CURSOR] keys**
These keys are used to move the cursor (> or) to select an item.

3) **[+ON/-OFF] keys**
These keys are used to change the value of a selected item or to turn the item on and off. When the **[+ON] key** is pressed, the selected value increases, and if the **[-OFF] key** is pressed, the value decreases. The selected item is activated by pressing the **[+ON] key**, and turned off by pressing the **[-OFF] key**.

4) **[ENTER] key**
This key is used to write the set or changed value and [ON/OFF] data to the **MA-627A**. After any data is set or changed, be sure to press this **[ENTER] key** to write the relevant data before moving the cursor.
If this **[ENTER] key** is not pressed, the **MA-627A** will not save the set data.

5) **[MENU] key**
This key is used to display the **[MENU] screen**. Press this key to return to the **[MENU] screen** from any other screen.

6) **Connector**
This connector is 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 weld sequence and turning off the Start signal.

If setting is performed while the start signal is input, the following screen appears. Turn off the start signal and press **[TROUBLE RESET] key** 1).

```
IS -600A IS BUSY OR NOT CONNECTED

Please RESET key in
```

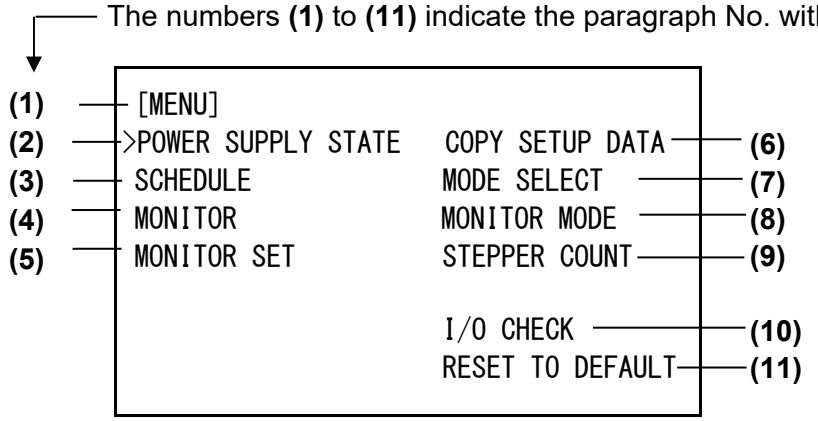
(Note) While the start signal is input, 1) **[TROUBLE RESET] key**, **[TROUBLE RESET] key** on the front panel (see **(1) 6)**) and the error reset input terminal of the external I/O (see **6. Interface**) do not work. Be sure to turn off the start signal before resetting an error.

4. How to Operate Screens

Appearance of characters used in the following explanation	
Shaded characters (000)	An item for which a value must be input, or which must be set ON or OFF. Move the cursor ( ) to the number (or to ON or OFF) to be selected or changed, and press the **[+ON/-OFF] key**.
Outlined characters (000)	An item that is indicated on-screen but that cannot be changed.

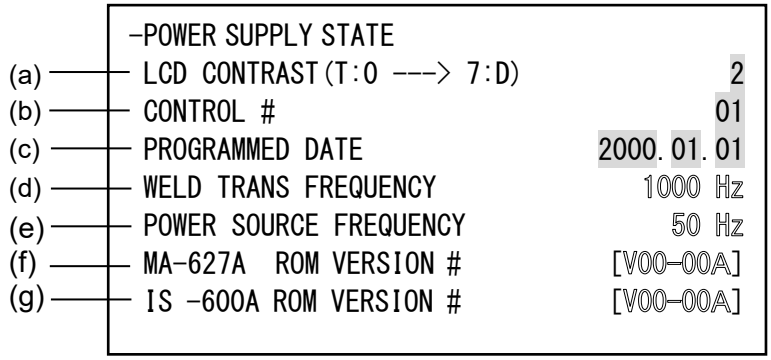
(1) MENU Screen

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



(2) POWER SUPPLY STATE Screen

This screen is used to display and set data for the Power Supply.



(a) LCD CONTRAST
Sets the screen contrast. The contrast can be set in a range from 0 to 7. The larger the value, the darker the screen. Adjust the contrast if the screen is difficult to view.

(b) CONTROL #
Input the identification No. of your Power Supply.
If you have two or more Power Supply units, input 01 for the first one, 02 for the second one, 03 for the third one, and so on.

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

(d) WELD TRANS FREQUENCY
Change the output frequency of the inverter power supply for the Power Supply. (Fixed to 1,000 Hz and cannot be changed.)

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

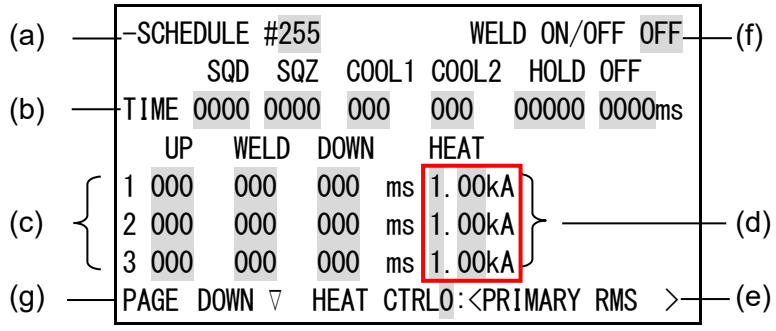
(f) MA-627A ROM VERSION #
Indicates the ROM version No. of program unit **MA-627A**.

(g) IS-600A ROM VERSION #
Indicates the ROM version No. of the Power Supply.

(Note) 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 2 seconds at longest to write data into the flash memory.

(3) SCHEDULE Screen

Up to 255 welding schedules can be set on the Power Supply. These schedules are indicated as **SCHEDULE** #1 to #255.
This screen is used to set the **SCHEDULE** No., length of weld time, welding current, and so on. This data can be indicated using the 12 modes shown below, but the indicated items are the same for all modes.
The **ms mode** or **CYC mode** can be changed via **WELD TIME** (See **(7)(i)**) on the **MODE SELECT screen**.



(Note) The screen shows the settings for **IS-600A-01-01**. The settings surrounded with frames are02.0kA or 02.0kW for **IS-600A-00-01/00-02**.

<Primary constant-current effective value control **ms mode**>

```
-SCHEDULE #001          WELD ON/OFF OFF
     SQD  SQZ  COOL1 COOL2  HOLD OFF
TIME 0000 0000  000   000   00000 0000ms
   UP   WELD  DOWN    HEAT
1 000   000   000  ms 1.00kA
2 000   000   000  ms 1.00kA
3 000   000   000  ms 1.00kA
PAGE DOWN ▽   HEAT CTRL0:<PRIMARY RMS  >
```

<Primary constant-current effective value control **CYC mode**>

```
-SCHEDULE #001          WELD ON/OFF OFF
     SQD  SQZ  COOL1 COOL2  HOLD OFF
TIME 000  000   00    00     000 00 CYC
   UP   WELD  DOWN   HEAT
1  00    00    00 CYC 1.00kA
2  00    00    00 CYC 1.00kA
3  00    00    00 CYC 1.00kA
PAGE DOWN ▽   HEAT CTRL0:<PRIMARY RMS  >
```

<Secondary constant-current effective value control **ms mode**>

```
-SCHEDULE #001          WELD ON/OFF OFF
     SQD  SQZ  COOL1 COOL2  HOLD OFF
TIME 0000 0000  000   000   00000 0000ms
   UP   WELD  DOWN    HEAT
1 000   000   000  ms 1.00kA
2 000   000   000  ms 1.00kA
3 000   000   000  ms 1.00kA
PAGE DOWN ▽   HEAT CTRL1:<SECONDARY RMS >
```

<Secondary constant-current effective value control **CYC mode**>

```
-SCHEDULE #001          WELD ON/OFF OFF
     SQD  SQZ  COOL1 COOL2  HOLD OFF
TIME  000  000   00    00     000 00 CYC
   UP   WELD  DOWN   HEAT
1  00    00    00 CYC 1.00kA
2  00    00    00 CYC 1.00kA
3  00    00    00 CYC 1.00kA
PAGE DOWN ▽   HEAT CTRL1:<SECONDARY RMS>
```

The items (a) to (f) indicated at the top screen are described beginning on Page 4-5.

<Secondary constant-power effective value control **ms mode**>

```
-SCHEDULE #001          WELD ON/OFF OFF
      SQD  SQZ  COOL1 COOL2  HOLD OFF
TIME 0000 0000  000   000   00000 0000ms
   UP   WELD  DOWN    HEAT
1 000   000   000  ms 1.00kW
2 000   000   000  ms 1.00kW
3 000   000   000  ms 1.00kW
PAGE DOWN ▽  HEAT CTRL2:<POWER RMS    >
```

<Secondary constant-power effective value control **CYC mode**>

```
-SCHEDULE #001          WELD ON/OFF OFF
      SQD  SQZ  COOL1 COOL2  HOLD OFF
TIME  000  000   00    00     000 00 CYC
   UP   WELD  DOWN    HEAT
1  00    00    00 CYC 1.00kW
2  00    00    00 CYC 1.00kW
3  00    00    00 CYC 1.00kW
PAGE DOWN ▽  HEAT CTRL2:<POWER RMS    >
```

<Primary constant-current peak value control **ms mode**>

```
-SCHEDULE #001          WELD ON/OFF OFF
      SQD  SQZ  COOL1 COOL2  HOLD OFF
TIME 0000 0000  000   000   00000 0000ms
   UP   WELD  DOWN    HEAT
1 000   000   000  ms 1.00kA
2 000   000   000  ms 1.00kA
3 000   000   000  ms 1.00kA
PAGE DOWN ▽  HEAT CTRL3:<PRIMARY LIMIT>
```

<Primary constant-current peak value control **CYC mode**>

```
-SCHEDULE #001          WELD ON/OFF OFF
      SQD  SQZ  COOL1 COOL2  HOLD OFF
TIME  000  000   00  00      000 00 CYC
   UP   WELD  DOWN    HEAT
1  00    00    00 CYC 1.00kA
2  00    00    00 CYC 1.00kA
3  00    00    00 CYC 1.00kA
PAGE DOWN ▽  HEAT CTRL3:<PRIMARY LIMIT>
```

<Secondary constant-voltage effective value control **ms mode**>

```
-SCHEDULE #001          WELD ON/OFF OFF
      SQD  SQZ  COOL1 COOL2  HOLD OFF
TIME 0000 0000  000   000   00000 0000ms
   UP   WELD  DOWN    HEAT
1 000   000   000  ms       0.20V
2 000   000   000  ms       0.20V
3 000   000   000  ms       0.20V
PAGE DOWN ▽  HEAT CTRL4:<VOLTAGE RMS  >
```

<Secondary constant-voltage effective value control **CYC mode**>

```
-SCHEDULE #001          WELD ON/OFF OFF
      SQD  SQZ  COOL1 COOL2  HOLD OFF
TIME  000  000   00    00     000 00 CYC
   UP   WELD  DOWN    HEAT
1  00    00    00 CYC       0.20V
2  00    00    00 CYC       0.20V
3  00    00    00 CYC       0.20V
PAGE DOWN ▽  HEAT CTRL4:<VOLTAGE RMS  >
```

<Constant-phase control **ms mode**>

```
-SCHEDULE #001          WELD ON/OFF OFF
      SQD  SQZ  COOL1 COOL2  HOLD OFF
TIME 0000 0000  000   000   00000 0000ms
   UP   WELD  DOWN    HEAT
1 000   000   000  ms 10.0 %
2 000   000   000  ms 10.0 %
3 000   000   000  ms 10.0 %
PAGE DOWN ▽  HEAT CTRL5:<FIXED PULSE  >
```

<Constant-phase control **CYC mode**>

```
-SCHEDULE #001          WELD ON/OFF OFF
      SQD  SQZ  COOL1 COOL2  HOLD OFF
TIME  000  000   00    00     000 00 CYC
   UP   WELD  DOWN    HEAT
1  00    00    00 CYC 10.0 %
2  00    00    00 CYC 10.0 %
3  00    00    00 CYC 10.0 %
PAGE DOWN ▽  HEAT CTRL5:<FIXED PULSE  >
```

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

(b) TIME
Set the time for each operation during welding. Units of time are in ms or CYC. For each operation, see **8. Timing Chart**.

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

(c) WELD (1, 2, 3)
Set the length of time to allow welding current to flow.

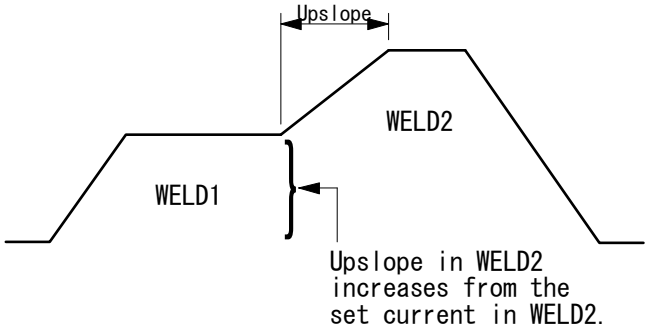
UP
Set the upslope time (to increase the welding current gradually).

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

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

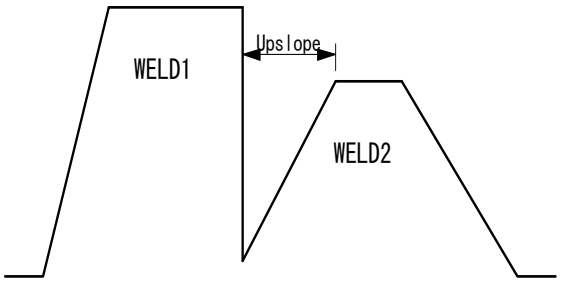
The welding current normally increases from the minimum value to the set value in Upslope and decreases from the set value to the minimum value in Downslope, but the following is an exception.

① When the upslope time is set for the subsequent stage in the multi-stage welding.
The upslope in the subsequent stage starts from the set current of the previous current. (See example below.)



When the Power Supply starts with the following setting, E-10 (schedule setting error) will occur.

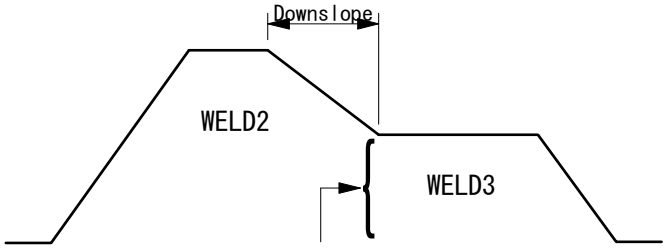
・When the current value in the previous stage is equal to or larger than the current value in the subsequent stage even with the upslope setting in the subsequent stage. (See example below.)



When producing a waveform like this, set COOL between WELD1 and WELD2.

Although the upslope time is set in WELD2,
WELD1 ＞ WELD2.

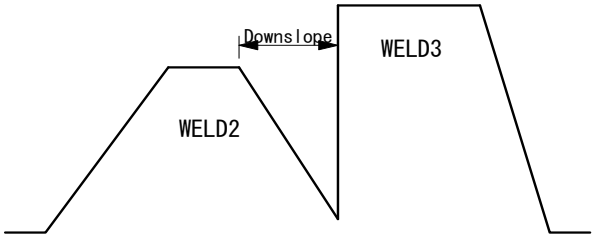
② When the downslope time is set for the previous stage in the multi-stage welding.
The downslope in the previous stage ends at the set current of the subsequent stage. (See example below.)



Downslope in WELD2
decreases to the
set current in WELD3.

When the Power Supply starts with the following setting, E-10 (schedule setting error) will occur.

・When the current value in the previous stage is equal to or smaller than the current value in the subsequent stage even with the downslope setting in the previous stage. (See example below.)



When producing a waveform like this, set COOL between WELD2 and WELD3.

Although the downslope time is set in WELD2,
WELD2 ＜ WELD3.

(Note) Set 1 ms 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.

(d) HEAT

Set the welding current for **WELD1**, **WELD2**, and **WELD3**, respectively.
When **CTRL** is changed, the items to be set also change.

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

(e) HEAT CTRL

Select one from the following six welding current control methods.

0	**<PRIMARY RMS>**	Primary constant-current effective value control
1	**<SECONDARY RMS>**	Secondary constant-current effective value control
2	**<POWER RMS>**	Secondary constant-power effective value control
3	**<PRIMARY LIMIT>**	Primary constant-current peak value control
4	**<VOLTAGE RMS>**	Secondary constant-voltage effective value control
5	**<FIXED PULSE>**	Constant-phase control

ATTENTION

When using another manufacturer's transformer and **<SECONDARY RMS>**, **<POWER RMS>**, or **<FIXED PULSE>**, connect the toroidal coil (sold separately) to the secondary of the transformer. An unconnected toroidal coil will be judged as a “No Current” event and error message E-05 (**13. Troubleshooting**) will be displayed.

⚠ DANGER

Even though E-05 (No Current error) is displayed, current is flowing. Exercise caution in handling.

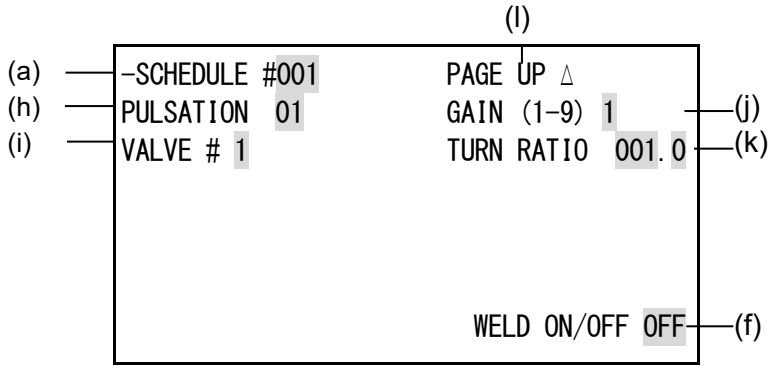
(f) WELD ON/OFF

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** 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** signal must all be **ON**.

(g) PAGE DOWN

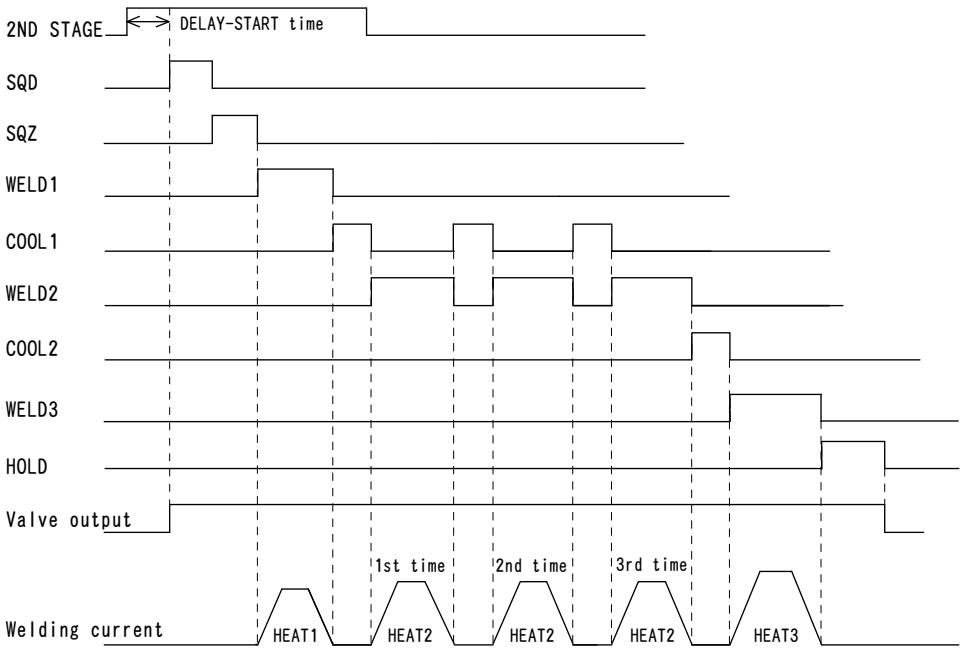
When the cursor is at ▽, moving the cursor down will change the display to the screen shown below. Use △ or ▽ to scroll up or down through different screens.



(h) PULSATION

Set the number of repetitions in the field for weld time in the **COOL1** and **WELD2**. (See the figure below.)

Timing chart obtained when **PULSATION** is set to "3"



(Note) PULSATION

- When performing a welding with the setting **PULSATION** to 2 or more and **COOL1** (cooling time) 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 2 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**.)

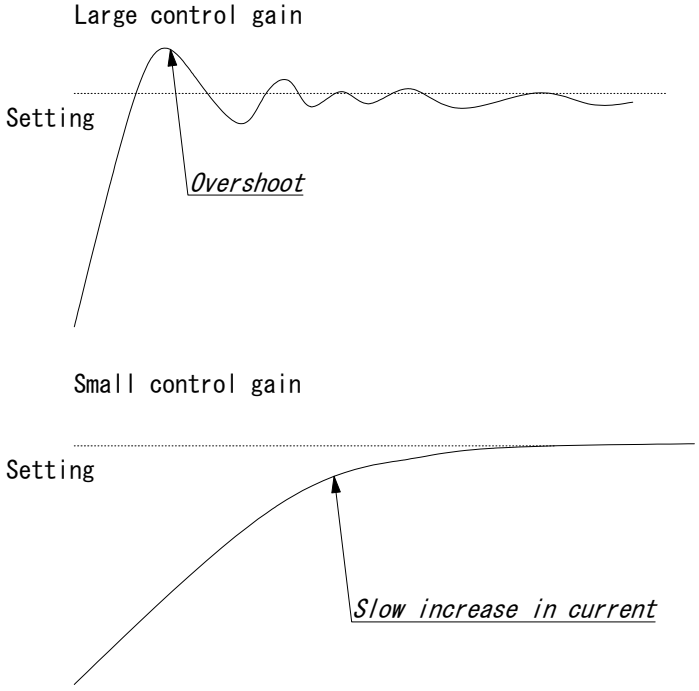
(i) VALVE #

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

(j) GAIN (1–9)

Sets the amount of feedback correction in 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 Primary constant-current peak value control and 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.

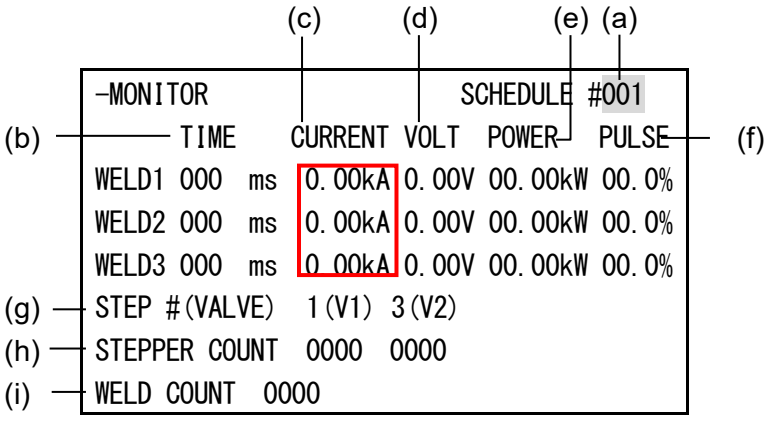
(l) PAGE UP

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

ATTENTION
When using **<PRIMARY RMS>** or **<PRIMARY LIMIT>**, always set the correct turns ratio. An incorrect ratio will result in malfunction.

(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 **IS-600A-01-01**.
The settings surrounded with frames are 00.0kA for **IS-600A-00-01/00-02**.

(a) SCHEDULE #

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

(b) TIME

The lengths of periods during which current was supplied in the course of **WELD1**, **WELD2** and **WELD3** operations are displayed. As units of time, **ms** and **CYC** may be selected. Either unit can be selected via the **MODE SELECT screen**. (See **(7)(i)**.)

(c) CURRENT

The welding current is displayed.

(d) VOLT

The measured voltage is displayed when the voltage detection cord is connected and the secondary voltage is input.

(e) POWER

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

(f) PULSE

The widest pulse among the supplied primary pulse current is displayed as a percentage of pulse width in full wave mode. The pulse width in full wave mode varies with the frequency setting (**WELD TRANS FREQUENCY**).

(g) STEP #

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

(h) STEPPER COUNT

The number of welds in the present step is displayed when **STEPPER MODE** (see **(7)(f)**) is activated on the **MODE SELECT screen**.

(i) WELD COUNT

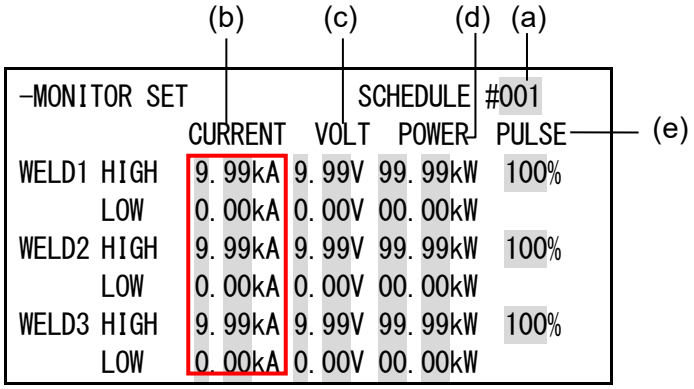
The present number of welds is displayed when the **WELD COUNT** (see **(7)(g)**) is activated on the **MODE SELECT screen**.

(Note) Monitored value

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

(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 **IS-600A-01-01**.
The settings surrounded with frames change as follows for **IS-600A-00-01/00-02**:
9.99 kA -> 99.9 kA
0.00 kA -> 00.0 kA

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

(b) CURRENT
Set the upper limit (HIGH) and lower limit (LOW) of the welding current for each of **WELD1**, **WELD2** and **WELD3**.

(c) VOLT
Set the upper limit (HIGH) and lower limit (LOW) of the secondary voltage for each of **WELD1**, **WELD2** and **WELD3**.

(d) POWER
Set the upper limit (HIGH) and lower limit (LOW) of the electric power for each of **WELD1**, **WELD2** and **WELD3**.

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

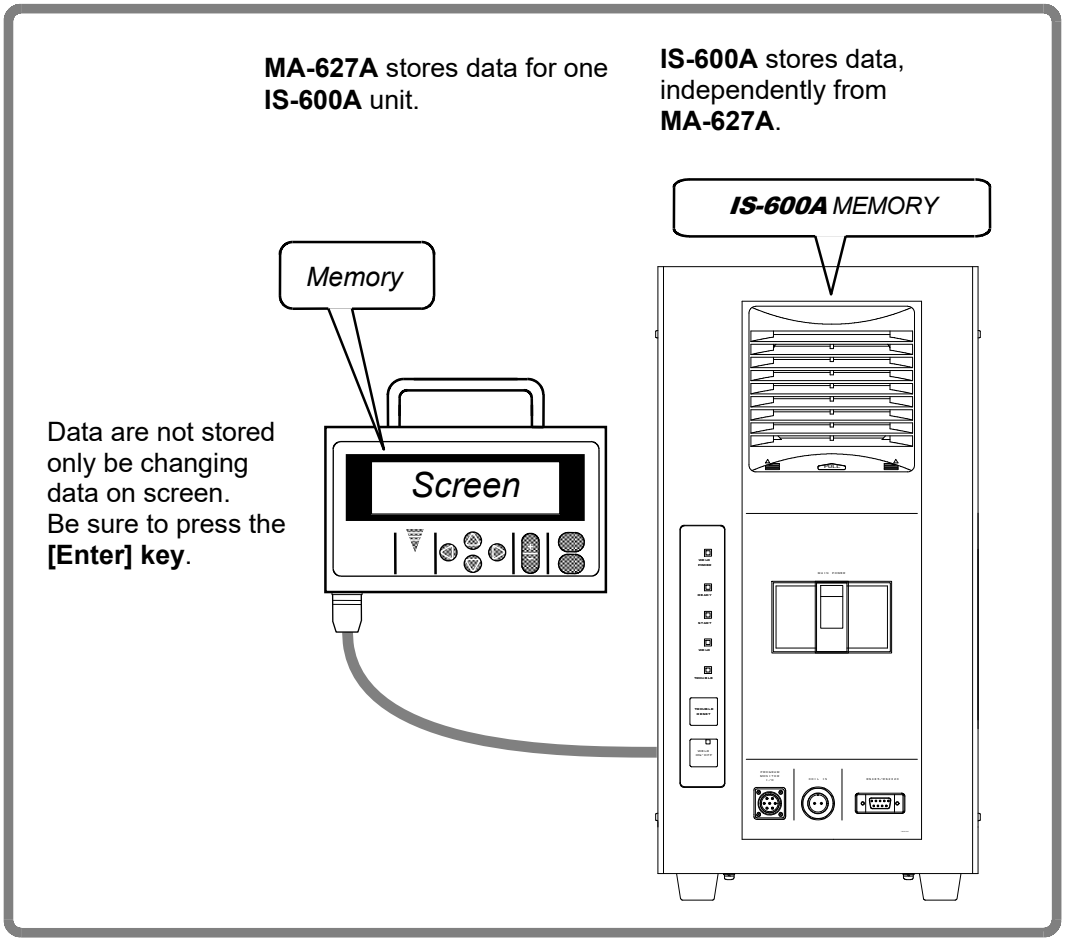
(Note) Upper/Lower limit judgment value when **STEPPER MODE** is set to ON
The upper/lower limit judgment value set here is for the current when a welding is performed, not for the initial setting.
Therefore, when **STEPPER MODE** is set to ON to perform step-up (step-down) for the initial setting, the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

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

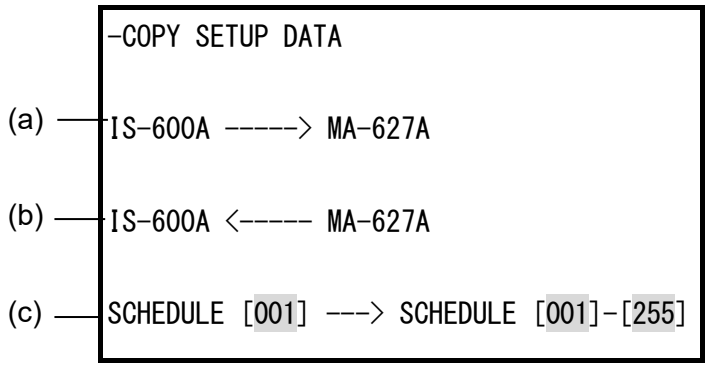
HIGH: 2.2 x 1.5 = 3.3 kA
LOW: 1.8 x 1.5 = 2.7 kA

(6) COPY SETUP DATA Screen

The **MA-627A** can store data. (Refer to the figure shown below.)
When the **MA-627A** is connected to the Power Supply, the data stored in the Power Supply memory is displayed on the Monitor Panel.
When the data is changed and the **[ENTER] key** is pressed, the contents of the memory of the Power Supply are overwritten by the new setting.



When two or more the Power Supply units are used and the contents of the memory of the first unit need to be copied to the second unit, copy the data from the first unit to the memory of **MA-627A** temporarily, and then copy this data to the second unit.



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

(a) IS-600A -----> MA-627A
The data in **IS-600A** is copied to MEMORY of **MA-627A**.

(b) IS-600A <----- MA-627A
The data in MEMORY of **MA-627A** is copied to **IS-600A**.

(c) SCHEDULE [001] -----> SCHEDULE [001]-[255]
This function is used to copy the **SCHEDULE** (welding condition).
The Power Supply can set up to 255 schedules, indicated as **SCHEDULE #1–#255**.
This function is also used to change from the **SCHEDULE #1** setting, to perform welding according to another schedule.

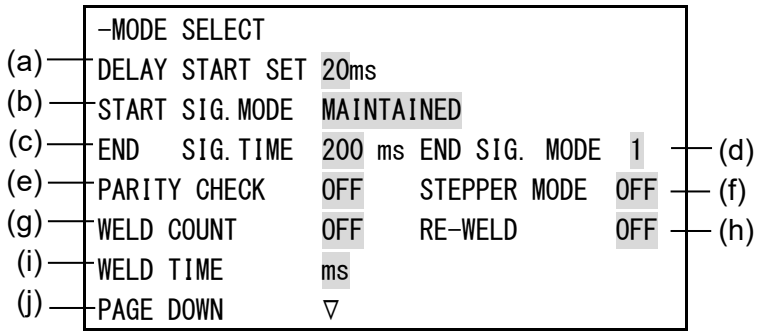
For example, **SCHEDULE #2** can be set by switching from **SCHEDULE #1** as follows:

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

SCHEDULE #1 can be copied immediately to **SCHEDULE #2** via **SCHEDULE #4** through the following setting:

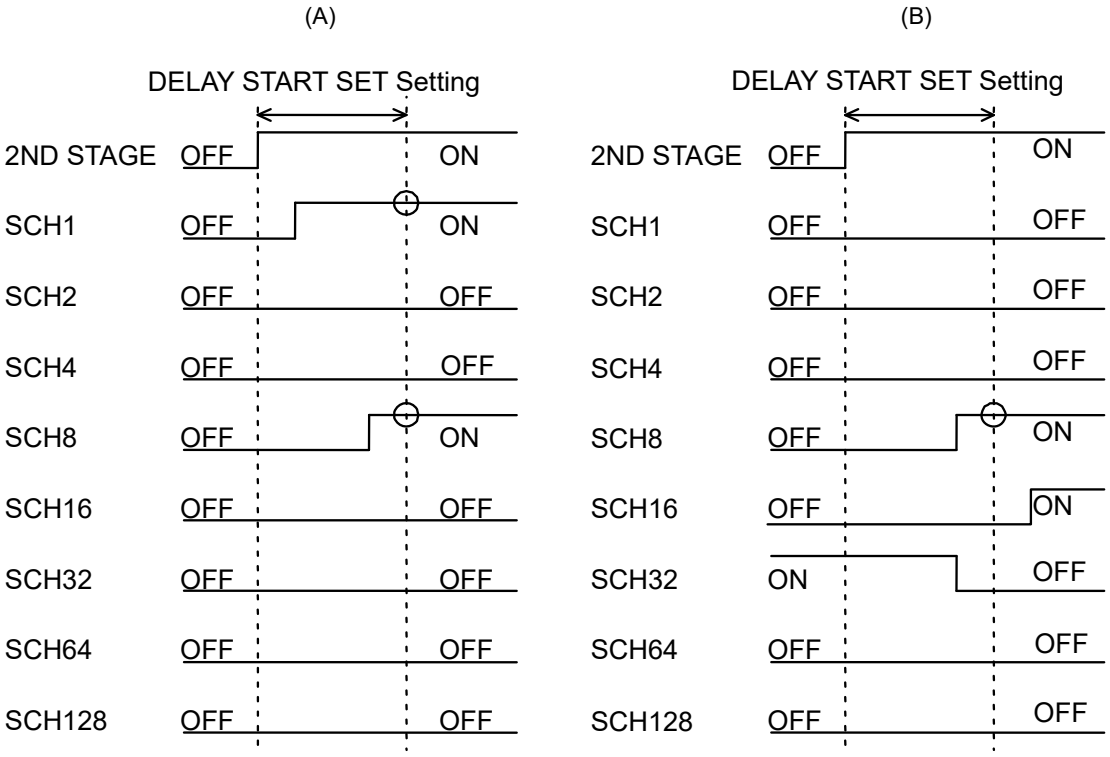
SCHEDULE [001] -----> SCHEDULE [002]-[004]

(7) 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 units of 1 ms.



In Fig. (A), schedule signals 1 and 8 are **ON**. Therefore, welding is performed using schedule No. 9. In Fig. (B), only schedule signal 8 is **ON**. As a result, welding is performed using schedule No. 8.
Schedule signals 16 and 32 are invalid because they are **OFF** when the schedule is determined.

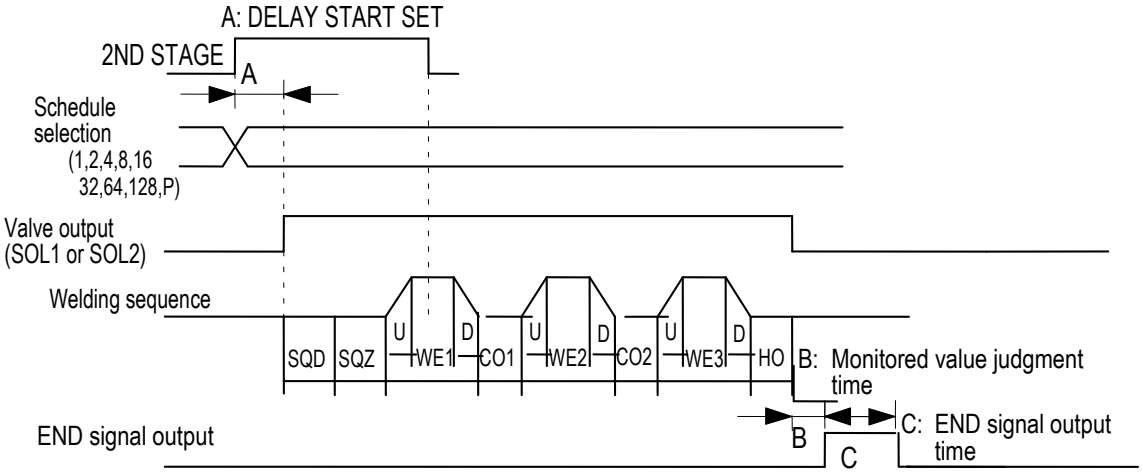
(Note) When **DELAY START SET** is 1 ms or 2 ms
The schedule number when the 2ND STAGE signal is received is selected. Therefore, in Fig. (A) above, the schedule number is not selected and the schedule signal input error occurs. When **DELAY START SET** is 1 ms or 2 ms, input the schedule signal in advance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

(b) START SIG.MODE

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

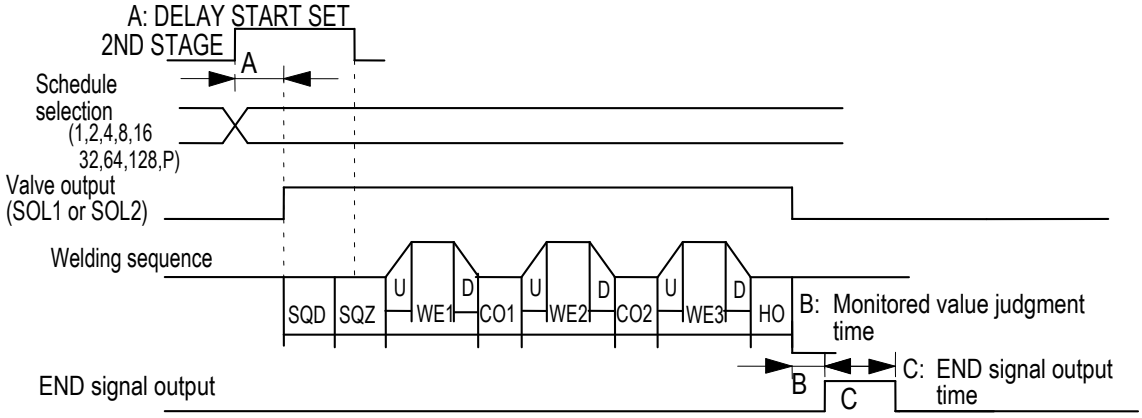
1) LATCHED

- 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

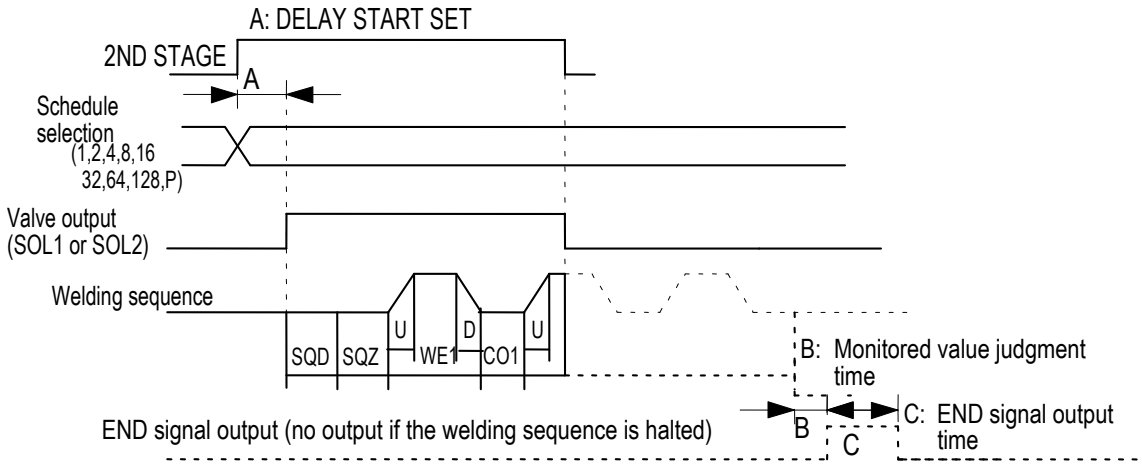
When the 2ND STAGE signal is input for more than the time set through **DELAY START SET** and then stops, the welding sequence will proceed to completion.



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 will not be output at this time.



(c) END SIG.TIME

Set the length of time for output of the end signal. The output time can be set in a range from 10 to 200 ms and in units of 10 ms. The start signal is not received while the end signal is output.

(d) END SIG.MODE

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

0: Outputs the end signal even when the monitored value is outside the upper and lower tolerance limits. The end signal will not be output in the event of a no-current or overcurrent error.

1: The end signal will not be output if the monitored value is outside the upper and lower tolerance limits or in the event of a no-current or overcurrent error.

2: The end signal will be output even when the monitored value is outside the upper and lower tolerance limits and even in the event of a no-current or overcurrent error.

(e) PARITY CHECK

Select whether or not parity check is performed. (Set external input pin 13.)

When **PARITY CHECK** = **ON**

Parity check will be performed. This check allows for detection of a failure resulting from a wire break in the schedule selection signal lines. Be sure that the total number of closed schedule selection and parity signal lines is always odd. (Refer to **Note 1**, **"Schedule Nos. and Schedule Selection Pins."**)

When **PARITY CHECK** = **OFF**

Parity check will not be performed. (The terminal functions as the WE1STOP terminal.) The sequence will proceed to **COOL1** if external input pin 13 is closed during the **WE1** sequence operation. (Refer to **Note 2**, **"Current shutoff function."**)

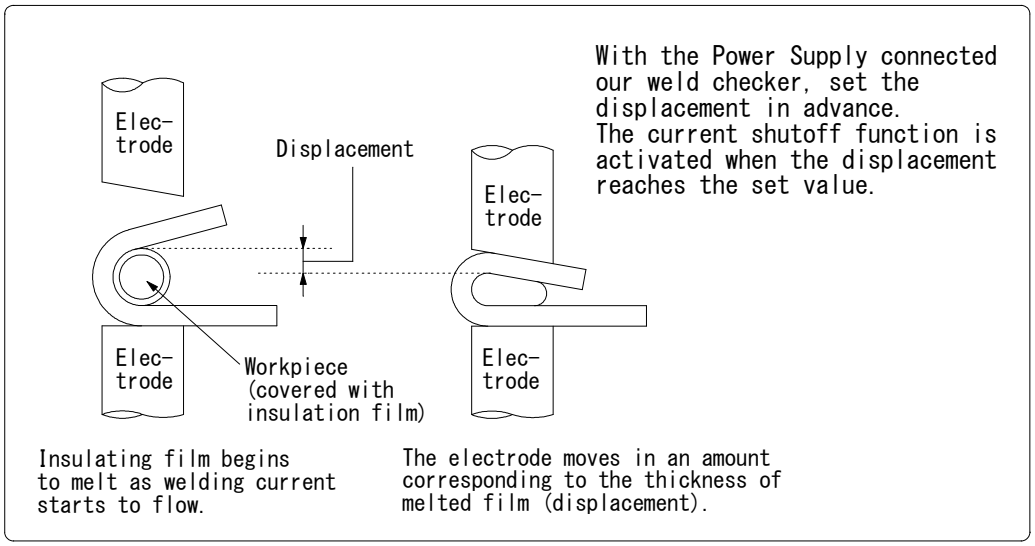
Note 1: Schedule Nos. and Schedule Selection Pins

●: Closed Blank: Open

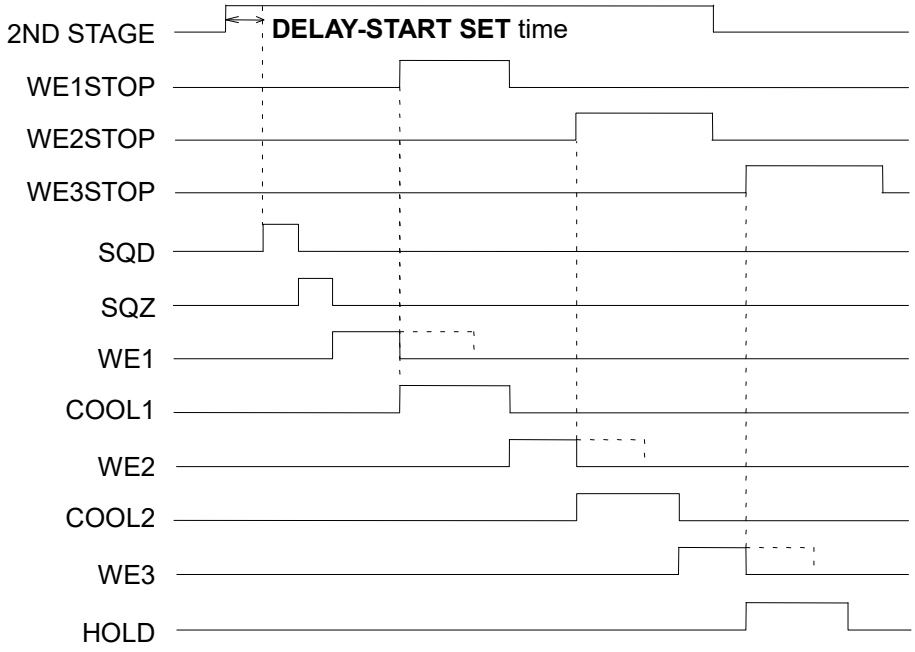
SCHEDULE#	SCH 1	SCH 2	SCH 4	SCH 8	SCH16	SCH32	SCH64	SCH128	PARITY
1	●								
2		●							
3	●	●							●
4			●						
5	●		●						●
6		●	●						●
7	●	●	●						
8				●					
9	●			●					●
10		●		●					●
11	●	●		●					
12			●	●					●
13	●		●	●					
14		●	●	●					
15	●	●	●	●					●
16					●				
17	●				●				●
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 the figure below.)



Timing chart for stopping current



The **WE1STOP** signal shuts off current immediately when input during the **WE1** period, switching the sequence to **COOL1**. The **WE1STOP** signal will not shut off current if input during the **WE2** or **WE3** period.
The **WE2STOP** signal shuts off current immediately when input during the **WE2** period, switching the sequence to **COOL2**. The **WE2STOP** signal will not shut off current if input during the **WE1** or **WE3** period.
The **WE3STOP** signal shuts off current immediately when input during the **WE3** period, switching the sequence to **COOL3**. The **WE3STOP** signal will not shut off current if input during the **WE1** or **WE2** period.
When the welding stop signal is input before the start signal is received, the welding stop error occurs.

(f) STEPPER MODE

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

ON	Step-up (step-down) will be performed.
OFF	Step-up (step-down) will not be performed.

(g) WELD COUNT

Select whether or not to check the weld count. (Set external input pin 14.)

When **WELD COUNT** = **ON**

The weld count will be checked. (Refer to **(a)** of **(8) MONITOR MODE Screen**.)

When **WELD COUNT** = **OFF**

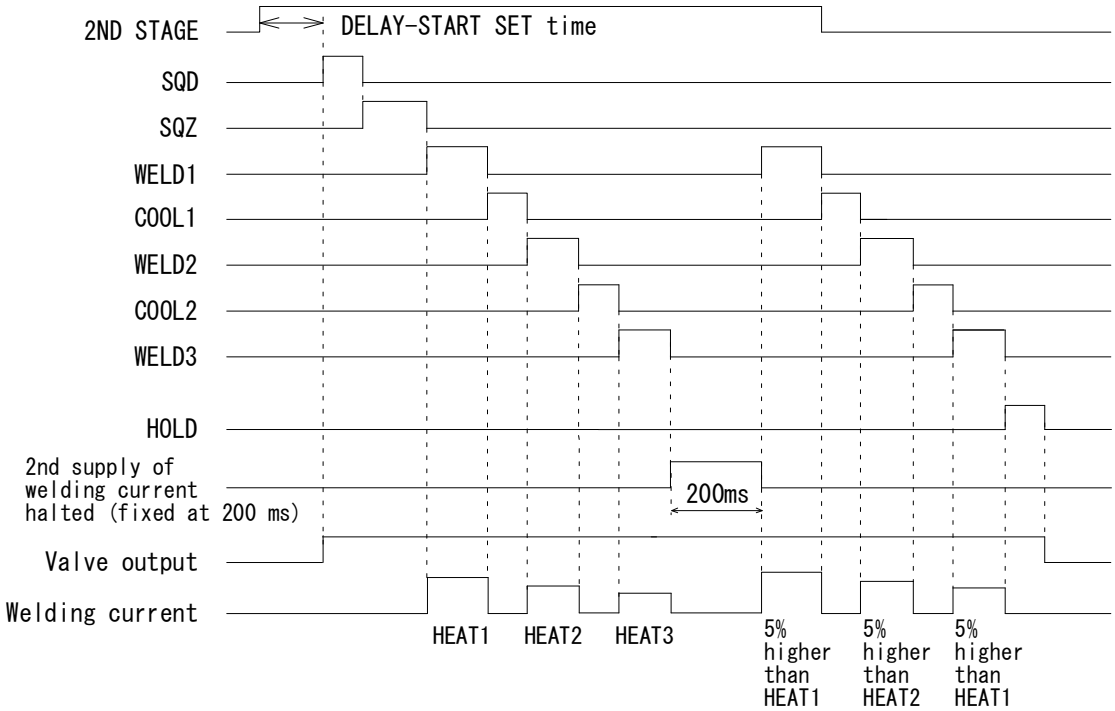
The weld count will not be checked. (The terminal functions as the WE2 STOP terminal.) The sequence will proceed to **COOL2** if external input pin 14 is closed during the **WELD2** sequence operation. (Refer to **Note 2**, **(7)(e)**.) When the WE2 STOP signal is input before the start signal is input, the welding stop error occurs.

(h) 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.

RE-WELD Timing Chart



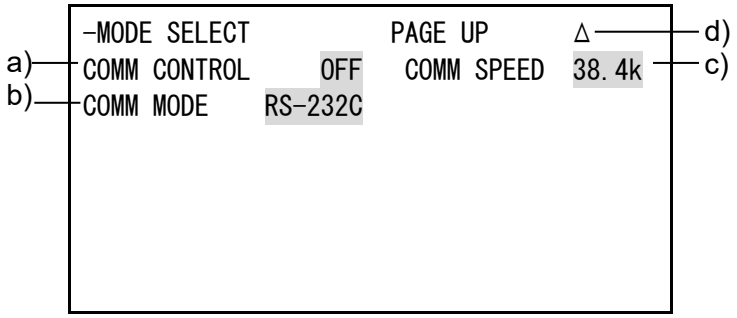
(i) WELD TIME

Use this setting to change the units for **TIME**, **UP SLOPE**, and **DOWN SLOPE**—the settings available on the **(3) SCHEDULE Screen**.

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

(j) PAGE DOWN

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



a) COMM CONTROL

Selects a communication function.

OFF	No communication
-->	One-way communication
<->	Both-way communication

b) COMM MODE

Selects a communication mode.

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

c) COMM SPEED

Selects a communication speed.

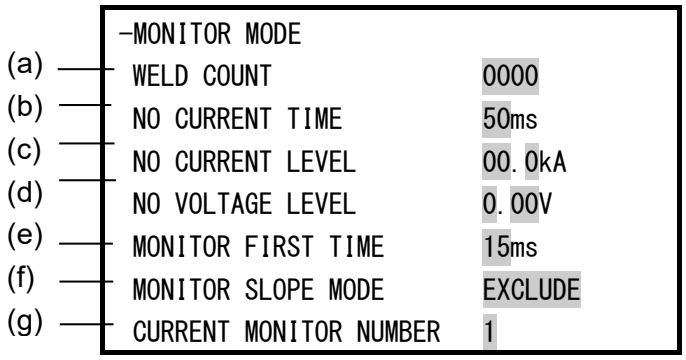
9.6k	Communication at 9600 bps
19.2k	Communication at 19200 bps
38.4k	Communication at 38400 bps

d) PAGE UP

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

For details of the external communication, see **11. External Communication Function**.

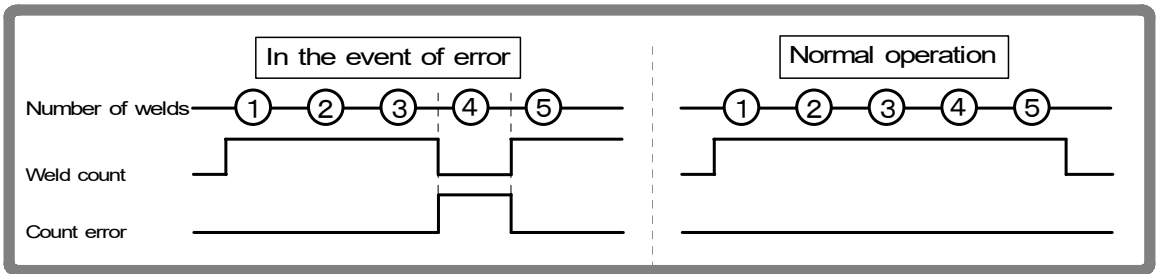
(8) MONITOR MODE Screen



(a) 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 **WELD COUNT** (weld count signal is turned off before the number of welds set for **WELD COUNT** is not deposited). (Refer to the figure below.)
For example, if you set the number of welds to 5 from the programmable logic controller, select “5” for **WELD COUNT** as well.
This function can be turned **ON** or **OFF** through **WELD COUNT** on the **(7) MODE SELECT Screen**. (Refer to **(7)(g)**.)

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.



(b) NO CURRENT TIME

The absence of welding current will not be detected as a no-current or no-voltage error (see **13. 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.

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

Set the current or voltage level for determining the absence of current or voltage as a no-current or no-voltage error.

The **[TROUBLE] lamp** will light up, and operation will stop if the monitored current or voltage falls below the level set here.

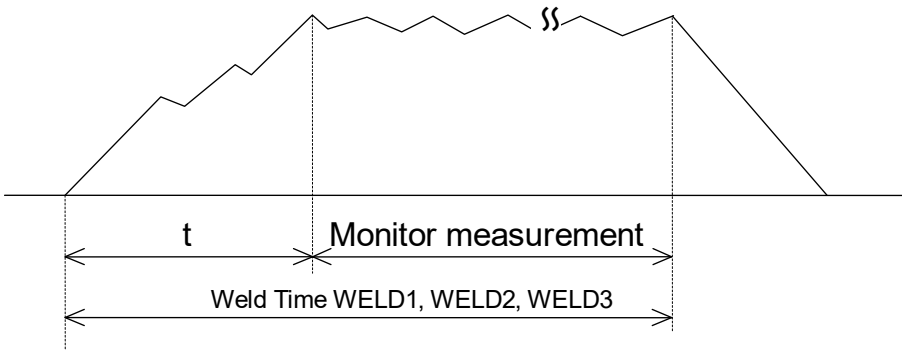
In the case of primary current control, supplying current with the welding transformer's secondary side open will cause an excitation current to flow through the primary side. Set the current level slightly higher than the monitored current.

(Note) No judgment as to no-current or no-voltage error will be made if you select 00.0 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 0 to 15 ms. Use this setting to exclude the initial rise of current from measurement.

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



t = MONITOR FIRST TIME

(f) MONITOR SLOPE MODE

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

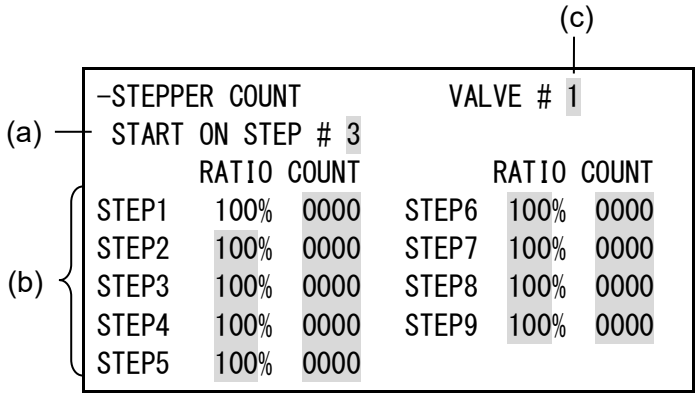
EXCLUDE	Slope period will not be included.
INCLUDE	Slope period will be included.

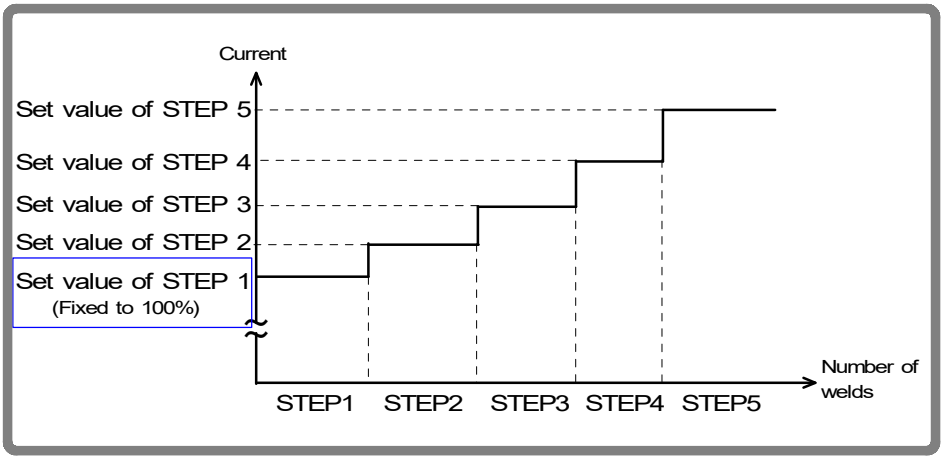
(g) CURRENT MONITOR NUMBER

Use this setting to switch between monitored currents to be displayed when our monitor unit **MA-628A** is connected. This function is not used with this system.

(9) 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.





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**.

(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) STEP 1–9

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

(c) VALVE #

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

(10) I/O CHECK Screen

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

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

Input signal

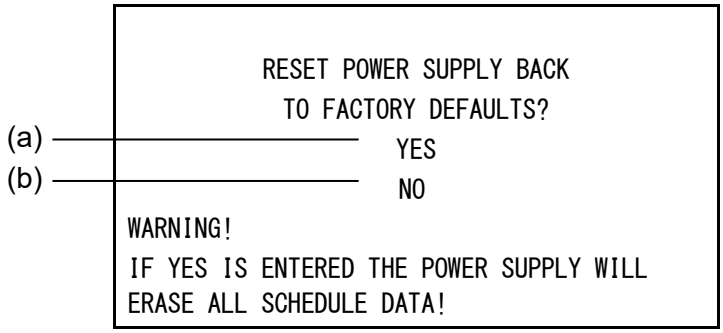
SCH01:	Pin 5	SCH128:	Pin 12	ERR RST:	Pin 23
SCH02:	Pin 6	PARITY:	Pin 13	STP RST:	Pin 24
SCH04:	Pin 7	WE CNT:	Pin 14	W3 STOP:	Pin 25
SCH08:	Pin 8	WELDON:	Pin 19	1ST STG:	Pin 16
SCH16:	Pin 9	THERMO:	Pin 20	2ND STG:	Pin 17
SCH32:	Pin 10	FLW SW:	Pin 21		
SCH64:	Pin 11				

Output signal

NG:	Pin 26	SOL1:	Pin 36
CATN:	Pin 27	SOL2:	Pin 37
END:	Pin 28		
CTER:	Pin 29		
REDY:	Pin 30		
STED:	Pin 31		
WESG:	Pin 32		

(11) RESET TO DEFAULT Screen

This screen is used to initialize the Power Supply's memory (i.e., to restore the initial settings).
Initialization will not clear the memory of the **MA-627A**.
To initialize, move the cursor (>) over **YES** or **NO** and press the **[ENTER] key**.

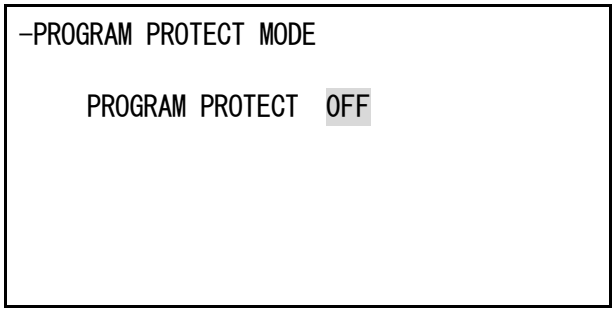


(a) YES	Initializes the Power Supply memory (restores the initial settings). After initialization, the screen will reflect the settings shown in this chapter.
(b) NO	Returns the display to the **MENU screen** without initializing the Power Supply memory.

(12) PROGRAM PROTECT MODE Screen

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

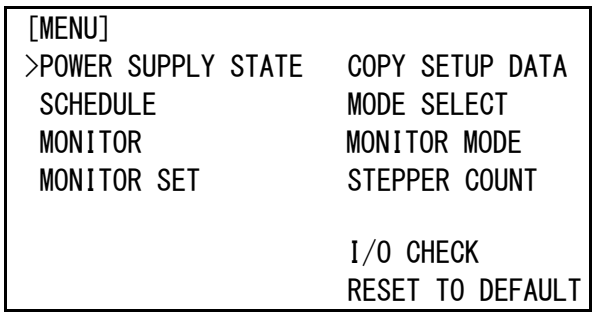
① Turn on the power supply with the **[▽ (DOWN)] key** pressed or connect the **MA-627A** to the circuit cable with the power supply turned on. The following screen is displayed.



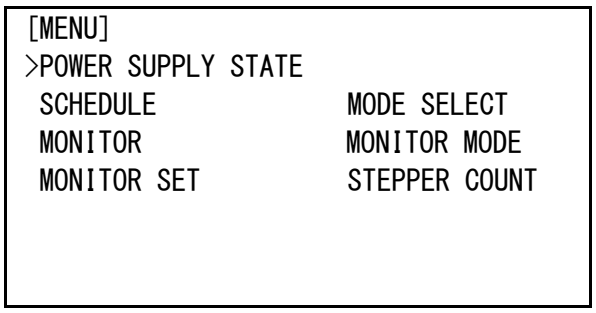
② When the **[ENTER] key** is pressed after the **[+ON] key** is pressed, ON is displayed.
You cannot go to other screens from this screen. Also, the external signals cannot be received.

③ Turn off the power supply and turn on it again, or disconnect the **MA-627A** with the power supply turned on and connect to the circuit cable again.
When **PROGRAM PROTECT** is ON, the display of the **MENU screen** changes. **COPY SETUP DATA**, **I/O CHECK** and **RESET TO DEFAULT** are not displayed. On the other screens, the cursor can be moved and the settings can be checked, but the settings cannot be changed.

<When the PROGRAM PROTECT is OFF>



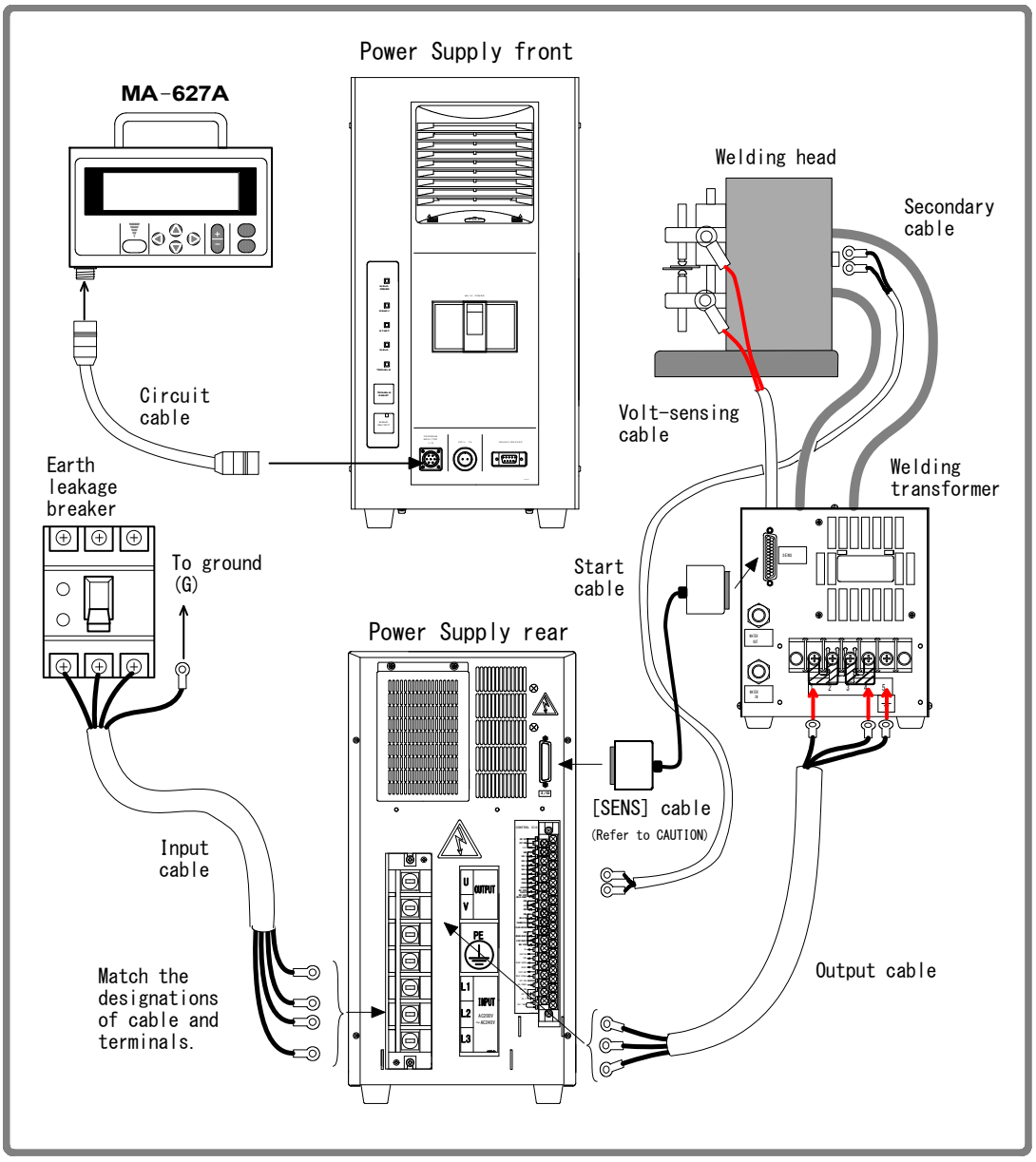
<When the PROGRAM PROTECT is ON>



5. Connection Procedures

(1) Basic Configuration

① When using our dedicated transformer

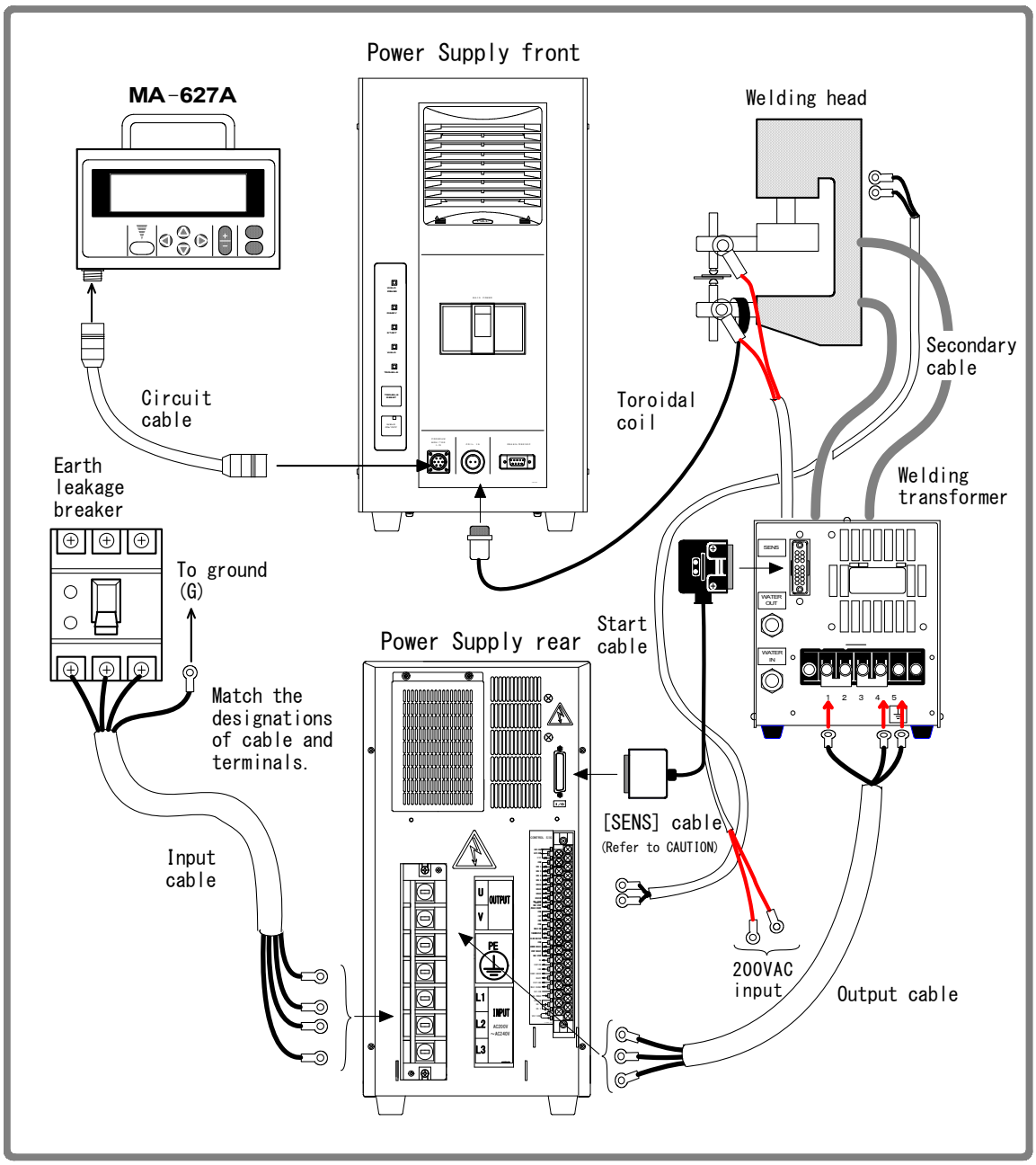


All items are sold separately except for the **IS-600A**. (See **10. (2) Options (Sold Separately)**.)

CAUTION

Be sure to use the **SK-05741** [SENS] cable to connect the **IS-600A** with our welding transformer. (See **10. (2) Options (Sold Separately)**.)

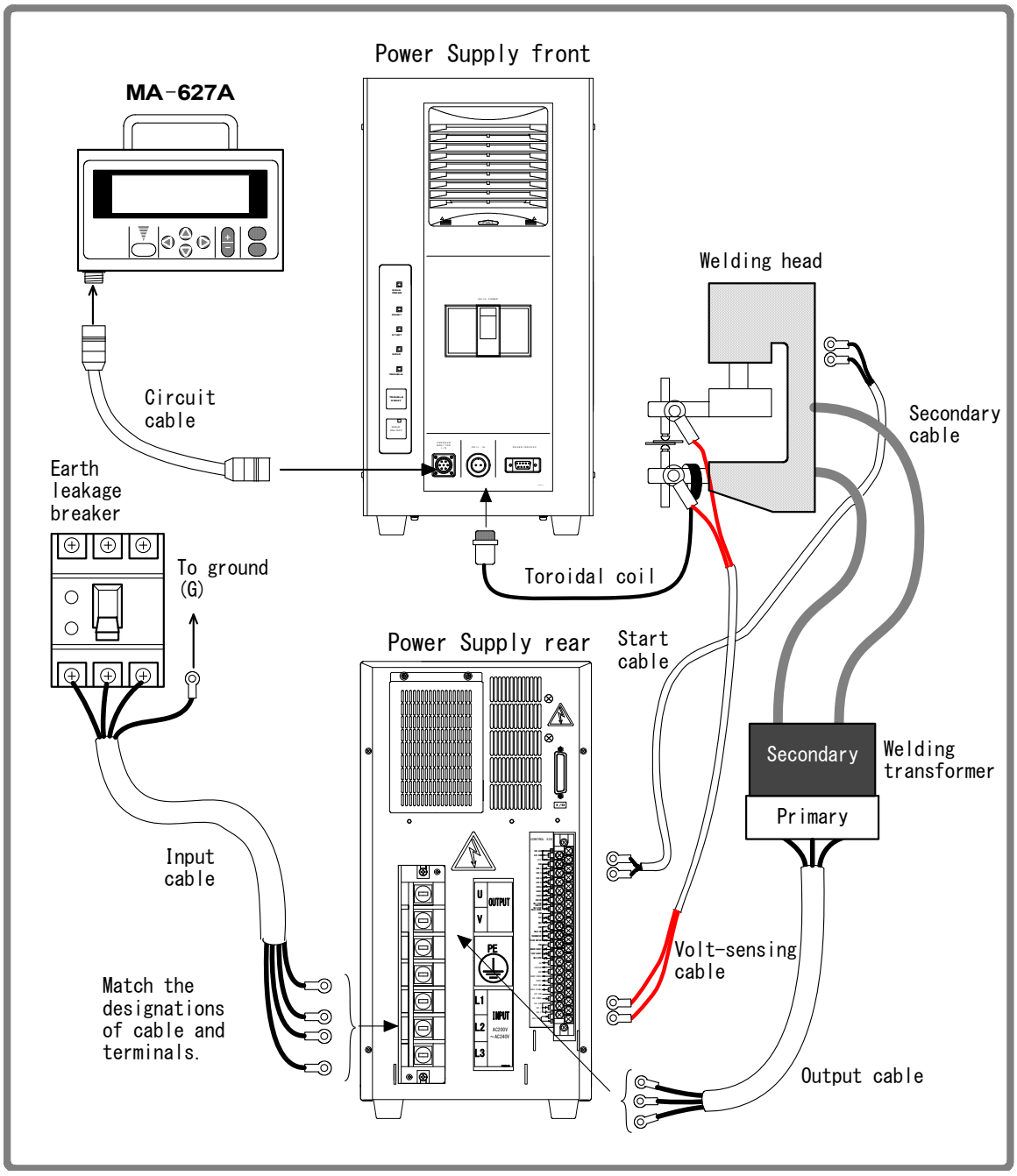
② When using our conventional transformer



All items are sold separately except for the **IS-600A**. (See **10. (2) Options (Sold Separately)**.)

CAUTION
Be sure to use the **SK-07527** [SENS] cable to connect the **IS-600A** with our welding transformer. (See **10. (2) Options (Sold Separately)**.)

③ When using another manufacturer's transformer



All items are sold separately except for the **IS-600A**. (See **10. (2) Options (Sold Separately)**.)

⚠ WARNING

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

Be sure to install an earth leakage breaker with at least 125 A to prevent electric shock.

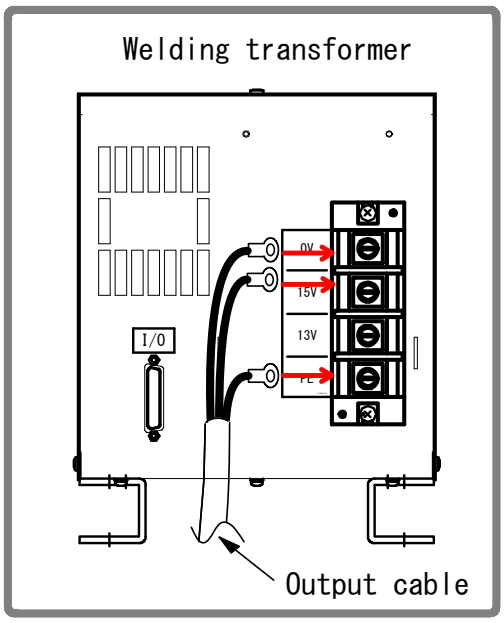
(2) Connecting

① When using our dedicated transformer

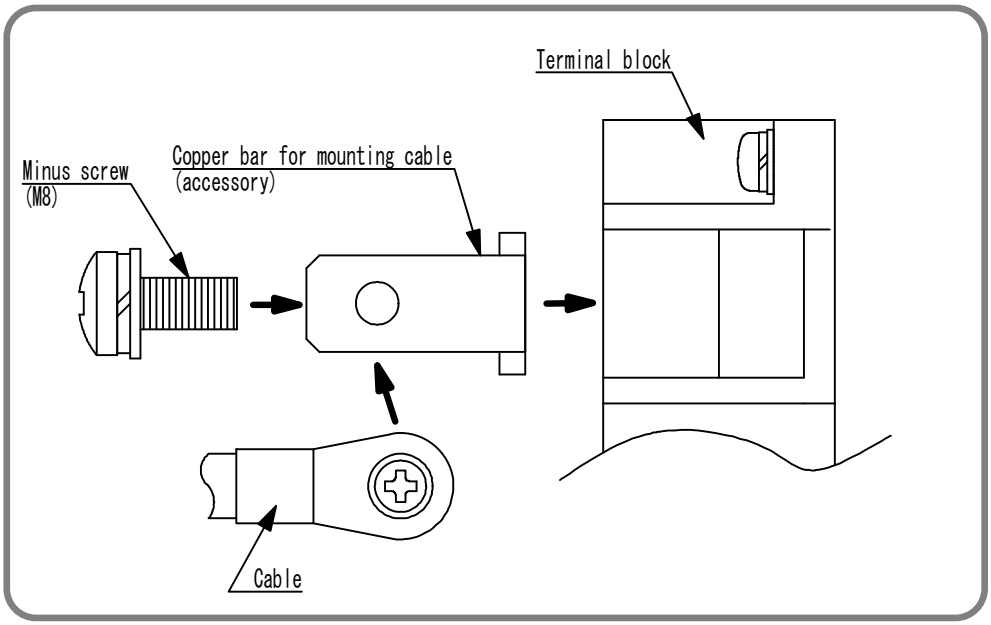
1) Connection to the transformer's input terminal block and [SENS] cable

Use the output cable to connect the welding power output terminal block on the Power Supply's rear panel with the welding transformer's input terminal block. For the output cable specification, see **10. (2) Options (Sold Separately)**.

According to the setting current value, the welding head and the secondary cable, connect the output cable to 0 V and 15 V, or 0 V and 13 V of the welding transformer's input terminal block.



When it is hard to connect cables to the **IS-600A** and the welding transformer terminal blocks, use the provided copper bars for mounting cable.



⚠ CAUTION

Use a sensing cable to connect the **Welding Transformer [I/O] connector** to the welding transformer. Bear the following in mind.

- **Do NOT connect** the **[COIL IN] connector** to the toroidal coil connector on the front panel.
- Be sure to keep the thermostat input terminal (No. 26) for the External Input/Output Signal open. (See **6. Interface**.)
- Connect the attached voltage detecting cable to the electrodes of welding head and insert the dedicated connector into the transformer's front panel in constant-voltage/constant-power control or when monitoring the secondary voltage.

2) Connecting the power cable

Connect the power supply to the **Welding Power Supply Breaker** on the rear panel and ground the [**PE**] terminal. (See **10. (2) Options (Sold Separately)**.)

3) Connect the necessary cables to the Connecting terminal block for External Input/Output Signal

(See **6. Interface**.)

(Note) Install the attached ferrite core to the portion of the external input/output signal cable within 10 cm of the **IS-600A**.

4) Connecting the program unit

Connect the circuit cable to the **[PROGRAM MONITOR I/O] connector** on the front panel.

(Note) Install the attached ferrite core to the portion of the program unit connecting cable within 10 cm of the program unit.

② When using our conventional transformer

1) Connection to the transformer's input terminal block and [SENS] cable
Use the output cable to connect the welding power output terminal block on the Power Supply's rear panel with the welding transformer's input terminal block. For the output cable specification, see **10. (2) Options (Sold Separately)**.

⚠ CAUTION

Use a sensing cable to connect the **Welding Transformer [I/O] connector** to the welding transformer. Bear the following in mind.

- Be sure to keep the thermostat input terminal (No. 26) for the External Input/Output Signal open. (See **6. Interface**.)
- Connect the attached voltage detecting cable to the electrodes of welding head and insert the dedicated connector into the transformer's front panel in constant-voltage/constant-power control or when monitoring the secondary voltage.

2) Connecting a toroidal coil for secondary current detection
Connect a toroidal coil to the **[COIL IN] connector** on the front panel.
(Do not connect a toroidal coil when our transformer is used.)

3) Connecting the power cable
Connect the power supply to the **Welding Power Supply Breaker** on the rear panel and ground the [**PE**] terminal. (See **10. (2) Options (Sold Separately)**.)

4) Connect the necessary cables to the Connecting terminal block for External Input/Output Signal
(See **6. Interface**.)

5) Connecting the program unit
Connect the circuit cable to the **[PROGRAM MONITOR I/O] connector** on the front panel.

③ When using another manufacturer's transformer

1) Connection to the transformer's input terminal block
Use the output cable to connect the welding power output terminal block on the Power Supply's rear panel with the welding transformer's input terminal block.
For the connection to the welding transformer, refer to the operation manual for the welding transformer.

2) Connecting a toroidal coil for secondary current detection
Connect a toroidal coil to the **[COIL IN] connector** on the front panel.
(Do not connect a toroidal coil when our transformer is used.)

3) When there is thermo sensor in the welding transformer
Connect to the thermo input terminal (Terminal No. 20) for External Input/Output Signals. (See **6. Interface**.)

4) When detecting the secondary voltage
Connect the voltage detecting cable to the voltage input terminal (Terminal No. 38 and 39). (See **6. Interface**.)

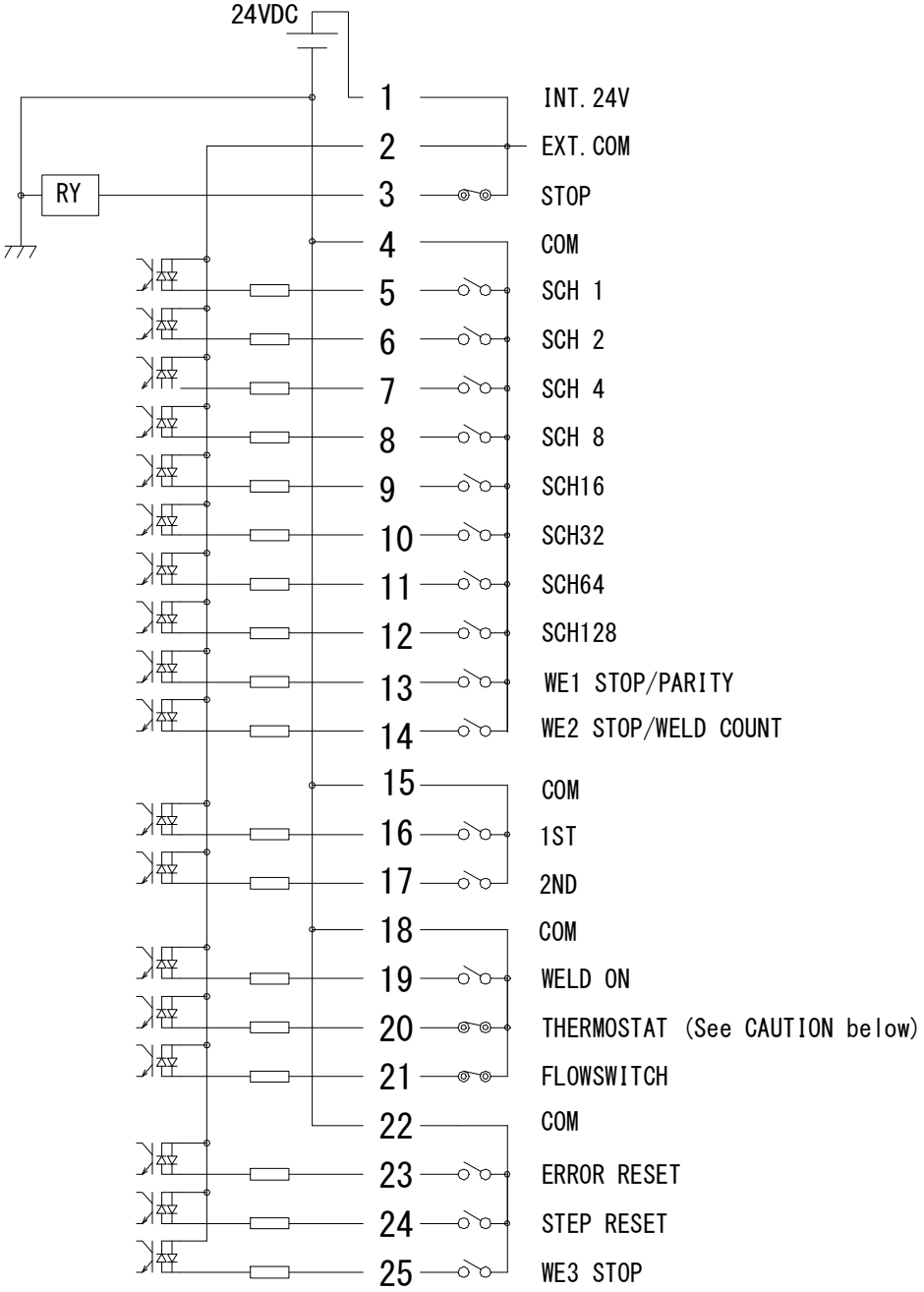
5) Connecting the power cable
Connect the power supply to the **Welding Power Supply Breaker** on the rear panel and ground the [**PE**] terminal. (See **10.(2) Options (Sold Separately)**.)

6) Connect the necessary cables to the Connecting terminal block for External Input/Output Signal
(See **6. Interface**.)

7) Connecting the program unit
Connect the circuit cable to the **[PROGRAM MONITOR I/O] connector** on the front panel.

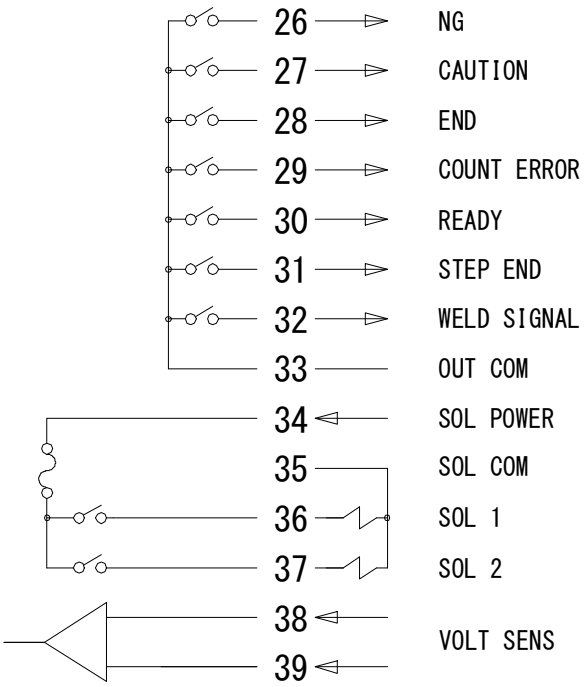
6. Interface

(1) Connection Diagram for External Input/Output Signals



⚠ CAUTION

Be sure to keep the **THERMOSTAT** (pin 20) open when connecting our welding transformer to the Power Supply.



Terminal strip specifications	
Terminals connectable	Two pieces max.
Pressure wire connectors	M3 or M3.5 (7.1 mm wide)
Recommended wire size	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

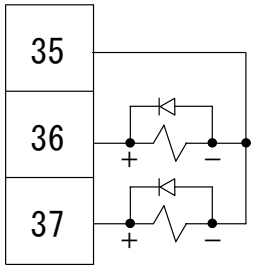
(2) Description of External I/O Signals

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. Note: Do not use pin 1 unless connecting it to pin 2 or 3. 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.
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. (7) (e) Schedule Nos. and Schedule Selection Pins**.)
13	WE1 STOP/ PARITY	Parity input or WE1 stop input pin. Switch between functions via the settings on the **(7) MODE SELECT screen** described in Chapter 4. When PARITY CHECK = ON This pin serves as the parity input pin, and 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. (7) (e) Schedule Nos. and Schedule Selection Pins**.) When PARITY CHECK = OFF This pin serves as the WE1 stop pin. The sequence will switch to COOL1 if this signal is closed during the WE1 sequence operation.
14	WE2 STOP/ WELD COUNT	Weld count input or WE2 stop input pin. Switch between functions via the settings on the **(7) MODE SELECT screen** described in Chapter 4. When WELD COUNT = ON This pin serves as the weld count input pin. This pin allows you to determine whether or not the number of deposited welds has reached the WELD COUNT setting. When WELD COUNT = OFF This pin serves as the WE2 stop input pin. The sequence will switch to COOL2 if this signal is closed during the WELD2 sequence operation.

Pin No.	Name	Description
15	COM	COM pin. This pin is internally connected to the GND chassis.
16	1ST	1ST STAGE input pin. (This function is not available with this Power Supply.)
17	2ND	2ND STAGE input pin. Closing this pin will start the sequence.
18	COM	COM pin. This pin is internally connected to the GND chassis.
19	WELD ON	Weld ON pin. Close this pin to turn ON the WELD ON signal, and open it to turn it OFF. Leaving this pin open will shut off welding current even when the sequence operation is performed. Use this pin, for example, to start the sequence experimentally.
20	THERMOSTAT	Thermostat input pin. Connect to the transformer thermostat or diode thermostat. Opening the pin will result in a thermostat error. Note that when connecting a sensing cable to the connector using our welding transformer, this pin must be left open. (See **5. Connection Procedures**.)
21	FLOWSWITCH	Flow switch input pin. Opening this pin will result in a flow rate error.
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.
24	STEP RESET	Step reset input pin. Closing this pin while the STEPPER is ON will reset the STEP number to 1.
25	WE3 STOP	WE3 stop input pin. Closing this pin during the WELD3 sequence will switch the sequence to HOLD. The current shutoff error occurs when the WE3 STOP signal is input before the start signal is input, even if WELD1 or WELD2 has been set.
26	NG	Error signal output pin. This signal is output upon completion of the welding sequence in the event of an operational error. If an error occurs, operation will halt until the reset signal is input. The contact is rated at 24 V DC at 20 mA (semiconductor switch).
27	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. 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).
28	END	End signal output pin. This pin is closed for a preset length of time after completion of the sequence. It is closed during the HOLD time, or for the length of time during which this pin is closed can be set in a range from 10 ms to 200 ms and in units of 10 ms. This signal is also output when the sequence operation is performed in the WELD OFF state. The contact is rated at 24 V DC at 20 mA (semiconductor switch).

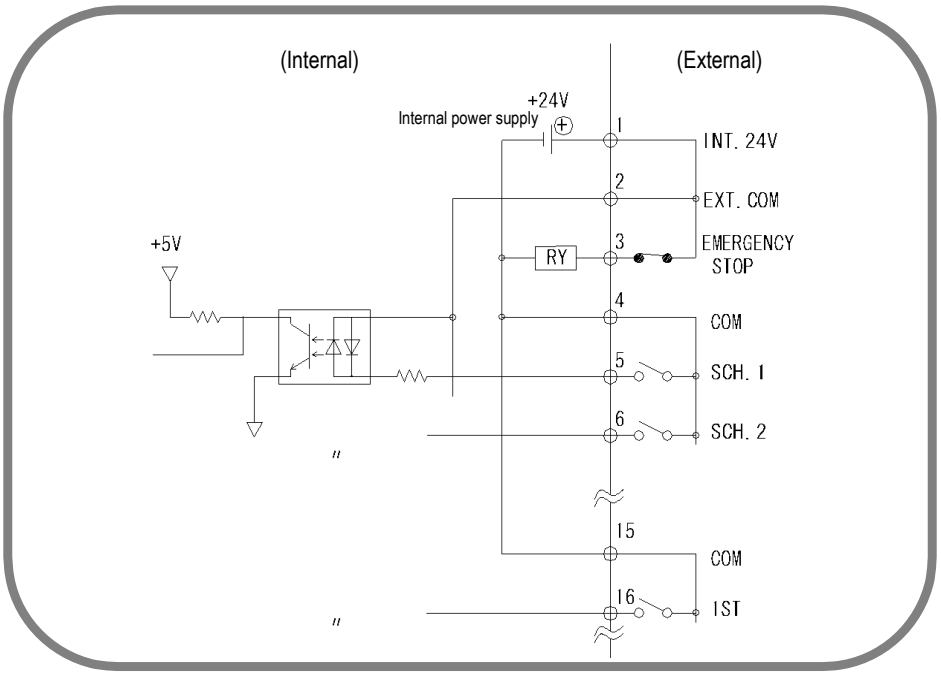
Pin No.	Name	Description
29	COUNT ERROR	Count error output pin. This signal is output if the set number of welds is not reached during count input. The contact is rated at 24 V DC at 20 mA (semiconductor switch).
30	READY	Ready output pin. This pin is closed when the Power Supply is able to supply welding current. The pin is opened in the WELD OFF or error state. The contact is rated at 24 V DC at 20 mA (semiconductor switch).
31	STEP END	Step end output pin. This signal is output upon completion of the last step during the step-up operation and continues until the step reset signal is input. The contact is rated at 24 V DC at 20 mA (semiconductor switch).
32	WELD SIGNAL	Welding current timing output pin. This signal is output at the beginning of WELD1, 2, or 3. The contact is rated at 24 V DC at 20 mA (semiconductor switch).
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.
36 **37**	SOL 1 SOL 2	Solenoid valve output pins. 36: SOL1; 37: SOL2 These pins are closed for the duration of 2ND STAGE input. 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. (However, do NOT connect when using our dedicated inverter transformer and the voltage detecting cable.)

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

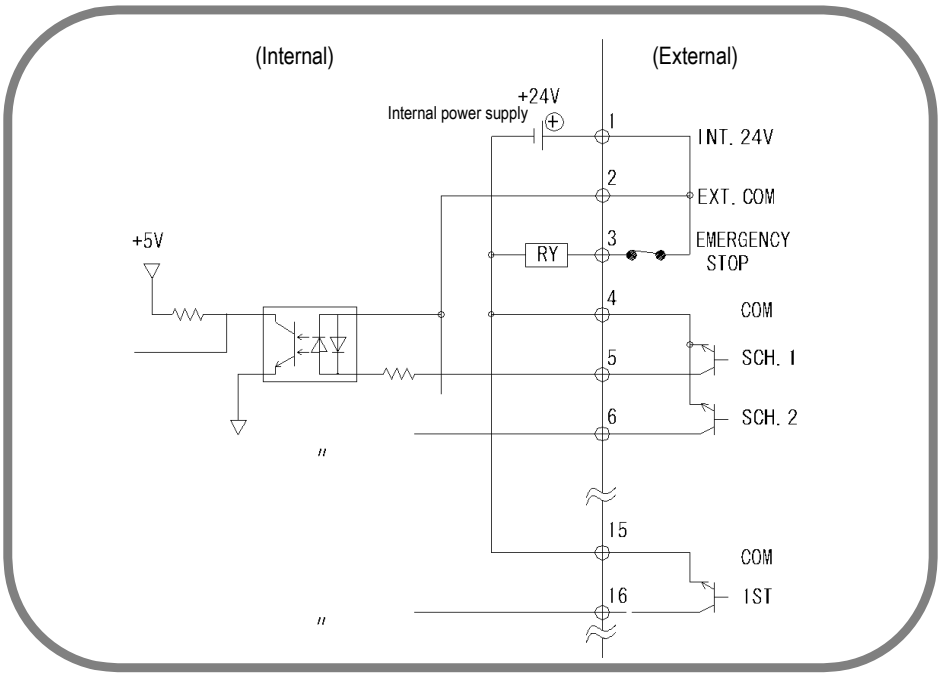


(3) Connection of Input Signals

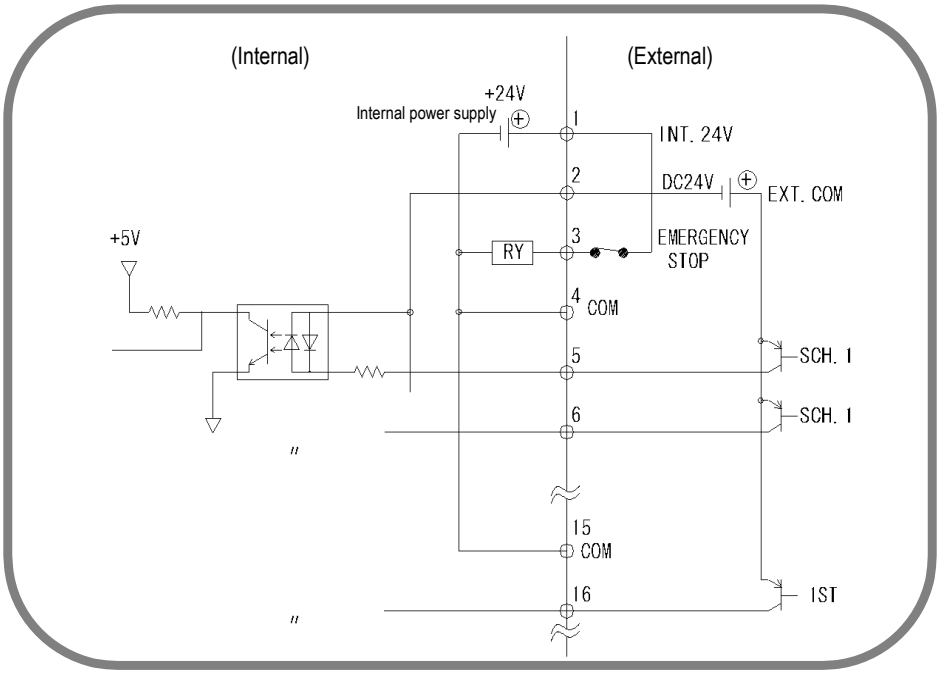
1) Connection with equipment having a contact input
Connect pins 1 and 2.



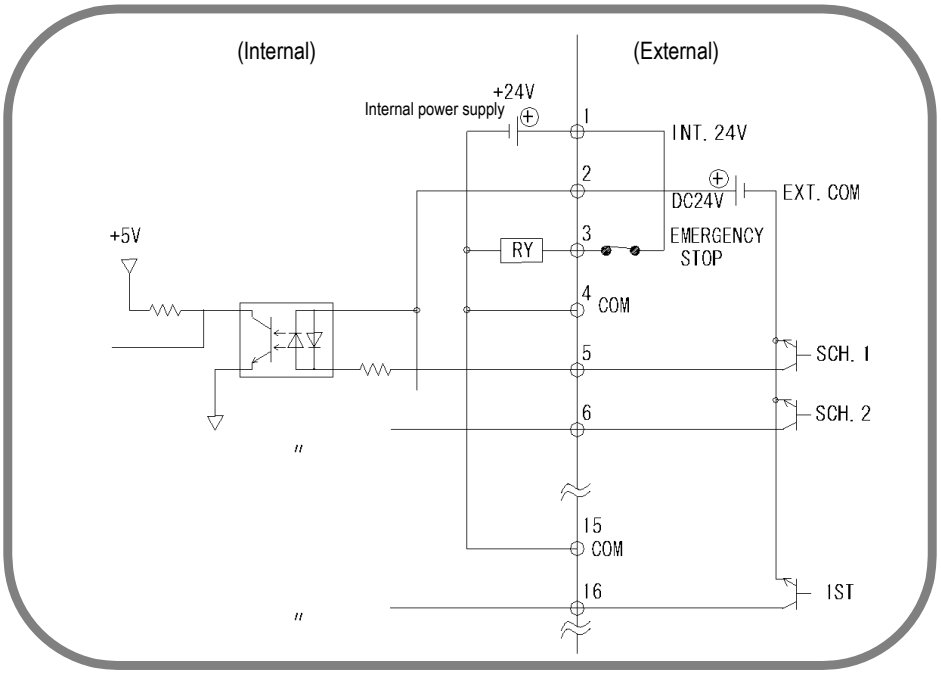
2) Connection with equipment featuring NPN open collector output (when using internal power supply)
Connect pins 1 and 2.



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

(1) Turn on the welding power.

1) Turn on the welding power. The **[WELD POWER] lamp** lights; the **[READY] lamp** blinks for 7 seconds, then goes off.

CAUTION
Check that the display screen and lamps are turned on normally and the fan motor is operated.

(2) Set the program unit.

1) Call up the **MENU screen**. If another screen is displayed, press the **[MENU] key**.
2) Move the cursor (>) to **SCHEDULE**, then press the **[ENTER] key**.
3) Set each item. For the initial weld, set each item slightly lower than the standard value.

(3) Start operation.

1) Input the start signal while the **[READY] lamp** is NOT on, and check each sequential operation.

⚠ WARNING

When confirming operation, check that the **SQD time** (squeeze delay time) and the **SQZ time** (squeeze time) are sufficient. If the welding current flows before the welding electrode force becomes sufficient, explosion may occur.

2) If no error is detected in 1) above, position a workpiece and begin welding. Turn on the **[WELD ON/OFF] key** on the front panel of the Power Supply, **WELD ON/OFF** of **MA-627A** and activate the external **WELD ON** signal. Check that the **[READY] lamp** is lit, and 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**.
3) Re-set the schedule to ensure that the workpiece will be welded adequately.
4) When welding multiple workpieces according to multiple schedules, change the **SCHEDULE #** and set a new time and welding current.
5) Set the upper and lower limits on the **MONITOR SET screen** for each **SCHEDULE #**.

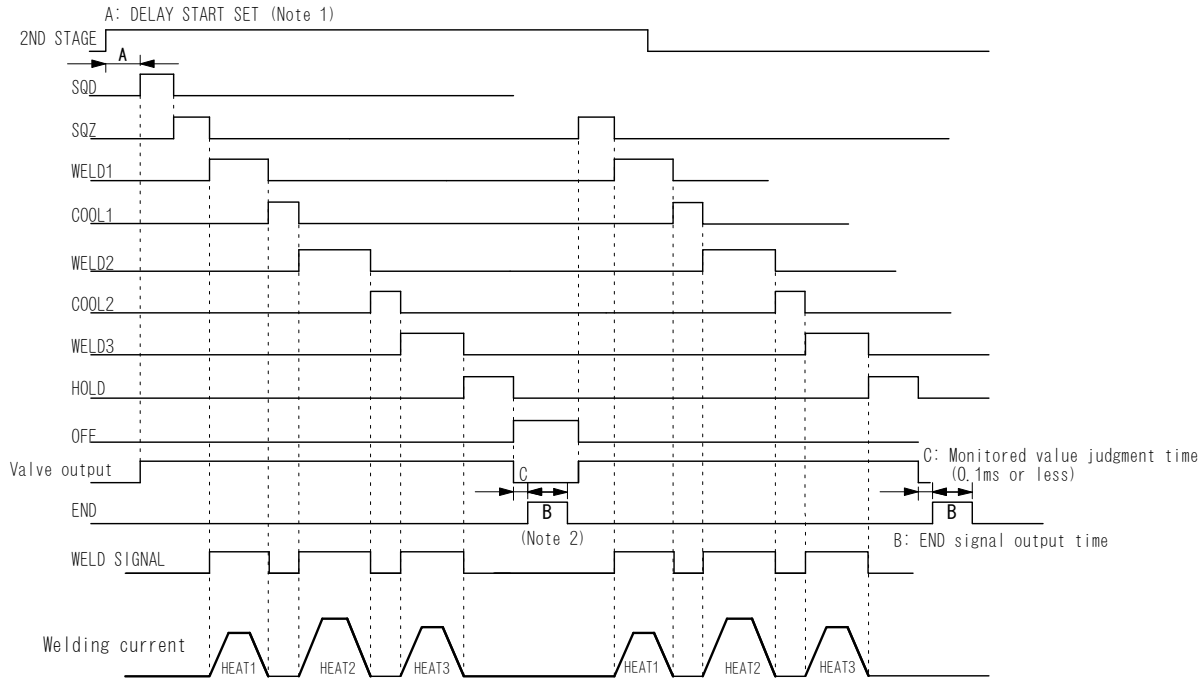
(Note) The Power Supply writes data into the flash memory on the control board when a setting is changed or a schedule data is copied. The **[READY] lamp** on the front panel and the external **READY** signal are turned off during writing. Check that the **[READY] lamp** is turned on to start welding. It takes about 2 seconds at longest to write data into the flash memory.

(4) Turn off the welding power.

1) Turn off the welding power; all LED lamps will be extinguished.

8. Timing Chart

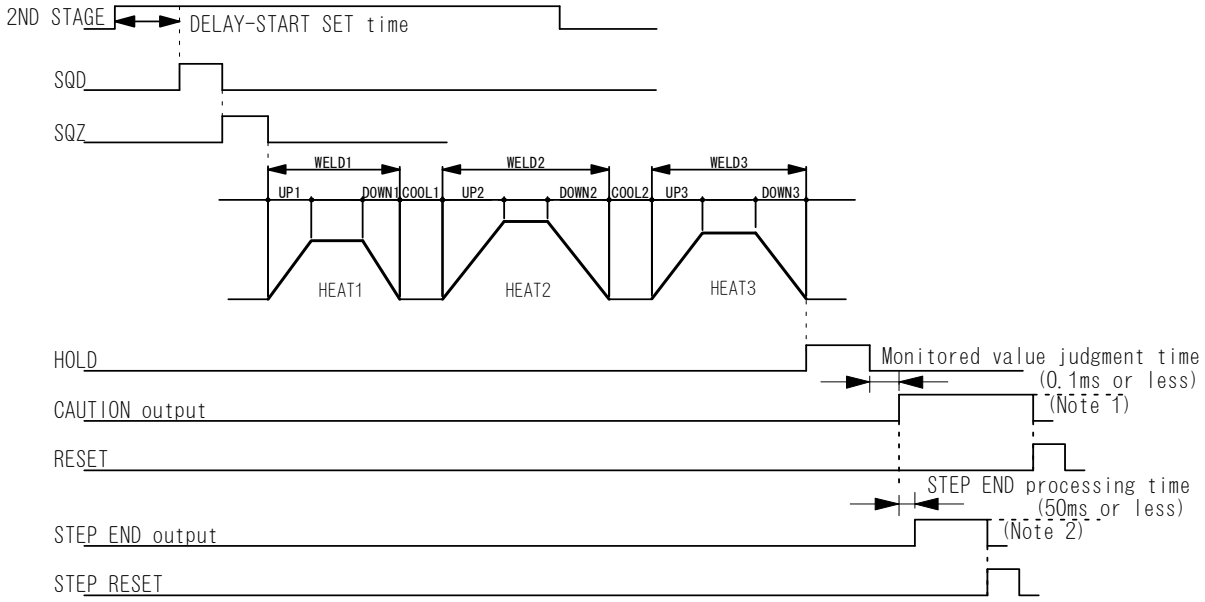
(1) Basic Sequence



(Note 1) To stop the sequence during **SQD** or **SQZ** (possible only when LATCHED or MAINTAINED is selected for **START SIG. MODE**; see **4.(7)(b)**), stop the start signal input for a period longer than that set for **DELAY START SET**.

(Note 2) Repetition operation is not performed if the OFF time is not set.

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



(Note 1) The CAUTION output is ON until the RESET signal or the next start signal is received.

(Note 2) The STEP END output is ON until the STEP RESET signal is received.

9. Maintenance

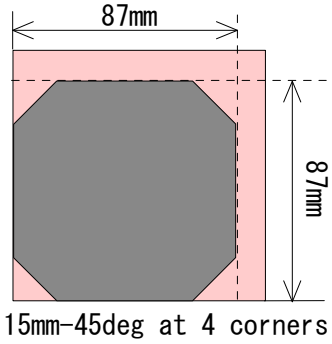
(1) Filter Cleaning and Replacement

The Power Supply's front air inlet is fitted with a filter.
Clean the filter once every six months, observing the following procedure.
If the filter is badly stained, replace it with a new one. If the filter is clogged, air will not flow adequately, causing internal temperature to rise and leading to malfunction.

- We do not offer replacement filters; please purchase these from the appropriate manufacturer.

[Manufacturer and Model Number of Replacement Filter]
Manufacturer: NITTO KOGYO CORPORATION
Model Number: SLP-F1 (10 sheet)

- Cut the replacement filter as shown:

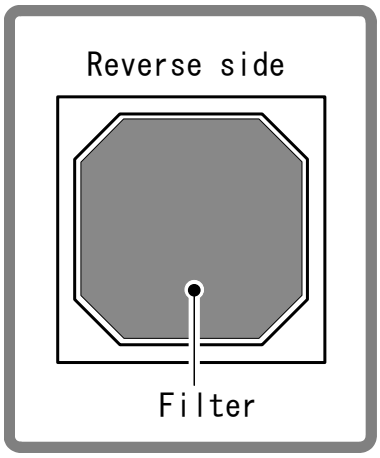


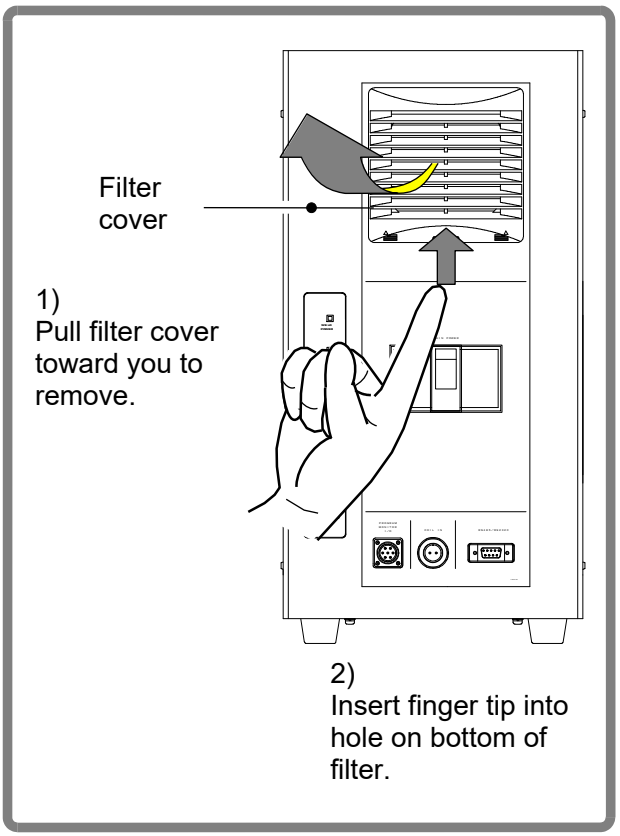
DANGER

Fan motor may hurt your finger.
When cleaning or replacing the filter, be sure to turn off the power supply first.

1) Remove the filter cover as shown in the right-hand figure.

2) Filter is inside the filter cover (See the figure below). Remove it and cleanse with neutral detergent water.





3) Allow the filter to dry sufficiently. Then put the cleaned filter (or the new filter if replaced) back on the filter cover and re-attach the filter cover to the air inlet.

10. Specifications

(1) Specifications

*: selectable for every 255 schedules

Model No.		IS-600A-		
		00-01	00-02	01-01
Welding power		3-phase, 200–240 V AC ±10% (50/60 Hz) (Voltage level is factory-set and is not field selectable.)		
Max. output current		600 A (peak value)		
Average max. duty cycle (See 10.(3).)	Output current [( ) indicates duty cycle.]	600 A (3%) 500 A (5%) 200 A (22.2%) 100 A (40%)		
Number of schedules		255		
Output frequency		1 kHz		
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) / 000–999 (CYC) 000–9999 (ms) / 000–999 (CYC) 000–400 (ms) / 00–20 (CYC) 000–600 (ms) / 00–30 (CYC) 000–400 (ms) / 00–20 (CYC) 000–999 (ms) / 00–99 (CYC) 000–400 (ms) / 00–20 (CYC) 000–600 (ms) / 00–30 (CYC) 000–400 (ms) / 00–20 (CYC) 000–999 (ms) / 00–99 (CYC) 000–400 (ms) / 00–20 (CYC) 000–600 (ms) / 00–30 (CYC) 000–400 (ms) / 00–20 (CYC) 00000–20000 (ms) / 000–999 (CYC) 0 or 0010–9990 (ms) / 00–99 (CYC)		
Transformer turns ratio * **(P/S RATIO)**		1.0–199.9		
Pulsation setting * **(PULSATION)**		01–19		
Valve setting * **(VALVE)**		2 valves (VALVE1, VALVE2)		
Control gain * **(GAIN)**		1–9		
Setting range * **(HEAT)**	Constant current control (Note 2) Constant power control Constant voltage control Constant phase control	02.0–20.0 kA 02.0–20.0 kW 0.20–9.99 V 10.0–99.9%		0.50–9.99 kA 0.50–9.99 kW 0.20–9.99 V 10.0–99.9%
Current monitor * **(CURRENT LOW/HIGH)**	HIGH (upper limit) LOW (lower limit)	00.0–99.9 kA 00.0–99.9 kA		0.00–9.99 kA 0.00–9.99 kA

Model No.		IS-600A-		
		00-01	00-02	01-01
Power monitor * (POWER LOW/HIGH)	HIGH (upper limit) LOW (lower limit)	00.00–99.99 kW 00.00–99.99 kW		
Voltage monitor * (VOLT HIGH/LOW)	HIGH (upper limit) LOW (lower limit)	0.00–9.99 V 0.00–9.99 V		
Pulse width monitor * (PULSE % HIGH)	HIGH (upper limit)	010–100%		
Step-up/-down (STEPPER COUNT)	STEP Up (down) ratio (RATIO) Counter setting (COUNT)	1–9 (9 steps) 50–200% 0000–9999 } Selectable for each valve		
Weld count monitor (WELD COUNT)		0000–9999		
State indicator LED		[WELD POWER] lamp [READY] lamp [START] lamp [WELD] lamp [TROUBLE] lamp [WELD ON/OFF] lamp		
Cooling method		Air-cooled (fan motor)		
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		
Protective functions	Overcurrent	325 A Fuse		
	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.		
Protective functions	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		457 (H) mm x 232 (W) mm x 608 (D) mm (Not including projection)		
Mass		31 kg		

Model No.		IS-600A-		
		00-01	00-02	01-01
Accessories	Fixing bracket: 2 pcs. Cable gland: 3 pcs. Operation manual: 1 copy Copper bar for mounting cable: 7 pcs. Ferrite core (Noise filter): 2 pcs.			

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 600 A.
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)

1) Input Cables

Customer-procured cables must meet the specifications at right.

- **IS-600A-00-01/-01-01**

Model No.	Length
PK-06888-002	2 m
PK-06888-005	5 m
PK-06888-010	10 m
PK-06888-015	15 m
PK-06888-020	20 m

Specifications of Standard Cable	
Rated Voltage	600 V AC min.
Section Area	38 mm^2 min.
No. of Cores	4
Cable Dia.	32 mm max.

- **IS-600A-00-02**

Model No.	Length
PK-06888-102	2 m
PK-06888-105	5 m
PK-06888-110	10 m
PK-06888-115	15 m
PK-06888-120	20 m

Specifications of CE Marking Compliant Cable	
Rated Voltage	500 V AC min.
Section Area	35 mm^2 min.
No. of Cores	4
Cable Dia.	38 mm max.

2) Output Cables

Customer-procured cables must meet the specifications at right.

Model No.	Length
PK-06889-002	2 m
PK-06889-005	5 m
PK-06889-010	10 m

Specifications of Standard Cable and CE Marking Compliant Cable	
Rated Voltage	750 V AC min.
Section Area	35 mm^2 min.
No. of Cores	3
Cable Dia.	32 mm max.

3) Others

Item	Model No.	Length
[SENS] cable	SK-05741-002 *1	2 m
	SK-05741-005 *1	5 m
	SK-05741-010 *1	10 m
	SK-07527-002 *2	2 m
	SK-07527-005 *2	5 m
	SK-07527-010 *2	10 m

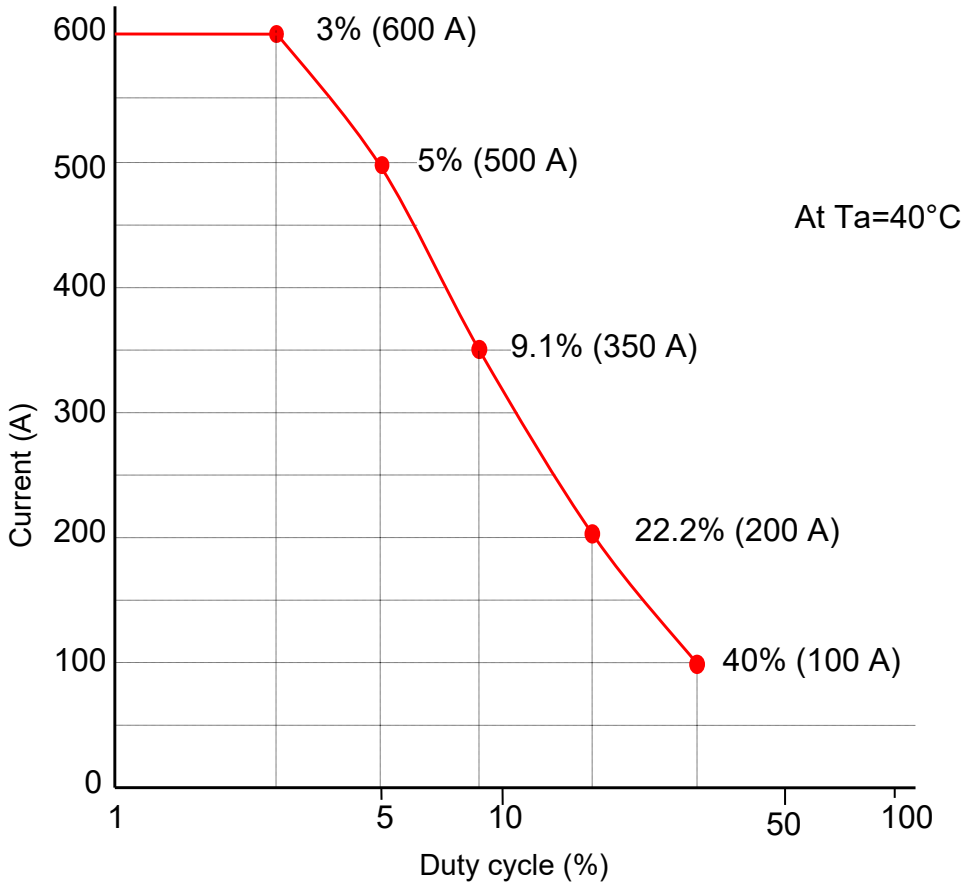
*1: Used for connecting to our dedicated inverter transformer.

*2: Used for connecting to our conventional inverter transformer.

Item	Model No.	Length
Circuit cable	SK-02136-002	2 m
	SK-02136-005	5 m
	SK-02136-010	10 m
	SK-02136-015	15 m
	SK-02136-020	20 m

Item	Model No.	Length
Toroidal coil	MB-400L (Belt, 470 mm approx.)	Cable, 2.8 m
	MB-800L (Belt, 890 mm approx.)	

(3) Duty Cycle Graph



(4) Board List for Maintenance

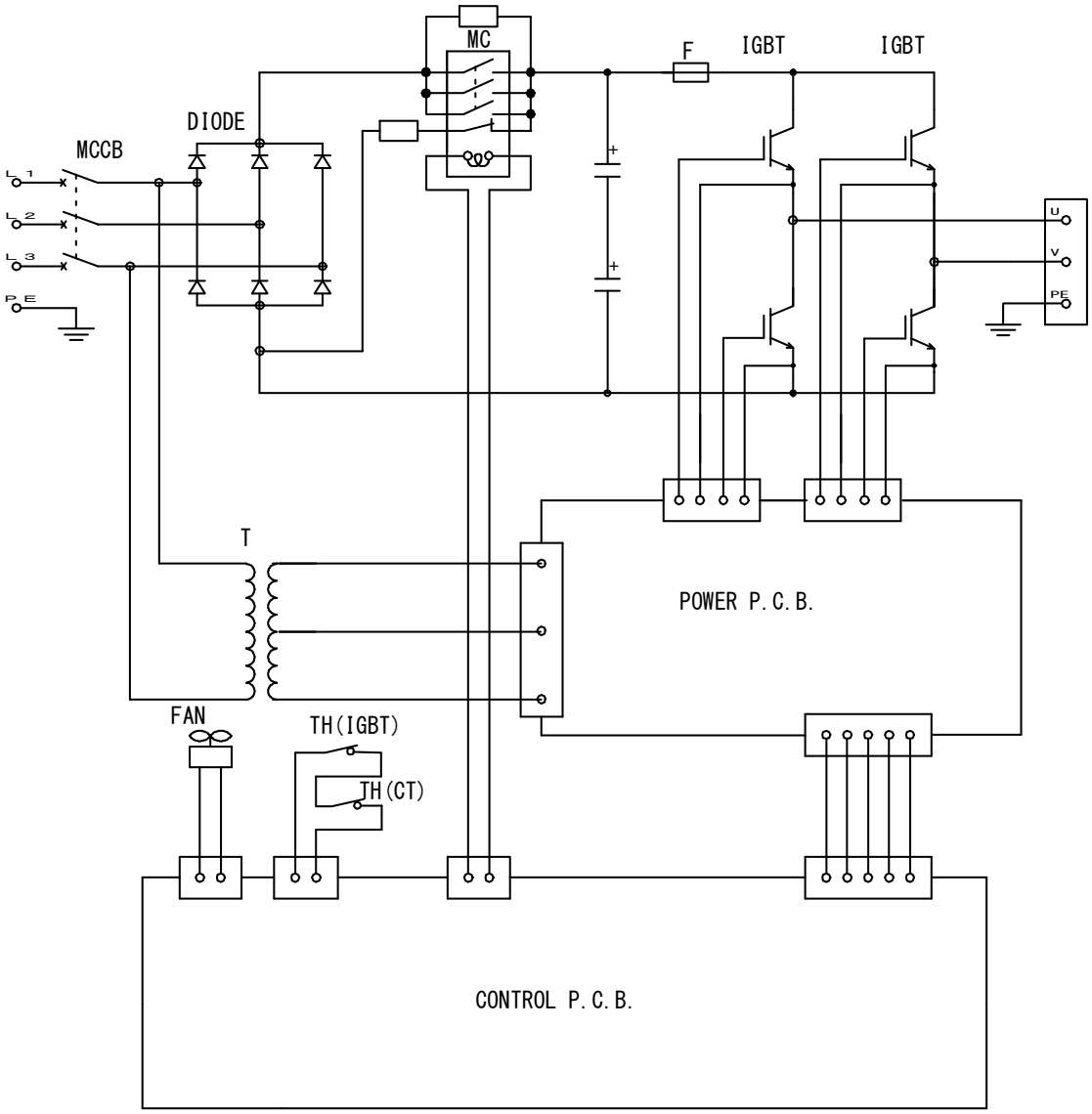
For repair or replacement, contact us.
Also, for models other than the models shown below, contact us.

Model / Board	IS-600A-00-01/00-02/01-01
Main control board	ME-2037-00S1
Drive board	ME-2046-00
IGBT gate board	AS1005542
Snubber board	ME-2051-01

(5) Major Components List

Item	Q'ty
Fan motor	1
Power transformer	1
Thermal protector	2
Diode module	1
IGBT module	2
Fast-blow fuse	1
Circuit breaker	1
Electromagnetic contactor	1

(6) Schematic


MC
F
IGBT
IGBT
DIODE
MCCB
L1
L2
L3
PE
U
V
PE
T
POWER P.C.B.
FAN
TH(IGBT)
TH(CT)
CONTROL P.C.B.

(7) Schedule Data Table

POWER SUPPLY STATE

LCD CONTRAST	
CONTROL #	
PROGRAMMED DATE	

MODE SELECT

DELAY-START SET	
START SIG. MODE	
END SIG. TIME	
END SIG. MODE	0 , 1 , 2
PARITY CHECK	ON , OFF
STEPPER MODE	ON , OFF
WELD COUNT	ON , OFF
RE-WELD	ON , OFF
WELD TIME	ms , CYC
COMM CONTROL	OFF , --> , <-->
COMM MODE	RS-232C , RS-485
COMM SPEED	9.6k , 19.2k , 38.4k

MONITOR MODE

WELD COUNT	
NO CURRENT TIME	
NO CURRENT LEVEL	
NO VOLTAGE LEVEL	
MONITOR FIRST TIME	
MONITOR SLOPE MODE	
CURRENT MONITOR NUMBER	

STEPPER COUNT

ITEMS \ VALVE #		1		2	
		RATIO	COUNT	RATIO	COUNT
STEPPER	STEP 1	100%		100%	
	STEP 2				
	STEP 3				
	STEP 4				
	STEP 5				
	STEP 6				
	STEP 7				
	STEP 8				
	STEP 9				

VALVE #																		
GAIN																		
PULSATION																		
CTRL																		
PULSE WIDTH	WE3																	
	WE2																	
	WE1																	
POWER	WE3																	
	WE2																	
	WE1																	
VOLT	WE3																	
	WE2																	
	WE1																	
CURR	WE3																	
	WE2																	
	WE1																	
OFF																		
HOLD																		
DOWN3																		
WE3																		
UP3																		
COOL2																		
DOWN2																		
WE2																		
UP2																		
COOL1																		
DOWN1																		
WE1																		
UP1																		
SQZ																		
SQD																		
ITEMS / SCHEDULE#																		

* As needed, copy and use this page.

ITEMS / SCHDULE#	CURR						VOLT						POWER						PULSE		
	WE1		WE2		WE3		WE1		WE2		WE3		WE1		WE2		WE3		WE1	WE2	WE3
	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	HIGH	HIGH

* As needed, copy and use this page.

11. External Communication Function

(1) Introduction

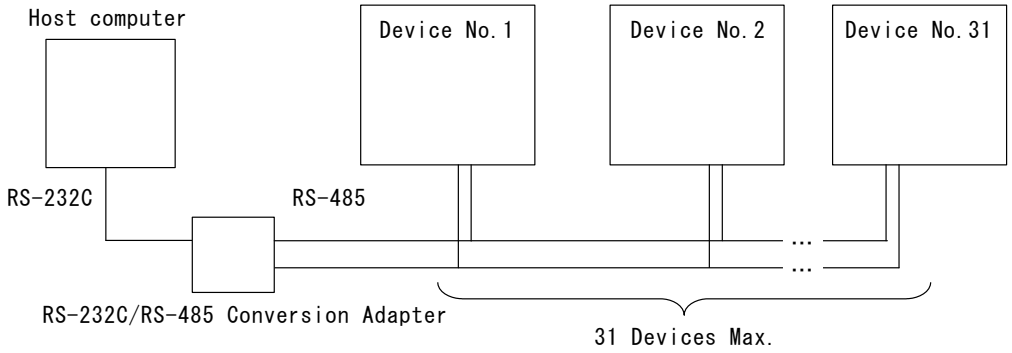
IS-600A can be used to set schedules from an externally-connected personal computer (abbreviated as PC) or to read monitored data and several kinds of status data.

(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, 4: SG, 6: RS+, 9: RS- In RS-232C, 2: RXD, 3: TXD, 5: SG, 7: RTS

(3) Configuration

① RS-485

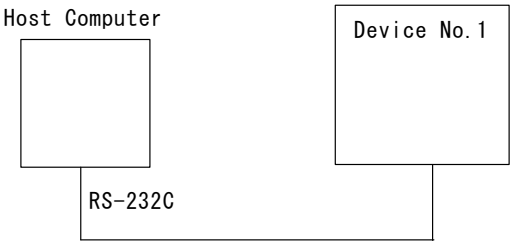


Note 1: When controlling two or more devices with one host computer, register the device No. (**CONTROL#**) for each device. Set the device No. at **POWER SUPPLY STATE Screen** (See **4.(2)(b)**).

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[CR][LF]
N O P Q R S T U V W

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 600) (ms) Fixed to 3 digits (000 to 030) (CYC)
E*	Monitor current of WE1	Fixed to 4 digits (0.00 to 9.99) (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 99.99) (kW)
H	Monitor pulse width of WE1	Fixed to 4 digits (00.0 to 99.9) (%)
I	Monitor time of WE2	Fixed to 3 digits (000 to 600) (ms) Fixed to 3 digits (000 to 030) (CYC)
J*	Monitor current of WE2	Fixed to 4 digits (0.00 to 9.99) (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 99.99) (kW)
M	Monitor pulse width of WE2	Fixed to 4 digits (00.0 to 99.9) (%)
N	Monitor time of WE3	Fixed to 3 digits (000 to 600) (ms) Fixed to 3 digits (000 to 030) (CYC)
O*	Monitor current of WE3	Fixed to 4 digits (0.00 to 9.99) (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 99.99) (kW)
R	Monitor pulse width of WE3	Fixed to 4 digits (00.0 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	WELD COUNT	Fixed to 4 digits (0000 to 9999)

* Fixed to 4 digits (00.0 to 99.9) (kA) for **IS-600A-00-01/00-02**.

2) Error Data

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

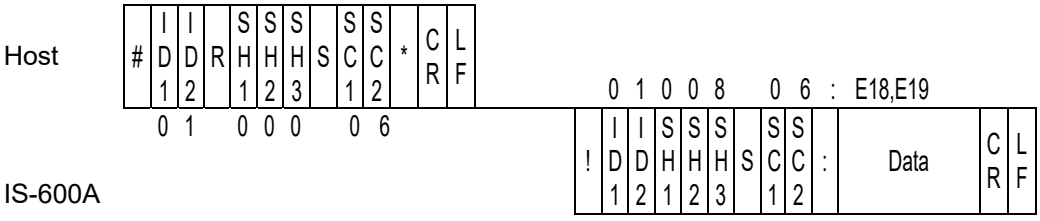
A	Device No.	Fixed to 2 digits (01 to 31)
B*1	Schedule No.	Fixed to 3 digits (001 to 255)
C*2	Error Code 1	Fixed to 2 digits (01 to 31)
D*2	Error Code 2	Fixed to 2 digits (01 to 31)
E*2	Error Code 3	Fixed to 2 digits (01 to 31)
F*2	Error Code 4	Fixed to 2 digits (01 to 31)
G*2	Error Code 5	Fixed to 2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

*1 Common Schedule No. to error codes other than E06, E07, E18, and E19. (Schedule No. is fixed to “000”)
*2 The number of Error Codes is of five max. In the case of only one error code, the error codes D to G are omitted.
For Error Codes, see **13. (1) Fault Code List**.

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. *

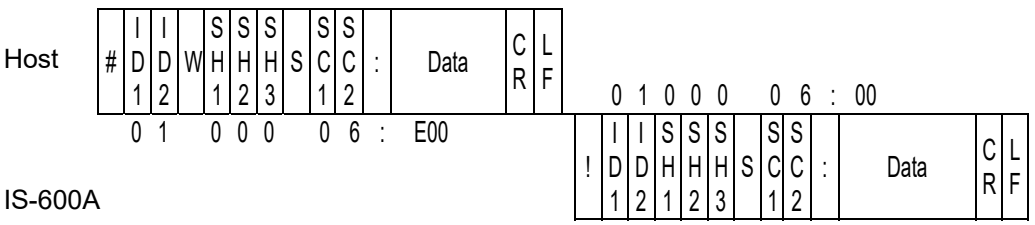
Example: Read all troubled data in the specified device, No. 01. (Schedule No. is “008” and Voltage error and Electric power error are occurring.)



1) Schedule numbers, SH1, SH2 and SH3 are fixed to 000.
However, schedule numbers are sent from **IS-600A** 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 06.
3) In no trouble, data of “00” returned.

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

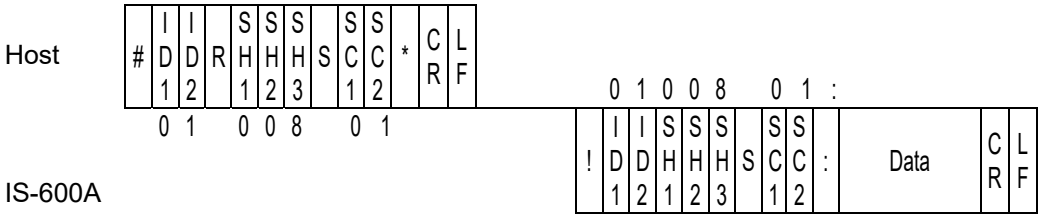
Example: Resets the trouble of the specified device, No. 01.



1) Schedule Nos, SH1, SH2 and SH3 are fixed to 000.
2) Screen Nos, SC1 and SC2 are fixed to 06.
3) “00” (no trouble) is returned as a confirmation data

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

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

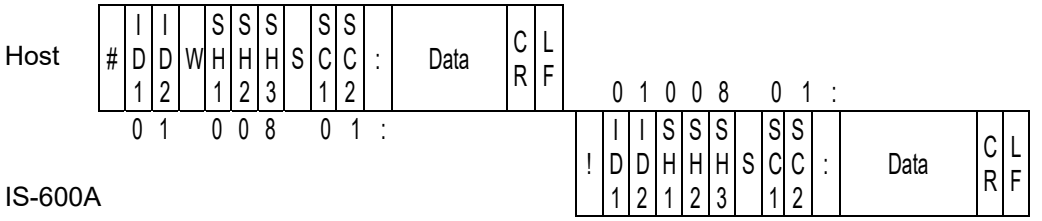


Insert [,] between data for a schedule.

1) SH1, SH2 and SH3 are schedule numbers.
   Fixed to 3 digits (SH1=Hundred’s place, SH2=Ten’s place, SH3=One’s place)
   However, screen 03, 05 and 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 List**.

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, 05 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 06 (1) are read only and cannot be written.
3) For the data order for a schedule and the screen No., see **(5) Data Code List**.
4) The set data is returned as a confirmation data. When data which is outside the range is set, previous data is returned.
5) It takes about 2 seconds at most to save data into the flash memory (The **READY** lamp is turned off during saving). Be careful when writing continuously.

(5) Data Code Table

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

Item	Contents	Character String	Range
1	Control mode	n,	0 to 5 0: Primary constant-current effective value control 1: Secondary constant-current effective value control 2: Secondary constant-power effective value control 3: Primary constant-current peak value control 4: Secondary constant-voltage effective value control 5: Constant-phase control
2	Unit of time *1	n,	m: ms C: CYC
3	SQD / Squeeze delay time	nnnn,	0000 to 9999 (ms mode) 0000 to 0999 (CYC mode)
4	SQZ / Squeeze time	nnnn,	0000 to 9999 (ms mode) 0000 to 0999 (CYC mode)
5	UP1 / Upslope 1 time	nnn,	000 to 400 (ms mode) 000 to 020 (CYC mode)
6	WELD1 / Weld 1 time	nnn,	000 to 600 (ms mode) 000 to 030 (CYC mode)
7	DOWN1 / Downslope 1 time	nnn,	000 to 400 (ms mode) 000 to 020 (CYC mode)
8	COOL1 / Cooling 1 time	nnn,	000 to 999(ms mode) 000 to 099(CYC mode)
9	UP2 / Upslope 2 time	nnn,	000 to 400 (ms mode) 000 to 020 (CYC mode)
10	WELD2 / Weld 2 time	nnn,	000 to 600 (ms mode) 000 to 030 (CYC mode)
11	DOWN2 / Downslope 2 time	nnn,	000 to 400 (ms mode) 000 to 020 (CYC mode)
12	COOL2 / Cooling 2 time	nnn,	000 to 999 (ms mode) 000 to 099 (CYC mode)
13	UP3 / Upslope 3 time	nnn,	000 to 400 (ms mode) 000 to 020 (CYC mode)
12	WELD3 / Weld 3 time	nnn,	000 to 600 (ms mode) 000 to 030 (CYC mode)
13	DOWN3 / Downslope 3 time	nnn,	000 to 400 (ms mode) 000 to 020 (CYC mode)
14	HOLD / Hold time	nnnnn,	00000 to 20000 (ms mode) 00000 to 00999 (CYC mode)
15	OFF / Off time	nnnn,	0000 to 9990 (ms mode) *2 0000 to 0099 (CYC mode)
16	HEAT1	n.nn,	0.50 to 9.99 (kA, kW) *3 0.20 to 9.99 (V)
		nn.n,	10.0 to 99.9 (%)
17	HEAT2	n.nn,	0.50 to 9.99 *3 0.20 to 9.99 (V)
		nn.n,	10.0 to 99.9 (%)

Item	Contents	Character String	Range
18	HEAT3	n.nn,	0.50 to 9.99 (kA, kW) 0.20 to 9.99 (V)
		nn.n,	10.0 to 99.9 (%)
19	PULSATION	nn,	00 to 19
20	GAIN	n,	1 to 9
21	VALVE	n,	1 to 2
22	TURN RATIO	nnn.n,	001.0 to 199.9
23	WELD ON/OFF	n	0: OFF 1: ON

*1 The setting of ms/CYC cannot be changed. You can change it via Screen 05 (SYSTEM data).
*2 10-ms increment. The setting in 1ms is omitted.
*3 Character string is “nn.n,” and Range is “00.0 to 20.0 (kA, kW)” for **IS-600A-00-01/00-02**.

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

Item	Contents	Character String	Range
1*	CURRENT HIGH of HEAT1 (upper limit)	n.nn,	0.00 to 9.99 (kA)
2*	CURRENT LOW of HEAT1 (lower limit)	n.nn,	0.00 to 9.99 (kA)
3	VOLT HIGH of HEAT1 (upper limit)	n.nn,	0.00 to 9.99 (V)
4	VOLT LOW of HEAT1 (lower limit)	n.nn,	0.00 to 9.99 (V)
5	POWER HIGH of HEAT1 (upper limit)	nn.nn,	00.00 to 99.99 (kW)
6	POWER LOW of HEAT1 (lower limit)	nn.nn,	00.00 to 99.99 (kW)
7	PULSE HIGH of HEAT1 (upper limit)	nnn,	010 to 100 (%)
8*	CURRENT HIGH of HEAT2 (upper limit)	n.nn,	0.00 to 9.99 (kA)
9*	CURRENT LOW of HEAT2 (lower limit)	n.nn,	0.00 to 9.99 (kA)
10	VOLT HIGH of HEAT2 (upper limit)	n.nn,	0.00 to 9.99 (V)
11	VOLT LOW of HEAT2 (lower limit)	n.nn,	0.00 to 9.99 (V)
12	POWER HIGH of HEAT2 (upper limit)	nn.nn,	00.00 to 99.99 (kW)
13	POWER LOW of HEAT2 (lower limit)	nn.nn,	00.00 to 99.99 (kW)
14	PULSE HIGH of HEAT2 (upper limit)	nnn,	010 to 100 (%)
15*	CURRENT HIGH of HEAT3 (upper limit)	n.nn,	0.00 to 9.99 (kA)
16*	CURRENT LOW of HEAT3 (lower limit)	n.nn,	0.00 to 9.99 (kA)
17	VOLT HIGH of HEAT3 (upper limit)	n.nn,	0.00 to 9.99 (V)
18	VOLT LOW of HEAT3 (lower limit)	n.nn,	0.00 to 9.99 (V)
19	POWER HIGH of HEAT3 (upper limit)	nn.nn,	00.00 to 99.99 (kW)
20	POWER LOW of HEAT3 (lower limit)	nn.nn,	00.00 to 99.99 (kW)
21	PULSE HIGH of HEAT3 (upper limit)	nnn	010 to 100 (%)

* Character string is “nn.n,” and Range is “00.0 to 99.9 (kA)” for **IS-600A-00-01/00-02**.

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

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

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	Monitor time of WELD1	nnn,	000 to 600 (ms mode) 000 to 030 (CYC mode)
3*	Monitor current of WELD1	n.nn,	0.00 to 9.99 (kA)
4	Monitor voltage of WELD1	n.nn,	0.00 to 9.99 (V)
5	Monitor power of WELD1	nn.nn,	00.00 to 99.99 (kW)
6	Monitor pulse width of WELD1	nn.n,	00.0 to 99.9 (%)
7	Monitor time of WELD2	nnn,	000 to 600 (ms mode) 000 to 030 (CYC mode)
8*	Monitor current of WELD2	n.nn,	0.00 to 9.99 (kA)
9	Monitor voltage of WELD2	n.nn,	0.00 to 9.99 (V)
10	Monitor power of WELD2	nn.nn,	00.00 to 99.99 (kW)
11	Monitor pulse width of WELD2	nn.n,	00.0 to 99.9 (%)
12	Monitor time of WELD3	nnn,	000 to 600 (ms mode) 000 to 030 (CYC mode)
13*	Monitor current of WELD3	n.nn,	0.00 to 9.99 (kA)
14	Monitor voltage of WELD3	n.nn,	0.00 to 9.99 (V)
15	Monitor power of WELD3	nn.nn,	00.00 to 99.99 (kW)
16	Monitor pulse width of WELD3	nn.n,	00.0 to 99.9 (%)
17	Step No. of VALVE1	n,	1 to 9
18	STEP COUNT of VALVE1	nnnn,	0000 to 9999
19	Step No. of VALVE2	n,	1 to 9
20	STEP COUNT of VALVE2	nnnn,	0000 to 9999
21	WELD COUNT	nnnn	0000 to 9999

* Character string is “nn.n,” and Range is “00.0 to 99.9 (kA)” for **IS-600A-00-01/00-02**.

⑤ Screen 05 (SYSTEM data) Common data (Schedule No.: 000)

Item	Contents	Character String	Range
1*[1]	WELDTRANS FREQUENCY	nnnn,	Transformer frequency (Hz)
2*[1]	POWER SOURCE FREQUENCY	nn,	50 or 60 (Hz)
3*[1]	Model name	nnnnnnnn,	IS-600A␣
4*[1]	ROM VERSION	Vnn-nnn,	V00-00A ~
5	DELAY START SET	nn,	01 to 20 (ms)
6	START SIGNAL MODE	n,	0: LATCHED 1: PULSED 2: MAINTAINED
7	END SIGNAL TIME	nnn,	010 to 200 (ms)
8	END SIGNAL MODE	n,	0, 1, 2
9	PARITY CHECK	n,	0: OFF 1: ON
10	STEPPER MODE	n,	0: OFF 1: ON
11	WELD COUNT	n,	0: OFF 1: ON

Item	Contents	Character String	Range
12	RE-WELD	n,	0: OFF 1: ON
13	WELD TIME	n,	0: ms 1: CYC
14	WELD COUNT	nnnn,	0000 to 9999
15	NO CURRENT TIME	nn,	01 to 99 (ms)
16*2	NO CURRENT LEVEL	n.nn,	0.00 to 9.99 (kA)
17	NO VOLTAGE LEVEL	n.nn,	0.00 to 9.99 (V)
18	MONITOR FIRST TIME	nn,	00 to 15 (ms)
19	MONITOR SLOPE MODE	n,	0: EXCLUDE 1: INCLUDE
20	CURRENT MONITOR NUMBER	n,	1 to 3
21*1	PROGRAM PROTECT	n	0:OFF 1:ON

*1 Items inhibited from setting (When setting data, omit these items.)
*2 Character string is “nn.n,” and Range is “00.0 to 20.0 (kA)” for **IS-600A-00-01/00-02**.

⑥ Screen 06 (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 E31
2	Error code 2	nnn,	E01 to E31
3	Error code 3	nnn,	E01 to E31
4	Error code 4	nnn,	E01 to E31
5	Error code 5	nnn	E01 to E31

The number of Error Codes is of five max. In the case of only one error code, the items 2 to 5 are omitted.
For Error Codes, see **13. (1) Fault Code List**.

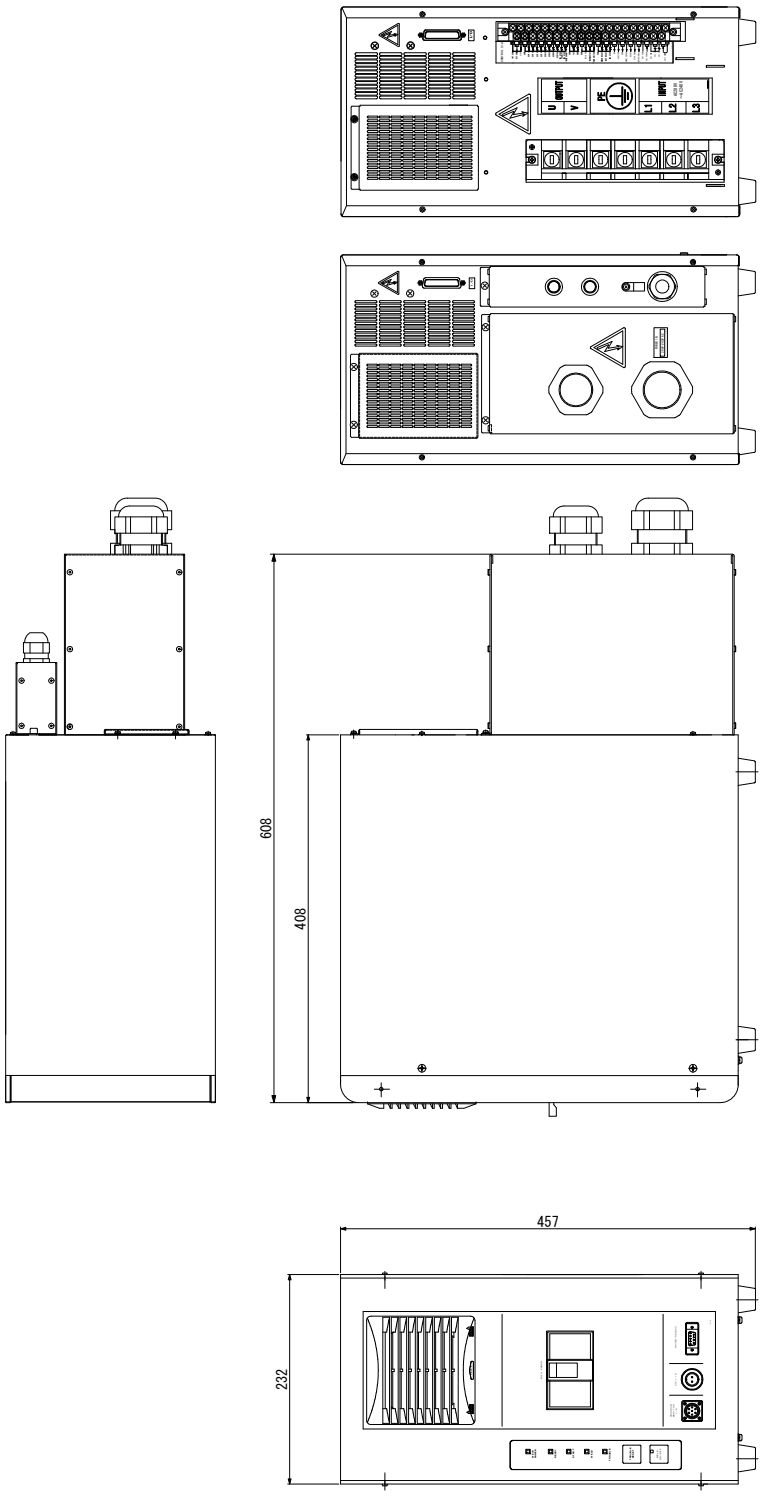
- Error reset (Data setting only)

Item	Contents	Character String	Range
1	Error reset	nnn	E00

12. Outline Drawing

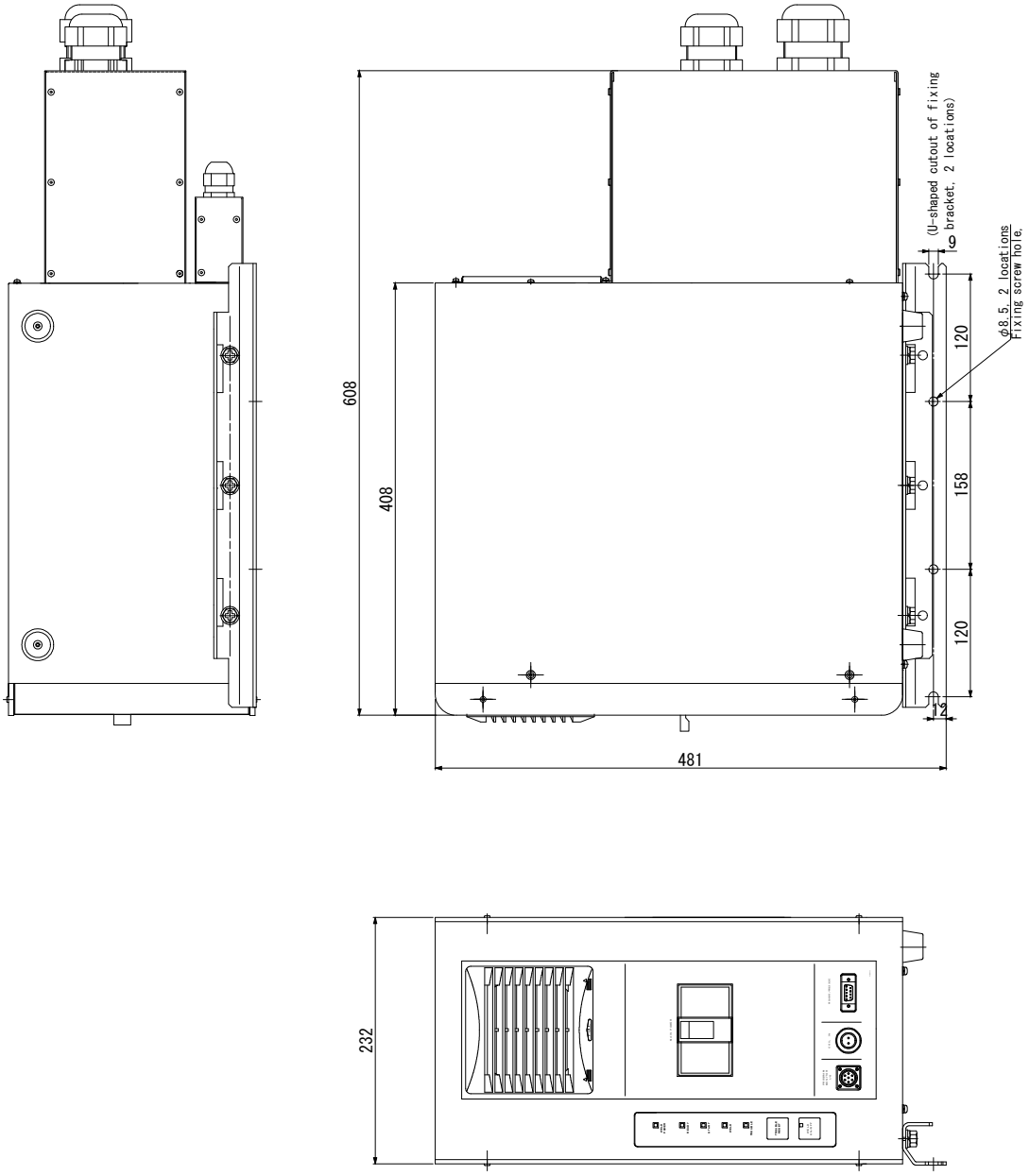
■ When the bracket removed

(Dimensions in mm)



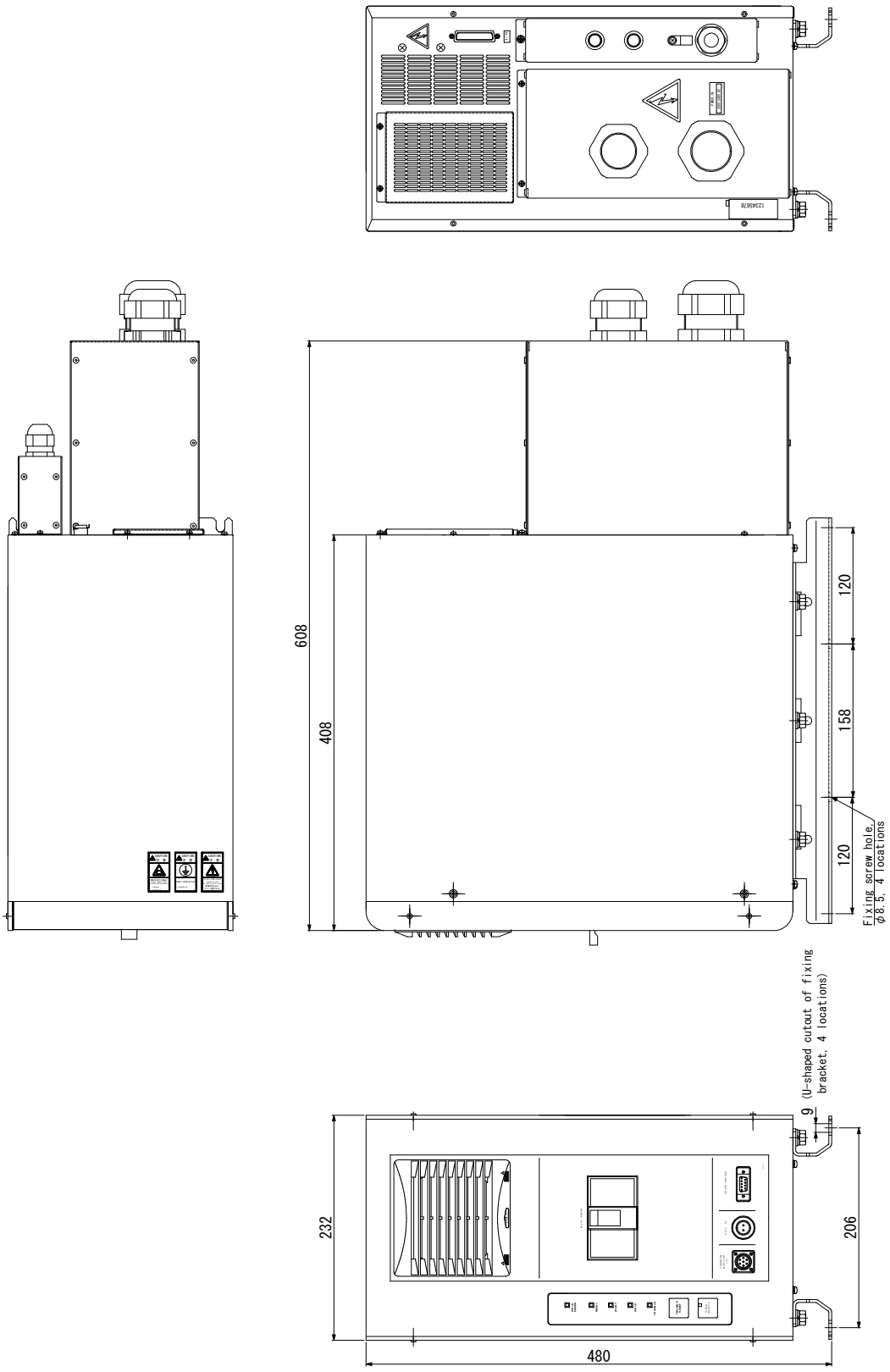
■ When the bracket mounted (horizontal type)

(Dimensions in mm)



■ When the bracket mounted (vertical type)

(Dimensions in mm)



13. Troubleshooting

(1) Fault Code List

In the event of a problem with the Power Supply, the **MA-627A** 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	Setting data 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.
		When writing data in bi-directional communication mode at external communication, data which is out of the range is written or data format is wrong.	Check the write data.
E-02	Start input error	Cable to input start signal is broken, and a parity check error is detected.	Check start signal input cable.
E-03	Transformer thermostat error	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-04	IGBT thermostat error	Internal temperature of equipment rises and thermostat for power transistor in power unit is open.	Check filter for clogging. (See **9. (1)**.)
			Ensure that the duty cycle does not exceed the specified value. (See **10. (3)**.)
E-05	Non-current error (Secondary or primary current is not detected)	Squeeze of welding electrode is not sufficient.	Adjust squeeze of welding electrode adequately.
		SQD or **SQZ** time is too short.	Check setting of **SQD** or **SQZ** time to determine whether it is too short. (Set **SQD** or **SQZ** time to a period longer than the stroke time of the electrode.)
		NO CURRENT LEVEL is high.	Set a lower **NO CURRENT LEVEL**. (See **4. (8)(c)**.)
		Fuse inside the equipment is blown.	The fuse needs replacement. Contact us.
		Other maker's transformer is used without connecting toroidal coil.	Connect toroidal coil, referring to **5. Connection Procedures**.

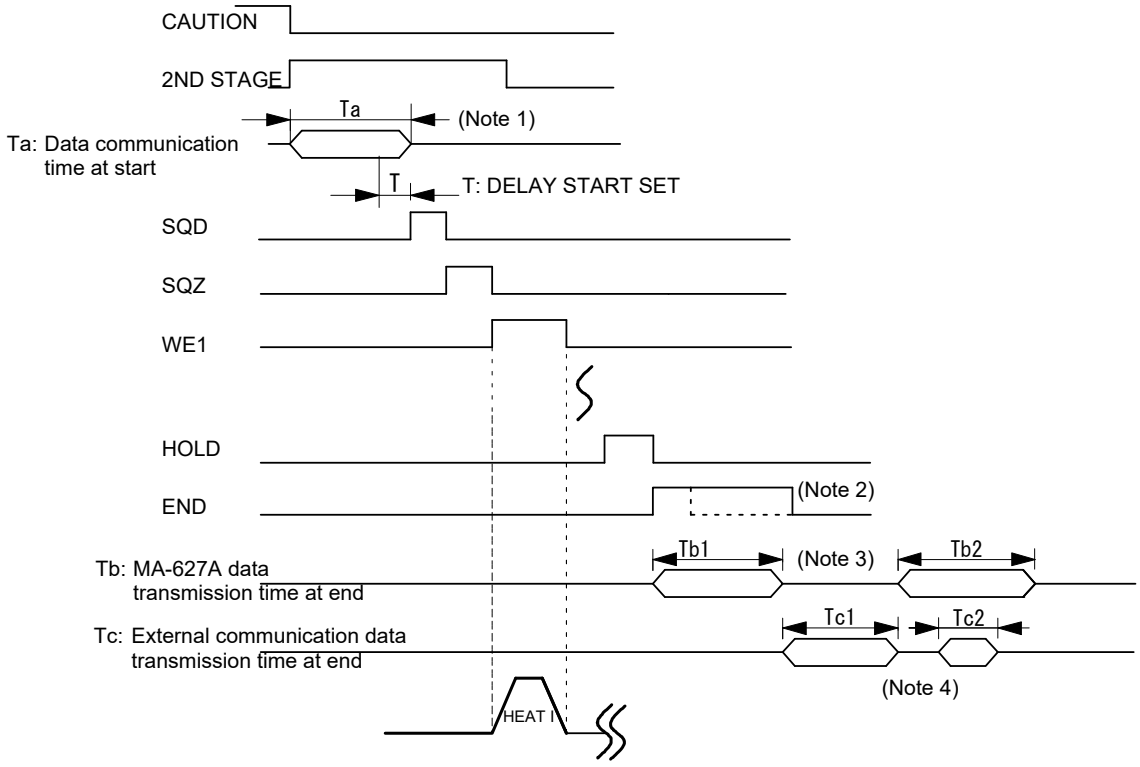
Fault code	Contents	Cause	Measures
E-06	Current error	Welding current is out of **CURRENT** setting range on **MONITOR SET** screen.	Check for stained welding electrode or loose cable connection.
E-07	Pulse width error	Pulse width of welding current is out of **PULSE HIGH** setting range on **MONITOR SET** screen.	Check workpiece and welding electrode.
E-08	Insufficient number of weld counts	Counted number of welds is less than **WELD COUNT** setting.	Add required number of welds to make up for insufficiency. (See **4. (8)(a)**.)
E-09	Step end	**STEPPER COUNT** has completed final step.	Dress or replace tip, then reset step. (See **6. (1)(2)**.)
E-10	Schedule setting error	$\frac{\textbf{HEAT}\ \text{setting}}{\textbf{P/S RATIO}} > 600$ However, in primary constant-current peak value control mode, $15 > \frac{\textbf{HEAT}\ \text{setting}}{\textbf{P/S RATIO}} > 600$	Correct each setting.
		UP SLOPE or **DOWN SLOPE** is longer than **WELD**.	
		The **WELD1**, **WELD2**, and **WELD3** values are all “0.”	
		Although the current in the subsequent stage is lower than that in the previous stage or the currents are equal, Upslope time is set in the subsequent stage and COOL is not set between the previous stage and the subsequent stage. Example) WELD1 = 20 ms 3.0 kA WELD2 = 40 ms 2.0 kA COOL1 = 0 ms UP2 = 10 ms	
		Although the current in the subsequent stage is higher than that in the previous stage or the currents are equal, Downslope time is set in the previous stage and COOL is not set between the previous stage and the subsequent stage. Example) WELD2 = 50 ms 3.0 kA WELD3 = 70 ms 4.0 kA COOL2 = 0 ms DOWN2 = 20 ms	
		Although STEPPER MODE is set to ON, STEPPER COUNT of STEP number set for START ON STEP# are all “0.”	

Fault code	Contents	Cause	Measures
E-11	Increase ratio error	**HEAT** setting, including **RATIO** setting is larger than max. value of current, voltage, or power setting.	Correct each setting. (See **4. (9)**.)
E-12	Emergency 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.
E-13	Overcurrent	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-15	Flow switch error	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	Schedule signal input error	Schedule signal is not input when external start signal is input.	Input schedule signal before start signal. (See **4. (7)(e)**.)
E-17	Input power supply error	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	Voltage error	Secondary voltage is out of **VOLT** setting range on **MONITOR SET** screen.	Check for stained welding electrode and low electrode force.
E-19	Electric power error	Welding power is out of **POWER** setting range on **MONITOR SET** screen.	
E-20	Welding stop error	The current shutoff signal is input prior to the start signal.	Check interrupt input signal. (See **4. (7)(e)**.)
E-21	No voltage error	No detection of the voltage across welding electrodes. **NO VOLTAGE** is high.	Make sure that the cable detecting the voltage across welding electrodes is connected. Set a lower **NO VOLTAGE**. (See **4. (8)(d)**.)
E-22	24VDC overcurrent	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	Setting data range error	There is a data outside the range in the welding schedule data.	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.
E-29	Monitored data error	Monitor data and count data stored into memory is damaged.	Data is lost since the retention period is expired. The retention period is 10 days after the power id turned off. If the error occurs frequently, the Power Supply needs repair. Contact us.

(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-627A**.



(Note 1) When the next start signal is received while the monitor error is displayed on **MA-627A**, the CAUTION signal is turned OFF and the previous screen is displayed.
At this time, the data is transferred to **MA-627A** from the Power Supply. The start signal is not received while the data is transferred. (Ta: 31 ms max. in the figure above.)
When the monitor error is displayed, input the start signal more than (Ta + T) time.

(Note 2) When the sequence ends, the END signal is output after HOLD. The Start signal is not received while the END signal is output.
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-627A** simultaneously with the END signal output (transmission time Tb1). The monitor data is not transferred when the screen other than MONITOR screen is displayed.
The next Start signal is not received while the monitor data is transferred. Also, on every screen, the data is transferred to **MA-627A** from the Power Supply to display the monitor error when the monitor data is beyond/below the upper/lower limit (data communication time Tb2).
To make takt faster, do not display the MONITOR screen or do not fall off the upper/lower judgment value.
The data transmission time Tb1 and Tb2 are shown in the table below.

	Monitor error does not occur	Monitor error occurs
MONITOR screen	Tb1: 160 ms max.	Tb1+Tb2+α: 249 ms max.
Screens other than MONITOR screen	0 ms	Tb2: 86 ms max.

(Note 4) When the RS-485/RS-232C external communication function is set to the single-directional communication mode (see **4. (7) MODE SELECT Screen**), the monitor data is transferred to the host computer after the completion of welding (transmission time Tc1).
Also, when the monitor 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 takt faster, set the external communication function to OFF.
Sown 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	124 ms max.
Tc2	25 ms max.