AC INVERTER SEAM WELDING
POWER SUPPLY

MIH-200A

OPERATION MANUAL

AMADA®

AA09OM1158384-07

Thank you for purchasing our AC Inverter Seam Welding Power Supply **MIH-200A**.
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.

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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.

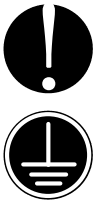
WARNING

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

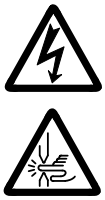
CAUTION

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 for 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 get 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-type 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.

- Transporting this Power Supply requires a minimum of two people. Be sure to hold the underside when transporting. Holding a projection such as the terminal cover may cause damage.

- 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, and
  - areas exposed to large amounts of vibration or shock.

- 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.

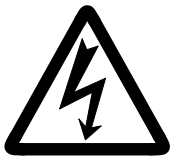
- Press switches/buttons one at a time. Pressing more than one switch/button at a time may result in a malfunction or failure.

(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 Label for Safety

On the main body is warning label for safety. Its location and meaning are as noted below.



Location: Output terminal cover.
Meaning: **Shock hazard.**

(5) Operation of the OK Signal

For products shipped in or after December 2014, the OK signal is not output at WELD OFF. Other signals remain the same.
To check the product oepration at WELD OFF, use the END signal.
The OK/CAUTION signal is output at WELD ON as before.

For the output operation of the OK signal, see **4.(7)(f) OUT MODE (OK)** and Terminal 29 in **6.(2) Description of External I/O Signals**.

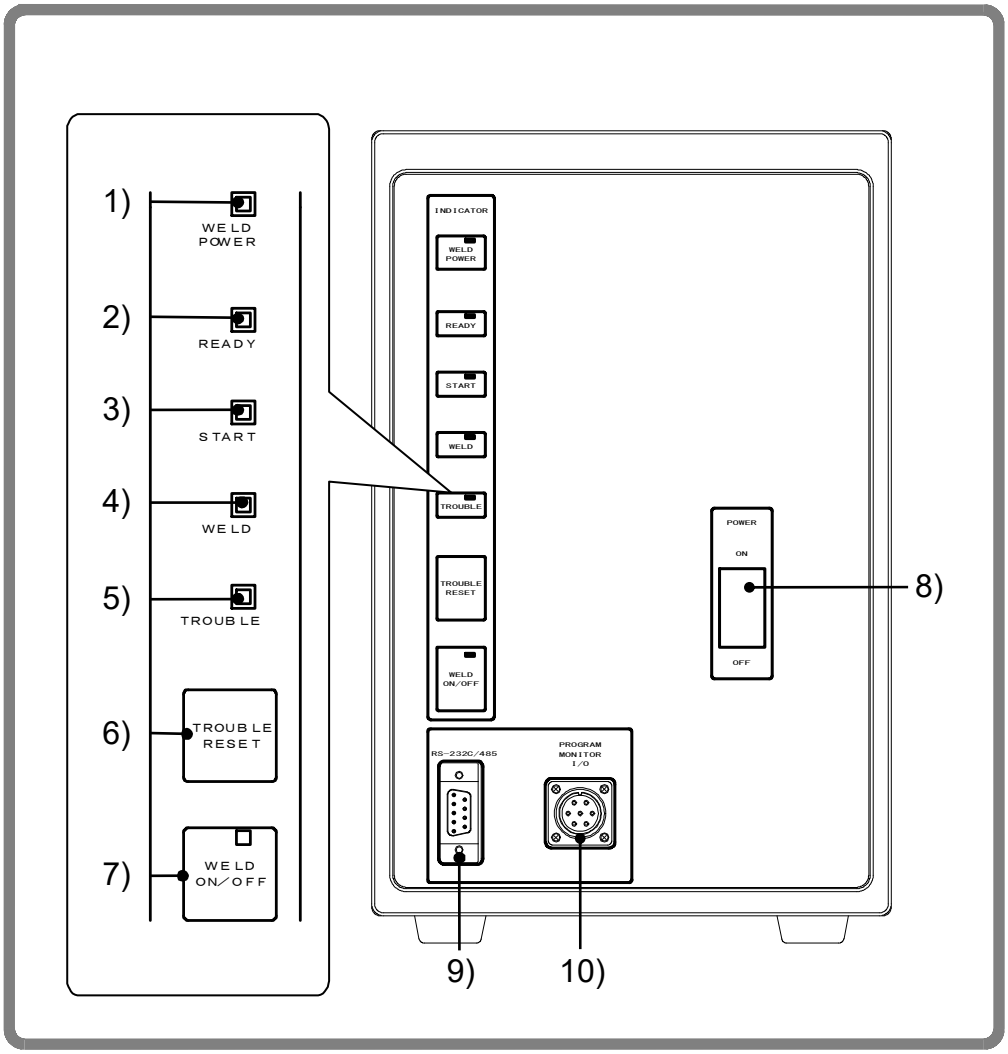
2. Features

The **MIH-200A** is an inverter-controlled power supply for AC welding. In combination with an AC transformer and a welding head, it can perform excellent welding with less surface flash and expulsion and burns.

- Function to monitor current, voltage, power and pulse width for judgment of weld quality
- 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
- High thermal efficiency, reduced weld time and less thermal effect on the surroundings are obtained because this power supply does not have no-current-carrying time as in thyristor phase control.
- Peltier effect (polarity effect) and uneven wear of electrodes, which are the problems in DC welding, seldom occur, because this power supply performs AC welding.
- Finer weld time setting in 0.2 ms and fine processing are possible, because the control frequency is 5 kHz.
- Stable welding current is always obtained, because this power supply is primary constant-current controlled.
- This power supply can be used for various purposes, because not only weld time but also upslope and downslope can be set for the welding takt.

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:
・**[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 2ND 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 2ND signal again; operation will then resume.

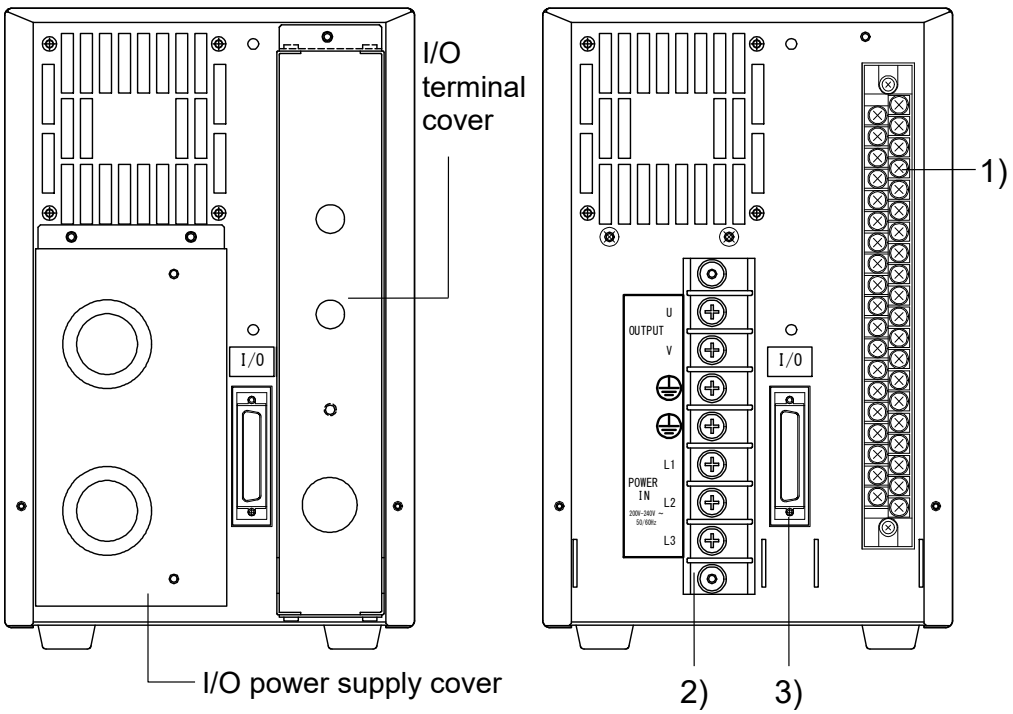
7) **[WELD ON/OFF] key**
This key is one of those required to activate the **[READY] lamp**.
Pressing this key alternately lights and shuts off this lamp. When the key is toggled on, the **[READY] lamp** lights, and when the key is toggled off, the lamp is turned off. Hold down this key to toggle ON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

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

9) **[RS-232C/485] connector**
For external communication. This is not used on this Power supply.

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

(2) Rear Panel



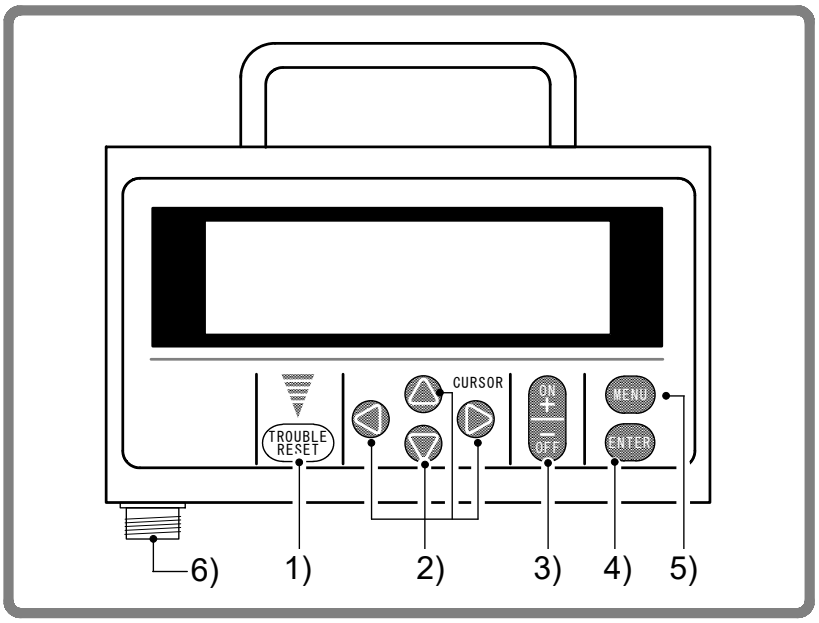
(With terminal covers mounted) **(With terminal covers removed)**

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

2) **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). The cable-mounting screw is for M5.

3) **Welding Transformer [I/O] connector**
This is not used on this Power supply. Do not connect anything.

(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 2ND signal through the end of the weld sequence and turning off the 2ND signal.

If setting is performed while the 2ND signal is input, the following screen appears. Turn off the 2ND signal and press **[TROUBLE RESET] key** 1).

```
MIH-200A IS BUSY OR NOT CONNECTED
Please RESET key in
```

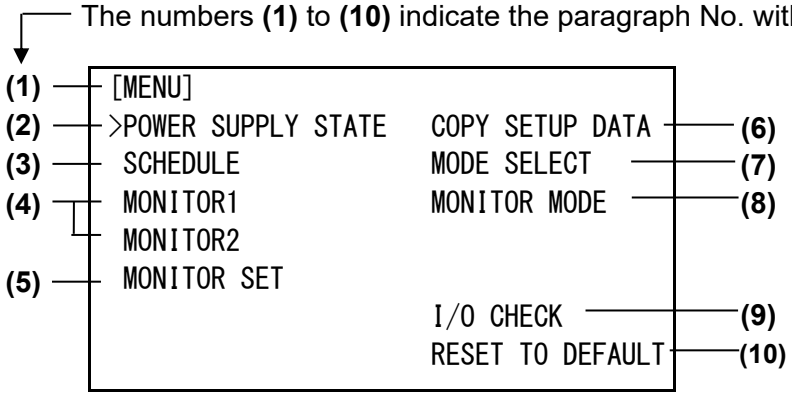
(Note) While the 2ND signal is input, 1) **[TROUBLE RESET] key**, **[TROUBLE RESET] key** on the front panel (see **(1) 6)**) and the error reset input terminal of the external I/O (see **6. Interface**) do not work. Be sure to turn off the 2ND signal before resetting an error.

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.

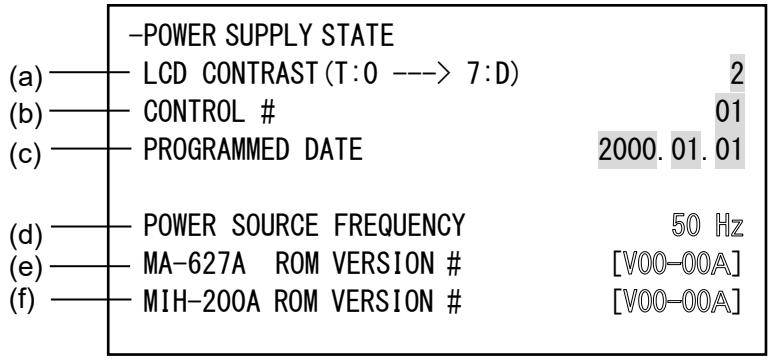
(1) MENU Screen

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**).
The display of the **[MENU] screen** changes depending on the PROGRAM PROTECT setting (See **(11) PROGRAM PROTECT MODE 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) POWER SOURCE FREQUENCY
The frequency of the welding power is measured and indicated automatically.

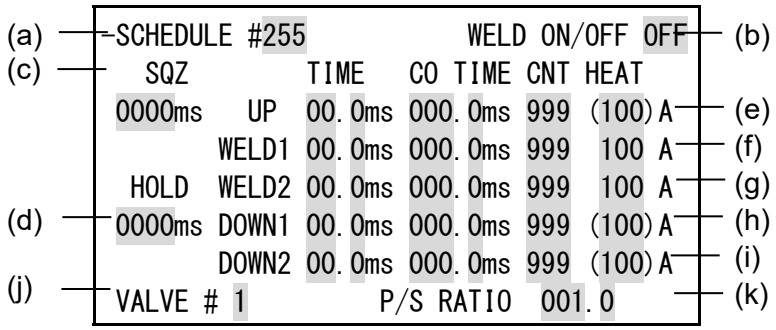
(e) MA-627A ROM VERSION #
Indicates the ROM version No. of program unit **MA-627A**.

(f) MIH-200A ROM VERSION #
Indicates the ROM version No. of the Power Supply.

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

(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.



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

(b) WELD ON/OFF
One of the settings required to turn **ON** the **[READY] lamp** of the Power Supply.
ON: **WELD ON** **OFF**: **WELD OFF**

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

(c) SQZ
Set the squeeze time during welding.

(d) HOLD
Set the hold time during welding.

(e) UP
Set the upslope time (to increase the welding current gradually), number of counts and current value.

TIME	Sets the weld time of half cycle. (a in the chart below)
CO TIME	Sets the no-current-carrying time of half cycle. (b in the chart below)
CNT	Sets the count of half cycle. (6 in the chart below)
(HEAT)	Sets the start current value of upslope. (Ⓐ in the chart below)

(f) WELD1
Set the first weld time, number of counts and current value.

TIME	Sets the weld time of half cycle. (c in the chart below)

CO TIME	Sets the no-current-carrying time of half cycle. (d in the chart below)
CNT	Sets the count of half cycle. (5 in the chart below)
HEAT	Sets the current value of the first weld time (HEAT1). (Ⓑ in the chart below)

(g) WELD2

Set the second weld time, number of counts and current value.

TIME	Sets the weld time of half cycle. (e in the chart below)
CO TIME	Sets the no-current-carrying time of half cycle. (f in the chart below)
CNT	Sets the count of half cycle. (6 in the chart below)
HEAT	Sets the current value of the second weld time (HEAT2). (Ⓒ in the chart below)

(h) DOWN1

Set the first downslope time (to decrease the welding current gradually), number of counts and current value.

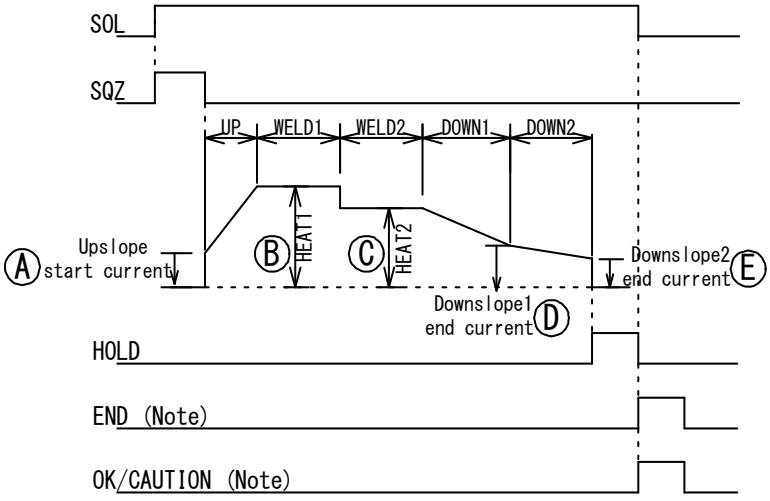
TIME	Sets the weld time of half cycle. (g in the chart below)
CO TIME	Sets the no-current-carrying time of half cycle. (h in the chart below)
CNT	Sets the count of half cycle. (5 in the chart below)
(HEAT)	Sets the current value of the first downslope. (Ⓓ in the chart below)

(i) DOWN2

Set the second downslope time (to decrease the welding current gradually), number of counts and current value.

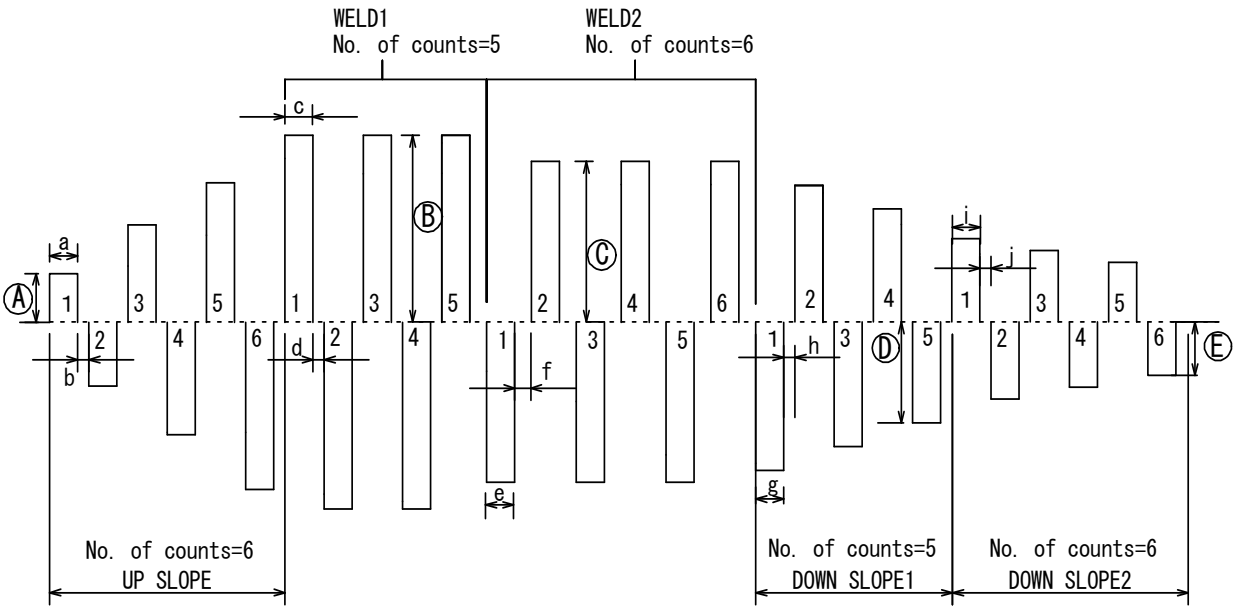
TIME	Sets the weld time of half cycle. (i in the chart below)
CO TIME	Sets the no-current-carrying time of half cycle. (j in the chart below)
CNT	Sets the count of half cycle. (6 in the chart below)
(HEAT)	Sets the current value of the second downslope. (Ⓔ in the chart below)

Basic sequence



(Note) When OUT MODE(END) and OUT MODE(OK) are OFF

Actual current waveform



(j) VALVE #

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

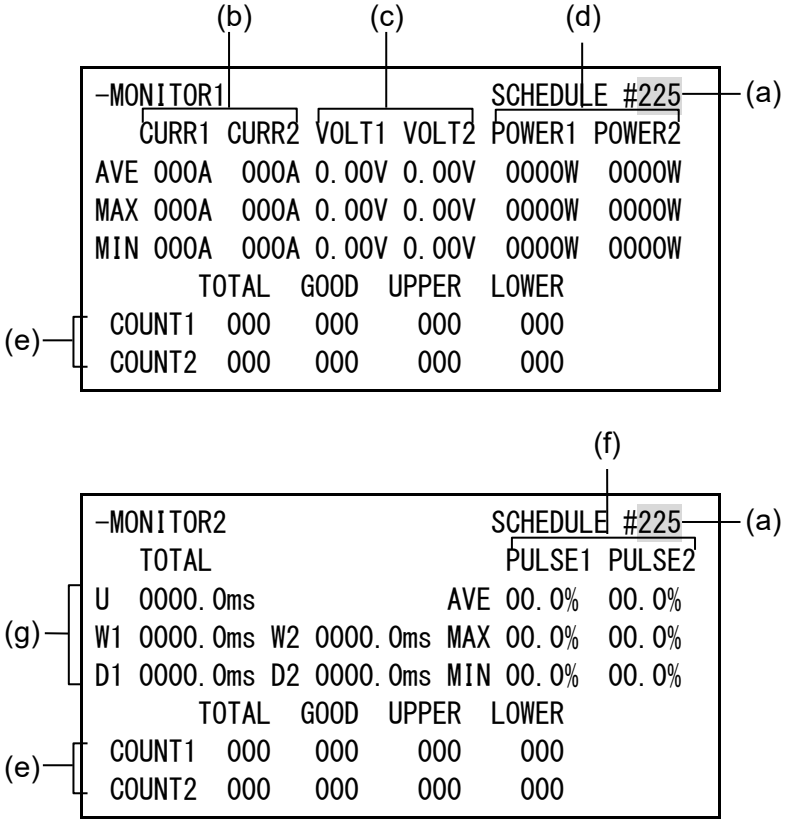
(k) P/S RATIO

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

(Example) When the tap voltage of the Welding Transformer **MT-510AC** is 3.5 V, set 57.1 for **P/S RATIO** according to the formula 200 / 3.5 = 57.1.

(4) MONITOR1/MONITOR2 Screen

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



(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) CURR1, CURR2

Displays the welding currents for WELD1 and WELD2.
Average value (AVE), maximum value (MAX) and minimum value (MIN) in the set count value are displayed.

(c) VOLT1, VOLT2

Displays the measured voltages for WELD1 and WELD2 when the voltage detecting cable is connected and the secondary voltage is input.
Average value (AVE), maximum value (MAX) and minimum value (MIN) in the set count value are displayed.

(d) POWER1, POWER2

Displays the measured electric powers (measured current x measured voltage) for WELD1 and WELD2 when the voltage detecting cable is connected and the secondary voltage is input.
Average value (AVE), maximum value (MAX) and minimum value (MIN) in the

set count value are displayed.

(e) COUNT1, COUNT2

Displays the count values for WELD1 and WELD2. Judged by the item selected in CAUTION ITEM on the MONITOR SET screen.
The number of total counts (TOTAL), values within range for judgment (GOOD), values out of upper limit (UPPER) and values out of lower limit (LOWER) are displayed.

(f) PULSE1, PULSE2

Displays the average pulse width of the primary current at half cycle as a percentage of pulse width in full wave mode.
Average value (AVE), maximum value (MAX) and minimum value (MIN) in the set count value are displayed.

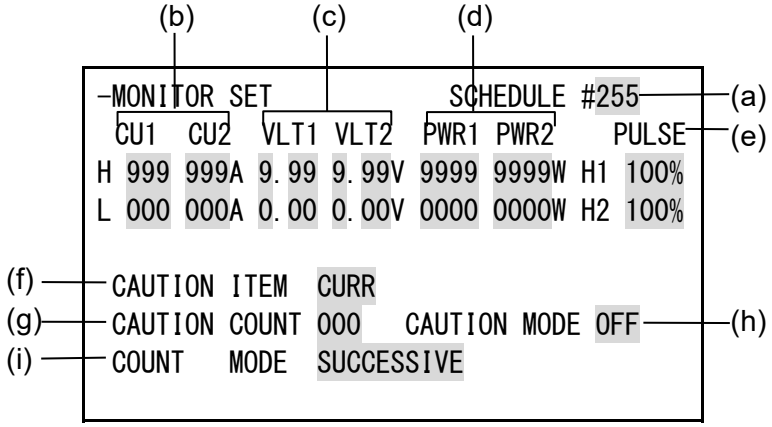
(g) TOTAL

Displays the total weld time for each UP, WELD1, WELD2, DOWN1, and DOWN2.
(Example) When TIME is 10.0 ms and CNT is 999, TOTAL is 9990.0 ms.

(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.

(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/power, pulse width, etc.
If the monitored values do not meet the set conditions, the CAUTION or NG signal is output, and can be used to activate an alarm buzzer, alarm lamp, or similar event.



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

(b) CU1, CU2
Set the upper limit (H) and lower limit (L) of the welding current for each of **WELD1** and **WELD2**.

(c) VLT1, VLT2
Set the upper limit (H) and lower limit (L) of the secondary voltage for each of **WELD1** and **WELD2**.

(d) PWR1, PWR2
Set the upper limit (H) and lower limit (L) of the secondary electric power for each of **WELD1** and **WELD2**.

(e) PULSE
If the pulse width exceeds the value set in PULSE, the CAUTION or NG signal is output. Pulse width is expressed assuming that the full wave is 100%. Set H1 and H2 for each of **WELD1** and **WELD2**.

(f) CAUTION ITEM Note: Common to all schedules
Select an item among current (CURR), voltage (VOLT), power (POWER), and pulse width (PULSE) to perform the upper/lower limit judgment. The result of judgment is displayed as GOOD/UPPER/LOWER on the MONITOR screen.

(g) CAUTION COUNT Note: Common to all schedules
For the item selected in CAUTION ITEM, when the number of half cycles out of the upper/lower limit exceeds the number of counts set in CAUTION COUNT, the CAUTION or NG signal is output. When 0 is set, the CAUTION or NG signal is output after the completion of the sequence.

(h) CAUTION MODE Note: Common to all schedules

Selects the action when the half cycle out of the upper/lower limit range for judgment exceeds the number of counts.

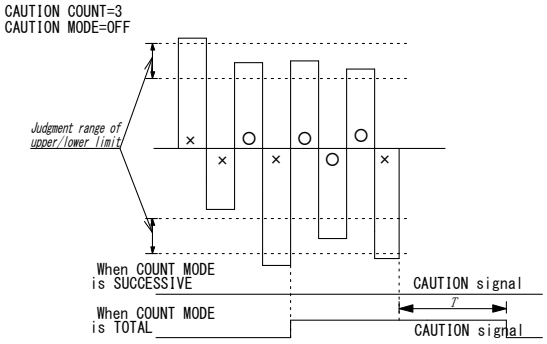
OFF	Outputs the CAUTION signal and continues the welding sequence. (Can be restarted)
ON	Output the NG signal and stops the welding sequence. (Cannot be restarted)

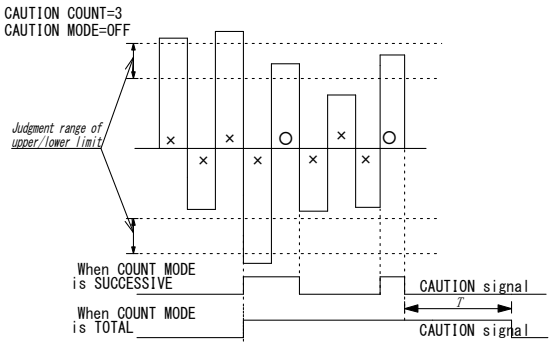
(i) COUNT MODE Note: Common to all schedules

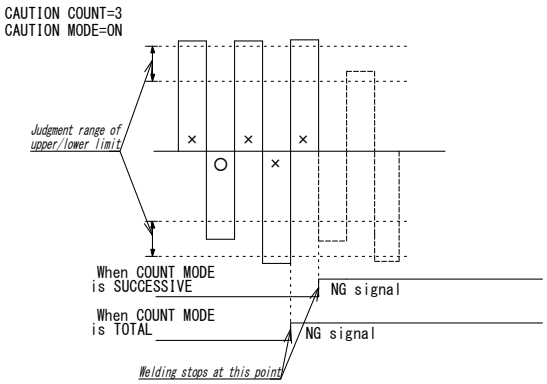
Selects total number or continuous number for counting the half cycle out of the upper/lower limit range for judgment.

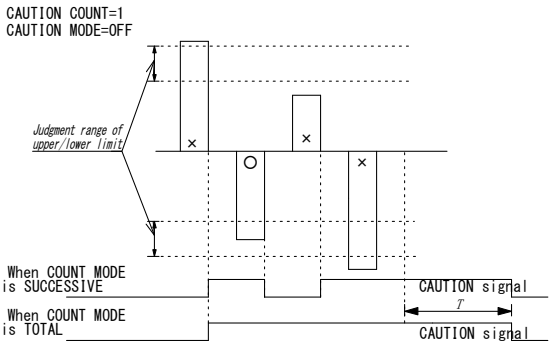
TOTAL	When the total number of half cycles out of the upper/lower limit exceeds the CAUTION COUNT setting, the CAUTION or NG signal is output.
SUCCESSIVE	When the half cycles out of the upper/lower limit exceeds the CAUTION COUNT setting sequentially, the CAUTION or NG signal is output.

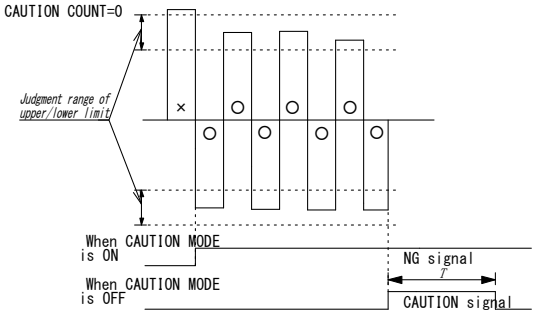
Difference in output between CAUTION signal and NG signal depending on COUNT MODE setting (T: END SIG.TIME)





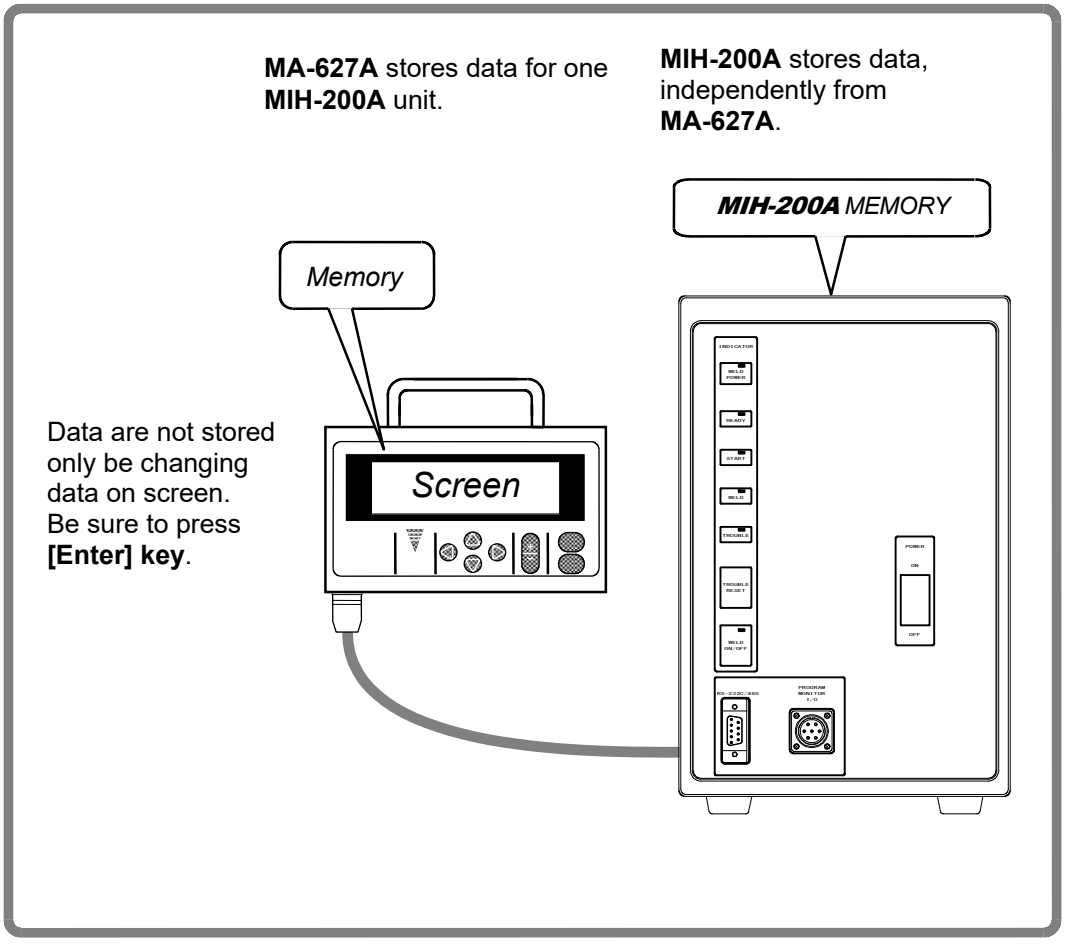




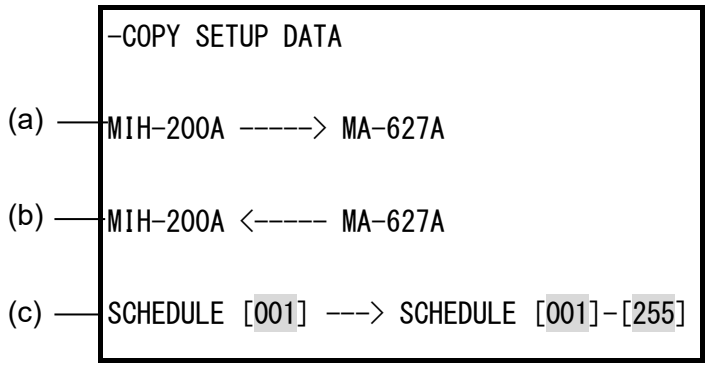


(6) COPY SETUP DATA Screen

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, 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) [MIH-200A -----> MA-627A]
The data in **MIH-200A** is copied to the memory of **MA-627A**.

(b) [MIH-200A <----- MA-627A]
The data in the memory of **MA-627A** is copied to **MIH-200A**.

(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.

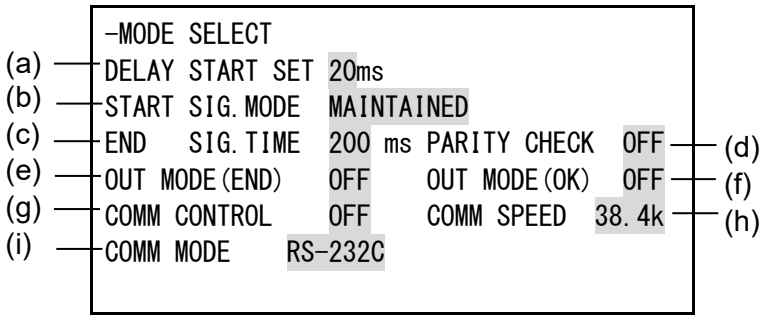
For example, **SCHEDULE #2** can be set by switching from **SCHEDULE #1** as follows:

- **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:

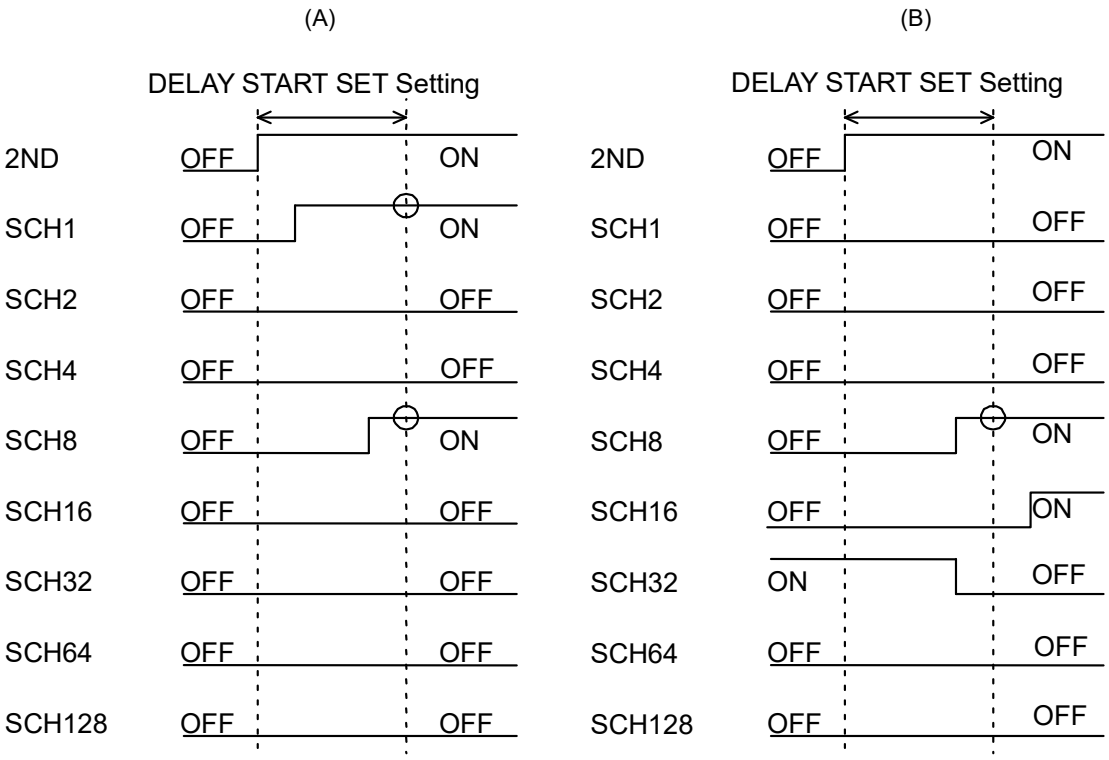
SCHEDULE [001] ---> SCHEDULE [002]-[004]

(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 the 2ND 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), SCH signals 1 and 8 are **ON**. Therefore, welding is performed using schedule No. 9. In Fig. (B), only SCH signal 8 is **ON**. As a result, welding is performed using schedule No. 8.
SCH signals 16 and 32 are invalid because they are **OFF** when the schedule is determined.

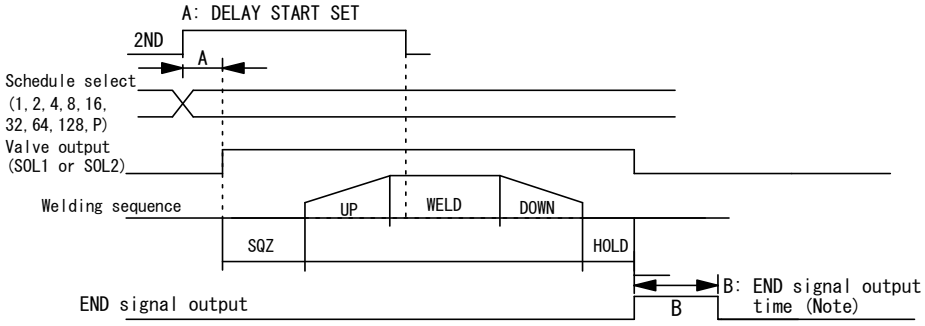
(Note) When **DELAY START SET** is 1 ms or 2 ms
The schedule number when the 2ND signal is received is selected. Therefore, in Fig. (A) above, the schedule number is not selected and the schedule signal input error occurs. When **DELAY START SET** is 1 ms or 2 ms, input the SCH signal in advance before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

(b) START SIG.MODE

Set the input method of the 2ND signal to activate the Power Supply.
(Note) When OUT MODE(END) is OFF

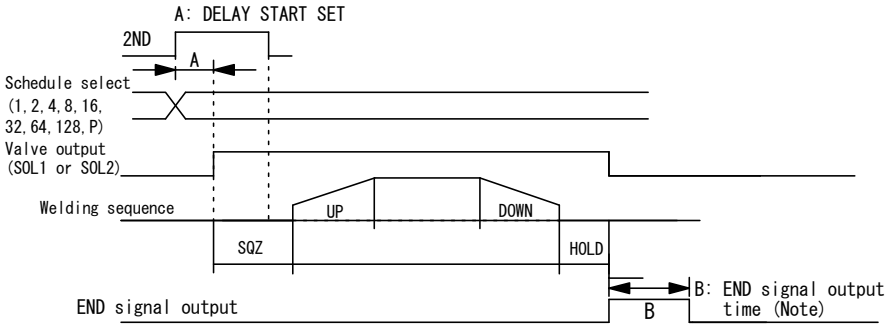
1) At LATCHED

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



2) At PULSED

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

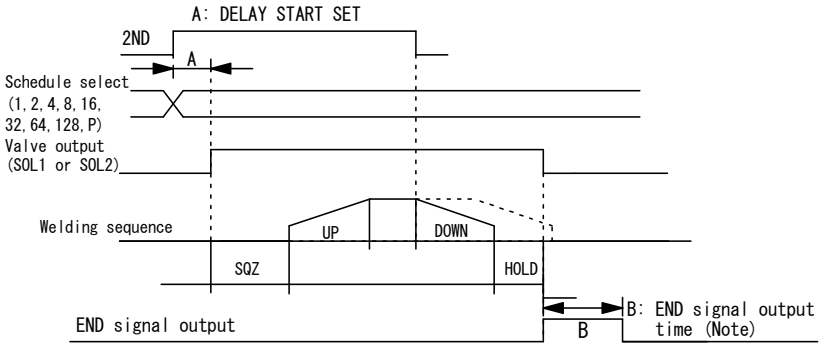


3) At MAINTAINED

If the 2ND signal stops between UP and DOWN2, the welding sequence will halt at that point and move to the hold time.

When DOWN1 or DOWN2 are set, the welding sequence will end after downslope.

(Note) When the 2ND signal stops halfway through half cycle, the welding sequence will end after welding a half cycle.



(c) END SIG.TIME

Sets the length of time for output of the END signal when OUT MODE(END) is OFF. The output time can be set in a range from 10 to 200 ms and in units of 10 ms. The 2ND signal is not received while the END signal is output.
The OK or CAUTION signal is also output for the set time when OUT MODE(OK) is OFF.

(d) PARITY CHECK

When ON is selected, parity check will be performed. This check allows for detection of a failure resulting from a wire break in the schedule selection signal lines. Be sure that the total number of closed schedule selection and parity signal lines is always odd. (Refer to Note 1, “Schedule Nos. and Schedule Selection Pins.”) When OFF is selected, parity check will not be performed.

(e) OUT MODE(END)

Sets the output method of the END signal. (Refer to Note 2, “Timer operation and operation between takts.”)

(f) OUT MODE(OK)

Sets the output method of the OK signal. (Refer to Note 2, “Timer operation and operation between takts”)
The output method of the OK signal differs depending on the shipment time of the product. (Refer to Note 3, “Operation at WELD OFF.”)

(g) COMM CONTROL

Selects a communication function. The setting can be changed, but it does not function.

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

(h) COMM MODE

Selects a communication mode. The setting can be changed, but it does not function.

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

(i) COMM SPEED

Selects a communication speed. The setting can be changed, but it does not function.

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

(Note 1) Schedule Nos. and Schedule Selection Pins

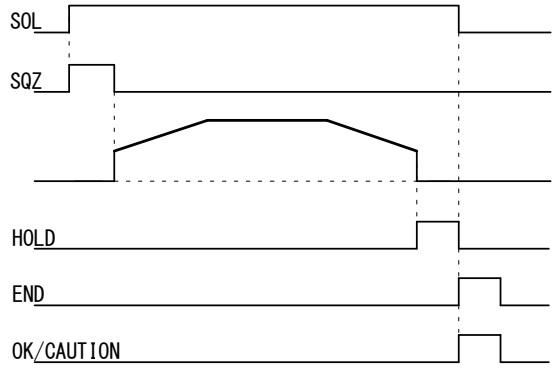
●: Closed Blank: Open

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	●	●	●	●	●	●	●	●	●

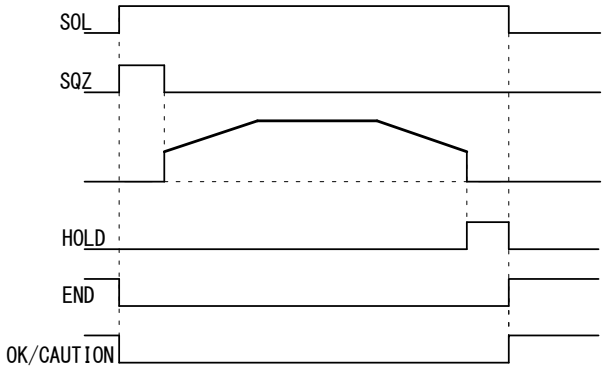
(Note 2) Timer operation and operation between takts

1) Timer operation: Output the signal for the time set for END SIG.TIME.
2) Operation between takts: Outputs the signal at power-on and releases when the 2ND signal is received.

1) Timer operation
OUTPUT MODE(END)=OFF
OUTPUT MODE(OK)=OFF

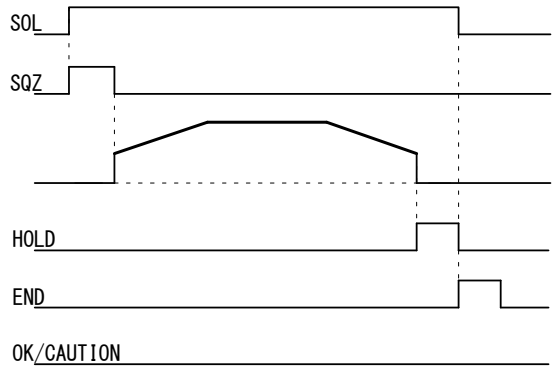


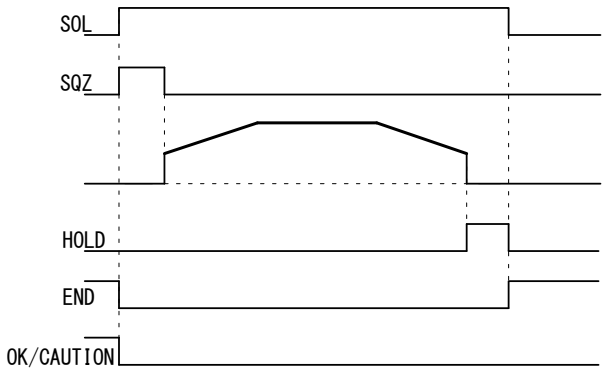
2) Operation between takts
OUTPUT MODE(END)=ON
OUTPUT MODE(OK)=ON



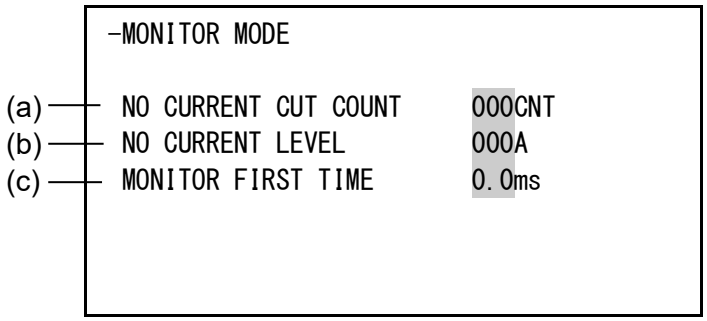
(Note 3) Operation at WELD OFF

For products shipped in or after December 2014, the OK/CAUTION signal is not output at WELD OFF.





(8) MONITOR MODE Screen



(a) NO CURRENT CUT COUNT

The absence of welding current will not be detected as a no-voltage error (see **11. Troubleshooting**) as long as the absence lasts for a period within the time set here.

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

The time can be set in a range from 0 to 999.

(b) NO CURRENT LEVEL

Set the current level for determining the absence of current as a no-current 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 error will be made if you select 000 A.

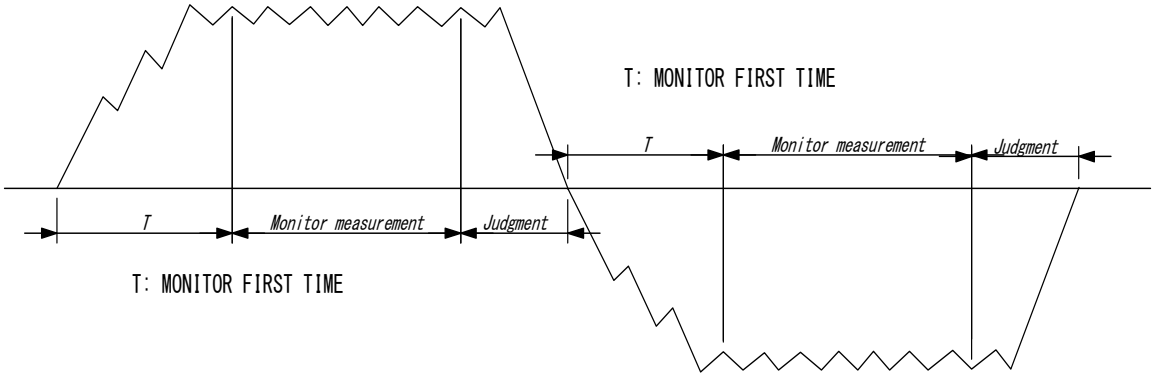
(c) MONITOR FIRST TIME

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 9.8 ms (in 0.2 ms).

Use this setting to exclude the initial rise of current from measurement.

When **MONITOR FIRST TIME** is 0.0 ms, the half cycle (excluding 0.2 ms of the last judgment) is measured. When **MONITOR FIRST TIME** is 9.8 ms, the monitor measurement and judgment are not performed.

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



(9) I/O CHECK Screen

This screen is used to check the status of the external I/O signals.
You cannot move to another screen while the 2ND 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 TH1 *
 SCH08* WELDON* 1ST STG* OK   0 TH2 *
 SCH16* THERMO* 2ND STG* REDY 0 TH3 *
 SCH32* FLW SW*          STED 0 TH4 *
 SCH64*                  WESG 0 TH5 *
```

Input signal

The "*" symbol appears when the corresponding input signal is **ON**. The asterisk disappears if the signal is **OFF**.

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				

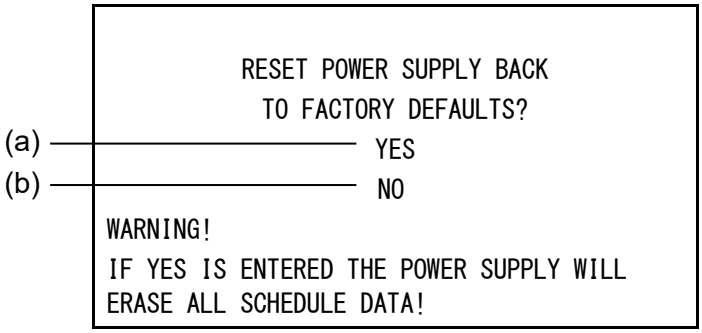
Output signal

Set the cursor reading to "0" to turn **OFF** the output signal, and "1" to turn it **ON**.

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

(10) 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**.

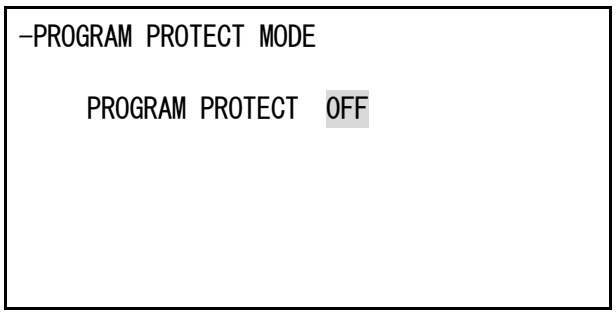


(a) YES	Initializes the Power Supply memory (restores the initial settings). After initialization, the screen will reflect the settings shown in this chapter.
(b) NO	Returns the display to the **MENU screen** without initializing the Power Supply memory.

(11) 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>

```
[MENU]
>POWER SUPPLY STATE   COPY SETUP DATA
 SCHEDULE             MODE SELECT
 MONITOR1             MONITOR MODE
 MONITOR2
 MONITOR SET
                      I/O CHECK
                      RESET TO DEFAULT
```

<When the PROGRAM PROTECT is ON>

```
[MENU]
>POWER SUPPLY STATE
 SCHEDULE             MODE SELECT
 MONITOR1             MONITOR MODE
 MONITOR2
 MONITOR SET
```

(12) OVER WRITE / DOWN LOAD Screen

Usually, the **MA-627A** is operated as a program unit of the connected model the moment it is powered on.
In the following cases, however, it takes a few minutes for the **MA-627A** to be powered on and become usable due to update process of the contents of memory.

- When the device is started for the first time after newly purchasing (a test program for inspection is stored) or the connected model is changed (See **1) OVER WRITE screen**.)
- When the memory rewriting is restarted after cancelled halfway or the battery for backup is dead (See **2) DOWN LOAD screen**. For battery replacement, see the operation manual for the **MA-627A**.)

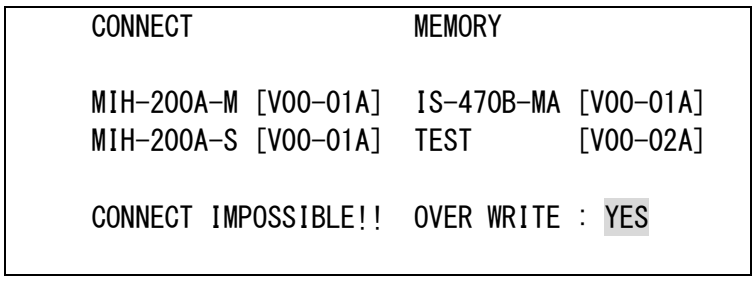
1) OVER WRITE screen

When the connected model is incompatible with the previously stored model name / program version, "**CONNECT IMPOSSIBLE!!**" is displayed at the bottom of the screen as shown below.

Set **OVER WRITE** to **YES** with the **[+ON] key** and press the **[ENTER] key** to rewrite the memory.

It takes about 5 minutes to rewrite the memory.

After rewriting, the **MA-627A** can be used.



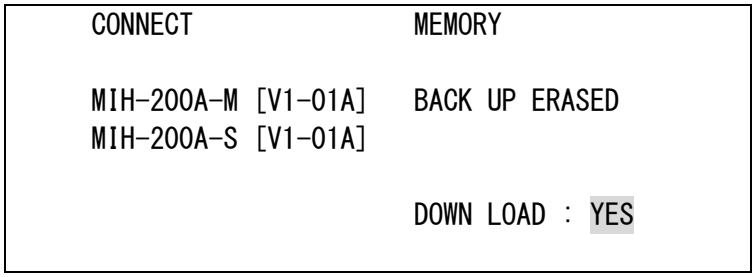
2) DOWN LOAD screen

This screen is for downloading a program from the product connected to the **MA-627A**.

To download a program, set **DOWN LOAD** to **YES** with the **[+ON] key** and press the **[ENTER] key**.

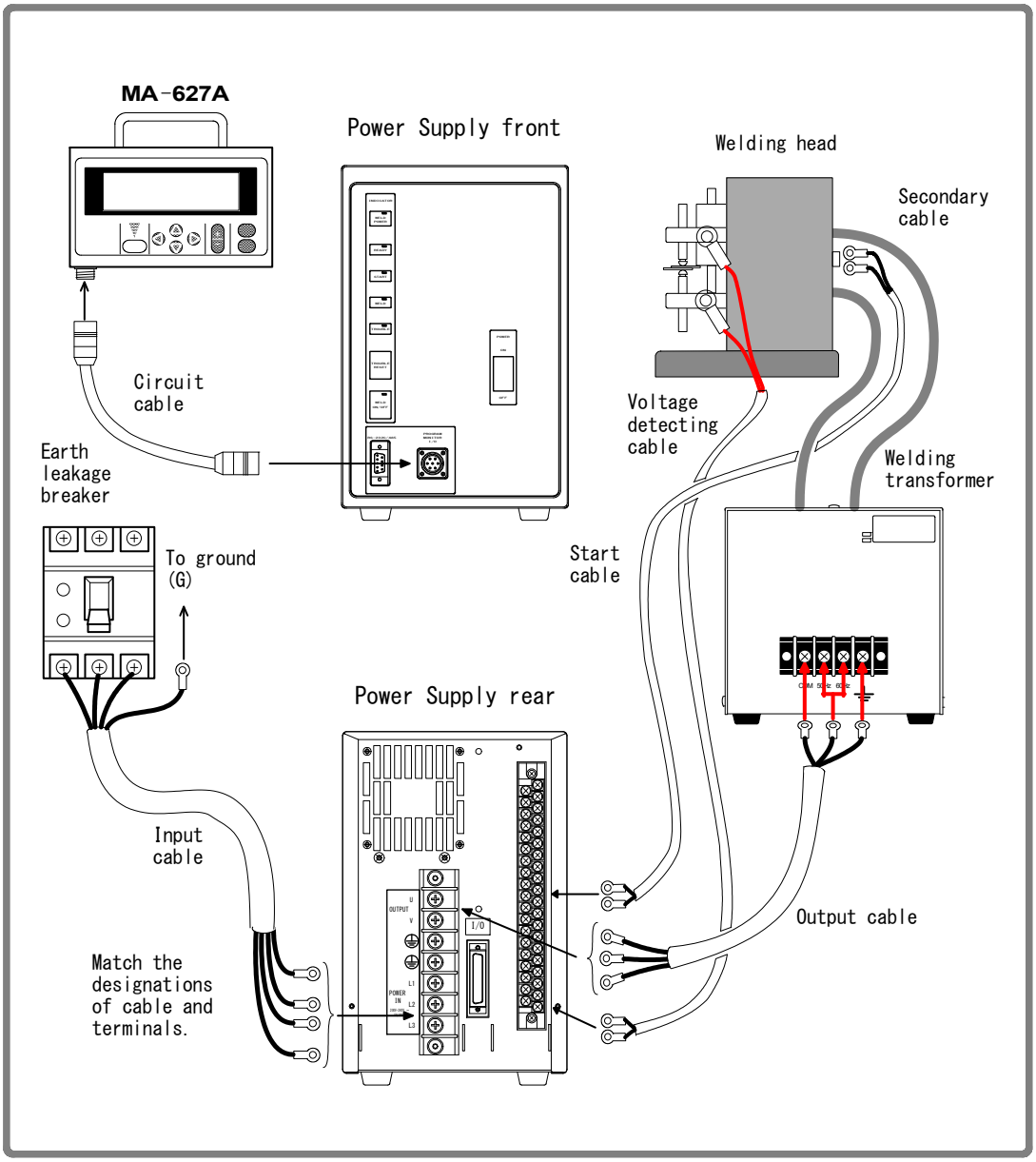
It takes about 5 minutes to download a program.

After downloading, the **MA-627A** can be used.



5. Connection Procedures

(1) Basic Configuration



(Note) All items are sold separately except for the Power Supply. (See **9. (2) Options**.)

(2) Connecting

1) **Connecting to the transformer's input terminal block and the voltage detecting 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 **9. (2) Options**.)
   Also, to monitor the secondary voltage, connect the voltage detecting cable to the electrodes of the welding head and connect the terminals to the pins 38 and 39 of the external input/output signal terminal block.

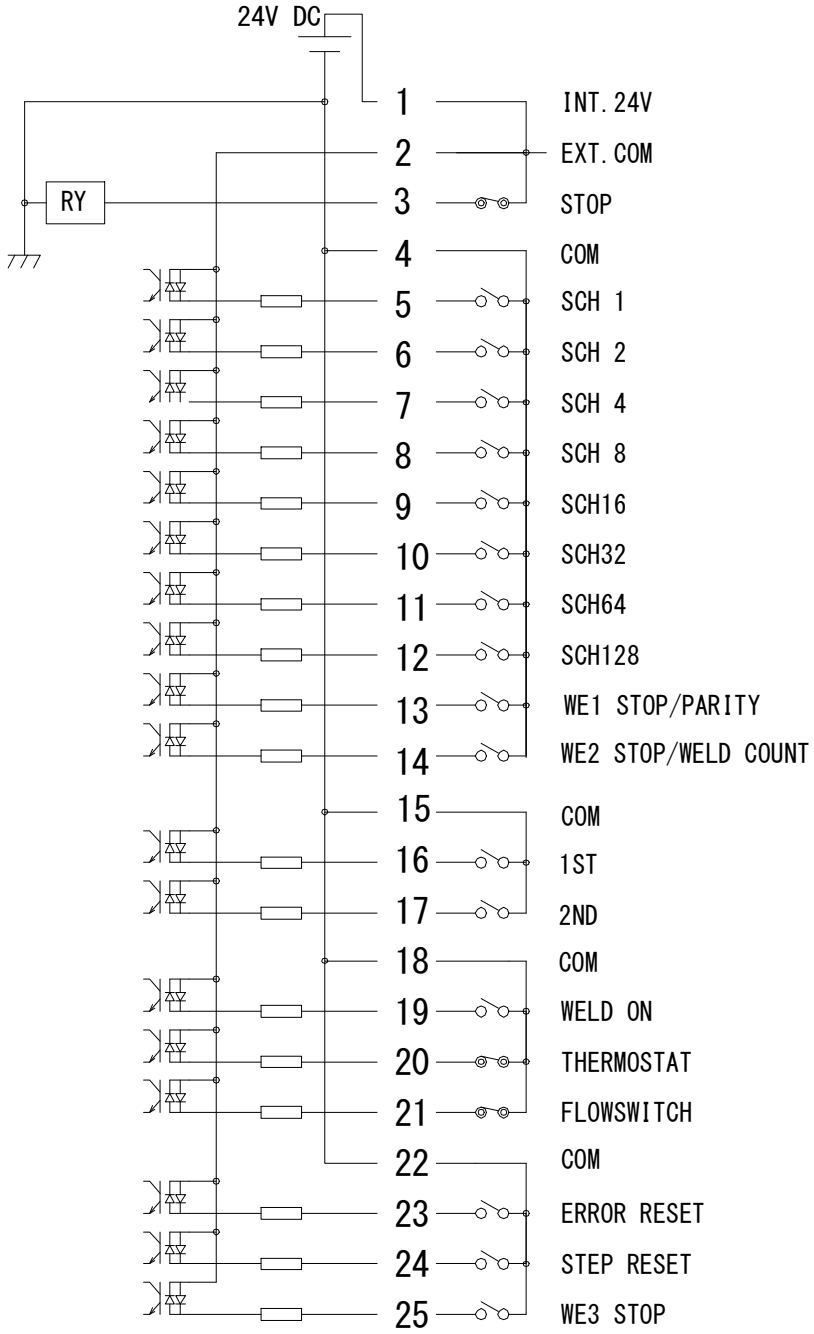
2) **Connecting the power cable**
   Connect the power supply to the **Welding Power Supply Breaker** on the rear panel with the input cable (see **9. (2) Options**) and ground the **[PE]** terminal.

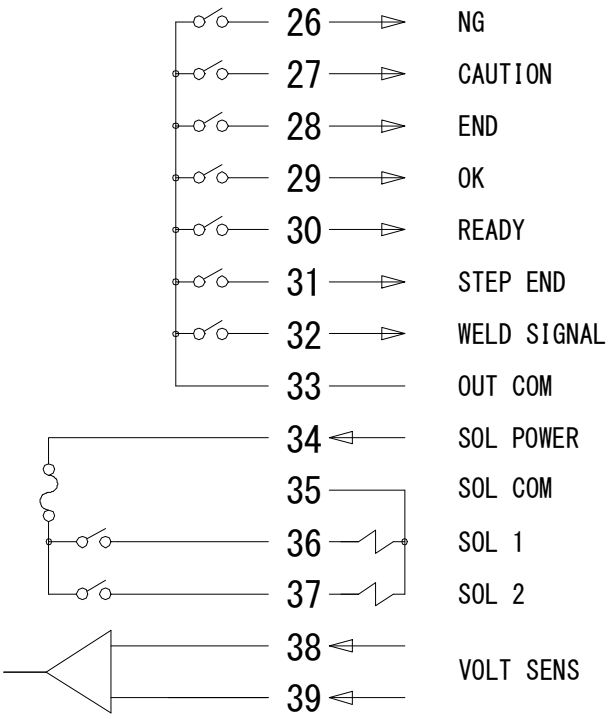
3) **Connecting the necessary cables to the Connecting terminal block for External Input/Output Signal**
   Refer to **6. Interface** to prepare a connecting cable.

4) **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





Terminal block 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

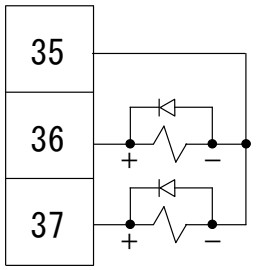
(2) Description of External I/O Signals

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. Closing 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) Schedule Nos. and Schedule Selection Pins**.)
13	WE1 STOP/ PARITY	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 when PARITY CHECK is selected on the MODE SELECT screen. Be sure that the total number of closed schedule selection and parity signal lines is always odd. (See **4. (7) Schedule Nos. and Schedule Selection Pins**.) The WE1 STOP does not function.
14	WE2 STOP/ WELD COUNT	Weld count input or WE2 stop input pin. (This function is not available with this Power Supply.)
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/OFF signal, and open it to turn it OFF. Leaving this pin open will shut off welding current even when the sequence operation is performed. Use this pin, for example, to start the sequence experimentally.
20	THERMOSTAT	Thermostat input pin for an external transformer. Connect to the transformer thermostat or diode thermostat. Opening the pin will result in a thermostat error.

Pin No.	Name	Description
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. (This function is not available with this Power Supply.)
25	WE3 STOP	WE3 stop input pin. (This function is not available with this Power Supply.)
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 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).
29	OK	Normal signal output pin. This signal is output for a preset length of time after completion of the welding sequence if the measured value is judged to be within the range set on the MONITOR SET screen. The contact is rated at 24 V DC at 20 mA (semiconductor switch). Note: For products shipped in or after December 2014, the normal signal is not output at WELD OFF.
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 function is not available with this Power Supply.)
32	WELD SIGNAL	Welding current timing output pin. This signal is output during welding and turned off during no-current-carrying time. (See **8. Timing Chart**.)

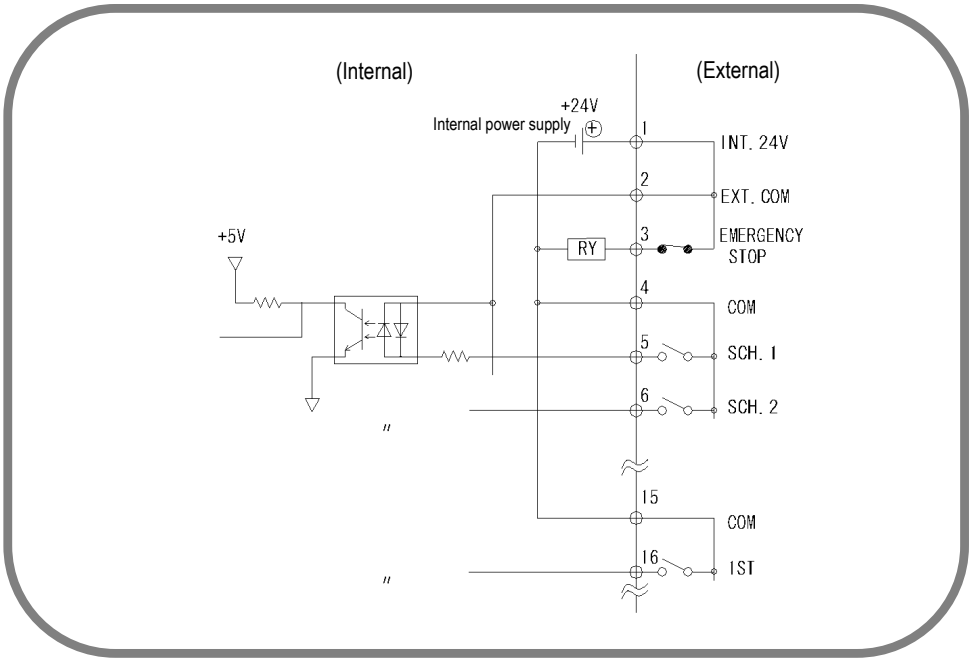
Pin No.	Name	Description
33	OUT COM	Common pin for output pins. This pin is the common pin for the NG, CAUTION, END, OK, READY, STEP END, and WELD SIGNAL pins.
34	SOL POWER	Power input pins to drive the solenoid valve. Input 120 V AC or 24 V AC/DC power.
35*	SOL COM	COM pin for the solenoid valve.
36* **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 when monitoring the secondary voltage.

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

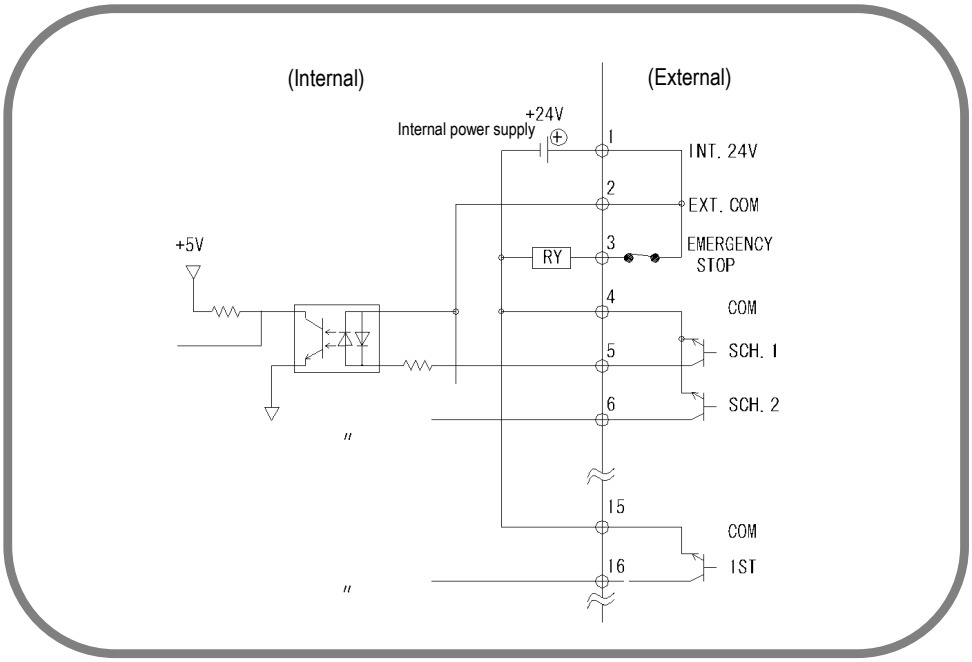


(3) Connection of Input Signals

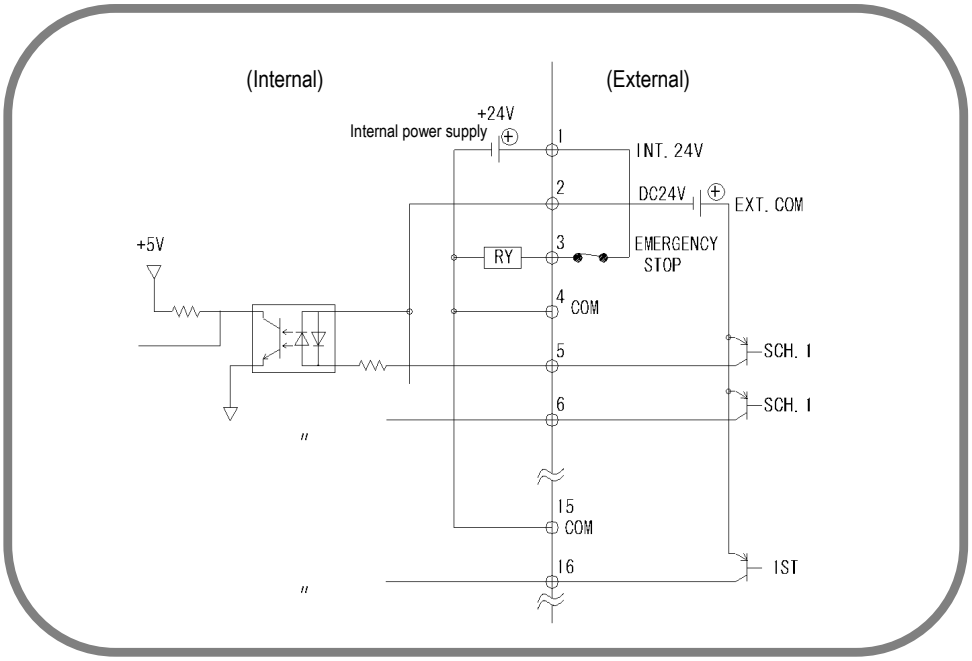
1) Connection with equipment having a contact input
Connect pins 1 and 2.



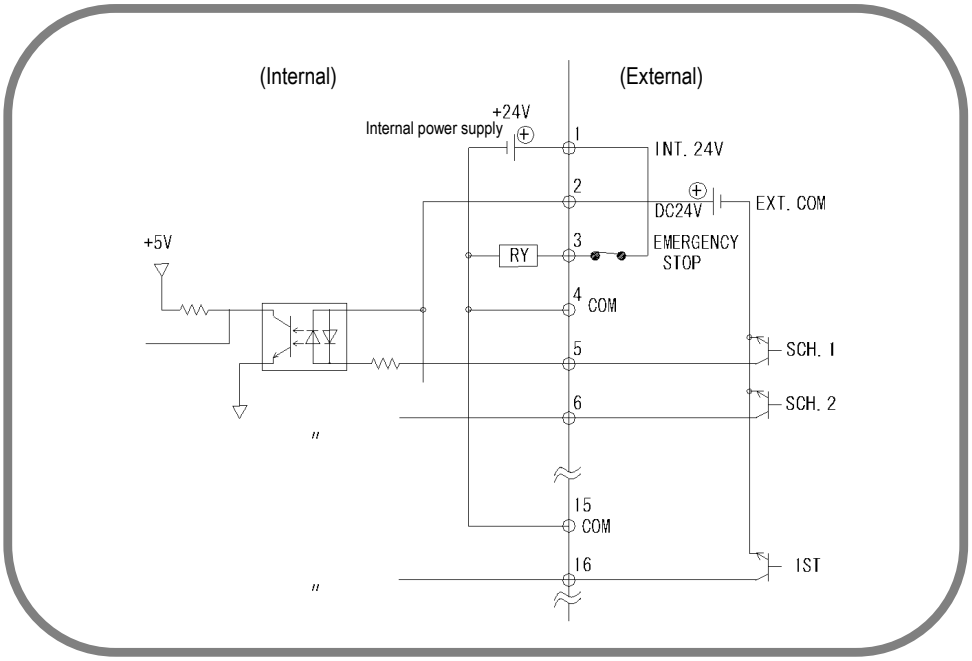
2) Connection with equipment featuring NPN open collector output (when using internal power supply)
Connect pins 1 and 2.



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.

(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 2ND signal while the **[READY] lamp** is NOT on, and check each sequential operation.

> **⚠ WARNING**
>
> When confirming operation, check that the **SQZ time** (squeeze time) is sufficient. If the welding current flows before the welding electrode force becomes sufficient, explosion may occur.

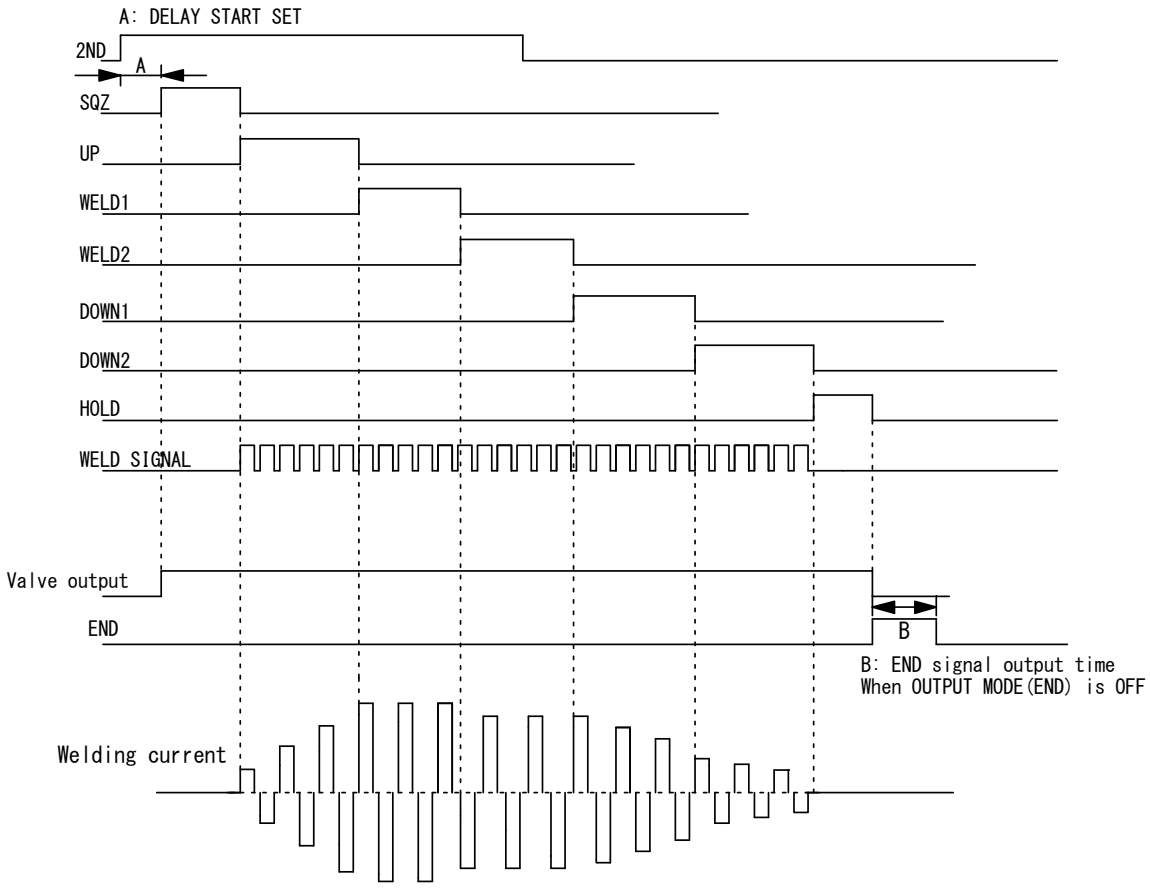
2) If no error is detected in 1) above, position a workpiece and begin welding. Turn on the **[WELD ON/OFF] key** on the front panel of the Power Supply, **WELD ON/OFF** of **MA-627A** and activate the external **WELD ON** signal. Check that the **[READY] lamp** is lit, and then supply the welding current. 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 FLASH ROM on the control board when a setting is changed or a schedule data is copied. The **[READY] lamp** on the front panel and the external **READY** signal are turned off during writing. Check that the **[READY] lamp** is turned on to start welding. It takes about 2 seconds at longest to write data into FLASH ROM.

(4) Turn off the welding power.

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

8. Timing Chart



(Note 1) To stop the sequence during **SQZ** (possible only when LATCHED or MAINTAINED is selected for **START SIG. MODE**; see **4.(7)(b)**), stop the 2ND signal input for a period longer than that set for **DELAY START SET**.

9. Specifications

(1) Specifications

*: Selectable for every 255 schedule

Welding power			3-phase, 200–240 V AC (50/60 Hz) ±10%
Max. output current			200 A (peak value) Duty cycle: 4% (at 40°C of ambient temperature)
Number of schedules			255
Control frequency			5 kHz
Control method			Primary constant-current peak value control
Timer setting range *	SQZ / squeeze time		0000–9999 (ms) (in 1 ms)
	UP/ upslope	Weld time No-current-carrying time No. of counts	00.0–10.0 (ms) (in 0.2 ms) 00.0–100.0 (ms) (in 0.2 ms) 001–999
	WE1/ weld 1	Weld time No-current-carrying time No. of counts	00.0–10.0 (ms) (in 0.2 ms) 00.0–100.0 (ms) (in 0.2ms) 001–999
	WE2/ weld 2	Weld time Downtime No. of counts	00.0–10.0 (ms) (in 0.2 ms) 00.0–100.0 (ms) (in 0.2 ms) 001–999
	D1/ downslope 1	Weld time No-current-carrying time No. of counts	00.0–10.0 (ms) (in 0.2 ms) 00.0–100.0 (ms) (in 0.2 ms) 001–999
	D2/ downslope 2	Weld time No-current-carrying time No. of counts	00.0–10.0 (ms) (in 0.2 ms) 00.0–100.0 (ms) (in 0.2 ms) 001–999
	HOLD / hold time		0000–9999 (ms) (in 1 ms)
Transformer turns ratio * (P/S RATIO)			1.0–199.9
Valve setting * (VALVE)			2 valves (VALVE1, VALVE2)
Current setting range * (HEAT) (Note 1)			20–500 A
Current monitor * (CU1/CU2)	H (upper limit) L (lower limit)		000–999 A 000–999 A
Power monitor * (PWR1/PWR2)	H (upper limit) L (lower limit)		0000–9999 W 0000–9999 W
Voltage monitor * (VLT1/VLT2)	H (upper limit) L (lower limit)		0.00–9.99 V 0.00–9.99 V
Pulse width monitor * (PULSE)	H1/H2 (upper limit)		010–100%
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 2)	Ambient temperature Humidity Altitude Protection degree	+5 to +40°C 90% max. (no condensation) 1000 m max. IP20
Transportation and storage conditions	Ambient temperature Humidity	-10 to +55°C 90% max. (no condensation)
Protective functions	Overcurrent	20 A Fuse
	No-current	Power is turned off when a primary current is not detected.
	Temperature	Overheating of power unit of inverter and welding transformer are detected.
	Self-diagnostic error	Setting dates (e.g., schedule settings) are diagnosed.
Setting accuracy (Note 3)		Within ±3% of full scale
Repetition accuracy (Note 3)		Within 4% of full scale
Outline dimensions	(H) x (W) x (D) (Not including projection)	270 mm x 172 mm x 510 mm
Mass		14 kg
Accessory	Operation manual	1 copy

(Note 1) Primary current can be set to 0.2 to 10 A.
(Note 2) 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 3) Using the fixed load and the specified transformer

(2) Options (Sold Separately)

1) Input Cables

Customer-procured cables must meet the specifications at right.

Model No.	Length
PK-03300-002	2 m
PK-03300-005	5 m
PK-03300-010	10 m
PK-03300-015	15 m
PK-03300-020	20 m

Specifications	
Rated Voltage	300 V AC min.
Section Area	2 mm^2 min.
No. of Cores	4
Cable Dia.	25 mm max.

2) Output Cables

Customer-procured cables must meet the specifications at right.

Model No.	Length
PK-03301-002	2 m
PK-03301-005	5 m
PK-03301-010	10 m

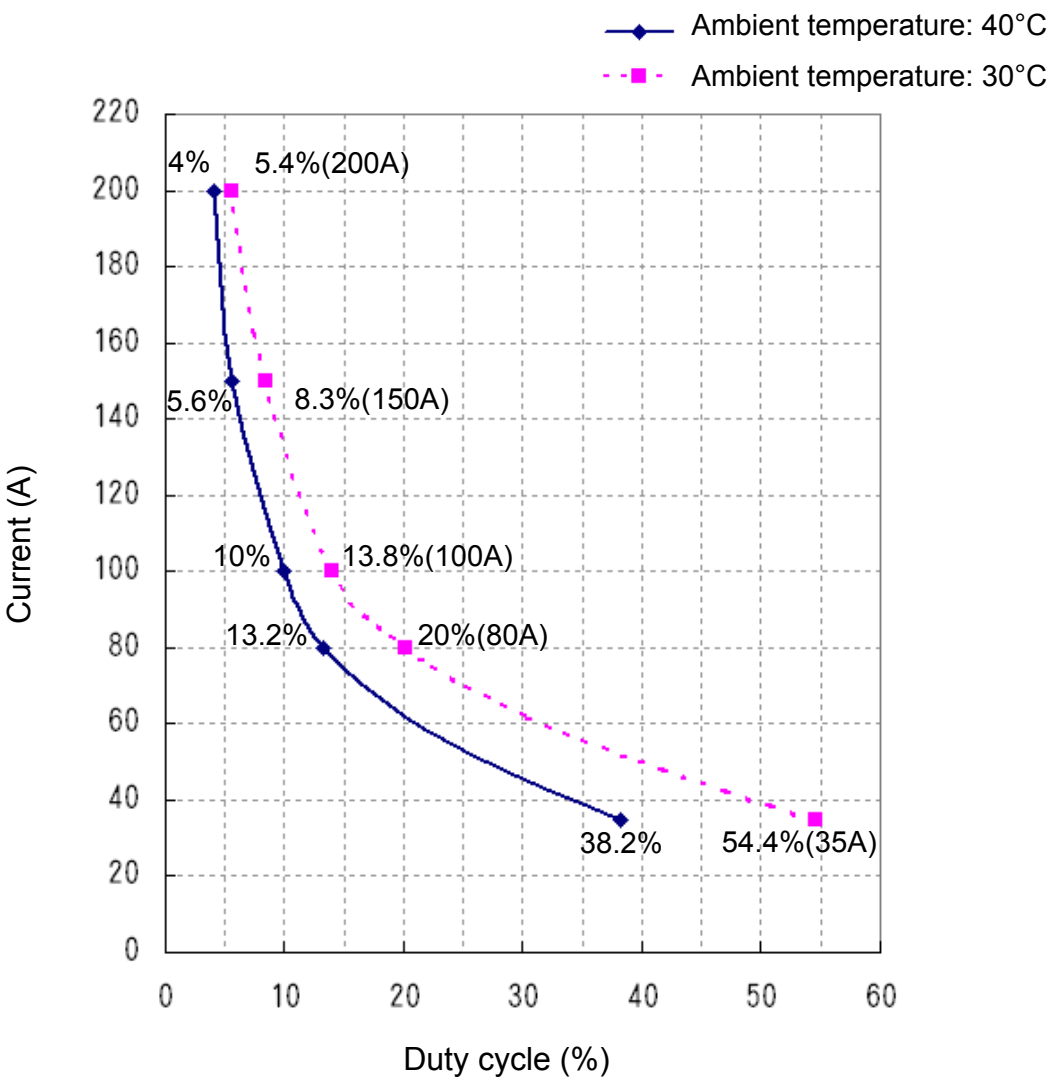
Specifications	
Rated Voltage	300 V AC min.
Section Area	2 mm^2 min.
No. of Cores	3
Cable Dia.	25 mm max.

3) Others

Item	Model No.	Length
Volt detecting cable	SK-1159947	2 m
	SK-1159948	5 m
	SK-1159949	10 m

Item	Branch No.	Length
Circuit cable	SK-1174089-002	2 m
	SK-1174089-005	5 m
	SK-1174089-010	10 m
	SK-1174089-015	15 m
	SK-1174089-020	20 m

(3) Duty Cycle Graph



(4) Schedule Data Table

① SCHEDULE Screen, MONITOR SET Screen

Note: As needed, copy and use this page.

Item \ SCHEDULE#																			
SQZ																			
UP	TIME																		
	CO TIME																		
	CNT																		
	(HEAT)																		
WELD1	TIME																		
	CO TIME																		
	CNT																		
	HEAT																		
WELD2	TIME																		
	CO TIME																		
	CNT																		
	HEAT																		
DOWN1	TIME																		
	CO TIME																		
	CNT																		
	(HEAT)																		
DOWN2	TIME																		
	CO TIME																		
	CNT																		
	(HEAT)																		
VALVE #																			
P/S RATIO																			
CU1	H																		
	L																		
CU2	H																		
	L																		
VLT1	H																		
	L																		
VLT2	H																		
	L																		
PWR1	H																		
	L																		
PWR2	H																		
	L																		
PULSE	H1																		
	H2																		

② MONITOR SET Screen

CAUTION ITEM	
CAUTION COUNT	
CAUTION MODE	
COUNT MODE	

③ Other Screens

POWER SUPPLY STATE

LCD CONTRAST	
CONTROL #	
PROGRAMMED DATE	

MODE SELECT

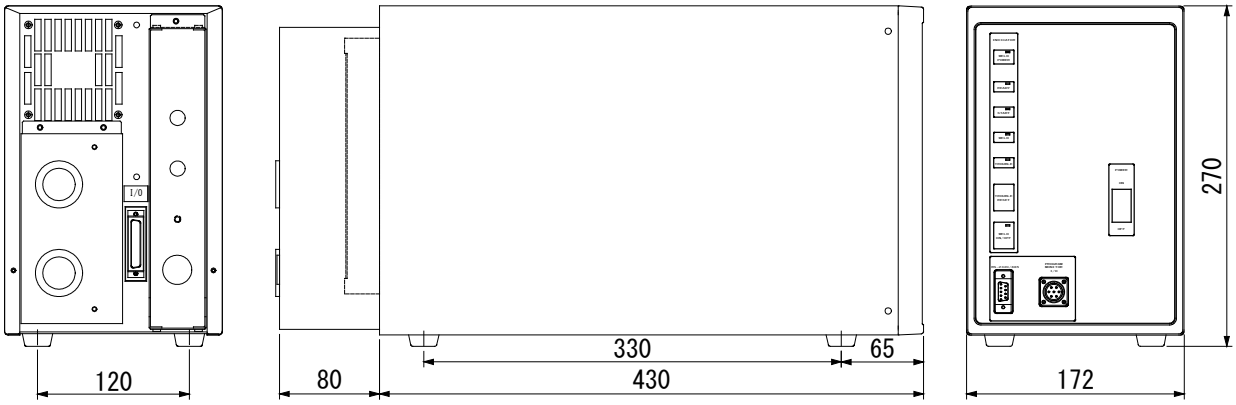
DELAY START SET	
START SIG. MODE	
END SIG. TIME	
OUT MODE(END)	ON , OFF
OUT MODE(OK)	ON , OFF
COMM CONTROL	OFF , --> , <-->
COMM MODE	RS-232C , RS-485
COM SPEED	9.6k , 19.2k , 38.4k

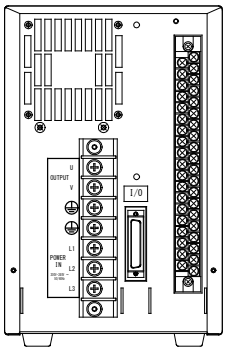
MONITOR MODE

NO CURRENT CUT COUNT	
NO CURRENT LEVEL	
MONITOR FIRST TIME	

10. Outline Drawing

(Dimensions in mm)





With terminal covers removed

11. 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 the 2ND signal is broken, and a parity check error is detected.	Check the 2ND signal input cable.
E-03	External 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.	Ensure that the duty cycle does not exceed the specified value. (See **9. (3)**.)
E-05	No-current error (Current is not detected)	Squeeze of welding electrode is not sufficient.	Adjust squeeze of welding electrode adequately.
		NO CURRENT LEVEL is high.	Set a lower **NO CURRENT LEVEL**. (See **4. (8)(b)**.)
		Fuse inside the equipment is blown.	The fuse needs replacement. Contact us.
E-06	Current error	Welding current is out of **CU1/CU2** 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 H1/H2** setting range on **MONITOR SET** screen.	Check workpiece and welding electrode.

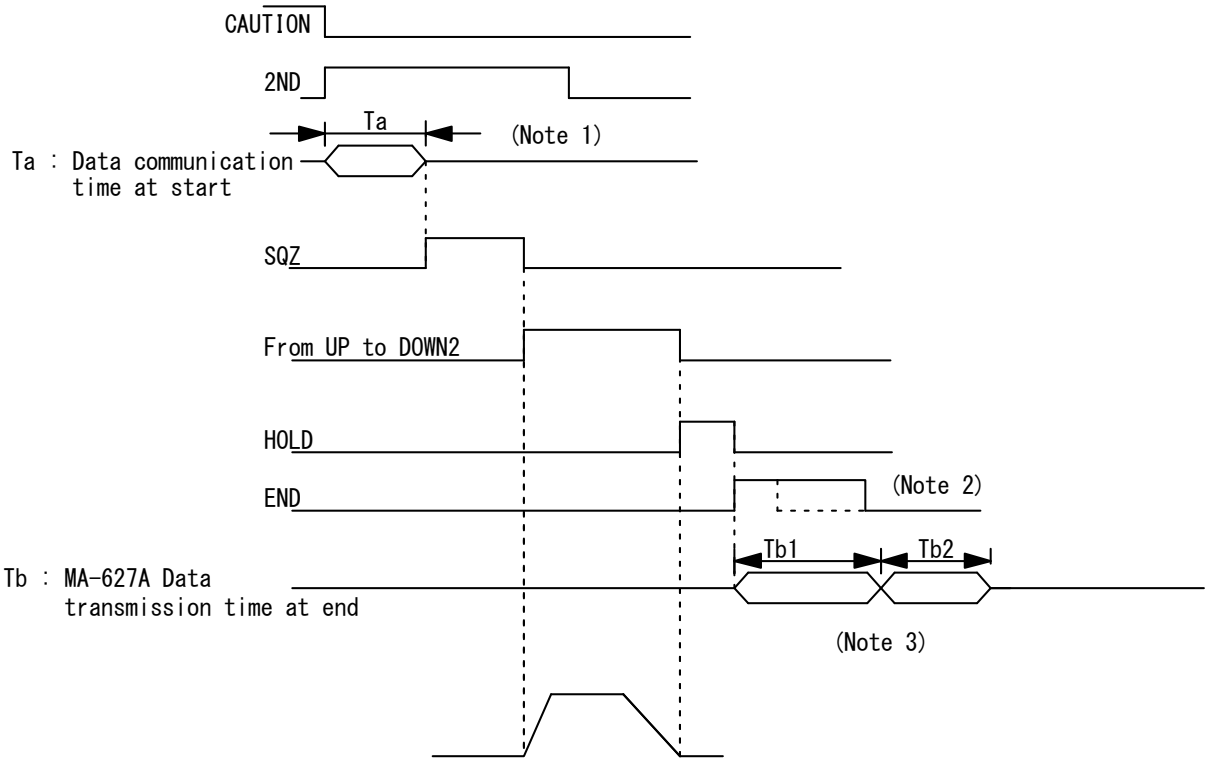
Fault code	Contents	Cause	Measures
E-10	Schedule setting error	$\frac{\textbf{HEAT}\text{ setting}}{\textbf{P/S RATIO}} > 10$ or $\frac{\textbf{HEAT}\text{ setting}}{\textbf{P/S RATIO}} < 0.2$	Correct each setting.
		The **UP**, **WELD1**, **WELD2**, **DOWN1** and **DOWN2** values are all "0."	
E-12	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.
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	SCH signal is not input when external 2ND signal is input.	Input SCH signal before 2ND signal. (See **4. (7)(a)**.)
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 **VLT1/VLT2** 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 **PWR1/PWR2** setting range on **MONITOR SET** screen.	
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-28	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.

* An error cannot be reset through the I/O. You can reset an error through the **MA-627A** or the **[TROUBLE RESET] key** on the front panel.

(2) When a Welding Does not Start Even if the 2ND Signal is Input

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

- READY does not light up.
- 2ND signal is shorter than DELAY START SET time setting.
- 2ND signal is input while the END signal is output.
- 2ND signal is input during communicating with the **MA-627A**.



(Note 1) When the next 2ND signal is received while the monitor error is displayed on the **MA-627A**, the CAUTION signal is turned OFF and the previous screen is displayed.
At this time, the data is transferred to the **MA-627A** from the Power Supply. The 2ND 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 2ND signal more than Ta time. Ta is constant regardless of the DELAY START SET time setting.

(Note 2) When the sequence ends, the END signal is output after HOLD. The 2ND 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 the **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 2ND signal is not received while the monitor data is transferred. Also, on every screen, the data is transferred to the **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 make the monitor data beyond/below the upper/lower limit.
The data transmission time Tb1 and Tb2 are shown in the table below.

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