

WELD CHECKER**MM-122A****OPERATION MANUAL****CONTENTS**

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1. Special Precautions

(1) Safety Precautions

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

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

DANGER

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

WARNING

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

CAUTION

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



These symbols denote "prohibition". They are warnings about actions out of the scope of the warranty of the product.



These symbols denote actions which operators must take.



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

DANGER



Never disassemble, repair or modify the Weld Checker

Do not touch the inside of the Weld Checker unnecessarily. This action can cause electric shock and fire.

When replacing, inspecting or repairing the battery, consult Miyachi Technos Corp.

WARNING



Do not put your hands between the electrodes

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



Do not touch any welded part or electrodes during welding and just after welding finished

The welded part of a workpiece, electrodes and arm are very hot. Do not touch them; otherwise you may be burnt.



Apply the specified power supply

Application of a power supply other than specified in the operation manual can cause fire and electric shock.



Connect the specified cables securely

Cables of insufficient current capacities and loose connections can cause fire and electric shock.



Do not damage the power supply cable and connecting cables

Do not tread on, twist or tense any cable. The power supply cable and connecting cables may be broken, and that can cause electric shock and fire. If any part needs to be repaired or replaced, consult Miyachi Technos Corp. 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 Miyachi Technos Corp. 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 shop 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 surface flash and expulsion directly during welding, your eyes may be damaged.

CAUTION



Do not splash water on the Weld Checker

Water splashed over the electric parts can cause electric shock and short circuits.



Keep combustible matter away from the welding machine

Surface flash and expulsion can ignite combustible matter. If it is impossible to remove all combustible matter, cover them with non-combustible material.



Do not cover the Weld Checker with a blanket, cloth, etc.

If such a cover is used, it may be heated and burn.



Keep the power supply plug clean and insert it all the way

If the plug is covered with dust or is not inserted completely, it will become hot and can cause fire.



When inserting or disconnecting the plug, hold the body

If the cable is pulled to disconnect the plug, it may be broken, and that can cause electric shock and fire.



When leaving this Weld Checker unused for a long time, disconnect the plug from the power supply outlet

Deterioration of insulation can cause electric shock, leak and fire.



Keep a fire extinguisher nearby

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



Maintain and inspect the Weld Checker periodically

Maintain and inspect the Weld Checker periodically, and repair any damage nearby before starting operation.



Use ear protectors

Loud noises can damage hearing.

(2) Precautions for Handling

- Do not install this Weld Checker in the following :
 - Damp places where humidity is 90% or higher,
 - Hot or cold places where temperatures are above 40°C or below 0°C,
 - Places near a high-frequency noise source,
 - Places where chemicals are handled,
 - Places where water will be condensed, and
 - Dusty places.
- Clean the outside of the Weld Checker with a soft, dry cloth or one wet with a little water. If it is very dirty, use diluted neutral detergent or alcohol. Do not use paint thinner, benzine, etc., since they can discolor or deform the Weld Checker.
- Do not put a screw, a coin, etc. in the Weld Checker, since they can cause a malfunction.
- Operate the Weld Checker according to the method described in this operation manual.
- Operate the button carefully by hand. If it is operated roughly or with the tip of a screwdriver, a pen, etc., this will cause malfunction or damage.

(3) On Disposal

Follow your local environmental regulations for disposal because the Weld Checker has the parts (photo coupler) which contain GaAs and the manganic lithium battery.

2. Features

The MIYACHI TECHNOS Weld Checker **MM-122A** is a current-measuring instrument for resistance welding power supply. The **MM-122A** has the following features.

- **Compact body**

Smaller than our conventional models.

Since the outline is 70(W) x 189(H) x 246(D) mm, the **MM-122A** can be installed anywhere. Also, since the weight is 1.9 kg, it can be carried easily.

- **Measurement processing speed improved**

The measurement time is reduced compared with that of conventional models.

- **Applicable to various welding currents**

The measurement of the AC-inverter welding current and the transistor welding current is possible, which conventional models have not conducted.

The **MM-122A** is applicable to any welding machine.

【List of applicable welding machines】

- | | |
|-------------------|--------------------------|
| ▪ Single-phase-AC | ▪ Transistor |
| ▪ DC-inverter | ▪ Single-phase-rectifier |
| ▪ AC-inverter | ▪ 3-phase-rectifier |
| ▪ Capacitor | ▪ 3-phase-low-frequency |

- **Upper/Lower limit judgment function provided**

When the measured value is outside the preset value, the trouble signal is output. This function is provided for quality control purpose.

- **Applicable to various power supplies**

The **MM-122A** can be used with 100–240VAC power supply. Also, the **MM-122A** can be operated with 24VDC, allowing a variety of application.

- **Easy operation with a button**

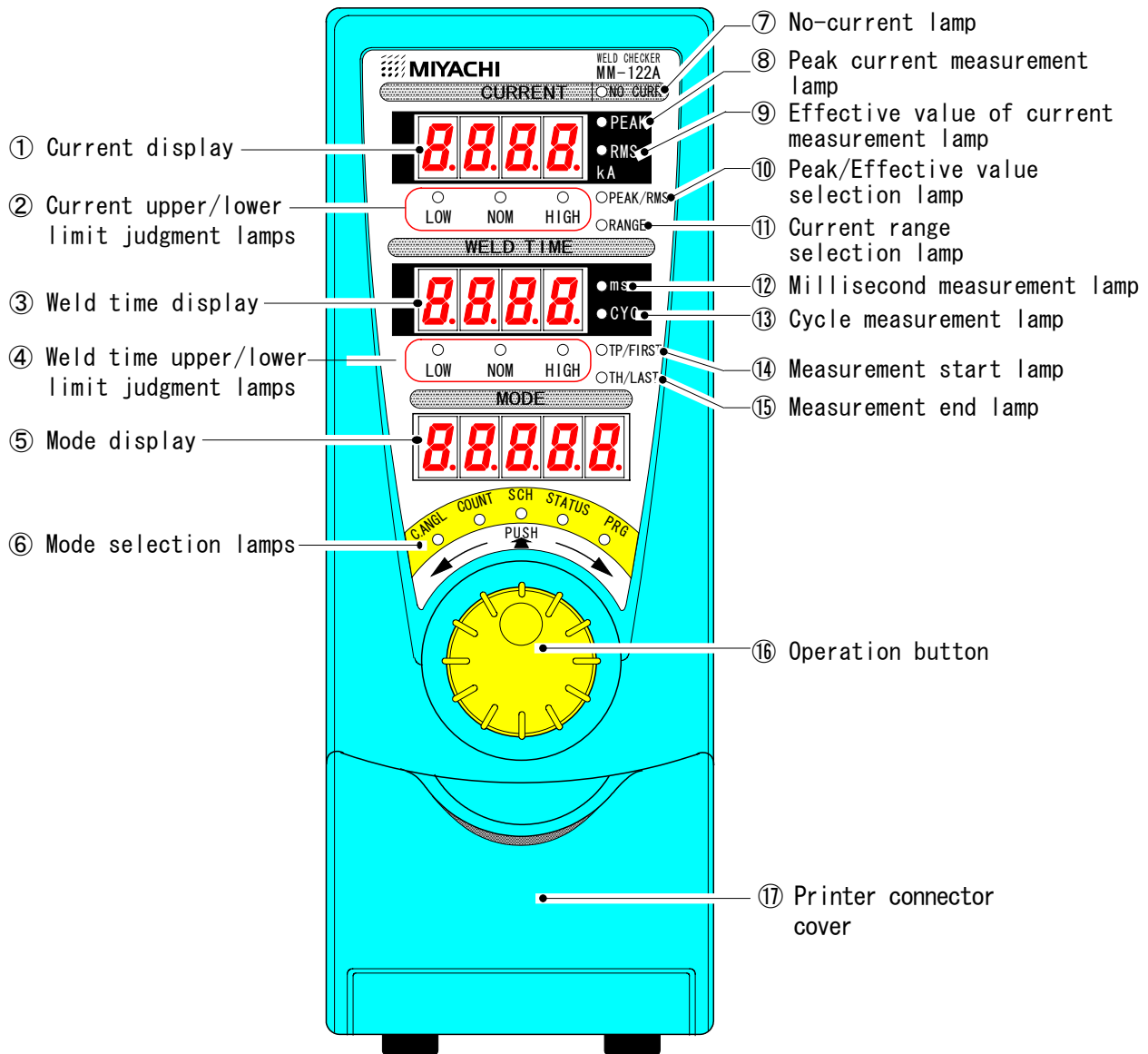
All operations are done with a switch. You don't need to select a desired switch to press among many switches on the panel.

- **Easy-to-see LED display**

Bright and clear 7-segment LED is employed. You can see characters on the display clearly from any angle.

3. Name and Functions of Each Section

(1) Front



① Current display

Displays the measurement results of the current and the set value for the current upper/lower limit judgment.

② Current upper/lower limit judgment lamps

Indicates the result of the current upper/lower limit judgment. There are three lamps, HIGH, NORMAL and LOW.

HIGH lamp (red) lights up	When the measured current is higher than upper limit.
NORMAL lamp (green) lights up	When the measured current is the upper limit or lower and the lower limit or higher.
LOW lamp (red) lights up	When the measured current is lower than lower limit.

When the green lamp (NORMAL) lights up, the [GOOD] signal is output.

When the red lamp (HIGH or LOW) lights up, the [NG] signal is output.

③ Weld time display

Displays the weld time of the welding current and the set time for the upper/lower limit judgment of the weld time. The unit for the weld time is cycle or ms.

④ Weld time upper/lower limit judgment lamps

Indicates the result of the weld time upper/lower limit judgment. There are three lamps, HIGH, NORMAL and LOW.

HIGH lamp (red) lights up	When the weld time is higher than upper limit.
NORMAL lamp (green) lights up	When the weld time is the upper limit or lower and the lower limit or higher.
LOW lamp (red) lights up	When the weld time is lower than lower limit.

When the green lamp (NORMAL) lights up, the [GOOD] signal is output.

When the red lamp (HIGH or LOW) lights up, the [NG] signal is output.

⑤ Mode display

Displays the setting items, such as conduction angle, schedule number and status.

⑥ Mode selection lamps

Data for the mode whose lamp is on is displayed on the mode display. Turn the operation button to select a mode. (See 6.(1).)

⑦ No-current lamp

Lights up when the welding current has not flowed (no-current), and the [NG] signal is output. To use the no-current judgment function, the [NO CURR] signal must be input. (See Interface, Pins 12 and 34 or Pins 10 and 11 in 4.(1).)

⑧ Peak current measurement lamp

Lights up when the peak current measuring mode is selected. When this lamp is on, the current is displayed as the peak value.

⑨ Effective value of current measurement lamp

Lights up when the effective value of current measuring mode is selected. When this lamp is on, the current is displayed as the effective value.

⑩ Peak/Effective value selection lamp

Lights up to select the current to be measured from peak and effective value in the program mode.

⑪ Current range selection lamp

Lights up to change the current range in the program mode.

⑫ Millisecond measurement lamp

Lights up when the weld time is measured in ms.

⑬ Cycle measurement lamp

Lights up when the weld time is measured in cycle.

⑭ Measurement start lamp

Lights up to set the measurement start cycle (or start time) in the program mode. (See 6.(2) ④.)

However, if this lamp is on in the capacitor welding current mode, the TP time is measured. (See 6.(4) ⑤.)

⑮ Measurement end lamp

Lights up to set the measurement end cycle (or end time) in the program mode. (See 6.(2) ④.)

However, if this lamp is on in the capacitor welding current mode, the TH time is measured. (See 6.(4) ⑤.)

⑯ Operation button

For all operations. This button can be pressed and turned right and left.

⑰ Printer connector cover

When this cover is opened toward you, the connector for connecting printer (25-pin, D-sub) appears. The optional dedicated printer can be connected to this connector.

(2) Rear

(Figure is on next page.)

① I/O connector

For input and output signals.

② Communication connector

The **MM-122A** can communicate with a personal computer by RS-232C or RS-485. Check the communication method before connecting. If the communication method is different from that on a personal computer, it causes malfunction. (For selecting RS-232C or RS-485, see 6.(4) ⑪.) The factory setting is RS-232C.

③ Toroidal coil connector

Connects to the toroidal coil for measurement of welding current.

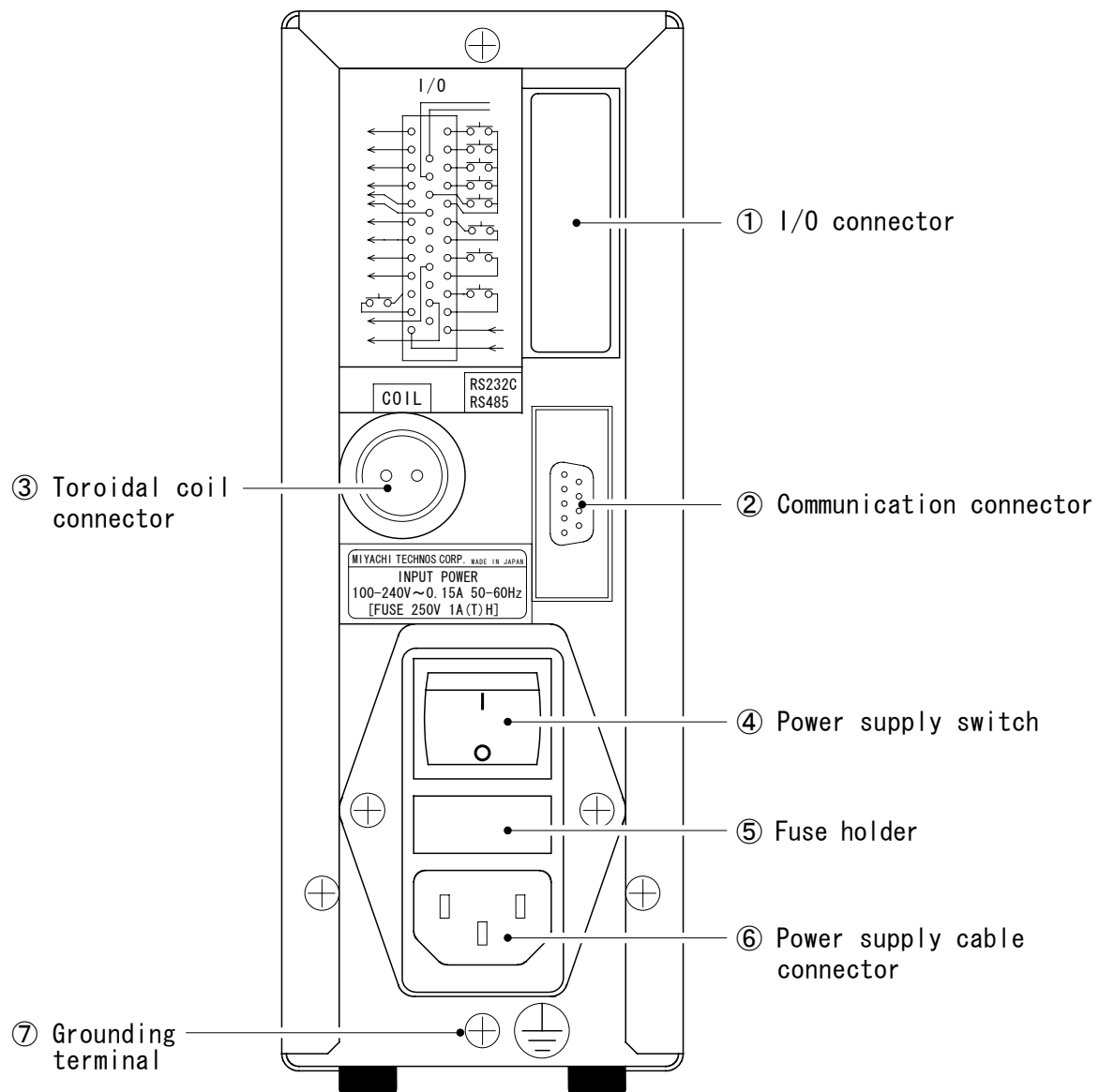
④ Power supply switch

Turns on/off the power supply when the AC power supply (100–240 V) is used.

⑤ Fuse holder

Has a fuse inside.

Fuse rating	250V, 1A, ϕ 5X20 mm (Time delay, High interrupting capacity)
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⑥ Power supply cable connector

Connects to the power supply cable (sold separately) when the AC power supply (100–240 V) is used.

⑦ Grounding terminal

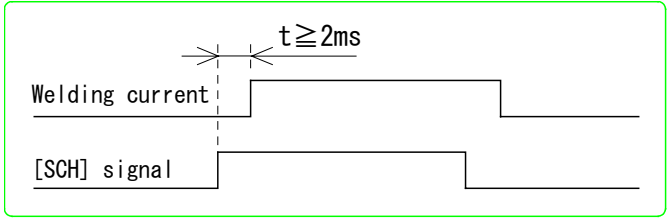
Use this terminal for grounding when the power supply cable with a grounding wire (sold separately) is not used. Be sure to ground the **MM-122A** before use.

4. Interface

(1) I/O Connector

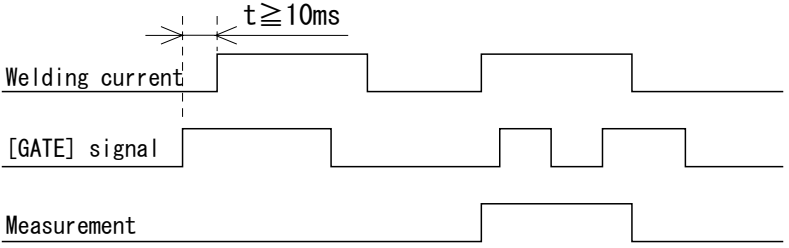
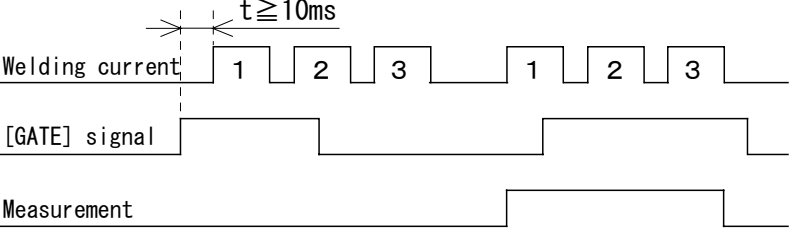
Description of each pin on the I/O connector.

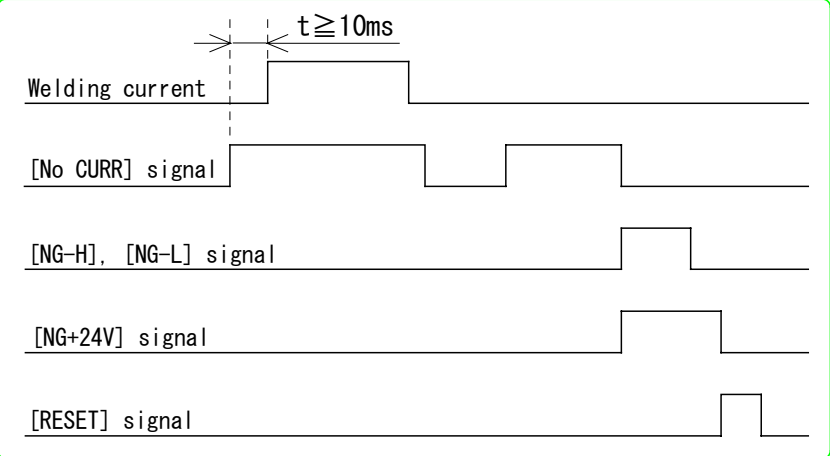
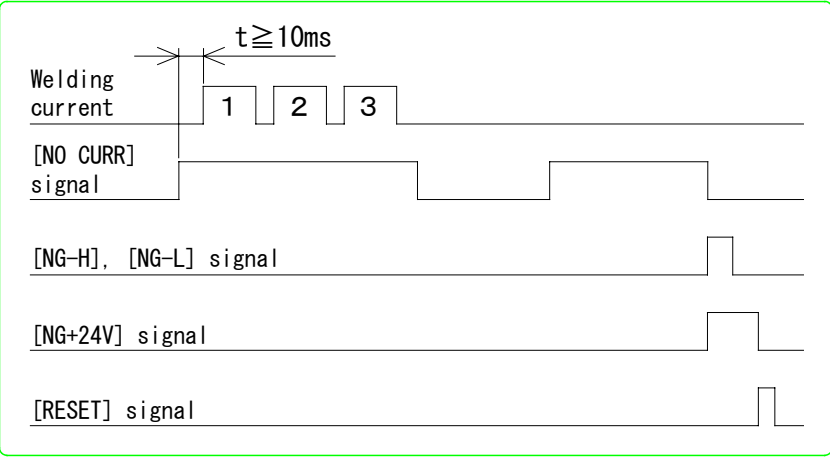
Input signal is explained as contact input.

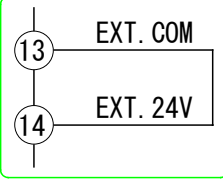
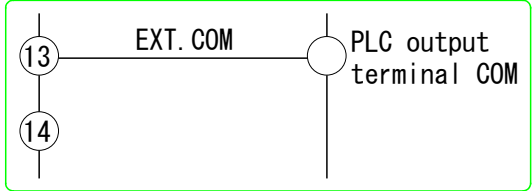
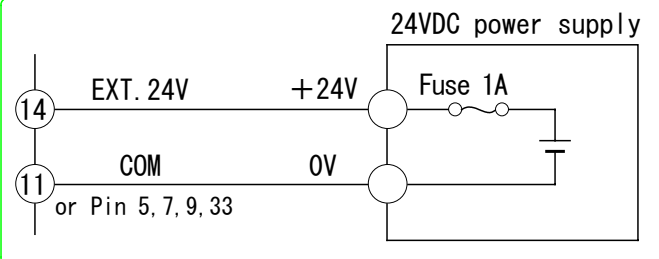
No.	I/O	Description
1	Input	<p>Select the schedule number by combining the pin numbers whose circuits are closed among Pins 1, 2, 3, 4 and 15. (See table below.)</p> <p>The schedule number selected by the I/O connector has priority over that set by the MM-122A. When selecting the schedule number by the operation button on the MM-122A, open the circuits of the Pins 1, 2, 3, 4 and 15.</p> <p>Input the Schedule select [SCH] signal at least 2 ms before the welding current flows. The schedule number cannot be changed during measurement.</p> <div style="text-align: center;">  </div>
2		
3		
4		

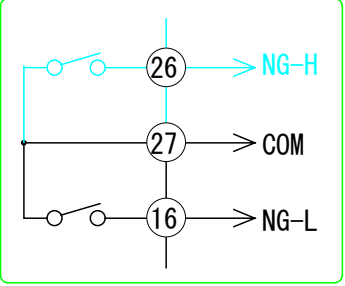
SCHNo. \ Pin No.	15	4	3	2	1
1					●
2				●	
3				●	●
4			●		
5			●		●
6			●	●	
7			●	●	●
8		●			
9		●			●
10		●		●	
11		●		●	●
12		●	●		
13		●	●		●
14		●	●	●	
15		●	●	●	●
16	●				

SCHNo. \ Pin No.	15	4	3	2	1
17	●				●
18	●			●	
19	●			●	●
20	●		●		
21	●		●		●
22	●		●	●	
23	●		●	●	●
24	●	●			
25	●	●			●
26	●	●		●	
27	●	●		●	●
28	●	●	●		
29	●	●	●		●
30	●	●	●	●	
31	●	●	●	●	●

No.	I/O	Description
5		Common terminal
6	Input	<ul style="list-style-type: none"> Input pin for the [RESET] signal. If a trouble occurs, rectify the trouble and close this circuit. The [NG] signals are turned off. (See Chapter 9 for fault codes.) If this circuit is closed when the [NG-L], [NG-H], [GOOD] or [NG+24V] signal is hold, the hold status is canceled. (See 6.(4) ⑫ for hold.) <p>Close at least for 2 ms and open.</p>
7		Common terminal
8	Input	<p>Input pin for the Measurement stop [GATE] signal. Measurement stops while this circuit is closed. When stopping the measurement, input the signal at least 10 ms before the welding current flows. Signals cannot be accepted during measurement (including pulsation measurement).</p> <p>【Single-stage welding】</p>  <p>【Pulsation welding】</p> 
9		Common terminal

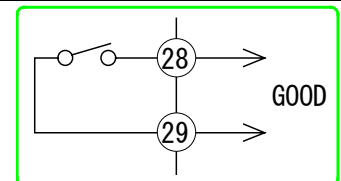
No.	I/O	Description
10	Input	<p>Input pin for the No-current detecting [NO CURR] signal. Close the circuit at least 10 ms before the welding current flows, and open it after the welding current flows. If the welding current doesn't flow while this circuit is closed, the no-current lamp lights up when the circuit is opened. (Pins 12 and 34 also detect no-current.)</p> <p>【Single-stage welding】</p>  <p>【Pulsation welding】</p> 
11		Common terminal
12	Input	<p>Pins 12 and 34 are input pins for the no-current detecting voltage. These are for detecting no-current by utilizing voltage. Input 24VAC or DC voltage at least 10 ms before the welding current flows, and stop inputting after the welding current flows. If the welding current doesn't flow while the voltage is input to this circuit, the no-current lamp lights up when the input of the voltage stops. When 24VDC or 24VAC is used for the power supply of the solenoid valve for weld force, the welding head can be driven by connecting this pin to the head. In that case, when the weld forcing is ceased, no-current is detected. (Pin 10 also detects no-current.)</p>

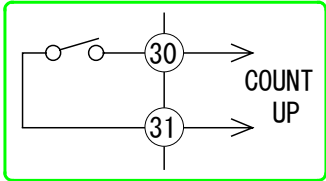
No.	I/O	Description
13		<p>Pins 13 and 14 are pins for the EXT.COM and the EXT.24V. Connect pins as follows:</p> <ul style="list-style-type: none"> When using contacts or NPN transistors (sink type) on a PLC as input signals to the I/O connector, connect Pins 13 and 14. When using PNP transistors (source type) on a PLC as input signals to the I/O connector, connect Pin 13 to the COM terminal of PLC.  
14		<ul style="list-style-type: none"> Pin 14 is the power supply input terminal when operating the MM-122A with 24VDC. <p>When using 24VDC power supply, connect +24 V to Pin 14; 0V to Pin 5, 7, 9, 11 or 33. Use more than 10-W power supply and be sure to install the overcurrent protective circuit (less than 1-A fuse). (See figure below.)</p> <p>When using 24VDC power supply, the power supply switch on the MM-122A doesn't work. Also, be sure to disconnect the power supply cable.</p> 
15	Input	<p>Select the schedule number by combining the pin numbers whose circuits are closed among Pins 1, 2, 3, 4 and 15. (See Pins 1 to 4 in 4.(1).)</p> <p>The schedule number selected by the I/O connector has priority over that set by the MM-122A. When selecting the schedule number by the operation button on the MM-122A, open the circuits of the Pins 1, 2, 3, 4 and 15.</p> <p>Input the Schedule select [SCH] signal at least 2 ms before the welding current flows. The schedule number cannot be changed during measurement.</p>

No.	I/O	Description
16	Output	<p>Pins 16 and 27 are output pins for the [NG-L] signal. (Contact capacity of semi-conductor relay: 24VDC, 20 mA) Function is switched by the setting of HL. (See 6.(4) ⑫.)</p>  <p>a HL1 and HLnc Close when the power supply is turned on.</p> <p>b HL2 and HLnc Close when the power supply is turned on. Open for the fixed time when the measured value is lower than the lower limit. (For the opened time, see 6.(4) ⑫.)</p> <p>c HL1 and HLno Open when the power supply is turned on.</p> <p>d HL2 and HLno Close for the fixed time when the measured value is lower than lower limit. (For the closed time, see 6.(4) ⑫.)</p>
17		Spare pin. Do not connect.
18		Spare pin. Do not connect.
19	Output	<p>Pins 19 and 21 are output pins for the [NG+24V] signal. Pin 19 is plus (+) terminal. Output capacity is 100 mA max.</p> <p>24VDC is output</p> <ul style="list-style-type: none"> • when the current is outside the upper/lower limit, • when the weld time is outside the upper/lower limit, and • when a trouble occurs. <p>24VDC relay and lamp can be turned on directly by the output power from this pin. When the [RESET] signal is input (when the Pins 6 and 7 are closed), the output stops. Also, pressing the operation button resets the Trouble signal.</p>
20		Spare pin. Do not connect.

No.	I/O	Description
21	Output	<p>Pins 19 and 21 are output pins for the [NG+24V] signal. Pin 21 is the COM terminal. Output capacity is 100 mA max.</p> <p>24VDC is output</p> <ul style="list-style-type: none"> • when the current is outside the upper/lower limit. • when the weld time is outside the upper/lower limit. • when a trouble occurs. <p>24VDC relay and lamp can be driven directly by the output power from this pin. When the [RESET] signal is input (when the Pins 6 and 7 are closed), the output stops. Also, pressing the operation button resets the Trouble signal.</p>
22		Spare pin. Do not connect.
23		Common terminal for Pins 24 and 25.
24	Output	<p>Pin 24 is output pin for the Current waveform [CURR SIG] signal. This is for viewing the current waveform with oscilloscope. This signal level is not calibrated. Output power is</p> <ul style="list-style-type: none"> • approx. 50 kA/V in 199.9 kA range, • approx. 5 kA/V in 19.99 kA range, and • approx. 0.5 kA/V in 1.999 kA range. <p>Output impedance is 1 kΩ.</p>
25		<p>Pin 25 is output pin for the Trigger [TRIG SIG] signal. This is used as the trigger for starting measurement when viewing the current waveform with oscilloscope. Output power is +5 V, and output impedance is 1 kΩ.</p>
26	Output	<p>Pins 26 and 27 are output pins for the [NG] or [NG-H] signal. Pin 27 is the COM terminal. (Contact capacity of semiconductor relay: 24VDC, 20 mA) Function is switched by the setting of HL. (See 6.(4) ⑫.)</p> <div data-bbox="1034 1346 1385 1632" data-label="Diagram"> </div> <p>a HL1 and HLnc</p>
27		<p>Factory setting. Close when the power supply is turned on and open for the fixed time at the following situation. (For the opened time, see 6.(4) ⑫.)</p> <ul style="list-style-type: none"> • When the measurement result is higher than the upper limit or lower than lower limit. • When judged as no-current. • When CCCC or EEEE is displayed. <p>Also, Pins 26 and 27 are opened until they are reset when a trouble (Memory trouble, Low battery or 24VDC overcurrent) occurs.</p>

No.	I/O	Description
26	Output	<p>b HL2 and HLnc Close when the power supply is turned on and open for the fixed time at the following situation. (For the opened time, see 6.(4) ⑫.)</p> <ul style="list-style-type: none"> When the measurement result is higher than the upper limit. When judged as no-current. When CCCC or EEEE is displayed. <p>Also, Pins 26 and 27 are opened until they are reset when a trouble (Memory trouble, Low battery or 24VDC overcurrent) occurs.</p>
		<p>c HL1 and HLno Close for the fixed time at the following situation. (For the closed time, see 6.(4) ⑫.)</p> <ul style="list-style-type: none"> When the measurement result is higher than the upper limit or lower than lower limit. When judged as no-current. When CCCC or EEEE is displayed. <p>Also, Pins 26 and 27 are closed until they are reset when a trouble (Memory trouble, Low battery or 24VDC overcurrent) occurs.</p>
27		<p>d HL2 and HLno Close for the fixed time at the following situation. (For the closed time, see 6.(4) ⑫.)</p> <ul style="list-style-type: none"> When the measurement result is higher than the upper limit. When judged as no-current. When CCCC or EEEE is displayed. <p>Also, Pins 26 and 27 are closed until they are reset when a trouble (Memory trouble, Low battery or 24VDC overcurrent) occurs.</p> <div style="border: 1px solid green; padding: 10px; margin-top: 10px;"> <p>Welding current</p> <p>Weld end judgment time</p> <p>Calculating time</p> <p>GOOD/NG signal output</p> </div>
28	Output	Pins 28 and 29 are output pins for the [GOOD] signal. (Contact capacity of semiconductor relay: 24VDC, 20 mA)
29		When the measured value is within the range of the upper/lower limit judgment function, Pins 28 and 29 are closed for the fixed time. (See 6.(4) ⑫ for the closed time.)

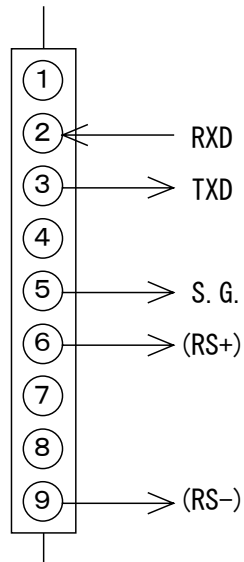


No.	I/O	Description
30	Output	<p>Pins 30 and 31 are output pins for the [COUNTUP] signal. (Contact capacity of semiconductor relay: 24VDC 20 mA)</p>  <p>【When the preset counter is used】 Closes when the count reaches the preset value. (See 6.(4) ③.)</p>
31		<p>【When the step-up counter is used】 Closes when the count of the last step ends. (See 6.(4) ⑥ and ⑦.)</p> <p>When the number of the welds exceeds its setting, the counter display blinks. When the Counter reset [COUNT RESET] signal is input, the counter is reset.</p>
32	Input	<p>Pin 32 is input for the [COUNT RESET] signal. When this circuit is closed, the counter is reset to 0.</p> <ul style="list-style-type: none"> When the [COUNTUP] signal is output, the counter becomes 0 and the [COUNTUP] signal stops. When the step-up function is used, the step-up counter becomes 0 and the step number is reset to 1. <p>(Pressing the operation button for one second when COUNT of the mode selection lamps is on also resets the counter.)</p>
33		Common terminal
34	Input	<p>Pins 12 and 34 are input pins for the no-current detecting voltage. These are for detecting no-current by utilizing voltage. Input 24VAC or DC voltage at least 10 ms before the welding current flows, and stop inputting after the welding current flows. If the welding current doesn't flow while the voltage is input to this circuit, the no-current lamp lights up when the input of the voltage stops. When 24VDC or 24VAC is used for the power supply of the solenoid valve for weld force, the welding head can be driven by connecting this pin to the head. In that case, when the weld forcing is ceased, no-current is detected. (Pin 10 also detects no-current.)</p>

(2) Communication Connector

The **MM-122A** can communicate with a personal computer by RS-232C or RS-485. Check the communication method before connecting. (See **6.(4) ⑪**.) If the communication method is different from that on a personal computer, it causes malfunction. The factory setting is RS-232C.

Caution: Signals of RS-232C use RXD, TXD and S.G. Signals of RS-485 use (RS+) and (RS-).



5. Connection

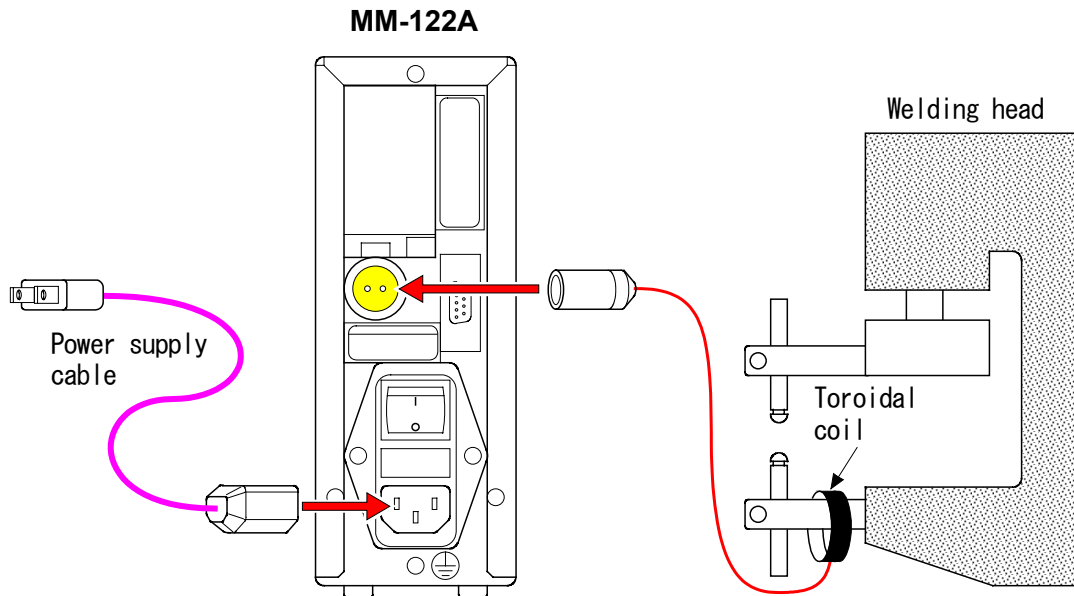
(1) Connecting the Power Supply

Connect the power supply cable to the power supply cable connector on the rear of the **MM-122A**. 100VAC to 240VAC power supply can be used.

Also, 24VDC power supply can be used. (See Pins 13 and 14 in **4.(1).**) When using 24VDC, do not connect the power supply cable.

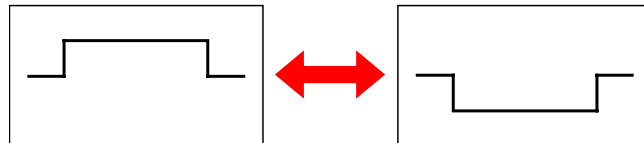
(2) Connecting the Toroidal Coil

Install the coil portion of the toroidal coil on the portion where the welding current flows such as the electrode holder and the secondary cable. Do not install it on the movable portion of the welding head. Installing it on the movable portion causes malfunction or breakage.



CAUTION

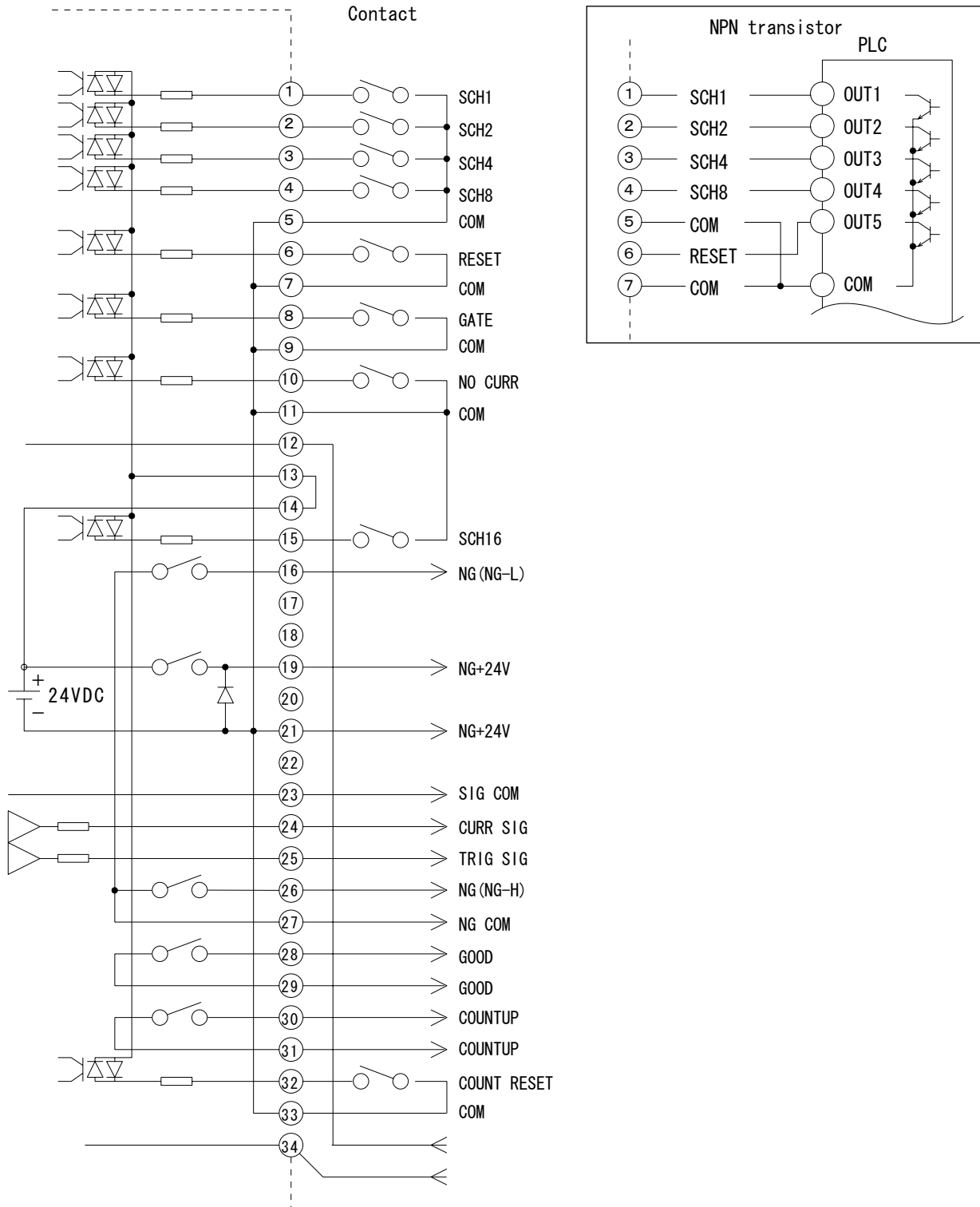
- If the toroidal coil is installed upside down, the waveform measured by the oscilloscope is displayed upside down as well.



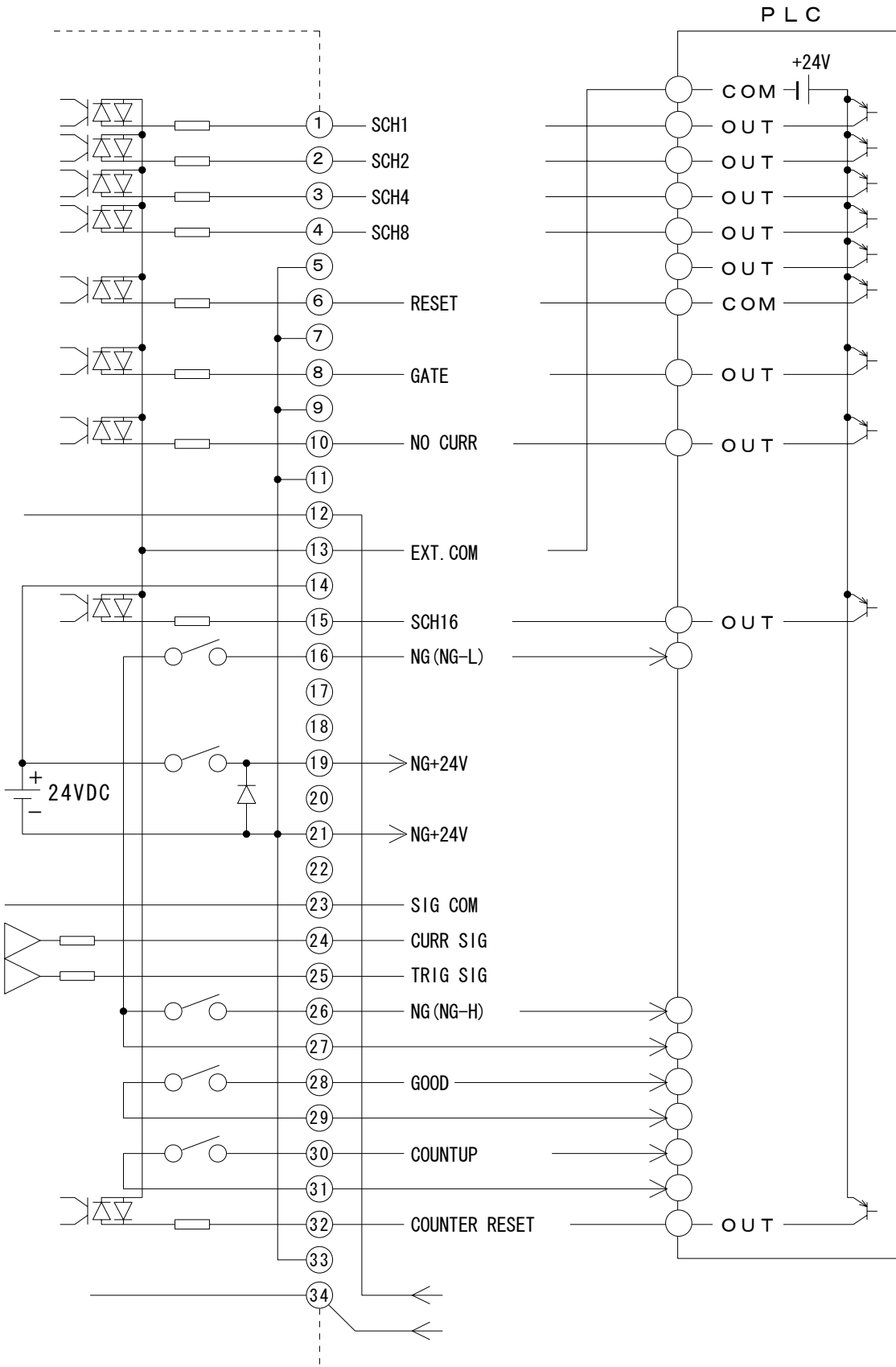
- Do not deform the band-type toroidal coil. Bending or straightening it over and over may break the inside wire.

(3) Connecting the I/O Connector

- ① When contact or NPN transistor (sink type) on a PLC is used as input signal.
(COM terminal is connected to chassis.)



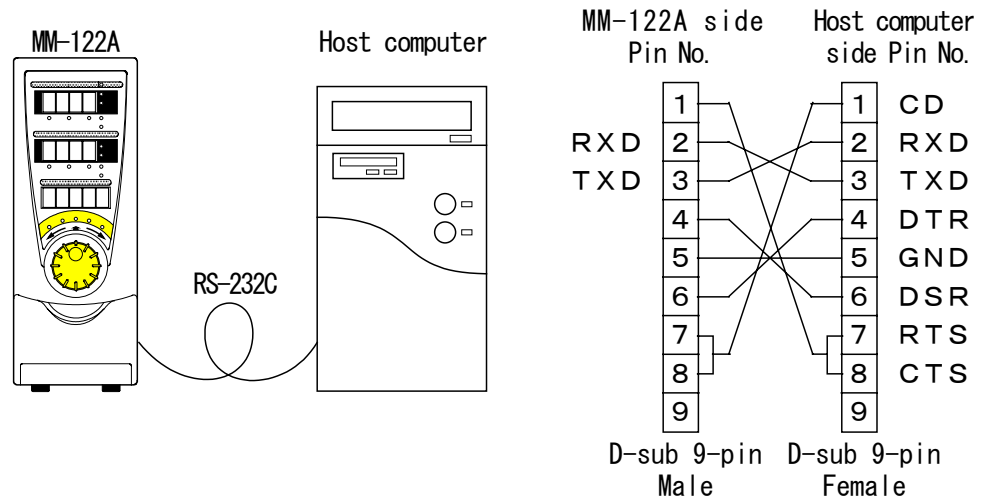
- ② When the PNP transistor (source type) on a PLC is used as input signal.
(COM terminal is connected to chassis.)



(4) Connecting the Communication Connector

① RS-232C

Signals of RS-232C use RXD, TXD and GND.

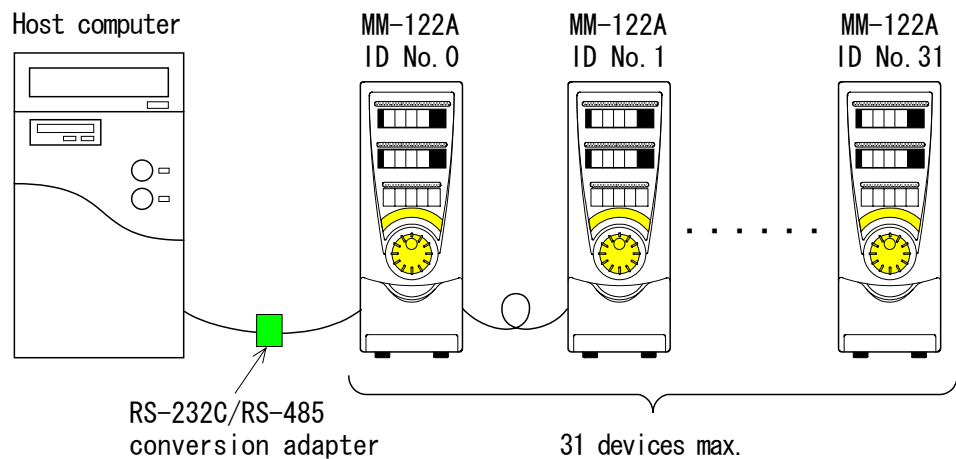


DTR and DSR are not used in **MM-122A**.
Also, CTS is not checked at the start of sending.

② RS-485

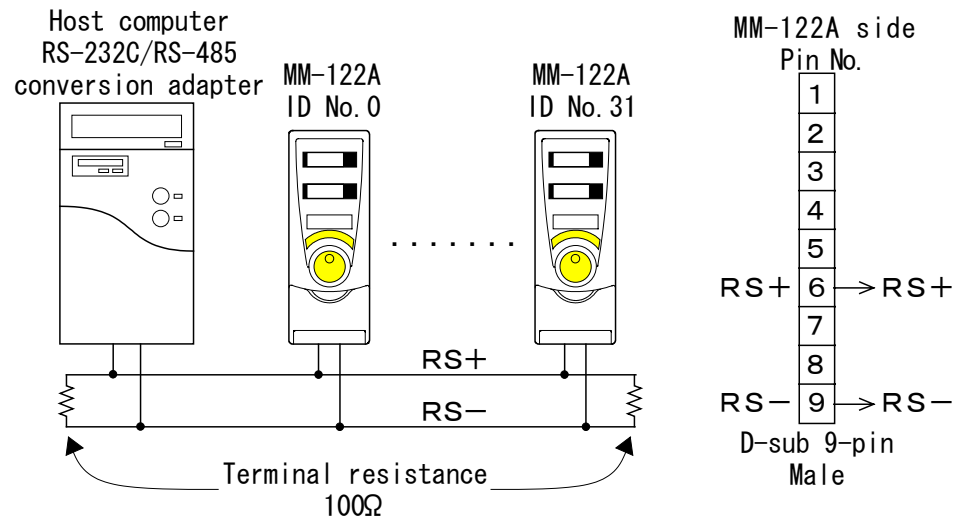
Signals of RS-485 use (RS+) and (RS-).

More than one **MM-122A** can be connected only when the communication method is set to "485Sy".



ATTENTION

- Do not assign one number to more than one device.
If one number is assigned to more than one device, data collision and inappropriate system operations may result.
- RS-232C/RS-485 conversion adapter is user provided.
- Mount 100 Ω of terminal resistance at the both ends of RS-485 cable (see figure on next page).



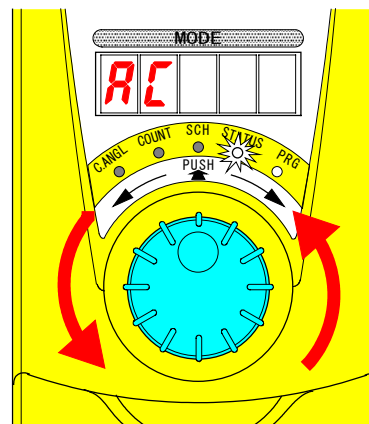
6. Basic Operation

(1) Mode

The **MM-122A** has the following five modes.

- ① C.ANGL (conduction angle)
- ② COUNT (count)
- ③ SCH (schedule)
- ④ STATUS (status)
- ⑤ PRG (program)

The mode selection lamp indicates the present mode. Use the operation button to switch the mode. Turn the operation button to turn on the lamp corresponding to the desired mode. The contents of display change depending on the selected mode.



Turn the operation button to select the mode to use.

① C.ANGL (conduction angle) Mode

Displays the conduction angle of the AC welding current.

The displaying range is 30 to 180 and the unit is degree. When the AC welding current is measured, the maximum conduction angle of the present welding is displayed on the mode display. In the single AC welding machine, the maximum applicable current flows when the conduction angle is displayed as 180 (degree).

② COUNT (count) Mode

Counts and displays the number of welds.

Functions as the preset counter and the step-up counter. (See 6.(4) ③ and ⑥.) When the operation button is pressed for one second with the number displayed, the counter is reset. However, the counter is not reset

- when the signal for the result of the upper/lower limit judgment ([NG-H], [NG-L], [GOOD]) is output by the OutHO method (see 6.(4) ⑫) and
 - when the [NG+24V] is output, and
- the signal output is turned off. Pressing the operation button again resets the counter.

The I/O connector also resets the counter.

③ SCH (schedule) Mode

The **MM-122A** can set 31 schedules of the upper/lower limit of the welding current and time. In this mode, the present schedule number and step count are displayed, and the schedule number and the step number to measure are set. Measurement cannot be made during setting.

How to change when STEP * is 0 (* See 6.(4) ⑫.)

- i) Turn the operation button to turn on the SCH of the mode selection lamps. The schedule number is displayed on the mode display.
- ii) Press the operation button. The number blinks.
- iii) Turn the operation button to display the desired schedule number.
- iv) Press the operation button. Blinking stops and setting is completed.

How to change when STEP * is 1 (* See 6.(4) ⑫.)

- i) Turn the operation button to turn on the SCH of the mode selection lamps. The schedule number and the step number are displayed on the mode display.



The left two places are the schedule number, and the rightmost number is the step number.

- ii) Press the operation button. The schedule number blinks.
- iii) Turn the operation button to select the desired schedule number.
- iv) Press the operation button to establish the schedule number. The step number blinks.
- v) Turn the operation button to select the desired step number.
- vi) Press the operation button to establish the step number. Blinking stops and the number turns on. Setting is completed.

However, the schedule number is not established

- when the signal for the result of the upper/lower limit judgment ([NG-H], [NG-L], [GOOD]) is output by the OutHO method (see 6.(4) ⑫) and
- when the [NG+24V] is output, and the signal output is turned off. Pressing the operation button again resets the counter.

The I/O connector also resets the counter. Priority is given to the selection by the I/O connector.

④ STATUS (status) Mode

Displays the types of the welding current to measure.

For details, see 6.(2).①.

⑤ PRG (program) Mode

Sets the various functions.

To input or change each setting, the **MM-122A** is required to be set in the program mode.

To set the **MM-122A** in the program mode,

i) Turn the operation button to turn on the PRG of the mode selection lamps.



ii) Press the operation button for one second while the PRG lamp is on.
Note that the mode is switched to the STATUS automatically when the operation button is not pressed in three seconds, even if the PRG lamp is turned on.



iii) When the operation button is pressed, all displays other than the PRG lamp are turned off, and the **MM-122A** is set in the program mode. Turn the operation button to select the desired setting item, and input or change the setting.

The PRG lamp is on during the program mode, in which measurement cannot be made.

(2) Preparation for Measurement

To measure the welding current, the following settings of ① to ④ are necessary. (To measure the peak value, the setting of ④ is unnecessary.)

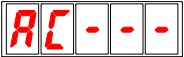






- ① Selecting the welding current to measure
- ② Peak and effective values of current
- ③ Current range
- ④ FIRST (measurement start time/measurement start cycle) and LAST (measurement end time/measurement end cycle)

① Selecting the Welding Current to Measure

Depending on the welding method, there are some types in the resistance welding power supply. Firstly, select the welding current to measure. There are eight types of the welding current that the **MM-122A** can select, including the difference in the display method of the weld time.

The type of the measured current selected here is common to 31 schedules.

Measurement method	Description	Unit
	Measures the single-phase AC welding current. The frequency is AC 50/60Hz, automatically selectable. (When using 24VDC power supply, set 50/60Hz manually.) The factory setting is AC.	Cycle (CYC)

Measurement method	Description	Unit
	Measures the AC inverter welding current. The right three places are for frequency, and the frequency is displayed as 'AC250'. The setting range is 50 to 250Hz. When measuring the Miyachi Technos AC inverter welding power supply, use 50, 53., 56., 59., 63., 67., 71., 77., 83., 91., 100, 111., 125, 143., 167., 200 or 250. (Values with decimal are the dedicated frequency. See vii) on next page.)	Cycle (CYC)
	Measures a welding current in an AC inverter welding machine.	ms (millisecond)
	Measures a welding current in a DC inverter welding machine.	Cycle (CYC)
	Measures a welding current in a DC inverter welding machine.	ms (millisecond)
	Stands for DC SHORT SHORT CURRENT. Used for measuring a welding current of a transistor.	ms (millisecond)
	Measures a welding current of a capacitor welding machine. The measurable time is 0.50 to 9.99ms.	ms (millisecond)
	Measures a welding current of a capacitor welding machine. The measurable time is 05.0 to 99.9ms.	ms (millisecond)

How to select

i) Turn the operation button to turn on the PRG of the mode selection lamps.



ii) Press the operation button for one second while the PRG lamp is on to set the **MM-122A** in the program mode.



iii) Turn the operation button left to turn on the STATUS. The present measurement method is displayed on the mode display.



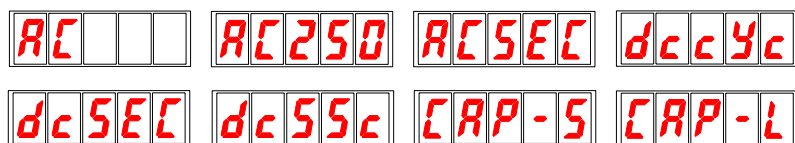
iv) Press the operation button.  is displayed on the mode display.



v) Press the operation button again. The present measurement method displayed on the mode display blinks.






vi) Turn the operation button to blinks the desired item.



↓

vii) Press the operation button to establish it. However, the additional setting item is displayed in the following cases.

- If the frequency is not detected automatically when  or  is selected (24VDC power supply is used), the item for selecting the frequency appears. Turn the operation button to select the desired frequency, and press the operation button to establish it.
- When  (not actual numerical value) is selected, the portion of numbers blinks.


The right three places indicate the frequency. (250Hz in the example above.) Firstly, the second and third places from the right blink. Turn the operation button to adjust the frequency. Secondly, the rightmost place blinks when the operation button is pressed. Adjust the frequency as well.

When setting the Miyachi Technos AC inverter welding power supply to 53, 56, 59, 63, 67, 71, 77, 83, 91, 111, 143 or 167 Hz, use the dedicated frequency registered in the **MM-122A**. The dedicated frequency is displayed when the number exceeds 250. A decimal follows the value. for example “53.” or “56.”.


When the setting of frequency is completed, press the operation button.

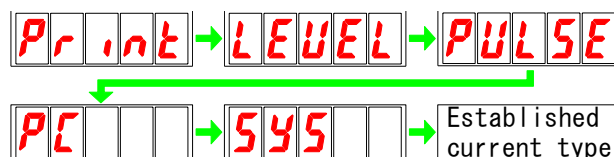
- When  or  is selected, the item for setting the non-measurement time appears.

The non-measurement time provides the time that the measurement is not made after measurement. This prevents the **MM-122A** from measuring the reset current after flowing the welding current particular to the capacitor welding machine.

 Display like the figure at left blinks on the mode display. The right two places indicate the non-measurement time. The setting range is 0.1 to 9.9 seconds. (0.1 seconds in the example above.) Turn the operation button to change the number, and press the operation button to establish it.

↓

viii) When the type of the current is established,  is displayed on the mode display. Turn the operation button right. The display is switched in the following order.




All displays other than the PRG lamp are turned off.

(If CAP-S or CAP-L is selected, PULSE is not displayed.)


↓


ix) Display is switched as figure above. Turn the operation button until all displays other than the PRG lamp are turned off.

- 
- x) Press the operation button for one second. The program mode is cancelled.








② Selecting Peak or Effective Value of Current

The welding current measured in the **MM-122A** can be displayed as the effective value or the peak value.





The value of the effective value display  Effective value from FIRST to LAST (See 6.(2) ④.)

The value of the peak value display  Maximum value from the welding current start to end. (However, it is required to select the stage of the welding current to measure in the multi-stage welding.)

How to select

- i) Turn the operation button to turn on the PRG of the mode selection lamps.
- 
- ii) Press the operation button for one second while the PRG lamp is on to set the **MM-122A** in the program mode.
- 
- iii) Turn the operation button to turn on the peak/effective value selection lamp (PEAK/RMS). The schedule number to set is displayed on the mode display.
- 
- iv) Press the operation button. Either of the peak current measurement lamp (PEAK) or the effective value of current measurement lamp (RMS) blinks.
- 
- v) Turn the operation button to blink either of the peak current measurement lamp (PEAK) or the effective value of current measurement lamp (RMS).
- 
- vi) When the operation button is pressed, blinking stops and setting is completed.
- 
- vii) Turn the operation button to turn on the PRG lamp only.
- 
- viii) Press the operation button for one second to cancel the program mode. Select the peak value or the effective value for each schedule number.

③ Selecting the Current Range

- i) Turn the operation button to turn on the PRG of the mode selection lamps.
- 
- ii) Press the operation button for one second while the PRG lamp is on to set the **MM-122A** in the program mode.
- 
- iii) Turn the operation button to turn on the current range selection lamp (RANGE).
- 
- iv) When the operation button is pressed, the number on the current display blinks. The schedule number to set is also displayed on the mode display.
- 

- v) Turn the operation button to select the current corresponding to your welding machine.

When the coil setting is 1 → Select from 1.999, 19.99 and 199.9 (kA).

When the coil setting is 10 → Select from 0.199, 1.999 and 19.99 (kA).

- vi) When the operation button is pressed, blinking stops and setting is completed.

- vii) Turn the operation button to turn on the PRG lamp only.

- viii) Press the operation button for one second to cancel the program mode. Select the current range for each schedule number.

④ Setting the Measurement Start Time (FIRST) and the Measurement End Time (LAST)

The **MM-122A** can specify the interval between the welding current start and end and measure its current.

When the measurement unit is CYC, → the current is measured in 0.5-cycle increment.

When the measurement unit is ms, → the current is measured in 1-ms increment.

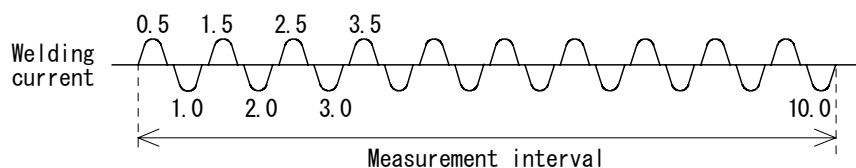
CAUTION

This setting doesn't function in the capacitor welding mode.

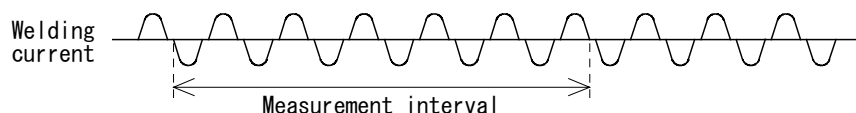
Example: When 10-cycle welding current is measured in AC welding machine

- To measure from start to end (the 10th cycle), set as follows:

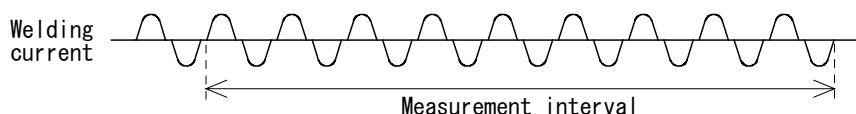
Measurement start time (FIRST) setting	0 or 0.5 cycle
Measurement end time (LAST) setting	10 cycle



- When setting FIRST to 1; LAST to 6.5,



- When setting FIRST to 1.5; LAST to 99.0,



Measurement ends when the welding current stops, even if LAST is set to 99.

How to set FIRST

- i) Turn the operation button to turn on the PRG of the mode selection lamps.
- ii) Press the operation button for one second while the PRG lamp is on to set the **MM-122A** in the program mode.
- iii) Turn the operation button to turn on the measurement start lamp (TP/FIRST). The setting is displayed on the weld time display. The schedule number to set is also displayed on the mode display.
- iv) Press the operation button. The rightmost place on the weld time display blinks.
- v) Turn the operation button to change the blinking number to the desired value.
- vi) Press the operation button to move the blinking place to the left. Set the desired measurement start time. When the operation button is pressed while the leftmost place is blinking, blinking stops and setting is completed.
- vii) Turn the operation button to turn on the PRG lamp only.
- viii) Press the operation button for one second to cancel the program mode.

How to set LAST

- i) Turn the operation button to turn on the PRG of the mode selection lamps.
- ii) Press the operation button for one second while the PRG lamp is on to set the **MM-122A** in the program mode.
- iii) Turn the operation button to turn on the measurement end lamp (TH/LAST). The setting is displayed on the weld time display. The schedule number to set is also displayed on the mode display.
- iv) Press the operation button. The rightmost place on the weld time display blinks.
- v) Turn the operation button to change the blinking number to the desired value.
- vi) Press the operation button to move the blinking place to the left. Set the desired measurement end time. When the operation button is pressed while the leftmost place is blinking, blinking stops and setting is completed.
- vii) Turn the operation button to turn on the PRG lamp only.
- viii) Press the operation button for one second to cancel the program mode.

(3) Upper/Lower Limit Judgment Function

The **MM-122A** is equipped with the upper/lower limit judgment function.

The upper/lower limit judgment function

Sets the range of the current and weld time for satisfactory welding in advance.

Judges whether the actually measured current and weld time is within the setting range.

- When the measured value is within the range
The [GOOD] signal is output, and the NOM of the current or weld time upper/lower limit judgment lamps lights up.
- When the measured value exceeds the upper limit
The [NG+24V] and the [NG-H] signals are output, and the HIGH of the current or weld time upper/lower limit judgment lamps lights up.
- When the measured value is less than the lower limit
The [NG+24V] and the [NG-L] signals are output, and the LOW of the current or weld time upper/lower limit judgment lamps lights up.

① Setting the Upper and Lower Limits of the Current

How to set the upper limit

- i) Turn the operation button to turn on the PRG of the mode selection lamps.
- ii) Press the operation button for one second while the PRG lamp is on to set the **MM-122A** in the program mode.
- iii) Turn the operation button to turn on the HIGH of the current upper/lower limit judgment lamps. The number on the current display is the upper limit. The schedule number to set is also displayed on the mode display.
- iv) Press the operation button. The rightmost place on the weld time display blinks.
- v) Turn the operation button to change the blinking number to the desired value.
- vi) Press the operation button to move the blinking place to the left. Set the desired value for all places. When the operation button is pressed while the leftmost place is blinking, blinking stops and setting is completed.
- vii) Turn the operation button to turn on the PRG lamp only.
- viii) Press the operation button for one second to cancel the program mode.

How to set the lower limit








- i) Turn the operation button to turn on the PRG of the mode selection lamps.
- ii) Press the operation button for one second while the PRG lamp is on to set the **MM-122A** in the program mode.
- iii) Turn the operation button to turn on the LOW of the current upper/lower limit judgment lamps. The number on the current display is the lower limit. The schedule number to set is also displayed on the mode display.
- iv) Press the operation button. The rightmost place on the weld time display blinks.
- v) Turn the operation button to change the blinking number to the desired value.
- vi) Press the operation button to move the blinking place to the left. Set the desired value for all places. When the operation button is pressed while the leftmost place is blinking, blinking stops and setting is completed.
- vii) Turn the operation button to turn on the PRG lamp only.
- viii) Press the operation button for one second to cancel the program mode.

② Setting the Upper and Lower Limits of the Weld Time

How to set the upper limit

- i) Turn the operation button to turn on the PRG of the mode selection lamps.
- ii) Press the operation button for one second while the PRG lamp is on to set the **MM-122A** in the program mode.
- iii) Turn the operation button to turn on the HIGH of the weld time upper/lower limit judgment lamps. The number on the weld time display is the upper limit. The schedule number to set is also displayed on the mode display.
- iv) Press the operation button. The rightmost place on the weld time display blinks.
- v) Turn the operation button to change the blinking number to the desired value.
- vi) Press the operation button to move the blinking place to the left. Set the desired value for all places. When the operation button is pressed while the leftmost place is blinking, blinking stops and setting is completed.
- vii) Turn the operation button to turn on the PRG lamp only.
- viii) Press the operation button for one second to cancel the program mode.

How to set the lower limit

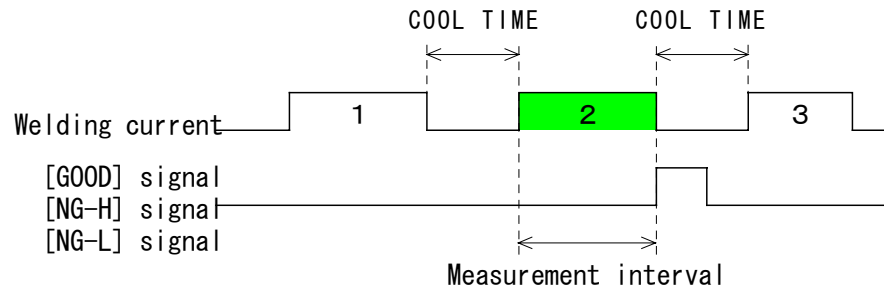
- i) Turn the operation button to turn on the PRG of the mode selection lamps.
- 
- ii) Press the operation button for one second while the PRG lamp is on to set the **MM-122A** in the program mode.
- 
- iii) Turn the operation button to turn on the LOW of the weld time upper/lower limit judgment lamps. The number on the weld time display is the lower limit. The schedule number to set is also displayed on the mode display.
- 
- iv) Press the operation button. The rightmost place on the weld time display blinks.
- 
- v) Turn the operation button to change the blinking number to the desired value.
- 
- vi) Press the operation button to move the blinking place to the left. Set the desired value for all places. When the operation button is pressed while the leftmost place is blinking, blinking stops and setting is completed.
- 
- vii) Turn the operation button to turn on the PRG lamp only.
- 
- viii) Press the operation button for one second to cancel the program mode.

(4) Other Settings

① Pulsation Measurement

More than one welding may be performed in one weld sequence. This welding method is called pulsation. In pulsation, the first welding is called the first stage, the second welding is the second stage, and so on.

With the pulsation measurement function of the **MM-122A**, you can measure the stage you selected, for example, the second stage only or the forth stage only (see below).



If the welding current doesn't reach the stage set in the pulsation measurement, the [NG+24V] signal and the [NG-H] signal are output.

CAUTION

Pulsation measurement cannot be used in the capacitor welding power supply.

COOL TIME

When measuring the pulsation welding, set the COOL TIME between weldings as follows:

Half cycle or
Weld end judgment time * \leq COOL TIME < 500ms

(* See 6.(4) ②.)

i) When measuring in CYC

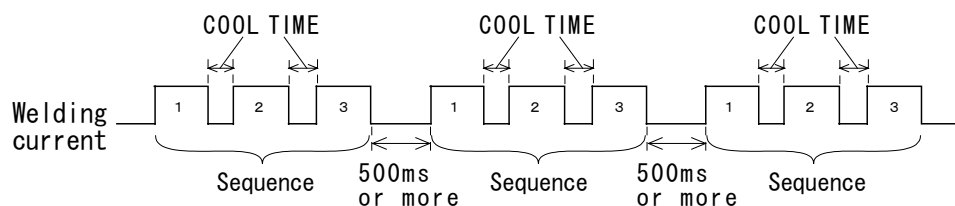
When the 50–250Hz AC welding current is measured and the welding current does not flow for half cycle or more, it is judged that the first-stage welding is finished. When applying the second-stage welding current, flow the welding current within 500ms.

ii) When measuring in ms

When measuring the weld time in ms, set the weld end judgment time. When the weld end judgment time has elapsed after the welding is finished, it is judged that the welding is finished. When it is set to 5ms, leave 5ms or more after the first-stage welding current has finished flowing and flow the second-stage welding current within 500ms.

Interval between sequences

In pulsation measurement, leave 500ms or more between sequences. When the interval is less than 500ms, it is judged as a single sequence.



Canceling the pulsation measurement

When the pulsation is set to 0, the pulsation measurement is cancelled. When the pulsation measurement is not used, leave the following time or more between weldings.

Weld end judgment time* + Processing time + Judgment output time

Time for processing the measured value

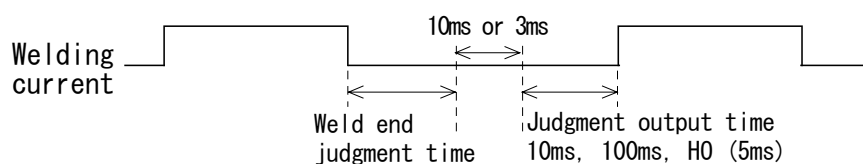
- When the current is dcSSC, CAP-S or CAP-L.....10ms
- Other currents.....3ms

Output time of the [GOOD] signal and the [NG] signal. 10ms, 100ms or HO is selectable. When HO is selected, the next welding current can be measured 5ms after the signal output.

Measurement unit of the weld time	Weld end judgment time *
CYC	Half cycle
ms	Setting

* See 6.(4) ② for the weld end judgment time.

Note that the next welding is not measured if the interval is short.



How to set

i) Turn the operation button to turn on the PRG of the mode selection lamps.



ii) Press the operation button for one second while the PRG lamp is on to set the **MM-122A** in the program mode.



iii) Turn the operation button to turn on the STATUS of the mode selection lamps.



iv) Press the operation button.  is displayed in the mode display.



v) Turn the operation button right to change the display on the mode display to **PULSE**.



vi) Press the operation button. The setting of the present pulsation is displayed on the mode display as **01-PO**.



vii) The blinking number of the left two places is the schedule number. Turn the operation button to set the schedule number (1–31).



viii) Press the operation button to establish the schedule number. The rightmost number blinks. This is the number of pulses of the welding current.



ix) Turn the operation button to set the number of stages (0–9).



x) Press the operation button to establish the number of stages (*). Display on the mode display returns to **PULSE** and setting is completed.

However, when measuring the weld time in ms, the display for setting the weld end judgment time appears after pressing the operation button to establish the number of stages (see * above), without returning to

PULSE.

Set the weld end judgment time, and then press the operation button again. (See 6.(4) ②.)



xi) Turn the operation button to turn on the PRG lamp only.



xii) Press the operation button for one second to cancel the program mode.

② Setting the Weld End Judgment Time (in ms measurement only)

When measuring the weld time in ms, the setting of the weld end judgment time is necessary. If the current doesn't flow for the time set here, it is judged that the welding is finished.

When measuring the weld time in CYC	Half cycle fixed
When measuring the weld time in ms	The weld end judgment time can be set as you desire. The setting range is 1 to 99ms and the initial setting is 1ms. However, if the dcSSc is selected for the type of the measured current, the settable time is 0.1 to 9.9ms and the initial setting is 0.1ms.

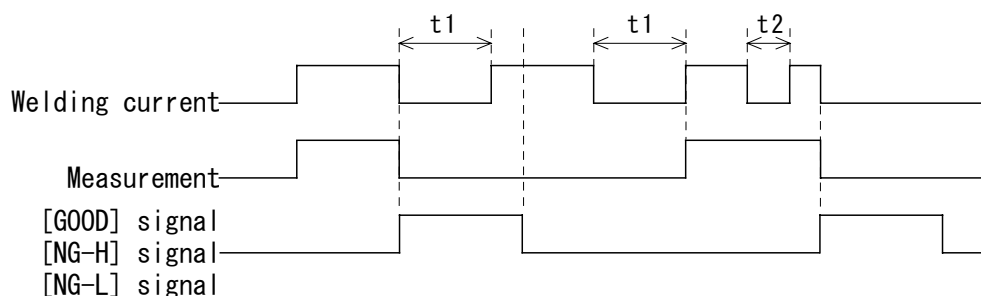
The time setting is common to 31 schedules.

【Example】

{ Weld end judgment time = 5ms
 { t1 = 10ms
 { t2 = 4ms

When the items are set as above, it is judged that the welding ends in t1 and the welding continues in t2.

Also, measurement is not done during judgment output. (See below.)



How to set

i) Turn the operation button to turn on the PRG of the mode selection lamps.



ii) Press the operation button for one second while the PRG lamp is on to set the **MM-122A** in the program mode.



iii) Turn the operation button to turn on the STATUS of the mode selection lamps.



iv) Press the operation button. **Cur** is displayed in the mode display.



v) Turn the operation button to change the display on the mode display to **PULSE**.



vi) Press the operation button. The setting of the present pulsation is displayed on the mode display as **01-PO**.



vii) Press the operation button. The weld end judgment time is displayed as **0001**.



viii) Press the operation button to change the weld end judgment time (the right two places). The setting range is 01–99 ms or 0.1–9.9 ms.



ix) Press the operation button to establish the weld end judgment time. The display on the mode display returns to **PULSE** and the setting is completed. When setting again, press the operation button and repeat the operation above.



x) Turn the operation button right to turn on the PRG lamp only.



xi) Press the operation button for one second to cancel the program mode.

③ Setting the Preset Counter

The **MM-122A** has the preset counter function. The counter proceeds by 1 when the measurement results of both the current and the weld time are within the upper/lower limit. When the value of the counter reaches the setting, the display blinks and the [COUTNTUP] signal is output. The preset counter is common to 31 schedules. The maximum value of the counter is 99999. Values more than 99999 are displayed as 99999.

How to set

i) Turn the operation button to turn on the PRG of the mode selection lamps.



ii) Press the operation button for one second while the PRG lamp is on to set the **MM-122A** in the program mode.



iii) Turn the operation button to turn on the COUNT of the mode selection lamps. Five-digit number is displayed on the mode display. This is the present preset value.



iv) Press the operation button. The rightmost place on the mode display blinks.



v) Turn the operation button to change the blinking number to the desired value.



vi) Press the operation button to move the blinking place to the left. Set the desired value in all places. When the operation button is pressed while the leftmost place is blinking, blinking stops and setting is completed.



vii) Turn the operation button to turn on the PRG lamp only.



viii) Press the operation button for one second to cancel the program mode.

④ Selecting the Schedule Number in the Program Mode

31 of judgment schedule can be set with the program mode as well as the schedule mode. When setting the upper limit and the lower limit, make sure that the desired schedule number has been set.

How to select

i) Turn the operation button to turn on the PRG of the mode selection lamps.



ii) Press the operation button for one second while the PRG lamp is on to set the **MM-122A** in the program mode.



iii) Turn the operation button to turn on the SCH of the mode selection lamps. The schedule number is displayed on the mode display.



iv) Press the operation button. The number blinks.



v) Turn the operation button to display the desired number.



vi) Press the operation button. Blinking stops and selecting is completed.



vii) Turn the operation button to turn on the PRG lamp only.

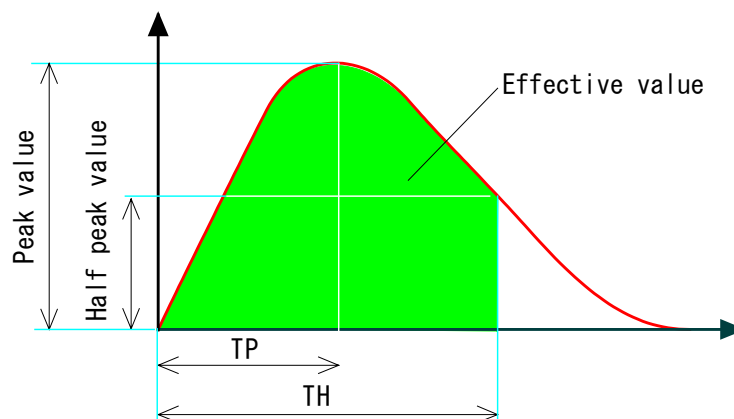


viii) Press the operation button for one second to cancel the program mode.

⑤ Selecting TP/TH (in the capacitor welding mode only)

When measuring the capacitor welding current, it is required to select the measured time from TP or TH.

TP (TIME PEAK)	Time duration from the time the welding current starts flowing to the time at max. value
TH (TIME HALF)	Time duration from the time the welding current starts flowing to the time the current decreases to half of the max. value



In the effective current measurement, the effective value over the TH is displayed.

How to select

- i) Turn the operation button to turn on the PRG of the mode selection lamps.
- ↓
- ii) Press the operation button for one second while the PRG lamp is on to set the **MM-122A** in the program mode.
- ↓
- iii) Turn the operation button to turn on the measurement start lamp (TP/FIRST) or the measurement end lamp (TH/LAST). The lamp set presently lights up.
- ↓
- iv) Press the operation button. The measurement start lamp (TP/FIRST) or the measurement end lamp (TH/LAST) blinks. The present schedule number is also displayed on the mode display.
- ↓
- v) Select the measurement time. Turn the operation button to blink the desired lamp, TP (the measurement start lamp) or TH (the measurement end lamp).
- ↓
- vi) When the operation button is pressed, blinking stops and selecting is completed.
- ↓
- vii) Turn the operation button to turn on the PRG lamp only.
- ↓
- viii) Press the operation button for one second to cancel the program mode.

⑥ Setting the Step-up Counter

When using the step-up function on the welding machine, set the step-up counter of the **MM-122A**. When the step count is increased, the value of the upper/lower limit judgment is switched.

- Set the same step-up counter (step count and weld count) with the welding machine.
The setting range is as follows:
Step count: 1–9
Weld count: 0–9999
The weld count set for each step is common to 31 schedules.
- The step-up counter proceeds by 1 regardless of the result of the upper/lower limit judgment. (However, the counter doesn't proceed by 1 in the no-current status.)
- To use the step-up counter, turn on the step-up counter in advance. (See **6.(4) ⑫.**)

How to select

CAUTION

The step-up function cannot be used in the transistor welding mode and the capacitor welding mode.

i) Turn the operation button to turn on the PRG of the mode selection lamps.



ii) Press the operation button for one second while the PRG lamp is on to set the **MM-122A** in the program mode.



iii) Turn the operation button to turn on the COUNT of the mode selection lamps. Five-digit number is displayed on the mode display.



There is a decimal point at the leftmost number. This shows the step count. Four digits on the right of the decimal point is the weld count.



iv) Press the operation button. The leftmost step count blinks.



v) Turn the operation button to select the desired step count.



vi) Press the operation button to establish the step count. The rightmost number blinks.



vii) Set the weld count (the number of welds) for the step set above. Turn the operation button to select the number. When the operation button is pressed, the number is established and the blinking place is moved to the left. Repeat this operation to establish four places.



viii) When the second place from the left is blinking, blinking stops and setting is completed.



ix) When the operation button is pressed again, the leftmost step count blinks. Select the next step count and set the weld count for the step.



x) Turn the operation button to turn on the PRG lamp only.



xi) Press the operation button for one second to cancel the program mode.

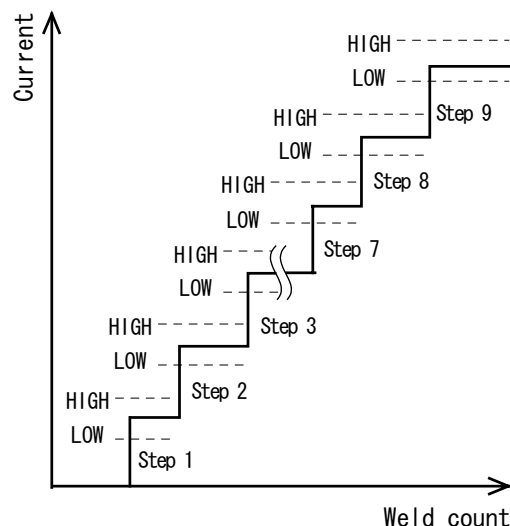
⑦ Setting the Upper/Lower Limit Judgment when Using the Step-up

To use the step-up counter described in ⑥, the current upper/lower limit must be set in advance.

In the **MM-122A**, 31 schedules can be registered in total.

When setting the upper limit and the lower limit, make sure that the desired schedule number and step count has been set.

The setting of the measurement start time, the measurement end time and the weld time upper/lower limit are common to 1–9 steps.



How to select

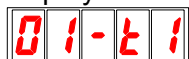
- i) Turn the operation button to turn on the PRG of the mode selection lamps.



- ii) Press the operation button for one second while the PRG lamp is on to set the **MM-122A** in the program mode.



- iii) Turn the operation button to turn on the SCH of the mode selection lamps. The schedule number and the step count are displayed on the mode display.



The left two places are the schedule number, and the rightmost number is the step count.



- iv) Press the operation button. The schedule number is displayed blinking.



- v) Turn the operation button to select the desired schedule number.



- vi) Press the operation button to establish the schedule number. The step count blinks.



- vii) Turn the operation button to select the desired step count.



- viii) Press the operation button to establish the step count. Blinking stops and setting is completed.

When turning the operation button, you can go to the setting items for the measurement start time and the measurement end time (see **6.(2) ④**), and the weld time upper/lower limit and the welding current upper/lower limit (see **6.(3) ①** and **②**).

When the step count is 2–9, the items for the measurement start time, the measurement end time, the weld time upper/lower limit and the peak effective value selection are not displayed. The setting for step 1 is applied.




- ix) Turn the operation button to turn on the PRG lamp only.



- x) Press the operation button for one second to cancel the program mode.

⑧ Checking the Setting

Press the operation button twice (within 0.5ms) to check the present setting and the current measured previously. If the welding current flows during this status, the **MM-122A** returns to the measurement operation. The settings other than this can be checked in the program mode.

When the operation button is turned, the display of the **MM-122A** is switched in the order of .

i) When the operation button is pressed twice (within 0.5ms), only the schedule number is displayed.



ii) The peak current measurement lamp (PEAK) lights up. The peak current measured previously is also displayed on the current display. (If the peak current has not been measured, 0000 is displayed.)



iii) The effective value of current measurement lamp (RMS) lights up. The effective value of current measured previously is also displayed on the current display. (If the effective value of current has not been measured, 0000 is displayed.)



iv) The LOW of the current upper/lower limit judgment lamps lights up. The lower limit of the current for the schedule number displayed presently is also displayed on the current display. (The initial setting is 00.00.)



v) The HIGH of the current upper/lower limit judgment lamps lights up. The upper limit of the current for the schedule number displayed presently is also displayed on the current display. (The initial setting is 19.99.)



vi) The LOW of the weld time upper/lower limit judgment lamps lights up. The lower limit of the weld time for the schedule number displayed presently is also displayed on the current display. (The initial setting is 000.0.)



vii) The HIGH of the weld time upper/lower limit judgment lamps lights up. The upper limit of the weld time for the schedule number displayed presently is also displayed on the current display. (The initial setting is 100.0.)



viii) The measurement start lamp lights up. The setting of measurement start for the schedule number displayed presently or the time of TP measured previously is also displayed on the current display. (In the capacitor welding current measurement mode, the measured value of TP time is displayed. In other measurement modes, the measurement start setting is displayed.)



ix) The measurement end lamp lights up. The setting of measurement end for the schedule number displayed presently or the time of TH measured previously is also displayed on the current display. (In the capacitor welding current measurement mode, the measured value of TH time is displayed. In other measurement modes, the measurement end setting is displayed.)

⑨ Setting the Trigger Level

When the welding current flows, the **MM-122A** measures it automatically. However, the **MM-122A** may malfunction due to the influence of noise or conditions of the welding current. For example, the **MM-122A** doesn't measure the current even if it is flowing or the **MM-122A** starts measurement even if the current is not flowing. When the welding current is with upslope, the weak current at the beginning of flow is not detected, and the **MM-122A** may measure the weld time shorter than the actual weld time. These troubles may be resolved by changing the trigger level.

How to select

- i) Turn the operation button to turn on the PRG of the mode selection lamps.



- ii) Press the operation button for one second while the PRG lamp is on to set the **MM-122A** in the program mode.




- iii) Turn the operation button left to turn on the STATUS of the mode selection lamps.



- iv) Press the operation button.  is displayed in the mode display.



- v) Turn the operation button right to change the display on the mode display to .




- vi) When the operation button is pressed, the trigger level set presently blinks. The initial setting is 90.



- vii) Turn the operation button to change the value of the trigger level. The setting range is 01 to 99. When the value is increased, the sensitivity rises. Note that too high setting of the sensitivity causes malfunction. The welding current can be measured during setting the trigger level. Repeat measurement to set the value so that the **MM-122A** doesn't malfunction or measures normally.



- viii) When the operation button is pressed, the trigger level is established. The display on the mode display returns to .



- ix) Turn the operation button right to turn on the PRG lamp only.



- x) Press the operation button for one second to cancel the program mode.

⑩ Connecting and Setting the Printer

Printer (sold separately) can be connected to the **MM-122A**. Connect the connecting cable to the 25-pin D-SUB connector that is mounted beyond the printer connector cover. (Do not touch the black connector under the printer connector.) Measurement cannot be made during printout.

How to set

i) Turn the operation button to turn on the PRG of the mode selection lamps.



ii) Press the operation button for one second while the PRG lamp is on to set the **MM-122A** in the program mode.



iii) Turn the operation button left to turn on the STATUS of the mode selection lamps.



iv) Press the operation button. is displayed in the mode display.



v) Turn the operation button right to change the display on the mode display to .



vi) When the operation button is pressed, the printer status set presently blinks. The initial setting is OFF.




vii) Turn the operation button to select the desired setting from the following five items:

	Printer doesn't operate. The factory setting is OFF.
	Prints the measured value after measuring the welding current.
	Prints the measured value, after current measurement, for every half cycle or every 1ms. <ul style="list-style-type: none"> • when it is outside the setting range of the upper/lower limit judgment, • when it is judged as no-current, and • when the current has not flowed to the set stage during the pulsation measurement.
	Prints the effective value (This doesn't function when the type of current is set to dcSSc, CAP-S or CAP-L.)
	Prints the value of the schedule setting.

When SCH is selected, is displayed on the mode display. The right two blinking places indicate the schedule number. Turn the operation button to select the schedule number you want to print. The number (1–31) or can be selected. indicates all setting schedules from 1 to 31.

When the desired schedule number is established, press the operation button. Printout starts. (For details, see **7. Printout Example.**)

When canceling the printout, press the operation button.

viii) When the operation button is pressed, the display returns to .

ix) Turn the operation button right to turn on the PRG lamp only.

x) Press the operation button for one second to cancel the program mode.

⑪ RS-232C/RS-485 Communication

Data can be sent to a personal computer through the communication connector on the rear. The communication method can be selected from RS-232C and RS-485. For the communication protocol, see **8. Data Communication.**

CAUTION

The connector on the **MM-122A** is used for both RS-232C and RS-485. Make sure of the setting of the communication method before connecting to a personal computer. Connecting with different communication method causes malfunction.


How to set

i) Turn the operation button to turn on the PRG of the mode selection lamps.

ii) Press the operation button for one second while the PRG lamp is on to set the **MM-122A** in the program mode.

iii) Turn the operation button left to turn on the STATUS of the mode selection lamps.

iv) Press the operation button.  is displayed in the mode display.

v) Turn the operation button right to change the display on the mode display to .

vi) When the operation button is pressed, the present communication setting is displayed. The initial setting is OFF.

vii) Turn the operation button to select the desired communication method from the following five items:

	Communication is not done. The factory setting is OFF.
	Communicates by RS-232C. Outputs the measured data after measuring the welding current. Measuring is not made during data output. Required time for output { 9600bps: 86ms 19200bps: 60ms
	Communicates by RS-232C. Schedule can be input when measurement is not made. Schedule data input/output cannot be done during measurement. Required time for output { 9600bps: 1200ms 19200bps: 690ms
	Communicates by RS-485. Outputs the measured data after measuring the welding current. Measuring is not made during data output. Required time for output { 9600bps: 86ms 19200bps: 60ms
	Communicates by RS-485. Schedule can be input when measurement is not made. Schedule data input/output cannot be done during measurement. Required time for output { 9600bps: 1200ms 19200bps: 690ms

viii) Turn the operation button to select the desired transmission rate from the following two types:

	Transmission rate is set to 9600bps.
	Transmission rate is set to 19200bps.

ix) If or is selected in vii), the display is changed to . This is the ID number when connecting more than one **MM-122A** to a personal computer. (Plural Weld Checkers can be connected with RS-485 only.) Turn the operation button to change the value. When using one **MM-122A**, leave the value 01 as it is.

x) When the operation button is pressed, the communication method is established. The display on the mode display returns to

xi) Turn the operation button right to turn on the PRG lamp only.

xii) Press the operation button for one second to cancel the program mode.

⑫ System Setting

i) Turn the operation button to turn on the PRG of the mode selection lamps.



ii) Press the operation button for one second while the PRG lamp is on to set the **MM-122A** in the program mode.



iii) Turn the operation button left to turn on the STATUS of the mode selection lamps.



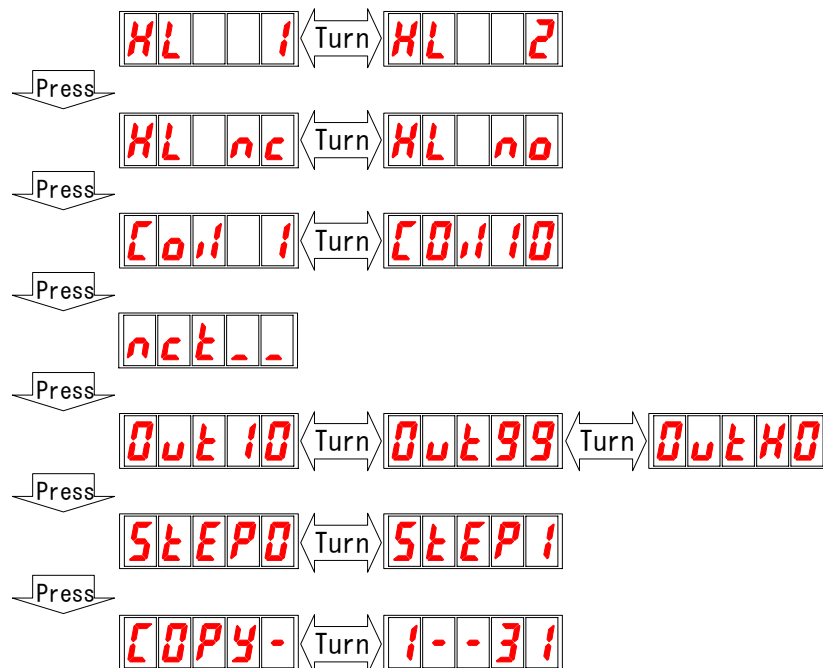
iv) Press the operation button. is displayed in the mode display.





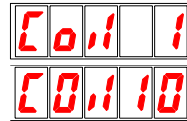
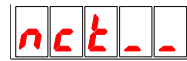
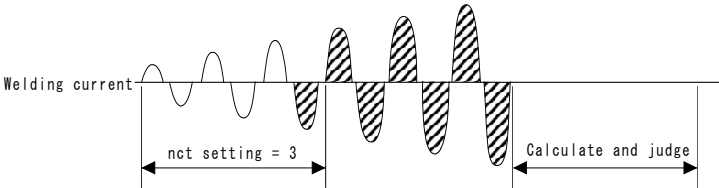
v) Turn the operation button right to change the display on the mode display to .

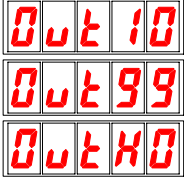
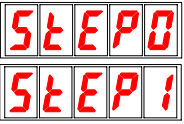
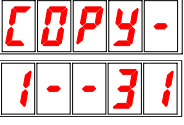


vi) Press the operation button. is displayed. ('-' indicates number.) Display changes as follows, depending on the operation of the operation button. Turn the operation button to change the setting. When the operation button is pressed, the setting becomes effective and the next setting item is displayed.



The contents of display are as follows:

	<p>HL1: When the measured value is outside the setting of the upper/lower limit judgment or a trouble occurs, the circuit of Pins 26 and 27 on the I/O connector is opened. (The factory setting is HL1.)</p> <p>HL2: When the measured value exceeds the setting of the upper limit judgment, the circuit of Pins 26 and 27 on the I/O connector is opened. When the measured value is lower than the setting of the lower limit judgment, the circuit of Pins 16 and 27 on the I/O connector is opened.</p>
	<p>HL nc: Pins 27–16 and –26 on the I/O connector are closed in normal status. When the measured value is outside the setting of the upper/lower limit judgment or a trouble occurs, the circuits are opened. (The factory setting is HL nc.)</p> <p>HL no: Pins 27–16 and –26 on the I/O connector are opened in normal status. When the measured value is outside the setting of the upper/lower limit judgment or a trouble occurs, the circuits are closed.</p>
	<p>When using a ten-time sensitivity toroidal coil for detecting the welding current, select Coil10. Use Coil1 normally. (The factory setting is Coil1.)</p>
	<p>Even if the current at the beginning of the flow is immeasurably small (this often occurs when upslope is used), the welding current can be measured as long as the measurable large current (shown by slanted line in figure below) is included in the time setting for [nct].</p>  <p>Setting range (The factory setting is 0.5.)</p> <p>CYC: 0.5–9.5CYC</p> <p>ms: 01–99 ms</p>

	<p>Changes the output times of the [GOOD] signal, the [NG-H] signal and the [NG-L] signal.</p> <ul style="list-style-type: none"> When Out10 is set, the output times of the [GOOD] signal, the [NG-H] signal and the [NG-L] signal become 10ms. The next current measurement cannot be made until the output ends. (The factory setting is Out10.) When Out99 is set, the output times of the [GOOD] signal, the [NG-H] signal and the [NG-L] signal become 100ms. The next current measurement cannot be made until the output ends. When OutHO is set, the [GOOD] signal, the [NG-H] signal and the [NG-L] signal continue outputting. To cancel the output, flow the next current or input the [RESET]. (Output can be cancelled by pressing the operation button as well.) The next measurement is possible at least 5ms after the [GOOD] or the [NG] signal is output.
	<p>Sets the step-up function on/off.</p> <p>0: Turns off the step-up function. 1: Turns on the step-up function. (The factory setting is StEP0.)</p>
	<p>Copies the value of Schedule 1 to Schedules 2–31.</p> <hr/> <p>How to operate</p> <p>When COPY- is displayed, turn the operation button right. The display changes to 1–31. When the operation button is pressed for more than one second, copying is finished and the display returns to SyS. If the operation button is pressed when COPY- is displayed, the schedule is not copied and the display returns to SyS.</p>

vii) Turn the operation button right to turn on the PRG lamp only.

viii) Press the operation button for one second to cancel the program mode.

⑬ Checking the Voltage of the Backup Battery

The **MM-122A** has a backup battery for its data storage. Note that the schedules are lost if the battery goes dead. When you want to replace the battery, consult Miyachi Technos Corp.

How to set

When the power supply switch is turned on, the voltage of the backup battery is displayed on the current display after all displays and lamps light up.

(Example)

Display when the voltage is 3.3V



When the voltage becomes 2.5V or less, a fault message is displayed.

7. Example Printout

The contents of printout change depending on the item set in **6.(4) ⑩**.

(1) on

Prints the measured value after measuring the welding current.

① When the measurement method is “AC”, “AC---” or “dccyc”

i) ↓	ii) ↓	iii) ↓	iv) ↓	v) ↓
COUNT	SCH	CURR kA	TIME CYC	ANG °
00001	01	3.73R	10.0	162
00002	02	5.35P	10.0	160

i) Counter	The contents of printout change depending on the setting for Step-up (see 6.(4) ⑫). OFF: Prints the present counts. ON: Prints the step number and the step counts. (Example 3-0015)
ii) Schedule No.	Prints the schedule number.
iii) Current	The effective value is followed by a character “R”. Also, the peak value is followed by a character “P”.
iv) Weld time	The unit is CYC or ms.
v) Conduction angle	Printed when the measurement method is “AC” or “AC---”.

② When the measurement method is “ACSEC” or “dcSEC”

i) ↓	ii) ↓	iii) ↓	iv) ↓
COUNT	SCH	CURR kA	TIME ms
00001	01	3.39R	197
00002	02	5.35P	197

See ① for description for each item.

③ When the measurement method is “dcSSc”

i) ↓	ii) ↓	iii) ↓	iv) ↓
COUNT	SCH	CURR kA	TIME ms
00001	01	3.68R	7.12
00002	02	5.06P	7.20

See ① for description for each item.

④ When the measurement method is "CAP-S" or "CAP-L"

i)	ii)	iii)	iv)
COUNT	SCH	CURR kA	TIME ms
00001	01	4.06R	3.27 ^T _P
00002	02	5.13P	3.12 ^T _H

i) Counter	Prints the present counts.
ii) Schedule No.	Prints the schedule number.
iii) Current	The effective value is followed by a character "R". Also, the peak value is followed by a character "P".
iv) Weld time	The value of TIME PEAK is followed by a character "P". Also, the value of TIME HALF is followed by a character "H".

⑤ When an error occurs

Count up

Prints the counts in reversal at the following situation:

- The number of count has reached the preset value. (Step-up OFF)
- When the count of the last step has ended. (Step-up ON)

[Step-up OFF]

COUNT	SCH	CURR kA	TIME CYC	ANG °
00002	01	3.62R	10.0	160
00003	01	3.60R	10.0	160

Count up

[Step-up ON]

STEP COUNT	SCH	CURR kA	TIME CYC	ANG °
9-0004	01	3.66R	10.0	162
9-0005	01	3.64R	10.0	162

Step end

Upper/lower limit judgment error

Prints the current or weld time in reversal.

Current or weld time is headed by a character "H" in the upper limit error; a character "L" in the lower limit error.

COUNT	SCH	CURR kA	TIME CYC	ANG °
00002	01	L 3.70R	10.0	162
00002	01	H 3.70R	10.0	160
00003	01	3.68R	10.0	160
00004	01	3.66R	L 10.0	160
00004	01	3.66R	H 10.0	162

Current lower limit error

Current upper limit error

Weld time lower limit error

Weld time upper limit error

No-current error

Prints "NO CURRENT" in reversal.

COUNT	SCH	CURR	TIME	ANG
		kA	CYC	°
00002	01	3.78R	10.0	160
00002	01	NO CURRENT		

No-current error

Pulsation error

Prints "CCCC" on the portion for current or weld time in reversal.

COUNT	SCH	CURR	TIME	ANG
		kA	CYC	°
00002	01	3.58R	10.0	160
00002	01	CC.CCR	CC.C	0

Pulsation error

Measurement overrange error

Prints "EEEE" on the portion for current or weld time in reversal.

COUNT	SCH	CURR	TIME	ANG
		kA	CYC	°
00002	01	3.61R	10.0	160
00002	01	HE.EEER	10.0	EEE
00002	01	0.399R	HEEE.E	78

Overrange of current measurement error (When the maximum conduction angle cannot be measured, "EEE" is displayed.)

Overrange of weld time measurement error

(2) on-Er

Prints when an error occurs.

COUNT	SCH	CURR	TIME	ANG
		kA	CYC	°
00005	01	NO CURRENT		
00008	01	L 3.69R	10.0	162
00018	01	3.59R	H 11.0	162

No-current error

Current lower limit error

Weld time upper limit error

For the contents of printout, see 7.(1) on.

(3) Allcyc

Prints the effective value for every half cycle or 1ms after measuring the welding current.

SCHEDULE	:	01	←	Schedule No.
CURRENT (RMS)	:	2.88 kA	←	Effective value of current
(PEAK)	:	4.86 kA	←	Peak current
WELD TIME	:	10.0 CYC	←	Weld time
MAX C. ANGLE	:	114 °	←	Maximum Conduction angle
COUNT	:	00022	←	Printed when the measurement method is "AC" or "AC---".
WELD TIME	CURR (RMS)	C. ANGLE		
0.5 CYC	0.71 kA	42 °		
1.0 CYC	1.80 kA	78 °		Counter
1.5 CYC	2.85 kA	112 °		The contents of printout change depending on the setting for step-up (see 6.(4) ⑫).
2.0 CYC	2.86 kA	112 °		
2.5 CYC●	2.88 kA	114 °		OFF { Prints the present counts.
3.0 CYC●	2.86 kA	112 °		
3.5 CYC●	2.89 kA	114 °		
4.0 CYC●	2.88 kA	114 °		ON { Prints the step number and the step counts.
4.5 CYC●	2.89 kA	114 °		(Example 3-0015)
5.0 CYC●	2.87 kA	114 °		
5.5 CYC●	2.89 kA	114 °		
6.0 CYC●	2.87 kA	114 °		Measurement range
6.5 CYC●	2.89 kA	114 °		The measurement range is indicated with ●.
7.0 CYC●	2.86 kA	114 °		
7.5 CYC●	2.90 kA	114 °		
8.0 CYC●	2.88 kA	114 °		
8.5 CYC●	2.89 kA	114 °		
9.0 CYC●	2.89 kA	114 °		
9.5 CYC	2.89 kA	114 °		
10.0 CYC	2.87 kA	114 °		Conduction angle
				Printed when the measurement method is "AC" or "AC---".

Weld time Effective value of current (every half cycle or 1ms)

(4) SCH

Prints the details of the set schedule.

The contents of printout change depending on the setting of the measurement method.

SCHEDULE 01		Schedule No.
CURRENT LOW : 0.00 kA		Current lower limit
CURRENT HIGH : 19.99 kA		Current upper limit
WELD TIME LOW : 0.0 CYC		Weld time lower limit
WELD TIME HIGH : 100.0 CYC		Weld time upper limit
FIRST TIME : 0.0 CYC		Measurement start time
LAST TIME : 100.0 CYC		Measurement end time
RANGE : 19.99 kA		Current range
PEAK/RMS : RMS		PEAK/RMS
TP/TH : TH		TP/TH
PALSATION : 0		Pulsation
SCHEDULE MODE		
CURRENT MODE : AC-CYC 50Hz		Measurement method
STOP TIME : 0.1 s		Non-measurement time
TRIG LEVEL : 90		Trigger level
PRINTER : OFF		Printer
COMMUNICATION : OFF		Communication
NG-HIGH/LOW : HIGH&LOW		NG-HIGH/LOW 1/2
NG-OUT : NC		NG-HIGH/LOW NC/NO
COIL GAIN : 1		Coil sensitivity
COOL TIME : 1 ms		Cool time
NO-CURR MON. T : 0.5 CYC		No-current neglecting time
GOOD/NG OUT : 10 ms		GOOD/NG output time
STEP UP : OFF		Step-up ON/OFF
SET COUNT : 00000		Count
		When the step-up is ON, Step count for STEP1-9 is printed out.

8. Data Communication

(1) Communication Specifications

Method	RS-232C: RS-232C, Asynchronous, Teletype procedure RS-485: RS-485, Asynchronous, Half-Duplex (For switching RS-232C and RS-485, see 6.(4) ⑪.)
Transmission rate	9600bps 19200bps (For switching 9600bps and 19200bps, see 6.(4) ⑪.)
Data type	Start bit: 1 Data bit: 8 Stop bit: 1 Parity bit: 1 (Even parity)
Character code	ASCII (Space code is indicated as " ^S _P "; CR code " ^C _R " and LF code " ^L _F ".)

(2) Data Type Output after Measurement

Refer to 6.(4) ⑪ to set the communication method to "232Fr" or "485Fr".
Data is output after the welding current has measured and a fault has occurred.
One host computer and one **MM-122A** are connected.

① Monitor Data

AC measurement mode

When the measurement method is set to "AC", "AC---" or "dccyc".

Item	Order	Character train	Description	Range
01	001-002	M:	Monitored value send code	Fixed
02	003-004	A,	AC mode	Fixed
03	005-007	nn,	Schedule No.	01–31
04	008-014	nnnnnn,	Count	^S _P 00000 – ^S _P 99999 (Step OFF) 1-0000 – 9-9999 (Step ON)
05	015-016	n,	Peak current judgment	N: NORMAL, L: LOW, H: HIGH, ^S _P : No judgment

Item	Order	Character train	Description	Range
06	017-022	nnnnn,	Peak current	0.000–0.199[kA] (0.199kA range) 0.000–1.999[kA] (1.999kA range) 00.00–19.99[kA] (19.99kA range) 000.0–199.9[kA] (199.9kA range)
07	023-024	n,	Effective value of current judgment	N: NORMAL, L: LOW, H: HIGH, ^S _P : No judgment
08	025-030	nnnnn,	Effective value of current	0.000–0.199[kA] (0.199kA range) 0.000–1.999[kA] (1.999kA range) 00.00–19.99[kA] (19.99kA range) 000.0–199.9[kA] (199.9kA range)
09	031-032	n,	Weld time judgment	N: NORMAL, L: LOW, H: HIGH, ^S _P : No judgment
10	033-038	nnnnn,	Weld time	000.0–500.0 [CYC] ^{*1}
11	039-041	nnn	Maximum conduction angle ^{*2}	000–180 [degree]
12	042-042	^C _R	CR code (0x0D)	Fixed

Example 1: M:A,01,^S_P27843,L,13.85,^S_P08.45,N,010.0,123^C_R (Step-up OFF)

Example 2: M:A,05,5-5246,^S_P10.36,H,04.24,L,019.0,148^C_R (Step-up ON)

*1) The range changes depending on the frequency to be measured.

*2) Maximum conduction angle is 000 degree when the measurement method is “dccyc”.

DC measurement mode

When the measurement method is set to “ACSEC ” or “dcSEC”.

Item	Order	Character train	Description	Range
01	001-002	M:	Monitored value send code	Fixed
02	003-004	D,	DC mode	Fixed
03	005-007	nn,	Schedule No.	01–31
04	008-014	nnnnnn,	Count	^S _P 00000 – ^S _P 99999 (Step OFF) 1-0000 – 9-9999 (Step ON)
05	015-016	n,	Peak current judgment	N: NORMAL, L: LOW, H: HIGH, ^S _P : No judgment
06	017-022	nnnnn,	Peak current	0.000–0.199[kA] (0.199kA range) 0.000–1.999[kA] (1.999kA range) 00.00–19.99[kA] (19.99kA range) 000.0–199.9[kA] (199.9kA range)

Item	Order	Character train	Description	Range
07	023-024	n,	Effective value of current judgment	N: NORMAL, L: LOW, H: HIGH, s_P : No judgment
08	025-030	nnnnn,	Effective value of current	0.000–0.199[kA] (0.199kA range) 0.000–1.999[kA] (1.999kA range) 00.00–19.99[kA] (19.99kA range) 000.0–199.9[kA] (199.9kA range)
09	031-032	n,	Weld time judgment	N: NORMAL, L: LOW, H: HIGH, s_P : No judgment
10	033-036	nnnn	Weld time	0000–2000[ms]
11	037-037	c_R	CR code (0x0D)	Fixed

Example 1: M:D,01, s_P 27843,L,13.85, s_P 08.45,N,0153 c_R (Step-up OFF)

Example 2: M:D,05,5-5246, s_P 10.36,H,04.24,L,0319 c_R (Step-up ON)

Transistor measurement mode

When the measurement method is set to “dcSSc”.

Item	Order	Character train	Description	Range
01	001-002	M:	Monitored value send code	Fixed
02	003-004	T,	Transistor mode	Fixed
03	005-007	nn,	Schedule No.	01–31
04	008-014	nnnnnn,	Count	s_P 00000 – s_P 99999
05	015-016	n,	Peak current judgment	N: NORMAL, L: LOW, H: HIGH, s_P : No judgment
06	017-022	nnnnn,	Peak current	0.000–0.199[kA] (0.199kA range) 0.000–1.999[kA] (1.999kA range) 00.00–19.99[kA] (19.99kA range) 000.0–199.9[kA] (199.9kA range)
07	023-024	n,	Effective value of current judgment	N: NORMAL, L: LOW, H: HIGH, s_P : No judgment
08	025-030	nnnnn,	Effective value of current	0.000–0.199[kA] (0.199kA range) 0.000–1.999[kA] (1.999kA range) 00.00–19.99[kA] (19.99kA range) 000.0–199.9[kA] (199.9kA range)
09	031-032	n,	Weld time judgment	N: NORMAL, L: LOW, H: HIGH, s_P : No judgment

Item	Order	Character train	Description	Range
10	033-037	nnnnn	Weld time	00.00–25.00[ms]
11	038-038	^C _R	CR code (0x0D)	Fixed

Example 1: M:T,05,^S_P02456,N,08.91,^S_P05.48,N,19.45^C_R

Capacitor measurement mode

When the measurement method is set to “CAP-S” or “CAP-L”.

Item	Order	Character train	Description	Range
01	001-002	M:	Monitored value send code	Fixed
02	003-004	C,	Capacitor mode	Fixed
03	005-007	nn,	Schedule No.	01–31
04	008-014	nnnnnn,	Count	^S _P 00000 – ^S _P 99999
05	015-016	n,	Peak current judgment	N: NORMAL, L: LOW, H: HIGH, ^S _P : No judgment
06	017-022	nnnnn,	Peak current	0.000–0.199[kA] (0.199kA range) 0.000–1.999[kA] (1.999kA range) 00.00–19.99[kA] (19.99kA range) 000.0–199.9[kA] (199.9kA range)
07	023-024	n,	Effective current judgment	N: NORMAL, L: LOW, H: HIGH, ^S _P : No judgment
08	025-030	nnnnn,	Effective current	0.000–0.199[kA] (0.199kA range) 0.000–1.999[kA] (1.999kA range) 00.00–19.99[kA] (19.99kA range) 000.0–199.9[kA] (199.9kA range)
09	031-032	n,	TP time judgment	N: NORMAL, L: LOW, H: HIGH, ^S _P : No judgment
10	033-037	nnnn,	TP time	0.00–9.99[ms] (CAP-S) 00.0–99.9[ms] (CAP-L)
11	038-039	n,	TH time judgment	N: NORMAL, L: LOW, H: HIGH, ^S _P : No judgment
12	040-043	nnnn	TH time	0.00–9.99[ms] (CAP-S) 00.0–99.9[ms] (CAP-L)
13	044-044	^C _R	CR code (0x0D)	Fixed

Example 1: M:C,01,^S_P27843,L,13.85,^S_P08.45,N,1.53,^S_P3.54^C_R

② Fault Data

Item	Order	Character train	Description	Range
01	001-002	E:	Fault send code	Fixed
02	003-005	nn,	Schedule No.	01–31
03	006-012	nnnnnn,	Count	$S_P00000 - S_P99999$ (Step OFF) 1-0000 – 9-9999 (Step ON)
04	013-014	nn	Fault code (If more than one fault occur, output them with “,”.)	13: Preset counter up 14: Step end 15: No-current error 16: Pulsation error
05	015-015	C_R	CR code (0x0D)	Fixed

Example 1: E:01, $S_P27843,15C_R$ (Step-up OFF)

Example 2: E:05,5-5246,13,16 C_R (Step-up ON)

(3) Bidirectional Communication

Refer to **6.(4) ⑪** to set the communication method to “232Sy” or “485Sy”.

Schedule data can be read or written by the command on the host computer side.

One **MM-122A** is connected with RS-232C per host computer.

Up to 32 **MM-122As** can be connected with RS-485 per host computer.

When the readout/overwrite command is sent from the host computer, **MM-122A** sends back data.

Also, do not send the next command until the data is sent back or the timeout time passes when sending command.

When using write command, compare the schedule of write command with that of the data sent back to check that it has been changed.

① Readout Command

System setting data

• Host computer → MM-122A

Item	Order	Character train	Description	Range
01	001-001	#	Communication start (from host)	Fixed
02	002-003	nn	Communication ID	01–31
03	004-004	R	Readout request	Fixed
04	005-007	000	Schedule No.	Fixed
05	008-008	*	All contents	Fixed
06	009-009	^C _R	CR code (0x0D)	Fixed
07	010-010	^L _F	LF code (0x0A)	Fixed

• MM-122A → Host computer

Item	Order	Character train	Description	Range
01	001-001	!	Communication start (to host)	Fixed
02	002-003	nn	Communication ID	01–31
03	004-004	R	Read request	Fixed
04	005-007	000	Schedule No.	Fixed
05	008-008	*	All contents	Fixed
06	009-009	:	Data start	Fixed
07	010-015	nnnnn,	Preset counter	00000–99999

Item	Order	Character train	Description	Range
08	016-020	nnnn,	STEP1 count	0000–9999
09	021-025	nnnn,	STEP2 count	
10	026-030	nnnn,	STEP3 count	
11	031-035	nnnn,	STEP4 count	
12	036-040	nnnn,	STEP5 count	
13	041-045	nnnn,	STEP6 count	
14	046-050	nnnn,	STEP7 count	
15	051-055	nnnn,	STEP8 count	
16	056-060	nnnn,	STEP9 count	
17	061-063	nn,	Measurement method	00: AC (AC mode) 01: AC--- (AC inverter mode) 02: ACSEC (AC ms mode) 03: dccyc (DC cyc mode) 04: dcSEC (DC ms mode) 05: dcSSc (Transistor mode) 06: CAP-S (Capacitor S mode) 07: CAP-L (Capacitor L mode)
18	064-070	nnnnHz,	Measurement frequency	0050–0250 053. 056. 059. 063. 067. 071. 077. 083. 091. 111. 143. 167.[Hz]
19	071-075	nnns,	Non-measurement time	0.1–9.9[s]
20	076-078	nn,	Printer	00: OFF (No printing) 01: on (Measured value printing) 02: on-Er (Printing when a trouble occurs.) 03: Allcyc (All cycle printing)
21	079-081	nn,	Trigger level	01–99
22	082-087	nnnms,	Cool time	00–099[ms] ACSEC,dcSEC 0.1–9.9[ms] dcSSc
23	088-090	nn,	Communication	00: OFF (Communication OFF) 01: 232Fr (RS-232C measured value output) 02: 232Sy (RS-232C schedule bidirection) 03: 485Fr (RS-485 measured value output) 04: 485Sy (RS-485 schedule bidirection) NB: No change is made through communication.
24	091-093	nn,	Transmission rate	00: SP 96 (9600bps) 01: SP192 (19200bps) NB: No change is made through communication.
25	094-096	nn,	Communication ID No.	01–31 NB: No change is made through communication.
26	097-099	nn,	NG-HIGH/LOW 1/2	00: HL 1 (upper/lower limit same terminal output) 01: HL 2 (upper/lower limit different terminal output)

Item	Order	Character train	Description	Range
27	100-102	nn,	NG-HIGH/LOW nc/no	00: HL nc (nc output) 01: HL no (no output)
28	103-105	nn,	Coil sensitivity	00: coil 1 (one-time sensitivity coil) 01: coil10 (ten-time sensitivity coil)
29	106-111	nnnms,	GOOD/NG output time	010[ms]: Out10 (Output time 10ms) 100[ms]: Out99 (Output time 100ms) HLD[ms]: OutHO (Output time HOLD)
30	112-114	nn,	Step-up function	00: StEP0 (Step-up ON) 01: StEP1 (Step-up OFF)
31	115-121	nnnCYC,	No-current neglecting time *1	0.5–9.5[CYC]
32	122-125	nnms	No-current neglecting time *2	01–99[ms]
33	126-126	^C _R	CR code (0x0D)	Fixed
34	127-127	^L _F	LF code (0x0A)	Fixed
35	128-128	^L _F	LF code (0x0A)	Fixed

*1) Applicable in “AC”, “A---” or “dccyc” modes.

*2) Applicable in “ACSEC” or “dcSEC” modes.

Schedule data

• Host computer → MM-122A

Item	Order	Character train	Description	Range
01	001-001	#	Communication start (from host)	Fixed
02	002-003	nn	Communication ID	01–31
03	004-004	R	Read request	Fixed
04	005-007	nnn	Schedule No.	001–031
05	008-008	*	All contents	Fixed
06	009-009	^C _R	CR code (0x0D)	Fixed
07	010-010	^L _F	LF code (0x0A)	Fixed

• MM-122A → Host computer

Item	Order	Character train	Description	Range
01	001-001	!	Communication start (to host)	Fixed
02	002-003	nn	Communication ID	01–31
03	004-004	R	Read request	Fixed
04	005-007	nnn	Schedule No.	001–031
05	008-008	*	All contents	Fixed
06	009-009	:	Data start	Fixed
07	010-018	nnnnnCYC,	Weld time upper limit ^{*1}	000.0–500.0[CYC] ^{*2}
08	019-027	nnnnnCYC,	Weld time lower limit ^{*1}	
09	028-035	nnnnnms,	Weld time upper limit ^{*3}	00000–02000[ms]
10	036-043	nnnnnms,	Weld time lower limit ^{*3}	
11	044-051	nnnnnms,	Weld time upper limit ^{*4}	00.00–25.00[ms]
12	052-059	nnnnnms,	Weld time lower limit ^{*4}	
13	060-067	nnnnnms,	Weld time TP upper limit ^{*5}	00.00–09.99[ms] CAP-S 000.0–099.9[ms] CAP-L
14	068-075	nnnnnms,	Weld time TP lower limit ^{*5}	
15	076-083	nnnnnms,	Weld time TH upper limit ^{*5}	
16	084-091	nnnnnms,	Weld time TH lower limit ^{*5}	
17	092-100	nnnnnCYC,	Measurement start time ^{*1}	000.0–500.0[CYC] ^{*2}
18	101-109	nnnnnCYC,	Measurement end time ^{*1}	
19	110-117	nnnnnms,	Measurement start time ^{*3}	00000–02000[ms]
20	118-125	nnnnnms,	Measurement end time ^{*3}	
21	126-133	nnnnnms,	Measurement start time ^{*4}	00.00–25.00[ms]
22	134-141	nnnnnms,	Measurement end time ^{*4}	
23	142-149	nnnnnkA,	Current range	1.999[kA] (1.999kA range) 19.99[kA] (19.99kA range) 199.9[kA] (199.9kA range)
24	150-152	nn,	Measurement current PEAK/RMS	00: PEAK (Peak value measurement) 01: RMS (Effective value measurement)
25	153-155	nn,	Measurement time TP/TH	00: TP (TP time measurement) 01: TH (TH time measurement)
26	156-158	nn,	Pulsation	00–09

*1) Applicable in “AC”, “A---” or “dccyc” modes.

*2) The range changes depending on the frequency to be measured.

*3) Applicable in “ACSEC” or “dcSEC” modes.

*4) Applicable in “dcSSc” mode.

*5) Applicable in “CAP-S” or “CAP-L” modes.

Item	Order	Character train	Description	Range
27	159-166	nnnnnkA,	STEP1 effective current upper limit	0.000–0.199 [kA] (0.199kA range)
28	167-174	nnnnnkA,	STEP1 effective current lower limit	
29	175-182	nnnnnkA,	STEP2 effective current upper limit	
30	183-190	nnnnnkA,	STEP2 effective current lower limit	
31	191-198	nnnnnkA,	STEP3 effective current upper limit	0.000–1.999 [kA] (1.999kA range)
32	199-206	nnnnnkA,	STEP3 effective current lower limit	
33	207-214	nnnnnkA,	STEP4 effective current upper limit	
34	215-222	nnnnnkA,	STEP4 effective current lower limit	
35	223-230	nnnnnkA,	STEP5 effective current upper limit	00.00–19.99 [kA] (19.99kA range)
36	231-238	nnnnnkA,	STEP5 effective current lower limit	
37	239-246	nnnnnkA,	STEP6 effective current upper limit	
38	247-254	nnnnnkA,	STEP6 effective current lower limit	
39	255-262	nnnnnkA,	STEP7 effective current upper limit	000.0–199.9 [kA] (199.9kA range)
40	263-270	nnnnnkA,	STEP7 effective current lower limit	
41	271-278	nnnnnkA,	STEP8 effective current upper limit	
42	279-286	nnnnnkA,	STEP8 effective current lower limit	
43	287-294	nnnnnkA,	STEP9 effective current upper limit	
44	295-302	nnnnnkA,	STEP9 effective current lower limit	
45	303-310	nnnnnkA,	STEP1 peak current upper limit	
46	311-318	nnnnnkA,	STEP1 peak current lower limit	
47	319-326	nnnnnkA,	STEP2 peak current upper limit	0.000–0.199 [kA] (0.199kA range)
48	327-334	nnnnnkA,	STEP2 peak current lower limit	
49	335-342	nnnnnkA,	STEP3 peak current upper limit	
50	343-350	nnnnnkA,	STEP3 peak current lower limit	
51	351-358	nnnnnkA,	STEP4 peak current upper limit	0.000–1.999 [kA] (1.999kA range)
52	359-366	nnnnnkA,	STEP4 peak current lower limit	
53	367-374	nnnnnkA,	STEP5 peak current upper limit	
54	375-382	nnnnnkA,	STEP5 peak current lower limit	
55	383-390	nnnnnkA,	STEP6 peak current upper limit	00.00–19.99 [kA] (19.99kA range)
56	391-398	nnnnnkA,	STEP6 peak current lower limit	
57	399-406	nnnnnkA,	STEP7 peak current upper limit	
58	407-414	nnnnnkA,	STEP7 peak current lower limit	
59	415-422	nnnnnkA,	STEP8 peak current upper limit	000.0–199.9 [kA] (199.9kA range)
60	423-430	nnnnnkA,	STEP8 peak current lower limit	
61	431-438	nnnnnkA,	STEP9 peak current upper limit	
62	439-445	nnnnnkA,	STEP9 peak current lower limit	
63	446-446	^C _R	CR code (0x0D)	Fixed
64	447-447	^L _F	LF code (0x0A)	Fixed
65	448-448	^L _F	LF code (0x0A)	Fixed

② Overwrite Command

System setting data

• Host computer → MM-122A

Item	Order	Character train	Description	Range
01	001-001	#	Communication start (from host)	Fixed
02	002-003	nn	Communication start	01–31
03	004-004	W	Overwrite request	Fixed
04	005-007	000	Schedule No.	Fixed
05	008-008	*	All contents	Fixed
06	009-009	:	Data start	Fixed
07	010-015	nnnnn,	Presser counter	00000–99999
08	016-020	nnnn,	STEP1 count	
09	021-025	nnnn,	STEP2 count	
10	026-030	nnnn,	STEP3 count	
11	031-035	nnnn,	STEP4 count	
12	036-040	nnnn,	STEP5 count	
13	041-045	nnnn,	STEP6 count	
14	046-050	nnnn,	STEP7 count	
15	051-055	nnnn,	STEP8 count	
16	056-060	nnnn,	STEP9 count	
17	061-063	nn,	Measurement method	00: AC (AC mode) 01: AC--- (AC inverter mode) 02: ACSEC (DC ms mode) 03: dccyc (DC cyc mode) 04: dcSEC (DC ms mode) 05: dcSSc (Transistor mode) 06: CAP-S (Capacitor S mode) 07: CAP-L (Capacitor L mode)
18	064-070	nnnnHz,	Measurement frequency	0050–0250[Hz] 251: 053.[Hz], 252: 056.[Hz], 253: 059.[Hz], 254: 063.[Hz], 255: 067.[Hz], 256: 071.[Hz], 257: 077.[Hz], 258: 083.[Hz], 259: 091.[Hz], 260: 111.[Hz], 261: 143.[Hz], 262: 167.[Hz]
19	071-075	nnns,	Non-measurement time	0.1–9.9[s]
20	076-078	nn,	Printer	00: OFF (No printing) 01: on (Measured value printing) 02: on-Er (Printing when a trouble occurs.) 03: Allcyc (All cycle printing)
21	079-081	nn,	Trigger level	01–99
22	082-087	nnnms,	Cool time	001–099[ms] ACSEC,dcSEC 0.1–9.9[ms] dcSSc

Item	Order	Character train	Description	Range
23	088-090	nn,	Communication	00: OFF (Communication OFF) 01: 232Fr (RS-232C measured value output) 02: 232Sy (RS-232C schedule bidirection) 03: 485Fr (RS-485 measured value output) 04: 485Sy (RS-485 schedule bidirection) NB: No change is made through communication.
24	091-093	nn,	Transmission rate	00: SP 96 (9600bps) 01: SP192 (19200bps) NB: No change is made through communication.
25	094-096	nn,	Communication ID No.	01-31 NB: No change is made through communication.
26	097-099	nn,	NG-HIGH/LOW 1/2	00: HL 1 (upper/lower limit same terminal output) 01: HL 2 (upper/lower limit different terminal output)
27	100-102	nn,	NG-HIGH/LOW nc/no	00: HL nc (nc output) 01: HL no (no output)
28	103-105	nn,	Coil sensitivity	00: coil 1 (one-time sensitivity coil) 01: coil10 (ten-time sensitivity coil)
29	106-111	nnnms,	GOOD/NG output time	010[ms]: Out10 (Output time 10ms) 100[ms]: Out99 (Output time 100ms) HLD[ms]: OutHO (Output time HOLD)
30	112-114	nn,	Step-up function	00: StEP0 (Step-up ON) 01: StEP1 (Step-up OFF)
31	115-121	nnnCYC,	No-current neglecting time *1	0.5-9.5[CYC]
32	122-125	nnms	No-current neglecting time *2	01-99[ms]
33	126-126	C_R	CR code (0x0D)	Fixed
34	127-127	L_F	LF code (0x0A)	Fixed

*1) Applicable in "AC", "A---" or "dccyc" modes.

*2) Applicable in "ACSEC" or "dcSEC" modes.

• MM-122A → Host computer

Item	Order	Character train	Description	Range
01	001-001	!	Communication start (to host)	Fixed
02	002-003	nn	Communication ID	01–31
03	004-004	W	Write request	Fixed
04	005-007	000	Schedule No.	Fixed
05	008-008	*	All contents	Fixed
06	009-009	:	Data start	Fixed
07	010-015	nnnnn,	Preset counter	00000–99999
08	016-020	nnnn,	STEP1 count	0000–9999
09	021-025	nnnn,	STEP2 count	
10	026-030	nnnn,	STEP3 count	
11	031-035	nnnn,	STEP4 count	
12	036-040	nnnn,	STEP5 count	
13	041-045	nnnn,	STEP6 count	
14	046-050	nnnn,	STEP7 count	
15	051-055	nnnn,	STEP8 count	
16	056-060	nnnn,	STEP9 count	
17	061-063	nn,	Measurement method	00: AC (AC mode) 01: AC--- (AC inverter mode) 02: ACSEC (DC ms mode) 03: dccyc (DC cyc mode) 04: dcSEC (DC ms mode) 05: dcSSc (Transistor mode) 06: CAP-S (Capacitor S mode) 07: CAP-L (Capacitor L mode)
18	064-070	nnnnHz,	Measurement frequency	0050–0250 053. 056. 059. 063. 067. 071. 077. 083. 091. 111. 143. 167.[Hz]
19	071-075	nnns,	Non-measurement time	0.1–9.9[s]
20	076-078	nn,	Printer	00: OFF (No printing) 01: on (Measured value printing) 02: on-Er (Printing when a trouble occurs.) 03: Allcyc (All cycle printing)
21	079-081	nn,	Trigger level	01–99
22	082-087	nnnms,	Cool time	001–099[ms] ACSEC,dcSEC 0.1–9.9[ms] dcSSc

Item	Order	Character train	Description	Range
23	088-090	nn,	Communication	00: OFF (Communication OFF) 01: 232Fr (RS-232C measured value output) 02: 232Sy (RS-232C schedule bidirection) 03: 485Fr (RS-485 measured value output) 04: 485Sy (RS-485 schedule bidirection) NB: No change is made through communication.
24	091-093	nn,	Transmission rate	00: SP 96 (9600bps) 01: SP192 (19200bps) NB: No change is made through communication.
25	094-096	nn,	Communication ID No.	01–31 NB: No change is made through communication.
26	097-099	nn,	NG-HIGH/LOW 1/2	00: HL 1 (upper/lower limit same terminal output) 01: HL 2 (upper/lower limit different terminal output)
27	100-102	nn,	NG-HIGH/LOW nc/no	00: HL nc (nc output) 01: HL no (no output)
28	103-105	nn,	Coil sensitivity	00: coil 1 (one-time sensitivity coil) 01: coil10 (ten-time sensitivity coil)
29	106-111	nnnms,	GOOD/NG output time	010[ms]: Out10 (Output time 10ms) 100[ms]: Out99 (Output time 100ms) HLD[ms]: OutHO (Output time HOLD)
30	112-114	nn,	Step-up function	00: StEP0 (Step-up ON) 01: StEP1 (Step-up OFF)
31	115-121	nnnCYC,	No-current neglecting time *1	0.5–9.5[CYC]
32	122-125	nnms	No-current neglecting time *2	01–99[ms]
33	126-126	C_R	CR code (0x0D)	Fixed
34	127-127	L_F	LF code (0x0A)	Fixed
35	128-128	L_F	LF code (0x0A)	Fixed

*1) Applicable in “AC”, “A---” or “dccyc” modes.

*2) Applicable in “ACSEC” or “dcSEC” modes.

Schedule data

• Host computer → MM-122A

Item	Order	Character train	Description	Range
01	001-001	#	Communication start (from host)	Fixed
02	002-003	nn	Communication ID	01–31
03	004-004	W	Write request	Fixed
04	005-007	nnn	Schedule No.	001–031
05	008-008	*	All contents	Fixed
06	009-009	:	Data start	Fixed
07	010-018	nnnnnCYC,	Weld time upper limit ^{*1}	000.0–500.0[CYC] ^{*2}
08	019-027	nnnnnCYC,	Weld time lower limit ^{*1}	
09	028-035	nnnnnms,	Weld time upper limit ^{*3}	00000–02000[ms]
10	036-043	nnnnnms,	Weld time lower limit ^{*3}	
11	044-051	nnnnnms,	Weld time upper limit ^{*4}	00.00–25.00[ms]
12	052-059	nnnnnms,	Weld time lower limit ^{*4}	
13	060-067	nnnnnms,	Weld time TP upper limit ^{*5}	00.00–09.99[ms]
14	068-075	nnnnnms,	Weld time TP lower limit ^{*5}	CAP-S
15	076-083	nnnnnms,	Weld time TH upper limit ^{*5}	000.0–099.9[ms]
16	084-091	nnnnnms,	Weld time TH lower limit ^{*5}	CAP-L
17	092-100	nnnnnCYC,	Measurement start time ^{*1}	000.0–500.0[CYC] ^{*2}
18	101-109	nnnnnCYC,	Measurement end time ^{*1}	
19	110-117	nnnnnms,	Measurement start time ^{*3}	00000–02000[ms]
20	118-125	nnnnnms,	Measurement end time ^{*3}	
21	126-133	nnnnnms,	Measurement start time ^{*4}	00.00–25.00[ms]
22	134-141	nnnnnms,	Measurement end time ^{*4}	
23	142-149	nnnnnkA,	Current range	1.999kA(1.99kA range) 19.99kA (19.99kA range) 199.9kA (199.9kA range)
24	150-152	nn,	Measurement current PEAK/RMS	00: PEAK (Peak value measurement) 01: RMS (Effective value measurement)
25	153-155	nn,	Measurement time TP/TH	00: TP (TP time measurement) 01: TH (TH time measurement)
26	156-158	nn,	Pulsation	00–09

*1) Applicable in “AC”, “A---” or “dccyc” modes.

*2) The range changes depending on the frequency to be measured.

*3) Applicable in “ACSEC” or “dcSEC” modes.

*4) Applicable in “dcSSc” mode.

*5) Applicable in “CAP-S” or “CAP-L” modes.

Item	Order	Character train	Description	Range
27	159-166	nnnnnkA,	STEP1 effective current upper limit	0.000–0.199 [kA] (0.199kA range)
28	167-174	nnnnnkA,	STEP1 effective current lower limit	
29	175-182	nnnnnkA,	STEP2 effective current upper limit	
30	183-190	nnnnnkA,	STEP2 effective current lower limit	
31	191-198	nnnnnkA,	STEP3 effective current upper limit	0.000–1.999 [kA] (1.999kA range)
32	199-206	nnnnnkA,	STEP3 effective current lower limit	
33	207-214	nnnnnkA,	STEP4 effective current upper limit	
34	215-222	nnnnnkA,	STEP4 effective current lower limit	
35	223-230	nnnnnkA,	STEP5 effective current upper limit	00.00–19.99 [kA] (19.99kA range)
36	231-238	nnnnnkA,	STEP5 effective current lower limit	
37	239-246	nnnnnkA,	STEP6 effective current upper limit	
38	247-254	nnnnnkA,	STEP6 effective current lower limit	
39	255-262	nnnnnkA,	STEP7 effective current upper limit	000.0–199.9 [kA] (199.9kA range)
40	263-270	nnnnnkA,	STEP7 effective current lower limit	
41	271-278	nnnnnkA,	STEP8 effective current upper limit	
42	279-286	nnnnnkA,	STEP8 effective current lower limit	
43	287-294	nnnnnkA,	STEP9 effective current upper limit	
44	295-302	nnnnnkA,	STEP9 effective current lower limit	
45	303-310	nnnnnkA,	STEP1 peak current upper limit	0.000–0.199 [kA] (0.199kA range)
46	311-318	nnnnnkA,	STEP1 peak current lower limit	
47	319-326	nnnnnkA,	STEP2 peak current upper limit	
48	327-334	nnnnnkA,	STEP2 peak current lower limit	
49	335-342	nnnnnkA,	STEP3 peak current upper limit	0.000–1.999 [kA] (1.999kA range)
50	343-350	nnnnnkA,	STEP3 peak current lower limit	
51	351-358	nnnnnkA,	STEP4 peak current upper limit	
52	359-366	nnnnnkA,	STEP4 peak current lower limit	
53	367-374	nnnnnkA,	STEP5 peak current upper limit	00.00–19.99 [kA] (19.99kA range)
54	375-382	nnnnnkA,	STEP5 peak current lower limit	
55	383-390	nnnnnkA,	STEP6 peak current upper limit	
56	391-398	nnnnnkA,	STEP6 peak current lower limit	
57	399-406	nnnnnkA,	STEP7 peak current upper limit	000.0–199.9 [kA] (199.9kA range)
58	407-414	nnnnnkA,	STEP7 peak current lower limit	
59	415-422	nnnnnkA,	STEP8 peak current upper limit	
60	423-430	nnnnnkA,	STEP8 peak current lower limit	
61	431-438	nnnnnkA,	STEP9 peak current upper limit	
62	439-445	nnnnnkA,	STEP9 peak current lower limit	
63	446-446	C_R	CR code (0x0D)	Fixed
64	447-447	L_F	LF code (0x0A)	Fixed

• MM-122A → Host computer

Item	Order	Character train	Description	Range
01	001-001	!	Communication start (to host)	Fixed
02	002-003	nn	Communication ID	01–31
03	004-004	W	Write request	Fixed
04	005-007	nnn	Schedule No.	001–031
05	008-008	*	All contents	Fixed
06	009-009	:	Data start	Fixed
07	010-018	nnnnnCYC,	Weld time upper limit ^{*1}	000.0–500.0[CYC] ^{*2}
08	019-027	nnnnnCYC,	Weld time lower limit ^{*1}	
09	028-035	nnnnnms,	Weld time upper limit ^{*3}	00000–02000[ms]
10	036-043	nnnnnms,	Weld time lower limit ^{*3}	
11	044-051	nnnnnms,	Weld time upper limit ^{*4}	00.00–25.00[ms]
12	052-059	nnnnnms,	Weld time lower limit ^{*4}	
13	060-067	nnnnnms,	Weld time TP upper limit ^{*5}	00.00–09.99[ms] CAP-S 000.0–099.9[ms] CAP-L
14	068-075	nnnnnms,	Weld time TP lower limit ^{*5}	
15	076-083	nnnnnms,	Weld time TH upper limit ^{*5}	
16	084-091	nnnnnms,	Weld time TH lower limit ^{*5}	
17	092-100	nnnnnCYC,	Measurement start time ^{*1}	000.0–500.0[CYC] ^{*2}
18	101-109	nnnnnCYC,	Measurement end time ^{*1}	
19	110-117	nnnnnms,	Measurement start time ^{*3}	00000–02000[ms]
20	118-125	nnnnnms,	Measurement end time ^{*3}	
21	126-133	nnnnnms,	Measurement start time ^{*4}	00.00–25.00[ms]
22	134-141	nnnnnms,	Measurement end time ^{*4}	
23	142-149	nnnnnkA,	Current range	1.999kA (1.99kA range) 19.99kA (19.99kA range) 199.9kA (199.9kA range)
24	150-152	nn,	Measurement current PEAK/RMS	00: PEAK (Peak value measurement) 01: RMS (Effective value measurement)
25	153-155	nn,	Measurement time TP/TH	00: TP (TP time measurement) 01: TH (TH time measurement)
26	156-158	nn,	Pulsation	00–09

*1) Applicable in “AC”, “A---” or “dccyc” modes.

*2) The range changes depending on the frequency to be measured.

*3) Applicable in “ACSEC” or “dcSEC” modes.

*4) Applicable in “dcSSc” mode.

*5) Applicable in “CAP-S” or “CAP-L” modes.

Item	Order	Character train	Description	Range
27	159-166	nnnnnkA,	STEP1 effective current upper limit	0.000–0.199 [kA] (0.199kA range)
28	167-174	nnnnnkA,	STEP1 effective current lower limit	
29	175-182	nnnnnkA,	STEP2 effective current upper limit	
30	183-190	nnnnnkA,	STEP2 effective current lower limit	
31	191-198	nnnnnkA,	STEP3 effective current upper limit	
32	199-206	nnnnnkA,	STEP3 effective current lower limit	
33	207-214	nnnnnkA,	STEP4 effective current upper limit	
34	215-222	nnnnnkA,	STEP4 effective current lower limit	
35	223-230	nnnnnkA,	STEP5 effective current upper limit	
36	231-238	nnnnnkA,	STEP5 effective current lower limit	
37	239-246	nnnnnkA,	STEP6 effective current upper limit	
38	247-254	nnnnnkA,	STEP6 effective current lower limit	
39	255-262	nnnnnkA,	STEP7 effective current upper limit	
40	263-270	nnnnnkA,	STEP7 effective current lower limit	
41	271-278	nnnnnkA,	STEP8 effective current upper limit	
42	279-286	nnnnnkA,	STEP8 effective current lower limit	
43	287-294	nnnnnkA,	STEP9 effective current upper limit	
44	295-302	nnnnnkA,	STEP9 effective current lower limit	
45	303-310	nnnnnkA,	STEP1 peak current upper limit	00.00–19.99 [kA] (19.99kA range)
46	311-318	nnnnnkA,	STEP1 peak current lower limit	
47	319-326	nnnnnkA,	STEP2 peak current upper limit	
48	327-334	nnnnnkA,	STEP2 peak current lower limit	000.0–199.9 [kA] (199.9kA range)
49	335-342	nnnnnkA,	STEP3 peak current upper limit	
50	343-350	nnnnnkA,	STEP3 peak current lower limit	
51	351-358	nnnnnkA,	STEP4 peak current upper limit	
52	359-366	nnnnnkA,	STEP4 peak current lower limit	
53	367-374	nnnnnkA,	STEP5 peak current upper limit	
54	375-382	nnnnnkA,	STEP5 peak current lower limit	
55	383-390	nnnnnkA,	STEP6 peak current upper limit	
56	391-398	nnnnnkA,	STEP6 peak current lower limit	
57	399-406	nnnnnkA,	STEP7 peak current upper limit	
58	407-414	nnnnnkA,	STEP7 peak current lower limit	
59	415-422	nnnnnkA,	STEP8 peak current upper limit	
60	423-430	nnnnnkA,	STEP8 peak current lower limit	
61	431-438	nnnnnkA,	STEP9 peak current upper limit	
62	439-445	nnnnnkA,	STEP9 peak current lower limit	
63	446-446	^C _R	CR code (0x0D)	Fixed
64	447-447	^L _F	LF code (0x0A)	Fixed
65	448-448	^L _F	LF code (0x0A)	Fixed

(4) PC Operation Example

The communication methods of data by **232Fr** and **485Fr** are given here as example. (These methods are not available in the two-way communication.)

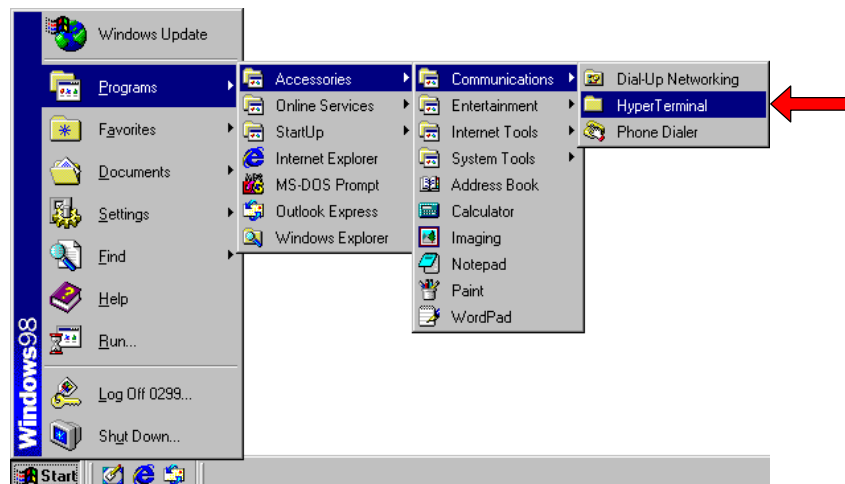
- ① Check if the Hyper Terminal has been installed on a personal computer.
- ↓
- ② If not, install it.
- ↓
- ③ Connect the **MM-122A** with a personal computer.
- ↓
- ④ Set the Hyper Terminal.
- ↓
- ⑤ Set the **MM-122A**.
- ↓
- ⑥ Start communication.

① Check if the Hyper Terminal has been installed on a personal computer.

If the Hyper Terminal has been installed, the Hyper Terminal will be displayed in the menu. Click on the [Start] button on the lower left portion of the screen.

(On Windows98)

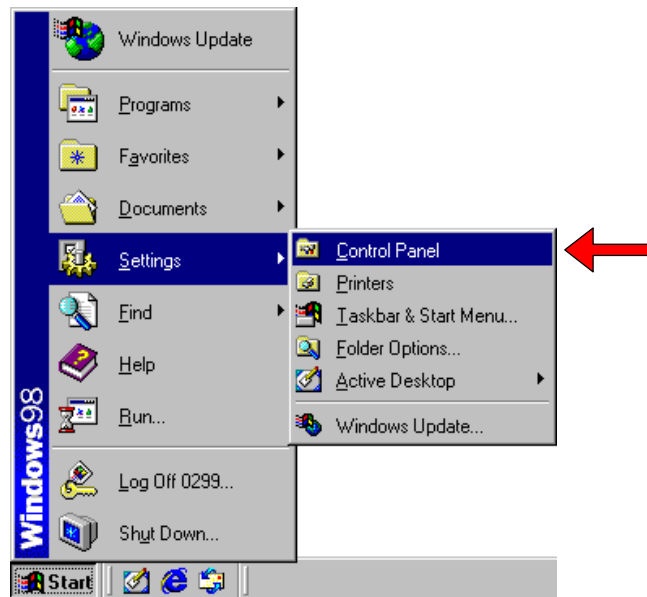
Program → Accessories → Communications → Hyper Terminal



If the Hyper Terminal is displayed in the menu, go to ③ **Connect the MM-122A with a personal computer.**

② Install the Hyper Terminal.

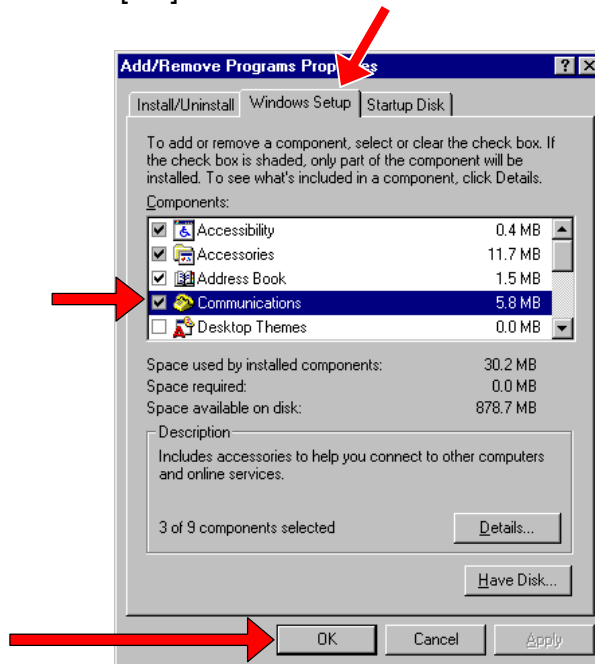
- i) Click on the [Start] button on the lower left portion of the screen, point to [Settings] and then select [Control Panel].



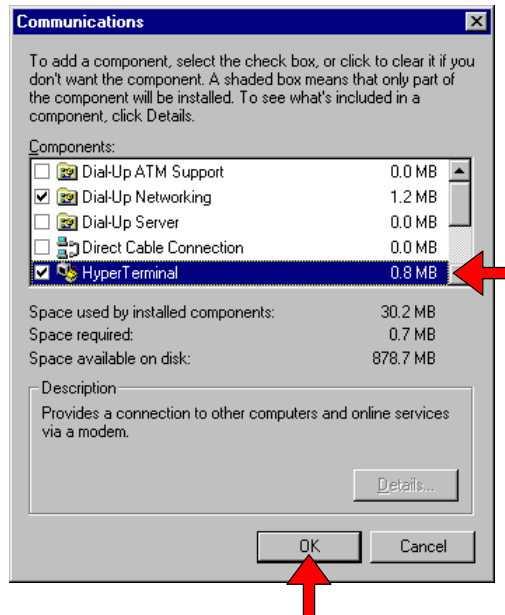
- ii) Double-click [Add/Remove Programs] in the Control Panel window.



- iii) When the Add/Remove Programs Properties window appears, click [Windows Setup] tab. Select [Communications] in [Components] field and click [OK] button.



- iv) When the Communications window appears, select [Hyper Terminal] and click [OK] button. Installation of the Hyper Terminal starts.

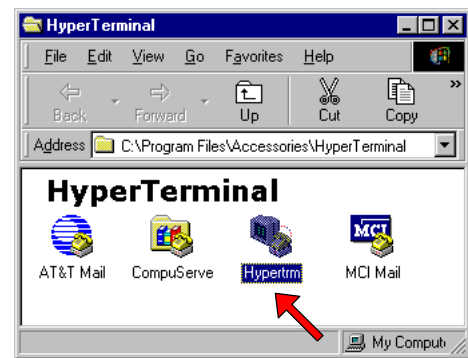


③ **Connect the MM-122A with a personal computer.**

Connect the communication connector at the rear of the **MM-122A** and a personal computer with the cable (sold separately)

④ Set the Hyper terminal.

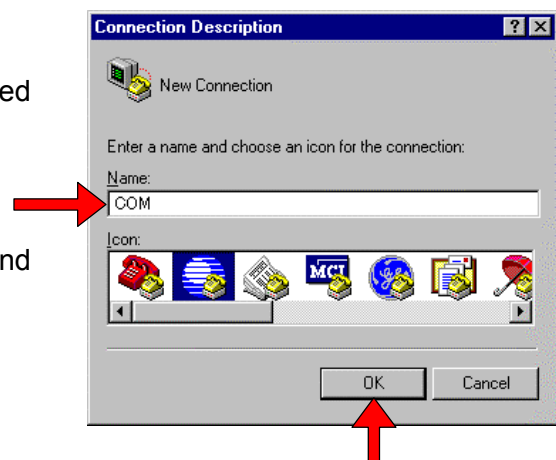
- i) Click on the [Start] button on the lower left portion of the screen and select [Hyper Terminal].
- ii) When the Hyper Terminal window appears, double-click [Hypertm.exe].



- iii) The Hyper Terminal starts and the Connection Description window appears.

- iv) Type a name. "COM" is typed in the example at right.

- v) Select an icon you like and click [OK] button.

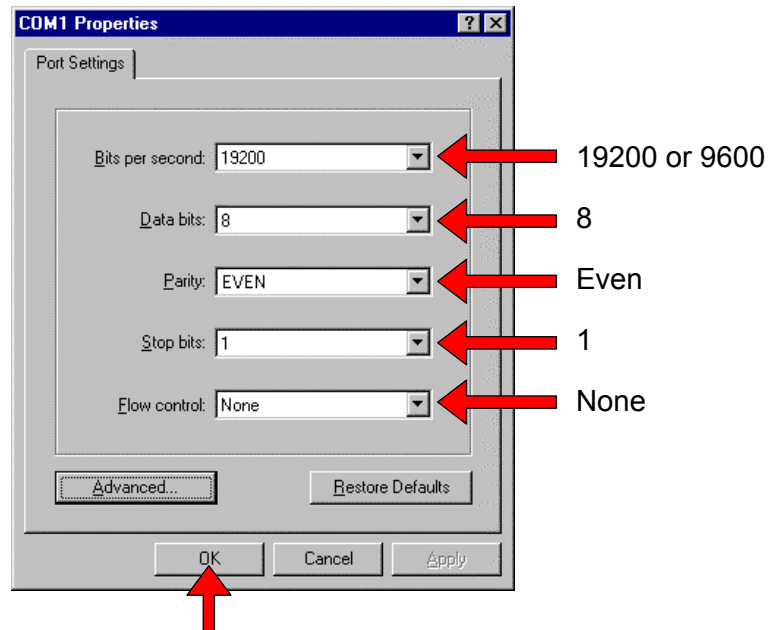


- vi) When the Connect To window appears, set [Connect using]. Select the connector connecting the cable. [Connect to COM1] is set in the example.



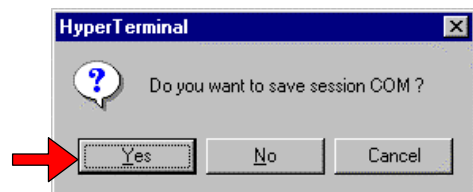
- vii) Click [OK] button. The COM1 Properties window appears. (Refer to next page.)

- viii) Set [Bits per second], [Data bits], [Parity], [Stop bits] and [Flow control].



ix) Click [OK] button to close the COM1 Properties window.



x) Select [Exit] from [File] menu.
When the message "Do you want to save session COM?" appears, click [Yes] button.



xi) The set icon (COM.ht) is displayed in the Hyper Terminal window.



⑤ **Set the MM-122A.**

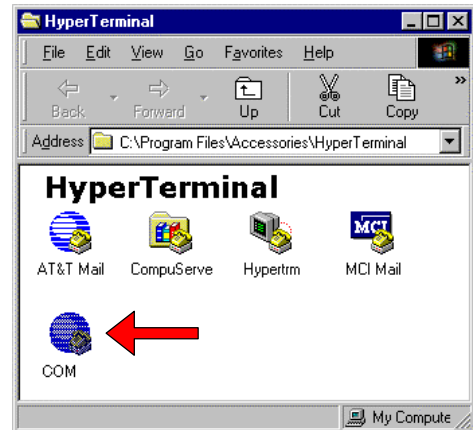
Refer to 6.(4) ⑪ **RS232C/RS485 Communication** to set to  when using RS-232C;  when using RS-485.

⑥ **Communication method**

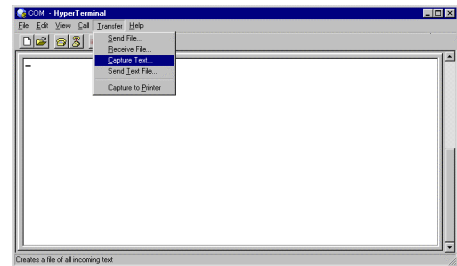
i) Connect the **MM-122A** with a personal computer.

ii) Turn on the **MM-122A**.

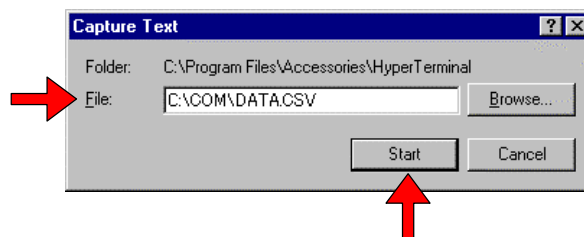
iii) Open the Hyper Terminal window from the start menu of a personal computer, double-click the [COM.ht] icon.



iv) When the COM - Hyper Terminal window appears, select [Capture Text] from [Transfer] menu.



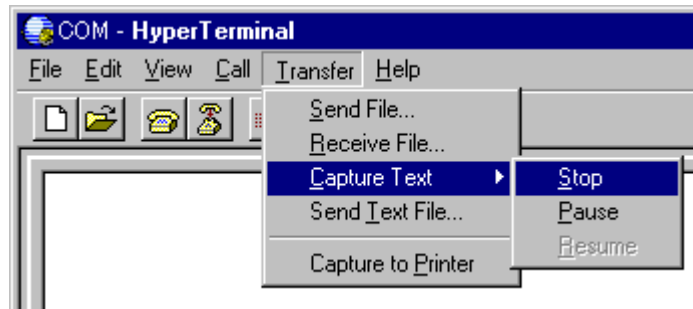
v) When the Capture Text window appears, type a filename including the path and click [Start] button. "C:\ COM\ DATA.CSV" is typed in the example below.



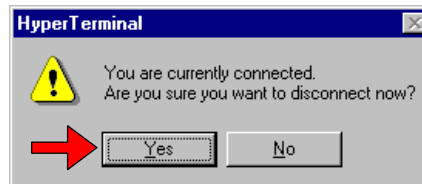
ATTENTION

Be sure to type the extension ".csv" at the end of the filename.

- vi) When the communication ends, [END] is displayed at the bottom of the screen. Point to [Capture Text] from [Transfer] menu, and then select [Stop].



- vii) Select [Exit] from [File] menu. When the message “You are currently connected. Are you sure you want to disconnect now?” is displayed, click [Yes] button.





Now the Hyper Terminal ends.

- viii) The saved data (csv format) can be read in Microsoft Excel.

- Windows95/98 is registered trademark of Microsoft Corporation, USA.
- Hyper Terminal is registered trademark of Hilgrave Inc., USA.
- TM and the mark are not used in this manual.

9. Fault Code List

The **MM-122A** lets you know the occurrence of troubles by lighting up lamps or displaying fault codes.

Fault code (Display name)	Cause	Measures
E-01 (Mode display)	<ul style="list-style-type: none"> • Trouble of the main memory • Low voltage of the backup battery • A part of schedule setting data is lost or broken because of electrostatic noise and so on. 	<p>Reset and check the setting data, and then input the proper setting again.</p> <p>To return the setting data to the initial value</p> <p>Turn on the power supply switch with the operation button pressed. Keep pressing the operation button.</p> <p style="text-align: center;">↓</p> <p>When the operation button is pressed for one second,</p> <p> is displayed on the mode display.</p> <p style="text-align: center;">↓</p> <p>When the operation button is turned a notch to the right, the display is changed to</p> <p>.</p> <p style="text-align: center;">↓</p> <p>When the operation button is pressed, data returns to the initial value.</p> <p>If E-01 is displayed when the power supply switch is turned on, the MM-122A may have been broken. Consult Miyachi Technos Corp.</p>
E-02 (Mode display)	Trouble of the sub memory	Repair is required. Consult Miyachi Technos Corp.
E-03 (Mode display)	A trouble is detected on the control system of the MM-122A .	Turn off the power supply, and then turn on again. If E-03 is displayed again, repair is required. Consult Miyachi Technos Corp.
E-04 (Mode display)	A trouble has occurred in the setting function of the start sensitivity level.	The start sensitivity level is not set properly. Repair is required. Consult Miyachi Technos Corp.
E-05 (Mode display)	The [NG+24V] signal output from the I/O connector is over duty.	Turn off the power supply, and then check that the I/O connector is connected.

Fault code (Display name)	Cause	Measures
E-06 (Mode display)	The voltage of the backup battery has become 2.5V or less.	Replace the battery.
E-07 (Mode display)	When the printer is set to use, it is not connected or the power supply is off.	Check the printer.
cccc (Current display, Time display)	The current has stopped during the pulsation measurement before it reaches the set stage.	Check the pulsation setting. Also, check whether the welding power supply is working normally.
EEEE (Current display or Time display)	The measured current or weld time has exceeded the measurable range.	Check the current range setting. Also, check whether the welding power supply is working normally.

Lamps light up when the measurement result is abnormal.

Current upper/lower limit judgment lamps Weld time upper/lower limit judgment lamps	HIGH lamp lights up when the measured value exceeds the upper limit. LOW lamp lights up when the measured value doesn't reach the lower limit.
No-current lamp	Lights up when the current is not detected.

10. Specifications

Power supply	Single-phase 100–240 VAC $\pm 10\%$ (50/60Hz) 24VDC $\pm 10\%$								
Measurement range of current	0.010–0.199kA (0.199kA range) (For a ten-time sensitivity coil only) 0.100–1.999kA (1.999kA range) 1.000–19.99kA (19.99kA range) 10.00–199.9kA (199.9kA range) (For a one-time sensitivity coil only)								
Current	<p>Peak value within the weld time or effective value between the measurement start and end (Only specified impulse is measured when using pulsation.)</p> <p>Effective values by measurement modes are as follows:</p> <table border="1"> <tr> <td>CYC display mode:</td><td>Arithmetic-averaged effective value every half cycle</td></tr> <tr> <td>ms display mode:</td><td>Arithmetic-averaged effective value every 1ms</td></tr> <tr> <td>Transistor:</td><td>Effective value between measurement start and end</td></tr> <tr> <td>Capacitor:</td><td>Effective value between measurement start and TH</td></tr> </table> <p>Peak/Effective value selection: 31 schedules Measurement accuracy: $2\%rdg \pm 3dgt$</p>	CYC display mode:	Arithmetic-averaged effective value every half cycle	ms display mode:	Arithmetic-averaged effective value every 1ms	Transistor:	Effective value between measurement start and end	Capacitor:	Effective value between measurement start and TH
CYC display mode:	Arithmetic-averaged effective value every half cycle								
ms display mode:	Arithmetic-averaged effective value every 1ms								
Transistor:	Effective value between measurement start and end								
Capacitor:	Effective value between measurement start and TH								
Current range	0.1999kA/1.999kA/19.99kA/199.9kA (0.1999kA range is for a ten-time sensitivity coil only.) (199.9kA range is for a one-time sensitivity coil only.) 31 schedules								
Measurable time	<p>0.5–500.0-cycle single-phase AC (2 seconds max.) Measurement accuracy: ± 0.0 cycle (at welding current of 50/60Hz commercial frequency)</p> <p>DC worth 0.5–500.0 cycle (2 seconds max.) Measurement accuracy: ± 0.5 cycle</p> <p>1–2000-ms AC or DC Measurement accuracy: $\pm 1ms$</p> <p>0.50–25.00-ms DC (for transistor welding power supply) Measurement accuracy: $\pm 0.02ms$</p> <p>0.50–9.99-ms TP or TH (for capacitor welding power supply) Measurement accuracy: $\pm 0.02ms$</p> <p>5.0–99.9-ms TP or TH (for capacitor welding power supply) Measurement accuracy: $\pm 0.1ms$</p>								
Measurement start and Measurement end	000.0–500.0 cycles (31 schedules) 0000–2000 ms (31 schedules) 0.00–25.00 ms (31 schedules)								
Non-measurement time	0.1–9.9 seconds (applied to capacitor welding power supply only)								

Selectable welding current	AC (AC) Measurement of a single-phase AC current of commercial frequency
	AC frequency select (AC---) Measurement of a single-phase AC or AC inverter welding current
	ACms (ACSEC) Measurement of welding current of an AC inverter welding machine (Weld time is displayed in ms.)
	DC cycle (dccyc) Measurement of welding current of a DC inverter welding machine (Weld time is displayed in CYC.)
	DCms (dcSEC) Measurement of welding current of a DC inverter welding machine (Weld time is displayed in ms.)
	DC short time (dcSSc) Measurement of welding current of a transistor welding machine (Weld time is displayed in ms.)
	Capacitor short time (CAP-S) Measurement of a capacitor welding current (Time is displayed in ms.)
	Capacitor long time (CAP-L) Measurement of a capacitor welding current (Time is displayed in ms.)
Welding end judgment time	Half cycle (when measuring AC or DC current in CYC)
	1–99 ms adjustable (when measuring AC or DC current in ms)
	0.1–9.9 ms adjustable (when measuring the transistor welding current)
Measurement frequency setting	50–250 Hz (in 1Hz increment) (Common to all schedules)
Judgment function	Upper/Lower limit judgment of current (31 schedules) (279 schedules (31 schedules x 9 steps) in step-up)
	Upper/Lower limit judgment of weld time (31 schedules) (31 schedules in step-up)
	No-current judgment
Input signal	Schedule select signal (SCH1, SCH2, SCH4, SCH8 and SCH16)
	[RESET] signal
	[GATE] signal
	[NO CURR] signal (contact or 24VAC/DC)

Output signal	[GOOD] signal (semiconductor relay, opens when the measured value is outside the range of the upper/lower limit.) Contact capacity: 24VDC, 20mA Output time: 10ms/100ms/Hold
	[NG-H]/[NG-L] signal (semiconductor relay, opens when the measured value is outside the range of the upper/lower limit.) Contact capacity: 24VDC, 20mA Output time: 10ms/100ms/Hold
	[NG+24V] output (24VDC output, Max. output is 100mA.) Output time: Hold
	[COUNTUP] signal (semiconductor relay, closes when counting up.) Contact capacity: 24VDC, 20mA Output time: Hold
Conduction angle	Max. value within the weld time (30–180 degrees)
Pulsation	0–9 times (31 schedules) (This doesn't function in the capacitor welding machine mode.)
Counter	Preset counter (5 digits for each schedule)
	Step-up counter (4 digits for each schedule)
Step up	1–9 steps (This doesn't function in the capacitor welding machine mode and the transistor welding machine mode.)
Printout	Print items: Current / Weld time / Judgment result / Schedule number / Conduction angle / All cycle / Schedule data NB: Printer is sold separately.
Communication	RS-485/RS-232C Communication items: Current / Weld time / Judgment result / Schedule number / Sending conduction angle / Sending and receiving schedule data
Power consumption	12W or less
Mass	1.9kg
Outline	70(W) x 189(H) x 246(D) mm (not including projection)
Accessories	I/O connection cable Operation manual
Separately sold parts	Power supply cable (3m)
	Printer (BL-58RII)
	Power supply adapter for printer
	AC cable for power supply adapter
	Printer connection cable (1.5m)
	RS-232C cable (1.5m)
	Connector for RS-485 (D-SUB, 9-pin male) Bracket (for fixing on table. See 11.Outline.)

11. Calibration

To maintain the performance of **MM-122A**, it is necessary to calibrate it periodically. The calibration is carried out at our factory.

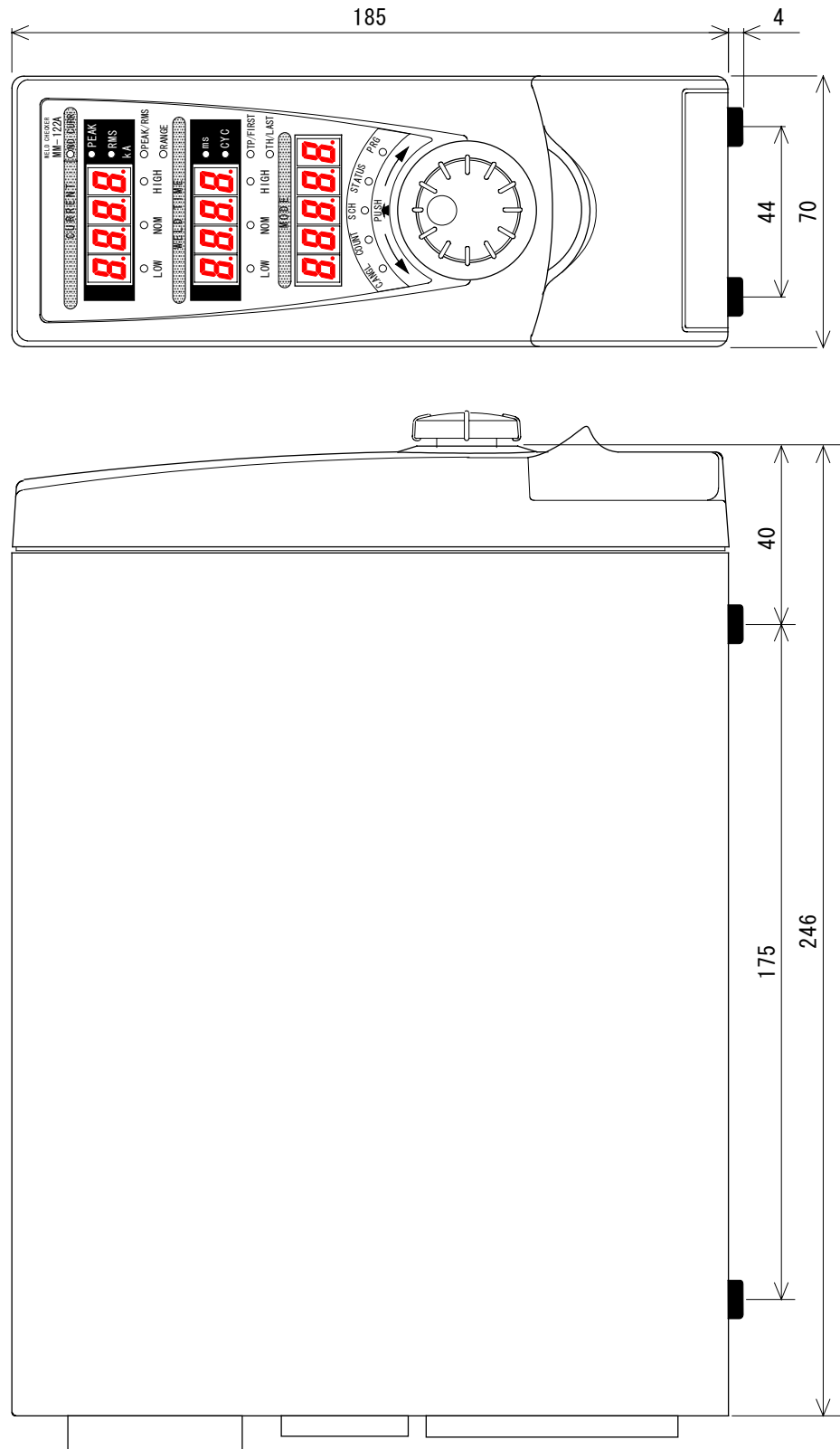
Send us your toroidal coil with **MM-122A** for calibration. Since the conditions of degradation differ from one **MM-122A** to another according to the operation environment, it is necessary to calibrate them together.

Contact Miyachi Technos Corp. for details of calibration.

12. Outline

(1) Body

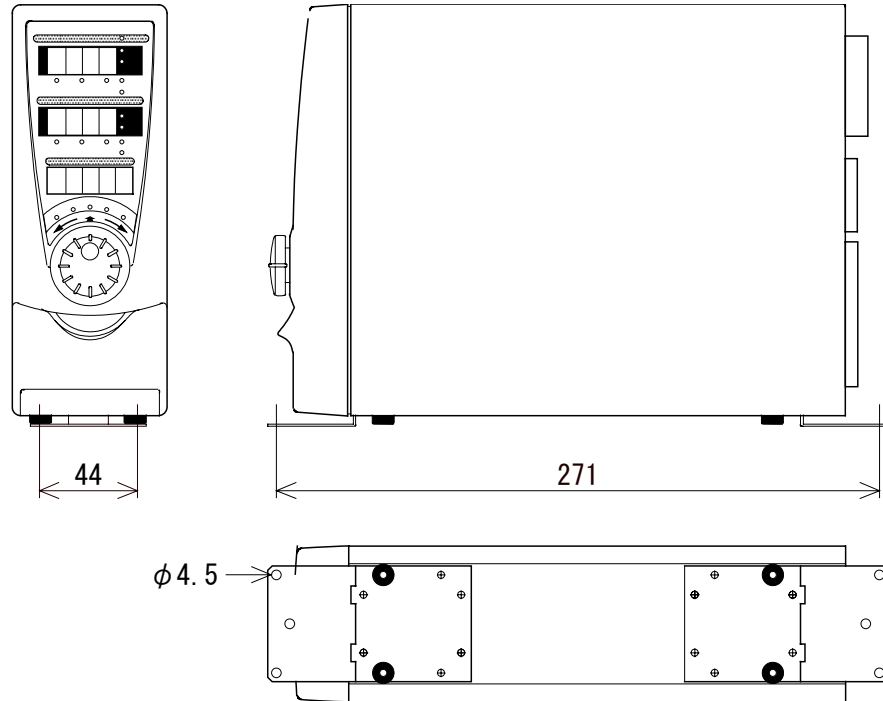
(Unit: mm)



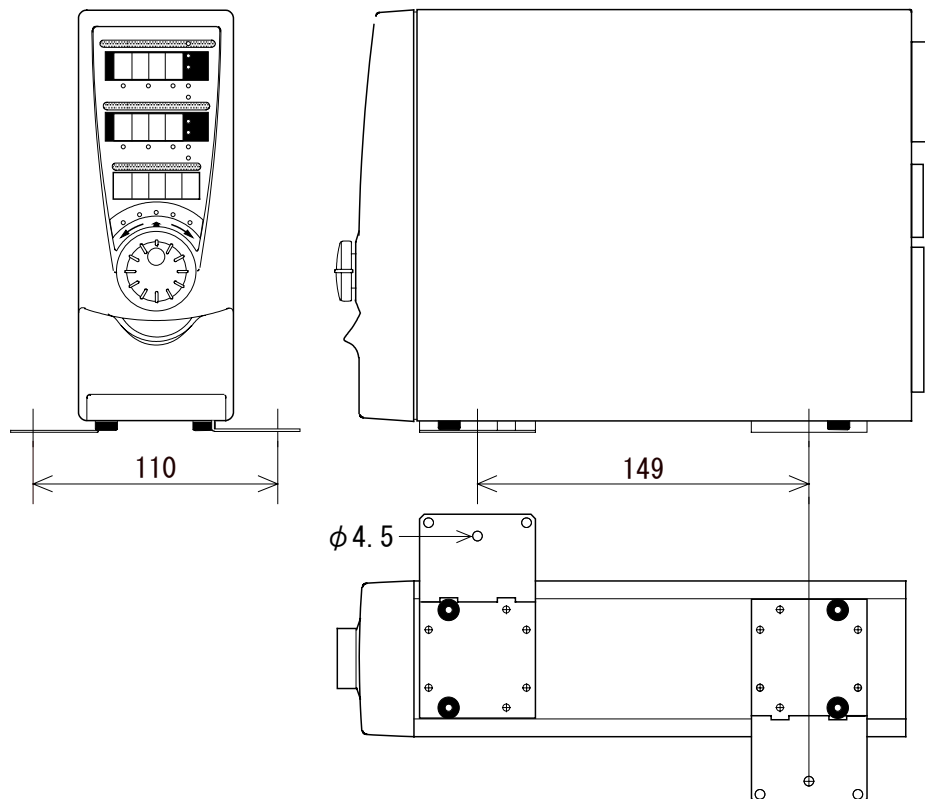
(2) Drawings for Mounting Bracket

(Unit: mm)

① Front and rear mounting



② Right and left mounting





MIYACHI TECHNOS CORPORATION

EC Declaration of Conformity

The company/manufacturer: **Miyachi Technos Corporation**
95-3, Futatsuka, Noda-City, Chiba, 278-0016 JAPAN

Herewith declares conformity of the products

Designation: **Weld Checker**
Type/Serial Number, etc: **MM-122A**

With applicable regulations below

EC Directive: **Machinery Directive 98/37/EC amended by:
89/392/EEC, 91/368/EEC, 93/44/EEC and 93/68/EEC**

**Low Voltage Directive 73/23/EEC amended by:
93/68/EEC**

**EMC Directive 89/336/EEC amended by:
92/31/EEC and 93/68/EEC**

Harmonized European Standards applied:

**EN 55011(Group 1, Class A):1991; EN 60204-1:1998;
EN 61000-4-2:1995(contact: level 3, air discharge: level 3);
EN 61000-4-3:1995(level 3);
EN 61000-4-4:1995(power line: level 3, signal line: level 3);**

Importer Distributor in EU: **MIYACHI TECHNOS EUROPE GmbH**
Pleidelsheimer Strasse 11, D-74321 Bietigheim, Germany

Division: **Miyachi Technos Corporation**

Noda-City July.01.2002

Place and Date


Michiro Hasegawa / Director, Production

Note: This Declaration certifies conformity with the above mentioned Directives, but gives no assurance of properties within the meaning of the Law concerning product liability. It becomes invalid if any technical or other modifications are carried out without manufacturers consent.

Warranty

1. Warranty Period

The warranty period is one (1) year from the date of shipment.

2. Warranty Service in Japan

If the product is defective within the warranty period under customer's normal use of the product in accordance with the precautions of the operation manual, labels attached to the products and so on, we repair the product free of charge. There will be no charge for warranty repair services performed at Miyachi Technos Corporation, Japan or the customers' location in Japan.

Example	<ul style="list-style-type: none">▪ Repair at Miyachi Technos Corporation : No shipping charges▪ Repair at customers' location : No traveling costs for serviceman to and from the customers' location
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3. Overseas Warranty Service

- (1) Products that are purchased at overseas Miyachi affiliated companies (listed on the last page) or at authorized overseas distributors are warranted in accordance with the warranty contract of those companies or distributors where the product was purchased. Customer must contact the purchasing company or distributor regarding the product warranty.

- (2) When a Miyachi Technos Corporation product is being set up for operation at an overseas facility under the presence of a serviceman of Miyachi Technos Corporation or overseas Miyachi affiliated companies, Miyachi Technos Corporation will warrant the product for the warranty period under the described conditions below. Product repair will be at the option of Miyachi Technos Corporation.

Conditions:

a. Repair at customers' location by Miyachi Technos Corporation serviceman

Miyachi Technos Corporation will repair or replace, at its option, defective parts and/or unit free of charge except for our travel related costs (Round-trip air ticket, local transportation costs, man-hour charge for inbound and outbound traveling, hotel, meals, etc.). Advance notice is required.

b. Repair at customers' location by overseas Miyachi affiliated companies

Miyachi Technos Corporation will repair or replace, at its option, defective parts and/or unit free of charge except for our travel related costs (Round-trip air ticket, local transportation costs, man-hour charge for inbound and outbound traveling, hotel, meals, etc.). Advance notice is required.

c. Repair by customer

Miyachi Technos Corporation will be responsible for the cost of parts and/or unit plus shipping to the customer's designated location within Japan only. No overseas shipments. Replaced defective parts and/or unit must be returned or discarded according to the instructions of Miyachi Technos Corporation, Japan.

d. Repair at Miyachi Technos Corporation, Japan

Miyachi Technos Corporation will repair or replace, at its option, defective parts and/or unit free of charge except for inbound and outbound shipping costs. If a customer requests Miyachi Technos Corporation to ship the repaired product within Japan, Miyachi Technos Corporation will send it to the customer's designated location free of charge. The customer is required to pay for any overseas shipping.

- In case of repair at overseas Miyachi affiliated companies, Miyachi Technos Corporation will repair or replace, at its option, defective parts and/or unit free of charge. All freight charges are responsibility of the customer. Miyachi Technos Corporation will send it to the customer's designated location and charge the customer for all shipping costs.

- (3) When a Miyachi Technos Corporation product is being set up for operation at overseas facility *without* the presence of a serviceman of Miyachi Technos Corporation or overseas Miyachi affiliated companies, the warranty expires in principle within the warranty period of one (1) year.

If a product is defective, Miyachi Technos Corporation or overseas Miyachi affiliated companies will repair the product and charge to the customer in principle according to the content of the defect and customer's location.

However, if the customer sends the product, freight pre-paid, to Miyachi Technos Corporation or overseas Miyachi affiliated companies, Miyachi Technos Corporation will warrant it as follows. Then, ask Miyachi Technos Corporation where to send.

- In case of repair at Miyachi Technos Corporation, Japan, Miyachi Technos Corporation will repair or replace, at its option, defective parts and/or unit free of charge. If a

customer requests Miyachi Technos Corporation to ship the repaired product within Japan, Miyachi Technos Corporation will send it to the customer's designated location free of charge. The customer is required to pay for all shipping charges to overseas locations.

- In case of repair at overseas Miyachi affiliated companies, Miyachi Technos Corporation will repair or replace, at its option, defective parts and/or unit free of charge. Miyachi Technos Corporation will send it to the customer's designated location and will charge the customer for all shipping costs.

4. Although products are within the warranty period, they are repaired *with a charge* in the following cases:

- (1) Defect or damage due to improper use, incorrect repair or modification by customer
- (2) Defect or damage due to improper handling such as dropping or shock in transportation and moving after delivery
- (3) Defect or damage caused by the external causes such as earthquake, fire, salt water, storm, lightning, other natural disasters, war, terrorism, other rebellion, or abnormal voltage, etc.
- (4) Defect or damage caused by the use of this product in combination with the product of other company or by any surrounding equipment
- (5) Damage due to crack, discoloration, dirt and deficiency on storage in use
- (6) Exchange of consumable items

5. Responsibility of our Company

Miyachi Technos Corporation is responsible for restoring the status of its products due to failure by repair in case of defect.

Miyachi Technos Corporation is not liable for any direct or indirect damage arising from any defect or use of its products.

6. Repair after Warranty Period

If the performance of a product can be recovered and maintained by repair, and a customer requests it, Miyachi Technos Corporation will repair the product and charge the customer for repair.

Miyachi Technos Corporation will warrant parts and/or unit replaced with a charge for three (3) months from the date of replacement or repair, except for consumable items.

7. Stock Period of Parts and Unit

Miyachi Technos Corporation will stock the necessary parts and units of its products for

repair for at least seven (7) years after production is discontinued.

In the case of a computer and its peripheral equipment, Miyachi Technos Corporation will stock the parts and units for repair for at least six (6) years in principle after production is discontinued. Miyachi Technos Corporation will provide hardware replacement options based on commercially available components or parts.

8. After-Service

If you have any question or request for repair and purchase of parts or units, please contact a distributor or representative of Miyachi Technos Corporation.

Please inform us of the model, serial number, problem and distributor's name where you purchased the product with your request for repair.

Attention

- Do not duplicate, partially or entirely, the operation manual.
- Miyachi Technos Corporation reserves the right to change the content of the operation manual at any time without notice.
- Although Miyachi Technos Corporation created the operation manual with making assurance doubly sure, if you find incomprehensible matters, mistake, typographical errors, etc., please inform us of them immediately.

For customer's use:

Date of Purchase	
Distributor's Name and address at purchase	
Serial No.	

Please contact the sales department of Miyachi Technos Corporation or the local distributor at your purchase if you have any request for after-service or other questions regarding our products.

For your memory, please fill in the above box.

■Miyachi Technos Corporation, Japan

Head Office / Factory

95-3, Futatsuka, Noda-city, Chiba-pref. 278-0016 Japan

TEL 04-7125-6177 FAX 04-7125-6170 TEL +81-4-7125-6177(Key Number)

Sales Headquarter / Tokyo Sales Office / Application Laboratory

Koyosha Building, 5-48-5, Higashi-Nippori, Arakawa-ku, Tokyo 116-0014 Japan

TEL 03-3891-2211 FAX 03-3891-7887 TEL +81-3-3891-2211(Key Number)

Osaka Sales Office / Application Laboratory

Shin-Osaka Meiko Building, 6-9-27, Nishi-Nakashima, Yodogawa-ku, Osaka-city,
Osaka 532-0011 Japan

TEL 06-6305-2211 FAX 06-6305-3870 TEL +81-6-6305-2211(Key Number)

Nagoya Sales Office / Application Laboratory

4F Kumada Bldg II, 1-2-2, Kanayama, Naka-ku, Nagoya-city, Aichi 460-0022 Japan

TEL 052-323-2301 FAX 052-323-2302 TEL +81-52-323-2301(Key Number)

■Overseas Miyachi affiliated companies

Miyachi Korea Corp.

D-510, Pundang Techno-Park, 151, Yatap-Dong, Pundang-Gu, Songnam-city,
Kyunggi-Do, Korea

TEL +82-342-707-5855 FAX +82-342-707-5857

Miyachi Trading (Shanghai) Co. Ltd.

6F, Building 64, No.421 Hong Cao Road Shanghai, 200233 China

TEL +86-21-6485-9595 FAX +86-21-6485-9797

Unitek Miyachi Corp.

1820 South Myrtle Ave., Monrovia, CA 91017-7133 U. S. A.

TEL +1-626-303-5676 FAX +1-626-358-8048

Miyachi Technos Europe GmbH

Pleidelsheimer Strasse 11, D-74321 Bietigheim, Germany

TEL +49-7142-9752-0 FAX +49-7142-9752-27