

INVERTER-TYPE WELDING POWER SUPPLY

IPB-5000B

IPB-5000B-MU

USER MANUAL



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Revision Record

Revision	EO	Date	Basis of Revision
A	30000	03/05	None. Original edition (IPB-5000A).
B	46191	01/21	Include displacement monitor in standard unit (IPB-5000B)
C	47208	01/24	Update Manual Title

FOREWORD

Thank you for purchasing an Amada Weld Tech IPB-5000 Inverter Power Supply. Upon receipt of your equipment, please thoroughly inspect it for shipping damage prior to its installation. Should there be any damage, please immediately contact the shipping company to file a claim, and notify us at:

Amada Weld Tech Inc.
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FAX: (626) 358-8048
e-mail: info@amadaweldtech.com

The purpose of this manual is to supply operating and maintenance personnel with the information needed to properly and safely operate and maintain the IPB-5000 Power Supply. We have made every effort to ensure that the information in this manual is accurate and adequate. The contents of this factory manual are subject to change without notice. AMADA WELD TECH is not responsible for any loss or injury due to improper use of this product.

This manual covers the following models:

Original Model Name	Original P/N		Current Model Name	Current P/N
IPB-5000A-MU/200-240	1-289-01	→	IPB-5000B-MU/200-240/DISP	1-289-02-02
IPB-5000A-MU/200-240/DISP	1-289-01-02			
IPB-5000A-MU/380-480	1-289-01-01	→	IPB-5000B-MU/380-480/DISP	1-289-02-03
IPB-5000A-MU/380-480/DISP	1-289-01-03			

The operation of the IPB-5000A is basically the same as the IPB-5000B, except that the Displacement Monitoring capability is now standard in the IPB-5000B models. This manual can be used as a reference for both the IPB-5000A and IPB-5000B Power Supply models.

Amada Weld Tech adds an I/O Accessory box on to the rear of the IPB-5000B Power Supply. This added option has the –MU suffix in the part number. See addendum at the end of this manual for information about the added –MU option.

Thank you for purchasing our Inverter Welding Power Supply **IPB-5000B**.

- For correct use, read this operation manual carefully.
- After reading, save it in a proper place where you can easily access to.

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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 safe operation.
- The meaning of the words and symbols is as follows.



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



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



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



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



These symbols denote actions which operators must take.



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



Do not touch the inside of the Power Supply unnecessarily.

Since very high voltages are charged to the inside of this Power Supply, it is very dangerous to touch it unnecessarily.

Any person other than service personnel, or authorized representatives' personnel must not touch the inside.



Never disassemble, repair or modify the Power Supply.

These actions can cause electric shock and fire.

If any part needs to be checked or repaired, contact us or your distributor for help.



Never burn, destroy, cut, crush or chemically decompose the Power Supply.

This product incorporates parts containing gallium arsenide (GaAs).

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.



Ground the equipment.

If the Power Supply is not grounded, you may get an electric shock when there is trouble, or when electricity leaks.



Connect the specified cables securely.

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



Do not damage the power cable and connecting cables.

Do not tread on, twist or tense any cable. The power 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 us or your distributor.



Do not use any damaged power cable, connecting cable and plug.

That can cause electric shock, short circuits and fire.
If any part needs to be repaired or replaced, consult us or your distributor.



Stop the operation if any trouble occurs.

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



Persons with pacemakers must stay clear of the welding machine.

A person who uses a pacemaker must not approach the welding machine or walk around the welding 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 flash directly during welding, your eyes may be damaged. If any Surface flash and expulsion gets in your eye, you may lose your eyesight.

CAUTION



Apply the specified source voltage.

Application of a voltage out of the specified range can cause fire and electric shock.



Do not splash water on the equipment.

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



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

Do not cut the conductor of wire. A flaw on it can cause fire and electric shock.



Install the equipment on firm and level surface.

If the equipment falls over or drops from an uneven surface, injury may result.



Do not sit on or do not put things on it.

Sitting on it, or putting things on it may cause malfunction.



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 this equipment with a blanket, cloth, etc.

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



Do not use this Power Supply for purposes other than welding.

Use of this equipment in a manner other than specified can cause electric shock and fire.



Use ear protectors.

Loud noises can damage hearing.



Keep a fire extinguisher nearby.

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



Regularly inspect and maintain the equipment.

Regular inspect and maintenance is essential to safe operation of the equipment. If you see any damage, make necessary before starting the operation.

(2) Precautions for Handling

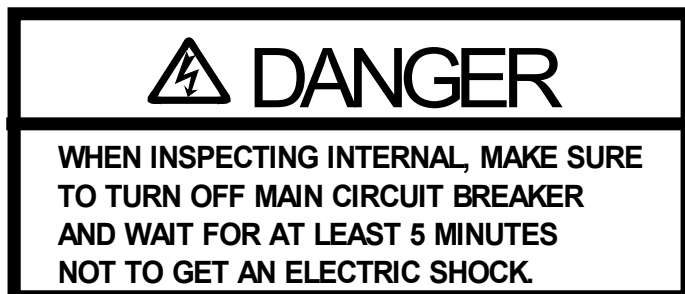
- When transporting or moving the Power Supply, do not lay it down. Also, handle the Power Supply with care so as not to make an impact such as drop on it.
- Install the Power Supply on a firm and level surface. If it is used inclined or on its side, it may have a malfunction.
Also, provide 10 cm clearance to the intake and exhaust for improving the effect of heat release (Refer to **5. (1) Installation**).
- Do not install this Power Supply in the following places:
 - Where there is considerably damp (humidity is higher than 90%).
 - Where the ambient temperature is above 40°C or below 5°C.
 - Where there is nearby high noise source.
 - Where the Power Supply may be exposed to chemicals.
 - Where moisture may be condensed on the surface of the Power Supply.
 - Where there is considerable dirt.
 - Where the Power Supply may be subjected to vibration or impact.
 - Where the altitude is above 1000 meters.
- If the outside of the Power Supply is stained, wipe it with a dry cloth or a moistened cloth. If it is badly stained, use diluted neutral detergent or alcohol to clean it. Do not use paint thinner, benzene, etc., which can discolor or deform the parts.
- Do not put screws, coins, etc., in the Power Supply, as they may cause a malfunction.
- Operate the Power Supply according to the method described in this operation manual.
- Operate the switches and buttons carefully by hand. If they are operated roughly or with the tip of a screwdriver, a pen, etc. they may be broken.
- Operate the switches and buttons one at a time.
If two or more of them are operated at a time, the Power Supply may have trouble or may be broken.
- The Power Supply is not equipped with auxiliary power such as an outlet for lighting.
- The cable to supply power, the welding head, the welding transformer, and cables for connecting among the welding head, the welding transformer and the Power Supply are separately needed to use the Power Supply.
- The I/O signal line to start the Power Supply is not attached. Prepare the crimp-on terminal and line for wiring to the terminal block.

(3) On Disposal

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

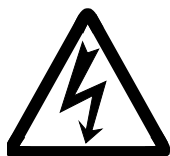
(4) Warning Labels for Safety

The following warning labels are attached to the Power Supply for safe operation. The location of labels and the meaning of the symbols are as follows:



Location: the side surface of a plastic cover inside **IPB-5000B**

Meaning: **Danger**



Location: Output terminal cover inside **IPB-5000B**

Meaning: **Danger of Electrical Shock**

(5) Function Difference Depending on Model

The function of “only for Model with Displacement Sensor” described in the operation manual is effective for the models equipped with Displacement Sensor as follows.

Other functions are effective for the Models with Sensor as same as the standard models.

Model		Welding Power	Sensor Equipped	CE Marking Compliance
IPB-5000B	-00-00	200 to 240V AC	×	×
	-00-01	380 to 480V AC	×	×
	-00-02	380 to 480V AC	×	○
	-00-03	200 to 240V AC	○	×
	-00-04	380 to 480V AC	○	×
	-00-05	380 to 480V AC	○	○
	-00-07	200 to 240V AC	×	×

○: Applicable ×: Not Applicable

2. Features

The **IPB-5000B** is an inverter welding power supply designed for spot welding and fusing.

Because of a compact design, it is easy to move and install. In addition, the monitor function makes possible the judgment of defective or non-defective welding.

- Has a welding current monitoring function for the judgment of weld quality.
- The selection from four control methods of Constant-current control, Constant-voltage control, constant-current/constant-voltage combination control and constant-power control is applicable for realizing the stable weld quality.
- Has an interrupting function (**INTERRUPT**) to interrupt fusing current by externally inputting the displacement of an electrode, etc. for stable fusing.
- Weld current can be stopped when the displacement reaches the set value, because the displacement change between electrodes generated by fusion penetration etc. is measured (only for the model with a displacement sensor).
- As an inverter is used, the power factor is high and the power condition is stabilized.
- Because of the menu selection system, setting of various items can easily be done.
- With four protective functions, the operator can work at ease.
 - Over current detecting function
 - No-current / no-voltage detecting function
 - Thermostat fault detecting function
 - Self diagnostics
- The TFT LCD is employed. You can see monitor values of the welding current etc. clearly from any angle.

3. Packaging

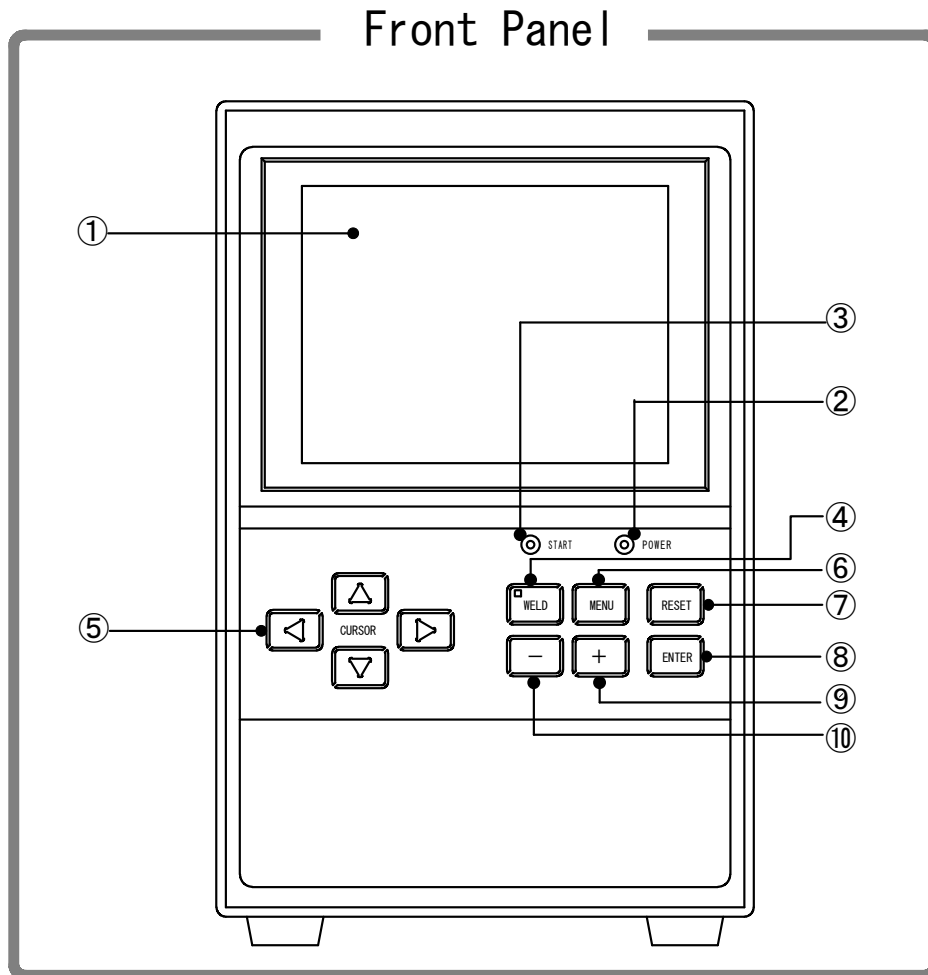
Shipping Kit List

Verify that contents of the container agree with the kit list.
If you see any damage, please contact us.

Packaged Kit	Quantity
IPB-5000B	1
Operation Manual	1
Cable Clamp (Large) for fixing I/O Cable	2
Cable Clamp (Small) for fixing I/O Cable	3

4. Name and Functions of Each Section

(1) Front Panel



① **Display Screen**

Displays the information such as setting of a weld schedule, monitored values of weld current, etc.

② **POWER Lamp**

Lights up when the power switch is turned on to supply the power to **IPB-5000B** and **IPB-5000B** works normally.

③ **START Lamp**

Lights up while the start signal is input to make the sequence start.

④ **WELD Key with WELD Lamp**

Use **WELD Key** if you want to make the sequence start without flowing the weld current.

When **WELD Key** is pressed to extinguish **WELD Lamp**, then the weld current does not flow.

⑤ **CURSOR Key**

Moves the cursor upward/downward or to the right/left on **Display Screen**.

⑥ **MENU Key**

Press **MENU Key** to display **MENU Screen**.

⑦ **RESET Key**

Press **RESET Key** to reset the display of a trouble after removing the cause of the trouble when the trouble display is shown on **Display Screen**.

⑧ **ENTER Key**

Use **ENTER Key** to put in a set value or selected item.

Move the cursor to each item to be changed and press **ENTER Key** item by item to complete the change.

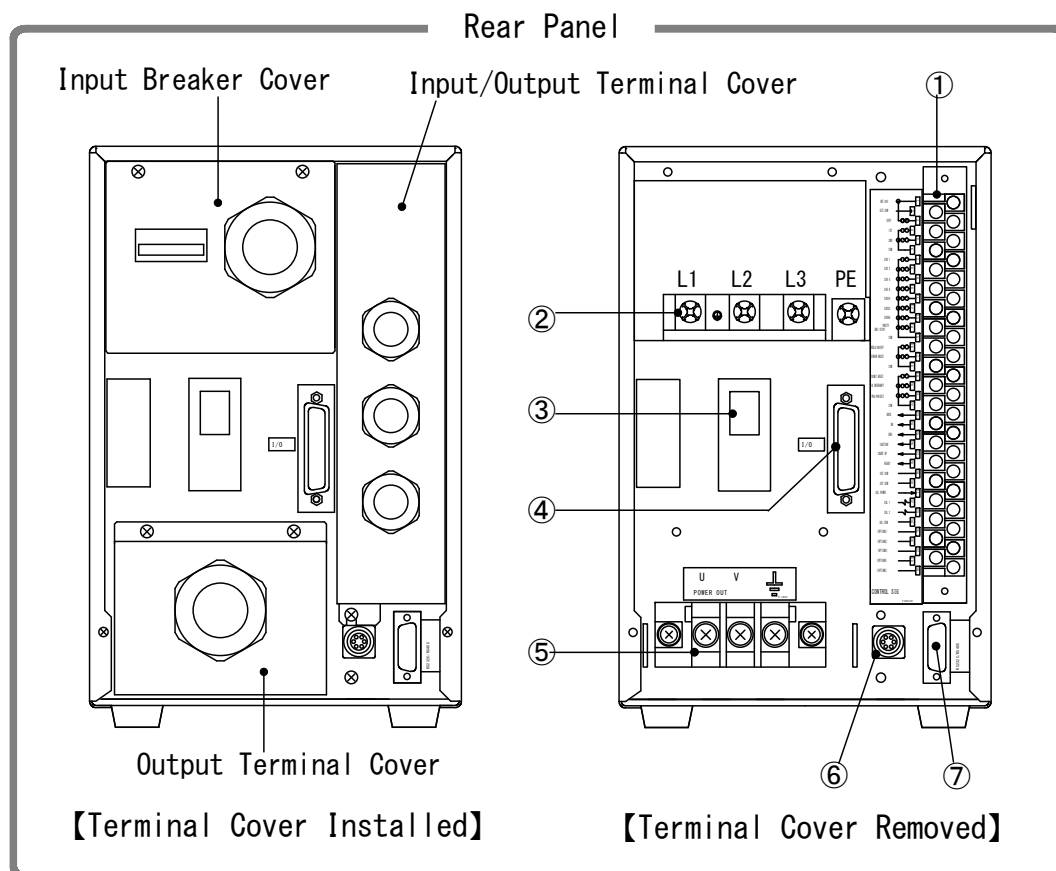
⑨ **+ Key**

Press **+ Key** to increase the value of a changed item.

⑩ **- Key**

Press **- Key** to decrease the value of a changed item.

(2) Rear Panel



- ① **Connecting Terminal Strip for External Input/Output Signal**
Used for inputting the schedule signals, outputting trouble signals, etc.
The size of screws is M3.5 for connection.
- ② **Breaker for Welding Power Input**
Used to accept three-phase power supply for welding.
The size of screws is M5 for connection.
- ③ **Lever for Welding Power Input Breaker**
Pulling up the Lever supplies power; pushing down disconnects power supply.
- ④ **Welding Transformer I/O Signal Connector**
Used for connecting [SENS] cable of our welding transformer.
- ⑤ **Terminal Block for Welding Power Output**
Used for connecting to the input of welding transformer.
The size of screws is M6 for connection.
- ⑥ **Displacement Sensor Connector**
Used for connecting a displacement sensor (only for the model with displacement sensor).

⑦ **Communication Connector**

Used for communicating with Personal Computer (abbreviated as PC from now) through RS-232C or RS-485.

Before coupling with the connector, decide which mode is to be selected, RS-232C or RS-485 and confirm the communication mode. RS-232C is set at the factory shipment.

Mismatching of the communication mode setting at **IPB-5000B** with the mode at PC results in malfunction.

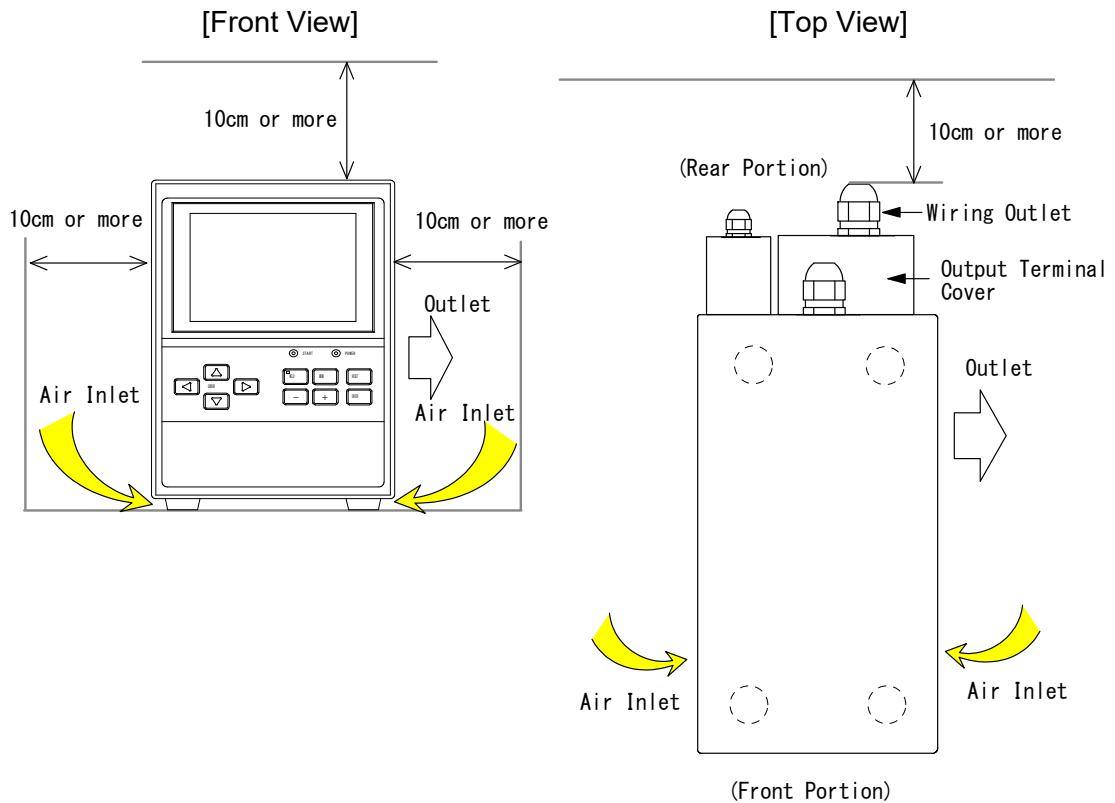
5. Installation and Connection

(1) Installation

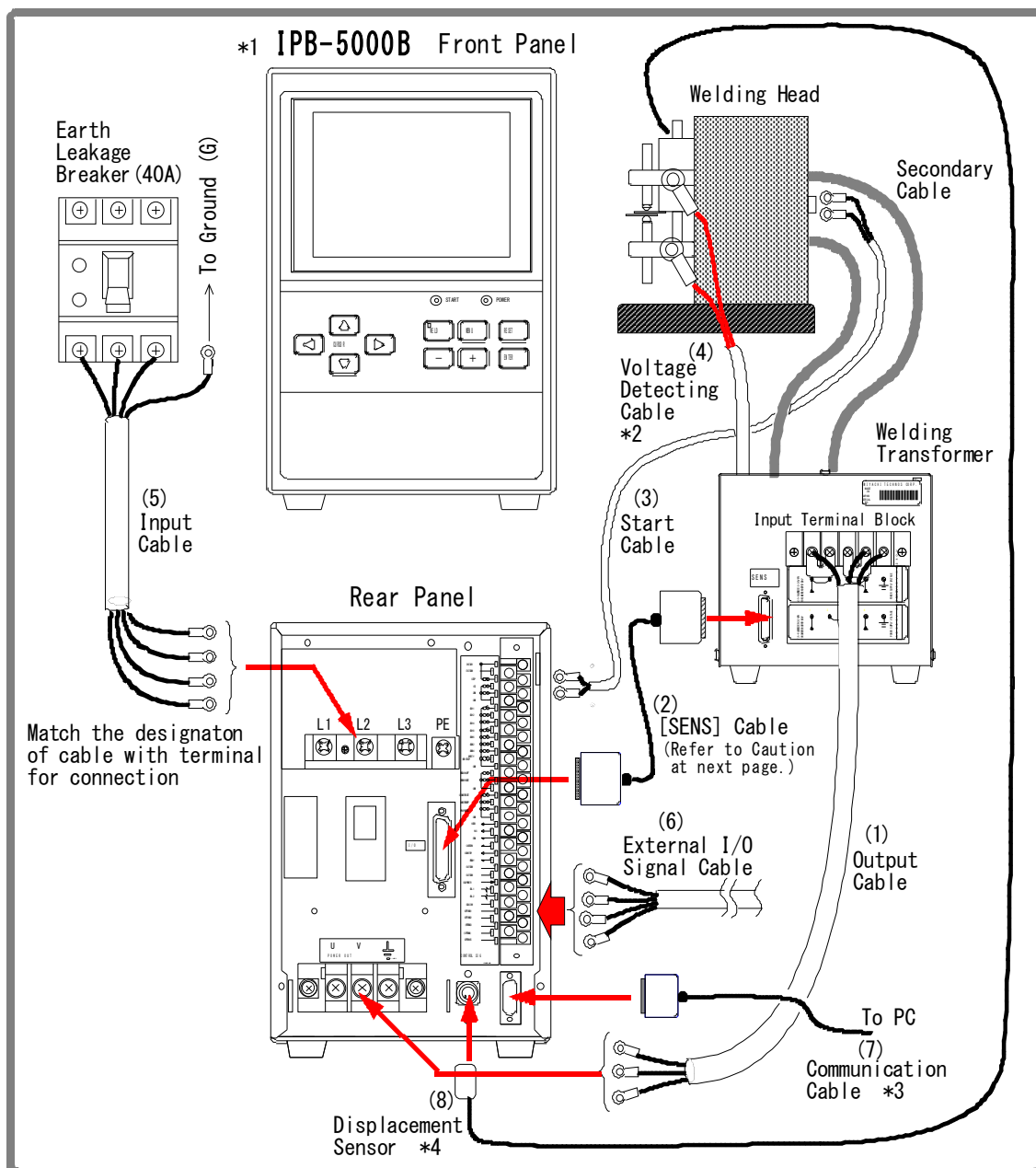
When planning for the installation, allow at least the figured clearance on each side from the wall, as referred to the figures below, for improving the effect of heat release.

Allow at least 10 cm or more from the end of the Wiring Outlet projected at the Output Terminal Cover in the rear portion of **IPB-5000B**.

As **IPB-5000B** should be air-cooled, do not install it in a closed area.



(2) Connection



Numerals of (1) to (8) in the above figure represent the order of connection procedures in the following pages.

- * 1: All items are separately sold except **IPB-5000B**.
- * 2: The Voltage Detecting Cable is used only for Constant Voltage Control, Constant Current/Constant Voltage Combination Control and Constant Power Control.
- * 3: Communication Cable is used only for connecting Personal Computer (PC).
- * 4: Displacement Sensor is used only for the model equipped with the Sensor.

⚠ CAUTION



Be sure to use **SK-05741** [SENS] cable when connecting **IPB-5000B** with Welding Transformer **IT*-360*6** or **IT*-780*6** (See **11.(2)③** for [SENS] cable).

⚠ WARNING



Be sure to ground the equipment.
Be sure to install the Terminal Cover after wiring.



Be sure to install an earth leakage breaker of **40A rated current or more**.

(1) Connecting Input Terminal Block of transformer.

Connect the Output Cable from the Input Terminal Block of the welding transformer to the **Terminal block for Welding Power Output** (See **4.(2)⑤**) on the rear panel of **IPB-5000B**.

The ways of connecting the Input Terminal Block of Welding Transformer are different from each other, depending on the input voltage of **IPB-5000B**.

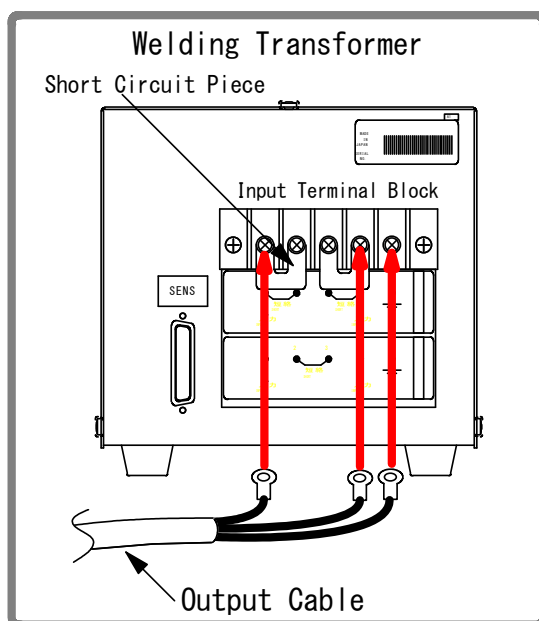
Connect in such way as ① below in the case of 200V System (200 to 240V) and as ② in 400V System (380 to 480V).

⚠ CAUTION

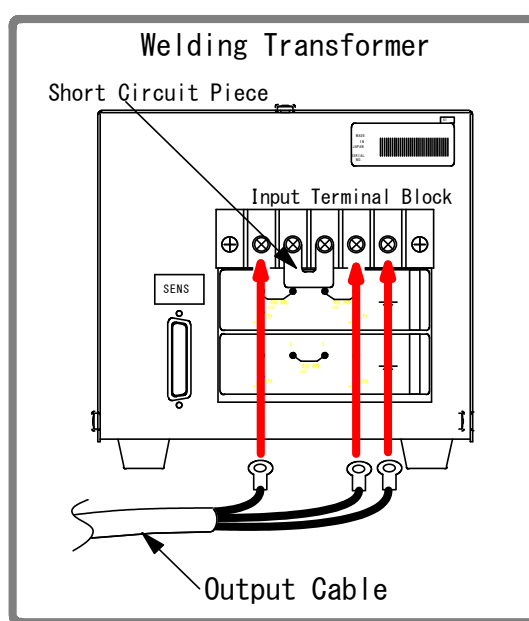


If the connection is done as the figure ① below in the case of **400V System**, it may damage **IPB-5000B** or Welding Transformer.

① **IPB-5000B-00-00** for use
(**200V System** Power Supply)



② **IPB-5000B-00-01** for use
(**400V System** Power Supply)



- (2) **Connecting [SENS] Cable to transformer.**
Connect [SENS] Cable from **Welding Transformer I/O Signal Connector** (See 4.(2)④) in the rear panel of **IPB-5000B** to Welding Transformer.
- (3) **Connecting Start Cable**
Connect Start Cable from **Terminal Strip for External Input/Output Signal** (See 4.(2)①) in the rear panel of **IPB-5000B** to Terminal Strip for Start Switch in Welding Head.
- (4) **Connecting Voltage Detecting Cable**
Connect the Voltage Detecting Cable in the case of using Constant Voltage Control, Constant Current/Constant Voltage Combination Control and Constant Power Control.
- (5) **Connecting a power supply**
Connect Input Cable from **Breaker for Welding Power Input** (See 4.(2)②) in the rear panel of **IPB-5000B** to Earth Leakage Breaker.
Connect the earth cable to **PE** Terminal.
- (6) **Connecting a necessary External I/O Signal Cable to Terminal Strip for External Input/Output Signal** (See 4.(2)①)
Prepare cables for the connection, referring to 8. **External Interface**.

(7) Connecting Communication Cable (only for PC connection)

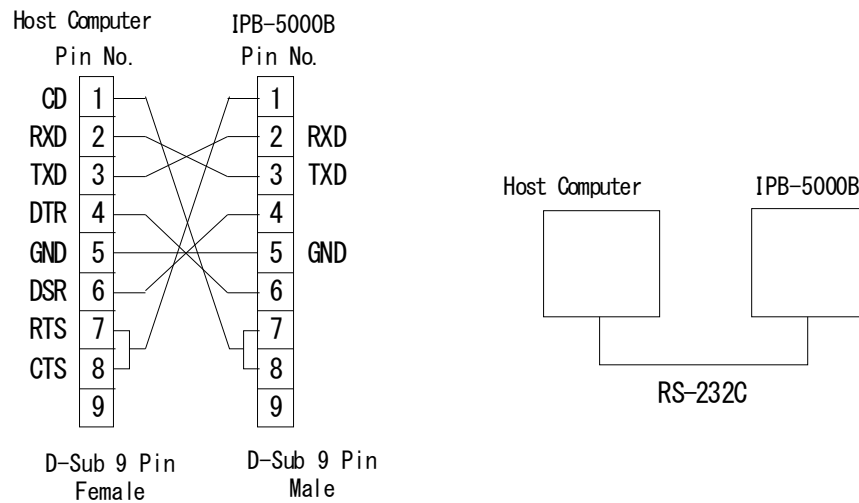
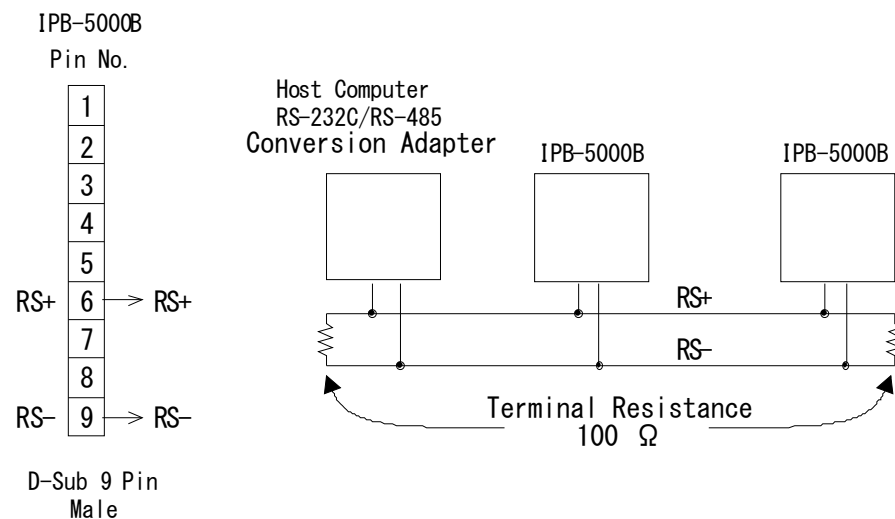
The communication with PC can be performed by the use of RS-232C and RS-485.

Before coupling with the connector, decide which mode is to be selected, RS-232C or RS-485 and confirm the communication mode (See **6.(9)②(c) COMM MODE** for the selection of RS-232C and RS-485).

Mismatching of the communication mode setting at **IPB-5000B** with the mode at PC results in malfunction.

RS-232C is set at the factory shipment.

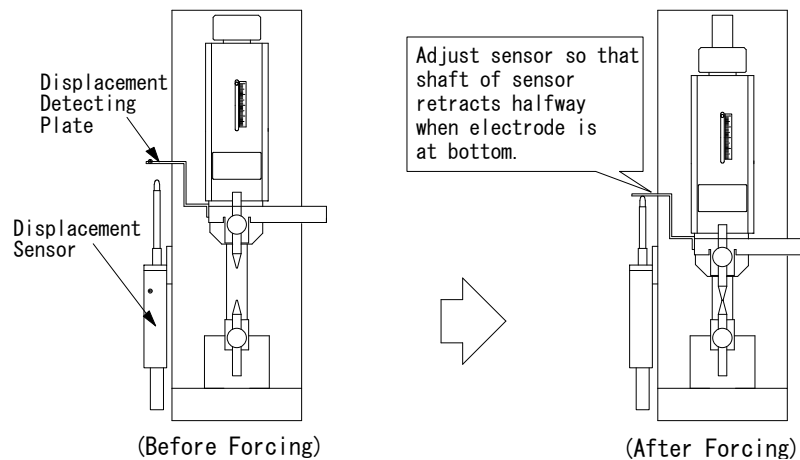
See **10. External Communication Function** for details.

① Connection of RS-232C**② Connection of RS-485**

(8) Connecting Displacement Sensor (only for model with Sensor)

Install firmly Displacement Sensor not so as to rattle in reference to the figure below.

Install Displacement Sensor with insulated.

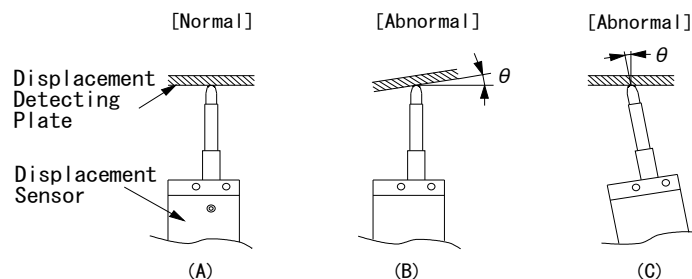


When using the function of detecting a workpiece, adjust the installation position of Sensor for the shaft of sensor so as to retract halfway in the condition before the electrode is forced (left-side figure above).

ATTENTION

As the figure (A) below, be sure to keep Displacement Sensor perpendicular to Displacement Detecting Plate.

If Displacement Sensor is slantingly installed like (B) or (C), the life of the sensor becomes shorter.

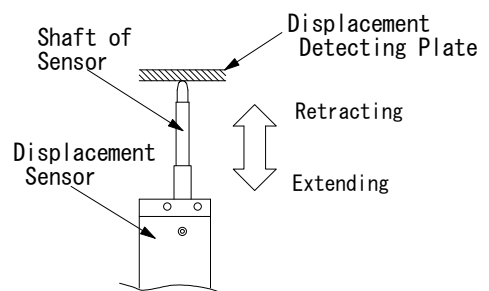


If Sensor is pressed beyond the range of measurement, it results in malfunction.

The measured value of displacement is minus (-) or plus (+).

When **NORMAL** is selected for **DISPLACEMENT POLARITY** in the **MISC** screen, the counted value is plus (+) in the direction of retraction of the movable part of Displacement Sensor and the value is minus (-) in the extension.

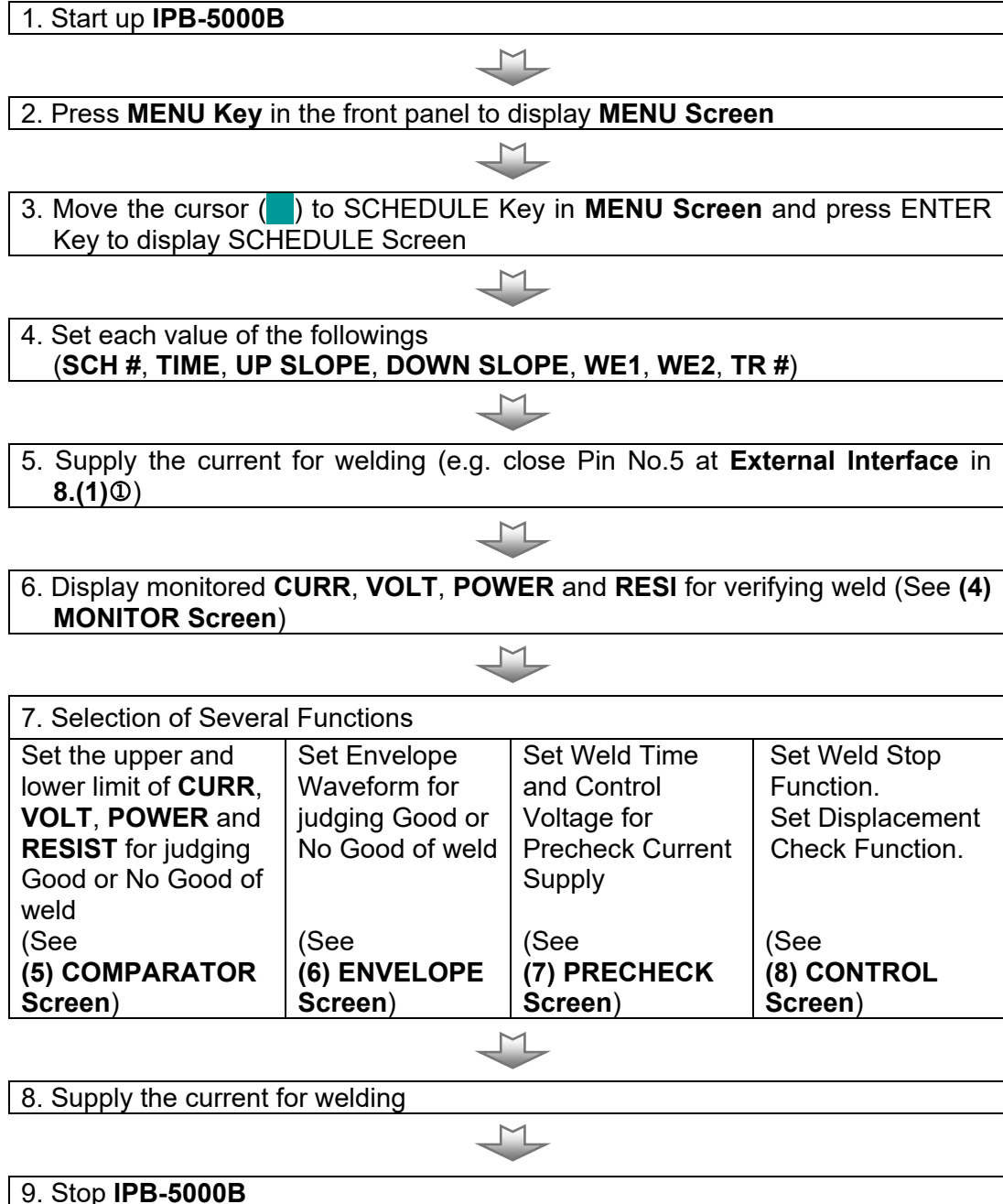
On the other hand, when **REVERSE** is selected, the counted value is minus (-) in the direction of retraction of the movable part of Displacement Sensor and the value is plus (+) in the extension.



6. Description of Display Screens

(1) Operation Flow

An example of the operation for the use of Welding Power Supply is shown as follows:



(2) MENU Screen

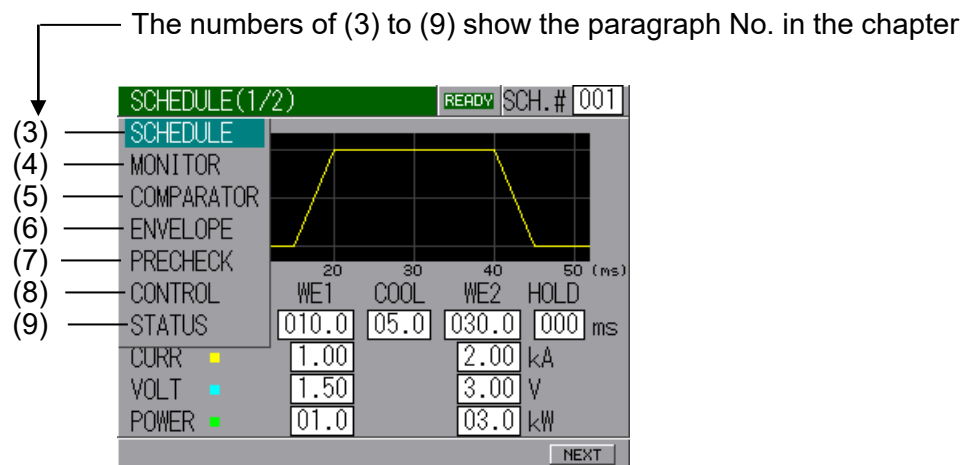
Setting of Values

Move the cursor (■) to the number or ON (or OFF) to be set or changed and press **+/- key** to complete such setting as input of a number or change of ON/OFF.

IPB-5000B has various functions, which are set in the respective screens. Press **MENU Key** in Front Panel to display **MENU screen**.

At the upper left of **MENU screen**, each function is displayed as a menu form.

Move the cursor (■) to an item you desire; press **ENTER key** to go to the selected screen.



(3) SCHEDULE Screen

Up to 127 weld schedules can be set on **IPB-5000B**.

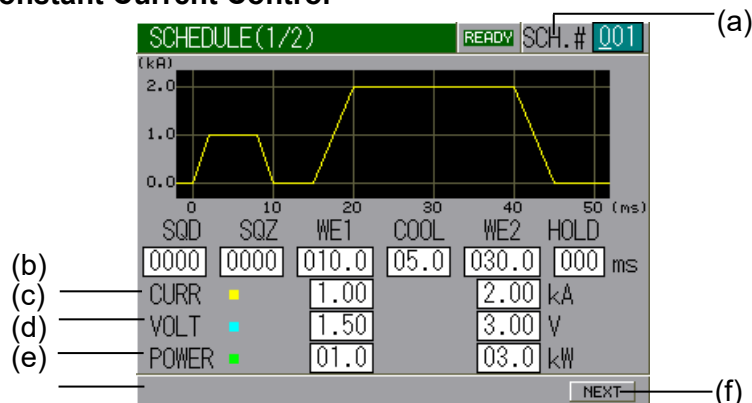
Those schedules are indicated as **SCHEDULE #1 to #127**.

The screen is used to set the **SCHEDULE No.**, length of weld time, weld current and so on.

Move the cursor (■) to **SCHEDULE** and press **ENTER key** to display **SCHEDULE Screen** as follows.

The control method can be set for **WE1** and **WE2** respectively, and the waveform of a selected control method is displayed as follows. Also, if the waveforms selected for each **WE1** and **WE2** are different each other, two different waveforms also are displayed.

① Constant Current Control



As the following, each item of (a) to (f) is described.

(a) **SCH. #**

It denotes No. of weld **SCHEDULE**. 127 weld schedules as **SCHEDULE #1** to **#127** can be set on **IPB-5000B**.

(b) **Time**

Time period of each movement in welding is set at the dimension of ms.
Refer to **9. Timing Chart** on the relation of each period.

SQR / Squeeze Delay Time	Period of time added to the Squeeze Time only once after start-up during repeated operation
SQZ / Squeeze Time	Period of time until proper squeeze is applied to workpiece
WE1 / Weld 1 Time	The first weld time for which weld current is supplied
COOL / Cooling Time	Period during which weld current is suspended between WE1 and WE2
WE2 / Weld 2 Time	The second weld time for which weld current is supplied
HOLD / Hold Time	Period of time to hold workpiece after ceasing weld current

(c) **CURR** (Note

Indicates the value of current for control. Set it for **WE1** and **WE2** respectively.

(d) **VOLT** (Note

Indicates the value of voltage for control. Set it for **WE1** and **WE2** respectively.

(e) **POWER** (Note

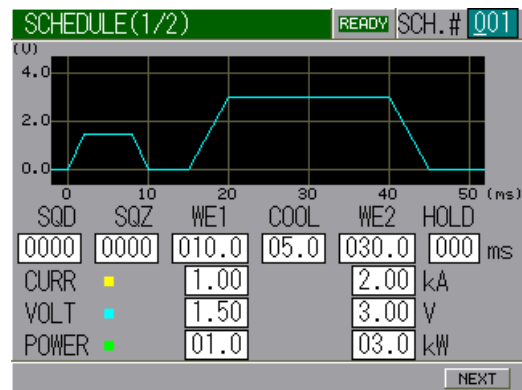
Indicates the value of power for control. Set it for **WE1** and **WE2** respectively.

(f) **NEXT**

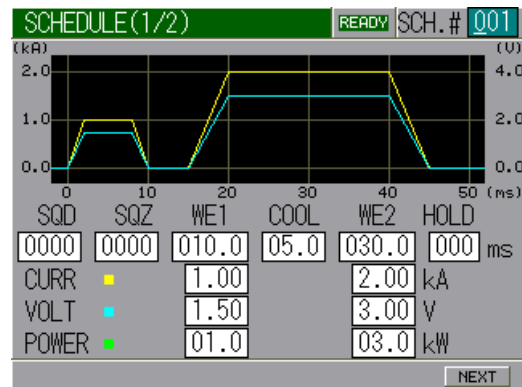
Displays **SCHEDULE (2/2) Screen**.

Note) Even if numbers are input at all the input boxes of control methods, **CURR**, **VOLT** and **POWER**, the numbers other than the selected control method do not work.

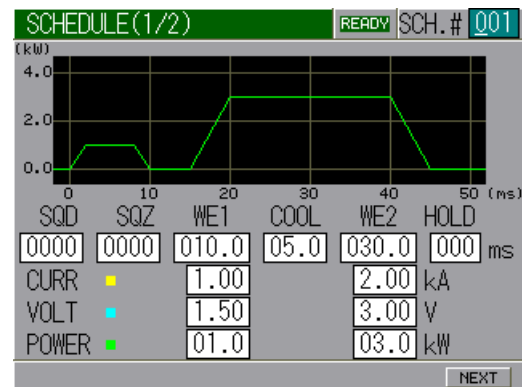
② Constant Voltage Control



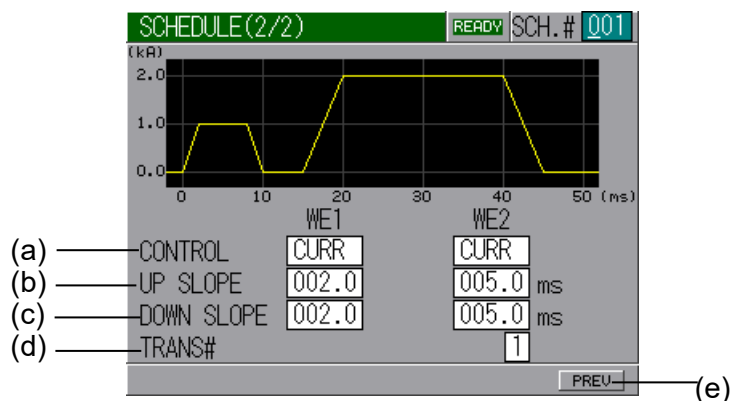
③ Constant Current/Constant Voltage Combination Control



④ Constant Power Control



⑤ SCHEDULE (2/2) Screen



As the following, each item of (a) to (e) is described.

(a) CONTROL

Sets a control method for **WE1** and **WE2** respectively.

CURR: Constant Current Control

VOLT: Constant Voltage Control

COMB: Constant Current/Constant Voltage Combination Control

POWER-H: Constant Power Control (**HIGH** Range)

POWER-L: Constant Power Control (**LOW** Range)

(b) UP SLOPE

Set the upslope time (to increase the weld current gradually) (See 9. Timing Chart). Set it for **WE1** and **WE2** respectively.

(c) DOWN SLOPE

Set the downslope time (to decrease the weld current gradually) (See 9. Timing Chart). Set it for **WE1** and **WE2** respectively.

(d) TRANS#

Indicates the number of a transformer.

Works only at the time when Transformer Selector **MA-650A** is used.

(e) PREV

Displays **SCHEDULE (1/2) Screen**.

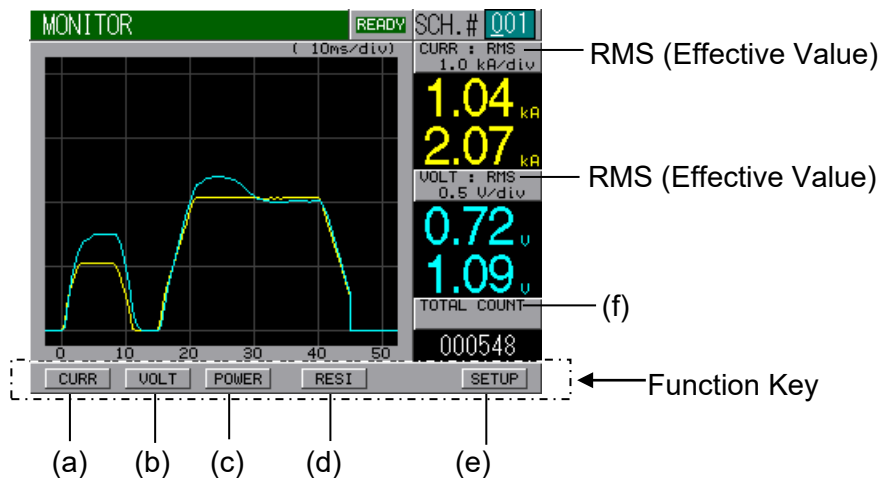
(4) MONITOR Screen

In this screen, you can confirm the working condition during welding. The monitored data, that is, Current, Voltage, Power and Resistance in every schedule are displayed.

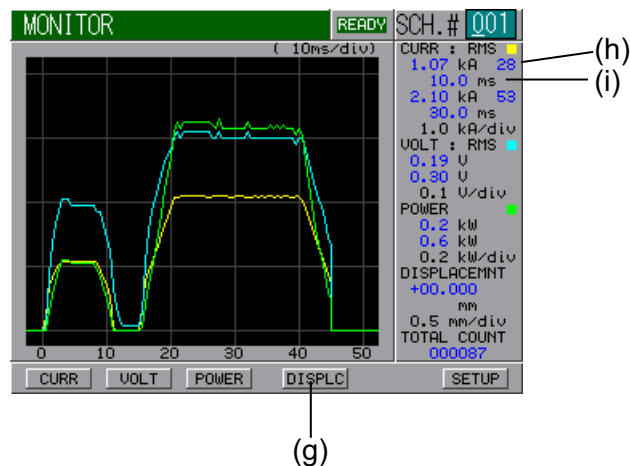
Current is indicated in yellow solid line, Voltage is cyan, Power is green and Resistance is magenta.

Move the cursor (■) to Function Key ((a) to (f)) to be selected and press **ENTER Key** to display the desired screen. Press one more time **ENTER Key** to erase the displayed data.

[When displaying data of two or less]



[When displaying data of three or more]



(a) CURR

The waveform of Current can be displayed.

(b) VOLT

The waveform of Voltage can be displayed.

(c) POWER

The waveform of Power can be displayed.

(d) RESI

The waveform of Resistance can be displayed.

(e) SETUP

The screen of SETUP can be displayed.

(f) TOTAL COUNT

The mode of a counter can be displayed. For details, see **(9)④(e) COUNTER**.

(g) DISPLC

The waveform of Displacement can be displayed.

(Only the model equipped with Displacement Sensor works. The waveform is upward displayed in the force-applying direction of Sensor and oppositely, downward in the force-releasing direction.)

(h) Pulse Width Monitor

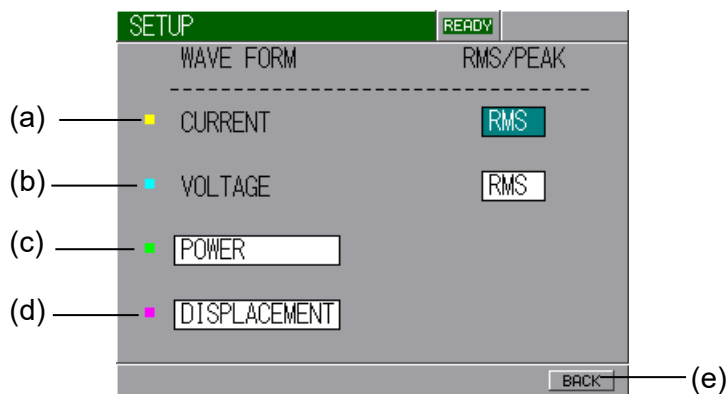
The mean value of pulse widths of the supplied pulse current is displayed in the percentage to 100% of the pulse width at the full wave.

Use **Pulse Width Monitor** as an indication.

(i) Weld Time

The period during which weld current is supplied is displayed.

Note) **IPB-5000B** holds the monitored value of all schedules (only the latest one for waveform) while the power is on. When the power is turned off, all values are cleared.

[SETUP Screen]**(a) CURRENT**

Selects **PEAK/RMS** of Current Value.

(b) VOLTAGE

Selects **PEAK/RMS** of Voltage Value.

(c), (d)

Selects the waveform to be displayed from 3 types.

POWER: Power Waveform

RESISTANCE: Resistance Waveform

DISPLACEMENT: Displacement Waveform (only for Sensor equipped)

(e) BACK

Returns to **MONITOR** Screen.

(5) COMPARATOR Screen

Set the upper and lower criterion of Current, Voltage, Power and Resistance for judging “Good” or “No Good” weld. If the monitored value is inside the criterion, Good is determined. If it is outside, No Good is determined.

If the monitored value equals to the criterion, Good is determined.

If No Good is determined, an error signal of “NG” or “Caution” is output, so it can be used to activate an alarm buzzer, alarm lamp, and so on.

(a)

COMPARATOR		READY	SCH. #	001
		WE1		WE2
(b)	CURR	0.98	H 9.99 L 0.00 RMS	1.87 H 9.99 L 0.00 kA
(c)	VOLT	1.04	H 9.99 L 0.00 RMS	2.12 H 9.99 L 0.00 V
(d)	POWER	1.0	H 99.9 L 00.0	3.9 H 99.9 L 00.0 kW
(e)	RESIST	1.0	H 99.9 L 00.0	1.1 H 99.9 L 00.0 mΩ

(a) SCH.

Input the No. of **SCHEDULE** to monitor (Schedule to be set).

(b) CURR

Set the upper limit (**H**) and lower limit (**L**) of the weld current for each of **WE1** and **WE2**. The setting range is 0.00 kA to 9.99 kA.

Switching between **PEAK** and **RMS** is possible. If the upper limit (**H**) is set to 9.99 kA and the lower (**L**) to 0.00 kA, no monitoring is done.

(c) VOLT

Set the upper limit (**H**) and lower limit (**L**) of the weld voltage for each of **WE1** and **WE2**. The setting range is 0.00 V to 9.99 V.

Switching between **PEAK** and **RMS** is possible. If the upper limit (**H**) is set to 9.99 V and the lower (**L**) to 0.00 V, no monitoring is done.

(d) POWER

Set the upper limit (**H**) and lower limit (**L**) of the weld power for each of **WE1** and **WE2**. When **POWER-H** is set for **CONTROL**, the setting range is 00.0 kW to 99.9 kW. If the upper limit (**H**) is set to 99.9 kW and the lower (**L**) to 00.0 kW, no monitoring is done. When **POWER-L** is set for **CONTROL**, the setting range is 0.00 kW to 9.99 kW. If the upper limit (**H**) is set to 9.99 kW and the lower (**L**) to 0.00 kW, no monitoring is done.

(e) RESIST

Set the upper limit (**H**) and lower limit (**L**) of the weld resistance for each of **WE1** and **WE2**. The setting range is 00.0 mΩ to 99.9 mΩ. If the upper limit (**H**) is set to 99.9 mΩ and the lower (**L**) to 00.0 mΩ, no monitoring is done.

Note) **IPB-5000B** holds the monitored value of all schedules (only the latest one for waveform) while the power is on. When the power is turned off, all values are cleared.

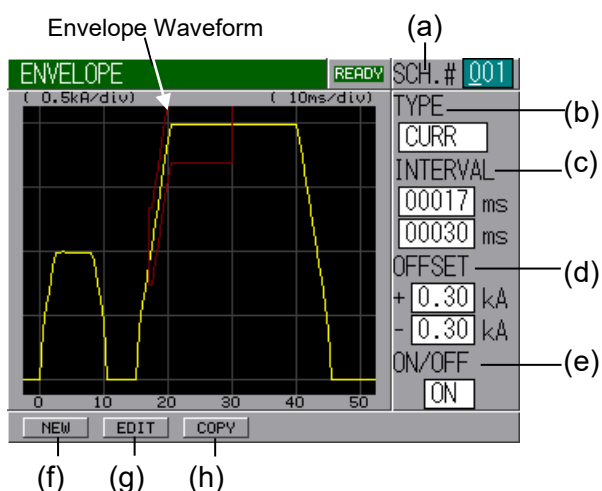
(6) ENVELOPE Screen

Here, the envelope waveform is prepared.

The function of Envelope is to draw a waveform (here, calling Envelope Waveform) having allowable criteria based on a standard waveform (an average actual weld waveform) and compare a monitored actual weld waveform with the Envelope Waveform in order to judge "Good" or "No Good" weld.

If the measured value is inside the Envelope Waveform, "Good" is determined. If it is outside, "No Good" is determined. If the monitored value equals to the Envelope Waveform value, "Good" is determined.

If No Good is determined, an error signal of "NG" or "Caution" is output, so it can be used to activate an alarm buzzer, alarm lamp, and so on.



(a) SCH.

Input No. of **SCHEDULE** to set the schedule.

(b) TYPE

Indicates the type of selected standard waveforms, **CURR**, **VOLT**, **POWER**, **RESIST** and **DISPLC**. Only one standard waveform can be selected among the following 8 types of waveform.

When setting the envelope based on the standard waveform from the monitor, flow the current before setting.

Waveform	How to Select
Set Current Waveform	Press NEW Button , next press SCH(C) Button on the displayed screen. (From now on, the word of Button is omitted here.)
Set Voltage Waveform	NEW , next SCH(V)
Set Power Waveform	NEW , next SCH(P)
Monitored Current Waveform	NEW , next MON , next CURR
Monitored Voltage Waveform	NEW , next MON , next VOLT
Monitored Power Waveform	NEW , next MON , next POWER
Monitored Resistance Waveform	NEW , next MON , next RESIST
Monitored Displacement Waveform	NEW , next MON , next DISPLC (only for model with Displacement Sensor)

(c) INTERVAL

Set the period of Envelope Waveform.

(d) OFFSET

Set the upper and lower limit of Envelope Waveform.

(e) ON/OFF

Set the activation or inactivation of the function.

ON: Envelope function works

OFF: Envelope function does not work

(f) NEW

Selects a standard waveform.

(g) EDIT

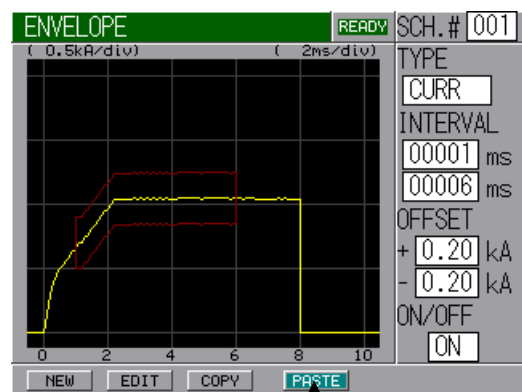
Changes **INTERVAL**, **OFFSET** or **ON/OFF** one another.

(h) COPY

Makes a copy of the data of Envelope Waveform.

Move the cursor (■) to **COPY Button** when **COPY Button** is displayed and press **ENTER Key** to show **PASTE Button**.

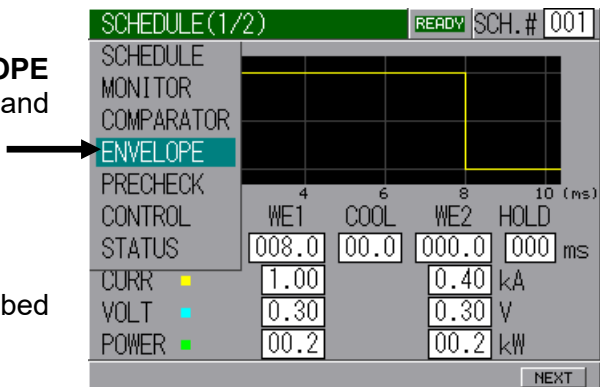
After changing **SCH. #** to be copied (source) into new **SCH. #** to be overwritten (destination), move the cursor (■) to **PASTE Button** and press **ENTER Key** to copy the data of Envelope Waveform.



How to Draw Standard Waveform and ENVELOPE Waveform

Here, the way how standard waveforms and ENVELOPE waveforms are drawn is described.

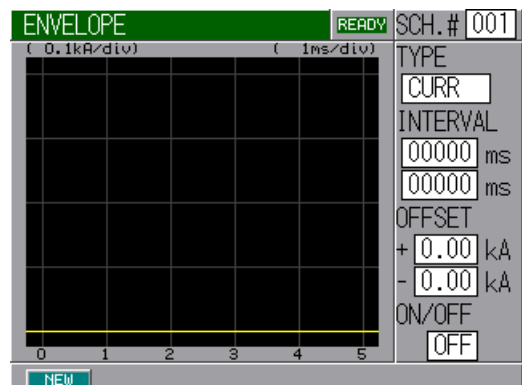
- ① Move the cursor (■) to **ENVELOPE** on **MENU Screen** (selecting) and press **ENTER Key**.



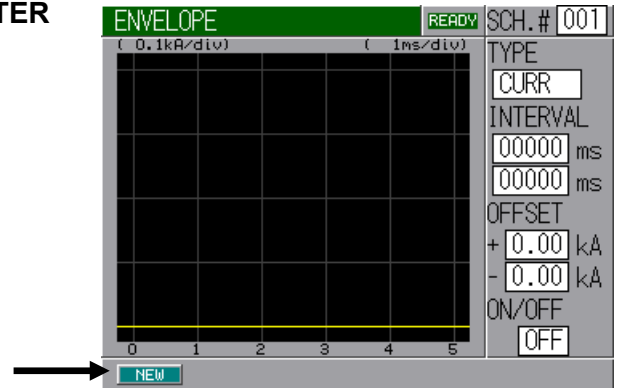
(The right-hand screen is described of Constant Current Control.)

The screen for drawing Envelope Waveform is prepared.

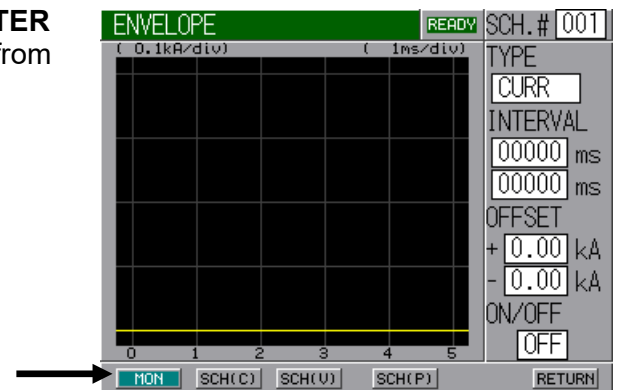
When modifying the existing waveforms, take steps ①, ⑤, ⑥, ⑦ and ⑧ (② to ④ is omitted).



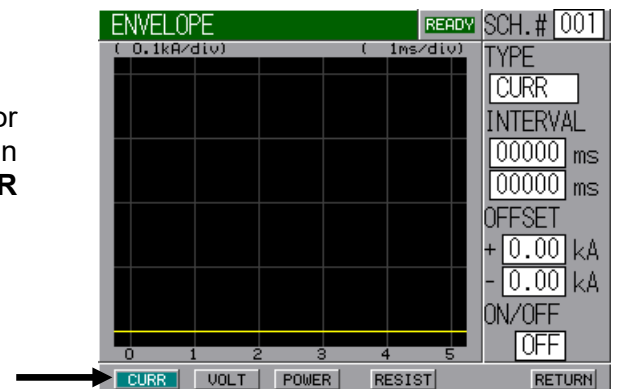
- ② Select **NEW Button** and press **ENTER Key** to draw a standard waveform.



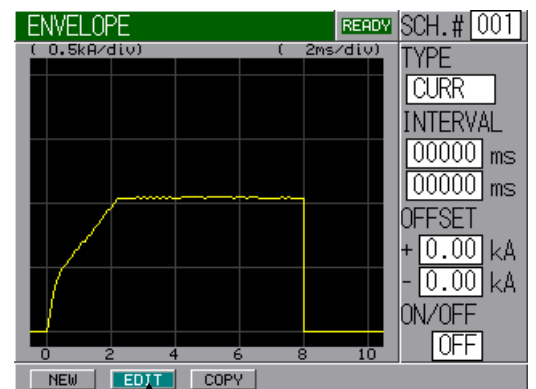
- ③ Select **MON Button** and press **ENTER Key** to draw a standard waveform from a monitored waveform.



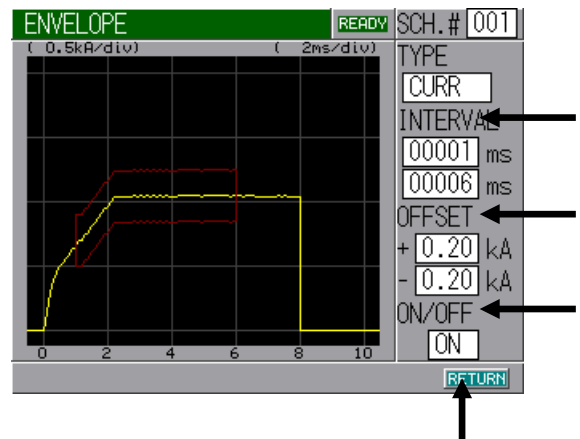
- ④ Select **CURR Button** and press **ENTER Key** to draw the standard waveform of a current waveform. In the case of Voltage, Power or Resistance, select each button situated on the right side of **CURR button** and press **ENTER Key**.



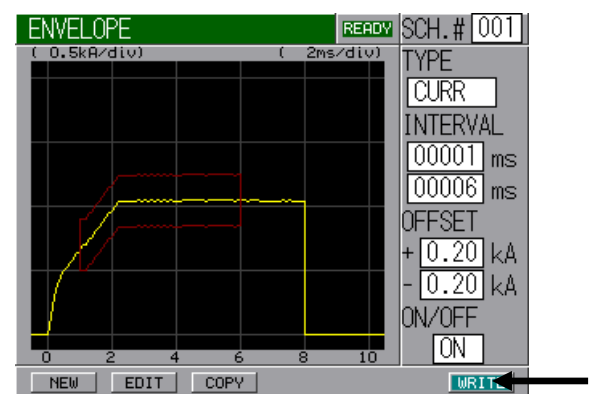
- ⑤ Select **EDIT Button** and press **ENTER Key** to draw Envelope Waveform.



- ⑥ **INTERVAL** sets the time period from the beginning to end of Envelope waveform.
OFFSET sets a plus (+) and minus (-) allowable value.
 Concerning **ON/OFF**, **ON** should always be selected when using Envelope function. If **OFF** is selected, no Envelope function works.
 After setting the above items, select **RETURN Button** and press **ENTER Key**.

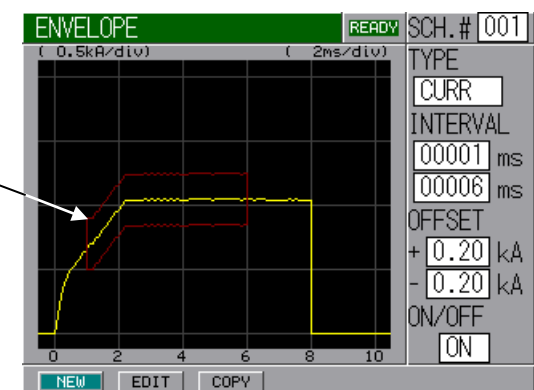


- ⑦ Select **WRITE Button** and press **ENTER Key** to store the setting.

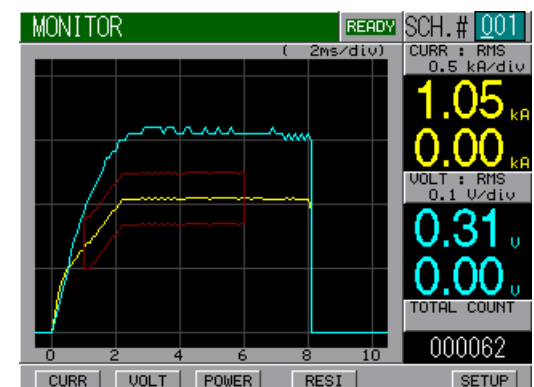


- ⑧ Here, in this step, Envelope Waveform has been set.

Envelope Waveform



When displaying the monitored screen, Envelope Waveform will appear.



(7) PRECHECK Screen

PRECHECK		READY	SCH.# 001
(a) — TIME		01.0	ms
(b) — VOLT		2.00	V
(c) — COMP CURR	HIGH	5.00	kA
	LOW	0.50	kA
(d) — CURR(MONITOR)		1.00	kA

Set the period of a weld time and a control voltage for Resistance PRECHECK in this screen.

The function of Resistance PRECHECK is to flow lower current in Constant Voltage Control method just before supplying the weld current and see if workpieces to be welded are correctly positioned by the use of the measured value of current then.

(a) TIME

Set a weld time. If the weld time equals to 0.0 ms, no PRECHECK is done.

(b) VOLT

Set a control voltage.

(c) COMP CURR HIGH/LOW

HIGH: Set the upper limit of current for PRECHECK.

LOW: Set the lower limit of current for PRECHECK.

(d) CURR (MONITOR)

Displays the monitored current at PRECHECK current supplying.

Note) **IPB-5000B** holds the monitored value of all schedules (only the latest one for waveform) while the power is on. When the power is turned off, all values are cleared.

(8) CONTROL Screen

The image shows two screenshots of the CONTROL screen. The top screenshot shows the 'INPUT' setting as 'OFF' for both WE1 and WE2. The bottom screenshot shows the 'INPUT' setting as 'DISPLC' for WE1 and 'CURR' for WE2, with a 'CONDITION' value of '+00.000 mm' for WE1 and '0.40 kA' for WE2.

Parameter	WE1	WE2	Unit
WELD STOP INPUT	OFF	OFF	
WELD TIME HI	500.0	500.0	ms
WELD TIME LOW	000.0	000.0	ms
DISPLACEMENT HI	+29.999	-29.999	mm
DISPLACEMENT LOW			
COMP			
DELAY TIME		000	ms
WORK DETECT	+00.000	+00.000	mm
MONITOR		+00.000	mm

Parameter	WE1	WE2	Unit
WELD STOP INPUT	DISPLC	CURR	
CONDITION	+00.000	0.40	mm / kA
WELD TIME HI	500.0	500.0	ms
WELD TIME LOW	000.0	000.0	ms
DISPLACEMENT HI	+29.999	-29.999	mm
DISPLACEMENT LOW			
COMP			
DELAY TIME		000	ms
WORK DETECT	+00.000	+00.000	mm
MONITOR		+00.000	mm

Depict the screens of setting Weld Stop Function, Weld Time Comparator, etc.

(a) INPUT

Selects the type of Weld Stops.

OFF: External Input, **WE1** Stop Input and Interrupt Input are effective.

DISPLC: Weld Stop works at the set displacement value (only for Sensor equipped).

CURR: Weld Stop works at the set current value.

VOLT: Weld Stop works at the set voltage value.

(b) CONDITION

Input the value depending on the setting at (a).

OFF: Not displayed.

DISPLC: Input the value of displacement.

CURR: Input current value.

VOLT: Input voltage value.

(c) HI

Input the upper limit of Weld Time.

(d) LOW

Input the lower limit of Weld Time.

(e) COMP

Input the upper limit (**HI**) / lower limit (**LOW**) of a final displacement.

(Works only for Model equipped with Displacement Sensor. When using the function of Displacement Sensor, the displacement from Weld Start to the end of **DELAY TIME** is measured to judge the upper and lower limit.)

(f) DELAY TIME

Sets **Delay Time**, the time period from Weld Stop to the time when a final displacement is measured (only for Sensor equipped). The setting range is from 0 to the time period of **HOLD TIME** (See (3)①(b)).

(g) WORK DETECT

Input the upper limit (**HI**) / lower limit (**LOW**) value at the time of detecting workpiece (only for Sensor equipped).

No detection of workpiece is done in the case that "0" is set to both the upper limit and lower limit.

For the detection of workpiece, the position of Sensor where the workpiece is set between electrodes is taken as the base point. The larger displacement without workpiece than the displacement with workpiece is detected to judge whether or not the workpiece is set.

(h) MONITOR

Displays the displacement at the time of detecting workpiece, the time of the end of squeeze time (only for Sensor equipped).

Note) **IPB-5000B** holds the monitored value of all schedules (only the latest one for waveform) while the power is on. When the power is turned off, all values are cleared.

(9) STATUS Screen

Change the initial setting of **IPB-5000B** here in this screen.
According to customer's preference, precise setting can be obtained.

① STATUS (1/2) Screen

Label	Setting
(a) WELD TRANS	IT*360*6
(b) WELD TIME	EXCLUDE SLOPE
(c) START SIG. TIME	20 ms
(d) START SIG. HOLD	NO HOLD
(e) SCHEDULE#	EXT. (NP)
(f) END SIG. TIME	100ms
(g) MONITOR MODE	EXCLUDE SLOPE
(h) CALCULATION MODE	NORMAL

READY

NEXT

(a) WELD TRANS

Set a transformer.

Select it between **IT*-360*6** and **IT*-780*6**.

Since **IT*-142*6** is used for adjustment, do not select it.

("*" indicates any letter of the alphabet A to Z.)

(b) WELD TIME

Set whether or not upslope/downslope is included in **WELD TIME**.

EXCLUDE SLOPE: upslope/downslope is not included

INCLUDE SLOPE: upslope/downslope is included

(c) START SIG. TIME

Set a delay time defined as the time period which elapses from an input of Start Signal to a beginning of weld sequence.

The setting can eliminate the chattering movement of a start switch.

Select the set value among 20 ms, 10 ms, 5 ms and 1 ms.

If a chattering-proof switch can be used, shortest Delay Time can be obtained.

(d) START SIG. HOLD

A self-sustaining timing at starting can be selected.

SQ HOLD: Self-sustaining action works from the starting of squeeze sequence

WE HOLD: Self-sustaining action works from the starting of weld sequence

NO HOLD: NO self-sustaining action works. Input a start signal until the end of sequence.

(e) SCHEDULE#

Fixes the method of how to select a schedule.

EXT. (NP): Select a schedule by closing a schedule-selecting terminal on Rear Panel

EXT. (P): Select a schedule by closing a schedule-selecting terminal and a parity terminal on Rear Panel.

PANEL: Select a schedule on Front Panel.

Input a parity signal so that the total number of a closed schedule-selecting terminal and a closed parity terminal may be odd.

(f) END SIG. TIME

Set the time period during which End signal or GOOD signal is output.

10/100ms: Outputs End signal for 10 ms or 100 ms.

HOLD: Outputs End or GOOD signal for the period during which 2ND STAGE terminal is closed. But if it is closed for 10 ms or less, the signals are output for 10 ms. If it is longer than 10 ms, they are output for the closed period of 2ND STAGE terminal.

(g) MONITOR MODE

Set the mode of a displayed monitor value.

EXCLUDE SLOPE: Slope period not included.

INCLUDE SLOPE: Slope period also included.

(h) CALCULATION MODE

Set the way of calculating a monitored value.

NORMAL: Set **NORMAL** usually.

FAST: If the takt time is needed to shorten, the shorter calculation time is obtained when **FAST** is set.

② STATUS (2/2) Screen

STATUS (2/2) READY

(a)	TRANS SCAN MODE	OFF
(b)	COMM CONTROL	OFF
(c)	COMM MODE	RS-232C
(d)	COMM UNIT#	00
(e)	COMM SPEED	9600 bps
(f)	NO CURR MONITOR START	01 ms
(g)	PW MONITOR START	01 ms
(h)	NG OUTPUT	NORMALLY CLOSE
(i)	READY OUTPUT	WELD ON

ERROR MISC PREV

(j) (k) (l)

(a) TRANS SCAN MODE

Set the scan mode of transformers.

Does not work in Model with Displacement sensor.

OFF: No scan mode is used.

ON: A **SCHEDULE** is performed.

1-2: Consecutive 2 **SCHEDULE**'s are performed.

1-3: Consecutive 3 **SCHEDULE**'s are performed.

1-4: Consecutive 4 **SCHEDULE**'s are performed.

1-5: Consecutive 5 **SCHEDULE**'s are performed.

Select a scan mode of ON, 1-2, 1-3, 1-4 or 1-5 for setting each scan mode when the transformer selector **MA-650A** is connected.

Concerning the timing chart by settings, refer to **9.(8) Behavior in TRANS SCAN MODE**.

(b) COMM CONTROL

Selects a communication function.

OFF: No communication

DATA OUTPUT: One-way communication

BI-DIRECTION: Both-way communication

(c) COMM MODE

Selects a communication mode.

RS-232C: Communication by RS-232C

RS-485: Communication by RS-485

(d) COMM UNIT#

Input No. of an equipment (ID#).

The range is 00 to 31.

(e) COMM SPEED

Selects a communication speed.

9600: Communication at 9600 bps

19200: Communication at 19200 bps

38400: Communication at 38400 bps

(f) NO CURR MONITOR START

Set the starting time (Period for Neglect) of no-current supplying monitor.
No-current supply is not detected during the Period for Neglect from the start of current supply.

(g) PW MONITOR START

Set the starting time (Neglect) of pulse width monitor.
No pulse width monitor is performed during the Neglect period from the start of current supply.

(h) NG OUTPUT

Set the mode of NG terminal.

NORMALLY CLOSE: Open at the occurrence of NG.

NORMALLY OPEN: Closed at the occurrence of NG.

(i) READY OUTPUT

Select the mode of READY terminal.

WELD ON: Ready at Weld On

POWER ON: Ready at Power On

(j) ERROR

Displays ③ **ERROR SETTING** Screen.

(k) MISC

Displays ④ **MISC** Screen.

(l) PREV

Displays ① **STATUS (1/2)** Screen.

③ ERROR SETTING Screen

ERROR SETTING		READY	RESTART
E08	: NO CURRENT	OFF	(a)
E09	: NO VOLTAGE	OFF	
E16/E17	: OUT LIMIT OF CURR	OFF	
E18/E19	: OUT LIMIT OF VOLT	OFF	
E20/E21	: OUT LIMIT OF POWER	OFF	
E22/E23	: OUT LIMIT OF RESIST	OFF	
E26/E27	: OUT LIMIT OF DISPLC	OFF	
E28/E29	: OUT LIMIT OF TIME	OFF	
E15/E30	: WORK CHECK ERROR	OFF	(b)
		BACK	

The signals output at the occurrence of an error (NG Signal/Caution Signal) can be set item by item.

(a) OFF/ON

OFF: NG Signal is output.

The input of Start Signal is not accepted at the occurrence of NG.

ON: Caution Signal is output.

The input of Start Signal is accepted even at the occurrence of Caution.

(b) BACK

Displays ② **STATUS (2/2)** Screen of the previous page.

④ MISC Screen

MISC READY

TRANS NAME IT*-360*6/IT*-780*6 MAX CURR 4.00/6.00 kA

(a) USER (1.00 - 9.99) 8.00 kA

(b) MIN CURR NORMAL

(c) DISPLACEMENT SENSOR STEP 01.0 μ m

(d) DISPLACEMENT POLARITY NORMAL

(e) COUNTER TOTAL

(f) PRESET(TOTAL/GOOD) 000000

(g) PRESET(WORK) 000000

(h) PRESET(WELD) 00

RESET D-CHK BACK

(i) (j) (k)

(a) USER (1.00 – 9.99)

It is for testing. It cannot be used.

(b) MIN CURR

Set the minimum current.

NORMAL: Settable from 10% of full scale.

LOW: Settable from 2.5% of full scale.

Note: You can set lower current in LOW mode, but note that it may exceed the range of the setting accuracy when the setting is 10% of full scale or less.

(c) DISPLACEMENT SENSOR STEP

Input the resolution of Displacement Sensor.

Ex.)

GS-1830A, GS-1813A, LGK-110: 1.0 μ m

ST1278: 0.5 μ m

(d) DISPLACEMENT POLARITY

Set the polarity of displacement.

NORMAL: Set the force-applying direction as plus.

REVERSE: Set the force-applying direction as minus.

(e) COUNTER

Set the mode of Counter.

TOTAL: Count-up (increment of +1) is done despite the result of the judgment in monitoring when the current is supplied.

Judgment in Monitor	Counting Manner
GOOD	Count-up
CAUTION	Count-up
NG	Count-up

GOOD: Count-up is done if the judgment is **GOOD** in current-supplied monitoring.

Judgment in Monitor	Counting Manner
GOOD	Count-up
CAUTION	No Count-up
NG	No Count-up

WORK: Count-up is not done if the judgment is **NG** in current-supplied monitoring.

Judgment in Monitor	Counting Manner
GOOD	WELD Counter counts-up. WORK Counter counts-up (increment of +1) when WELD Counter reached the set value.
CAUTION	WELD Counter counts-up. WORK Counter counts-up (increment of +1) when WELD Counter reached the set value.
NG	WELD Counter does not count-up. WELD Counter is reset to 0 (zero) when NG is reset. WORK Counter does not count-up.

Note: The period for retaining the memory of counted numbers is approximately 10 days since the day when a power supply is turned off at latest.

(f) PRESET (TOTAL/GOOD)

Input the preset value of **TOTAL/GOOD** Counter.

(g) PRESET (WORK)

Input the preset value of **WORK** Counter.

(h) PRESET (WELD)

Input the preset value of **WELD** Counter.

(i) RESET

Resets the count.

(j) D-CHK

Checks the operation of Displacement Sensor. The amount of displacement is shown on the right side of this button.

(k) BACK

Displays Ⓢ **STATUS (2/2)** Screen of the previous page.

7. Basic Operation

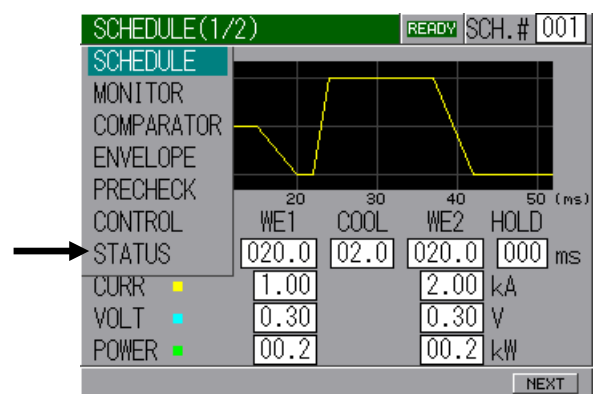
The example of a basic operation is described, using a transformer **IT*-780*6** and a control method of **Constant Current Control**.

- (1) Connect correctly Welding Transformer **IT*-780*6** and peripheral equipments to **IPB-5000B**, referring to the connection way (**5. Installation and Connection**).
- (2) Turn on the Breaker.

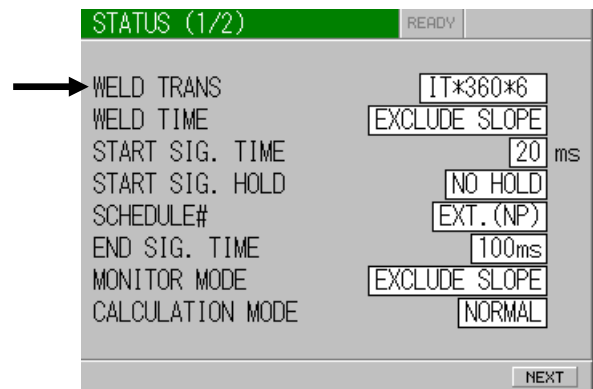
CAUTION

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

- (3) Press **MENU** key on Front Panel to display **MENU Screen**.
Move the cursor (■) to **STATUS** and press **ENTER** Key.



- (4) **STATUS Screen** is displayed.
Set the function. Move the cursor (■) to the desired item and press **+/-** key to select the function.
Set **IT*-780*6** to **WELD TRANS**.

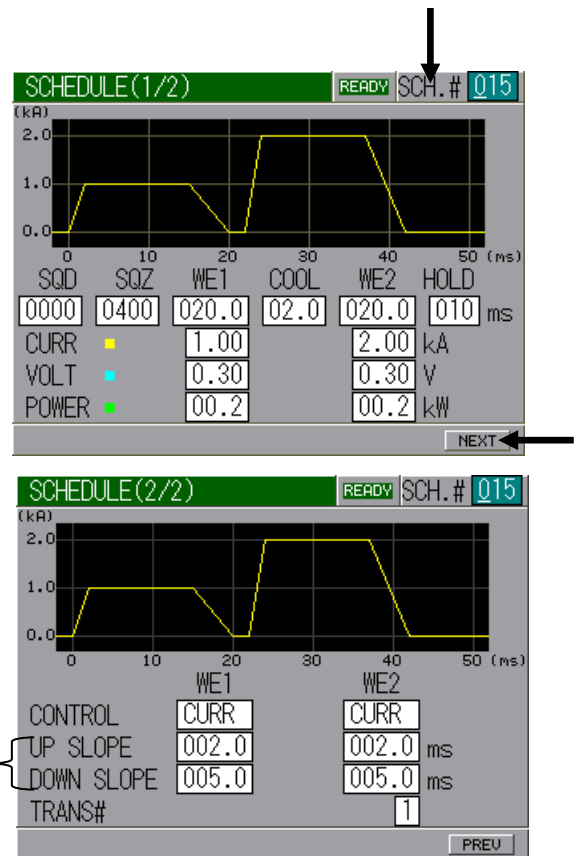


- (5) Press **MENU Key** on Front Panel to display **MENU Screen**.

Move the cursor (■) to **SCHEDULE** and press **ENTER Key** to display **SCHEDULE Screen**.

Move the cursor (■) to each place and set the values of the table below to each place by **+/- Key**.

Press **NEXT Button** to set the values of **UP SLOPE** and **DOWN SLOPE** in the following screen.

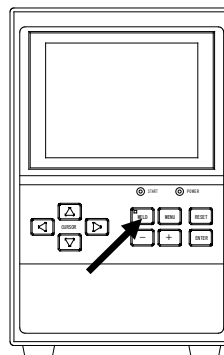


Item	Value	Item	Value
SCH. #	15	UP SLOPE at WE1	2 ms
SQD	0 ms	UP SLOPE at WE2	2 ms
SQZ	400 ms	DOWN SLOPE at WE1	5 ms
WE1	20 ms	DOWN SLOPE at WE2	5 ms
COOL	2 ms	CURR at WE1	1 kA
WE2	20 ms	CURR at WE2	2 kA
HOLD	10 ms		

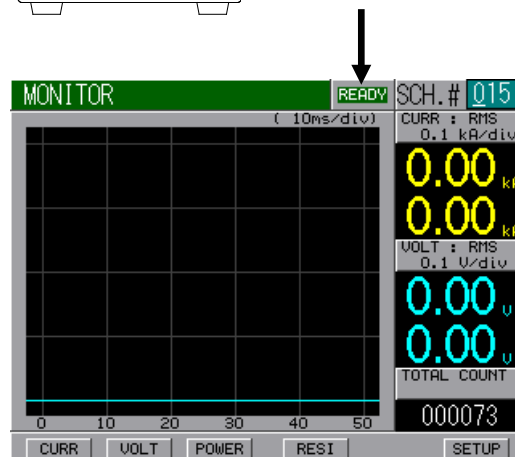
- (6) For the test of welding, press **MENU Key** on Front Panel, select **MONITOR** and press **ENTER Key**. **MONITOR Screen** is displayed.



- (7) Press **WELD Key** on Front Panel to light up **WELD Lamp** (LED).



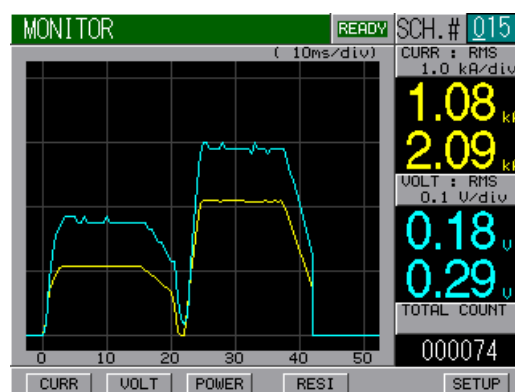
- (8) Set ON (Closed circuit) to **WELD ON/OFF** on **Connecting Terminal Strip for External Input/Output Signal** at Rear Panel.
Make sure that the letter of **READY** on the upper right of Screen is green-lighted.



- (9) Set ON (Closed circuit) to **SCH1, SCH2, SCH4 and SCH8** on **Connecting Terminal Strip for External Input/Output Signal** at Rear Panel for setting **SCH. #015**.

- (10) Set ON (Closed circuit) to 2ND STAGE Start Input to begin testing the weld.
The squeeze signal is output, and then the weld head begins to squeeze for the weld.

As the figure on the right is displayed, check that the weld schedule is correctly set.



! WARNING



When confirming the operation, check that **SQZ Time** (Squeeze Time) is sufficient.

If weld current flows before the welding electrode force becomes sufficient, spatters are produced.

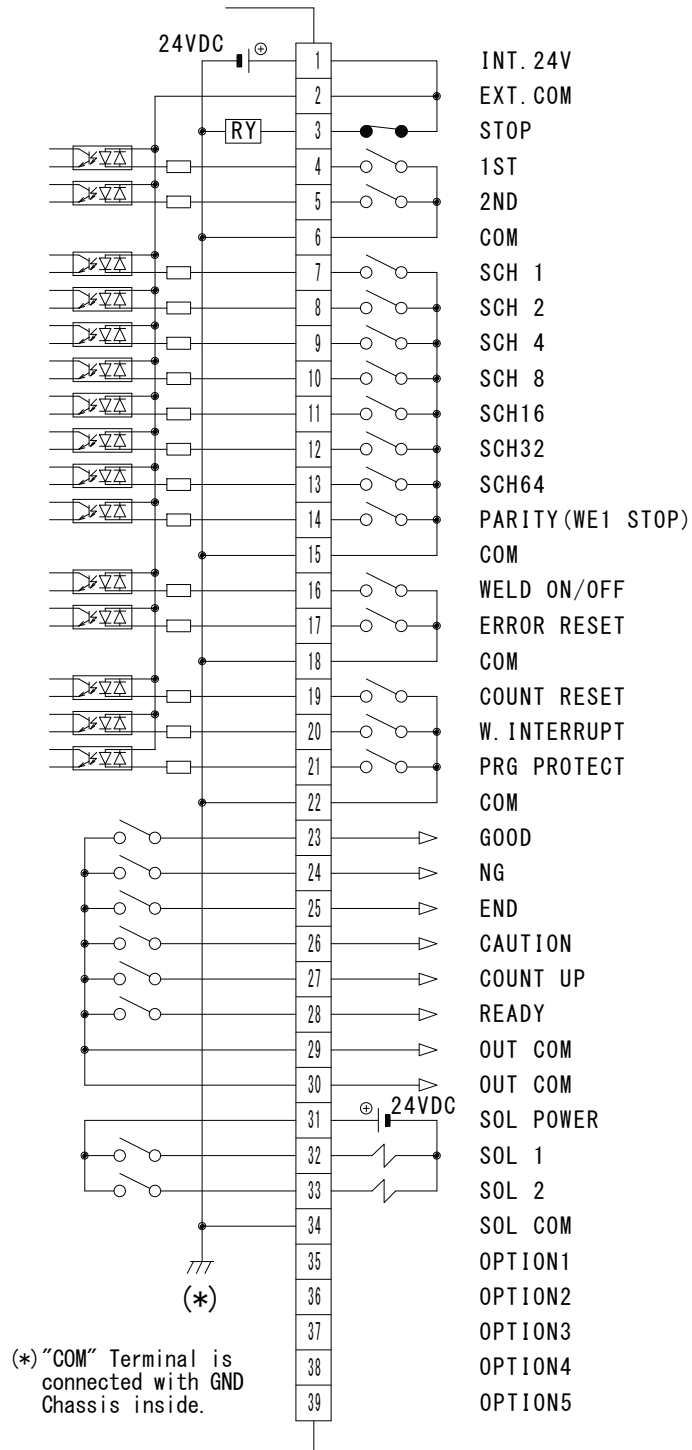
8. External Interface

(1) Connection Diagram for External Input/Output Signals

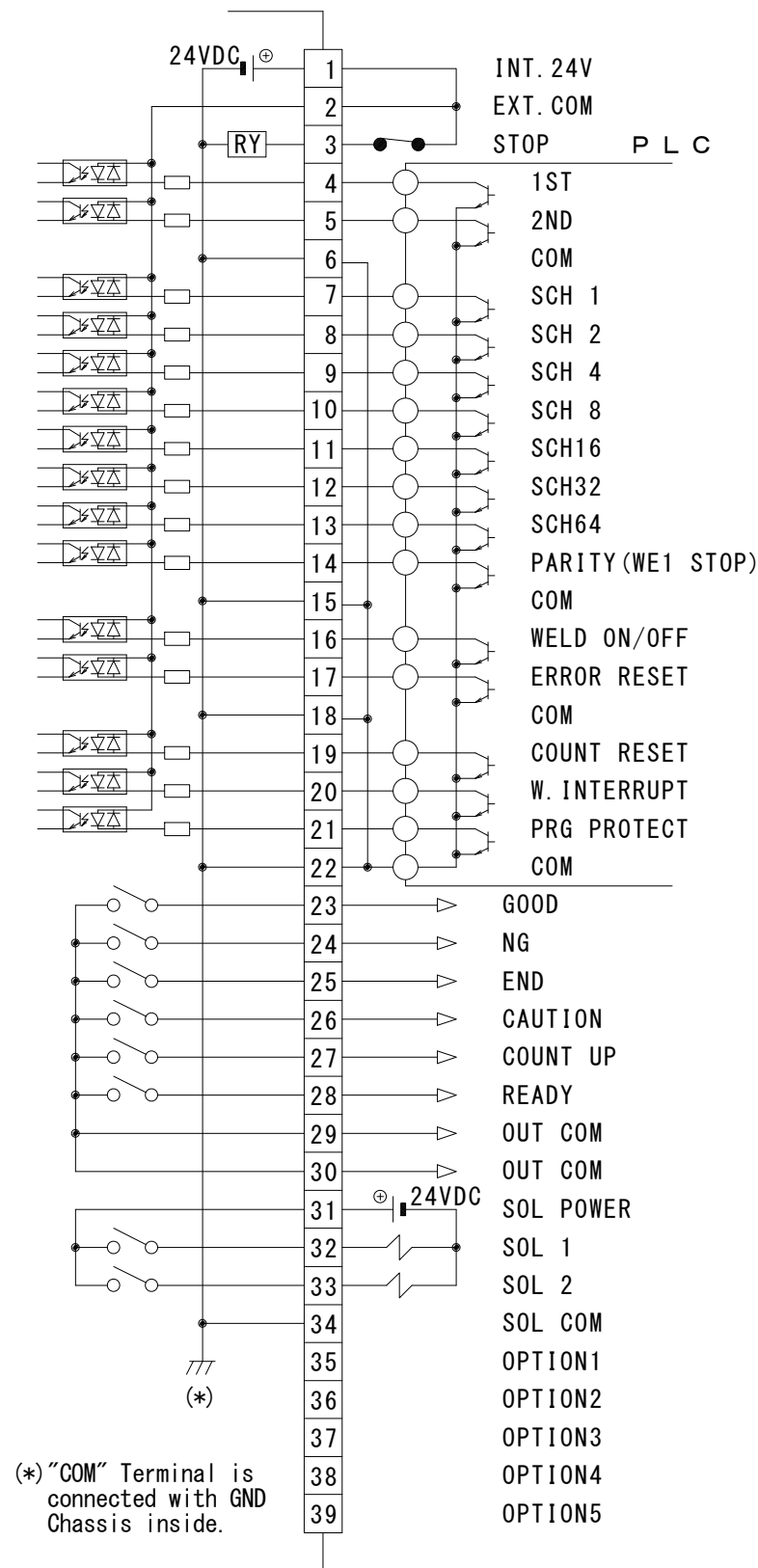
CAUTION

Use the shielded for the external input/output signals and connect the shielded line to the COM terminal (6, 15, 18, 22, or 34).

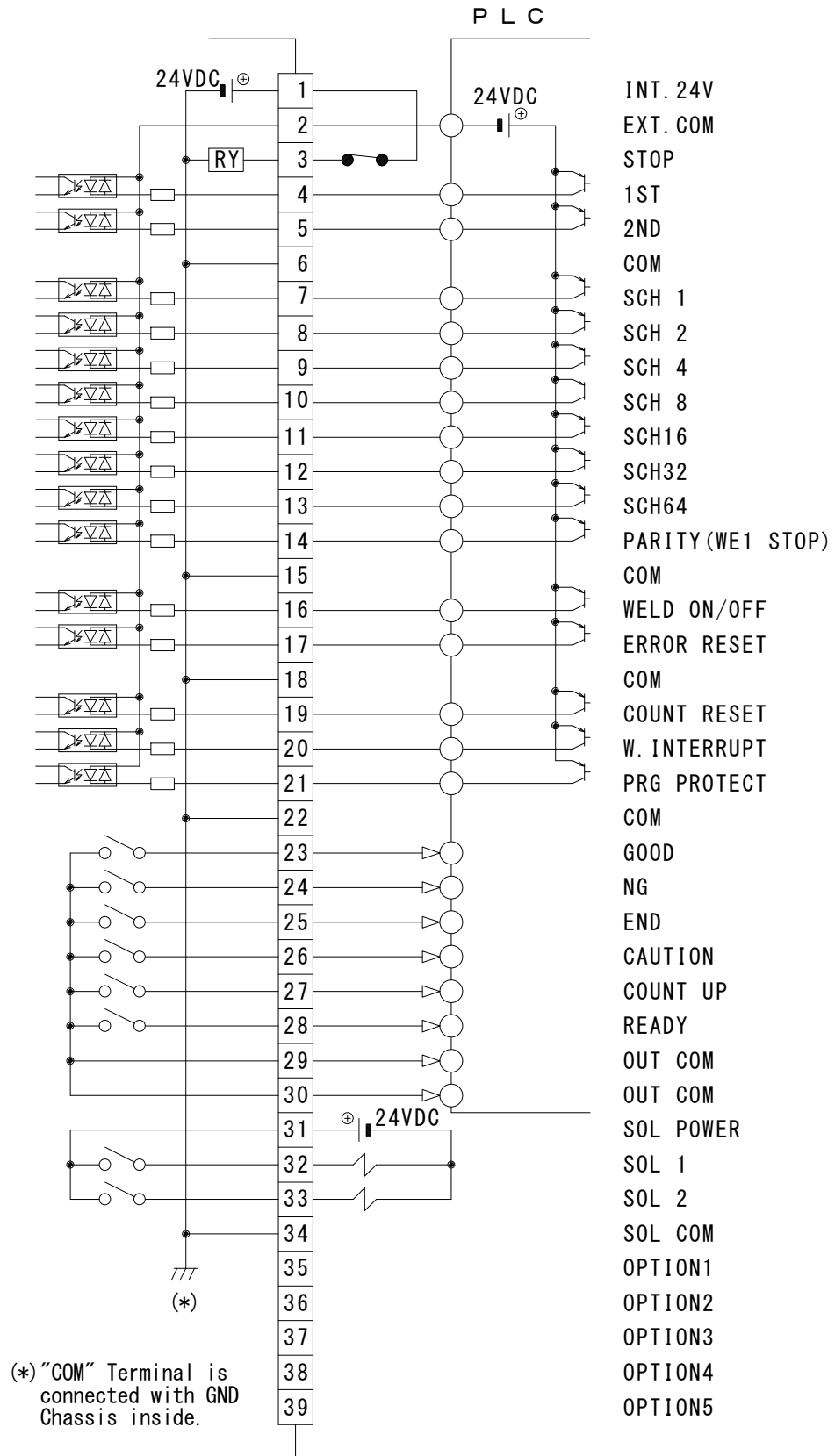
① When contacts on PLC are used as input signal



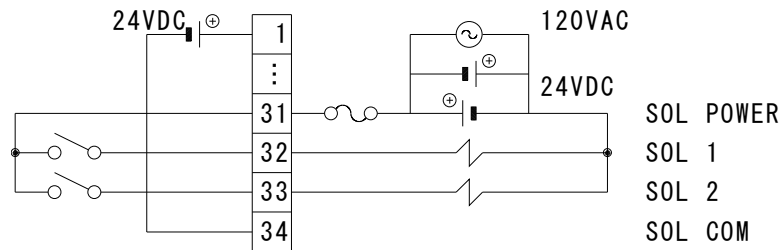
② When NPN transistor (sink type) on PLC is used as input signal



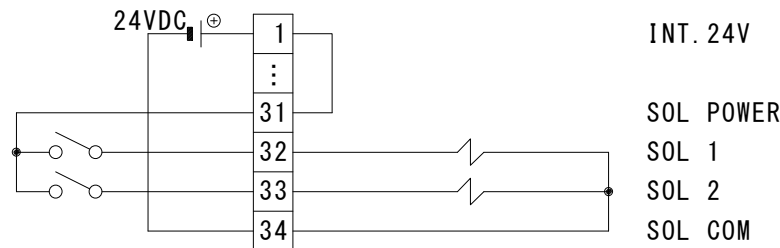
③ When PNP transistor (source type) on PLC is used as input signal



- ④ When solenoid valves are activated by the use of an external power supply



- ⑤ When solenoid valves are activated by the use of an internal power supply



(2) External Input/Output Signals

The contact input method is described as follows:

Pin No.	Description
1	24V DC Output Terminal. When contacts or NPN transistor (sink type) on PLC is used as an input signal (for start or selecting Schedule, etc.), connect Pin 1 to Pin 2. Note: Do not use Pin 1 other than for connecting to Pin 2 and Pin 3 or connecting to Pin 31 to activate a solenoid valve. If so, it may result in a trouble.
2	When contacts or NPN transistor (sink type) on PLC is used as an input signal (for start or selecting Schedule, etc.), connect Pin 2 to Pin 1. When PNP transistor (source type) on PLC is used as an input signal (for start or selecting Schedule, etc.), connect Pin 2 to COM Terminal on PLC.
3	Normally, connect Pin 3 to Pin 1. When opening Pin 3, a trouble display "Operation Stop" comes out and the operation stops. When the sequence is required to stop on the way while employing the start in a self-sustaining manner, open this Pin.
4	1ST STAGE Input Terminal. Closing of this Pin makes SOL1 Terminal of Pin 32 close. As the current-supplying sequence does not start, the adjustment or check of a squeeze location can be done. When closing 2ND STAGE Terminal at this location, the weld at the optimum squeeze location can be obtained.

Pin No.	Description
5	2ND STAGE Input Terminal. Closing the Pin makes the sequence start. When the sequence works, SOL2 Terminal on Pin 33 is closed.
6	COM Terminal. Internally connected to GND Chassis.
7 to 13	Schedule Input Terminal. 7 = Schedule 1, 8 = Schedule 2, 9 = Schedule 4, 10 = Schedule 8, 11 = Schedule 16, 12 = Schedule 32, 13 = Schedule 64, When the select method of Schedule is External Schedule Select Method, they work. The sum of Schedule No. of closed Pins is corresponding to the selected Schedule No. (Refer to (3) Schedule No. and Schedule Select Terminal.)
14	Parity Input or WE1 STOP Input Terminal. The setting of SCHEDULE# in 6.(9)⓪STATUS (1/2) Screen allows the function to be switched. <u>When EXT. (P) is selected in SCHEDULE#,</u> Parity Input Terminal. This Pin makes it possible to detect a trouble caused by the breaking of a Schedule Select Signal wire. Select Pins so that the sum of the numbers of closed Schedule Select Signal wires and a Parity Signal wire may always be odd. (Refer to (3) Schedule No. and Schedule Select Terminal.) <u>When EXT. (NP) or PANEL is selected in SCHEDULE#,</u> The function is changed in dependence on the selection of WELD STOP (INPUT) at 6.(8) CONTROL Screen . * In the case of OFF selected at INPUT , It is WE1 Stop Input Terminal. When this Pin is closed while the sequence works at WE1 (W1), the sequence skips to COOL (CO). * In the case of DISPLC** , CURR and VOLT selected at INPUT , This terminal does not work. ** (only for Displacement Sensor equipped)
15	COM Terminal. Internally connected to GND Chassis.
16	Weld ON/OFF Input Terminal. Closed circuit is for Weld ON and Open circuit for Weld OFF. As weld current does not flow even in the activated sequence if the Pin is open, it can be used at starting for trial. Note: When the Pin is open in the process of sequence (including the End signal and the screen display time), the monitor value is not displayed. Except in an emergency, open the Pin after the End signal and the screen display time are complete (see 9.(1) Fundamental Sequence).
17	Error and Caution Reset Input Terminal. When the Pin is closed after eliminating a cause of NG or Caution, a display of NG or Caution is reset.
18	COM Terminal. Internally connected to GND Chassis.
19	Count Reset Input Terminal. Close the Pin when resetting a counter.

Pin No.	Description
20	Interrupt Input Terminal. The function is changed in dependence on the selection of WELD STOP (INPUT) at 6.(8)CONTROL Screen. * In the case of OFF selected at INPUT, When this Pin is closed while the sequence works at WE1 (W1), COOL (CO) and WE2 (W2), the sequence skips to HOLD. * In the case of DISPLC**, CURR and VOLT selected at INPUT, This terminal does not work. ** (Only for Displacement Sensor equipped)
21	Program Protection Input Terminal. If the Pin is closed, the condition of settings cannot be changed. In order to make the settings effect, once turn off the power supply.
22	COM Terminal. Internally connected to GND Chassis.
23	GOOD Signal Output Terminal. If it is determined that the measured value is inside the range set in MONITOR Screen after a weld sequence has ended, the Pin keeps closed for the certain period. The period of closing can be selected among HOLD, 10 ms and 100 ms. The rated capacity of a contact is 24V DC 20 mA (Semi-conductor switch used).
24	NG Signal Output Terminal. The signal is output when the measured value goes out of the range set in COMPARATOR, PRECHECK and ENVELOPE Screen after a weld sequence has ended or when a trouble occurs in an operation. (An error output signal, NG or Caution can be switched at the setting in 6.(9)③ERROR SETTING Screen.) The operation stays stopped at the occurrence of an error until the reset signal is input. The output manner can be selected at the setting of NG OUTPUT in 6.(9)②STATUS (2/2) Screen. <u>NORMALLY CLOSE</u> The Pin is closed with the power turned on, but becomes open with an error occurring. <u>NORMALLY OPEN</u> The Pin is closed with an error occurring. The rated capacity of a contact is 24V DC 20 mA (Semi-conductor switch used).
25	END Signal Output Terminal. After the sequence has ended, the Pin is closed for the certain period. The period of closing can be set to HOLD, 10 ms or 100 ms. The signal also is output when the sequence is made operate in the condition of WELD OFF. The rated capacity of a contact is 24V DC 20 mA (Semi-conductor switch used).
26	CAUTION Signal Output Terminal. When ON is set at ERROR SETTING Screen, NG Signal can be switched to Caution Signal. The Pin is closed after the weld sequence has ended. Even if Caution Signal is generated, the welding operation can be continued. Input a reset signal or start signal for releasing Caution Signal. The rated capacity of a contact is 24V DC 20 mA (Semi-conductor switch used).

Pin No.	Description
27	COUNT-UP Output Terminal. The Pin is closed when COUNT-UP reaches the set pre-set count value. Input Count Reset Signal for releasing the output of COUNT-UP. The rated capacity of a contact is 24V DC 20 mA (Semi-conductor switch used).
28	READY Output Terminal. The output manner can be selected at the setting of READY OUTPUT in 6.(9)@STATUS (2/2) Screen. WELD ON Closed at the time when weld current is ready for being supplied. Open at WELD OFF or in the occurrence of NG. POWER ON Closed in the occasion when the power supply of IPB-5000B is turned on. The rated capacity of a contact is 24V DC 20 mA (Semi-conductor switch used).
29	COMMON Terminal for Output. Shared commonly for GOOD, NG, END, CAUTION, COUNT UP and READY.
30	COMMON Terminal for Output. Shared commonly for GOOD, NG, END, CAUTION, COUNT UP and READY.
31	POWER Input Terminal for activating a solenoid valve. Input the power of 120V AC, 24V AC/DC. Note: When an external power supply is used, prepare the power supply protected by a fuse.
32	Solenoid Valve 1 Output Terminal. Closed at inputting of 1ST STAGE. The rated capacity of a contact is 120V AC, 24V AC/DC 0.5 A (Semi-conductor switch used). Prepare a solenoid valve with the current capacity of 0.5 A or less.
33	Solenoid Valve 2 Output Terminal. Closed when the sequence works. The rated capacity of a contact is 120V AC, 24V AC/DC 0.5 A (Semi-conductor switch used). Prepare a solenoid valve with the current capacity of 0.5 A or less.
34	COM Terminal for Solenoid Valve. Used for activating a solenoid valve by the use of an internal power supply. Internally connected to GND Chassis.
35	Preparatory Input Terminal. (Do not connect here. If it is connected without instruction, it may be damaged.)
36	Preparatory Input Terminal. (Do not connect here. If it is connected without instruction, it may be damaged.)
37	Preparatory Output Terminal. (Do not connect here. If it is connected without instruction, it may be damaged.)
38	Preparatory Output Terminal. (Do not connect here. If it is connected without instruction, it may be damaged.)
39	Preparatory Output Terminal. (Do not connect here. If it is connected without instruction, it may be damaged.)

(3) Schedule No. and Schedule Select Terminals

Schedule No.: SCHEDULE# ●: Closed Blank: Open

SCHEDULE#	SCH 1	SCH 2	SCH 4	SCH 8	SCH16	SCH32	SCH64	PARITY
1								●
1	●							
2		●						
3	●	●						●
4			●					
5	●		●					●
6		●	●					●
7	●	●	●					
8				●				
9	●			●				●
10		●		●				●
11	●	●		●				
12			●	●				●
13	●		●	●				
14		●	●	●				
15	●	●	●	●				●
16					●			
17	●				●			●
18		●			●			●
19	●	●			●			
20			●		●			●
21	●		●		●			
22		●	●		●			
23	●	●	●		●			●
24				●	●			●
25	●			●	●			
26		●		●	●			
27	●	●		●	●			●
28			●	●	●			
29	●		●	●	●			●
30		●	●	●	●			●
31	●	●	●	●	●			
32						●		
33	●					●		●
34		●				●		●
35	●	●				●		
36			●			●		●
37	●		●			●		
38		●	●			●		
39	●	●	●			●		●
40				●		●		●
41	●			●		●		
42		●		●		●		
43	●	●		●		●		●

Schedule No.: SCHEDULE# ●: Closed Blank: Open

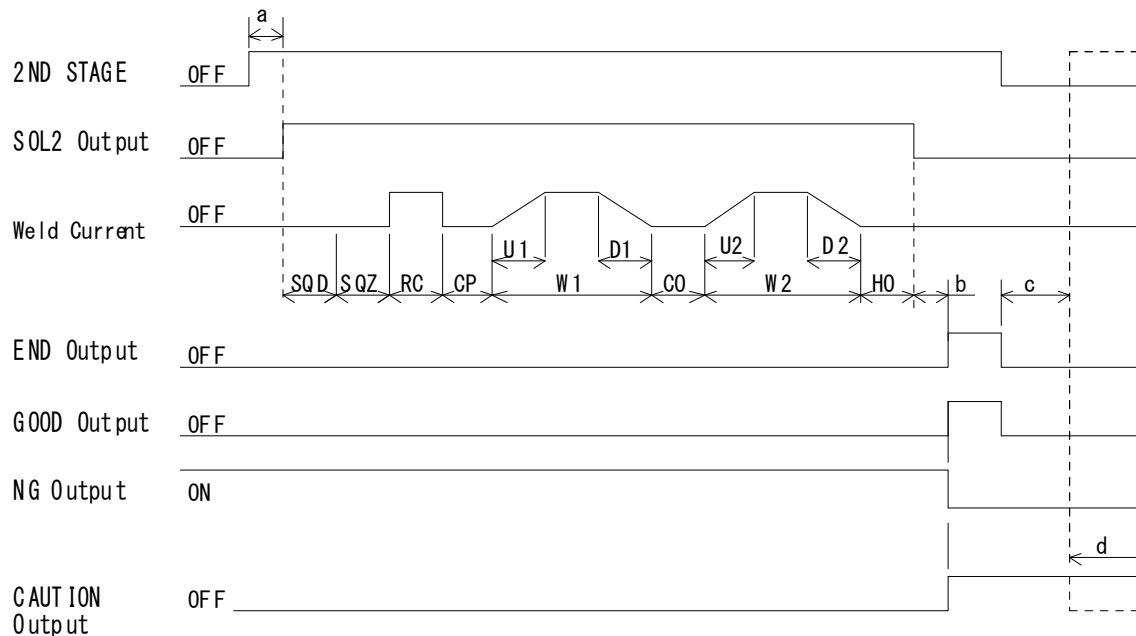
SCHEDULE#	SCH 1	SCH 2	SCH 4	SCH 8	SCH16	SCH32	SCH64	PARITY
44			●	●		●		
45	●		●	●		●		●
46		●	●	●		●		●
47	●	●	●	●		●		
48					●	●		●
49	●				●	●		
50		●			●	●		
51	●	●			●	●		●
52			●		●	●		
53	●		●		●	●		●
54		●	●		●	●		●
55	●	●	●		●	●		
56				●	●	●		
57	●			●	●	●		●
58		●		●	●	●		●
59	●	●		●	●	●		
60			●	●	●	●		●
61	●		●	●	●	●		
62		●	●	●	●	●		
63	●	●	●	●	●	●		●
64							●	
65	●						●	●
66		●					●	●
67	●	●					●	
68			●				●	●
69	●		●				●	
70		●	●				●	
71	●	●	●				●	●
72				●			●	●
73	●			●			●	
74		●		●			●	
75	●	●		●			●	●
76			●	●			●	
77	●		●	●			●	●
78		●	●	●			●	●
79	●	●	●	●			●	
80					●		●	●
81	●				●		●	
82		●			●		●	
83	●	●			●		●	●
84			●		●		●	
85	●		●		●		●	●
86		●	●		●		●	●
87	●	●	●		●		●	
88				●	●		●	

Schedule No.: SCHEDULE# ●: Closed Blank: Open

SCHEDULE#	SCH 1	SCH 2	SCH 4	SCH 8	SCH16	SCH32	SCH64	PARITY
89	●			●	●		●	●
90		●		●	●		●	●
91	●	●		●	●		●	
92			●	●	●		●	●
93	●		●	●	●		●	
94		●	●	●	●		●	
95	●	●	●	●	●		●	●
96						●	●	●
97	●					●	●	
98		●				●	●	
99	●	●				●	●	●
100			●			●	●	
101	●		●			●	●	●
102		●	●			●	●	●
103	●	●	●			●	●	
104				●		●	●	
105	●			●		●	●	●
106		●		●		●	●	●
107	●	●		●		●	●	
108			●	●		●	●	●
109	●		●	●		●	●	
110		●	●	●		●	●	
111	●	●	●	●		●	●	●
112					●	●	●	
113	●				●	●	●	●
114		●			●	●	●	●
115	●	●			●	●	●	
116			●		●	●	●	●
117	●		●		●	●	●	
118		●	●		●	●	●	
119	●	●	●		●	●	●	●
120				●	●	●	●	●
121	●			●	●	●	●	
122		●		●	●	●	●	
123	●	●		●	●	●	●	●
124			●	●	●	●	●	
125	●		●	●	●	●	●	●
126		●	●	●	●	●	●	●
127	●	●	●	●	●	●	●	

9. Timing Chart

(1) Fundamental Sequence



Symbol:

SQD: Squeeze Delay Time

RC: Resistance Pre-check Time

U1: Upslope 1 Time

D1: Downslope 1 Time

U2: Upslope 2 Time

D2: Downslope 2 Time

SQZ: Squeeze Time

CP: Resistance Judgment Time (1ms)

W1: 1st Weld Time

CO: Cool Time

W2: 2nd Weld Time

HO: Hold Time

a: Sum of the period set at **START SIG. TIME** and the period for preparing the supply of weld current (0.4 ms max.)

b: Monitored Value Computing Time

Changes in dependence on Monitor Value Calculation Mode (**CALCULATION MODE** at **6.(9)①STATUS(1/2)Screen**) and Communication Setting (**COMM CONTROL** and **COMM SPEED** at **6.(9)②STATUS(2/2)Screen**).

① In the case of **OFF** or **BI-DIRECTION** at **COMM CONTROL**,

Calculation Mode Setting (CALCULATION MODE)	
NORMAL	FAST
205 ms Max.	155 ms Max.

- ② In the case of **DATA OUTPUT** at **COMM CONTROL**,
Communication data output time is included.

Communication Speed Setting (COMM SPEED)	Calculation Mode Setting (CALCULATION MODE)	
	NORMAL	FAST
9600bps	330 ms Max.	280 ms Max.
19200bps	275 ms Max.	225 ms Max.
38400bps	245 ms Max.	195 ms Max.

c: Screen Display Time and Start Signal Standby Time

① **Screen Display Time**

Screen Display Time is the period required from the end of END Signal Output for screen displaying.

It is 355 ms Max. However, it changes in accordance with the type of screens as follows.

Display Screen	Period
SCHEDULE	205 ms Max.
MONITOR (The next coming signal makes the screen display cancelled in MONITOR Screen.)	0 ms
COMPARATOR	220 ms Max.
ENVELOPE	355 ms Max.
PRECHECK	60 ms Max.
CONTROL	55 ms Max.
STATUS	0 ms

Note) If the takt time is needed to shorten, display the MONITOR or STATUS screen.

② **Start Signal Standby Time**

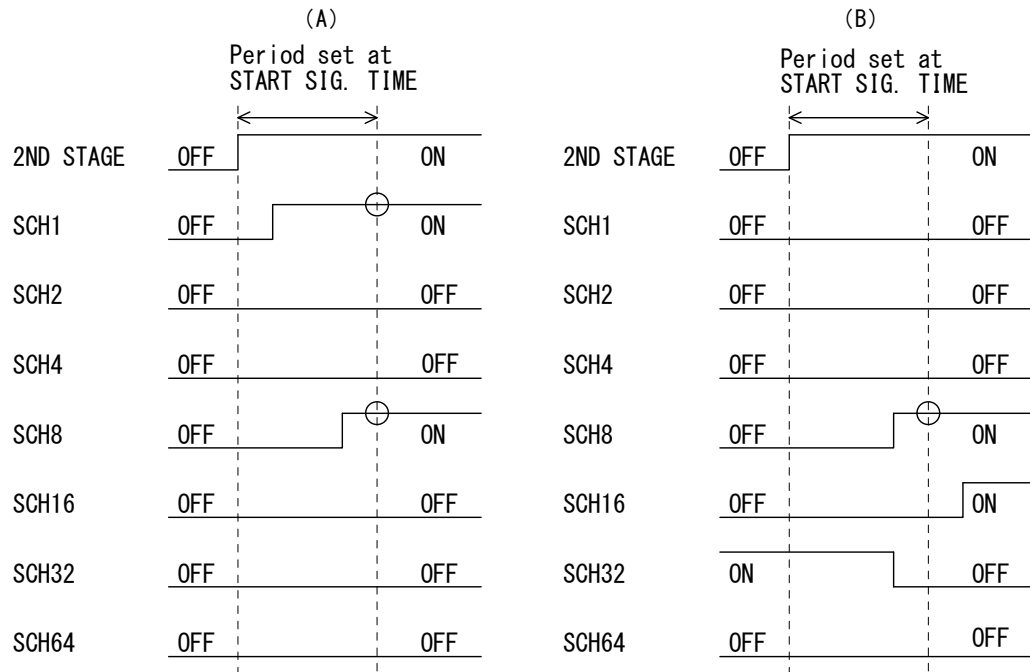
It is the period necessary for opening Start Input Signal.

After Screen Display Time elapsed, it is required to open Start Input for 10ms or more.

d: CAUTION Output is switched to OFF at the coming input of Start Signal.

(2) Determination of Weld Schedule

Weld Schedule is determined after Chattering Prevention Time, “**START SIG. TIME**” elapses from the input of Start Signal.

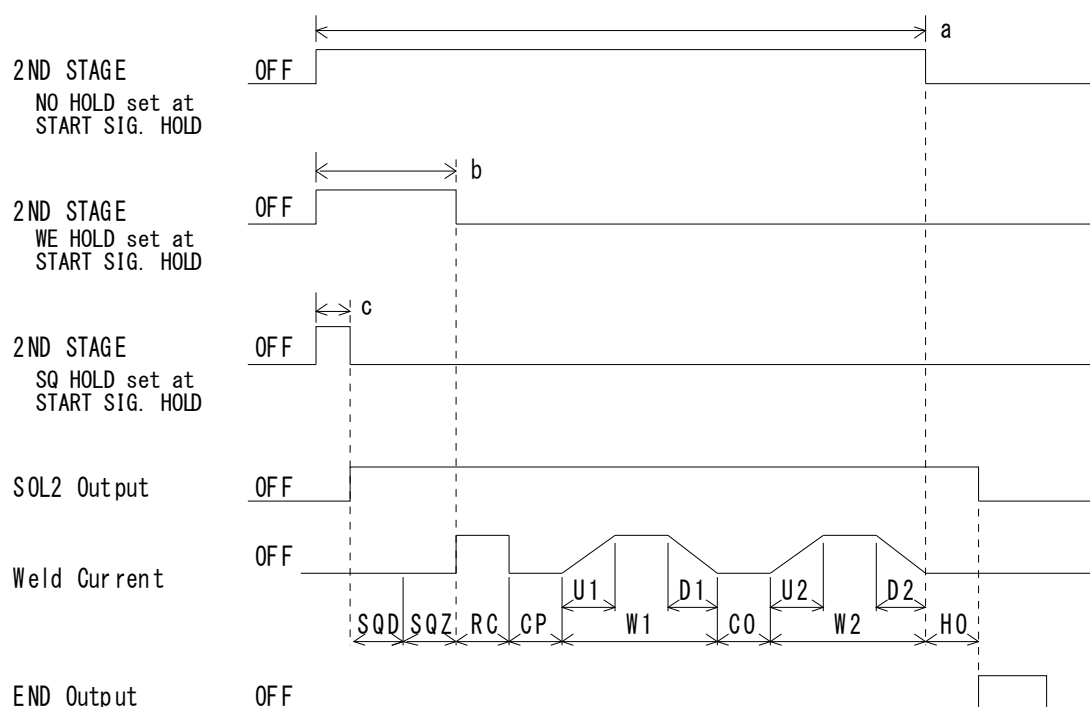


In the above figure (A), as SCH 1 and SCH 8 are set to ON, weld is performed at Schedule #9.

In (B), as only SCH 8 is set to ON, weld is at Schedule #8. As SCH 16 and 32 are set to OFF at the timing of determining Schedule, they are invalid.

(3) Behavior of START SIG. HOLD

- * **NO HOLD** Setting: If Start Signal is made open during the period from SQD to W2, a weld sequence is broken off on the way and results in **E13: CYCLE ERROR**. Even if Start Signal is made open during HO, the weld sequence goes to an end.
- * **WE HOLD** Setting: After a beginning of W1, a weld sequence goes to an end even if Start Signal is made open.
- * **SQ HOLD** Setting: After Start Signal is accepted, a weld sequence goes to an end even if Start Signal is made open.



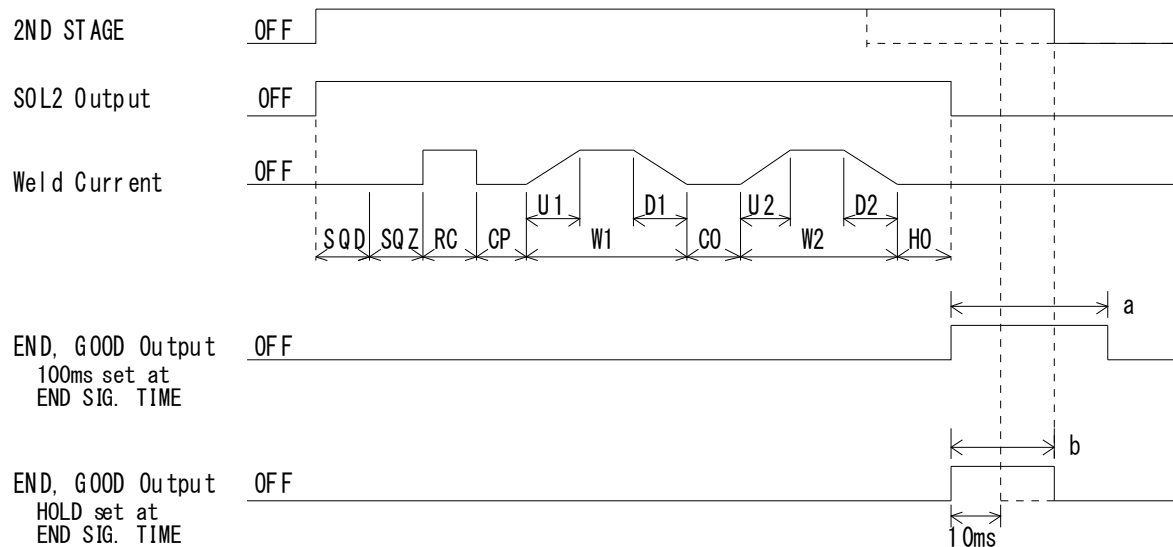
Symbol:

SQD: Squeeze Delay Time	SQZ: Squeeze Time
RC: Resistance Pre-check Time	CP: Resistance Judgment Time (1 ms)
U1: Upslope 1 Time	W1: 1st Weld Time
D1: Downslope 1 Time	CO: Cool Time
U2: Upslope 2 Time	W2: 2nd Weld Time
D2: Downslope 2 Time	HO: Hold Time

- a:** Closed circuit is required until the termination of W2.
- b:** Closed circuit is required until the termination of SQZ.
- c:** Closed circuit is required until the beginning of SQZ.

(4) Behavior of END SIG. TIME

- * **HOLD:** When **2ND STAGE** Signal is closed for 10ms or less, **END** or **GOOD** Signal is output for 10ms.
When **2ND STAGE** Signal is closed for the longer period than 10ms, **END** or **GOOD** Signal is output for the closed period.
- * **10ms, 100ms:** **END** or **GOOD** Signal is output for the set period regardless of the condition of **2ND STAGE** Signal.



Symbol:

SQD: Squeeze Delay Time

RC: Resistance Pre-check Time

U1: Upslope 1 Time

D1: Downslope 1 Time

U2: Upslope 2 Time

D2: Downslope 2 Time

SQZ: Squeeze Time

CP: Resistance Judgment Time (1 ms)

W1: 1st Weld Time

CO: Cool Time

W2: 2nd Weld Time

HO: Hold Time

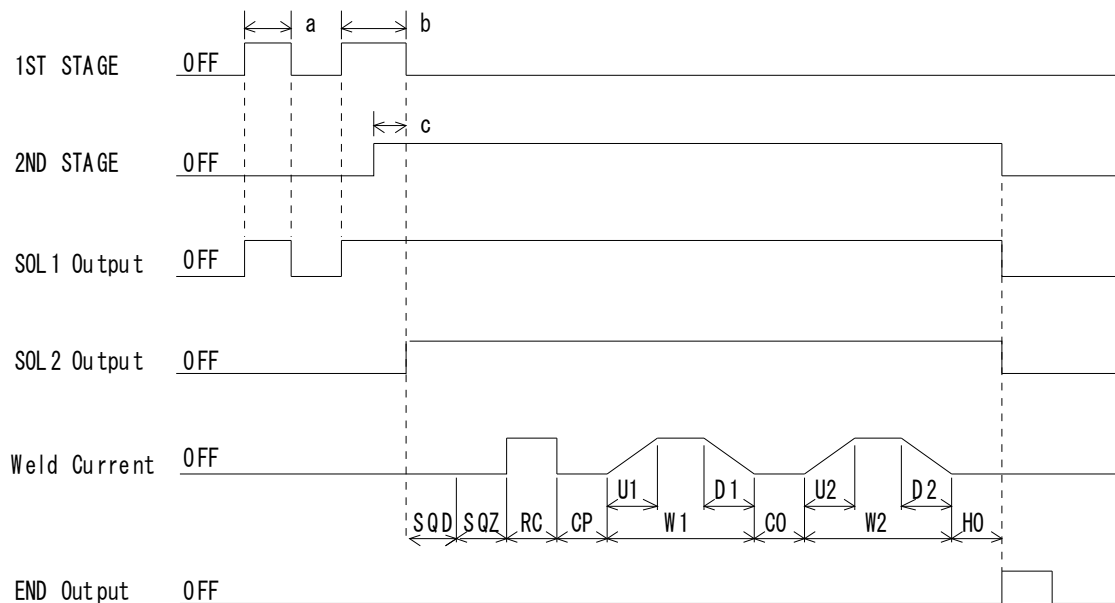
- a:** During the set period (100 ms), **END** or **GOOD** Signal is output regardless of the condition of **2ND STAGE** Input.
- b:** When the period of **2ND STAGE** Input is 10 ms or less, **END** or **GOOD** Signal is output for 10 ms.
When the period of **2ND STAGE** Input is longer than 10 ms. **END** or **GOOD** Signal is output until **2ND STAGE** Input is open.

(5) Behavior of SOL1 and SOL2

SOL1 Output works by the Input of **1ST STAGE**. When **1ST STAGE** Input is open, **SOL1** Output also becomes open if it is before the start of a weld sequence. After the start of a sequence, even if **1ST STAGE** Input is open, **SOL1** Output keeps closed until the sequence comes to an end.

When using **SOL1**, **1ST STAGE** Input allows **SOL1** to adjust a squeeze location. After inputting **1ST STAGE**, weld current can be supplied by **2ND STAGE** Input. **SOL1** becomes opened with **SOL2** output after the end of HO in spite of the input condition of **1ST STAGE**.

SOL2 output works by the Input of **2ND STAGE** and is closed from SQD to HO.



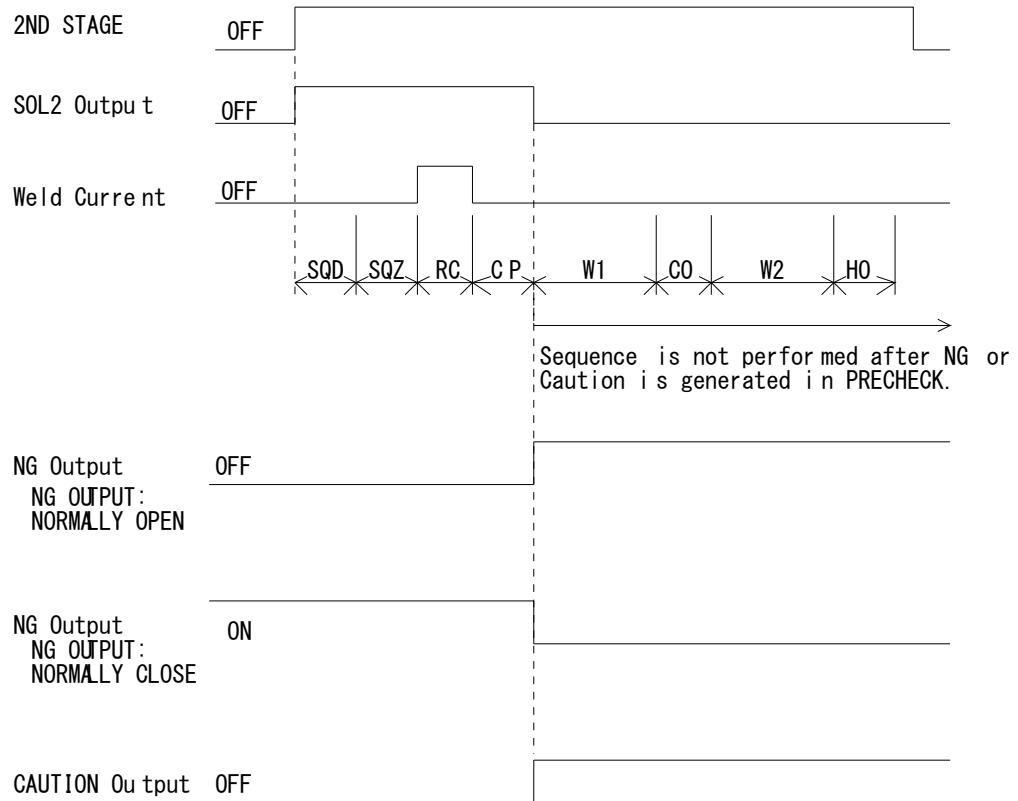
Symbol:

SQD: Squeeze Delay Time	SQZ: Squeeze Time
RC: Resistance Pre-check Time	CP: Resistance Judgment Time (1 ms)
U1: Upslope 1 Time	W1: 1st Weld Time
D1: Downslope 1 Time	CO: Cool Time
U2: Upslope 2 Time	W2: 2nd Weld Time
D2: Downslope 2 Time	HO: Hold Time

- a: When **1ST STAGE** Input is open before the start of a weld sequence, **SOL1** Output also becomes open.
- b: Once the sequence is started, **SOL1** Output keeps closed until HO is completed even if **1ST STAGE** Input is made open.
- c: **START SIG. TIME**, the period set for prevention of chattering.

(6) “Error” or “Caution” in PRECHECK

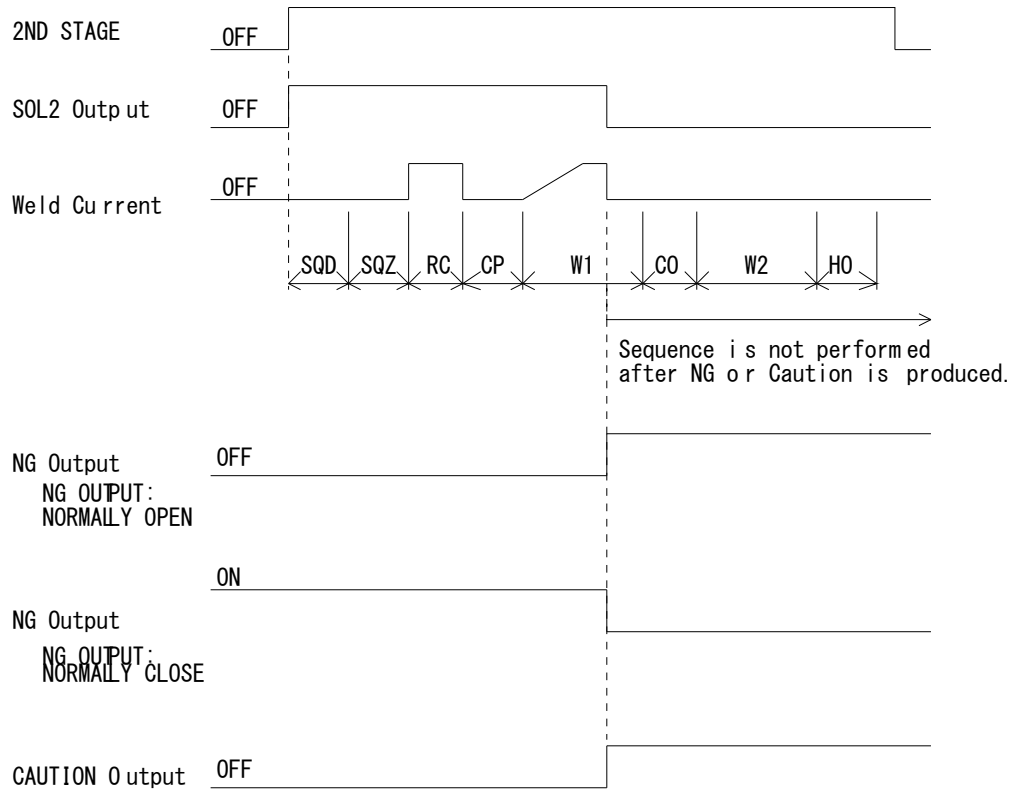
An example of weld sequence is shown, representing that a current goes out of the range between the upper and lower limit set in **PRECHECK Screen** with an error signal, “**NG**” or “**Caution**” generated in the use of PRECHECK Current Supply function.



(END Output is not produced.)

(7) At Occurrence of “Error” or “Caution”

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



(END Output is not produced.)

Note) Reset an error at least a second after an error is displayed.
If an error is reset immediately, the display may not disappear.

(8) Behavior in TRANS SCAN MODE

① OFF Setting

It is a setting of the case where Transformer Selector **MA-650A** is not used.
The behavior is the same as the one in **(1) Fundamental Sequence**.

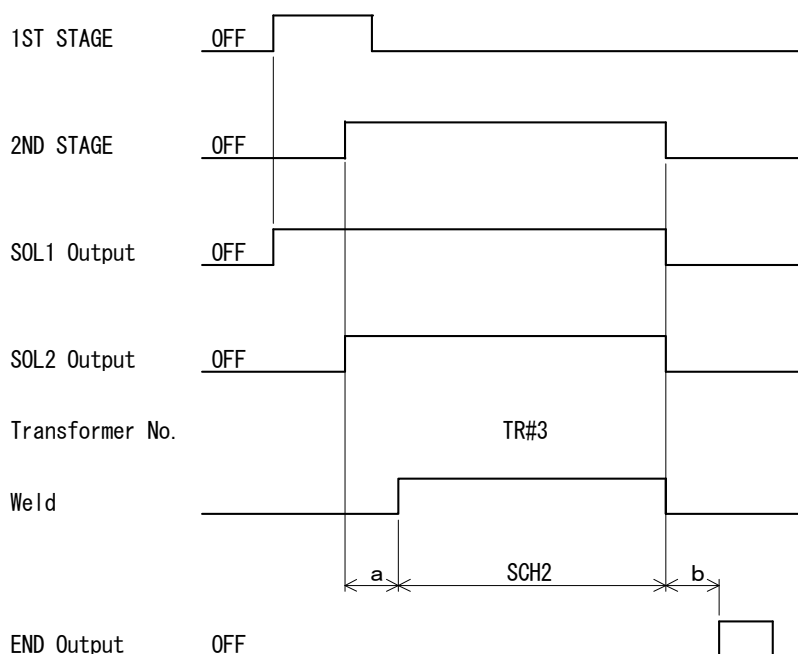
Those settings mentioned below in ② through ⑥ are the ones of the case where Transformer Selector **MA-650A** is used.

② ON Setting

The weld current is supplied through the transformer set at the item of Transformer No. (TR#) in **SCHEDULE Screen**.

Supposing that **SCHEDULE No.** is 2 (**SCH2**) and Transformer No. is 3 (**TR#3**), the timing chart where the supply of weld current is started is shown as follows.

ON Setting in Transformer Selector



a: Transformer Changeover Time (10 ms)

b: Time period for computing a monitored value

See **b: Time period for computing a monitored value** at **9.(1) Fundamental Sequence**.

Because Transformer 3 (**TR#3**) is set for **SCHEDULE #2 (SCH2)**, weld current is supplied through the Transformer connected to Transformer 3 in Transformer Selector **MA-650A**.

③ 1-5 Setting

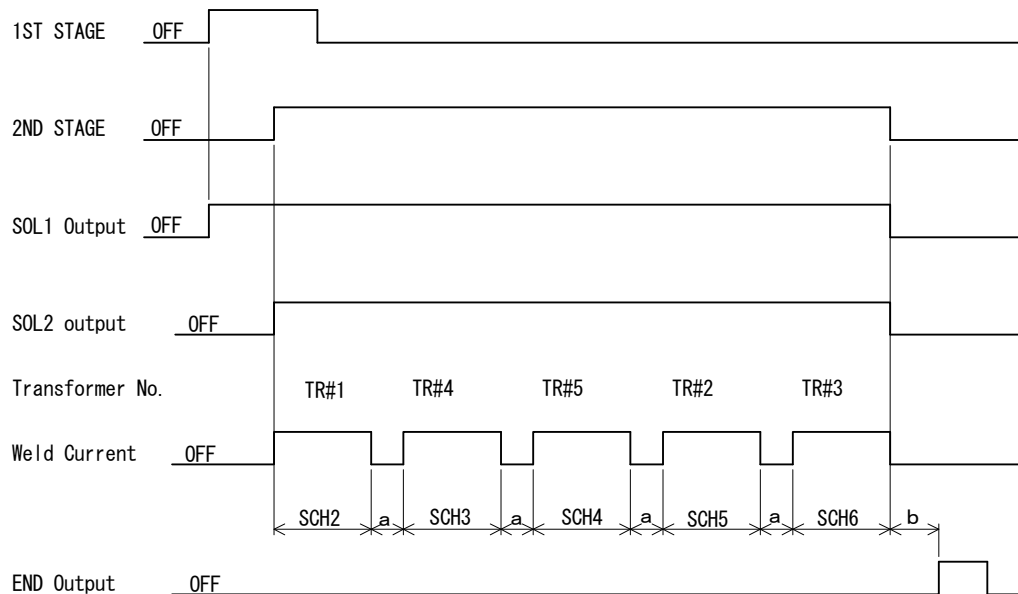
Firstly, weld current is supplied on the first selected **SCHEDULE No. (N)**, then on the next **SCHEDULE No. (N+1)**, and then on the consecutive **SCHEDULE Nos. N+2, N+3, N+4** in turn.

In this occasion, weld current is supplied through the transformer selected at Transformer No. (**TR#**) in each **SCHEDULE Screen**.

That is to say, in the case that the supply of weld current is started in the condition of SCHEDULE No.2 selected, firstly weld current is supplied on SCHEDULE No.2, then SCHEDULE No.3, SCHEDULE No.4, SCHEDULE No.5, lastly on SCHEDULE No.6.

For example, Supposing that **SCHEDULE No. is 2 (SCH2)** and Transformer No. is 1 (**TR#1**), similarly **SCH3-TR#4, SCH4-TR#5, SCH5-TR#2, SCH6-TR#3**, the timing chart where the supply of weld current is started is shown as follows.

1-5 Setting in Transformer Selector



As Transformer 1 (**TR#1**) is set for the first SCHEDULE No.2 (**SCH2**), weld current is firstly supplied through the transformer connected to Transformer 1 of Transformer Selector **MA-650A**, and then through Transformer 4, Transformer 5, Transformer 2 and Transformer 3 in turn. The Squeeze Delay Time (**SQD**) is added in the first weld current only. In the example above, it is added in **SCH2** only.

a: Monitored Value Computing Time and Transformer Changeover Time

It is the sum of **b**: Monitored Value Computing Time plus Transformer Changeover Time, 10 ms.

b: Monitored Value Computing Time

Changes in dependence on Monitor Value Calculation Mode (**CALCULATION MODE** at **6.(9)@STATUS (1/2) Screen**), Communication Setting (**COMM CONTROL** and **COMM SPEED** at **6.(9)@STATUS (2/2) Screen**) and the type of screens as the following page.

1) In the case of **OFF** or **BI-DIRECTION** at **COMM CONTROL**,

Display Screen	CALCULATION MODE	
	NORMAL	FAST
SCHEDULE	360 ms	310 ms
MONITOR	205 ms	155 ms
COMPARATOR	380 ms	330 ms
ENVELOPE	515 ms	465 ms
PRECHECK	220 ms	170 ms
CONTROL	215 ms	165 ms
STATUS	205 ms	155 ms

Note)
The values at the tables show maximum ones.

2) In the case of **DATA OUTPUT** at **COMM CONTROL**,

COMM SPEED	Display Screen	CALCULATION MODE	
		NORMAL	FAST
9600bps	SCHEDULE	485 ms	435 ms
	MONITOR	330 ms	280 ms
	COMPARATOR	505 ms	455 ms
	ENVELOPE	640 ms	590 ms
	PRECHECK	345 ms	295 ms
	CONTROL	340 ms	290 ms
	STATUS	330 ms	280 ms
19200bps	SCHEDULE	430 ms	380 ms
	MONITOR	275 ms	225 ms
	COMPARATOR	450 ms	400 ms
	ENVELOPE	585 ms	535 ms
	PRECHECK	290 ms	240 ms
	CONTROL	285 ms	235 ms
	STATUS	275 ms	225 ms
38400bps	SCHEDULE	400 ms	350 ms
	MONITOR	245 ms	195 ms
	COMPARATOR	420 ms	370 ms
	ENVELOPE	555 ms	505 ms
	PRECHECK	260 ms	210 ms
	CONTROL	255 ms	205 ms
	STATUS	245 ms	195 ms

Note)
The values at the tables show maximum ones.

④ 1-2 Setting

As same as in ③ 1-5 Setting, weld current is supplied on the consecutive 2 **SCHEDULE No.'s** in turn.

Weld current is supplied through the transformer selected at Transformer No. (TR#) in each **SCHEDULE Screen**.

⑤ **1-3 Setting**

Similarly in the following part, weld current is supplied on the consecutive 3 **SCHEDULE No.'s**.

Weld current is supplied through the transformer selected at Transformer No. (TR#) in each **SCHEDULE Screen**.

The Squeeze Delay Time (**SQD**) is added in the first weld current only.

⑥ **1-4 Setting**

Weld current is supplied on the consecutive 4 **SCHEDULE No.'s**.

Weld current is supplied through the transformer selected at Transformer No. (TR#) in each **SCHEDULE Screen**.

The Squeeze Delay Time (**SQD**) is added in the first weld current only.

NG/CAUTION during Weld Current Supplied

When the errors of Upper Limit (**H**) and Lower Limit (**L**) of the weld current, voltage, power and resistance are set as the setting of NG, the equipment stops by the NG Signal at the occurrence of the errors. When the errors of them are set as the setting of CAUTION, the CAUTION Signal is generated after completing all the supply of weld current.

Concerning the errors of CAUTION when the count-up of a counter has reached the preset counter value, the CAUTION Signal is generated after completing all the supply of weld current.

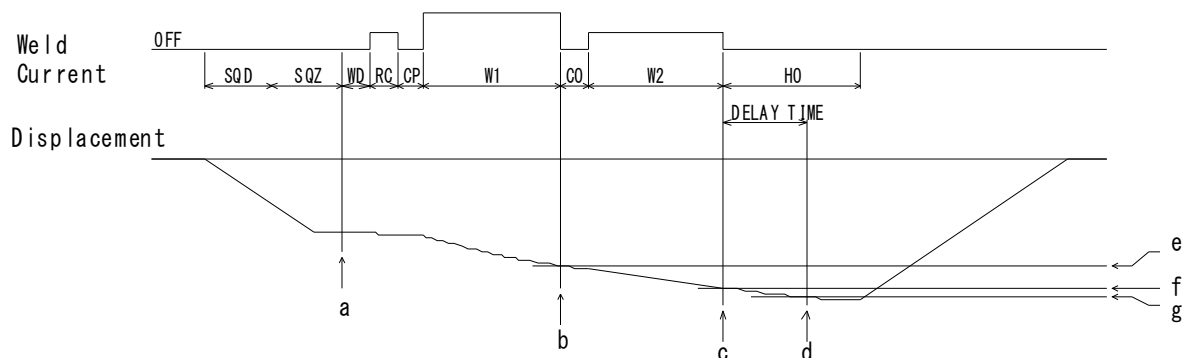
Concerning NG/CAUTION in other judgment, the equipment stops at the occurrence of NG/CAUTION.

Note) The monitor is not redisplayed when the weld current is not supplied in the schedule (the weld time is 0 ms).

Also, the next welding starts, redisplaying the monitor is interrupted.

Therefore, when the last schedule of transformer changeover is set not to supply the weld current, the previous monitor is remained displayed.

(9) Movement of Displacement Sensor



Symbol:

SQD: Squeeze Delay Time

WD: Work Detecting Time (0.4 ms Max.)

CP : Resistance Judgment Time (1 ms)

CO : Cool Time

HO: Hold Time

SQZ: Squeeze Time

RC: Resistance Pre-check Time

W1: 1st Weld Time

W2: 2nd Weld Time

a: Work Detection

When the range of work detection is set to the work detection (**WORK DETECT** at **6.(8) CONTROL Screen**), the work detection is done after the end of SQZ. If the range of work detection is set to ± 00.00 mm, no work detection is done. Work detection Time is of 0.4 ms Max.

b: 1st Weld Stop (W1)

When the displacement weld stop (DISPLC) is set to 1st Weld Stop to set the displacement (**WE1 DINPUT** at **6.(8) CONTROL Screen**) and the displacement sensor arrives at the set displacement (**e** at the above figure), 1st Weld is stopped to make the sequence move to the next cool time (CO).

c: 2nd Weld Stop (W2)

When the displacement weld stop (DISPLC) is set to 2nd Weld Stop to set the displacement (**WE1 DINPUT** at **6.(8) CONTROL Screen**) and the displacement sensor arrives at the set displacement (**f** at the above figure), 2nd Weld is stopped to make the sequence move to the next hold time (HO).

d: Delay Time

When the value of Delay Time is set to DELAY TIME (**DELAY TIME** at **6.(8) CONTROL Screen**), the displacement (**g** at the above figure) after the delay time elapses is measured.

10. External Communication Function

(1) Introduction

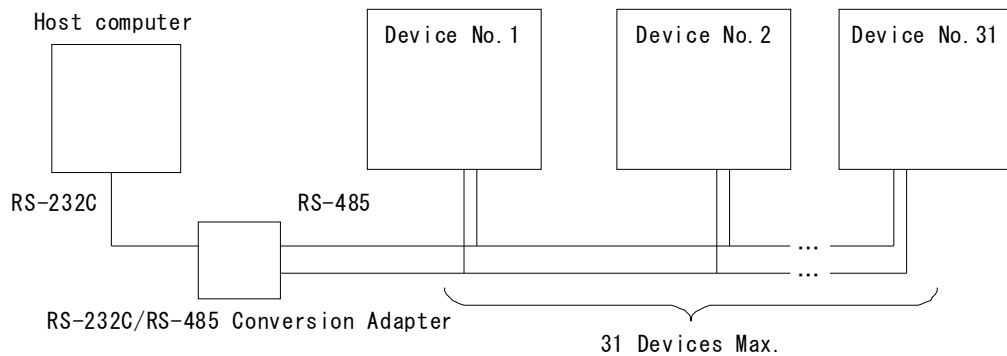
IPB-5000B can be used to set schedules from an externally-connected personal computer (abbreviated as PC) or to read monitored data and several kinds of status data.

(2) Data Transmission

Item	Content
Transmission Mode	Select either of the followings at STATUS Screen : * RS-485, Asynchronous, Half-Duplex * RS-232C
Transmission Rate	Select either of the followings at STATUS Screen : 9600, 19200, 38400 bps
Data Format	Start bit: 1, Data bit: 8, Stop bit: 1, Parity bit: Even
Character Code	Output in ASCII code LF Code: [LF] 0AH, Space Code: [SP] 32H CR Code: [CR] 0DH
Checksum Data	None
Connector	D-Sub 9 pins Pin Position In RS-485, 5: SG, 6: RS+, 9: RS- In RS-232C, 2: RXD, 3: TXD, 5: SG

(3) Configuration

① RS-485

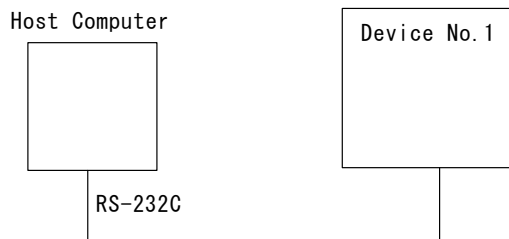


Note 1: When controlling two or more Lasers with one host computer, register the device No. (**COMM UNIT#**) for each device. Set the device No. at **STATUS Screen** (See 6.(9)②(d)).

Note 2: 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.

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

② RS-232C



Only a device can be connected.

(4) Protocol

① Single-directional Communication Mode

(When **DATA OUTPUT** is selected at **COMM CONTROL** in **STATUS Screen**)

1) Monitor Data

Data strings: !01001:1.49,1.51,0.51,0.55,0.7,0.3,2.01,2.03,0.61,
 A B C D E F G H I J K
 0.55,1.2,0.3,+01.250,010.0,010.0,-00.300 [CR] [LF]
 L M N O P Q R

A	Device No.	Fixed to 2 digits (00 to 31)
B	Schedule No.	Fixed to 3 digits (001 to 127)
C	Monitor Current of WE1 (RMS)	Fixed to 4 digits (0.00 to 6.00) (kA)
D	Monitor Current of WE1 (PEAK)	Fixed to 4 digits (0.00 to 6.00) (kA)
E	Monitor Voltage of WE1 (RMS)	Fixed to 4 digits (0.00 to 9.99) (V)
F	Monitor Voltage of WE1 (PEAK)	Fixed to 4 digits (0.00 to 9.99) (V)
G	Monitor Power of WE1	Fixed to 4 digits (0.0 to 20.0) (kW) (CURR, VOLT, COMB, POWER-H Control) (NB1)
		Fixed to 4 digits (0.00 to 9.99) (kW) (POWER-L Control)
H	Monitor Resistance of WE1	Fixed to 4 digits (0.0 to 99.9) (mΩ) (NB1)
I	Monitor Current of WE2 (RMS)	Fixed to 4 digits (0.00 to 6.00) (kA)
J	Monitor Current of WE2 (PEAK)	Fixed to 4 digits (0.00 to 6.00) (kA)
K	Monitor Voltage of WE2 (RMS)	Fixed to 4 digits (0.00 to 9.99) (V)
L	Monitor Voltage of WE2 (PEAK)	Fixed to 4 digits (0.00 to 9.99) (V)
M	Monitor Power of WE2	Fixed to 4 digits (0.0 to 20.0) (kW) (CURR, VOLT, COMB, POWER-H Control) (NB1)
		Fixed to 4 digits (0.00 to 9.99) (kW) (POWER-L Control)
N	Monitor Resistance of WE2	Fixed to 4 digits (0.0 to 99.9) (mΩ) (NB1)
O	Final Displacement	Fixed to 7 digits (-29.999 to +29.999) (mm)
P	Weld Time of WE1	Fixed to 5 digits (000.0 to 500.0) (ms)
Q	Weld Time of WE2	Fixed to 5 digits (000.0 to 500.0) (ms)
R	Displacement at detecting Workpiece	Fixed to 7 digits (-29.999 to +29.999) (mm)

NB1: The range between 0.0 and 9.9 is output as [SP]0.0 and [SP]9.9.

2) Error Data

Data strings: !01001:E01,02,03,05,07[CR][LF]
 A B C D E F G

A	Device No.	Fixed to 2 digits (00 to 31)
B	Schedule No.	Fixed to 3 digits (001 to 127) ^(NB1)
C	Error Code 1	Fixed to 2 digits (01 to 31)
D	Error Code 2	Fixed to 2 digits (01 to 31)
E	Error Code 3	Fixed to 2 digits (01 to 31)
F	Error Code 4	Fixed to 2 digits (01 to 31)
G	Error Code 5	Fixed to 2 digits (01 to 31)

The number of Error Codes is of five Max. In the case of only one error code, the error codes D to G are omitted.

NB1: When a setting for consecutive weldings is selected in TANS SCAN MODE, the schedule number of the last occurred error is sent.

② Bi-directional Communication Mode

(When **BI-DIRECTION** is selected at **COMM CONTROL** in **STATUS Screen**)

Description of Symbols

ID1, ID2: Shows Device No.
 Fixed to 2 digits (ID1=Ten's place, ID2=One's place)
 SH1, SH2, SH3: Shows Schedule No.
 Fixed to 3 digits (SH1=Hundred's place, SH2=Ten's place,
 SH3=One's place)
 CD1, CD2, CD3: Shows Specified Code.
 CD1-----Alphabet Classified Symbol
 CD2, CD3----Code Classified Number
 (See (5)③Specified Code for details of codes.)

No.	Description of Command	Code
1	Inquiry about Model and ROM Version	# Device No. I
	Example: Read model of Device No. 1 and ROM Version From Host PC to IPB-5000B <u># ID1 ID2 I CR LF</u> (# 0 1 I CR LF) From IPB-5000B to Host PC <u>! ID1 ID2 : IPB-5000B , ROM Version CR LF</u> (! 0 1 : IPB-5000B , ROM Version CR LF) Note) When “*” is set for both ID1 and ID2, all connected devices respond. In the case that all devices respond, the time-lag of response is 100 ms multiplied by ID No. (Device No.).	

No.	Description of Command	Code
2	Reading of Schedule Data	# Device No. R Schedule No. *
	Example: Read all data of Schedule No. 8 in Device No. 01. From Host PC to IPB-5000B <u># ID1 ID2 R SH1 SH2 SH3 * CR LF</u> (# 0 1 R 0 0 8 * CR LF) From IPB-5000B to Host PC <u>! ID1 ID2 SH1 SH2 SH3 : Data String CR LF</u> (! 0 1 0 0 8 : Data String CR LF) Note) When Schedule No. (SH1, SH2, SH3) is "000", the basic set conditions are read. See (5)①Order Table of Schedule Data for the data order of a Schedule.	
3	Setting of Schedule Data	# Device No. W Schedule No. : Data
	Example: Set data on Schedule No. 8 in Device No. 01. From Host PC to IPB-5000B <u># ID1 ID2 W SH1 SH2 SH3 : Data String CR LF</u> (# 0 1 W 0 0 8 : Data String CR LF) From IPB-5000B to Host PC <u>! ID1 ID2 SH1 SH2 SH3 : Data String CR LF</u> (! 0 1 0 0 8 : Data String CR LF) Note) * Regarding the number of digits and location of the decimal point in each data, each data is required to follow Data Code Table and be separated with ",". * See (5)①Order Table of Schedule Data for the data order of a Schedule. * When Schedule No. is "000", the basic set conditions are set. * The set data is returned as confirmation from IPB-5000B. When data outside the range is set, the last data before setting is exactly returned.	
4	Reading of Specified Item	# Device No. R Schedule No. Specified Code
	Example: Read 2nd. Weld Time (23 ms) on Schedule No. 31 in Device No. 01. From Host PC to IPB-5000B <u># ID1 ID2 R SH1 SH2 SH3 CD1 CD2 CD3 CR LF</u> (# 0 1 R 0 3 1 T 0 7 CR LF) From IPB-5000B to Host PC <u>! ID1 ID2 SH1 SH2 SH3 : Data CR LF</u> (! 0 1 0 3 1 T 0 7 : 0 2 3 . 0 m s CR LF) Note) See (5)③Specified Code for Specified Code and Data.	

No.	Description of Command	Code
5	Setting of Specified Data	# Device No. W Schedule No. Specified Code : Data
	Example: Set the current of 1st. Weld Time on Schedule No. 31 in Device No. 01 to 3.2 kA. From Host PC to IPB-5000B <u># ID1 ID2 W SH1 SH2 SH3 CD1 CD2 CD3 : Data CR LF</u> (# 0 1 W 0 3 1 H 0 1 : 3 . 2 0 k A CR LF) From IPB-5000B to Host PC <u>! ID1 ID2 SH1 SH2 SH3 : Data CR LF</u> (! 0 1 0 3 1 H 0 1 : 3 . 2 0 k A CR LF) Note) * See (5)③Specified Code for Specified Code and Data. * Regarding the number of digits and location of the decimal point in each data, each data is required to follow Data Code Table. * The set data is returned as confirmation from IPB-5000B. When data outside the range is set, the last data before setting is exactly returned.	
6	Reading of Initial Setting	# Device No. R Specified Code
	Example: Read model of Transformer IT*-360*6 (Data is 01) at Initial Setting (6.(9) STATUS Screen) in Device No. 01. From Host PC to IPB-5000B <u># ID1 ID2 R CD1 CD2 CD3 CR LF</u> (# 0 1 R P 4 0 CR LF) From IPB-5000B to Host PC <u>! ID1 ID2 CD1 CD2 CD3 : Data CR LF</u> (! 0 1 P 4 0 : 0 1 CR LF) Note) See (5)③Specified Code for Specified Code and Data.	
7	Setting of Initial Setting Condition	# Device No. W Specified Code : Data
	Example: Set the time period during which Weld End Signal Time is output to 100 ms (Data is 01) at Initial Setting (6.(9) STATUS Screen) in Device No. 01. From Host PC to IPB-5000B <u># ID1 ID2 W CD1 CD2 CD3 : Data CR LF</u> (# 0 1 W P 0 3 : 0 1 CR LF) From IPB-5000B to Host PC <u>! ID1 ID2 CD1 CD2 CD3 : Data CR LF</u> (! 0 1 P 0 3 : 0 1 CR LF) Note) * See (5)③Specified Code for Specified Code and Data. * Regarding the number of digits and location of the decimal point in each data, each data is required to follow Data Code Table. * The set data is returned as confirmation from IPB-5000B. When data outside the range is set, the last data before setting is exactly returned.	

No.	Description of Command	Code
8	Reading of monitor data in specified range	# Device No. ? Specifying of Range
	Example: Read monitor data from No. 0001 to 0017 in Device No. 01. From Host PC to IPB-5000B <u># ID1 ID2 ? Start No. – End No. CR LF</u> (# 0 1 ? 0 0 0 1 - 0 0 1 7 CR LF) From IPB-5000B to Host PC <u>! ID1 ID2 Start No. – End No., Data CR LF</u> (! 0 1 0 0 0 1 - 0 0 1 7 , Data String CR LF) Note) See (5)@Order Table of Monitor Data for Start No. and End No.	
9	Reading of Trouble	# Device No. R E99
	Example: Read all troubled items (Error Codes, E02 E05) in Device No. 01. From Host PC to IPB-5000B <u># ID1 ID2 R CD1 CD2 CD3 CR LF</u> (# 0 1 R E 9 9 CR LF) From IPB-5000B to Host PC <u>! ID1 ID2 SH1 SH2 SH3 : Data CR LF</u> (! 0 1 E 9 9 : E 0 2 , E 0 5 CR LF) Note) All error codes are read (Each error code is separated with “,”). In no trouble, data of “00” is returned. (! 0 1 E 9 9 : 0 0 CR LF)	
10	Error Reset	# Device No. R E00
	Example: Release troubles in Device No. 01. From Host PC to IPB-5000B <u># ID1 ID2 R E 0 0 CR LF</u> (# 0 1 R E 0 0 CR LF) From IPB-5000B to Host PC <u>! ID1 ID2 E 0 0 : 0 0 CR LF</u> (! 0 1 E 0 0 : 0 0 CR LF)	

(5) Data Code Table

① Order Table of Schedule Data

1) Specific Data in accordance with Schedule No. (Schedule No.: 001 to 127)

Order	Character String	Item		Range of Setting	Increment/Decrement
1	nnnn,	Squeeze Time		0000 to 9999	1ms
2	nnn.n,	Upslope 1 Time ^(NB1)		000.0 to 500.0	0.2ms
3	nnn.n,	1st. Weld Time ^(NB1)		000.0 to 500.0	0.2ms
4	nnn.n,	Downslope 1 Time ^(NB1)		00.0 to 500.0	0.2ms
5	nn.n,	Cool Time ^(NB1)		00.0 to 99.8	0.2ms
6	nnn.n,	Upslope 2 Time ^(NB1)		000.0 to 500.0	0.2ms
7	nnn.n,	2nd. Weld Time ^(NB1)		000.0 to 500.0	0.2ms
8	nnn.n,	Downslope 2 Time ^(NB1)		000.0 to 500.0	0.2ms
9	nnn,	Hold Time		000 to 999	1ms
10	n.nn,	WE1 Current Setting	MIN CURR: NORMAL	0.40 to 6.00	0.01kA
			MIN CURR: LOW	0.10 to 6.00	
11	n.nn,	WE2 Current Setting	MIN CURR: NORMAL	0.40 to 6.00	0.01kA
			MIN CURR: LOW	0.10 to 6.00	
12	n.nn,	WE1 Voltage Setting		0.30 to 9.99	0.01V
13	n.nn,	WE2 Voltage Setting		0.30 to 9.99	0.01V
14	nn.n,	WE1 Power Setting	CONTROL: POWER-H	00.2 to 20.0	0.1kW
			CONTROL: POWER-L	0.10 to 9.99	0.01kW
15	nn.n,	WE2 Power Setting	CONTROL: POWER-H	00.2 to 20.0	0.1kW
			CONTROL: POWER-L	0.10 to 9.99	0.01kW
16	n,	Transformer No.		1 to 5	----
17	nn,	Control Method in WE1		00 to 04 ^(NB2)	----
18	nn,	Control Method in WE2			
19	nnnn	Squeeze Delay Time		0000 to 9999	1ms

NB1: You can select whether or not Upslope Time and Downslope Time are included in Weld Time. If they are not included, the total time of Upslope Time, Weld Time and Downslope is up to 500 ms.

NB2: 00: CURR, 01: VOLT, 02: COMB, 03: POWER (**POWER-H**), 04: POWER (**POWER-L**)

2) Common Data

Order	Character String	Item	Contents
1	nn,	Selection of Welding Transformer	01: IT*-360*6 02: IT*-780*6
2	nn,	Weld Time	00: Slope Time Excluded 01: Slope Time Included
3	nn,	Selection of Start-up Condition Stabilizing Time	00: 1ms 01: 5ms 02: 10ms 03: 20ms
4	nn,	Selection of Start-up Input Signal Type	00: No Self-sustaining 01: Self-sustaining from Weld Time 02: Self-sustaining from Squeeze Time
5	nn,	Schedule Select Method	00: Closed Circuit of Schedule Select Terminal (No Parity) 01: Closed Circuit of Schedule Select Terminal (Parity Valid) 02: Select on Front Panel
6	nn,	End Signal Output Time	00: 10ms 01: 100ms 02: While Start Signal Output
7	nn,	Monitor Mode	00: Slope Time Excluded 01: Slope Time Included
8	nn,	Transformer Scan Mode	00: OFF 01: ON 02: 1-2 03: 1-3 04: 1-4 05: 1-5
9	nn,	No-current Monitor Neglect Time	00 to 10 (ms)
10	nn,	Pulse Width Monitor Neglect Time	00 to 10 (ms)
11	nn,	NG Output Mode	00: Open Circuit at NG 01: Closed Circuit at NG
12	nn,	READY Output Mode Setting	00: ON at Weld ON 01: ON at Power ON
13	nn,	Monitor Value Calculation Mode	00: High Rate Sampling 01: Low Rate Sampling, Faster Takt Time
14	nn,	Minimum Current	00: Settable from 10% of full scale. 01: Settable from 2.5% of full scale.
15	nn	Displacement polarity	00: Set the force-applying direction as plus. 01: Set the force-applying direction as minus.

② Order Table of Monitor Data (Most Recent Monitor Value)

Order	Output Data (n=0 to 9)	Contents	
0001	n.nn,	WE1 Monitor Current (Peak Value)	
0002	n.nn,	WE2 Monitor Current (Peak Value)	
0003	n.nn,	WE1 Monitor Voltage (Peak Value)	
0004	n.nn,	WE2 Monitor Voltage (Peak Value)	
0005	nn.n, ^(NB1)	WE1 Monitor Power	POWER-H Constant Power Control
	n.nn,		POWER-L Constant Power Control
0006	nn.n, ^(NB1)	WE2 Monitor Power	POWER-H Constant Power Control
	n.nn,		POWER-L Constant Power Control
0007	nn.n, ^(NB1)	WE1 Monitor Resistance	
0008	nn.n, ^(NB1)	WE2 Monitor Resistance	
0009	n.nn,	Precheck Monitor Current	
0010	n.nn,	WE1 Monitor Current (RMS Value)	
0011	n.nn,	WE2 Monitor Current (RMS Value)	
0012	n.nn,	WE1 Monitor Voltage (RMS Value)	
0013	n.nn,	WE2 Monitor Voltage (RMS Value)	
0014	+/-nn.nnn,	Final Displacement	
0015	nnn.n,	W1 Weld Time	
0016	nnn.n,	W2 Weld Time	
0017	+/-nn.nnn	Displacement at detecting Workpiece	

NB1: The range between 0.0 and 9.9 is output as [SP]0.0 and [SP]9.9.

③ Specified Code

1) Specifying of Weld Sequence (T)

Dimension of “ms” is added to each data.

Specified Code	Item	Range of Setting	Increment/Decrement
T00	Squeeze Delay Time	0000ms to 999ms	1ms
T01	Squeeze Time	0000ms to 999ms	1ms
T02	Upslope 1 Time	000.0ms to 500.0ms	0.2ms
T03	1st. Weld Time	000.0ms to 500.0ms	0.2ms
T04	Downslope 1 Time	000.0ms to 500.0ms	0.2ms
T05	Cool Time	00.0ms to 99.8ms	0.2ms
T06	Upslope 2 Time	000.0ms to 500.0ms	0.2ms
T07	2nd. Weld Time	000.0ms to 500.0ms	0.2ms
T08	Downslope 2 Time	000.0ms to 500.0ms	0.2ms
T13	Hold Time	000ms to 999ms	1ms
T15	Precheck Weld Time	00.0ms to 10.0ms	0.2ms

2) Setting of Control Current, Voltage and Power (H)

Specified Code	Item		Range of Setting	Increment/Decrement
H01	WE1 Current Setting	NORMAL	0.40kA to 4.00kA (IT*-360*6) 0.60kA to 6.00kA (IT*-780*6) Bracket () shows Transformer.	0.01kA
		LOW	0.10kA to 4.00kA (IT*-360*6) 0.15kA to 6.00kA (IT*-780*6)	0.01kA
H02	WE2 Current Setting	NORMAL	0.40kA to 4.00kA (IT*-360*6) 0.60kA to 6.00kA (IT*-780*6)	0.01kA
		LOW	0.10kA to 4.00kA (IT*-360*6) 0.15kA to 6.00kA (IT*-780*6)	0.01kA
H04	WE1 Voltage Setting		0.30V to 9.99V	0.01V
H05	WE2 Voltage Setting		0.30V to 9.99V	0.01V
H06	WE1 Power Setting		00.2kW to 20.0kW (POWER-H)	0.1kW
			0.10kW to 9.99kW (POWER-L)	0.01kW
H07	WE2 Power Setting		00.2kW to 20.0kW (POWER-H)	0.1kW
			0.10kW to 9.99kW (POWER-L)	0.01kW
H21	Precheck Voltage Setting		0.00V to 9.99V	0.01V
H50	Transformer Number		1 to 5	1

3) Setting of Monitor Upper/Lower Limit (N)

Specified Code	Item	Range of Setting	Increment/Decrement
N00	WE1 Monitor Current Upper Limit	0.00kA to 9.99kA	0.01kA
N01	WE1 Monitor Current Lower Limit	0.00kA to 9.99kA	0.01kA
N02	WE2 Monitor Current Upper Limit	0.00kA to 9.99kA	0.01kA
N03	WE2 Monitor Current Lower Limit	0.00kA to 9.99kA	0.01kA
N06	WE1 Monitor Voltage Upper Limit	0.00V to 9.99V	0.01V
N07	WE1 Monitor Voltage Lower Limit	0.00V to 9.99V	0.01V
N08	WE2 Monitor Voltage Upper Limit	0.00V to 9.99V	0.01V
N09	WE2 Monitor Voltage Lower Limit	0.00V to 9.99V	0.01V
N12	WE1 Monitor Power Upper Limit	POWER-H ^(NB1)	00.0kW to 99.9kW
		POWER-L ^(NB1)	0.00kW to 9.99kW
N13	WE1 Monitor Power Lower Limit	POWER-H	00.0kW to 99.9kW
		POWER-L	0.00kW to 9.99kW
N14	WE2 Monitor Power Upper Limit	POWER-H	00.0kW to 99.9kW
		POWER-L	0.00kW to 9.99kW
N15	WE2 Monitor Power Lower Limit	POWER-H	00.0kW to 99.9kW
		POWER-L	0.00kW to 9.99kW
N24	WE1 Monitor Resistance Upper Limit	00.0m* to 99.9m*	0.1m* ^(NB2)
N25	WE1 Monitor Resistance Lower Limit	00.0m* to 99.9m*	0.1m*
N26	WE2 Monitor Resistance Upper Limit	00.0m* to 99.9m*	0.1m*
N27	WE2 Monitor Resistance Lower Limit	00.0m* to 99.9m*	0.1m*
N36	Final Displacement Upper Limit	-29.999 to +29.999mm	0.001mm
N37	Final Displacement Lower Limit	-29.999 to +29.999mm	0.001mm
N42	Resistance Precheck Monitor Current Upper Limit	0.00kA to 9.99kA	0.01kA
N43	Resistance Precheck Monitor Current Lower Limit	0.00kA to 9.99kA	0.01kA
N65	WE1 Weld Time Upper Limit	000.0ms to 500.0ms	0.1ms
N66	WE1 Weld Time Lower Limit	000.0ms to 500.0ms	0.1ms
N67	WE2 Weld Time Upper Limit	000.0ms to 500.0ms	0.1ms
N68	WE2 Weld Time Lower Limit	000.0ms to 500.0ms	0.1ms
N70	Setting of Current RMS/PEAK	0:RMS/1:PEAK	--
N72	Setting of Voltage RMS/PEAK	0:RMS/1:PEAK	--
N73	Displacement Delay Time	0 to 999ms	
N74	Workpiece Detect Upper Limit	-29.999 to +29.999mm	0.001mm
N75	Workpiece Detect Lower Limit		

NB1: **POWER-H**, **POWER-L** indicates Constant Power Control.

NB2: The symbol “*” means Ω.

4) Reading of Monitor Judgment Results (J)

The function to save judging results is not equipped. Read them after each welding.

Specified Code	Item	Contents
J00	Judgment Result of Current Upper/Lower Limit	Judgment Result Data: 'N' means OK. 'L' means Lower Limit NG. 'H' means Upper Limit NG.
J03	Judgment Result of Voltage Upper/Lower Limit	
J06	Judgment Result of Power Upper/Lower Limit	
J12	Judgment Result of Resistance Upper/Lower Limit	
J18	Judgment Result of Final Displacement	
J55	Judgment Result of Weld Time	
J21	Judgment Result of Precheck Current	Judgment of Weld Workpiece Setting Status in Precheck: 'N' means OK. 'E' means NG.
J56	Judgment Result of Work Detection	
J99	Judgment Result (Batch Output)	Batch output of monitor judgment result

• Batch Output of Monitor Judgment Result (Specified code: J99)

Order	Output Data	Contents
1	n, (NB1)	Judgment Result of Current Upper/Lower Limit
2	n, (NB1)	Judgment Result of Voltage Upper/Lower Limit
3	n, (NB1)	Judgment Result of Power Upper/Lower Limit
4	n, (NB1)	Judgment Result of Resistance Upper/Lower Limit
5	n, (NB2)	Judgment Result of Precheck Current
6	n, (NB1)	Judgment Result of Final Displacement
7	n, (NB1)	Judgment Result of Weld Time
8	n (NB2)	Judgment Result of Work Detection

NB1: Judgment Result Data: 'N' means OK, 'L' means Lower Limit NG, and 'H' means Upper Limit NG.

NB2: Judgment Result Data: 'N' means OK, and 'E' means NG.

5) Reading of Monitored Value (M)

The function to save judging results is not equipped. Read them after each welding.

Specified Code	Item	Contents (n=0 to 9)
M00	WE1 Monitor Current (PEAK Value)	n.nnkA
M01	WE2 Monitor Current (PEAK Value)	n.nnkA
M03	WE1 Monitor Voltage (PEAK Value)	n.nnV
M04	WE2 Monitor Voltage (PEAK Value)	n.nnV
M06	WE1 Monitor Power (POWER-H) ^(NB2)	nn.nkW ^(NB1)
	WE1 Monitor Power (POWER-L) ^(NB2)	n.nnkW
M07	WE2 Monitor Power (POWER-H) ^(NB2)	nn.nkW ^(NB1)
	WE2 Monitor Power (POWER-L) ^(NB2)	n.nnkW
M12	WE1 Monitor Resistance	nn.nm* ^(NB1) ^(NB3)
M13	WE2 Monitor Resistance	nn.nm* ^(NB1) ^(NB3)
M18	Final Displacement	+/-nn.nnnmm
M21	Precheck Monitor Current	n.nnkA
M23	WE1 Weld Time	nnn.nms
M24	WE2 Weld Time	nnn.nms
M30	WE1 Monitor Current (RMS Value)	n.nnkA
M31	WE2 Monitor Current (RMS Value)	n.nnkA
M32	WE1 Monitor Voltage (RMS Value)	n.nnV
M33	WE2 Monitor Voltage (RMS Value)	n.nnV
M65	Work Detecting Displacement	+/-nn.nnnmm
M99	Monitor Value (Batch Output)	Batch output of monitor value

NB1: The range between 0.0 and 9.9 is output as [SP]0.0 and [SP]9.9.

NB2: **POWER-H**, **POWER-L** indicates Constant Power Control.

NB3: The symbol "*" means Ω.

• Batch Output of Monitor Value (Specified code: M99)

Order	Output Data (n=0 to 9)	Contents
1	n.nn,	WE1 Monitor Current (PEAK Value)
2	n.nn,	WE2 Monitor Current (PEAK Value)
3	n.nn,	WE1 Monitor Voltage (PEAK Value)
4	n.nn,	WE2 Monitor Voltage (PEAK Value)
5	nn.n, ^(NB1)	WE1 Monitor Power (POWER-H Constant Power Control)
	n.nn,	WE1 Monitor Power (POWER-L Constant Power Control)
6	nn.n, ^(NB1)	WE2 Monitor Power (POWER-H Constant Power Control)
	n.nn,	WE2 Monitor Power (POWER-L Constant Power Control)
7	nn.n, ^(NB1)	WE1 Monitor Resistance
8	nn.n, ^(NB1)	WE2 Monitor Resistance

Order	Output Data (n=0 to 9)	Contents
9	n.nn,	Precheck Monitor Current
10	n.nn,	WE1 Monitor Current (RMS Value)
11	n.nn,	WE2 Monitor Current (RMS Value)
12	n.nn,	WE1 Monitor Voltage (RMS Value)
13	n.nn,	WE2 Monitor Voltage (RMS Value)
14	±nn.nnn,	Final Displacement
15	nnn.n,	WE1 Weld Time
16	nnn.n,	WE2 Weld Time
17	±nn.nnn	Work Detecting Displacement

NB1: The range between 0.0 and 9.9 is output as [SP]0.0 and [SP]9.9.

6) Reading of Items relating with Envelope (V)

Specified Code	Item	Contents
V00	Envelope Type	0: Current, 1: Voltage, 2: Power, 3: Resistance, 4: Displacement
V01	Interval Start Time	nnnnnms
V02	Interval End Time	nnnnnms
V03	Offset Upper Limit (+)	n.nnkA/n.nnV/nn.nkW/nn.nm*/ nn.nnnmm (NB1)
V04	Offset Lower Limit (-)	n.nnkA/n.nnV/nn.nkW/nn.nm*/ nn.nnnmm (NB1)
V05	Envelope ON/OFF	0 : OFF, 1 : ON

NB1: The symbol “*” means Ω.

7) Setting of Items relating with Counter (C)

Specified Code	Item	Contents
C00	Reading of Displayed Counter	
C14	Counter Mode	0: TOTAL, 1: GOOD, 2: WORK
C05	Preset (TOTAL/GOOD)	000000 to 999999
C06	Preset (WORK)	000000 to 999999
C07	Preset (WELD)	00 to 99
C11	Counter Reset (All Counters)	
C12	Resolution of Displacement Sensor	00.1 to 10.0um

8) Setting of Initial Setting Condition (P)

Specified Code	Item	Contents
P01	Schedule Select Method	00: Closed Circuit of Schedule Select Terminal (No Parity) 01: Closed Circuit of Schedule Select Terminal (Parity Valid) 02: Select on Front Panel
P02	Start Signal Stabilizing Time (Delay Time)	00: 1ms 01: 5ms 02: 10ms 03: 20ms
P03	End Signal Output Time	00: 10ms 01: 100ms 02: While Start Signal Output
P04	Self-sustaining Time at Starting	00: No Self-sustaining 01: Self-sustaining from Weld Time 02: Self-sustaining from Squeeze Time
P10	Weld ON/OFF	00: Weld OFF 01: Weld ON
P40	Weld Transformer	00: IT*-142*6 (Do not select) 01: IT*-360*6 02: IT*-780*6
P41	Monitor Value Display Mode	00: Slope Time Excluded 01: Slope Time Includes
P43	Transformer Scan Mode	00: OFF 01: ON 02: 1-2 03: 1-3 04: 1-4 05: 1-5
P45	No-current Monitor Start Time	00 to 10 (Dimension "ms" Eliminated)
P46	Pulse Width Monitor Start Time	00 to 10 (Dimension "ms" Eliminated)
P47	NG Terminal Mode Setting	00: Open Circuit at NG 01: Closed Circuit at NG
P48	READY Output Mode Setting	00: ON at Weld ON 01: ON at Power ON
P49	Monitor Value Calculation Method	00: Normal 01: Fast
P52	Weld Time	00: Slope Time Excluded 01: Slope Time Included
P60	Minimum Current	00: Settable from 10% of full scale. 01: Settable from 2.5% of full scale.
P61	Displacement polarity	00: Set the force-applying direction as plus. 01: Set the force-applying direction as minus.

9) Reading of Error and Error Reset (E)

Specified Code	Item
E00	Error Reset
E99	Error Reading

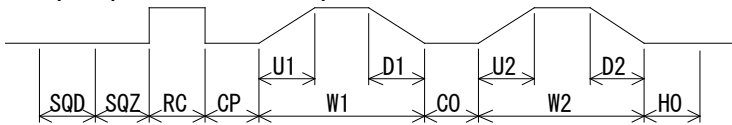
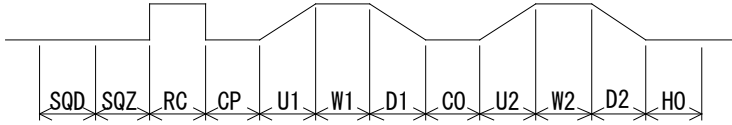
See **12. Error Codes** for details of Codes E01 to E25.

10) Control (Q)

Specified Code	Item	Contents
Q00	W1 Control Mode	00: Constant Current 01: Constant Voltage 02: COMBI 03: Constant Power (POWER-H) 04: Constant Power (POWER-L)
Q01	W2 Control Mode	
Q02	Selection of W1 Weld Stop Input	00: OFF 01: Displacement 02: Current 03: Voltage
Q03	Selection of W2 Weld Stop Input	
Q04	W1 Weld Stop Condition	n.nnkA n.nnV +/-nn.nnnmm
Q05	W2 Weld Stop Condition	

11. Specifications

(1) Specifications

Items	Common Specification in IPB-5000B
Weld Current Control Method	(1) Constant Current Control: Controls so that weld current can be the set current (2) Constant Voltage Control: Controls so that the voltage detected at V sensing cord connected across electrodes can be the set voltage (3) Constant Current/Constant Voltage Combination Control: Either of both methods in which the value arrives at set value more quickly is prioritized while both Constant Current and Constant Voltage Control method work simultaneously (4) Constant Power Control: Controls so that power value can be the set power
Rated Capacity	17.4kVA (IT*-780*6 in use)
Schedule Select Numbers	127 Schedules (1 to 127), Selected by External Signal or on Panel
Timer Setting Range	Squeeze Delay Time (SQD): 0000 to 9999ms (1ms each*) * "each" represents Increment or Decrement. Squeeze Time (SQZ): 0000 to 9999ms (1ms ea.) PRECHECK Current (RC): 00.0 to 10.0ms (0.2ms ea.) PRECHECK Judgment (CP): 1ms (Fixed) Upslope 1 (U1): 000.0 to 500.0ms (0.2ms ea.) Weld Time 1 (W1): 000.0 to 500.0ms (0.2ms ea.) Downslope 1 (D1): 000.0 to 500.0ms (0.2ms ea.) Cool Time (CO): 00.0 to 99.8ms (0.2ms ea.) Upslope 2 (U2): 000.0 to 500.0ms (0.2ms ea.) Weld Time 2 (W2): 000.0 to 500.0ms (0.2ms ea.) Downslope 2 (D2): 000.0 to 500.0ms (0.2ms ea.) Hold Time (HO): 000 to 999ms (1ms ea.) When Upslope and Downslope are included in Weld Time.  When Upslope and Downslope are not included in Weld Time. (The total time of Upslope Time, Weld Time and Downslope is up to 500ms.) 

Items	Common Specification in IPB-5000B		
Current Setting Range	Maximum current setting	Transformer	Setting range
	NORMAL (From 10 to 100% of Transformer maximum current)	IT*-360*6	0.40 to 4.00kA
		IT*-780*6	0.60 to 6.00kA
	LOW (From 2.5 to 100% of Transformer maximum current)	IT*-360*6	0.10 to 4.00kA
		IT*-780*6	0.15 to 6.00kA
	The maximum current available for welding depends on the load such as the welding head used. When you use a general welding head, the approximate maximum current is 3000A for IT*-360*6 and 4000A for IT*-780*6 . Also, in LOW mode, the set current may not flow when the current less than 400A for IT*-360*6 or 600A for IT*-780*6 is set.		
Voltage Setting Range	0.30 to 9.99V		
Power Setting Range	00.2 to 20.0kW (POWER-H) 0.10 to 9.99kW (POWER-L) * POWER-H, POWER-L indicates Constant Power Control.		
Monitor	IPB-5000B holds the monitored value of all schedules (only the latest one for waveform) while the power is on. When the power is turned off, all values are cleared.		
Resistance PRE-CHECK Function	Weld Time Setting Range: 00.0 to 10.0ms (0.2ms ea.) Voltage Setting Range: 0.30 to 9.99V (0.01V ea.) Current Upper/Lower Limit: 0.00 to 9.99kA (0.01kA ea.)		
Monitor Upper/Lower Limit Setting Range	Current: 0.00 to 9.99kA (0.01kA ea.) Voltage: 0.00 to 9.99V (0.01V ea.) Power (POWER-H)*: 00.0 to 20.0kW (0.1kW ea.) (POWER-L)*: 0.00 to 9.99kW (0.01kW ea.) Resistance: 00.0 to 99.9mΩ (0.1mΩ ea.) Weld Time: 000.0 to 500.0ms (0.2ms ea.) * POWER-H, POWER-L indicates Constant Power Control.		
Envelope	Upper/Lower Limit setting is possible for the only one waveform selected among Current, Voltage, Power and Resistance.		
Weld Stop	When WE1 or WE2 reaches the designated value of Current or Voltage, WE1 moves to CO and WE2, to HO. Setting Range of Weld Stop Current Value IT*-360*6 : 0.40 to 4.00kA IT*-780*6 : 0.60 to 6.00kA Setting Range of Weld Stop Voltage Value : 0.30 to 9.99V		

Items	Common Specification in IPB-5000B
Counter	Set at COUNTER. Count-up Output is produced when the counting arrives at Pre-set value for each mode. (1) TOTAL (Total Counter Mode) Every time the weld current is supplied, Count-up (+1 increment) is performed regardless of a judgment result. Counter Pre-set Setting Range: 000000 to 999999 (2) GOOD (Good Product Counter Mode) Every time GOOD is judged, Count-up is performed Counter Pre-set Setting Range: 000000 to 999999 (3) WORK (Production Counter Mode) Every time the counting arrives at the set value of Weld Counter, WORK Count is counted- up (+1 increment). When the monitored value is judged as No Good, Count-up is not performed. WELD Counter Pre-set Setting Range: 00 to 99 WORK Counter Pre-set Setting Range: 000000 to 999999 Note: The period for retaining the memory of counted numbers is approximately 10 days since the day when a power supply is turned off at latest.
Start Signal Stabilizing Period	Set at START SIG. TIME. Weld Sequence is started after finding the set value of 1, 5, 10 or 20ms and the Start Signal.
Self-sustaining Method	Set at START SIG. HOLD. NO HOLD: No self-sustaining action WE HOLD: Self-sustaining action works from the start of current supply SQ HOLD: Self-sustaining action works from the start of SQD
Schedule Select Method	Set at SCHEDULE#. EXT. (NP): Selected by the use of binary data EXT. (P): Selected by binary data with odd-numbered parity PANEL: Selected on Panel
Period for outputting END or GOOD Signal	Set at END SIG. TIME. Output for 10ms, 100ms or the period during which Start Signal is input (Note: if it is input 10ms or less, END or GOOD Signal is output for 10ms.). HOLD: Output for period during which Start Signal is input 10ms: Output for 10ms 100ms: Output for 100ms
Monitor Computing Range	Set at MONITOR MODE. EXCLUDE SLOPE: Computing a monitored value excluding Slope Period INCLUDE SLOPE: Computing a monitored value including Slope Period
PARITY/WE1STOP Input Selection	Set at SCHEDULE#. EXT. (P): Parity Input at External Input Terminal Pin 14 EXT. (NP) or PANEL: WELD1 Stop Input at External Input Terminal Pin 14

Items	Common Specification in IPB-5000B
Starting Time of detecting No Current or No Voltage	Set at NO CURR MONITOR START . 00 to 10ms (Starts to detect No Current or Voltage after the set period)
Pulse Monitoring Start Time	Set at PW MONITOR START . 00 to 10ms (Starts the pulse monitoring after the set period)
NG Output Setting	Set at NG OUTPUT . NORMALLY CLOSE: Closed with Power Supply turned on and open with NG generated NORMALLY OPEN: Closed with NG generated
READY Output Setting	Set at READY OUTPUT . WELD ON: Closed with Weld Current Supply ready POWER ON: Closed with IPB-5000B turned on
Accuracy of Constant Current	+/-3%, Full Scale (Designated Condition / Fixed Load) at the case of setting and monitoring
Accuracy of Constant Voltage	+/-3%, Full Scale (Designated Condition / Fixed Load) at the case of setting and monitoring
Duty Cycle	See the duty cycle graph in the operation manual for the welding transformer in use IT*-360*6 or IT*-780*6 .
Operation Environment	Temperature: 5 to 40°C Humidity: 90% or less (No condensation) Altitude: 1000 meters or lower Caution: Use this product in the environment without conductive dust. If conductive dust enters in the product, this may result in a failure, electric shock, or fire. When using this product in this environment, make contact with us.
Storage Environment	Temperature -10°–55°C and dew condensation not allowed
Heat-Resistant Class	E
Case Protection	IP20

	IPB-5000B-00-00/03/07	IPB-5000B-00-01/02/04/05
Weld Power Supply	Three-phase, 200 to 240 V AC ±10% (50 Hz / 60 Hz) (Voltage cannot be selected. Fixed to a customer-specified voltage in factory shipment.)	Three-phase, 380 to 480 V AC ±10% (50 Hz / 60 Hz) (Voltage cannot be selected. Fixed to a customer-specified voltage in factory shipment.)

	IPB-5000B-00-00/01/03/04/07	IPB-5000B-00-02/05
Outline dimensions (mm)	269 (H) x 172 (W) x 470 (D) (No projections included)	349 (H) x 172 (W) x 470 (D) (No projections included)
Mass (kg)	15	19

	IPB-5000B-00-03/04/05
Displacement Measurement Range	30.000mm Max.
Displacement Measurement Accuracy	+/-15μm
Displacement Sensor (Option)	GS-1830A manufactured by Ono Sokki Co. Ltd. GS-1813A manufactured by Ono Sokki Co. Ltd. LGK-110* manufactured by Mitutoyo Corp. ST1278* manufactured by HEIDENHAIN * An optional conversion cable is necessary.
Displacement Monitor Setting Range	Upper/Lower Limit Setting Range of Final Displacement: -29.999mm to +29.999mm (0.001mm ea.) Delay Time: 0 to 999ms
Workpiece Detection	At the end of Squeeze, the displacement is checked to confirm whether or not a workpiece is set. Upper/Lower Limit Setting Range of workpiece detection: -29.999mm to +29.999mm (0.001mm ea.)
Weld Stop	When WE1 or WE2 reaches the designated value of Displacement, WE1 moves to CO and WE2, to HO. Displacement Setting Range of Weld Stop: -29.999mm to +29.999mm (0.001mm ea.)
Envelope	Possible to set Upper/Lower Limit Setting to Displacement waveform

(2) Optional Items (Separately Sold)

① Input Cables PK-01855-□□□

If a customer procures the cable by oneself, prepare it in accordance with the following right-hand specifications.

Type	Branch No.	Length (m)
Standard	-002	2
	-005	5
	-010	10
	-015	15
	-020	20



Specifications of Standard Cable	
Rated Voltage	600V AC min.
Section Area	8 mm ² min.
No. of Cores	4
Cable Dia.	25 mm max.

Type	Branch No.	Length (m)
CE Marking Compliant	-102	2
	-105	5
	-110	10
	-115	15
	-120	20



Specifications of CE Marking Compliant Cable	
Rated Voltage	500V AC min.
Section Area	10 mm ² min.
No. of Cores	4
Cable Dia.	25 mm max.
Compliance Standard	Conductor: VDE0812/0281 Insulation: VDE0250/0281

② Output Cables PK-01856-□□□

If a customer procures the cable by oneself, prepare it in accordance with the following right-hand specifications.

Type	Branch No.	Length (m)
Standard	-002	2
	-005	5
	-010	10



Specifications of Standard Cable	
Rated Voltage	600V AC min.
Section Area	8 mm ² min.
No. of Cores	3
Cable Dia.	25 mm max.

Type	Branch No.	Length (m)
CE Marking Compliant	-102	2
	-105	5
	-110	10



Specifications of CE Marking Compliant Cable	
Rated Voltage	750V AC min.
Section Area	10 mm ² min.
No. of Cores	3
Cable Dia.	25 mm max.
Compliance Standard	Conductor: VDE0812/0281 Insulation: VDE0250/0281

③ [SENS] Cables SK-05741

Item	Branch No.	Length (m)
[SENS] Cable SK-05741	-002	2
	-005	5
	-010	10

④ Start Cables A-03081

Item	Branch No.	Length (m)
Start Cable A-03081	-001	1
	-002	3

⑤ Displacement Sensors

Item	Manufacturer
GS-1830A	ONO SOKKI Co. Ltd.
GS-1813A	
LGK-110	Mitutoyo Corp.
ST1278	HEIDENHAIN

⑥ Displacement Sensor Conversion Cables

Item	Application
A-06037-001	LGK-110 (Mitutoyo)
A-06037-002	ST1278 (HEIDENHAIN)

12. Error Codes

If the Power Supply has a trouble, the screen displays the error code and message.

Error Code	Message	Cause	Corrective Action
E-01	SYSTEM ERROR	Error has been detected on control system of IPB-5000B .	Once turn off power and turn on again. If E-01 SYSTEM ERROR is displayed again, repair is required. Contact us.
E-02	MEMORY ERROR	Schedule data stored in memory are broken down.	Check all set data. The following is assumed to cause the data stored in memory to be corrupted. * Strong power noise or electrostatic noise * Abnormal voltage of power supply due to thunderbolt or lightning conduction * Exceed in writing count limit of flash memory It is required to write down set values for a later use and also convenient in case of data corruption. (Use attached Schedule Data Table.) When turning power on along with MENU key pressed, the memory is initialized and all data return to values on the factory shipment after displaying the message of "Initializing.....Please wait a moment". Re-set the values on record. It takes approximately 10 seconds to initialize the memory. Do not turn off power for the period. If E-02 MEMORY ERROR is displayed again, repair is required. Contact us.
E-03	OVER HEAT	Temperature rises inside IPB-5000B and thermostat for power element inside power unit is open.	*Check whether or not duty cycle exceeds the specific value. Observe the value. *Stop the operation and, after cooling the Equipment, reset the error.
E-04	OVER HEAT (TRANS)	Temperature of weld transformer rises and thermostat is open inside weld transformer.	*Check connection of [SENS] Cable. *Check whether or not duty cycle exceeds the specific value. Observe the value. *Stop the operation and, after cooling the Equipment, reset the error.
E-05	OVER CURRENT	Actual weld current is greater than set value.	Check whether or not weld transformer and electrodes are normal.
E-06	POWER SUPPLY ERROR	Error has been detected on three-phase weld power supply.	Check input connection of three-phase weld power supply.

Error Code	Contents	Cause	Corrective Action
E-07	ABORT	Short-circuit wire is cut between Pin 1 and Pin 3 STOP on rear panel.	Connect Pin 1 to Pin 3 on rear terminal strip.
E-08	NO CURRENT	Weld current is not flowing. Or measured value of weld current is 3% or less of current range.	*Check the pressing force, electrode contact and wire connection of weld head. *Check the setting of SQZ . Set longer SQZ period than period of electrode moving. *At NO CURR MONITOR START in STATUS Screen, start time of checking "No Current" can be set. It is possible to stop the detection of "No Current" at the start of current flow by that setting.
E-09	NO VOLTAGE	Voltage across electrodes is 0.2V or less. Or voltage detecting cable is not connected.	*Check connection and location of voltage detecting cable. *Check the pressing force, electrode contact and wire connection of weld head. *At NO CURR MONITOR START in STATUS Screen, start time of checking "No Current" can be set. It is possible to stop the detection of "No Current" at the start of current flow by that setting. This error does not happen when CURR is set at CONTROL setting in STATUS Screen.
E-11	PARITY ERROR	Sum of numbers of closed Schedule Select Signal wires and a Parity Signal wire is not odd.	Select and close Parity Signal so that the sum of the numbers of closed Schedule Select Signal wires and a Parity Signal wire can be odd. This error happens only when EXP. (P) is set at SCHEDULE# setting in STATUS Screen.
E-12	INTERRUPT ERROR	Signals of Pin 20, W. INTERRUPT and Pin 14, PARITY(WE1STOP) at terminal strip on rear panel are closed at weld starting.	Check input of W. INTERRUPT and PARITY(WE1STOP) .
E-13	CYCLE ERROR	Pin 5, 2ND STAGE has been open on rear panel while weld sequence operates.	Close Pin 5, 2ND STAGE until WE2 in weld sequence goes to an end. This error happens only when NO HOLD is set at START SIG. HOLD setting in STATUS Screen.
E-14	COUNT MEMORY ERROR	Count Data stored in memory are damaged.	Memory was erased because period for retaining memory of count data elapsed over specified period. The period for retaining the memory of count data is approximately 10 days since the day when a power supply is turned off at latest.

Error Code	Contents	Cause	Corrective Action
E-15	PRECHECK ERROR	Current is out of range between upper limit and lower limit set PRECHECK Screen when PRECHECK Current Supply is used.	*Check weld pickup (contamination) of electrodes, contact of electrodes and workpieces. *Check range set at PRECHECK Screen.
E-16	CURR ERROR (HIGH)	Measured weld current is out of upper limit set at COMPARATOR Screen.	*Check workpieces, welder and welding power supply voltage. *Check range set at COMPARATOR Screen.
E-17	CURR ERROR (LOW)	Measured weld current is out of lower limit set at COMPARATOR Screen.	*Check workpieces, welder and welding power supply voltage. *Check range set at COMPARATOR Screen.
E-18	VOLT ERROR (HIGH)	Measured voltage across electrodes is out of upper limit set at COMPARATOR Screen.	*Check workpieces, welder and welding power supply voltage. *Check range set at COMPARATOR Screen.
E-19	VOLT ERROR (LOW)	Measured voltage across electrodes is out of lower limit set at COMPARATOR Screen.	*Check workpieces, welder and welding power supply voltage. *Check range set at COMPARATOR Screen.
E-20	RESIST ERROR (HIGH)	Measured resistance across electrodes is out of upper limit set at COMPARATOR Screen.	*Check workpieces, welder and welding power supply voltage. *Check range set at COMPARATOR Screen.
E-21	RESIST ERROR (LOW)	Measured resistance across electrodes is out of lower limit set at COMPARATOR Screen.	*Check workpieces, welder and welding power supply voltage. *Check range set at COMPARATOR Screen.
E-22	POWER ERROR (HIGH)	Measured weld power is out of upper limit set at COMPARATOR Screen.	*Check workpieces, welder and welding power supply voltage. *Check range set at COMPARATOR Screen.
E-23	POWER ERROR (LOW)	Measured weld power is out of lower limit set at COMPARATOR Screen.	*Check workpieces, welder and welding power supply voltage. *Check range set at COMPARATOR Screen.
E-24	COUNT UP	Counting has arrived at set pre-set count value.	Re-set counter.
E-25	OVER CURRENT (24VDC)	Internal 24VDC power supply output at terminal strip on rear panel is overloaded.	Turn off power and check connection at I/O terminal strip on rear panel.

Error Code	Contents	Cause	Corrective Action
E-26	DISPLACEMENT ERROR (HIGH)	Measured displacement is out of upper limit set at CONTROL Screen.	*Check workpieces, welder and welding power supply voltage. *Check range set at CONTROL Screen.
E-27	DISPLACEMENT ERROR (LOW)	Measured displacement is out of lower limit set at CONTROL Screen.	*Check workpieces, welder and welding power supply voltage. *Check range set at CONTROL Screen.
E-28	WELD TIME ERROR (HIGH)	Measured weld time is out of upper limit set at CONTROL Screen.	*Check workpieces, welder and welding power supply voltage. *Check weld stop setting in CONTROL Screen and weld stop input in external interface. *Check range set at CONTROL Screen.
E-29	WELD TIME ERROR (LOW)	Measured weld time is out of lower limit set at CONTROL Screen.	*Check workpieces, welder and welding power supply voltage. *Check weld stop setting in CONTROL Screen and weld stop input in external interface. *Check range set at CONTROL Screen.
E-30	WORK DETECT ERROR	Measured displacement at end of squeeze is out of range between lower and upper limit set at CONTROL Screen.	*Check workpieces setting and positioning. *Check range set at CONTROL Screen.

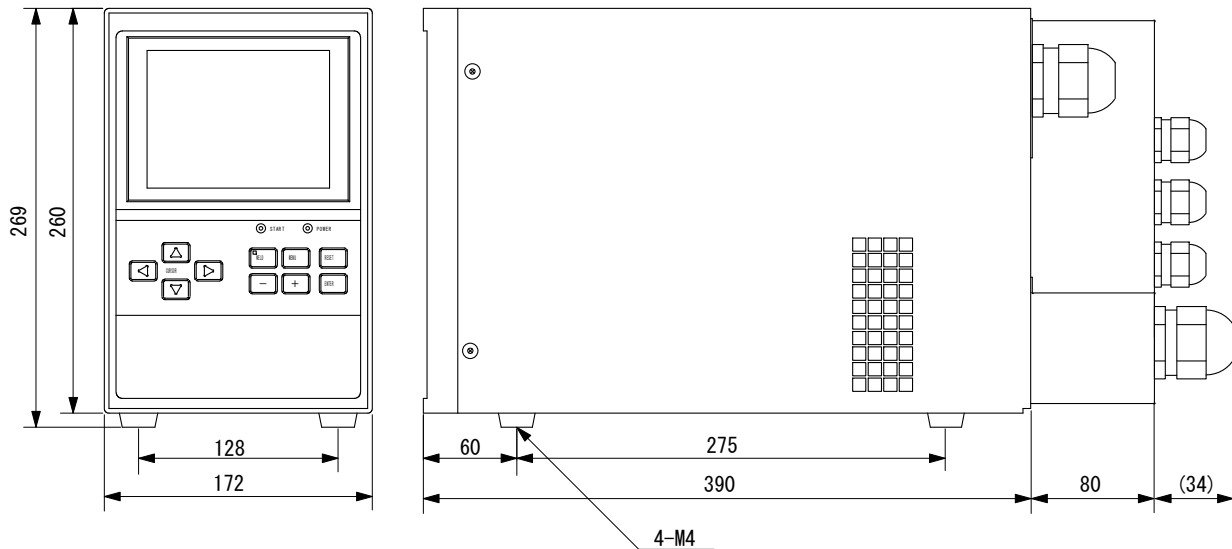
CAUTION

If the monitor value is not displayed, the WELD ON/OFF input terminal may be open in the process of sequence (including the screen display time. See **9.(1) Fundamental Sequence**).

13. Outline Drawing

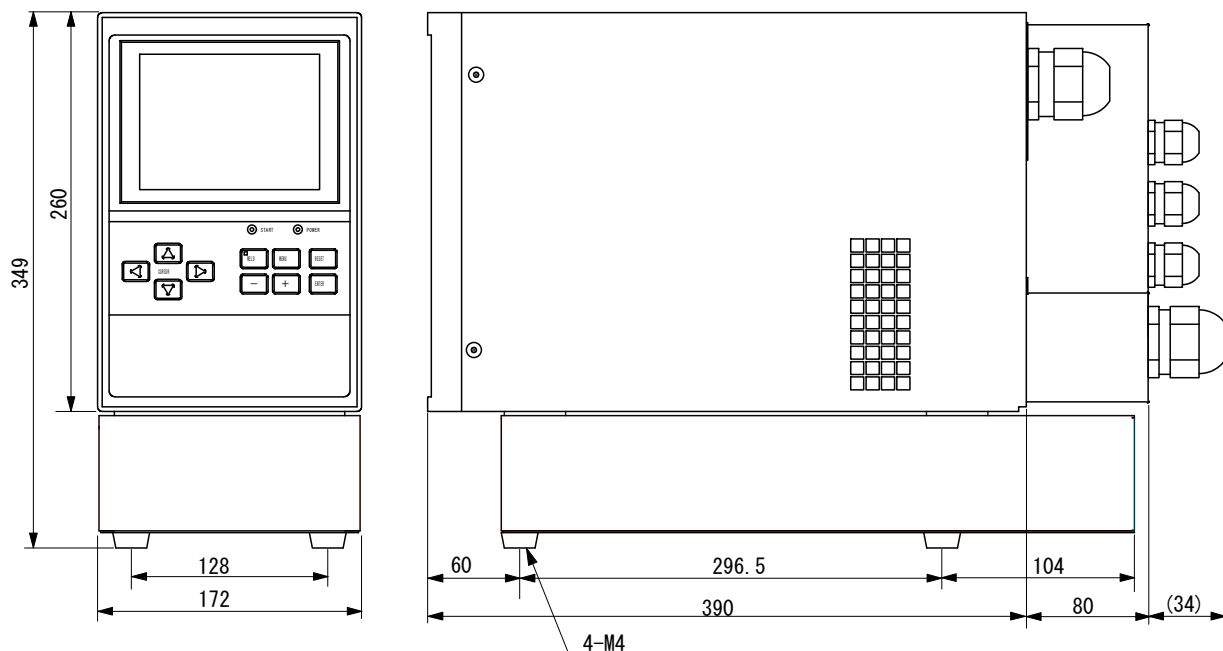
(1) IPB-5000B-00-00/01/03/04/07

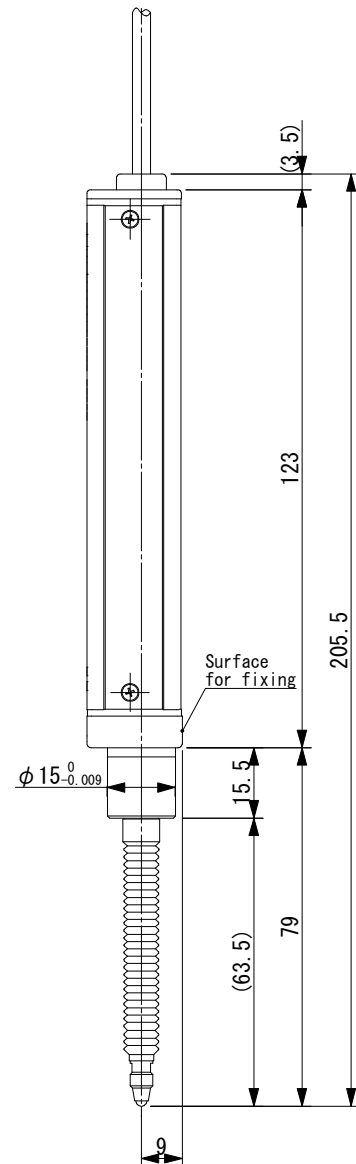
(Dimensions in mm)



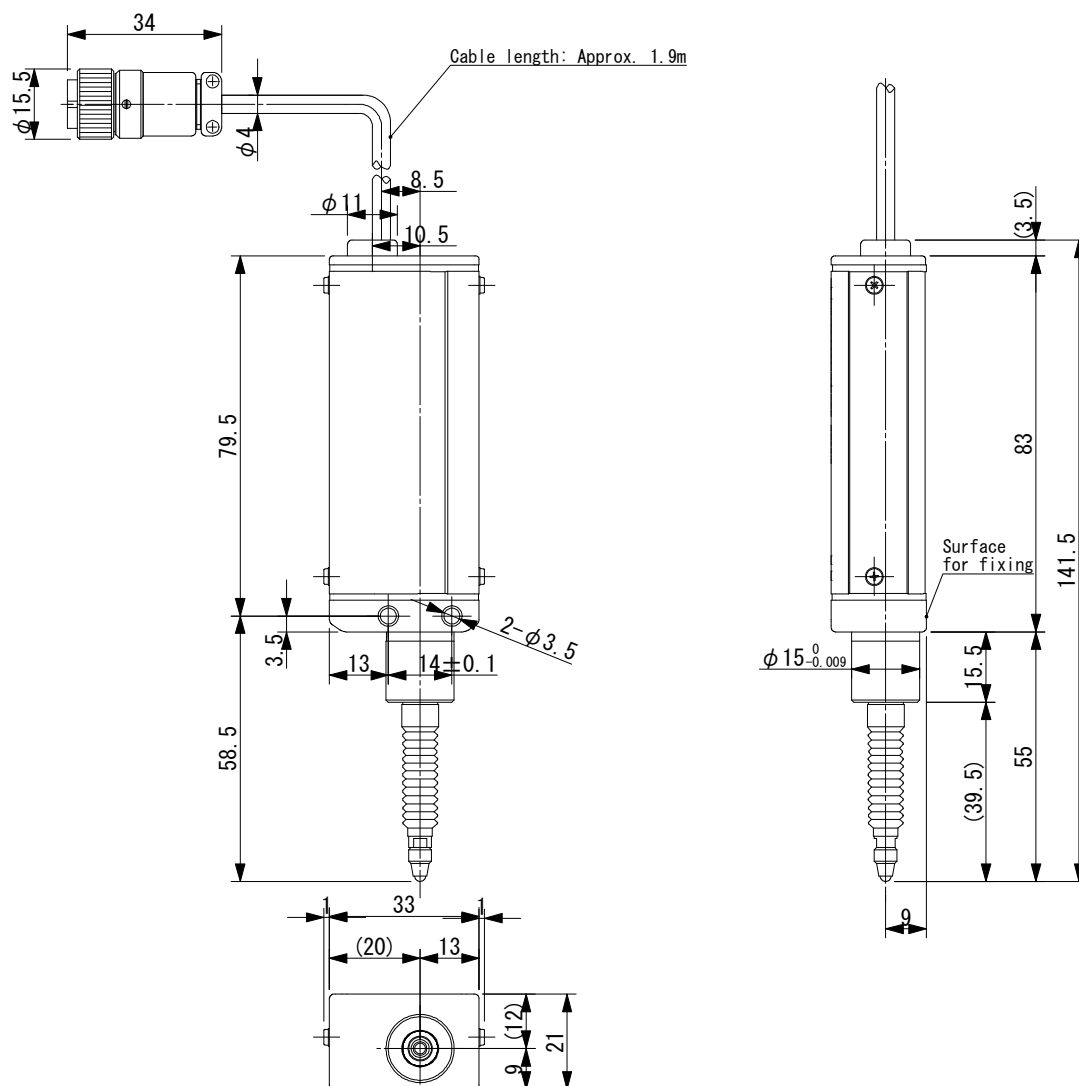
(2) IPB-5000B-00-02/05

(Dimensions in mm)

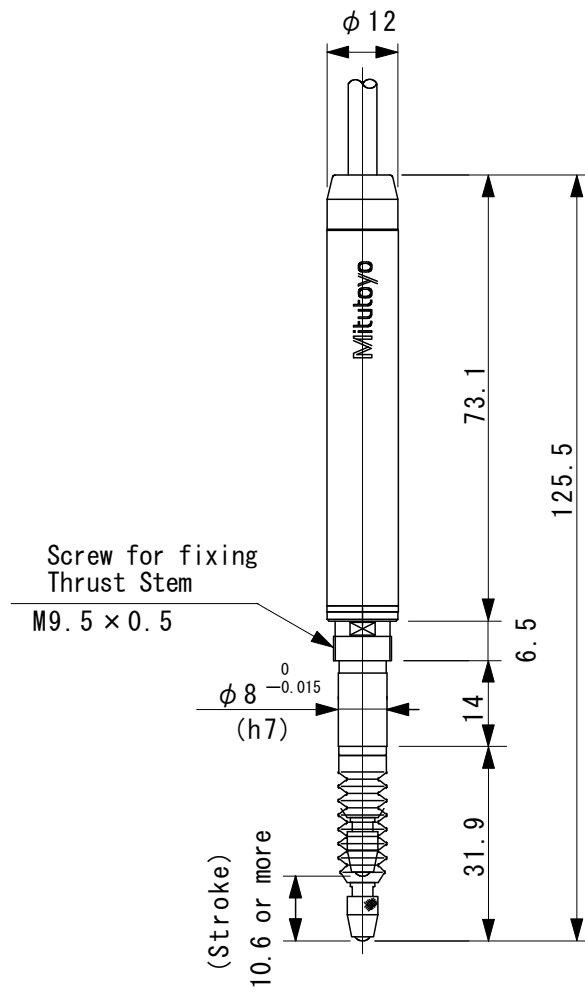


[illegible]

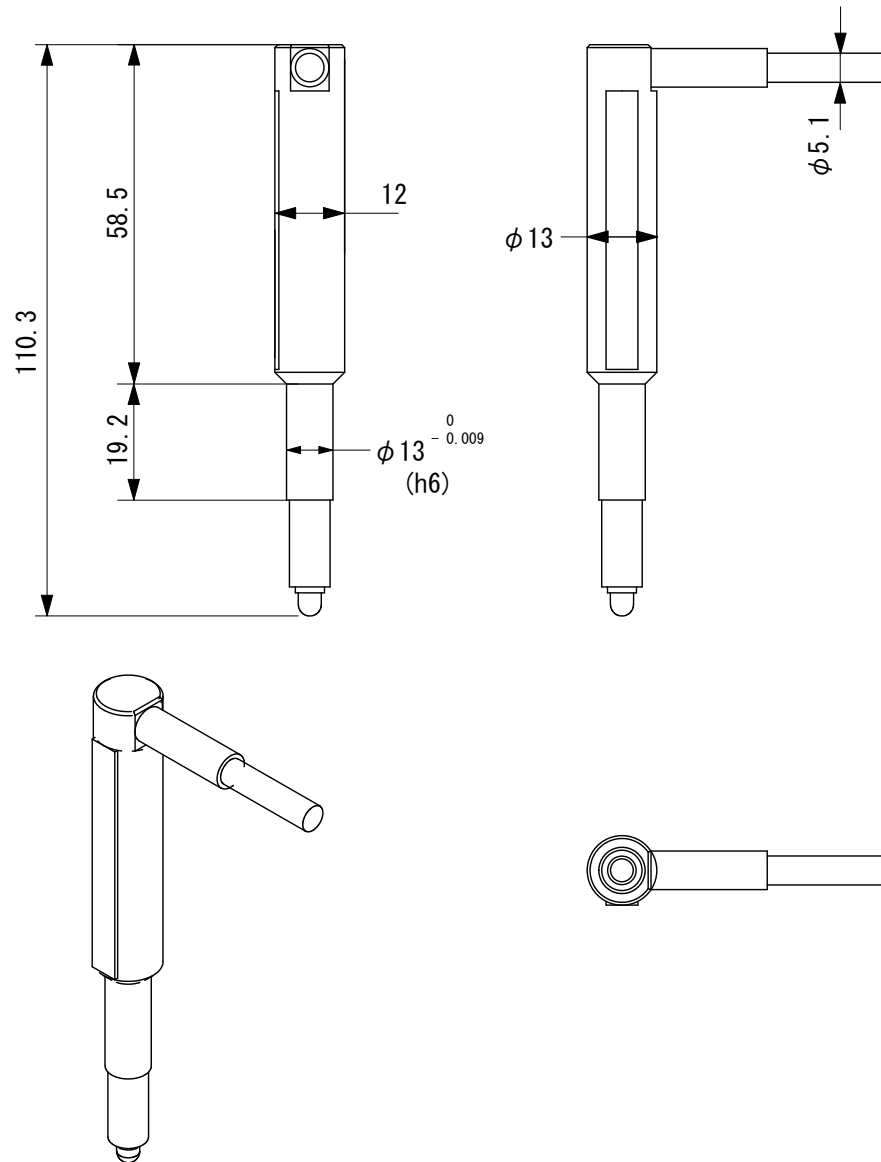
② **GS-1813A** Type, Ono Sokki



③ LGK-110 Type, Mitutoyo



④ ST1278 Type, HEIDENHAIN



14. Schedule Data Table

(1) Weld SCHEDULE Setting

ITEM SCH #	SQD	SQZ	WE1	COOL	WE2	HOLD	CURR		VOLT		POWER		CONTROL		UP SLOPE		DOWN SLOPE		TRANS #
							WE1	WE2	WE1	WE2	WE1	WE2	WE1	WE2	WE1	WE2	WE1	WE2	
SCH1																			
SCH2																			
SCH3																			
SCH4																			
SCH5																			
SCH6																			
SCH7																			
SCH8																			
SCH9																			
SCH10																			
SCH11																			
SCH12																			
SCH13																			
SCH14																			
SCH15																			
SCH16																			
SCH17																			
SCH18																			

ITEM SCH #	SQD	SQZ	WE1	COOL	WE2	HOLD	CURR		VOLT		POWER		CONTROL		UP SLOPE		DOWN SLOPE		TRANS #
							WE1	WE2	WE1	WE2	WE1	WE2	WE1	WE2	WE1	WE2	WE1	WE2	
SCH19																			
SCH20																			
SCH21																			
SCH22																			
SCH23																			
SCH24																			
SCH25																			
SCH26																			
SCH27																			
SCH28																			
SCH29																			
SCH30																			
SCH31																			
SCH32																			
SCH33																			
SCH34																			
SCH35																			
SCH36																			

ITEM SCH #	SQD	SQZ	WE1	COOL	WE2	HOLD	CURR		VOLT		POWER		CONTROL		UP SLOPE		DOWN SLOPE		TRANS #
							WE1	WE2	WE1	WE2	WE1	WE2	WE1	WE2	WE1	WE2	WE1	WE2	
SCH37																			
SCH38																			
SCH39																			
SCH40																			
SCH41																			
SCH42																			
SCH43																			
SCH44																			
SCH45																			
SCH46																			
SCH47																			
SCH48																			
SCH49																			
SCH50																			
SCH51																			
SCH52																			
SCH53																			
SCH54																			

ITEM SCH #	SQD	SQZ	WE1	COOL	WE2	HOLD	CURR		VOLT		POWER		CONTROL		UP SLOPE		DOWN SLOPE		TRANS #
							WE1	WE2	WE1	WE2	WE1	WE2	WE1	WE2	WE1	WE2	WE1	WE2	
SCH55																			
SCH56																			
SCH57																			
SCH58																			
SCH59																			
SCH60																			
SCH61																			
SCH62																			
SCH63																			
SCH64																			
SCH65																			
SCH66																			
SCH67																			
SCH68																			
SCH69																			
SCH70																			
SCH71																			
SCH72																			

ITEM SCH #	SQD	SQZ	WE1	COOL	WE2	HOLD	CURR		VOLT		POWER		CONTROL		UP SLOPE		DOWN SLOPE		TRANS #
							WE1	WE2	WE1	WE2	WE1	WE2	WE1	WE2	WE1	WE2	WE1	WE2	
SCH73																			
SCH74																			
SCH75																			
SCH76																			
SCH77																			
SCH78																			
SCH79																			
SCH80																			
SCH81																			
SCH82																			
SCH83																			
SCH84																			
SCH85																			
SCH86																			
SCH87																			
SCH88																			
SCH89																			
SCH90																			

ITEM SCH #	SQD	SQZ	WE1	COOL	WE2	HOLD	CURR		VOLT		POWER		CONTROL		UP SLOPE		DOWN SLOPE		TRANS #
							WE1	WE2	WE1	WE2	WE1	WE2	WE1	WE2	WE1	WE2	WE1	WE2	
SCH91																			
SCH92																			
SCH93																			
SCH94																			
SCH95																			
SCH96																			
SCH97																			
SCH98																			
SCH99																			
SCH100																			
SCH101																			
SCH102																			
SCH103																			
SCH104																			
SCH105																			
SCH106																			
SCH107																			
SCH108																			

ITEM SCH #	SQD	SQZ	WE1	COOL	WE2	HOLD	CURR			VOLT		POWER		CONTROL		UP SLOPE		DOWN SLOPE		TRANS #
							WE1	WE2		WE1	WE2	WE1	WE2	WE1	WE2	WE1	WE2	WE1	WE2	
SCH109																				
SCH110																				
SCH111																				
SCH112																				
SCH113																				
SCH114																				
SCH115																				
SCH116																				
SCH117																				
SCH118																				
SCH119																				
SCH120																				
SCH121																				
SCH122																				
SCH123																				
SCH124																				
SCH125																				
SCH126																				
SCH127																				

(2) PRECHECK Setting

ITEM SCH#	TIME	VOLT	COMP CURR	
			HI	LO
SCH1				
SCH2				
SCH3				
SCH4				
SCH5				
SCH6				
SCH7				
SCH8				
SCH9				
SCH10				
SCH11				
SCH12				
SCH13				
SCH14				
SCH15				
SCH16				
SCH17				
SCH18				
SCH19				
SCH20				
SCH21				
SCH22				
SCH23				
SCH24				
SCH25				
SCH26				
SCH27				

ITEM SCH#	TIME	VOLT	COMP CURR	
			HI	LO
SCH28				
SCH29				
SCH30				
SCH31				
SCH32				
SCH33				
SCH34				
SCH35				
SCH36				
SCH37				
SCH38				
SCH39				
SCH40				
SCH41				
SCH42				
SCH43				
SCH44				
SCH45				
SCH46				
SCH47				
SCH48				
SCH49				
SCH50				
SCH51				
SCH52				
SCH53				
SCH54				

ITEM SCH#	TIME	VOLT	COMP CURR	
			HI	LO
SCH55				
SCH56				
SCH57				
SCH58				
SCH59				
SCH60				
SCH61				
SCH62				
SCH63				
SCH64				
SCH65				
SCH66				
SCH67				
SCH68				
SCH69				
SCH70				
SCH71				
SCH72				
SCH73				
SCH74				
SCH75				
SCH76				
SCH77				
SCH78				
SCH79				
SCH80				
SCH81				
SCH82				
SCH83				

ITEM SCH#	TIME	VOLT	COMP CURR	
			HI	LO
SCH84				
SCH85				
SCH86				
SCH87				
SCH88				
SCH89				
SCH90				
SCH91				
SCH92				
SCH93				
SCH94				
SCH95				
SCH96				
SCH97				
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SCH99				
SCH100				
SCH101				
SCH102				
SCH103				
SCH104				
SCH105				
SCH106				
SCH107				
SCH108				
SCH109				
SCH110				
SCH111				
SCH112				

ITEM SCH#	TIME	VOLT	COMP CURR	
			HI	LO
SCH113				
SCH114				
SCH115				
SCH116				
SCH117				
SCH118				
SCH119				
SCH120				

ITEM SCH#	TIME	VOLT	COMP CURR	
			HI	LO
SCH121				
SCH122				
SCH123				
SCH124				
SCH125				
SCH126				
SCH127				

(3) COMPARATOR Setting

ITEM SCH #	CURR						VOLT						POWER						RESIST					
	WE1			WE2			WE1			WE2			WE1			WE2			WE1			WE2		
	HI	LO		HI	LO		HI	LO		HI	LO		HI	LO		HI	LO		HI	LO		HI	LO	
SCH1																								
SCH2																								
SCH3																								
SCH4																								
SCH5																								
SCH6																								
SCH7																								
SCH8																								
SCH9																								
SCH10																								
SCH11																								
SCH12																								
SCH13																								
SCH14																								
SCH15																								
SCH16																								
SCH17																								
SCH18																								

ITEM SCH #	CURR						RMS/ PEAK	VOLT						POWER						RESIST						
	WE1			WE2				WE1			WE2			WE1			WE2			WE1			WE2			
	HI	LO		HI	LO			HI	LO		HI	LO		HI	LO		HI	LO		HI	LO		HI	LO		
SCH19																										
SCH20																										
SCH21																										
SCH22																										
SCH23																										
SCH24																										
SCH25																										
SCH26																										
SCH27																										
SCH28																										
SCH29																										
SCH30																										
SCH31																										
SCH32																										
SCH33																										
SCH34																										
SCH35																										
SCH36																										

ITEM SCH #	CURR						VOLT						POWER						RESIST					
	WE1			WE2			WE1			WE2			WE1			WE2			WE1			WE2		
	HI	LO		HI	LO	RMS/ PEAK	HI	LO		HI	LO	RMS/ PEAK	HI	LO		HI	LO		HI	LO		HI	LO	
SCH37																								
SCH38																								
SCH39																								
SCH40																								
SCH41																								
SCH42																								
SCH43																								
SCH44																								
SCH45																								
SCH46																								
SCH47																								
SCH48																								
SCH49																								
SCH50																								
SCH51																								
SCH52																								
SCH53																								
SCH54																								

ITEM SCH #	CURR						RMS/ PEAK	VOLT						POWER						RESIST						
	WE1			WE2				WE1			WE2			WE1			WE2			WE1			WE2			
	HI	LO		HI	LO			HI	LO		HI	LO		HI	LO		HI	LO		HI	LO		HI	LO		
SCH55																										
SCH56																										
SCH57																										
SCH58																										
SCH59																										
SCH60																										
SCH61																										
SCH62																										
SCH63																										
SCH64																										
SCH65																										
SCH66																										
SCH67																										
SCH68																										
SCH69																										
SCH70																										
SCH71																										
SCH72																										

ITEM SCH #	CURR						VOLT						POWER						RESIST						
	WE1			WE2			RMS/ PEAK	WE1			WE2			WE1			WE2			WE1			WE2		
	HI	LO		HI	LO			HI	LO		HI	LO		HI	LO		HI	LO		HI	LO		HI	LO	
SCH73																									
SCH74																									
SCH75																									
SCH76																									
SCH77																									
SCH78																									
SCH79																									
SCH80																									
SCH81																									
SCH82																									
SCH83																									
SCH84																									
SCH85																									
SCH86																									
SCH87																									
SCH88																									
SCH89																									
SCH90																									

ITEM SCH #	CURR						VOLT						POWER						RESIST						
	WE1			WE2			RMS/ PEAK	WE1			WE2			WE1			WE2			WE1			WE2		
	HI	LO	HI	LO	HI	LO		HI	LO	HI	LO	HI	LO	HI	LO	HI	LO	HI	LO	HI	LO				
SCH91																									
SCH92																									
SCH93																									
SCH94																									
SCH95																									
SCH96																									
SCH97																									
SCH98																									
SCH99																									
SCH100																									
SCH101																									
SCH102																									
SCH103																									
SCH104																									
SCH105																									
SCH106																									
SCH107																									
SCH108																									

ITEM SCH #	CURR						VOLT						POWER						RESIST					
	WE1			WE2			WE1			WE2			WE1			WE2			WE1			WE2		
	HI	LO		HI	LO		HI	LO		HI	LO		HI	LO		HI	LO		HI	LO		HI	LO	
SCH109																								
SCH110																								
SCH111																								
SCH112																								
SCH113																								
SCH114																								
SCH115																								
SCH116																								
SCH117																								
SCH118																								
SCH119																								
SCH120																								
SCH121																								
SCH122																								
SCH123																								
SCH124																								
SCH125																								
SCH126																								
SCH127																								

(4) CONTROL Setting

** Only for model with displacement sensor (Option)

ITEM	WELD STOP				WELD TIME				DISPLACEMENT **			
	INPUT		CONDITION		WE1		WE2		COMP		DELAY TIME	
	WE1	WE2	WE1	WE2	HI	LO	HI	LO	HI	LO	HI	LO
SCH #												
SCH1												
SCH2												
SCH3												
SCH4												
SCH5												
SCH6												
SCH7												
SCH8												
SCH9												
SCH10												
SCH11												
SCH12												
SCH13												
SCH14												
SCH15												
SCH16												
SCH17												
SCH18												

** Only for model with displacement sensor (Option)

ITEM	WELD STOP						WELD TIME						DISPLACEMENT **					
	INPUT			CONDITION			WE1			WE2			COMP			DELAY		
	WE1	WE2	WE1	WE1	WE2	WE2	HI	LO	HI	LO	HI	LO	HI	LO	HI	LO	HI	LO
SCH #																		
SCH19																		
SCH20																		
SCH21																		
SCH22																		
SCH23																		
SCH24																		
SCH25																		
SCH26																		
SCH27																		
SCH28																		
SCH29																		
SCH30																		
SCH31																		
SCH32																		
SCH33																		
SCH34																		
SCH35																		
SCH36																		

** Only for model with displacement sensor (Option)

ITEM	WELD STOP				WELD TIME				DISPLACEMENT **			
	INPUT			CONDITION		WE1		WE2		COMP		WORK DETECT
	WE1	WE2	WE1	WE2	WE1	HI	LO	HI	LO	HI	LO	
SCH #												
SCH37												
SCH38												
SCH39												
SCH40												
SCH41												
SCH42												
SCH43												
SCH44												
SCH45												
SCH46												
SCH47												
SCH48												
SCH49												
SCH50												
SCH51												
SCH52												
SCH53												
SCH54												

** Only for model with displacement sensor (Option)

ITEM	WELD STOP				WELD TIME				DISPLACEMENT **					
	INPUT			CONDITION		WE1		WE2		COMP		DELAY TIME	WORK DETECT	
	WE1	WE2	WE1	WE2	HI	LO	HI	LO	HI	LO	HI		LO	
SCH #														
SCH55														
SCH56														
SCH57														
SCH58														
SCH59														
SCH60														
SCH61														
SCH62														
SCH63														
SCH64														
SCH65														
SCH66														
SCH67														
SCH68														
SCH69														
SCH70														
SCH71														
SCH72														

** Only for model with displacement sensor (Option)

ITEM	WELD STOP						WELD TIME						DISPLACEMENT **					
	INPUT			CONDITION			WE1		LO		HI		WE2		LO		HI	
	WE1	WE2	WE1	WE1	WE2	WE2	HI	LO	LO	HI	HI	LO	HI	LO	LO	HI	HI	LO
SCH #																		
SCH73																		
SCH74																		
SCH75																		
SCH76																		
SCH77																		
SCH78																		
SCH79																		
SCH80																		
SCH81																		
SCH82																		
SCH83																		
SCH84																		
SCH85																		
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SCH87																		
SCH88																		
SCH89																		
SCH90																		

** Only for model with displacement sensor (Option)

ITEM	WELD STOP				WELD TIME				DISPLACEMENT **						
	INPUT		CONDITION		WE1		WE2		COMP			DELAY TIME		WORK DETECT	
	WE1	WE2	WE1	WE2	HI	LO	HI	LO	HI	LO	LO	TIME	HI	LO	
SCH #															
SCH91															
SCH92															
SCH93															
SCH94															
SCH95															
SCH96															
SCH97															
SCH98															
SCH99															
SCH100															
SCH101															
SCH102															
SCH103															
SCH104															
SCH105															
SCH106															
SCH107															
SCH108															

** Only for model with displacement sensor (Option)

ITEM	WELD STOP						WELD TIME						DISPLACEMENT **					
	INPUT			CONDITION			WE1			WE2			COMP			DELAY TIME		
	WE1	WE2	WE1	WE2	WE1	WE2	HI	LO	HI	LO	HI	LO	HI	LO	HI	LO	HI	LO
SCH109																		
SCH110																		
SCH111																		
SCH112																		
SCH113																		
SCH114																		
SCH115																		
SCH116																		
SCH117																		
SCH118																		
SCH119																		
SCH120																		
SCH121																		
SCH122																		
SCH123																		
SCH124																		
SCH125																		
SCH126																		
SCH127																		

(5) STATUS Setting**STATUS**

WELD TRANS	
WELD TIME	
START SIG.TIME	
START SIG.HOLD	
SCHEDULE#	
END SIG.TIME	
MONITOR MODE	
CALCULATION MODE	
TRANS SCAN MODE	
COMM CONTROL	
COMM MODE	
COMM UNIT#	
COMM SPEED	
NO CURR MONITOR START	
PW MONITOR START	
NG OUTPUT	
READY OUTPUT	

ERROR SETTING

E08 :NO CURRENT	
E09 :NO VOLTAGE	
E16/E17:OUT LIMIT OF CURR	
E18/E19:OUT LIMIT OF VOLT	
E20/E21:OUT LIMIT OF POWER	
E22/E23:OUT LIMIT OF RESIST	
E26/E27:OUT LIMIT OF DISPLC	
E28/E29:OUT LIMIT OF TIME	
E15/E30:WORK CHECK ERROR	

MISC

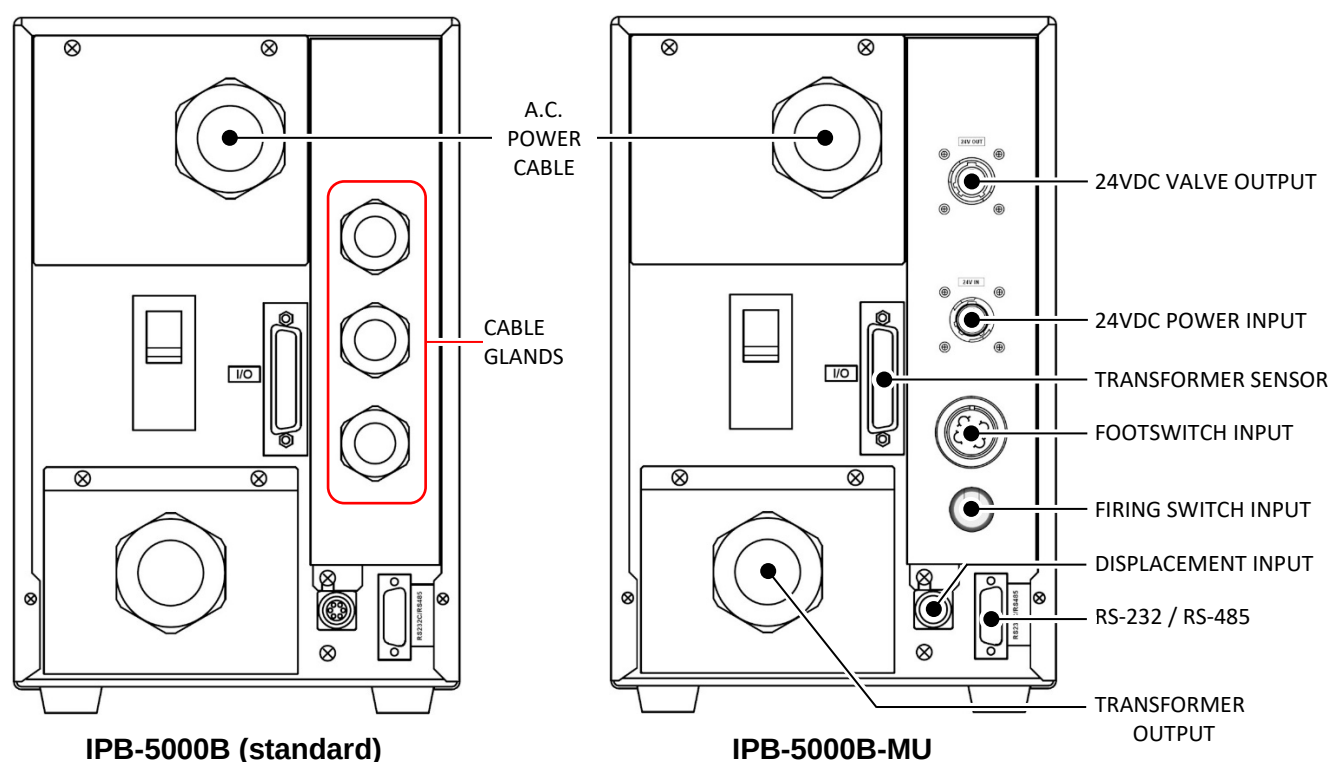
TRANS USER1	
DISPLACEMENT SENSOR STEP	
COUNTER	
PRESET (TOTAL/GOOD)	
PRESET (WORK)	
PRESET (WELD)	

IPB-5000B-MU Addendum

This addendum is designed to be a supplement to the IPB-5000B Operator Manual and it addresses the difference between the standard Amada Weld Tech IPB-5000B Inverter Power Supply and the Amada Weld Tech IPB-5000B-MU Inverter Power Supply. The Amada Weld Tech IPB-5000B Power Supplies with the -MU suffix (i.e. IPB-5000B-MU) include an I/O Connector Panel.

The standard IPB-5000B includes cable glands for all I/O connections. The cable glands essentially “hard-wire” the power supply into position, making it harder to relocate or change equipment. The added -MU Accessory Box includes panel mounted connectors, which allows for quick connect/disconnect of external equipment and easy relocation of equipment.

The physical difference between the IPB-5000B and IPB-5000B-MU rear panel is shown below:

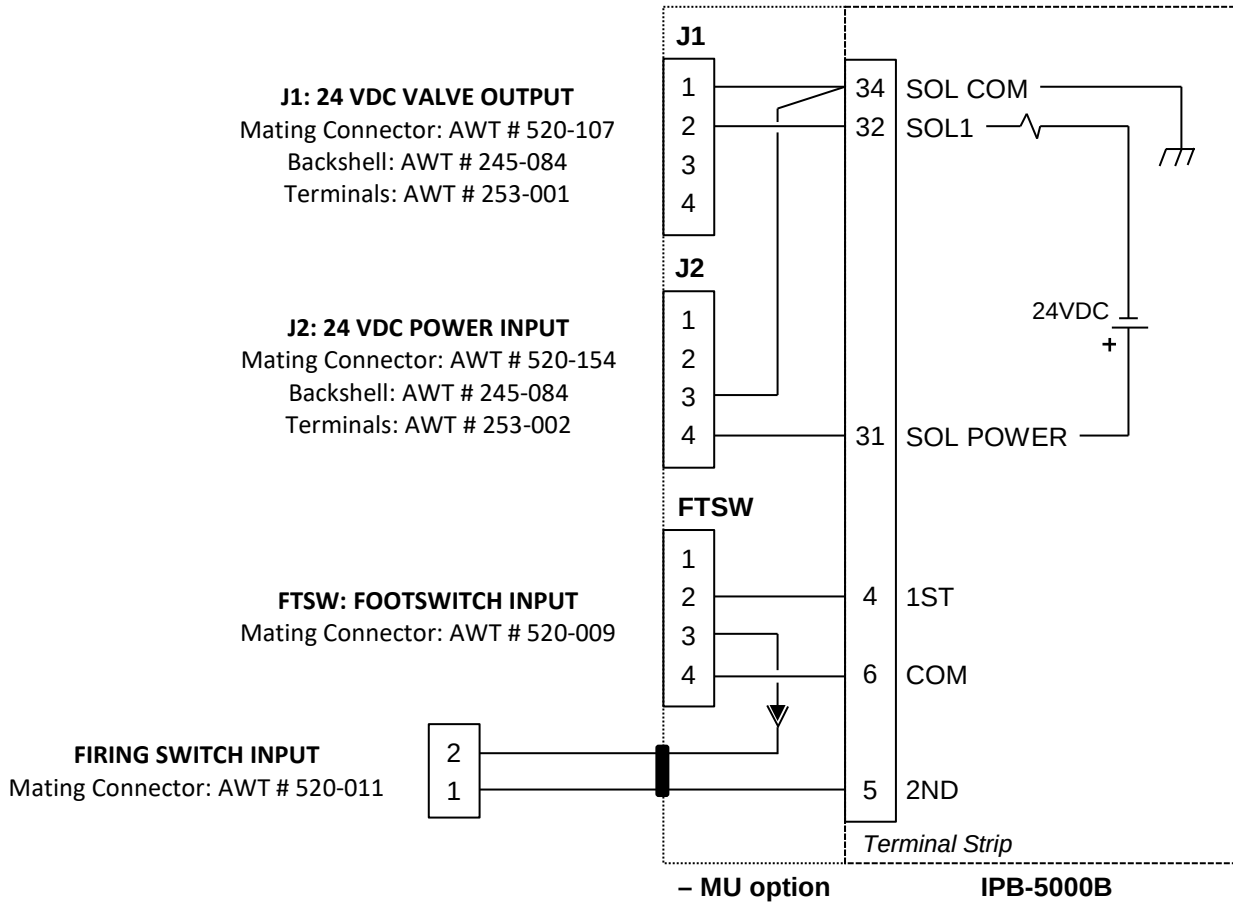


In the standard IPB-5000B, the end user must terminate all I/O connections to the terminal block underneath the I/O cover. These terminated cables are then routed through and secured by the cable glands (see above). Refer to *Chapters 5 and 8* in this manual for information on the Installation and External I/O connections respectively for information on interfacing with the IPB-5000B Inverter Power Supply.

Connection to the IPB-5000B-MU is the same as a standard IPB-5000B, except that some of the connection points will terminate on the panel mount connectors. All panel mount connectors terminate on the terminal block underneath the I/O cover. Below is a simple schematic of the -MU - I/O Accessory Box, list of mating connectors, and a pin-out detail for each panel connector. Refer to Chapter 8 in this manual for information on the function and operation of the external I/O connections.

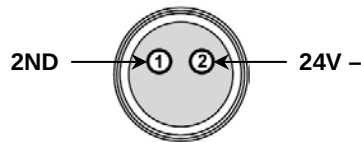
-MU – I/O Accessory Box Schematic + Mating Connectors

The terminal strip shown in the schematic below is located behind the –MU –I/O Accessory Box. Refer to *Chapter 8. External Interface* for more information on the available signals on this terminal strip.

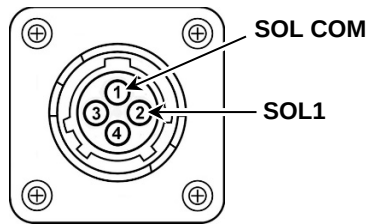


PANEL CONNECTOR DETAIL

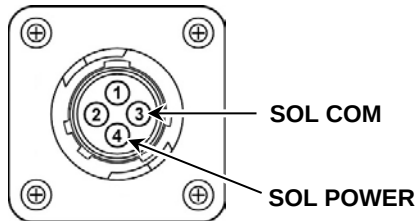
Firing Switch Cable



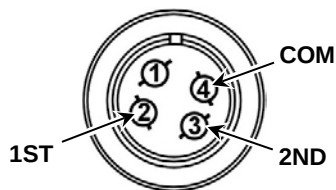
PIN #	SIGNAL NAME	MAX VOLTAGE	MAX CURRENT	I/O	COMMENTS
1	2ND	24 VDC	5 mA	I	Same as Terminal Block # 5
2	24V-	---	---	---	Connects to Footswitch Connector

J1: 24VDC Valve Output Connector

PIN #	SIGNAL NAME	MAX VOLTAGE	MAX CURRENT	I/O	COMMENTS
1	SOL COM	24 VDC	0.5A	O	Same as Terminal Block # 34
2	SOL1	24 VDC	0.5A	O	Same as Terminal Block # 32
3	Not Used				
4	Not Used				

J2: 24VDC Power Input Connector

PIN #	SIGNAL NAME	MAX VOLTAGE	MAX CURRENT	I/O	COMMENTS
1	Not Used				
2	Not Used				
3	SOL COM	24 VDC	0.5A	O	Same as Terminal Block # 34
4	SOL POWER	24 VDC	0.5A	O	Same as Terminal Block # 31

FTSW: Foot Switch Connector

PIN #	SIGNAL NAME	MAX VOLTAGE	MAX CURRENT	I/O	COMMENTS
1	Not Used				
2	1ST	24 VDC	5 mA	I	Same as Terminal Block # 4
3	2ND	24 VDC	5 mA	I	Connects to Firing Switch Cable
4	COM	---	---	---	Same as Terminal Block # 6