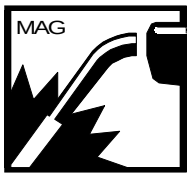
MANUAL NO:P10322

OWNER'S MANUAL

FOR



DIGITAL INVERTER DM350

MODEL: DM-350 P10322

INVERTER CONTROLLED WELDING POWER SOURCE

DO NOT DESTROY

IMPORTANT: Read and understand the entire contents of this manual, with special emphasis on the safety material throughout the manual, before installing, operating, or maintaining this equipment. This equipment and this manual are for use only by persons trained and experienced in the safety operation of welding equipment. Do not allow untrained persons to install, operate or maintain this equipment. Contact your distributor if you do not fully understand this manual.

DAIHEN Corporation WELDING PRODUCTS DIVISION

December 18, 2003

Upon contact, advise MODEL and MANUAL NO.

TABLE OF CONTENTS

1. SAFETY INFORMATION

The following safety alert symbols and signal words are used throughout this manual to identify various hazards and special instructions.

⚠ **WARNING**	**WARNING gives information regarding possible personal injury or loss of life.**

⚠ **CAUTION**	**CAUTION refers to minor personal injury or possible equipment damage.**

2. ARC WELDING SAFETY PRECAUTIONS

⚠ **WARNING**
ARC WELDING can be hazardous.
◆ **PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. Be sure to:** **・Keep children away.** **・Keep pacemaker wearers away until consulting a doctor.**
◆ **Read and understand the summarized safety information given below and the original principal information that will be found in the PRINCIPAL SAFETY STANDARDS.**
◆ **Have only trained and experienced persons perform installation, operation, and maintenance of this equipment.**
◆ **Use only well maintained equipment. Repair or replace damaged parts at once.**
ARC WELDING is safe when precautions are taken.

2. ARC WELDING SAFETY PRECAUTIONS (continued)

ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuits are electrically live whenever the output is on. The power line and internal circuits of this equipment are also live when the line disconnect switch is on. When arc welding all metal components in the torch and work circuits are electrically live.

1. **Do not touch live electrical parts.**
2. **Wear dry insulating gloves and other body protection that are free of holes.**
3. **Insulate yourself from work and ground using dry insulating mats or covers.**
4. **Be sure to disconnect the line disconnect switch before installing, changing torch parts or maintaining this equipment.**
5. **Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.**
6. **Keep all panels and covers of this equipment securely in place.**
7. **Do not use worn, damaged, undersized, or poorly spliced cables.**
8. **Do not touch electrode and any metal object if POWER switch is ON.**
9. **Do not wrap cables around your body.**
10. **Turn off POWER switch when not in use.**

ARC RAYS can burn eyes and skin: FLYING SPARKS AND HOT METAL can cause injury. NOISE can damage hearing.

Arc rays from the welding process produce intense heat and strong ultraviolet rays that can burn eyes and skin.
Noise from some arc welding can damage hearing.

1. **Wear face shield with a proper shade of filter (See ANSI Z 49.1 listed in PRINCIPAL SAFETY STANDARDS) to protect your face and eyes when welding or watching a welder work.**
2. **Wear approved safety goggles. Side shields recommended.**
3. **Use protective screens or barriers to protect others from flash and glare: warn others not to look at the arc.**
4. **Wear protective clothing made from durable, flame-resistant material (wool and leather) and foot protection.**
5. **Use approved earplugs or earmuffs if noise level is high.**
   Chipping and grinding can cause flying metal. As welds cool, they can throw off slag.
6. **Wear approved face shield or safety goggles. Side shields recommended.**
7. **Wear proper body protection to protect skin**

2. ARC WELDING SAFETY PRECAUTIONS (continued)

WELDING can cause fire and explosion.

Sparks and spatter fly off from the welding arc. The flying sparks and hot metal, spatter, hot base metal, and hot equipment can cause fire and explosion. Accidental contact of electrode or welding wire to metal object can cause sparks, overheating, or fire.

1. **Protect yourself and others from flying sparks and hot metals.**
2. **Do not weld where flying sparks can strike flammable material.**
3. **Remove all flammables within 10m of the welding arc. If this is not possible, tightly, cover them with approved covers.**
4. **Be alert that welding sparks and hot metals from welding can easily pass through cracks and openings into adjacent areas.**
5. **Watch for fire, and keep a fire extinguisher nearby.**
6. **Be aware that welding on a ceiling, floor, bulkhead, or partition can ignite a hidden fire.**
7. **Do not weld on closed containers such as tanks or drums.**
8. **Connect base metal side cable as close to the welding area as possible to prevent the welding current from traveling along unknown paths and causing electric shock and fire hazards.**
9. **Remove stick electrode from holder or cut off welding wire at contact tip when not in use.**
10. **Do not use the welding power source for other than arc welding.**
11. **Wear oil-free protective garments such as leather gloves, a heavy shirt, cuffless trousers, boots, and a cap.**
12. **A loose cable connection can cause sparks and excessive heating.**
13. **Tighten all cable connections.**

FUMES AND GASES can be hazardous to your health.

Arc welding produce fumes and gases. Breathing these fumes and gases can be hazardous to your health.

1. **Keep your head out of the fumes. Do not breathe the fumes.**
2. **Ventilate the area and / or use exhaust at the arc to remove welding fumes and gases.**
3. **If ventilation is poor, use an approved air-supplied respirator.**
4. **Read the Material Safety Data Sheets (MSDS) and the manufacturer's instructions on metals, consumables, coatings, and cleaners.**
5. **Do not weld or cut in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.**
6. **Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Shielding gases used for welding can displace air causing injury or death. Be sure the breathing air is safe.**

2. ARC WELDING SAFETY PRECAUTIONS (continued)

CYLINDER can explode if damaged.

A shielding gas cylinder contains high-pressure gas. If damaged, a cylinder can explode. Since gas cylinders are normally part of the welding process, be sure to treat them carefully.

1. **Use only correct shielding gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them in good condition.**
2. **Protect compressed gas cylinders from excessive heat, mechanical shock, and arcs.**
3. **Keep the cylinder upright and securely chained to a stationary support or a rack to prevent falling or tipping.**
4. **Keep cylinders away from any welding or other electrical circuit.**
5. **Never touch cylinder with welding electrode.**
6. **Read and follow instructions on compressed gas cylinders, associated equipment, and the CGA publication P-1 listed in PRINCIPAL SAFETY STANDARDS.**
7. **Turn face away from valve outlet when opening cylinder valve.**
8. **Keep protective cap in place over valve except when gas cylinder is in use or connected for use.**

Rotating parts may cause injuries. Be sure to observe the following.

If hands, fingers, hair or clothes are put near the fan's rotating parts or wire feeder's feed roll, injuries may occur.

1. **Do not use this equipment if the case and the cover are removed.**
2. **When the case is removed for maintenance/inspection and repair, certified or experienced operators must perform the work. Erect a fence, etc. around this equipment to keep others away from it.**
3. **Do not put hands, fingers, hair or clothes near the rotating fans or wire feed roll.**

2. ARC WELDING SAFETY PRECAUTIONS (continued)

ARC WELDING work areas are potentially hazardous.

FALLING or MOVING machine can cause serious injury.

- **When hanging the welding power source by a crane, do not use the carrying handle.**
- **Put the welding power source and wire feeder solidly on a flat surface.**
- **Do not pull the welding power source across a floor laid with cables and hoses.**
- **Do not put wire feeder on the welding power source.**
- **Do not put the welding power source and wire feeder where they will pit or fall.**

WELDING WIRE can cause puncture wounds.

- **Do not press gun trigger until instructed to do so.**
- **Do not point gun toward any part of the body, other people, or any metal when threading welding wire.**

PRINCIPAL SAFETY STANDARDS

Arc welding equipment – Installation and use, Technical Specification
IEC 62081, from International Electrotechnical Commission

Arc welding equipment Part 1: Welding power sources IEC 60974-1, from International Electrotechnical Commission

Safety in Welding and Cutting, ANSI Standard Z49.1, from American Welding Society.

Safety and Health Standards, OSHA 29 CFR 1910, from Superintendent of Documents, U.S. Government Printing Office.

Recommended Practices for Plasma Arc Cutting, American Welding Society Standard AWS C5.2, from American Welding Society.

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers That Have Held Hazardous Substances, American Welding Society Standard AWS F4.1, from American Welding Society.

National Electrical Code, NFPA Standard 70, from National Fire Protection Association.

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, from Compressed Gas Association.

Code for Safety in Welding and Cutting, CSA Standard W117.2, from Canadian Standards Association, Standards Sales.

Safe Practices For Occupation And Educational Eye And Face Protection, ANSI Standard Z87.1, from American National Standards Institute.

Cutting And Welding Processes, NFPA Standard 51B, from National Fire Protection Association.

3. GENERAL NOTICE OF OPERATION

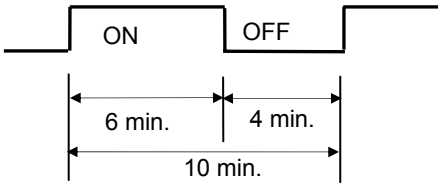
3.1 Rated Duty Cycle

⚠ CAUTION
● **Use this welding power source at or under the rated duty cycle. Exceeding the rated duty cycle limitation may result in damage to the welding machine.**

- The rated duty cycle of the welding power source is the following:

  - DM350: 350A, 60%

- The duty cycle of 60% means the way the machine is rested for 4 minutes after 6 minutes of continuous welding at the rated current.

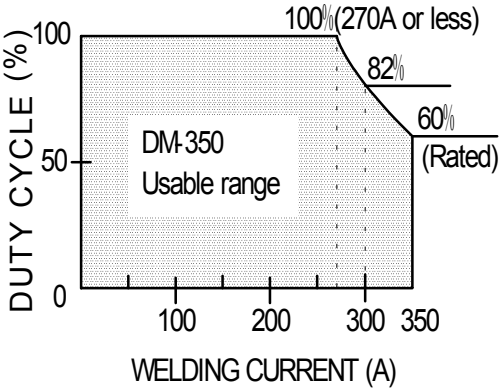


Operation cycle of 60% duty cycle

- Failure to observe duty cycle limitations may cause an excess of the tolerance of the temperature inside the welding machine. This may contribute to premature welding machine failure or product damage.

- The figure shown right indicates the relation between welding current and duty cycle. Use the welding machine within its usable range, following the duty cycle for the welding current.

- The duty cycle of the welding power source is also limited by the duty cycles of accessories combined with such as welding torches. Use the welding machine within the lowest rated duty cycle of the accessories.



3.2 Applicable Welding Process and Wire Diameter

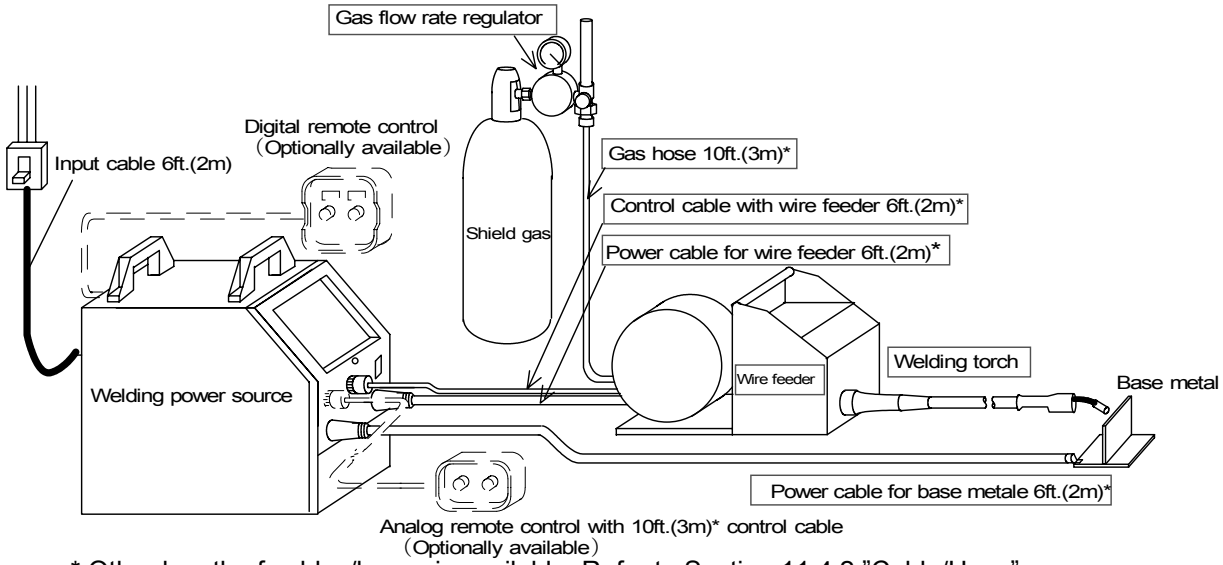
Applicable wire	Wire dia. In.(mm)	Applicable gas
MILD STEEL SOLID	0.035 (0.9)	CO_2 or MAG (80% Ar, 20% CO_2)
	0.040 (1.0)	
	0.045 (1.2)	
MILD STEEL CORED	0.045 (1.2)	MAG (80% Ar, 20% CO_2)
	0.052 (1.4)	
STAINLESS STEEL CORED	0.045 (1.2)	
STAINLESS STEEL SOLID	0.035 (0.9)	MIG (90%He, 7.5%Ar, 2.5%O_2)
	0.040 (1.0)	
	0.045 (1.2)	
SOFT ALUMINUM	3/64 (1.2)	Ar
HARD ALUMINUM	3/64 (1.2)	Ar

NOTE: Use of mixture gas other than the mixture ratio of the gas mentioned above may not properly adjust welding voltage at SYNERGIC control, etc.

4. STANDARD COMPOSITION AND ACCESSORIES

4.1 Standard Composition

- **This welding power source is not included the accessories indicated in the boxes. Preparation of the Accessories for welding.**



* Other length of cables/hoses is available. Refer to Section 11.4.2,"Cable/Hose".

- Input cable and grounding cable
  For a switch box, the 6ft. (2m) input and grounding cables are from the back panel of welding power source.

Input cable	AWG9 (5.5mm^2) with 2/5 in. Φ (10mm) terminal	x 3
Grounding cable	AWG9 (5.5mm^2) with 2/5 in. Φ (10mm) terminal	x 1

4.2 Accessory

Make sure you have the item below before you start using the welding power source.

Description	Specification	Q'ty	Part number	Remarks
Power cable connector	DIX SK 70	2	4734-016	For the power cable to welding power source
Dust filter *	109-1000M3	2	4519-031	For the fan on the rear panel of welding power source

NOTE:

- When using the dust filter, perform 50% or less duty-cycle operation (without clogging). Otherwise, the welding machine may be damaged. Refer to Section 3.1, "Rated Duty Cycle".

4.3 Preparation of consumables for welding

(1) Shield Gas

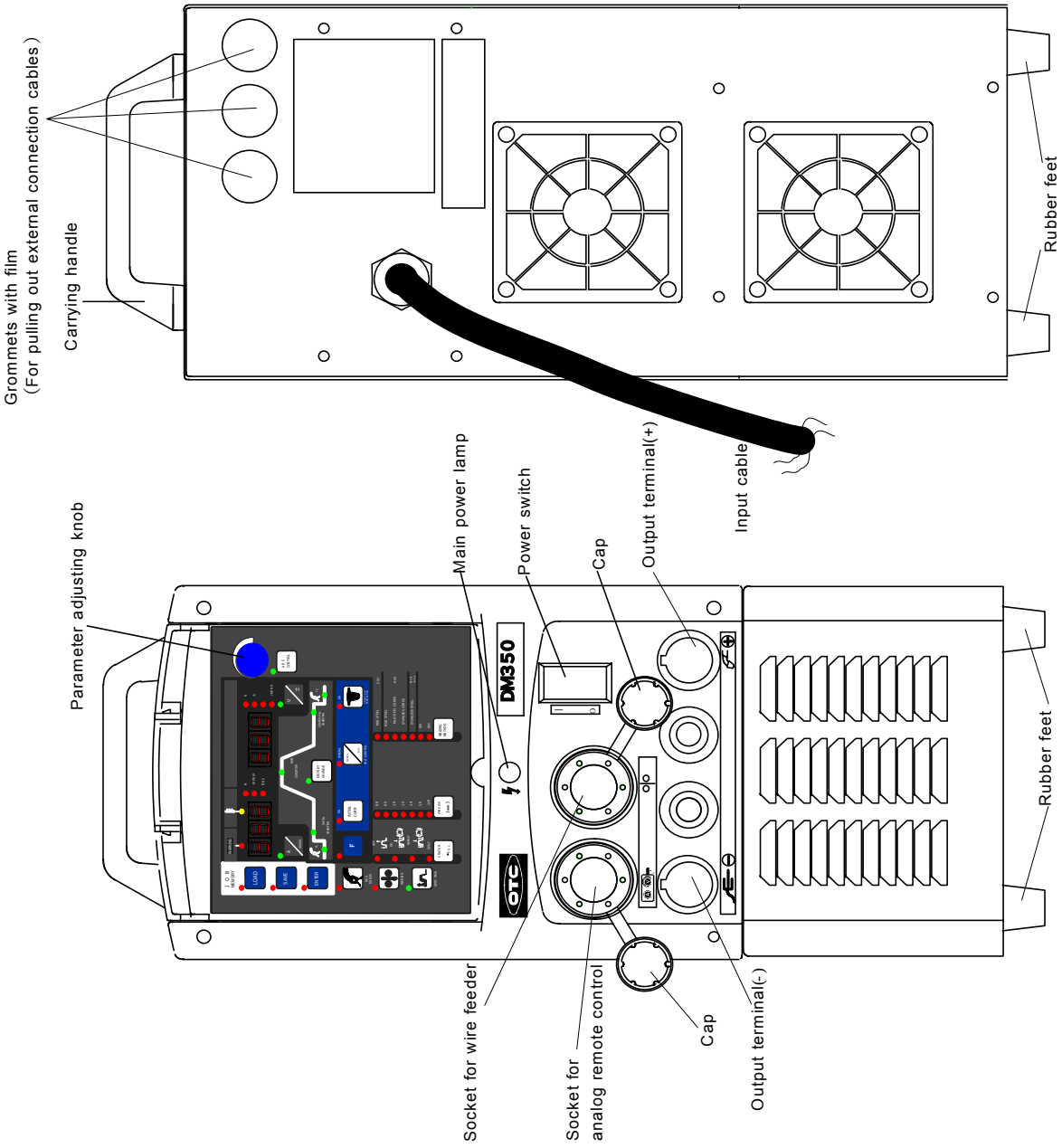
Use a suitable gas for welding method.

- Carbon dioxide gas (CO_2 gas)
  For welding (purity: 99.9% or more, moisture content: 0.002% or less)
- MAG gas
  80% argon (Ar) + 20% carbon dioxide gas (CO_2 gas)
- MIG gas for stainless steel
  90% helium (He) + 7.5% argon (Ar) + 2.5% oxygen (O_2)
- MIG gas for Aluminum
  Pure argon (Ar)

(2) Welding Wire

5. FUNCTION OF EQUIPMENT

5.1 Welding Power Source



5. FUNCTION OF EQUIPMENT (continued)

5.2 Gas Flow Rate Regulator

⚠ WARNING

- **Use a proper gas regulator for type of gas.**
- **Argon gas regulator should be used only for argon gas (Ar). Never use any other high pressure gas.**
- **Never attempt to disassemble the gas flow rate regulator and to touch the pressure regulation system and the pressure regulation screws, which may cause serious physical injury. Refer to an operation manual that came with the gas flow rate regulator for details.**

6. NECESSARY POWER SOURCE EQUIPMENT

6.1 Welding Power Source Equipment (for commercial use)

⚠ WARNING
● **When the welding machine is used in such a humid environment as construction site, on the steel plate, or on steel structure, install a leakage breaker.**

⚠ CAUTION
● **Be sure to install a switch with fuse or a circuit breaker (for motor) to the input sides of each welding machine.**

Capacity of Necessary Power Source Utility

MODEL	DIGITAL INVERTER DM-350
Power supply voltage	208/230/460V, Three phase 230/460V, Single phase * The welding power source links the primary voltage automatically.
Tolerance range of fluctuation of power supply voltage	187 - 506V, Three phases 207 - 506V, Single phase
Installed capacity	20kVA or more
Capacity of switch/circuit breaker	50 A

6.2 Precautions for Use of the Engine Generator

⚠ CAUTION
● **Use the auxiliary power of engine welder whose voltage waveform has been improved. Some of the engine welders have poor electricity, which may cause product damage. Contact an engine welder manufacturer for improvement of waveform.**

To prevent the engine generator or auxiliary power from being damaged, follow the instructions below.

- Set the output voltage of the engine generator to the voltage range between 230 and 240V at no-load welding operation. Setting to extremely high output voltage may result in product damage.
- Use the engine generator with a damper winding of which capacity is more than twice as much as the rated input of the welding machine. Generally, the recovery time of the engine generator's voltage for load change is slower than that of the commercial input power source, and if the engine generator does not have sufficient capacity, this may result in abnormal decrease in output current with arc loss during arc start etc. Ask an engine generator manufacturer for a damper winding.
- Do not combine more than two welding machines with an engine generator. The affect of each welding machine may cause easy loss of arc.

7. TRANSPORT AND INSTALLATION

7.1 Transport

⚠ WARNING	
Follow the instructions below to avoid trouble and product damage when carrying the welding machine.	
	● **Do not touch the charging parts inside or outside the welding machine.** ● **Be sure to disconnect the line disconnect switch when carrying the welding machine.**
	● **When hanging the welding power source by a crane, do not use the carrying handle.**

7.2 Installation

⚠ WARNING	
When installing the welding machine, follow the instructions below to avoid a fire caused by welding and physical damages by fume gas.	
	● **Do not place the welding machine near combustible materials and flammable gas.** ● **Remove combustible materials to prevent dross coming into contact with combustible objects. If that not possible, cover them with noncombustible covers.**
	● **To avoid gas poisoning and danger of suffocation, wear a gas mask or adequately ventilate when the welding machine is used in the place regulated by a local law.** ● **To prevent disorder or poisoning caused by fume, wear a gas mask or weld at a partial exhaust facility approved by the local regulation.** ● **Adequately ventilate or wear a gas mask when using the welding machine in a tank, a boiler, a hold of a ship, because heavier gas such as carbon dioxide or argon gases are drifting there.** ● **When using the welding machine at a narrow space, comply with a trained supervisor's directions. And be sure to wear a gas mask.** ● **Do not operate the welding machine near the place where degreasing, cleansing, and spraying are performed. Otherwise, poisonous gas may be generated.** ● **Be sure to wear a gas mask or adequately ventilate when welding a coating steel plate. (Poisonous gas and fume may be generated.)**

7. TRANSPORT AND INSTALLATION (continued)

7.2 Installation (continued)

⚠ CAUTION

To prevent electromagnetic troubles, read the following.
Also, if electromagnetic troubles occur, check the following again.

Since large current abruptly flows inside the welding machine during welding, other machines near the welding power source may be troubled due to electromagnetic noise

- **Do not ground the welding power source commonly with other machines.**
- **Close and fix all doors and covers of the welding machine.**
- **Do not use an unnecessarily long cable.**
- **Place a base metal cable and a torch side cable as closely as possible.**

In the event of electromagnetic trouble, follow the instructions below.

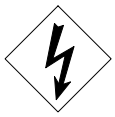
- **Change the installation place of the welding machine.**
- **Keep the machines which may be affected away as far from the welding machine, cables and welding site as possible.**
- **Add a noise filter to the input cables.**
- **Mount an input cable in the grounded metallic conduit.**
- **Shield the whole welding places from electromagnetic trouble. If electromagnetic troubles are still not solved after following the above instructions, consult your nearest DAIHEN dealer.**

⚠ CAUTION

Follow the instructions below when selecting an installation place of the welding power source.

- **Do not install the welding power source in the place subject to direct sunlight and rain.**
- **Place the welding machine on a strong and stable surface.**
- **Install the welding machine in the place where the ambient temperature is between -10 ˚C and +40 ˚C (+14 ˚F and +104 ˚F).**
- **Do not install the welding machine in the place where metal material such as spatter enters the welding power source.**
- **Keep the install distance of 30 cm between the welding power source and the wall or other welding power.**
- **Install a wind shield to protect arc from wind.**
- **Fix the gas cylinder to the stand only for gas cylinder.**

8. CONNECTION PROCEDURE AND GROUND FOR SAFETY USE

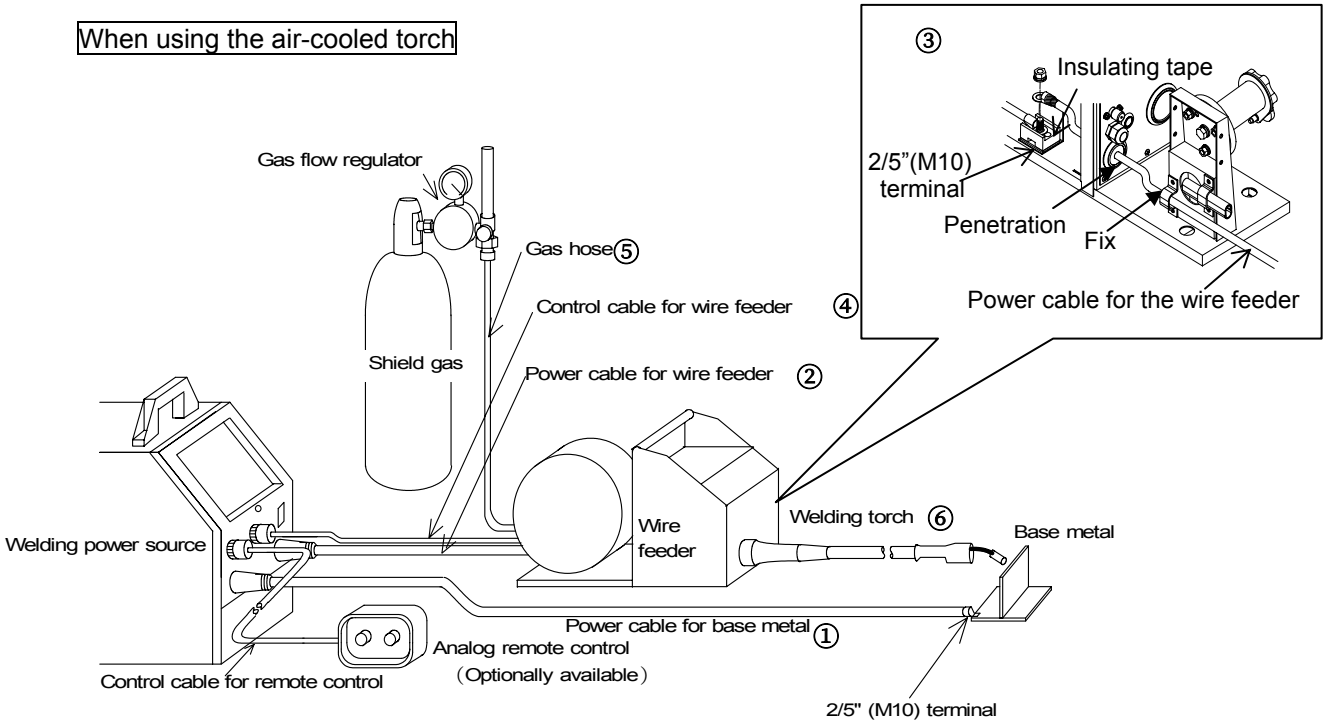
⚠ WARNING	
	**Follow the instructions below to avoid electric shock.**

* **Do not touch the charging parts, as this will result in fatal shock and severe burn.**

- **Do not touch the charging parts of the welding machine.**
- **Have a qualified electric engineer ground the case of the welding power source and the base metal or jig electrically connected, following a local low.**
- **With the line disconnect switch inside the switch box all turned off, ground and connect the welding machine.**
- **Do not use a cable with lack of capacity or a cable seriously damaged.**
- **Tighten and insulate the connections of cables.**
- **Surely attach the cover of the welding machine after connection of the cables.**

8.1 Connecting of the Welding Power Source

When using the air-cooled torch



8. CONNECTION PROCEDURE AND GROUND FOR SAFETY USE (continued)

Follow the steps below to attach the cables to the output connectors of the welding power source referring to the illustrations of “Connection of the Welding Power Source“ on the previous page.

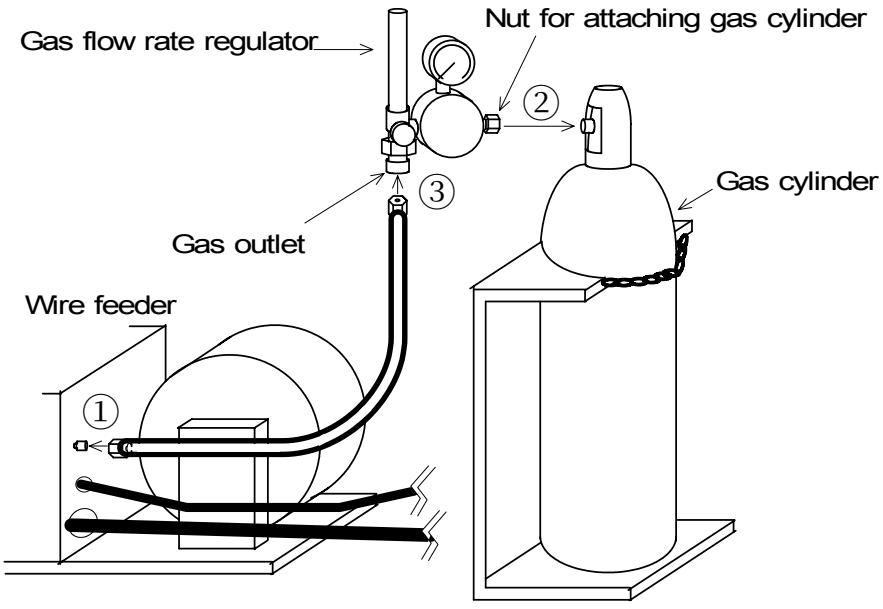
1. Connect the power cable for base metal between the “base metal ⊖“ terminal and the base metal.
2. Attach the power cable for wire feeder to the “torch ⊕“ output terminal.
3. Insert the control cable for wire feeder into the socket for wire feeder.
4. Attach the gas hose to the gas outlet on the wire feeder.
5. Connect the welding torch to the wire feeder.
6. Connect the hoses for water supply and for condensed water to the water cooler. (When using a water-cooled torch.)

8.2 Connecting of the Gas Hose

⚠ WARNING	
	● **You may suffer from danger of suffocation caused by lack of oxygen when shield gas keeps drifting in a closed place. Be sure to turn off the shield gas at the main when the welding power source is not in use.**

⚠ CAUTION
● **Be sure to connect the gas hose after fixing gas cylinder to the stand, as physical injuries may result from falling down of it.**
● **Attach a proper gas flow regulator to a gas cylinder. Failure to observe the demand may result in physical injuries. The gas flow regulator for high pressure gas must be used.**

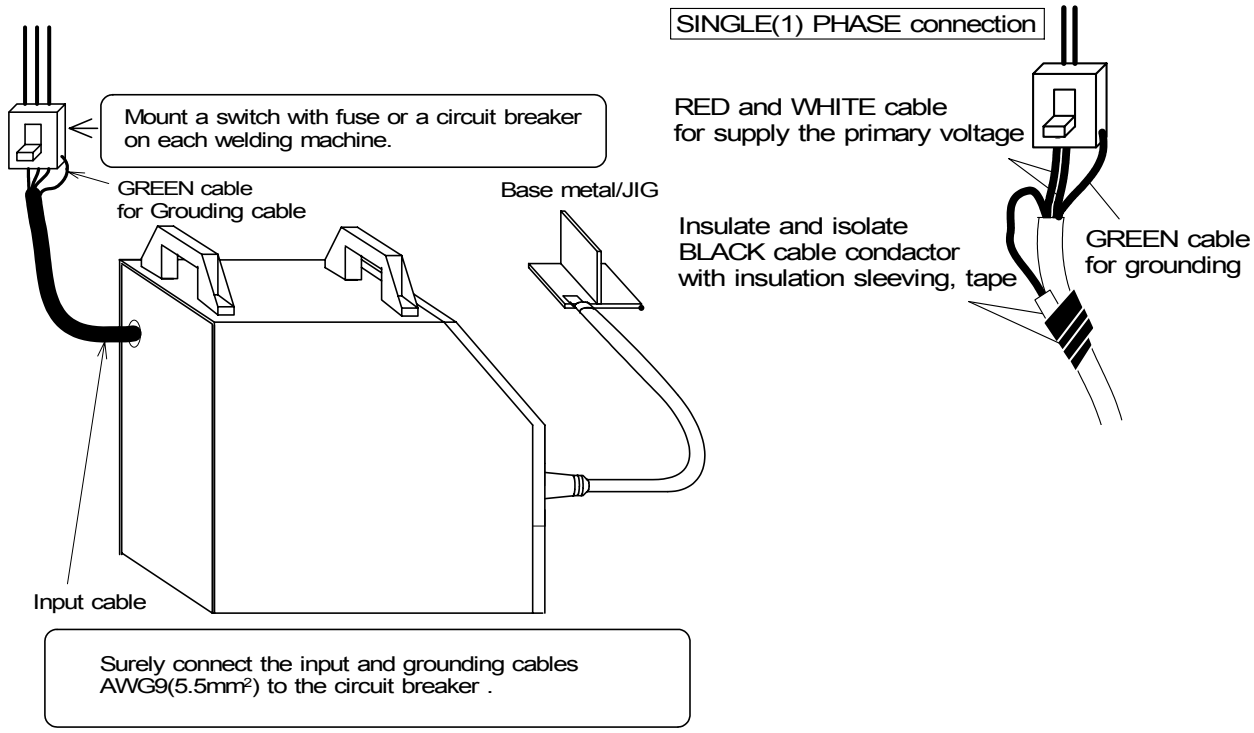
1. Securely attach the gas hose to the gas inlet located on the rear side of the wire feeder with a monkey wrench, etc.
2. Fix the nut for attaching the gas cylinder with a monkey wrench, etc.
3. Securely attach the gas hose to the gas outlet with a monkey wrench, etc.



8. CONNECTION PROCEDURE AND GROUND FOR SAFETY USE (continued)

⚠ WARNING
Follow the instructions below to avoid electric shock.
* **Touching the charging parts may result in fatal electric shock and severe burn.** ● **Do not touch the charging parts of the welding machine.** ● **Have a qualified electric engineer ground the case of the welding power source and the base metal or jig electrically connected in accordance with a local low.** ● **With the line disconnect switch in the switch box all touched off, ground and connect the welding machine.**

⚠ CAUTION
● **Be sure to install a switch with fuse or a circuit breaker (for motor) to the input sides of each welding machine.**



⚠ CAUTION
Be sure to ground the case of the welding power source. **Use a grounding cable of which thickness is more than AWG9 (5.5mm^2).**
● **If the welding power source which is not grounded is used, voltage will be generated in the case through the capacitor between the welding power source input circuit and the case or floating capacity (electrostatic capacity naturally generated between the input conductor and the case metal). If you touch the case or the base metal, you may suffer from electric shock. Be sure to ground the case of the welding power source or jig.**

9. WELDING PREPERATION

9.1 Preparing the Protective Equipment

	**To protect you from gas generated from welding, fume, and lack of oxygen, wear protective equipment**

- **To avoid gas poisoning and danger of suffocation, wear a gas mask or adequately ventilate when the welding machine is used in the place regulated by a local law.**
- **To prevent disorder or poisoning caused by fume, wear a gas mask or weld at a partial exhaust facility approved by the local regulation.**
- **Adequately ventilate or wear a gas mask when using the welding machine in a tank, a boiler, a hold of a ship, because heavier gas such as carbon dioxide or argon gases are drifting.**
- **When using the welding machine at a narrow space, comply with a trained supervisor's directions. And be sure to wear a gas mask.**
- **Do not operate the welding machine near the places where degreasing, cleansing, and spraying are performed. Otherwise, poisonous gas may be generated.**
- **Be sure to wear a gas mask or adequately ventilate when welding a coating steel plate. (Poisonous gas and fume may be generated.)**

NOTE: Install a windshield to protect arc from wind when using an electric fan for ventilation or when welding outdoors. Failure to observe the demand may result in poor welding.

⚠ CAUTION	
	**Use the protective equipment to protect you and other workers from arc rays, spattering dross, and noise from welding operation.**

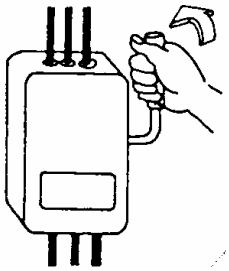
- **When performing or monitoring welding operation, wear an eye protector with a good light blocking effect or face shield.**
- **Wear protective glasses to protect your eyes from the spattering dross.**
- **Wear protective equipment such as protective gloves, long-sleeve clothes, leg covers, and leather apron.**
- **Install protective screens or barriers to protect the eyes of others in the work area from arc ray.**
- **Wear an ear protector when noise level is high.**

9. WELDING PREPARATION

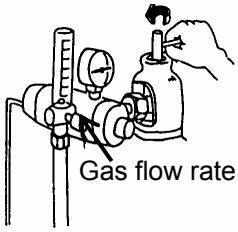
9.2 Operating the Switches and Controlling the Gas Flow Rate Regulator

⚠ CAUTION
● **Keep your face away from the outlet when turning on gas at the main of the gas cylinder, as burst of high-pressure gas may result in physical injuries.**

NOTE: Gas checking automatically stops in two minutes.



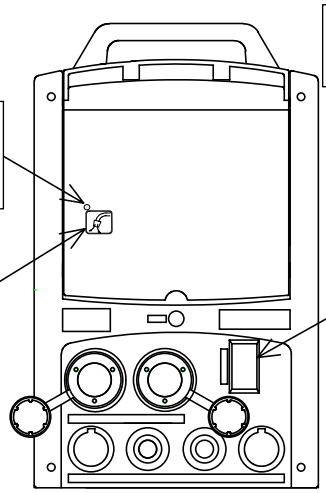
① Turn on the line disconnect switch.



Gas flow rate adjusting knob

④ Set the gas flow rate regulator to "SHUT" , then turn on gas at the main.

⑤ Set the gas flow rate adjusting knob to "OPEN" to adjust the gas flow rate.

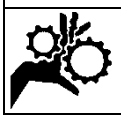


③ Press the GAS CHECK key. (The GAS CHECK lamp lights up.)

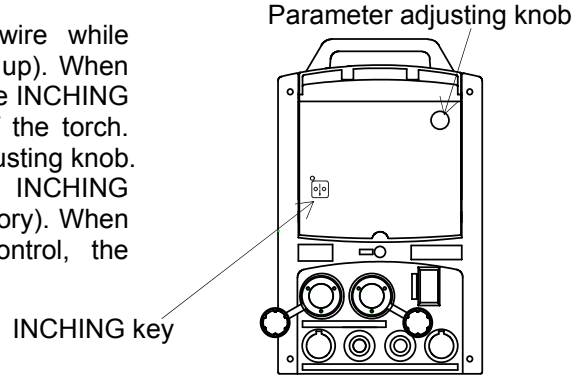
⑥ Press the GAS CHECK key again. (The GAS CHECK lamp goes out.)

② Place the power switch in the "I" (ON) position.

9.3 Inching Operation

⚠ WARNING	
	● **Do not look into the tip hole to check for the rate of wire feeding while inching.**
⚠ CAUTION	
	● **Keep away your hands, fingers, hair or clothes from the rotating parts of the feed roll, etc. to prevent you from being caught into the rotating parts while inching.**

After straightening the welding torch, feed the wire while pressing the inching button. ("INCHING" lamp lights up). When the wire appears from the end of the torch, release the INCHING key. Cut the wire at about 10 mm from the end of the torch. When adjusting wire feed rate, use the parameter adjusting knob. Inching operation can be controlled by using the INCHING button on the analog remote control (optional accessory). When controlling inching operation from the remote control, the INCHING key on the front panel does not function.



9. WELDING PREPARATION (continued)

9.4 Welding Conditions

When setting to the improper welding conditions, the following troubles will occur.

Cause	Trouble
Wire extension is too long.	・Long Arc length ・Wide bead width ・Poor shield
Wire extension is too short.	・Short arc length ・Easy generation of spatter
Arc voltage is too high.	・Long arc length ・Wide bead width ・Shallow penetration and flat bead
Arc voltage is too low.	・Stick to base metal and easy generation of spatter ・Narrow bead width ・Deep penetration and high excess metal
Welding current is too high.	・Wide bead width ・Deep penetration and high excess metal
Welding speed is too fast.	・Narrow bead width ・Shallow penetration and low excess metal

9. WELDING PREPARATION (continued)

The data in the tables below is only for reference. Please find the optimum welding conditions for weldment shape and welding position.

9.4.1 Example CO_2 Welding Conditions

(1) Example Welding Conditions of Horizontal Fillet

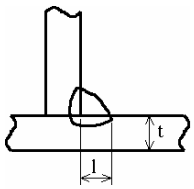


Plate thickness in.(mm)	Length of leg in. (mm)	Wire size in. (mm)	Welding current (A)	Arc voltage (V)	Welding speed IPM (cm/min.)	CO_2 gas flow rate cfh. (ℓ /min)
.045 (1.2)	.098-0.12 (2.5-3.0)	.035-.040 (0.9-1.0)	70-100	18-19	19.7-23.6 (50-60)	21.2-31.8 (10-15)
1/16 (1.6)	.098-0.12 (2.5-3.0)	.035-.045 (0.9-1.2)	90-120	18-20	19.7-23.6 (50-60)	21.2-31.8 (10-15)
5/64 (2.0)	0.12-0.14 (3.0-3.5)	.035-.045 (0.9-1.2)	100-130	19-20	19.7-23.6 (50-60)	31.8-42.4 (15-20)
3/32 (2.3)	0.12-0.14 (3.0-3.5)	.035-.045 (0.9-1.2)	120-140	19-21	19.7-23.6 (50-60)	31.8-42.4 (15-20)
1/8 (3.2)	0.12-0.16 (3.0-4.0)	.035-.045 (0.9-1.2)	130-170	19-21	17.7-21.7 (45-55)	31.8-42.4 (15-20)
3/16 (4.5)	0.16-0.18 (4.0-4.5)	.045 (1.2)	190-230	22-24	17.7-21.7 (45-55)	31.8-42.4 (15-20)
1/4 (6.0)	0.2-0.24 (5.0-6.0)	.045 (1.2)	250-280	26-29	15.7-19.7 (40-50)	31.8-42.4 (15-20)
3/8 (9.0)	0.24-0.28 (6.0-7.0)	.045 (1.2)	280-300	29-32	13.8-15.7 (35-40)	31.8-42.4 (15-20)
1/2 (12.0)	0.28-0.31 (7.0-8.0)	.045 (1.2)	300-340	32-34	11.8-13.8 (30-35)	42.4-53.0 (20-25)

(2) Example Welding Conditions of Down Fillet

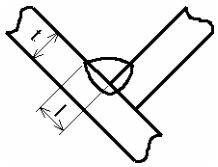
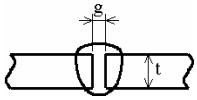


Plate thickness in.(mm)	Length of leg in. (mm)	Wire size in. (mm)	Welding current (A)	Arc voltage (V)	Welding speed IPM (cm/min.)	CO_2 gas flow rate cfh. (ℓ /min.)
.045 (1.2)	.098-0.12 (2.5-3.0)	.035, .040 (0.9, 1.0)	70-100	18-19	19.7-23.6 (50-60)	21.2-31.8 (10-15)
1/16 (1.6)	.098-0.12 (2.5-3.0)	.035-.045 (0.9-1.2)	90-120	18-20	19.7-23.6 (50-60)	21.2-31.8 (10-15)
5/64 (2.0)	0.12-0.14 (3.0-3.5)	.035-. 045 (0.9-1.2)	100-130	19-20	19.7-23.6 (50-60)	31.8-42.4 (15-20)
3/32 (2.3)	0.12-0.14 (3.0-3.5)	.035-. 045 (0.9-1.2)	120-140	19-21	19.7-23.6 (50-60)	31.8-42.4 (15-20)
1/8 (3.2)	0.12-0.16 (3.0-4.0)	.035-. 045 (0.9-1.2)	130-170	20-22	17.7-21.7 (45-55)	31.8-42.4 (15-20)
3/16 (4.5)	0.16-0.18 (4.0-4.5)	. 045 (1.2)	200-250	23-26	17.7-21.7 (45-55)	31.8-42.4 (15-20)
1/4 (6.0)	0.2-0.24 (5.0-6.0)	. 045 (1.2)	280-300	29-32	15.7-19.7 (40-50)	31.8-42.4 (15-20)
3/8 (9.0)	0.24-0.31 (6.0-8.0)	. 045 (1.2)	300-350	32-34	15.7-17.7 (40-45)	31.8-42.4 (15-20)
1/2 (12.0)	0.4-0.47 (10.0-12.0)	. 045 (1.2)	320-350	33-36	9.8-13.8 (25-35)	42.4-53.0 (20-25)

9. WELDING PREPARATION (continued)

(3) Example Welding Conditions of I Shape Butt without Backing Plate



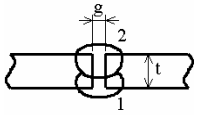
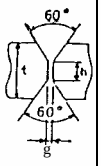
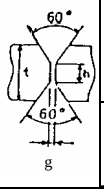


Plate Thickness (t) in.(mm)	Root Gap (g) in.(mm)	Wire size in. (mm)	Welding current (A)	Arc voltage (V)	Welding speed IPM (cm/min.)	CO_2 gas flow rate cfh.(ℓ /min)	Number of layers	
.045 (1.2)	0 (0)	.035, .040 (0.9, 1.0)	70-80	17-18	17.7-21.7 (45-55)	21.2 (10)	1	
1/16 (1.6)	0 (0)	.035, .040 (0.9, 1.0)	80-100	18-19	17.7-21.7 (45-55)	21.2-31.8 (10-15)	1	
5/64 (2.0)	0-.020 (0-0.5)	.035, .040 (0.9, 1.0)	100-110	19-20	19.7-21.7 (50-55)	21.2-31.8 (10-15)	1	
3/32 (2.3)	.020-.040 (0.5-1.0)	.035-.045 (0.9-1.2)	110-130	19-20	19.7-21.7 (50-55)	21.2-31.8 (10-15)	1	
1/8 (3.2)	.040-.045 (1.0-1.2)	.035-.045 (0.9-1.2)	130-150	19-21	15.7-19.7 (40-50)	21.2-31.8 (10-15)	1	
3/16 (4.5)	.045-.060 (1.2-1.5)	.045 (1.2)	150-170	21-23	15.7-19.7 (40-50)	21.1-31.8 (10-15)	1	
1/4 (6.0) 3/8 (9.0)	.045-.060 (1.2-1.5) .045-.060 (1.2-1.5)	.045 (1.2) .045 (1.2)	220-260 320-340	24-26 32-34	15.7-19.7 (40-50) 17.7-21.7 (45-55)	31.8-42.4 (15-20) 31.8-42.4 (15-20)	Front 1 Back 1	2
1/4 (6.0)	.045-.060 (1.2-1.5)	.045 (1.2)	220-260	24-26	15.7-19.7 (40-50)	31.8-42.4 (15-20)	Front 1 Back 1	2

(4) Example Welding Conditions of Single and Double Grooves

Plate thickness (t) in. (mm)	Bevel shape	Root Gap (g) In. (mm)	Root face(h) in.(mm)	Wire diameter in.(mm)	Welding current (A)	Arc voltage (V)	Welding speed IPM(cm/min)	CO_2 gas flow rate cfh.(ℓ/min)	Number of layers	
0.47 (12)		0-.020 (0 – 0.5)	0.16-0.24 (4－6)	.045 (1.2)	300－350	32－35	11.8-15.7 (30－40)	42.4-53.0 (20－25)	Front	2
							17.7-19.7 (45－50)		Back	
0.62 (16)							9.8-11.8 (25－30)		Front	
							11.8-13.8 (30－35)		Back	
0.62 (16)		0					11.8-13.8 (30－35)		Front	
							11.8-13.8 (30－35)		Back	

- Example Welding Conditions of Lap Fillet

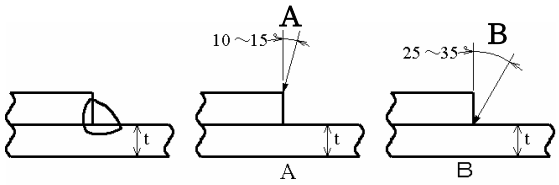
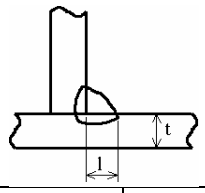


Plate thickness in.(mm)	Wire size in.(mm)	Welding current (A)	Arc voltage (V)	Welding speed in./min.(cm/min.)	Mark position	CO_2 gas flow rate cfh.(ℓ /min.)
.045 (1.2)	.030-.040 (0.8-1.0)	80-100	18-19	17.7-21.7 (45-55)	A	21.2-31.8 (10-15)
1/16 (1.6)	.030-.045 (0.8-1.2)	100-120	18-20	17.7-21.7 (45-55)	A	21.2-31.8 (10-15)
5/64 (2.0)	.035-.045 (0.9-1.2)	100-130	18-20	17.7-21.7 (45-55)	A or B	31.8-42.4 (15-20)
3/32 (2.3)	.035-.045 (0.9-1.2)	120-140	19-21	17.7-19.7 (45-50)	B	31.8-42.4 (15-20)
1/8 (3.2)	.035-.045 (0.9-1.2)	130-160	19-22	17.7-19.7 (45-50)	B	31.8-42.4 (15-20)
3/16 (4.5)	.045 (1.2)	150-200	21-24	15.7-17.7 (40-45)	B	31.8-42.4 (15-20)

9. WELDING PREPARATION (continued)

9.4.2 Example Welding Conditions of Wire CO_2 with Flux
(1)Example Welding Conditions of Horizontal Fillet



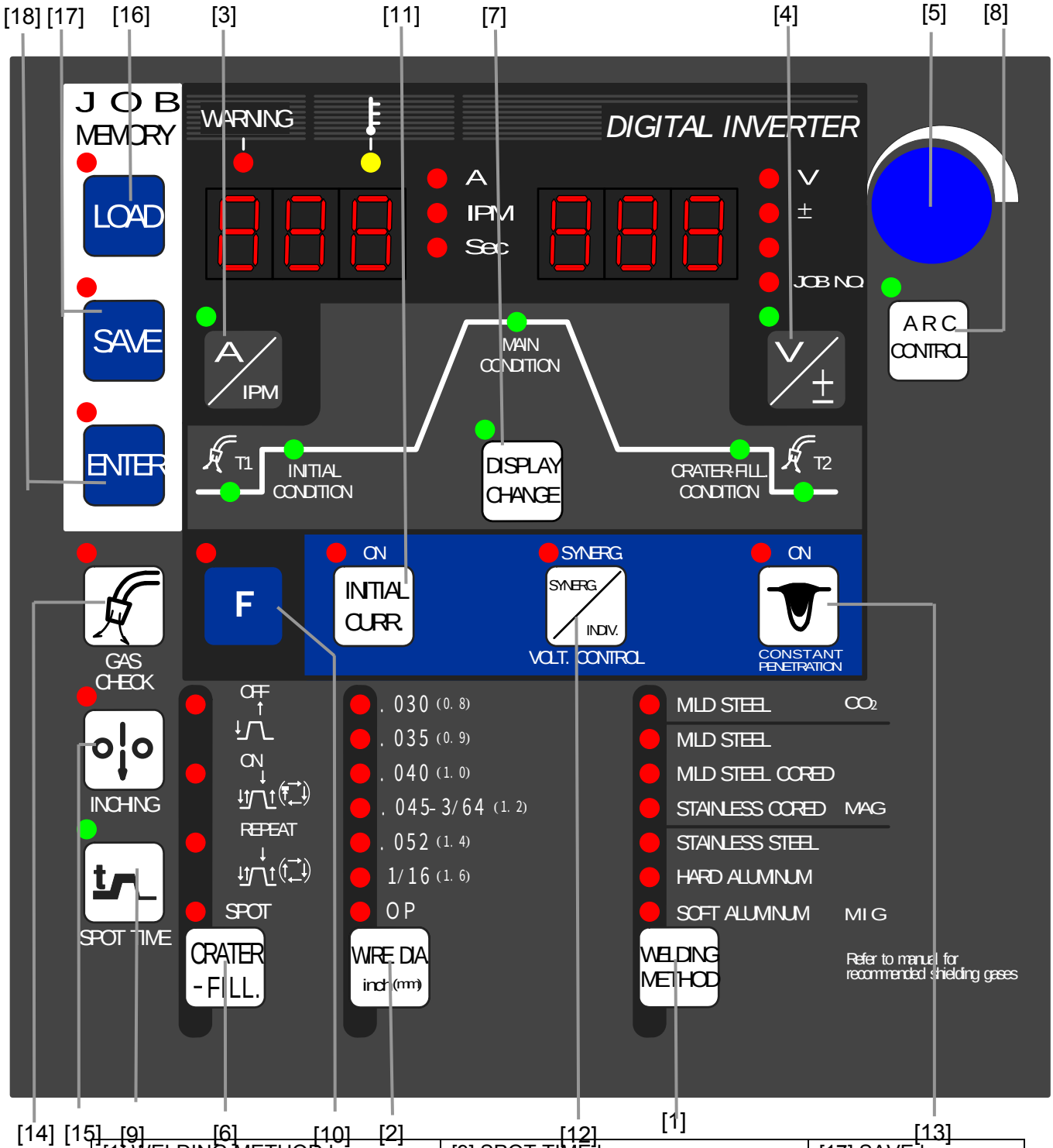
Length of leg in.(mm)	Wire size in.(mm)	Current (A)	Voltage (V)	Speed in./min.(cm/min)
0.16 (4)	.045 (1.2)	250	27	19.7 (50)
	.052 (1.4)	330	29	39.3 (100)
	1/16 (1.6)	350	31	41.3 (105)
0.2 (5)	.045 (1.2)	270	29	19.7 (50)
	.052 (1.4)	330	30	35.4 (90)
	1/16 (1.6)	370	33	35.4 (90)
0.24 (6)	.045 (1.2)	270	29	17.7 (45)
	.052 (1.4)	330	31	31.5 (80)
	1/16 (1.6)	380	34	31.5 (80)
0.28 (7)	.045 (1.2)	280	30	15.7 (40)
	.052 (1.4)	350	32	19.7 (50)
	1/16 (1.6)	380	34	25.6 (65)
0.31 (8)	.045 (1.2)	300	31	11.8 (30)
	.052 (1.4)	350	33	17.7 (45)
	1/16 (1.6)	380	34	20.5 (52)
0.35 (9)	.045 (1.2)	320	32	11.8 (30)
	.052 (1.4)	350	34	15.7 (40)
	1/16 (1.6)	380	34	15.7 (40)

9.4.3 Example Welding Conditions of MAG Short Arc
Material: Mild steel, Gas: Mixture gas of Ar + CO_2 21.2 - 31.8 cfh. (10－15 ℓ/min)

Joint Geometry	Plate Thickness(t) In. (mm)	Wire diameter In. (mm)	Gap In. (mm)	Welding current (A)	Arc voltage (V)	Welding speed IPM (cm/min)
Butt	.040 (1.0)	.030-.040 (0.8-1.0)	0 (0)	50-55	13-15	15.7-21.7 (40-55)
	.045 (1.2)	.030-.040 (0.8-1.0)	0 (0)	60-70	14-16	11.8-19.7 (30-50)
	1/16 (1.6)	.030-.040 (0.8-1.0)	0 (0)	100-110	16-17	15.7-23.6 (40-60)
	3/32 (2.3)	.035-.045 (0.9-1.2)	0-.040 (0-1.0)	110-120	17-18	11.8-15.7 (30-40)
	1/8 (3.2)	.035-.045 (0.9-1.2)	.040-.060 (1.0-1.5)	120-140	17-19	9.8-11.8 (25-30)
	0.16 (4.0)	.035-.045 (0.9-1.2)	.060-.078 (1.5-2.0)	150-170	18-21	9.8-15.7 (25-40)

10. OPERATION

10. Front Panel



[1] WELDING METHOD key	[9] SPOT TIME key	[17] SAVE key
[2] WIRE DIA In. (mm) key	[10] F (FUNCTION) key	[18] ENTER key
[3] A/IPM selector key	[11] INITIAL CURR. key	
[4] V/± selector key	[12] VOLT. CONTROL key	
[5] Parameter adjusting knob	[13] CONSTANT PENETRATION key	
[6] CRATER-FILL key	[14] GAS CHECK key	
[7] DISPLAY CHANGE key	[15] INCHING key	
[8] ARC CONTROL key	[16] LOAD key	

10. OPERATION (continued)

⚠ CAUTION

- **This welding machine should be operated by persons only after reading and understanding contents of this owner's manual and having knowledge and skills for handling the welding machine safely.**
- **Use this welding power source at or under the rated duty cycle. Exceeding the rated duty cycle limitation may result in damage to the welding machine.**

When reading the operating instructions described below, unfold Page 69 so that you can read them confirming the location of the keys on the front panel.

10.1 Basic Settings

10.1.1 Setting of Welding Mode

Choose the welding mode using the WELDING METHOD key [1] and the WIRE DIA In. (mm) key [2] in accordance with the welding method and wire diameter used. The selectable welding modes are shown in the table below.

WELDING METHOD		WIRE DIA. In. (mm)
TYPE OF WIRE	Shielding GAS	
MILD STEEL SOLID	CO_2	0.035 (0.9)
		0.040 (1.0)
		0.045 (1.2)
MILD STEEL SOLID	MAG	0.035 (0.9)
		0.040 (1.0)
		0.045 (1.2)
MILD STEEL CORED	MAG	0.045 (1.2)
		0.052 (1.4)
STAINLESS STEEL CORED	MAG	0.045 (1.2)
STAINLESS STEEL SOLID	MIG	0.035 (0.9)
		0.040 (1.0)
		0.045 (1.2)
SOFT ALUMINUM	MIG	3/64 (1.2)
HARD ALUMINUM	MIG	3/64 (1.2)

NOTE:

- **MAG gas is mixture gas of 80% argon(Ar) and 20% carbon dioxide(CO_2) gas.**
- **MIG gas for Stainless Steel is mixture gas of 90% helium(He), 7.5% argon(Ar) and 2.5% oxygen(O_2) gas.**
- **MIG gas for Aluminum is pure argon(Ar) gas.**

When setting the welding mode, select the welding method using the WELDING METHOD key [1] first. Once the welding method is set, the available wire diameters are automatically decided according to the welding method. Then, set the wire diameter with the WIRE DIA In.(mm) key[2].

Selecting the proper combination of material and gas can cancel the error and activate the welding power source. Wrong combination of welding mode and wire diameter will cause "---"and "---" in the displays to blink, the LED lamps to light, and then the welding power source to stop.

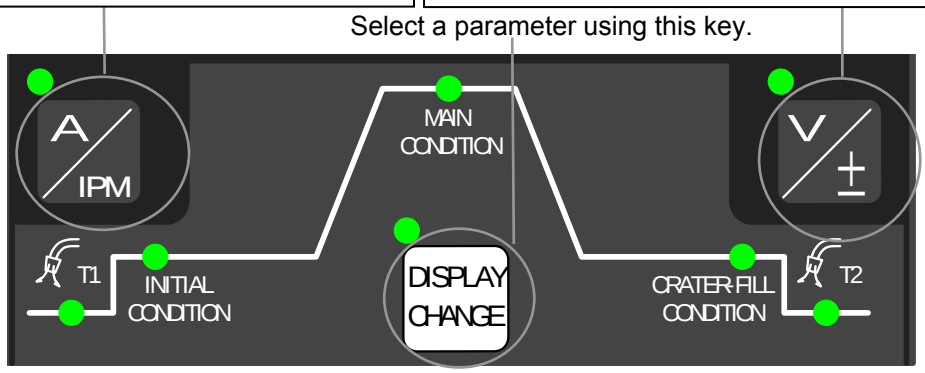
For example, when selecting "STAINLESS STEEL CORED" while setting "MILD SOLID CO_2 0.035" with the WELDING METHOD key [1], the "MILD STEEL SOLID CO_2" lamp blinks, which means the preset combination is incorrect. In that case, select a wire diameter using the WIRE DIA In.(mm) key [2] or reset the welding method using the WELDING METHOD key [1].

10. OPERATION (continued)

10.1.2 Setting the Parameter

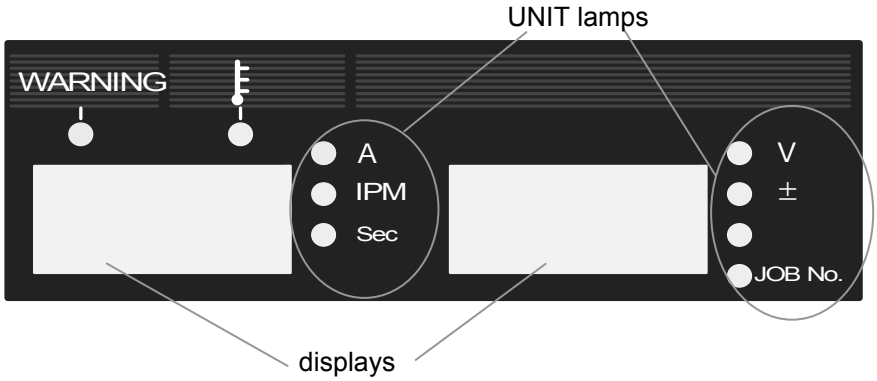
Pressing the key while the A/IPM lamp (located at the upper left of the A/IPM selector key [3]) is lit changes over displays of current setting and wire feed rate. Pressing the A/IPM selector [3] key while the A/IPM lamp is not lit causes the A/IPM lamp to light. While the A/IPM lamp is lit, current can be adjusted using the parameter adjusting knob [5].

Pressing the key while the V/± lamp (located at the upper left of the V/± selector [3] key) is lit changes over displays of voltage setting and SYNERGIC fine adjust. Pressing the V/± selector key [3] while the V/± lamp is not lit causes the V/± lamp to light. While the V/± lamp is lit, voltage can be adjusted using the parameter adjusting knob [5].



[Parameter selector]

Choose a desired parameter using the DISPLAY CHANGE key [7]. Display in the displays are changed according to the parameters you select and the UNIT lamp of the parameter lights up.



[Parameter displays]

- When the wire feed speed is displayed, you can not set to the maximum feed speed using the parameter adjusting knob [5] depending on the welding mode settings (especially for large diameter). You are only allowed to set the wire feed rate to the value that can achieve the current setting determined by the rated output current.

- The values shown in the displays are not the actual data but the setting values of voltage, current, and wire feed speed. Use the values in the displays as approximations.

10. OPERATION (continued)

10.1.2 Setting the Parameter (continued)

(1) Pre-flow Time Setting

Once the pre-flow time is chosen, the setting value is displayed in the left display and the "sec." lamp lights. At this condition, you can set the pre-flow time while turning the parameter adjusting knob [5]. The setting range of pre-flow time covers 0 second to 10 seconds.

(2) Setting of the Initial Conditions

The initial conditions can be chosen only when initial current is ON. Once the initial conditions are chosen, the setting values of initial conditions are displayed in the displays.

(3) Setting of the Main Conditions

Once the main conditions are chosen, the setting values of the main conditions are displayed in the displays.

(4) Setting of the Crater Conditions

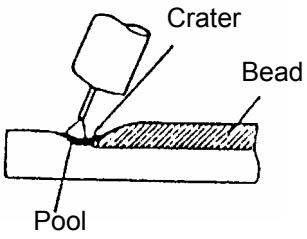
Only for ON or REPEAT crater, a crater condition can be selected. Once a crater condition is chosen, the setting values of the crater conditions are displayed in the display.

(5) Setting of the Post-flow Time

Once the post-flow time is selected, the setting value is displayed in the right display and the "sec." lamp lights up. At this conditions, the post-flow time can be set while turning the parameter adjusting knob [5]. The setting range of post-flow time covers 0 second to 10 seconds.

10. OPERATION (continued)

10.1.3 Setting of the CRATER-FILL Functions

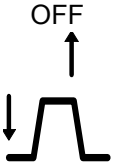
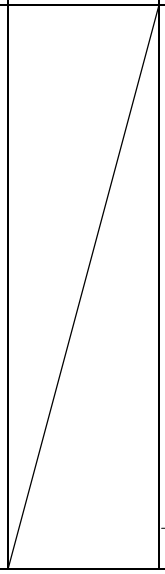
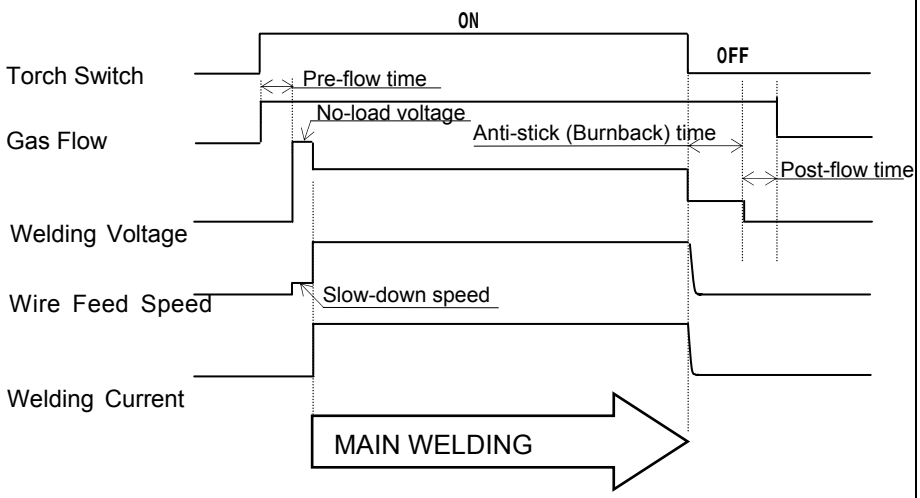


Crater is a depression left at the termination of the weld. As it may cause cracks and poor welding, a crater treatment called crater-filler is used to fill in the depression.

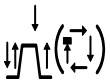
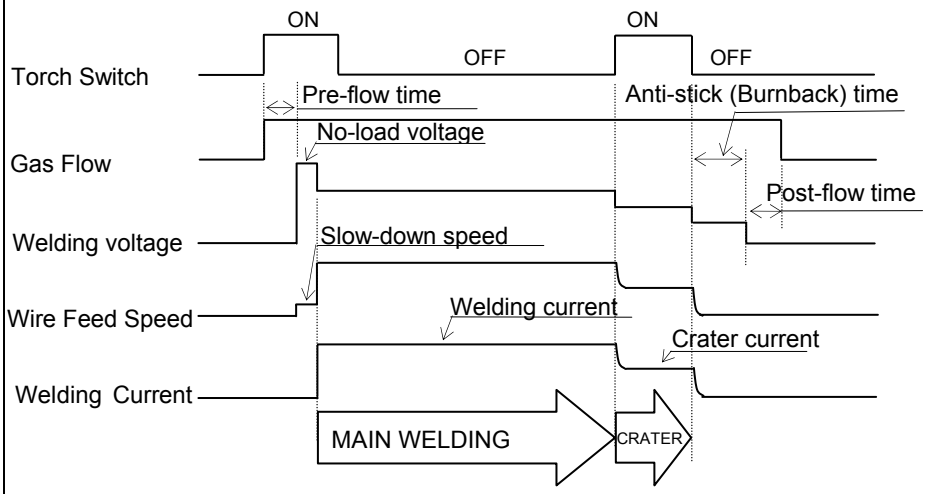
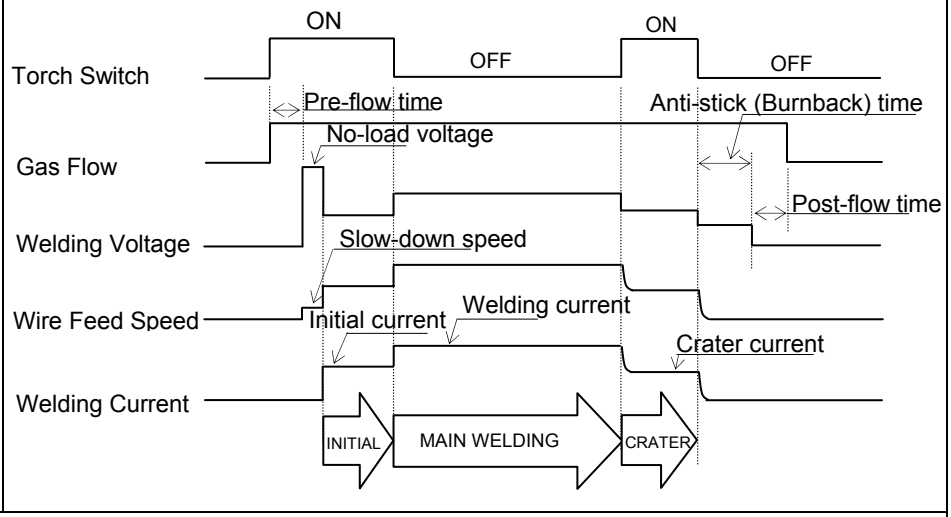
When giving a crater treatment, set the CRATER-FILL key [6] to "ON" or "REPEAT".

Each press of the CRATER-FILL key [6] changes the crater-fill mode in order.

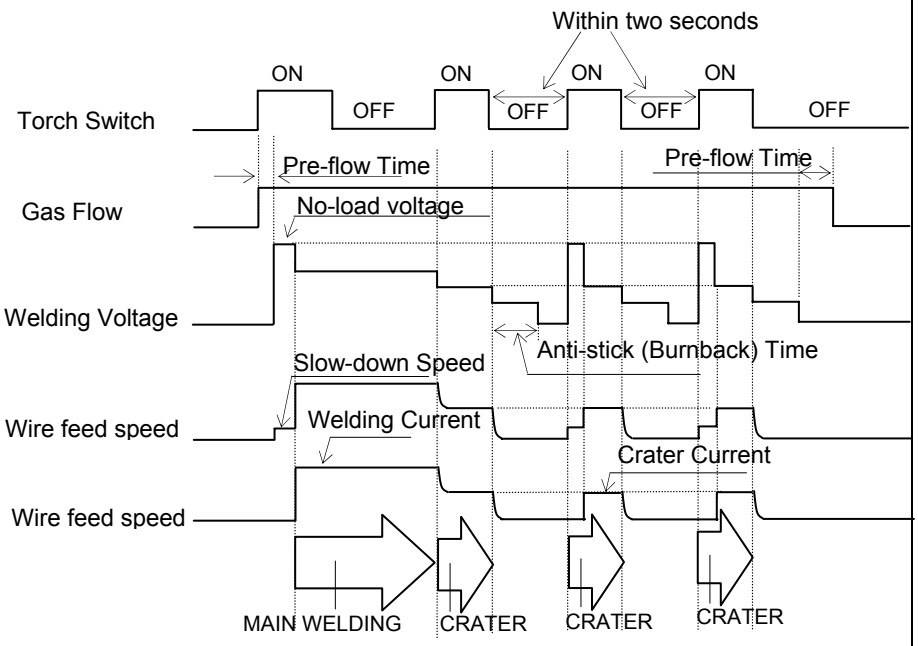
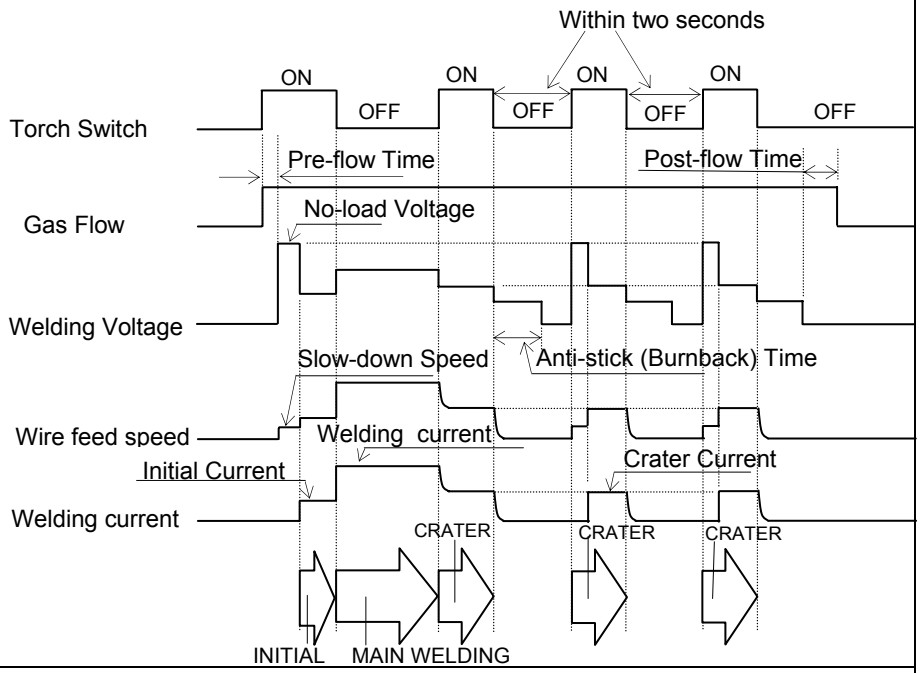
"OFF" → "ON" → "REPEAT" → "SPOT"

Crater	Initial Current	Timing Chart
OFF 		 ● Keep the torch switch pressed and held during welding.

10. OPERATION (continued)

<table>
<tr><th>Crater</th><th>Initial Current</th><th>Timing Chart</th></tr>
<tr><td rowspan="2">ON
  </td><td>OFF</td><td> 
</td></tr>
<tr><td>ON</td><td> 
</td></tr>
<tr><td colspan="3">● Even if the torch switch is switched off during welding, start signal will be self-hold. The torch switch should be kept pressed and held during the INITIAL and CRATER period.
● Even if the CONSTANT PENETRATION switch is set to "ON" during the CRATER period, constant penetration will not be carried out.</td></tr>
</table>

10. OPERATION (continued)

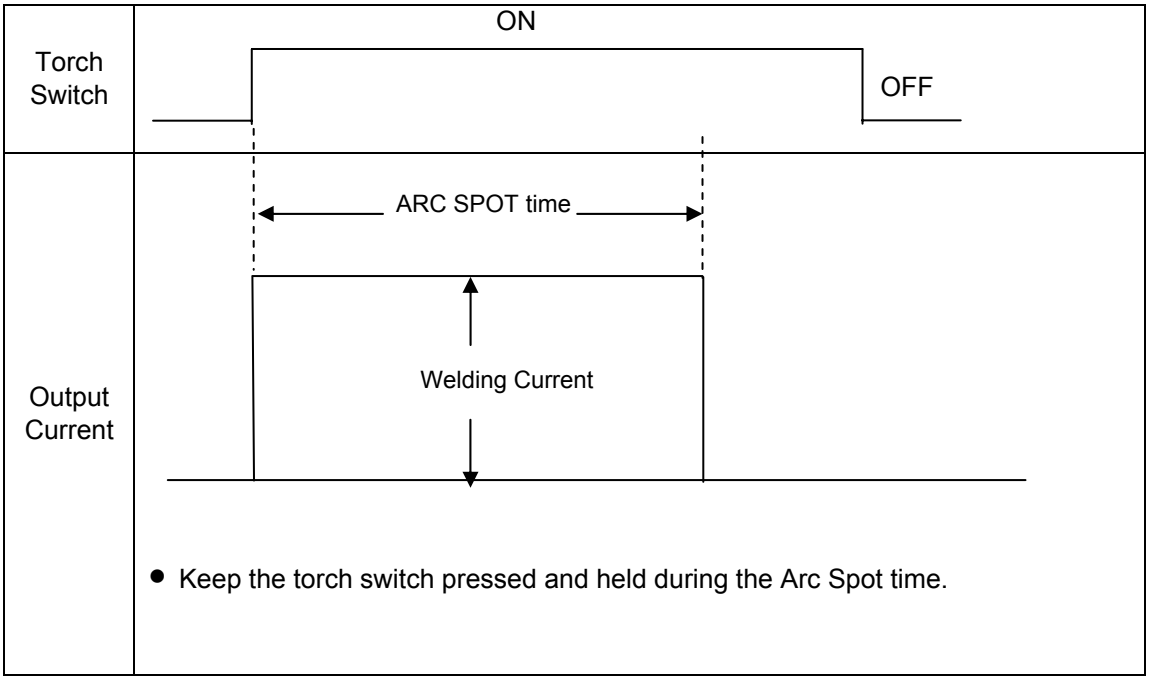
<table>
<tr><th>Crater</th><th>Initial Current</th><th>Timing Chart</th></tr>
<tr><td rowspan="3">REPEAT
↓
  </td><td>OFF</td><td> 
</td></tr>
<tr><td>ON</td><td> 
</td></tr>
<tr><td colspan="2">● Even if the torch switch is switched off during welding, start signal will be self-hold. The torch switch should be kept pressed during the INITIAL and CRATER period.
● When turning on the torch switch again within about 2 seconds after arc disappears, welding condition starts with CRATER condition. The condition will continue until the torch switch is turned off. Repetition of the same operation enables you to have crater treatment as many times as you need.
● Even if the CONSTANT PENETRATION switch is “ON" during the CRATER period, constant penetration will not carried out.</td></tr>
</table>

10. OPERATION (continued)

10.1.4 Setting of Arc Spot Time ()

When arc spot treatment is carried out using the CRATER-FILL key [6], set to "SPOT". Then, when pressing the SPOT TIME key [9], the SPOT TIME lamp (located at the upper left of the CRATER-FILL key) lights up, the setting value is displayed in the right display, then the "sec." lamp lights up. At that condition, the ARC SPOT time can be set while turning the parameter adjusting knob [5]. The ARC SPOT time between 0.1 second and 10 seconds can be set. Press the SPOT TIME key [9] again or press the DISPLAY CHANGE key [7] to return to the last parameter item. It is also possible to change the display to a current-related parameter using the A/IPM selector key [3] and to a voltage-related parameter using the V/± selector key[4].

The SPOT TIME key functions only during Arc Spot time.



- Keep the torch switch pressed and held during the Arc Spot time.

NOTE: When the welding machine is in the ARC SPOT mode, the penetration control does not function. When setting the CATER-FILL function to “SPOT” while the CONSTANT PENETRATION function is “ON”, the setting of the CONSTANT PENETRATION function is automatically changed to “OFF”.

10. OPERATION (continued)

10.1.5 Adjusting Welding Voltage

Using the VOLT. CONTROL key [12] allows you to select one of the following voltage adjustment methods.

(1)Making the INDIVIDUAL Adjustment

The INDIVIDUAL adjustment can be achieved when the VOLT.CONTROL lamp (located at the upper left of the VOLT. CONTROL key [12]) is off. In the case of the INDIVIDUAL adjustment, welding current and welding voltage must be adjusted individually. When you want to set welding voltage, make sure that the VOLT. CONTROL lamp is lit, then adjust the welding voltage while turning the parameter adjusting knob [5]. When changing the voltage adjustment method from INDIVIDUAL to SYNERGIC, the present voltage setting value is reflected. The voltage setting value after the voltage adjustment method is changed is not that of synergic center.

(2)Making the SYNERGIC Adjustment

The SYNERGIC adjustment can be achieved when the VOLT. CONTROL lamp (located at the upper left of VOLT. CONTROL key [12]) is on. For the SYNERGIC adjustment, the proper welding current for the current setting is automatically set. When the VOLT. CONTROL lamp is lit, welding voltage can be finely adjusted using the parameter adjusting knob [5]. In addition, it is also possible to change over the display setting in the right display using the V/± selector key [4]. The selectable display settings are the INDIVIDUAL mode (V) and the SYNERGIC mode (± adjustment) . In the SYNERGIC display mode, the standard value is 0. The setting range of welding voltage is 0 to ±30 . Even when changing the voltage adjustment method from SYNERGIC to INDIVIDUAL, the voltage setting value right before the voltage adjustment method is changed reflected.

The welding voltage at SYNERGIC control, etc. may be not adjusted properly with use of mixture gas other than the mixture ratio of the following gas

- MAG gas is mixture gas of 80% argon(Ar) and 20% carbon dioxide(CO_2) gas.
- MIG gas for Stainless Steel is mixture gas of 90% helium(He), 7.5% argon(Ar) and 2.5% oxygen(O_2) gas.
- MIG gas for Aluminum is pure argon(Ar) gas.

10. OPERATION (continued)

10.1.6 CONSTANT PENETRATION Function

For conventional CO_2/MAG welding, as the wire extension changes, welding current changes and base metal penetration depth and bead width change. By setting the constant penetration function to “ON”, wire feed speed is automatically adjusted so that constant current is always obtained even when wire extension varies. As a result, effects of reducing change in penetration depth and in bead width of the base metal are able to be obtained. When penetration depth is particularly held constant, set the CONSTANT PENETRATION function to “ON” using the CONSTANT PENETRATION key [13].

Penetration control ON/OFF selection can be done by using the CONSTANT PENETRATION key [13]. When setting the CONSTANT PENETRATION function to ON, the CONSTANT PENETRATION lamp (located at the upper left of the CONSTANT PENETRATION key) lights up. When setting the CONSTANT PENETRATION function to OFF, the CONSTANT PENETRATION lamp goes out.

NOTE:
The PENETRATION CONTROL function does not function during the INITIAL and CRATER period. When setting to Arc Spot, the PENETRATION CONTROL function can not be used. The PENTRATION CONTROL function is automatically set to “OFF”.

10.1.7 Arc Characteristics Function

When pressing the ARC CONTROL key [8] while the INITIAL CONDITION, MAIN CONDITION, or CRATER-FILL CONDITION is selected, the ARC CONTROL lamp (located at the upper left of the ARC CONTROL key [8]) lights up, the setting value is displayed in the right display, and the V/± lamp lights up. At that condition, it is possible to set arc characteristics by using the parameter adjusting knob [5]. The setting range is 0 to ±99. Pressing the ARC CONTROL key [8] again or pressing the DISPLAY CHANGE key [7] returns to the previous parameter setting. In addition, it is also possible to change over the display to a current-related parameter by using the A/IPM selector key [3] and to a voltage-related parameter by using the V/± selector key [4].

The standard setting value of arc characteristic is 0. As the setting value of the arc characteristic is set in the negative direction (down to -99), arc condition becomes harder. As the setting value of the arc characteristic is set in the positive direction, arc condition becomes softer (up to 99). When you use the welding power source in the low current range, set the setting value of the arc characteristic in the positive direction to obtain good welding results. When you use the welding machine in the high current range, set the setting value of the arc characteristic in the positive direction to obtain good welding results. If you can not obtain optimum arc condition due to use of the extension cables, set the setting value of the arc characteristic in the negative direction.

10.1.8 GAS CHECK  Function (with gas save function)

This function is used when opening the discharge valve of the shield gas and when adjusting the gas flow rate. When pressing the GAS CHECK key [14] once, the GAS CHECK lamp (located at the upper left of the GAS CHECK key) lights up and allows gas to flow. Pressing the GAS CHECK key [14] again turns off the GAS CHECK lamp and stops discharging gas. In more than two minutes after the GAS CHECK key [14] is pressed, gas discharge automatically stops and the GAS CHECK lamp goes out. In the event that the machine is started while gas is being checked, gas stops flowing after welding is completed (upon completion of post-flow) and gas does not even continue to flow during down period.

10. OPERATION (continued)

10.1.9 INCHING Function

When pressing the INCHING key [15], the INCHING lamp (located at the upper left of the INCHING key) light up and begins feeding wire. Releasing the key stops wire feeding and the INCHING lamp to go out. When changing the wire feed rate by turning the parameter adjusting knob [5], make sure that the INCHING lamp lights up. When connecting to the analog remote control (optionally available), the INCHING key [15] on the front panel can not be used for inching operation. When connecting to the analog remote control, use the inching switch on the remote control to activate the INCHING function.

10.1.10 Verifying the Parameters in the Displays

The displays on the front panel provides the following functions:

1. Display of Parameter Setting Value

When setting to “parameter setting values display” mode during down period (excluding the result display period right after the completion of welding) and during welding, values of parameters under adjustment are displayed.

2. Display of Output Current During Welding

The parameters shown in the displays automatically change to average values of output current and output voltage according to the output conditions every about 0.5 second. The display accuracy is Class 2.5 or equivalent and is the same as that of a general needle type meter. When you want to change the parameters during welding, press the DISPLAY CHANGE key [7] to go to the “parameter setting values display” mode. When no welding operation is not carried out for about 5 seconds or the DISPLAY CHANGE key [7] is held down, the display mode automatically returns to the “average parameter setting values display” mode. When the TORCH key is pressed, the LED lamps of the sequence parameters go on sequentially according to the welding operations. When the display setting is switched to the "parameter setting values display" mode, each LED lamps (located at the sequence parameter setting section) of the sequence that is currently outputting begin blinking. Refer to Section 10.1.13, “Using the Parameter Adjusting Knob” for the parameters that can be adjusted using the parameter adjusting knob [5] during welding.

3. Display of Welding Results after Completion of Welding

Upon completion of welding, the average output current and voltage for last one second blink for about 20 seconds (however, the output conditions of crater fill are ignored). Therefore, the operators can verify the welding conditions right after the completion of welding and can use them as approximates when adjusting the welding conditions. This display is cancelled by starting the next welding or pressing any key on the front panel without waiting 20 seconds after the completion of welding. The result display time can be preset to F8 by using the F key [10]. The setting value is displayed in the left digital and the "sec" lamp lights up. The setting range of the result display time is 5 seconds to 60 seconds.

NOTE: In the case where the less than one-second welding such as tack welding, etc. is performed, the correct results of the welding are not displayed.

4. Display of Error Message

If an error is detected in the power source of electric welding, an error number indicating error messages blinks. See Section 11.1, "Troubleshooting".

NOTE: The average output values shown in the displays are processed by software and are not guaranteed as control data of measuring instruments.
(Display accuracy: Class 2.5 or equivalent)

10. OPERATION (continued)

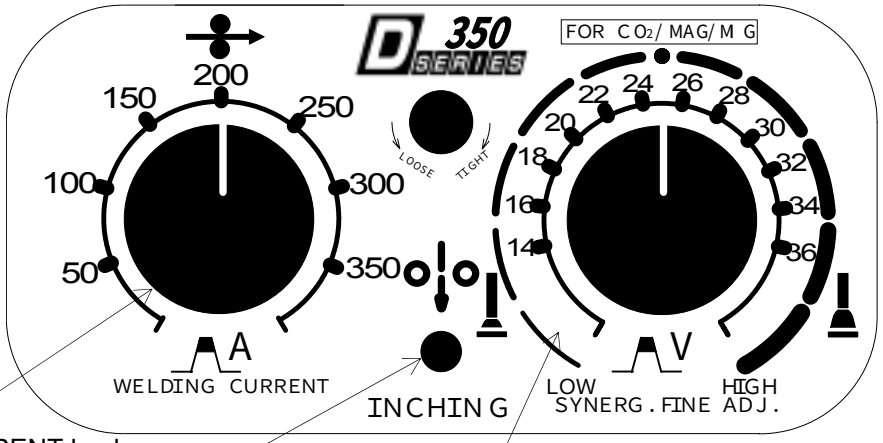
10.1.11 Using the Parameter Adjusting Knob

When adjusting parameters using the parameter adjusting knob [5] during welding, change over the display mode to the “parameter setting value display” mode by pressing the DISPLAY CHANGE key [7]. The initial conditions, the main conditions, and the crater conditions can be changed during the INITIAL welding, MAIN welding, and CRATER welding respectively. Pressing the ARC CONTROL key [8] after changing to the “parameter setting value display” mode adjusts the pulse arc characteristics.

10.1.12 Using the Analog Remote Control K5416H (optional accessory)

The welding machine automatically recognizes the analog remote control when the power switch is turned on. When the analog remote control is connected to the welding power source, the analog remote control is recognized first. Therefore even when selecting welding current/voltage, the welding current/voltage can not be adjusted by using the parameter adjusting knob [5] on the front panel. When the analog remote control is connected, adjust the parameter while turning the WELDING CURRENT/VOLTAGE knobs on the analog remote control. It is possible to verify the parameter setting values which are preset at the analog remote control, in the displays of the front panel. Once the analog remote control is disconnected, the setting values preset at the remote control are erased.

NOTE: With the power switch turned off, connect or disconnect the analog remote control.



WELDING CURRENT knob

To set welding current.

INCHING button

Pressing this switch feeds wire only. The wire feed rate changes by turning the WELDING CURRENT knob on the left.

VOLTAGE knob

< INDIVIDUAL adjustment>
Set welding voltage.
< SYNERGIC adjustment >
Aligning to mark “ ● ” achieves the standard setting. Turn the knob in the "HIGH" direction to increase voltage and in the "LOW" direction to decrease voltage.

10. OPERATION (continued)

10.1.12 Using the Analog Remote Control K5416H (optional accessory) (continued)

- When making the INDIVIDUAL adjustment:
  Selecting the "INDIVIDUAL" adjustment allows you to set welding current and welding voltage individually.

  .

- When making the SYNERGIC adjustment:
  When selecting the "SYNERGIC" adjustment, welding voltage is automatically adjusted only by turning the WELDING CURRENT knob [5]. To finely adjust welding voltage, use the VOLTAGE. knob.

  It is possible to adjust low-current region, where a small-diameter wire is used for weld, and to finely adjust welding current by replacing with the full-scale 200A plate (supplied). When replacing the scale plate, press the F key [10] and change the initial value of F9 to 200. Refer to Section 10.2.1(9), “Selection of scale plate of analog remote control”.

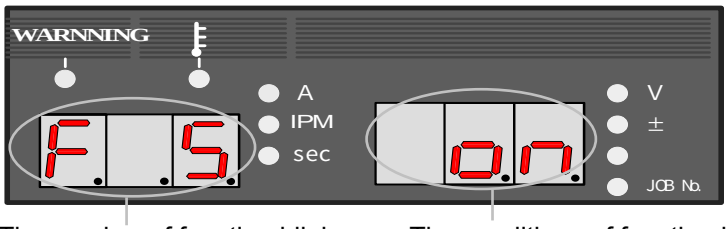
10. OPERATION (continued)

10.2 Applied Settings

10.2.1 Using Internal Function

- How To Use Internal Functions

① When holding down the F key [10] for a few seconds, the function number in the left-side display blinks, and the status of function assigned to the function number lights up and is displayed in the right-side display. Under this condition, a function number can be selected by using the parameter adjusting knob [5].



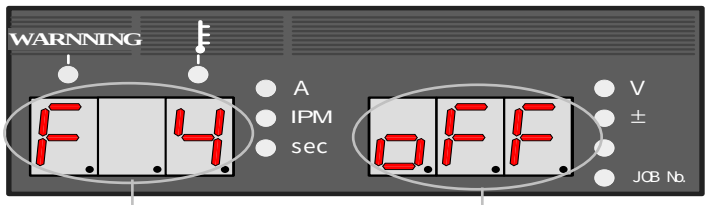
The number of function blinks. The conditions of function lights.

↓

A function number can be selected with the parameter adjusting knob [5]

The above example indicates that F5 is set to “on”.

② When pressing the F key [10] again after selecting the desired function number, the function number lights and the function conditions blinks. Under this condition, functions can be set by using the parameter adjusting knob [5].



The number of function lights. The condition of function blinks.

↓

Conditions can be set while turning the parameter adjusting knob [5].

The above example indicates that F4 is set to “oFF”.

③ Pressing the F key [10] again causes the function number to light up and returns to the step ①. To leave the function mode, hold down the F key [10] for a few seconds.

NOTE: In the function mode, no confirmation for changing the function is carried out when it is changed. Upon change of the setting by using the parameter adjusting knob [5], the change becomes valid. Therefore, before changing a function setting, make sure that the correct function number is selected and that the proper setting value for the function number is set.

10. OPERATION (continued)

The following functions can be adjusted by using the F key [10].

(1) Fine Adjustment of Anti-Stick (Burnback) Time: F1

Anti-stick (burnback) time means the processing time to prevent electrode wire from fusing to base metal when welding is completed. Anti-stick (Burnback) time is preset to proper conditions according to welding methods and wire diameters at shipment, but it can be finely adjusted by activating F1. The standard anti-stick (burnback) time is preset to "0", time decreases in the negative direction and increases in the positive direction. The fine adjustment range is 0 to ±50 and the unit is 0.01 seconds.

Ex. 1) When the setting value of anti-stick (burnback) time is “25”,0.25 seconds is added to the standard anti-stick (burnback) time.

Ex. 2) When the setting value of anti-stick (burnback) time is “-10”,0.1 seconds is subtracted from the standard anti-stick (burnback) time.

(2) Fine Adjustment of Anti-stick (Burnback) Voltage: F2

Anti-stick (Burnback) voltage means the voltage which is output when processing is carried out to prevent electrode wire from fusing to base metal at the end of welding. Anti-stick (Burnback) voltage is preset to proper conditions according to welding method and wire diameter at shipment, but it can be finely adjusted by activating F2. The standard anti-stick (burnback) voltage is preset to “0”. When the voltage is set in the negative direction, it decreases. When the voltage is set in the positive direction, it increases. The fine adjustment range is 0 V to ±9.9V.

(3) Fine Adjustment of Slow-down Speed: F3

Slow-down speed means the speed to feed wire that is slower than the feed rate at normal welding during the period from startup to arc start. The slowdown speed is preset to proper conditions according to welding methods and wire diameters at shipment, but it can be finely adjusted by activating F3. The standard slowdown speed is preset to “0”. When the slowdown speed is set in the negative direction, it decreases. When the slowdown speed is set in the positive direction, it increases. The fine adjustment range is 0 IPM to ± 35 IMP. When poor arc start occurred, lower the slowdown speed. Even when arc start is good, the slow-down speed can be increased to shorten tact time.

NOTE: The minimum slow-down speed is 15 IPM.

10. OPERATION (continued)

(4) Selection of Auto/Semi-automatic: F4
Selection of Auto allow the welding power source to do the following operation.

- Operation stop can be cancelled by short-circuiting on 12P terminal block "STOP" without main power reset.
- After anti-stick (burnback) voltage time, the voltage is applied for approximately 0.2 second for prevent wire stick on base metal.

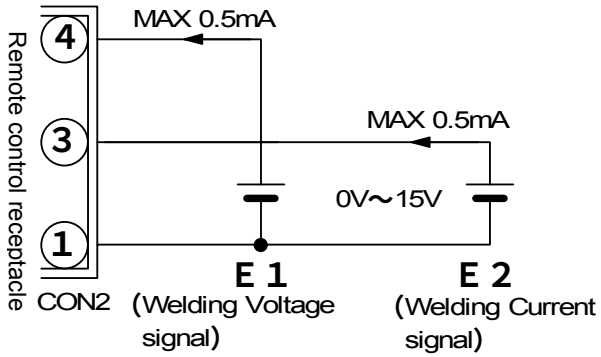
When using the welding power source by combining a robot, etc. and inputting welding current signal and welding voltage signal by utilizing external voltage signal, set to the Auto mode.

When activating "Auto" mode, set F4 to "on".

NOTE:

- **Even when supplying external setting voltage to a remote controller receptacle in the "semi-auto" mode, the values set at the front panel are valid.**
- **Regardless of auto/semi-auto mode, when the analog remote control is connected, the values set at the analog remote control are recognized first.**
- **Set to F4 to "auto " to use the function of F5.**

- When welding current signal and welding voltage signal are entered utilizing external setting voltage, make the connections as illustrated below.



Acceptable plug

Spec.	DPC25-6A
Part No.	4730-009

⚠ CAUTION

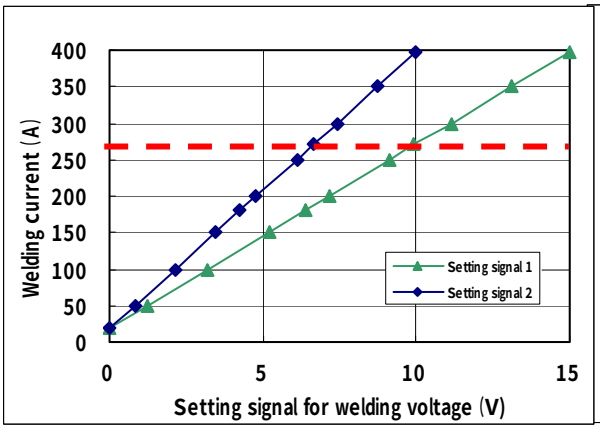
- **Supply 0V to 15V to E1 and E2. Exceeding 15V may result in damage to the control circuit of the welding power source.**
- **Be sure to finish setting and inputting before 100 milliseconds when starting signal is input. Inputting after starting signal is input or at starting signal may result in unstable start.**

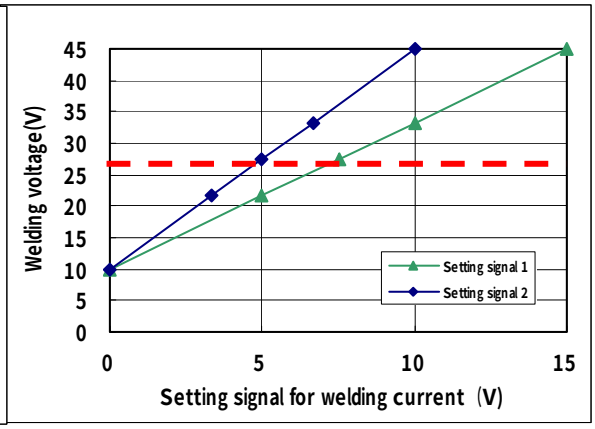
10. OPERATION (continued)

(5) For external setting voltage ranges between 0 and 10V: F5

When the welding machine is used by combining with a robot or an automatic machine, and the maximum command voltage from the robot or an automatic machine is up to 10V, activate F5 using the F key [10]. This function is preset to “oFF” at shipment. Set F5 and F4 to "on" to activate the function using the F key [10].

- The relationship between current/voltage command voltage from outside and welding current or welding voltage is shown as follows. The welding current and welding voltage corresponding to welding conditions setting voltage may differ from the indications in the graphs due to wire extension length and dragging of output cable. These graphs are only for reference.





* Setting Signal 1: When command voltage is externally supplied in the range from 0V to 15V under the standard settings.

* Setting Signal 2: When command voltage is externally supplied in the range from 0V to 10V with F 5 set to "on"

* During single phase input power, maximum output are 270A for current and 27V for voltage.

(6) Setting of Up-slope Time: F6

Upslope time means the time for increasing welding conditions stepwise when initial current is changed to main current. The upslope time at shipment is set to 0 second, but can be adjusted by using F6. The setting range is 0 second to 10 seconds. This function is used when wire burns up while conditions are changed over due to the great difference of setting between initial current and main current.

(7) Setting of Down-slope Time: F7

Down-slope time means the time for decreasing welding conditions stepwise when main current is changed to crater current. The down-slope time at shipment is set to 0 second, but it can be adjusted by using F7. The setting range covers 0 second to 10 seconds. This function is used when wire crashes into the base metal while the conditions are changed over due to the great difference of setting between main current and crater current.

(8) Setting of Result Display Holding Time: F8

After completion of welding, the average value of output current and output voltage for last one second blinks for about 20 seconds, but the result display holding time can be set by F8 using F key [10]. The setting range of result display holding time is 5 seconds to 60 seconds.

10. OPERATION (continued)

(9) Selection of Scale Plate of Analog Remote Control: F9

When the analog remote control (optional accessory) is used, it is possible to finely adjust a low-current region where a small-diameter wire is used for weld by replacing the full-scale 350A scale plate with the full-scale 200A scale plate (supplied). The analog remote control scale plate is changed over by using the F selector key [10]. Set to "200" by using F9.

(10) Error Detection Level for Feed Motor Load Current: F10

In the event that contact resistance is applied to the wire feed line section due to worn liners, defective tips, etc., the current supplied to the motor increases (when feed roll lacks smooth movement). Monitoring current of this motor can detect defective feed. The motor load current detection level at shipment is 70% (2.0A) of the rated motor current 2.8A (continuous), and if the current exceeds the setting value, "E-" and "820" in the displays are displayed after welding. In that case, the welding machine does not stop operation immediately. And it self-restores by re-welding. This detection level can be changed by changing the setting of F10 using F selector key [10]. The setting range of motor load current trouble detection level is 20% to 150%.

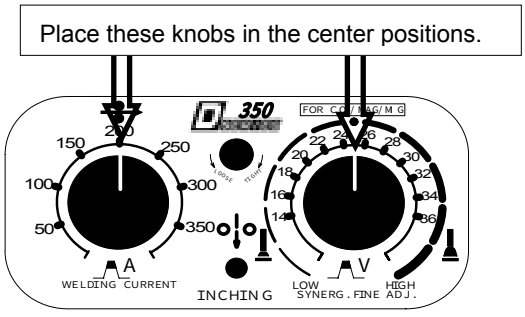
NOTE: Adjust the detection level optionally and use it in the best detection level, because the application environment and judgment criteria vary depending on wires and torches and customers respectively.

(11) Fine Adjustments of JOB MEMORY: F11

Under the welding conditions already stored in JOB MEMORY, current can be finely adjusted with the WELDING CURRNET knob located on the optional analog remote control and voltage with the VOLTAGE knob. The initial setting of F11 is “oFF”. When activating the function, set F11 to “on”. The JOB MEMORY fine adjustment can be activated by F11 using F selector key [10]. The function is preset to “oFF” at shipment. Setting both CURRENT and VOLTAGE knobs to the center of the scales allows the machine to work under the conditions already stored in the JOB MEMORY. To increase welding current slightly, turn the knob clockwise. To decrease slightly, turn it counter-clockwise. Welding voltage can be adjusted in the same manner. The fine adjustment range is ±20%.

NOTE:

- **When no data is stored in the JOB MEMORY, the function cannot be activated.**
- **For the conditions stored in memory in synergic mode, adjust them in individual mode.**



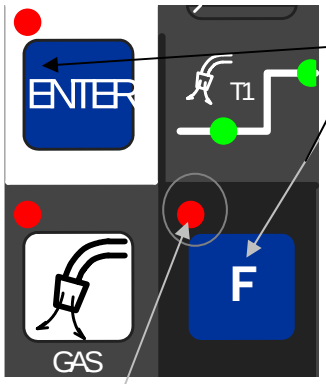
(12) Setting of Soft Arc Mode: F12

The welding power source features SOFT ARC mode. Use of the SOFT ARC mode enables you to obtain softer arc. To switch the arc mode from STANDARD to SOFT, set F12 to “on”. When setting a wire method to CO_2 MILD STEEL SOLID and a wire diameter to .045/.040/.035, the ARC CONTROL lamp (located at the left upper side of the ARC CONTROL lamp) lights up. The mode can be held in memory for each welding condition number.

10. OPERATION (continued)

10.2.2 Key Lock

Key lock is a function to prevent the welding conditions from being changed by accidentally operating keys and knobs on the front panel. Only the keys and parameter adjusting knob which are used for changing each parameters and modes can be protected. However, the settings can be checked and confirmed by using the DISPLAY CHANGE key [7] and the SPOT TIME key [9].



Holding down both the F [10] key and ENTER key [18] simultaneously

Holding down both the F key [10] and ENTER key [18] simultaneously for a while brings the key-lock condition. While keys are locked, the F lamp (located at the upper left of the F key) blinks. Key lock can be cancelled by holding both the F key and ENTER key simultaneously for a while again. Key lock cannot be cancelled by starting the machine up again.

While keys are locked, the F lamp blinks

Even when the keys are locked, GAS CHECK, INCHING, and JOB MEMORY function can be activated.

10.2.3 JOB MEMORY Function

The JOB MEMORY function enables welding conditions to be reproducible by storing the welding conditions in memory inside power source and by reading out the stored data at any time. The number of welding conditions that can be held in memory is up to 30.

NOTE: The parameters of F functions can not set by using the JOB MEMORY function.

⚠ CAUTION
● **The welding conditions (electronic information) stored by this function are susceptible to occurrence of static electricity, impact, repair, etc., and there is a possibility that the storage contents may be changed or lost. BE SURE TO MAKE A COPY FOR IMPORTANT INFORMATION.** ● **We shall not assume any responsibility for any change or loss of electronic information resulting from repair, which you should note in advance.**

Once the machine enters the memory mode and read-out mode, all the key operations are denied except the SAVE key, LOAD key, and ENTER key. To exit the mode, press the LOAD key [16] if it is in the memory mode and the SAVE key [17] if in the read-out mode. Memory can be copied to a different condition number after reading the welding conditions to be copied.

NOTE: Even when welding conditions are read out while the analog remote control is connected to the welding power source, the setting values set at the analog remote control are valid.

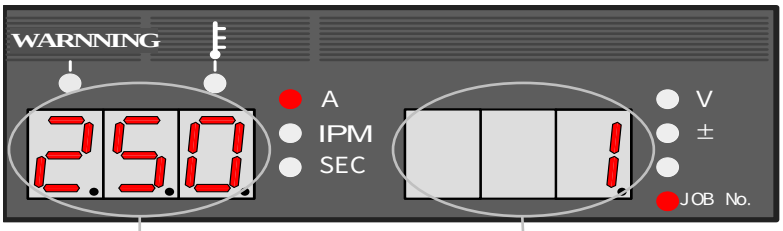
10. OPERATION (continued)

① SAVE Function

Welding conditions being currently in use are stored in the memory inside the welding power source.

- Holding the welding conditions in memory

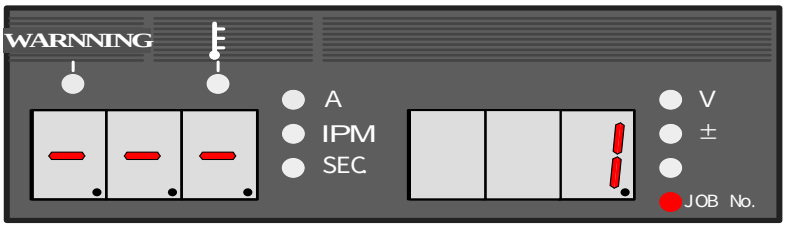
(1) When pressing the SAVE key [17], the machine enters memory mode, the SAVE lamp (located at the upper left of the SAVE key) lights up. See the following picture. In the right display, condition number “1” blinks and the LED lamp of the welding condition number lights up. In the left display, the setting value of welding current preset to the condition number "1" is displayed. Under this condition, a condition number can be set while turning the parameter adjusting knob [5].



Welding Current setting value held in memory

Condition number blinks

In the event that any memory data is already preset to the condition number you selected, the CRATER lamp, the WELDING METHOD lamp, etc. also light up. If no memory data is preset to the condition number you selected, “- - -” in the left display blinks. In this case, the system skips the parameter check condition of Step (2) and jumps to Step (3).



(2)

When pressing the ENTER key [18] after setting the condition number, the ENTER lamp blinks (located at the upper left of the key). Under this condition, you are allowed to confirm the setting value of the parameter preset to the condition number by using the DISPLAY CHANGE key [7]. The setting value of the parameter you selected blinks.

NOTE: In the save mode, you can not change the welding condition number or select any memory/readout mode. To reset the condition number, press the SAVE key [17], then return to the step (1). To quit the setting and exit from the memory mode, press the LOAD key [16].

(3) Pressing the ENTER key [18] again holds the data in memory and allow you to exit from the memory mode.

10. OPERATION (continued)

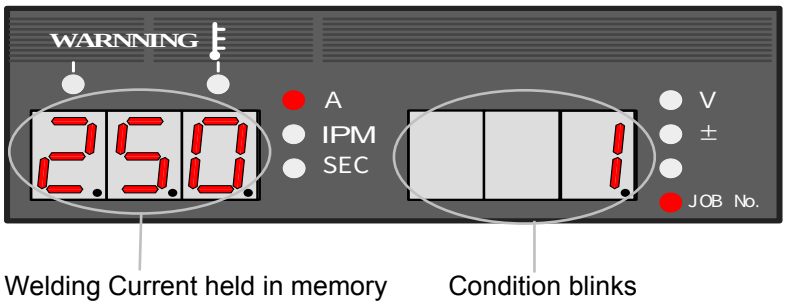
② LOAD Function

The welding conditions stored in memory are read out from the memory inside welding power source.

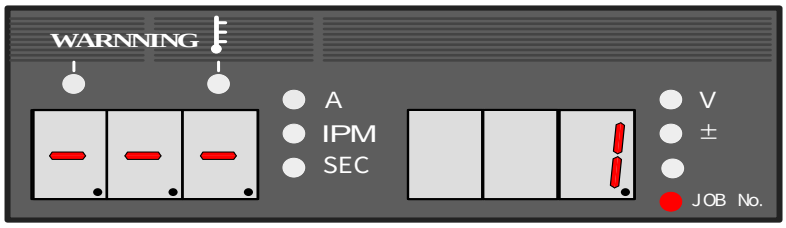
NOTE: The welding conditions currently used are overwritten with the welding conditions that are read out. When you wan to save the welding conditions that have been used until now, set the welding conditions to any condition number, then carry out readout.

● Reading out the preset welding conditions

(1) When pressing the LOAD key [16], the machine enters the readout mode, LOAD lamp (located at the upper left of the LOAD key) lights up. See the figure below. The condition number "1" in the right-side display blinks and the JOB No. LED lamp lights up. In the left-side display, the setting of welding current preset to condition number "1" lights up. Under this condition, a condition number can be set while turning the parameter adjusting knob [5].



In the event that any memory data is preset to the condition number you selected, the CRATER lamp, the WELDING METHOD lamp, etc. also lights up. When no memory data is preset to the condition number, "- - -" in the left-side display appears and blinks. See the figure below.



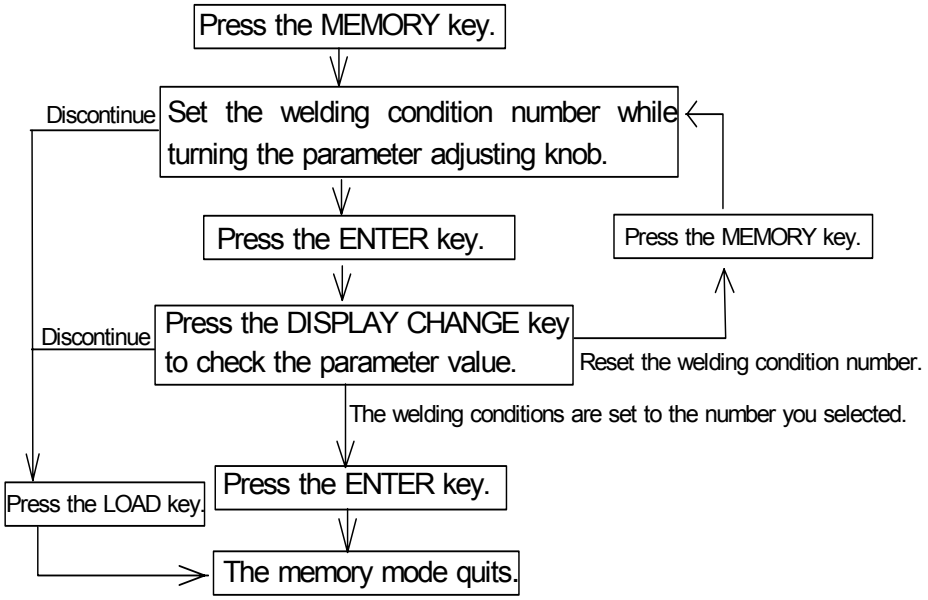
(2) When pressing the ENTER key [18] after setting the condition number, the ENTER lamp (located at the upper left of the key) blinks. Under this condition, you are allowed to confirm the setting of each parameter you want to read out by using the DISPLAY CHANGE key [7]. The setting of the parameter you selected blinks.

NOTE: You are not allowed to change condition number or select a welding method, etc. To reset the condition number, press the SAVE key [17], then return to the step (1). To quit the setting and exit from the readout mode, press the SAVE key [17].

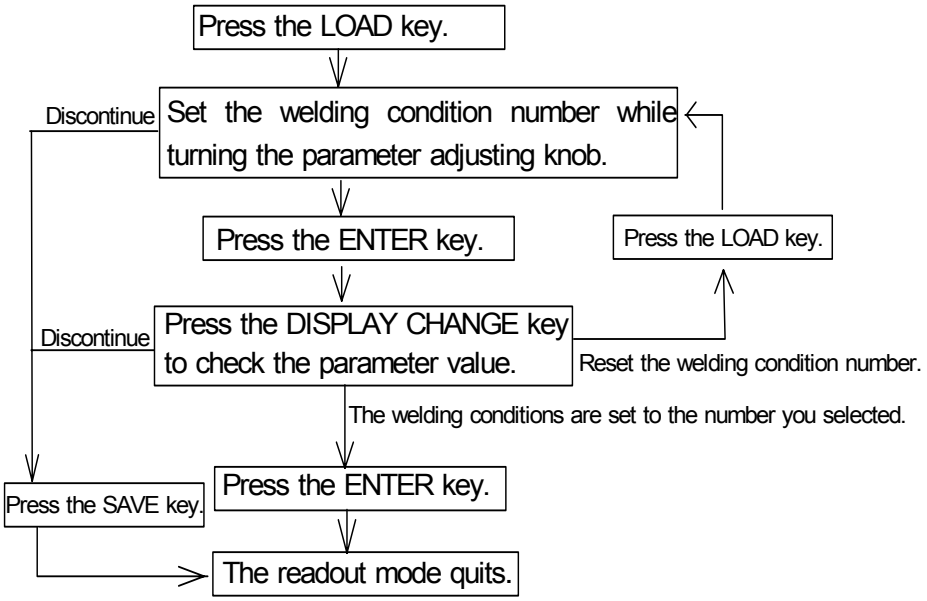
(3) When pressing the SAVE key [17] again, you can read out the preset welding conditions and exit from the readout mode.

10. OPERATION (continued)

- Operation flow in the memory mode



- Operation flow in the readout mode



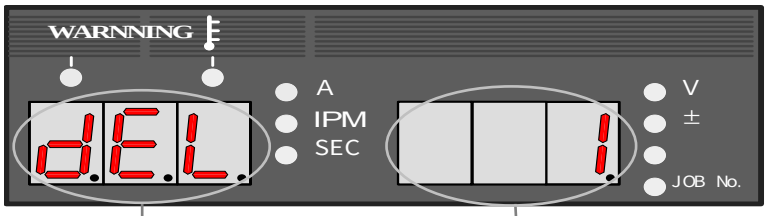
10. OPERATION (continued)

③ Erasing the Welding Conditions

When you erase the welding conditions stored in memory, you can select either erasing all or erasing one.

- Erasing the welding conditions

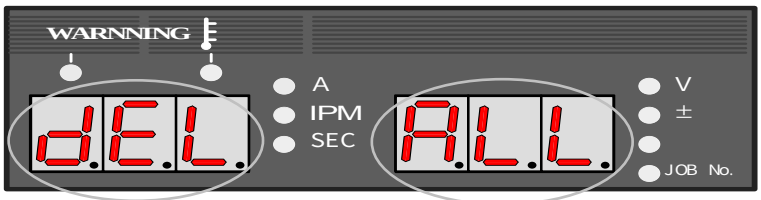
(1) Turn off the power switch and turn on the power switch with both the LOAD key [16] and SAVE key [17] pressed. Release the keys after turning on the power switch, and then "dEL" appear in the left-side display. See the picture below.



"dEL" display means the machine in the delete mode.

Condition number to be deleted blinks.

(2) Set the condition number to be deleted while turning the parameter adjusting knob [5]. When turning the knob counterclockwise, "ALL" appears in the right-side display as illustrated below and you can erase all the welding conditions.



"dEL" is displayed

"ALL" blinks

NOTE: When the welding conditions are deleted by selecting "ALL" welding conditions currently in use are also deleted. Consequently, all the parameters return to the initial settings.

(3) Pressing the ENTER key [18] blinks "dEL." Confirm the condition number again and if you want to cancel erasing of the condition number, press any key other than the ENTER key [18] to return to step (2). To quit the delete mode, turn off the welding power source.

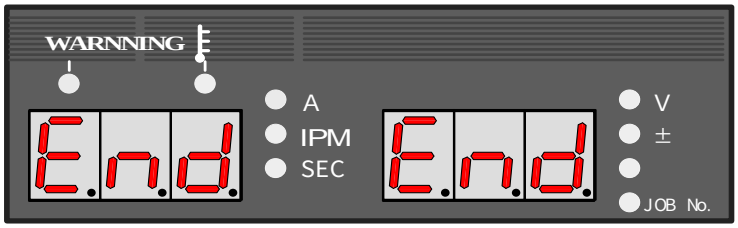
(4) Pressing the ENTER key [18] again deletes the welding condition that is preset to the condition number. When "End" is displayed after end of data deletion, turn off the power switch, then start up the welding machine.

NOTE: When pressing the ENTER key [18] twice in the deletion mode, you can not recover the erased welding conditions. When you attempt to delete a welding condition that is held in memory, make sure that the condition number you want to erase is surely selected.

10. OPERATION (continued)

10.2.4 Resetting to Initial Values

When resetting to the welding conditions to initial values, the welding conditions that are currently used (including the welding condition currently used) are all reset to initial values. But, even when resetting to initial values, the welding conditions held in memory are not changed. To reset to initial values, turn off the power switch, and then turn on the power switch with both the F key [10] and GAS CHECK key [14] held down. When "End"s appear in the displays after turning on the power switch, release the keys, turn off the power switch, then turn it on again. See the picture below.



See “SPECIFICATIONS” for initial values of each parameter and function.

10.2.5 Confirming software version

The version of software incorporated in the welding power source can be verified following these steps. Turn on the power switch with only the F key [10] held down. After powering the welding power source, the version number appears in the display.

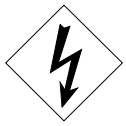
(Example)
Right and left displays : "P10322"← Software number (P10322) is displayed.
↓ Press the F key [10].
Left display : "001" ← Main software version (Ver. 001) is displayed.
Right display : "000" ← Sub software version is displayed.
↓ Press the F key [10].
Left display : "- - -"
Right display : "002" ← Combination is displayed.
↓ Press the F key [10].
The welding power source starts up as usual and gets ready to perform welding.

10.2.6 Automatic Stop of Fan

When main power is ON, the cooling fan stops until detecting welding current.
The cooling fan automatically stops in 10 minutes after welding is finished and automatically starts turning when welding is started. When turning on the welding power source, the cooling fan is also turning but automatically stops in 10 minutes when no operation is carried out.

11. APPLIED FUNCTION

11.1 How to Solve an Error

⚠ WARNING	
	**Observe the following to prevent electrical shock.**
When touching charging parts, critical electric shock and burn may occur. ● **Do not touch charging parts inside or outside the welding machine.** ● **Grounding to the case of the welding power source should be performed by persons qualified electric work and according to the laws and regulations in your area.** ● **When touching the parts inside the welding power source, wait more than three minutes after powering off all input power supply by turning off the line disconnect switch in the switch box.**	

If an error occurs during use, an error code shown in the displays on the front panel blinks, then the welding power source stops automatically. In this case, check the errors in the following table.

No.	Displays on the front panel		Classification of errors
	Left	Right	
1	d A I	H E n	Torch switch off state waiting
2	E -	0 0 0	Operation Stop
3	E -	2 0 0	Primary / secondary current detection error
4	E -	2 1 0	Error in the voltage detection wire
5	E -	3 0 0	Thermal overload
6	E -	6 0 0	Replacement of batteries (warning)
7	E -	7 0 0	Output overcurrent
8	E -	8 0 0	Encoder in the wire feeder
9	E -	8 1 0	Thermal overload in the governor circuit
10	E -	8 2 0	Motor overcurrent warning
11	E -	8 3 0	Motor overcurrent error
12	E -	9 0 0	Microcomputer error-1
13	E -	9 1 0	Microcomputer error-2

11. APPLIED FUNCTION (continued)

1) dAIHEn Display

If “dAI” and “HEn” in the displays blink, it indicates the “Torch switch off state waiting“.
When turning on the power switch, the displays on the front panel shows “dAI” and “Hen” for one second, then the welding power source becomes operable. But, if the torch switch remains on, the safety circuit will function, the welding power source will hold a halt condition, then the WARNING lamp and "dAI” and “HEn" shown in the displays will blink. In this case, turn off the torch switch to reset the safety circuit and make the welding power source operable.

2) E-000 Display

If “ E-“ and “000” in the displays blink, it indicates the “Operation Stop “.
When disconnecting the wiring of the STOP terminals (Operation Stop terminals: wiring number 143) on the 12P external connection terminal block (TM1), “E-“ and “000” in the displays blink and the welding power source stops. In this case, after turning off the power switch and eliminating the possible causes of the stoppage of the welding power source, short-circuit the STOP terminals and turn on the power switch to cancel the error.

NOTE: When canceling the operation stop, it is also possible to solve the error only by short-circuiting the Operation Stop terminals again without starting the welding power source up again. Refer to Section 10.2.1 (4), “Selecting Auto/Semi-auto”.

3) E-200 Display

If “E-“ and “200” in the displays blink, it indicates the " Primary/Secondary current detection error ".
If an error is detected in the current detecting area, “E-“ and “200” in the displays will blink and the welding power source will stop automatically. In this case, turn off the power switch, then turn it on again after making sure that CN8 and CN9 on the printed circuit board P10322U are surely connected.

4) E-210 Display

If “E-“ and “210” in the displays blink, it indicates the " Error in the voltage detection wire ".
If there is an error in the plus voltage detection line (+), the warning lamp will light up, “E-“ and “210” in the displays will blink, then the welding power source will stop automatically. In this case, after checking to make sure that the wire feeder control cable (10P) is not damaged and that CN3 and CN6 on the printed circuit board P10264T are surely connected.

5) E-300 Display

If “E-“ and “300” in the displays blink, it indicates the "Thermal overload"
If the actual duty cycle exceeds the rated duty cycle of or temperature inside the welding power source increases, "E-“ and “300" will blink and the welding power source will stop automatically. At this time, the temperature lamp also will be lit. In this case, wait more than 10 minutes with the power switch pressed and the fan turned. When restart welding, turn off the power switch and restore the system after lowering the duty cycle and the welding current. Such action will cancel the error. Repetitious welding without more than ten-minute rest may lead to damage to the welding machine. Refer to Section 3.1, “Rated Duty Cycle” for the rated duty cycle of the welding power source.

11. APPLIED FUNCTION (continued)

6) E-600 Display

If "E-“ and “600" in the displays blink, it indicates the "Replacement of batteries (warning)".
This welding power source uses batteries so that it can hold the welding conditions in memory even when no operation is carried out for long time. “E-“ and “600” in the displays blink when the batteries get low. “E-“ and 600” are displayed only when the front panel and the welding power source are temporarily not in use. To cancel the display of the error , press any key. Even when “E-“ and “600” appear in the displays, welding can continued to be performed, **but when the batteries run down, the preset welding condition functions and the settings of functions are all erased. The last welding conditions before power is applied to the welding machine can not be stored. Each time power is applied to the equipment, all the parameters are reset to initial values.** Refer to Section 12.4, “ Replacement of batteries” for details.

7) E-700 Display

If “E-“ and “700” in the displays blink, it indicates the “Output overcurrent”.
If an overcurrent or short circuit on the secondary output continues for more than one second during welding, the WARNING lamp lights up, “E-“ and “700” in the display blink, then the welding power source stops automatically. In this case, turn off the control power switch and check to make sure that the welding current does not exceed the rated output value, or that there is no short circuit on the output side such as a contact between the tip and the base metal, or a short circuit of the output cables.

8) E-800 Display

If “E-“ and “800” in the displays blink, it indicates the “Encoder in the wire feeder “.
If there is an error in an encoder feedback signal for detecting the feeding rate of wire feeder, the warning lamp will light up, “E-“ and “800” in the displays will blink, and then the welding machine will stop automatically. In this case, make sure that there is no damage in the encoder connector (4P) on the top of the motor inside the wire feeder, the control cable for the wire feeder (10P), and the printed circuit board P10261Q.

9) E-810 Display

If “E-“ and “810” in the displays blink, it indicates the “Thermal overload in the governor circuit “.
If thermal overload in governor circuit (printed circuit board P10261Q) is detected, the WARNING lamp will light up, “E-“ and “810” in the displays will blink, and then the welding machine will stop automatically. In this case, check for printed circuit board P10261Q, short circuit on the motor power supply lines, rough feeding of wire, and error in the torch or the wire feeder.

10) E-820 Display

If “E-“ and “820” in the displays blink, it indicates the “Motor overcurrent warning”.
Contact resistance to the feeding parts causes motor current to increase. If the motor current exceeds 70% of the rated motor current, “E-“ and “820” in the displays will blink only while no operation at the front panel is carried out. When pressing any key or starting welding again, “E” and “820” in the displays will disappear (, but welding power source does not stop automatically). In this case, check for short circuit in the motor power transmission line, rough feeding of wire, and an error in the torch or the wire feeder. Refer to Section 10.2.1(10) “Setting of Feed Motor Load Current Error Detection Level”.

11. APPLIED FUNCTION (continued)

11) E-830 Display

If “E-“ and “830” in the displays blink, it indicates the “Motor overcurrent”.
If short circuit in the power line to the motor or motor overload happens, “E-“ and “830” in the displays will blink and the welding machine will automatically stop. In this case, check for short circuit in the power supply line, rough feeding of the wire, and an error in the torch or the wire feeder.

12) E-900 Display

If “E-“ and “900” in the displays blink, it indicated the “Microcomputer error-1”.
There could be an error in the built-in microcomputer, Please contact your dealer immediately. When contacting your dealer, you are required to provide the details of the problem you are facing.

13) E-910 Display

If “E-“ and “910” in the displays blink, it indicated the “Microcomputer error-2”.
There could be an error in the built-in microcomputer, Please contact your dealer immediately. When contacting your dealer, you are required to provide the details of the problem you are facing.

11. APPLIED FUNCTION (continued)

⚠ WARNING

Observe the following to prevent electrical shock.

- **Do not touch charging parts inside or outside the welding machine.**
- **Grounding to the case of the welding power source should be performed by persons qualified electric work and according to the laws and regulations in your area.**
- **When touching the parts inside the welding power source, wait more than three minutes after powering off all input power supply by turning off the line disconnect switch in the switch box.**

⚠ CAUTION

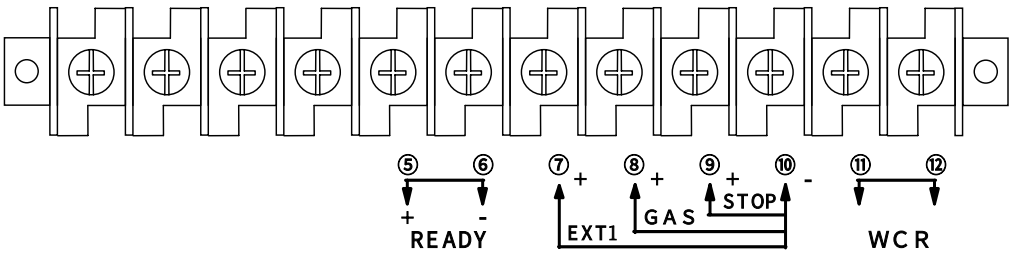
- **Try to move the control cable which is pulled out from the automatic connection terminal on the chassis father away from the welding power cable or the torch cable when making an external connection. Otherwise, equipment failure may be caused by noise, etc., during welding operation.**
- **Do not pull out the wiring on the printed circuit board to outside except the wiring to the external connection terminal block.**

11.2 External Connection of Inside Terminal Block of Automatic Machine

When taking off the upper cover of the welding power source, you will find there is a 12P terminal block (TM1) on the chassis. Use the 12p terminal block to connect with an automatic machine. Refer to Section 12, “Parts layout” for the locations of the terminal blocks.

NOTE: Wait more than three minutes after turning off the line disconnect switch or no-fuse breaker and the power switch on the front panel to remove the cover.

NOTE: Break the grommet with filter located on the rear side of the welding machine to lead in the external connecting wires. When leading in the external connection wires, do not touch the parts on the printed circuit board and the edges of the steel plate.



[12P terminal block]

11. APPLIED FUNCTION (continued)

12P terminal block (TM 1)

Pin No.	Signal name	Function	
①②③④	Unused		
⑤+ — ⑥-	READY (OUTPUT) Ready Power	The terminals used for ready power for prep. relay. When there is not any error such as open phase, Operation Stop, output overcurrent, and thermal overload, the terminals work, etc. while the power switch is on, ⑤ and ⑥ terminals are short-circuit through the output transistor.	*1
⑦+ — ⑩-	EXT1 (INPUT) Extra Input Signal 1	The terminals used for special specifications. These terminals should not be used for normal use.	*2
⑧+ — ⑩-	GAS (INPUT) Solenoid Valve Control	The terminals used for controlling the gas solenoid valve by external signals. (If the terminals are short-circuited, the gas valve will open.)	*2
⑨+ — ⑩-	STOP (INPUT) Operation Stop	To stop welding externally. Release the wiring between two terminals to run Operation Stop. Welding machine is stopped by running Operation Stop. Close the terminals after turning off the torch switch to restart welding. To avoid accidental restart, use of a Pushlock Turn reset switch is suggested.	*2
⑪+ — ⑫-	WCR(OUTPUT) Welding Current Detection	Contact Output of welding current relay used for detection of welding current. The contacts close while welding current is flowing.	*3

NOTE:

Precaution for connection with terminals on the terminal block
The wires from the terminal blocks should be twisted for each signals to avoid accidental operation. Take care that the wires form the terminal blocks do not cross other signal wires from other welding power source.

*1 Equivalent circuit is as the figure shown right. Maximum capacity of TR is 80V, 100mA. When connecting such as relay to two terminals, do not exceed 80% of the maximum capacity of TR. (Figure 1)

*2 Equivalent circuit is as the figure shown right. Connect allowable contacts (10mA or more) to two terminals. (Figure 2)

*3 Rating of the provided relay contacts is 125V AC, 0.5V, 30V DC, 1A. Do not exceed 80% of the rating of the provided relay contacts.

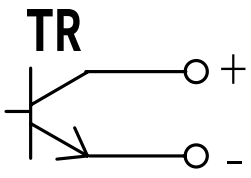


Figure 1

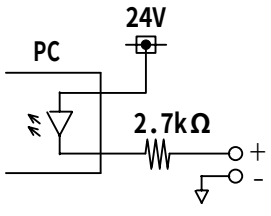


Figure 2

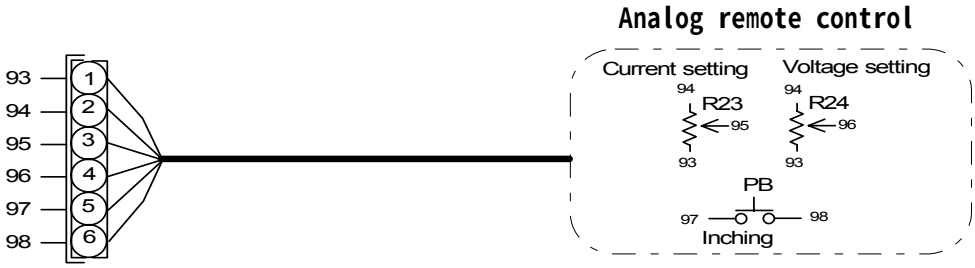
11. APPLIED FUNCTION (continued)

11. 3 Combining with an Automatic Machine

When combining with an automatic machine, use the external receptacles and the sockets for remote control or for wire feeder. Refer to Section 11.4, “External Connection of the Inside Terminal Block of the Automatic Machine” for the details of the terminal block inside the welding power source.

(1) Current/Voltage Settings and Inching Signal

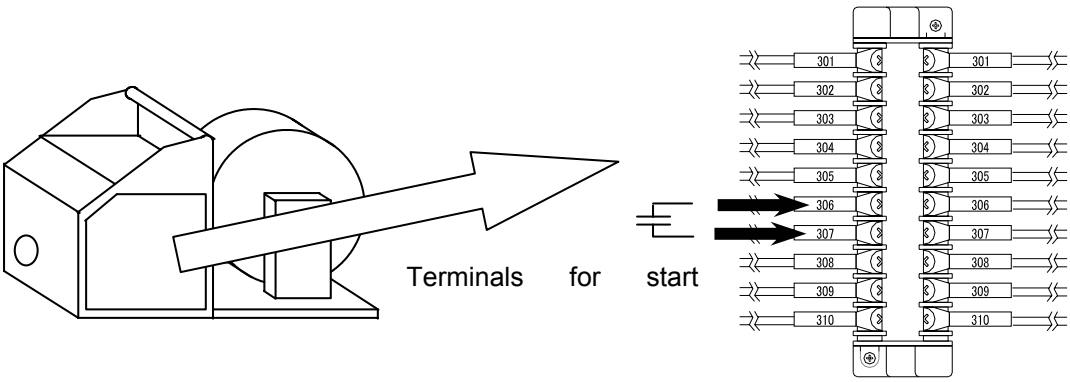
As the analog remote control (optionally supplied) is replaced in use, resistor R23 for current setting, resistor R24 for voltage setting, and switch PB for inching, which are all listed in Section 13.1 “Parts List”, should be used. For setting current/voltage on external voltage, refer to Section 10.2.1(4), “Selection of Auto/Semi-automatic”.



(2) Start Signal

When removing the right-side plate of the wire feeder, you will find a 10P terminal block. See the figure below. Welding is carried out by the start signal when terminals of wiring numbers 306 and 307 are closed. Welding stops when the terminals are open.

*Outgoing lines of start signal and direct detection signal are located next to the 10P control cable. Break the grommet with film.



11. APPLIED FUNCTION (continued)

11.4 Optional Accessories

11.4.1 Other Optional Accessories

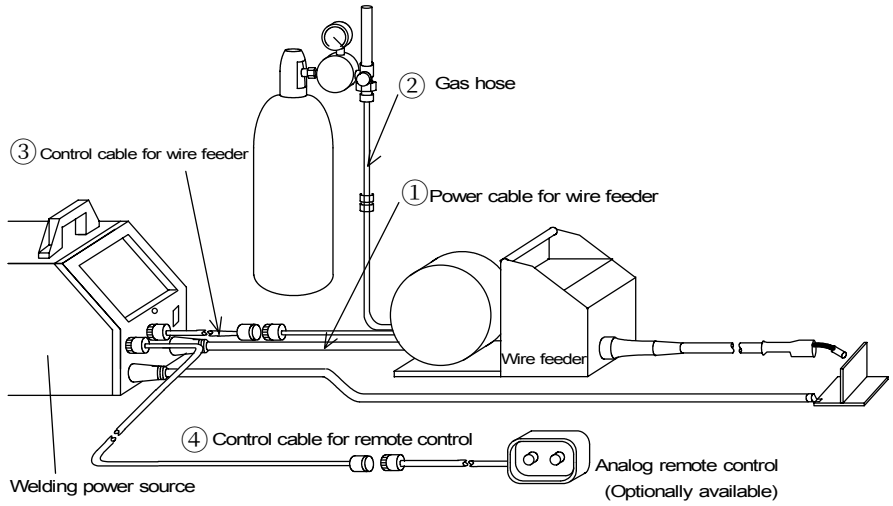
Description	Part No.	Remarks
Analog remote control	K5416H00	With a 10ft. (3m) cable
Digital remote control	E-2457	The cable is not included
CAN I/F board	K5416D00	
Wheel kit	K5416B00	

11.4.2 Extension Cable/Hose (Extension of Work Space)

⚠ CAUTION

- **Do not connect an unnecessarily long extension cable.**
- **When using an extension cable, roll it out. Failure to observe the demand may result in unstable arc.**

Choose a proper torch cable (separately sold) for work space. When extending the work space, use other extension torch cables/hoses (separately sold) that match the work space.



11. APPLIED FUNCTION (continued)

1. Power Cable (for torch and for base metal)

	16ft.(5m)	33ft.(10m)	49ft.(15m)	66ft.(20m)
Model	BKPDT-3807	BKPDT-3812	BKPDT-3817	BKPDT-3822

2. Gas Hose (for CO_2, MAG, MIG)

	16ft.(5m)	33ft.(10m)	49ft.(15m)	66ft.(20m)
Model	BKGG-0605	BKGG-0610	BKGG-0615	BKGG-0620

3. Control Cable for Wire Feeder (10 P)

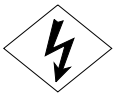
	16ft.(5m)	33ft.(10m)	49ft.(15m)	66ft.(20m)
Model	BKCPJ-1005	BKCPJ-1010	BKCPJ-1015	BKCPJ-1020

4. Control Cable for Analog Remote Control (6P)

	16ft.(5m)	33ft.(10m)	49ft.(15m)	66ft.(20m)
Model	BKCPJ-0605	BKCPJ-0610	BKCPJ-0615	BKCPJ-0620

12. MAINTENANCE AND TROUBLESHOOTING

⚠ WARNING



To avoid electric shock, follow the below instructions.

- **Do not touch live electrical parts inside or outside the welding machine.**
- **Turn off all of the line disconnect switches before touching the parts inside the welding machine.**
- **Perform the maintenance checks periodically. If any damaged parts are found, only use the welding machine after troubleshooting or repairing.**
- **Only certified operators should maintain, inspect, or repair the welding machine.**
- **When carrying out the maintenance, wait more than three minutes after powering off all input power supply by turning off the line disconnect switch in the switch box. Capacitor may be discharging even after powering off all input power supply. Check to make sure that charging voltage does not exist before carrying out the maintenance.**
- **This welding power source uses a high-frequency inverter system, be careful of accidental connection of the line disconnect switch at input side.**
- **Have qualified operators or the persons familiar with this welding power source test withstand voltage. And install a protective wall around the welding machine to keep away others from the welding machine.**

⚠ CAUTION

Rotating parts may cause injuries. Be sure to observe the following.

- **Only certified operators should maintain, inspect, or repair the welding machine.**
- **Install a fence around the welding machine to keep others away from it.**
- **Do not put your hands, fingers, hair and clothes near the fans and wire feed roll rotating.**

⚠ CAUTION

- **Do not touch the parts for the main circuit which are located inside the power source, such as single-phase transformer, DC inductor, heat sink, etc. immediately after welding is performed, as the parts are extremely hot. Wait until the parts cool down, when touching. Failure to observe the demand may result in burn.**

⚠ CAUTION

- **The welding conditions (electronic information) stored using the JOB MEMORY keys are likely to be affected by occurrence of static electricity, and there is a possibility that the preset data contents may be changed or erased. We recommend taking notes of important data.**
- **We shall not assume any responsibility for any change or erase of the electronic information resulting from repair.**

12. MAINTENANCE AND TROUBLESHOOTING (continued)

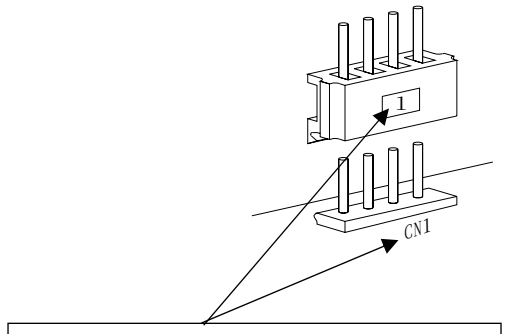
12.1 Carrying out Maintenance on the Welding Power Source

(1) Periodical checking
Periodically check the welding power source to ensure the safety of the equipment and the efficiency of work.

- Check the following daily:
  - No strange vibration, buzzing noise, and smell are generated from the welding power source.
  - No excessive heat is generated from the cable connections.
  - Fan functions properly when the power switch is turned on.
  - The switches properly function.
  - Connection and insulation of cables are surely made.
  - There are no break in cables.
  - Fluctuation of power source voltage is not large.
  - Case Earth is surely connected. (Disconnection of the Case Earth may result in failure or malfunction of the equipment.)
- Check the following each three to six months:
  - There is no damage inside the torch.
  - There are no loose connections or no poor contacts caused from rust, on input side of the welding power source and output side of the cables.
  - There is no trouble with insulation.
  - The welding power source is properly grounded.
  - Built-up dust on the transistor or the cold plate on the rectifier may affect the equipments. Take off the cover of the welding power source once a half year, then remove dust by blowing moisture-free compressed air on each part.
  - The dust protective filter located on the inlet of the fan does not clog, which may result in damage to the welding power source. Be sure to inspect it periodically.

12.2 Precaution for Replacement of the Printed Circuit Board

- Make sure that the connector number inscribed on the printed circuit board matches the number marked on the connector.
- Turn off the control power switch and line disconnect switch before carrying out maintenance on the welding power source, and wait three minutes until the capacitors inside the welding power source discharge.
- This welding power source uses a high-frequency inverter system, be careful of accidental connection of the line disconnect switch at input side.

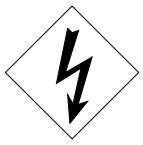


NOTE: Match the number on the printed circuit board with that on the connector.

- Surely connect the connectors until the connector clicks. Failure to do so may result in damage to the printed circuit board and the welding .
- With the connectors disconnected, do not turn on the power switch on the front panel.
- Do not use organic solvent such as thinner, trichloroethylene, gasoline, etc., to clean the plastic cover and carrying handle of the welding machine. Deformation and flaw may result from the adherence of the organic solvent.

12. MAINTENANCE AND TROUBLESHOOTING (continued)

12.3 Insulation Resistance Test

⚠ WARNING	
	**Observe the following to prevent an electrical shock.**
When touching charging parts, a critical electric shock and burn may occur. ● **Have qualified operators or the persons familiar with this welding power source measure insulation resistance and test withstand voltage . And install a protective wall around the welding machine to keep away others from the welding machine. Check to make sure that charging voltage does not exist before carrying out the maintenance before carrying out measurement of insulation resistance and withstand voltage test.**	

When measuring insulation resistance and testing withstand voltage, follow the steps below. And, refer to the schematic diagram, parts layout, and parts list for maintenance.

1. Disconnect the grounding cable (wiring number: 80) from the earth.
2. Short-circuit on AC side and DC side of DR1.
3. Short-circuit between TR1 (C1) and (E1), TR2(C2) and (E2), TR3(C2) and (E2).

Be sure to reconnect the cables after carrying out measurement of insulation resistance and withstand voltage test.

12.4 Replacement of Batteries

This welding power source uses lithium batteries to hold welding conditions in memory. The life of the batteries differs depending on the environments. “E-“ and “600” shown in the displays on the front panel blinks when the batteries gets low. Replacement of the batteries every 5 years or so are recommended even when “E-“ and “600” do not blink. Replace the batteries following the steps:

1. Turn off the line disconnect switch in the switch box or the no-fuse breaker, and the power switch of the welding power source.
2. After more than three minutes, remove six screws that secure the front panel, and then pull the front panel out. Do not pull it forcibly. With the wiring inside the equipment disconnected, do not turn on the power switch. Failure to do so may result in damage to the welding power source.
3. Remove the connectors on the P.C.B.P10263R to replace the printed circuit board. Refer to the position for “Rear side of the front panel” in Section 12.7, “ Parts List”.
4. Insert the disconnected connectors into the P.C.B.P10263R.
5. Screw the front panel in position.

12. MAINTENANCE AND TROUBLESHOOTING (continued)

12.5 Troubleshooting

When an error code is displayed, refer to Section 11.1, “How To Solve an Error”.

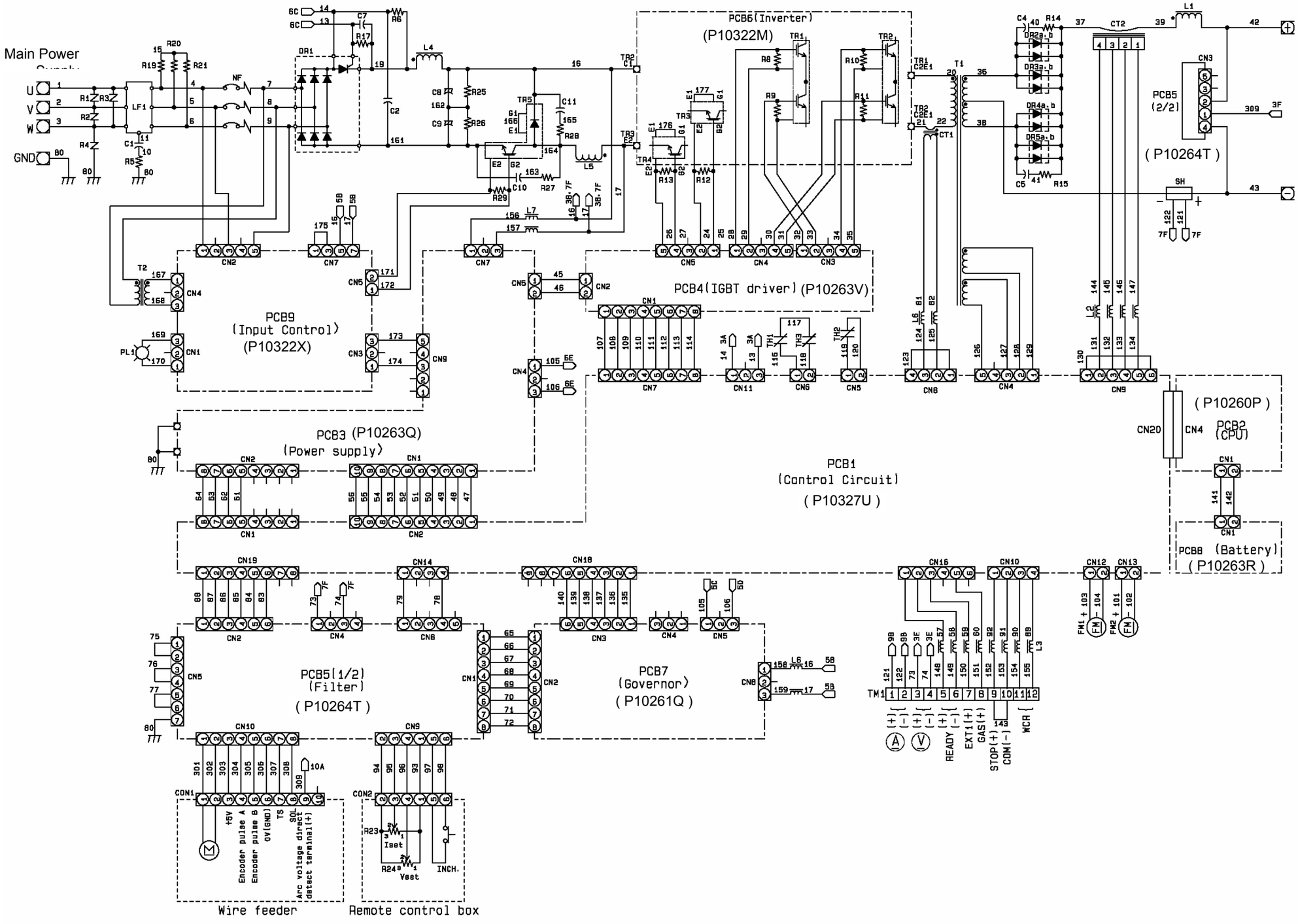
- Check the troubleshooting information listed below before contacting your dealer for service.

No.	Trouble		Cause	Solution
1	The power switch on the front panel is tripped.	Never turn it on again. Contact your dealer.		
2	The main power lamp PL1 will not light.	When turning on the power switch, the displays light.	Trouble with PL1.	Inspect PL1.
		When turning on the power switch, nothing appears in the display.	The line disconnect switch in the switch box is not turned on.	Inspect the power box.
			The input cables are not surely attached.	Inspect the input cables.
3	When turning on the power switch, nothing appears in the display.	The main power lamp PL1 will not light.	Refer to No.2 in this list.	
		PL1 lights.	Shortage of the input voltage	Check for proper input voltage.
			Trouble of the power circuit.	After inspecting PCB P10263Q, PCB P10322X, replace it if necessary.
4	When turning on the power switch, the WARNING and TEMPERATURE lamps light up and an error code appears in the display,		Refer to Section 11.1, “How To Solve an Error”.	
5	Shield gas is not generated when the torch switch is pressed.	Gas is not generated when the GAS CHECK key is pressed.	The discharge valve of the gas cylinder is closed.	Open the gas valve.
			Lack of gas pressure of the gas cylinder.	Check for proper gas pressure.
			Trouble of the gas electromagnetic valve SOL.	Inspect the gas electromagnetic valve SOL.
		Gas is generated when the GAS CHECK key is pressed.	Disconnection of the torch switch cable or incomplete insertion to receptacle.	Check the wiring numbers 306 and 307.
6	Shield gas does not stop.		The GAS CHECK lamp lights up.	Stop gas checking by pressing the GAS CHECK key.
			Trouble with the gas solenoid valve SOL	Check for operation of the gas solenoid valve of wire feeder.
7	When the torch switch is pressed, no-load voltage is not output but shield gas is generated.		Trouble with the inverter main circuit	Turn off the power switch, then contact your dealer.
			Trouble with the control circuit	After inspecting PCB P10260P or P10322U replace it if necessary.

12. MAINTENANCE AND TROUBLESHOOTING (continued)

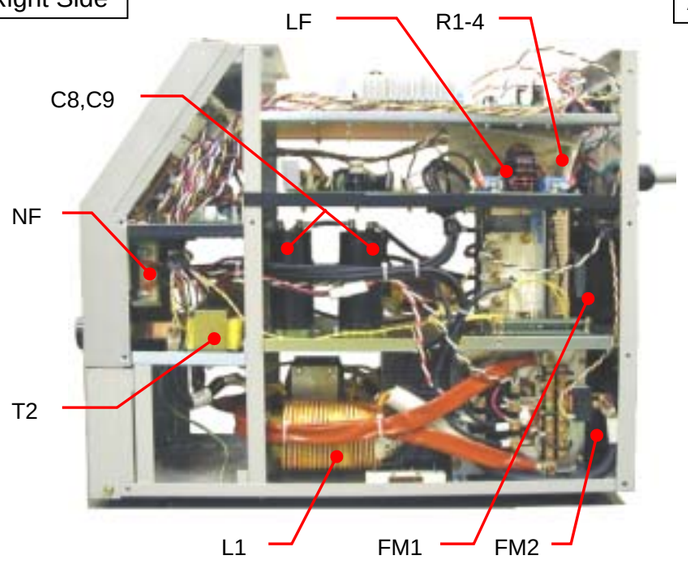
No.	Trouble	Cause	Solution
8	Current and voltage can not be set.	Trouble with the control circuit	After inspecting PCB P10260P or P10322U and replace it if necessary.
		Trouble with the filter circuit	After inspecting PCB P10264T, replace it if necessary.
		Trouble with the remote control	After inspecting the cable/plug for remote control or the remote control, replace them if necessary.
		Error in wire voltage detection	Inspect connections of CN4 on PCB P10322U.
9	Wire is not fed.	Incomplete insertion or breaking of the control cable for wire feeder	After inspecting the contacts of the plug and cable, replace them if necessary.
		Trouble with the motor control circuit	After inspecting PCB P10263Q, replace it if necessary.
		Trouble with the filter circuit	After inspecting PCB P10264T, replace it if necessary.
10	WCR keeps working.	Trouble with the hole current detector CT2	Inspect the hole current detector CT2.
		Trouble with the WCR circuit	After inspecting PCB P10260P, replace it if necessary.

12.6 Schematic Diagram

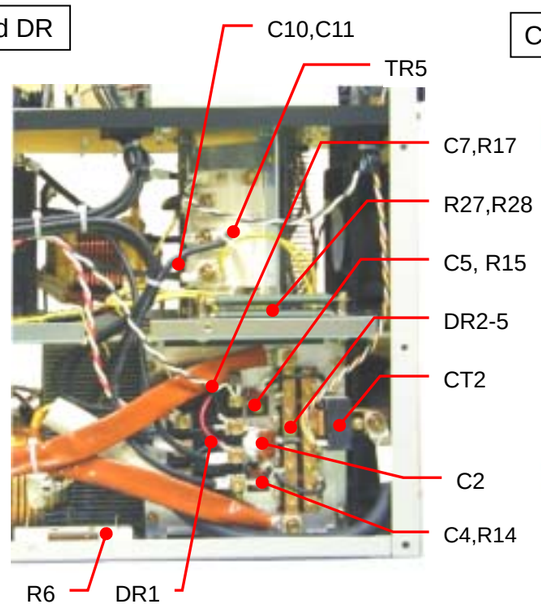


12.7 Parts Layout

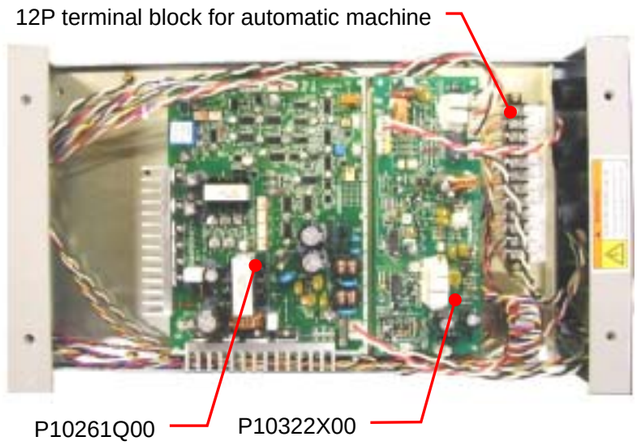
Right Side



Around DR

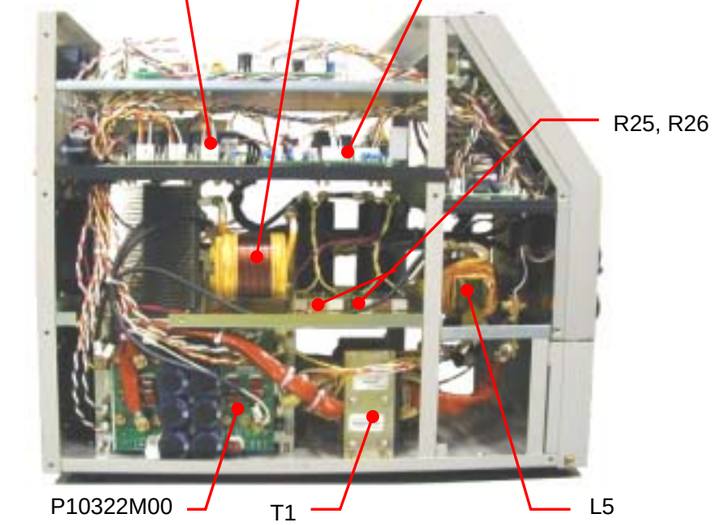


Chassis



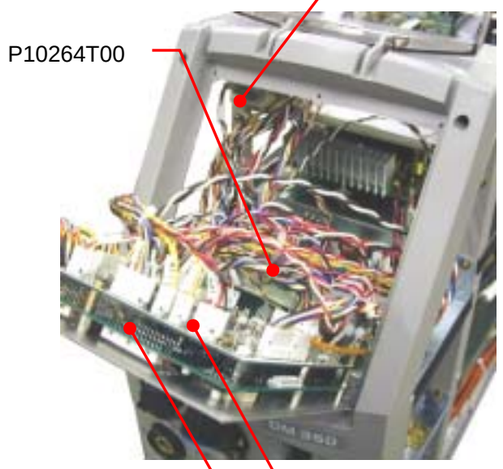
Rear Side

Left Side

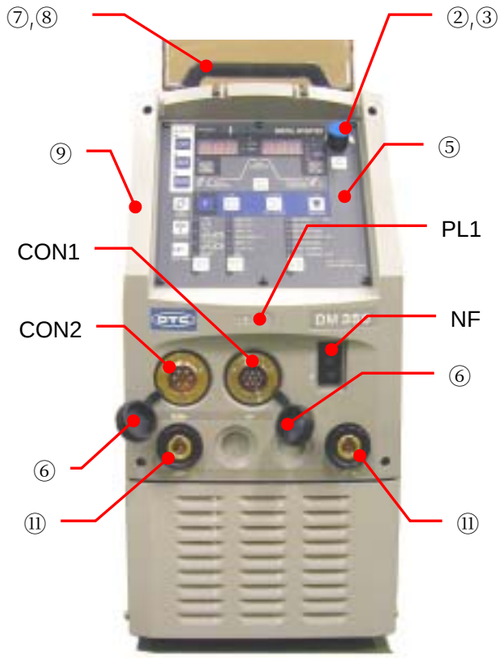


TR1 – 4
(located under P10327M00)

Back Side of Front Panel



Front Side



13. PARTS LIST

- Please contact your dealer to order parts. (See the back cover for telephone and fax numbers, and mailing addresses.)

Symbol	Part No.	Description	Specifications	Q'ty	Remarks
NF	4614-101	Circuit protector	CB3-XO-10-072-42D-C	1	
LF	4519-036	Line filter	FS5681-33-99	1	
PL1	4600-341	Pilot lamp	NPA10-2H-WS	1	
DR1	4531-717	Diode module	DFA150AA160	1	
DR2 – 5	4531-308	High speed diode module	DBA200UA60	4	
TR1,2	4534-407	IGBT module	2MBI150TA-060	2	
TR3,4	4534-407	IGBT module	2MBI150TA-060	2	
TR5	4534-415	IGBT module	SKM200GB128D	1	
CT1	4810-030	Current transformer	TMH0.025X5X25X35	1	
CT2	4406-009	Hole current detector	HA400S3EH	1	
T1	P10260B00	Inverter transformer	P10260B00	1	
T2	4810-351	Aux. transformer	W-W02921	1	
L1	P10260C00	DC reactor	P10260C00	1	
L2,3,6	4739-497	Ferrite core	E04RA400270150	3	
L4	P10322L00	Primary reactor	P10322L00	1	
L5	P10322C00	Choke coil	P10322C00	1	
THP1	4258-024	Thermostat	US-602AXTTL 130℃	1	
THP2	4258-033	Thermostat	67L070	1	
THP3	4615-057	Thermostat	67L080	1	
FM1,2	4805-074	Fan	4715SL-05W-B60-D00	2	
R1 - 3	4536-119	Surge absorber	ENC911D－14A	3	
R4	4536-119	Surge absorber	ENC911D－14A	1	
R5	4509-018	Metal oxide film resistor	RS2B 510 OHM	1	
R6	4509-819	Cement resistor	40SH 200ΩJ	1	
R8 - 13	4509-704	Carbon resistor	RD1／4W 1kΩJ	6	
R14,15	4509-121	Metal film resistor	RNP－50SC 10ΩF	2	
R17	4509-704	Carbon resistor	RD1/4W 1kΩJ	1	
R19-21	4509-128	Metal oxide film resistor	RS2B 200kΩJ	3	
R25,26	4509-883	Cement resistor	20SH 20kΩJ	2	
R27	4504-413	Non-Inductive resistor	NCRF22V 5 ΩJ	1	
R28	4504-322	Non-Inductive resistor	NCRF22V 20 ΩJ	1	
R29	4509-704	Carbon resistor	RD1／4W 1kΩJ	1	
C1	4517-452	Ceramic capacitor	0.0022μF 2kV	1	
C2	4518-530	Film capacitor	US16X154JAASA	1	
C4,5	4518-519	Film capacitor	MIC-ST3D182J	2	
C7	4518-402	Film capacitor	0.47μF 50V	1	
C8,9	4511-251	Aluminum electrolytic capacitor	W-W02212	2	
C10,11	4518-528	Film capacitor	US20X103JAASA	2	
SH	4403-116	Meter shunt	KY400A 400A/60mV	1	
CON1	4730-421	Metal socket	HS25R-10	1	
CON2	4730-010	Metal socket	DPC25-6BP	1	
TM1	4739-505	Terminal block	TB-10-01 12P	1	

13. PARTS LIST (continued)

Symbol	Part No.	Description	Specifications	Q'ty	Remarks
PCB1	P10322U00	Printed circuit board	P10322U00	1	
PCB2*	P10260P00	Printed circuit board	P10260P00	1	Refer to "NOTE" below.
PCB3	P10263Q00	Printed circuit board	P10263Q00	1	
PCB4	P10263V00	Printed circuit board	P10263V00	1	
PCB5	P10264T00	Printed circuit board	P10264T00	1	
PCB6	P10322M00	Printed circuit board	P10322M00	1	
PCB7	P10261Q00	Printed circuit board	P10261Q00	1	
PCB8	P10263R00	Printed circuit board	P10263R00	1	
PCB9	P10322X00	Printed circuit board	P10322X00	1	
①	4739-474	Grommet with film	W-W02805	2	
②	4735-038	Knob	K-100 22RSB	1	Adjusting knob
③	4735-039	Cap	K-100 22CSBL	1	
④	4739-475	Rubber foot	C-30-RK-3220	4	
⑤	P10322W02	Control panel sheet	P10322W02	1	
⑥	4739-476	Cap	W-W02814	2	
⑦	P5801G03	Carrying Handle	P5801G03	2	
⑧	P10263G12	Bush	P10263G12	4	
⑨	P10260J01	Front cover	P10260J01	1	
⑩	P10263J02	Control panel cover	P10263J02	1	
⑪	4734-007	Machine socket	DIX BE 50/70	2	Output terminal
	4734-016	Power cable connector	DIX SK 70	2	For ⑪

***NOTE: When ordering a printed circuit board P10260P00, provide the software version on a label below a nameplate attached to the rear side of the welding power source.**

P10322 Ver. ###.###.000

Replace the ###.### with software version.

Parts list for analog remote control (optional accessories)

Symbol	Part no.	Description	Specifications	Q'ty	Remarks
R23,24	4501-039	Variable carbon resistor	RV24YN20SB 5KΩ	2	
PB	4250-077	Push button switch	A2A-4R	1	
	4730-009	Metal socket plug	DPC25-6A	1	
	4735-007	Knob	K-2195 (large)	2	
	K5416H02	350/500A scale plate	K5416H02	1	

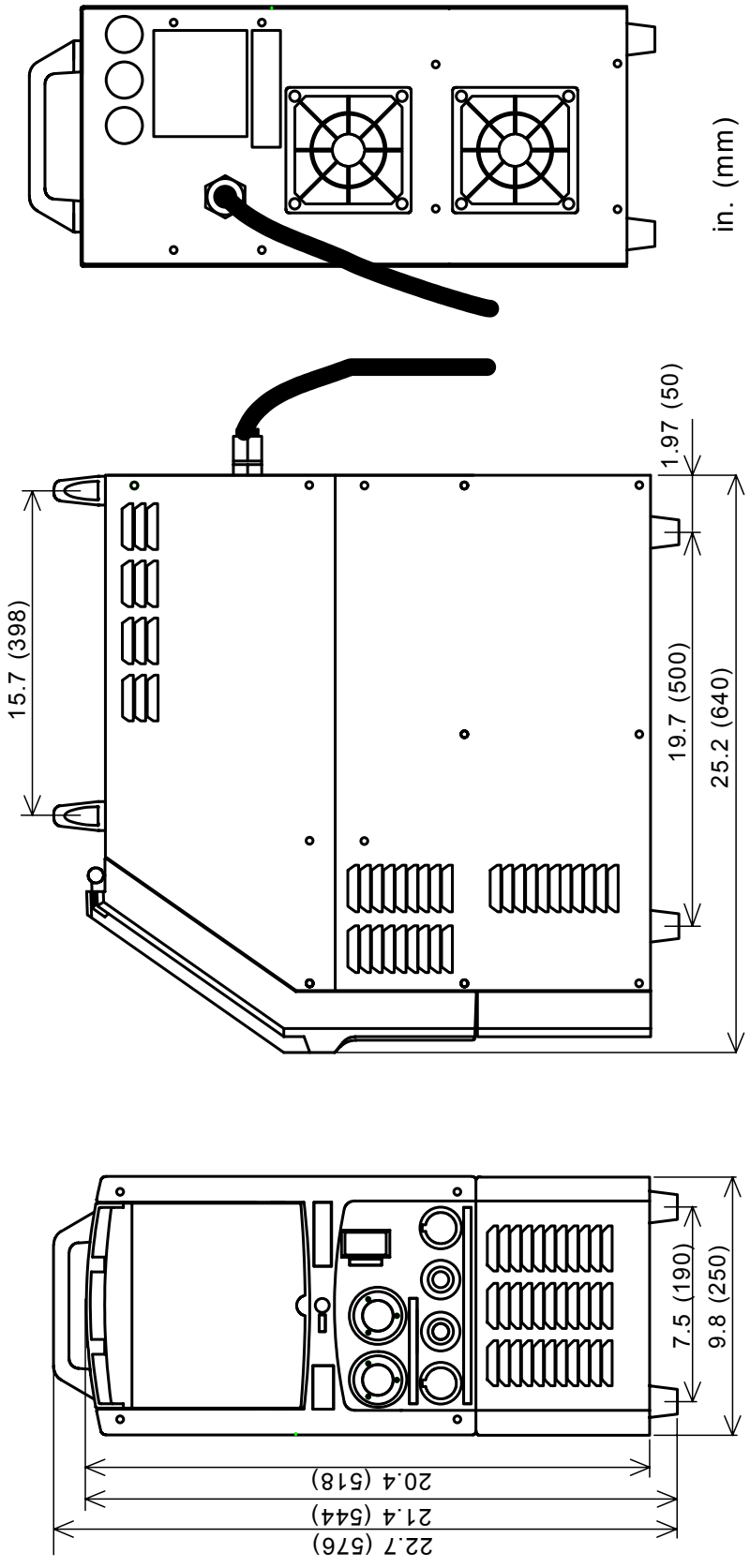
14. SPECIFICATIONS

(1) Welding power source

Specifications \ Model	Digital Inverter DM350	
Model	DM-350	
Static characteristic	Constant voltage characteristic	
Number of phase	Three phase	Single phase
Rated frequency	50 / 60 Hz	
Rated input voltage	208 V / 230 V / 460 V	230 V / 460 V
Input voltage range	187 - 253V, 414 - 506 V	207 - 253V, 414 - 506 V
Rated input	16.3 kVA, 13.5kW	11.6 kVA, 8.6 kW
Rated input current	40.8A / 36.9A / 20.5A	45.2A / 25.3A
Rated output current	350 A	250 A
Rated no-load voltage	31.5 V	26.5 V
Rated output current range	30 - 350 A	30 - 250 A
Rated output voltage range	12 - 36 V	12 - 31 V
Maximum no-load voltage	67 V	
Rated duty cycle	60 %	
Number of welding condition	30	
Temperature rise	+320 ˚F (+160 ˚C)	
Usable temperature range	+14 ˚F - +104 ˚F (-10 ˚C - +40 ˚C)	
Usable moisture range	20 - 80% (without dew condensation)	
Storage temperature range	+14 ˚F - +140 ˚F (-10 ˚C - +60 ˚C)	
Storage moisture range	20 % - 80 % (without dew condensation)	
External dimensions(W x D x H) without the carrying handle	9.84 in. x 25.2 in. x 21.6 in. (250 mm x 640 mm x 548 mm)	
Degree of protection	IP 21S	
Mass	85.8 lb (39 kg)	

14. SPECIFICATIONS (continued)

14.2 External View



14. SPECIFICATIONS (continued)

●Initial Values and Setting Range of Parameter

		Initial value	Setting range
Pre-flow time		0.1 second	0 – 10 seconds
• Initial condition • Main condition • Crater filler condition	Current	30 A	30 – 400 A (30 - 270 A on single phase input) 15-865 IPM (0.4 – 22.0 m/min.)
	Voltage	10 V	5 – 38 V (5 - 27 V on single phase input)
	Fine adjustment of voltage	0	-30 – 30
Post-flow time		0.1 second	0 – 10 seconds
Arc spot time		3 seconds	0.1 – 10 seconds
Arc characteristic		0	-99 – 99
JOB Memory numbers		1	1 – 30

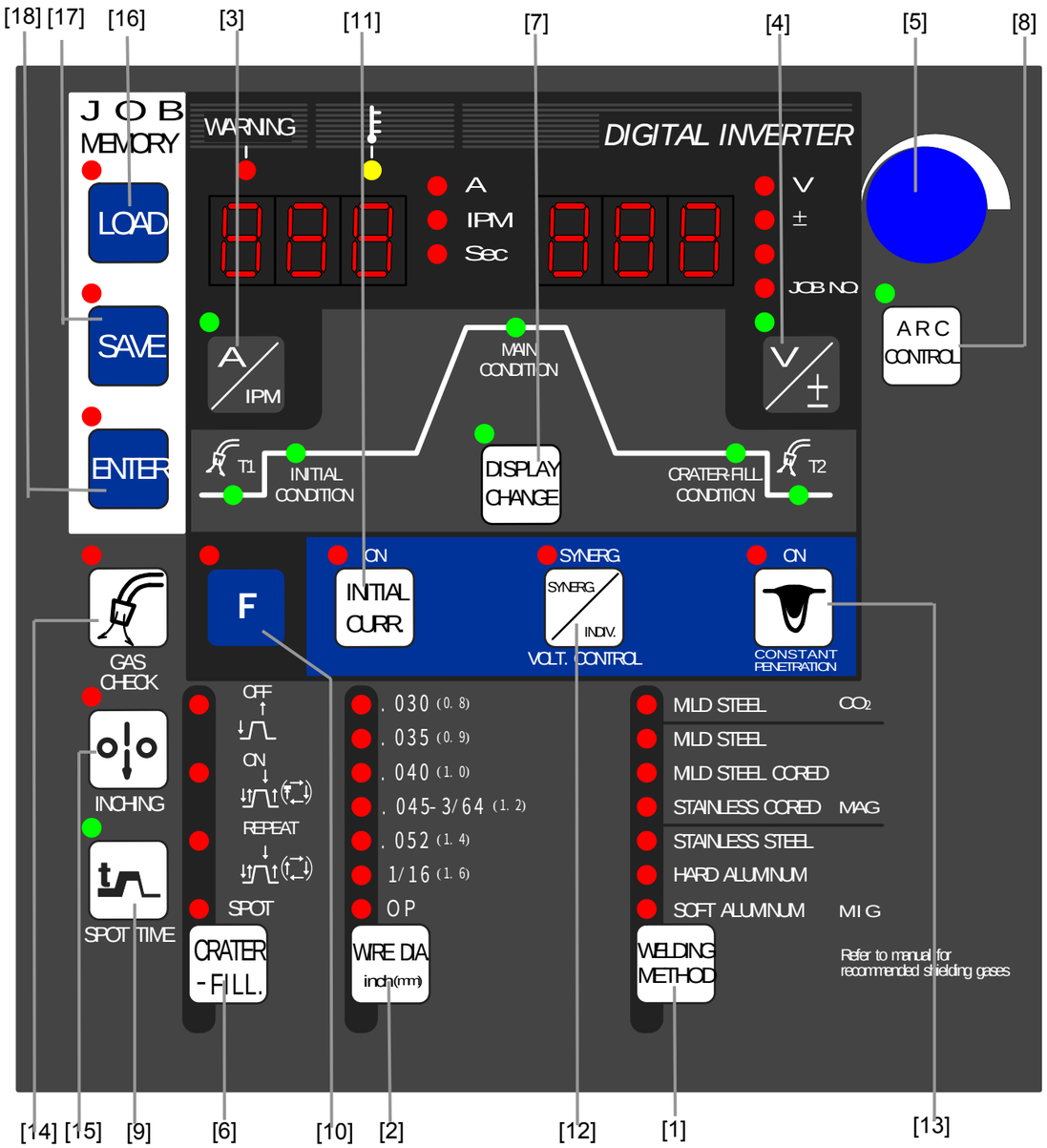
●Functions

	Initial value	Setting item
Crater	OFF	OFF/ON/ REPEAT/SPOT
Welding method	MILD STEEL /MAG	MILD STEEL SOLID / CO_2 MILD STEEL SOLID / MAG MILD STEEL CORED / CO_2 STAINLESS STEEL SOLID / MIG STAINLESS CORED / MAG SOFT ALUMINUM / MIG HARD ALUMINUM / MIG
Wire diameter	0.045	0.030 / 0.035 / 0.040 / 0.045 / 0.052
Initial current	OFF	ON/OFF
Adjustment of welding voltage	INDIVIDUAL	SYNERGIC/INDIVIDUAL
Penetration control	OFF	ON/OFF

●Internal Functions <Refer to Section 10.2.1, “Using of internal functions >

		Initial value	Setting range
F1	Fine adjustment of anti-stick (burnback) time	0	-50(0.50 second down) – 50(0.50 second up)
F2	Fine adjustment of anti-stick (burnback) voltage	0.0	-9.9 – +9.9 V
F3	Fine adjustment of slow-down speed	0.0	-35 - +35 in. (-1.0 - +1.0 m/min.)
F4	Selection of automatic/semi-automatic	OFF	ON(AUTOMATIC)/OFF(SEMI-AUTOMATIC)
F5	10 V MAX external setting voltage	OFF	ON(VALID)/OFF(INVALID)
F6	Setting of up-slope time	0.0	0 – 10.0 seconds
F7	Setting of down-slope time	0.0	0 – 10.0 seconds
F8	Result display holding time	20	5 – 60 seconds
F9	Selection of scale plate of analog remote control	350	200/350/500
F10	Setting of feed motor load current error detection level	70	20 – 150 %
F11	Fine adjustment of JOB MEMORY	OFF	**ON** (VALID) /**OFF** (INVALID)
F12	Setting of Soft Arc Mode	OFF	**ON** (SOFT) /**OFF** (STANDARD)

10. Front Panel



[1] WELDING METHOD key	[9] SPOT TIME key	[17] SAVE key
[2] WIRE DIA In.(mm) key	[10] F (FUNCTION) key	[18] ENTER key
[3] A / IPM selector key	[11] INITIAL CURR. key	
[4] V / ± selector key	[12] VOLT. CONTROL key	
[5] Parameter adjusting knob	[13] CONSTANT PENETRATION key	
[6] CRATER-FILL key	[14] GAS CHECK key	
[7] DISPLAY CHANGE key	[15] INCHING key	
[8] ARC CONTROL key	[16] LOAD key	

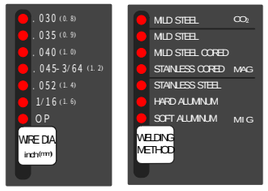
14. SPECIFICATIONS (continued)

QUICK MANUAL

Refer to Section 10.1, “Basic Settings”and Section 10.2, “Applied Settings”.

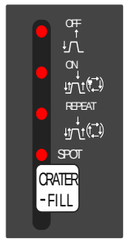
① Before Using the Welding Power Source

1. Settings of Welding Method



Set a welding method, then wire diameter by using the WELDING METHOD key, and the WIRE DIA. (In.) key respectively.

2. Settings of Crater/Arc Spot



Use the CRATER-FILL key to select OFF/ON/REPEAT/SPOT.

3. Settings of Functions

- For using INITIAL CURRENT, press the INITIAL CURR. key to set the function to “ON”.

  [ON]: INITIAL CURR. lamp is on.
  [OFF]: INITIAL CURR. lamp is off.

- For controlling voltage in the SYNERG. way, select “SYNERG.” by pressing the VOLT.CONTROL key.

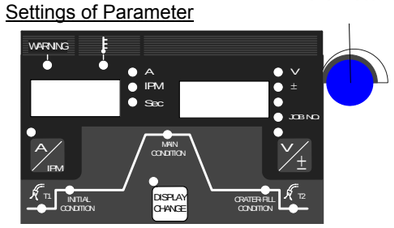
  [SYNERGIC]: VOLT. CONTROL lamp is on.
  [INDIVIDUAL]: VOLT. CONTROL lamp is off.

- For activating a CONSTANT PENETRATION function, set the function to “ON”.

  [ON]: CONTANT PENETRATION lamp is on.
  [OFF]: CONSTANT PENETRATION lamp is off.

4. Settings of Parameter

Parameter adjusting knob



Use the DISPLAY CHANGE key to select the parameter you want to set, then adjust it while turning the parameter adjusting knob.
When changing the parameter unit in the display, use the A/IPM or V/± selector key.

When adjusting SPOT TIME, press the SPOT TIME key, then set SPOT TIME while turning the parameter adjusting knob.

[ON]: SPOT TIME lamp is on.
[OFF]: SPOT TIME lamp is off.

To adjust the desired arc characteristic (HARD/SOFT), after turning on the ARC CONTROL lamp by pressing the ARC CONTROL key, set the level of the arc characteristic.

[ON]: ARC CONTROL lamp is on.
[OFF]: ARC CONTROL lamp is off.

NOTE:

- **Turning the parameter adjusting knob clockwise increases the parameter. To decrease the parameter, turn the parameter adjusting knob counter-clockwise.**
- **There may be unavailable parameters in some crater settings and function settings. Refer to Section 10, “OPERATION” for details**.

5. Checking the Rate of Gas Flow

Open the discharge valve of the gas cylinder, press the GAS CHECK key to check the rate of gas flow. After performing GAS CHECK, stop the gas flow by pressing the GAS CHECK key.

6. Inching the Wire

After pressurizing the wire mounted on the wire feeder using the pressure roll, feed the wire up to the end of the torch while using the INCHING key. When pressing the INCHING key again, the wire feeding stops.

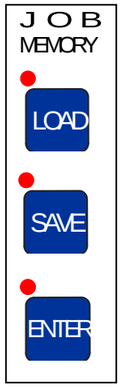
Now you have completed the preparations that are required to start welding. Press the torch switch to start welding.

② Protecting the Keys and Releasing the Key Protection

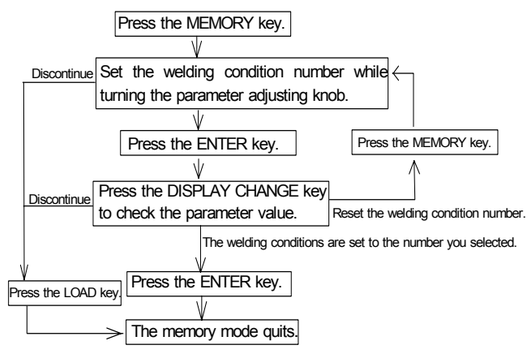
- Protecting of the keys
  Hold down the ENTER key + the F key at a time for a few seconds. The F lamp starts blinking. Blinking of the F lamp means the welding machine is in the key protection mode.

- Releasing the key protection
  Hold down the ENTER key + the F key at a time for a few seconds. When the F lamp turns off, the key protection function is released.

③ Presetting the Welding Conditions

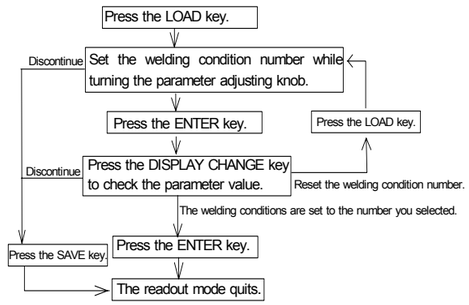


1) Pressing the SAVE key enters the save mode. The preset welding condition number is displayed in the right display and the welding current is displayed in the left display.
2) Preset the welding conditions to the desired numbers 0 - 100 while turning the parameter adjusting knob. When “---“ is displayed in the left display, the number you selected is available. When “---” is not displayed in the left display, the number you selected is unavailable. In this case, select another number. Otherwise, the welding conditions preset to the number are erased and overwritten with the welding conditions you newly set.
3) Press the ENTER key to check the parameter preset to the number.
4) When pressing the ENTER key again, the welding conditions are set.



④ Loading the Welding Conditions

1) Pressing the LOAD key enter the load mode. The preset welding condition number is displayed in the right display and the welding current is displayed in the left display.
2) Preset the welding conditions to the desired numbers 0 – 30 while turning the parameter adjusting knob. When “---“ is displayed in the left display, no welding conditions are preset to the number you selected.
3) Press the ENTER key to check for the parameter preset to the number.
4) When pressing the ENTER key again, the welding conditions preset to the welding condition number are retrieved.



⑤ Settings of the (Internal) Functions

1) When holding down the F key for a few seconds, the function mode is activated. The function number blinks in the left display, the function status is displayed in the right display.
2) Set the function number while turning the parameter adjusting knob.
3) When pressing the F key, the function number lights up, then the function status blinks.
4) Set the function status while turning the parameter adjusting knob.

No.	Displays on the front panel		Classification of errors
	Left	Right	
1	dAI	HEn	Torch switch off state waiting
2	E -	000	Operation stop
3	E -	200	Primary/ secondary current detection error
4	E -	210	Error in the voltage detection wire
5	E -	300	Thermal overload
6	E -	600	Replacement of battery (Warning)
7	E -	700	Output over current
8	E -	800	Encoder error for wire feeder
9	E -	810	Thermal overload in the governor circuit
10	E -	820	Motor overcurrent Warning
11	E -	830	Motor overcurrent Error
12	E -	900	Microcomputer error – 1
13	E -	910	Microcomputer error – 2

5) To cancel the function mode, hold down the F key for a few minutes.

15. SERVICE AND SUPPORT

Please contact your local dealer for service. (See the back cover for telephone numbers, fax numbers, and mailing addresses.)

NOTE:

1) **See Section 12, "MAINTENANCE AND TROUBLESHOOTING" before contacting your dealer for service.**
2) **When contacting your dealer for service, you are required to provide the following information:**
   - **Address**
   - **Name**
   - **Telephone number**
   - **Product model**
   - **Manufacture year**
   - **Serial number**
   - **Software version number**
   - **Details of troubles**